Documents of the World Administrative Radio Conference
to deal with matters relating to the maritime mobile service (WARC Mar)

(Geneva, 1967)

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 1-E(Rev.)
20 July 1967
Original : English

PLENARY MEETING

Note by the Secretary-General ad interim

AGENDA OF THE CONFERENCE

In accordance with Administrative Council Resolution No. 590, the Agenda of the Conference is as follows :

" To consider, and revise as necessary, the provisions of the Radio Regulations and of the Additional Radio Regulations pertaining to the Maritime Mobile Service including :

1. The use of single sideband technique in the Maritime Mobile Service in the bands available to that service between 1605 and 4000 kc/s and in the exclusive HF Maritime Mobile Radiotelephone bands.

2. Questions concerning the exclusive HF Maritime Mobile bands :

2.1 frequency bands for coast and ship radiotelephone stations in the 6 Mc/s band,

2.2 frequencies for intership radiotelephone traffic,

2.3 the possible use of the high traffic bands by tankers of 12,500 tons gross,

2.4 the desirability of accommodating requirements for oceanographic communications,

2.5 frequencies to be used by coast stations for wide band telegraphy, facsimile and special transmission systems.

3. Consequential revision of Appendices 15, 17 and 25 to the Radio Regulations.

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4. Possible revision of Appendix 18 to the Radio Regulations.

5. Classes of emission to be used on the international distress and calling frequencies 500 kc/s and 2182 kc/s.

6. Examination of the pertinent portions of the revised International Code of Signals.

7. Other matters relating to the Maritime Mobile Service :

7.1 data transmission from ship stations,

7.2 conditions for the use of emergency position-indicating beacons,

7.3 conditions for the use of selective calling devices,

7.4 hours of service for ship stations,

7.5 frequencies to be assigned for the transmission by television of port radar images,

7.6 the establishment of a separate category for mobile radiotelephone traffic on inland waterways."

Resolution No. 590, as amended by the Council during its 22nd Session, also states that agenda items 5, 7.2 and 7.3, which were questions under study by the C.C.I.R., would be dealt with by the Conference only if answers thereto were provided by the C.C.I.R.

The Oslo Plenary Assembly of the C.C.I.R. issued Recommendations and an Opinion on items 5 and 7.2 (see Document No. 2).

As regards item 7.3 on the conditions for the use of selective calling devices, it was not able to come to a conclusion, but a Special Meeting of C.C.I.R. Study Group XIII (Mobile Services) was convened in April last to continue to study the question. The Report of that Meeting was despatched to Administrations on 14 June.

Mohamed MILI
Secretary-General a.i.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 1-E
30 November, 1966
Original : English

PLENARY MEETING

Note by the Secretary-General

AGENDA OF THE CONFERENCE

In accordance with Administrative Council Resolution No. 590, the Agenda of the Conference is as follows :

" , To consider, and revise as necessary, the provisions of the Radio Regulations and of the Additional Radio Regulations pertaining to the Maritime Mobile Service including :

1. The use of single side-band technique in the Maritime Mobile Service in the bands available to that service between 1605 and 4000 kc/s and in the exclusive HF Maritime Mobile Radiotelephone bands.

2. Questions concerning the exclusive HF Maritime Mobile bands :

2.1 frequency bands for coast and ship radiotelephone stations in the 6 Mc/s band,

2.2 frequencies for intership radiotelephone traffic,

2.3 the possible use of the high traffic bands by tankers of 12,500 tons gross,

2.4 the desirability of accommodating requirements for oceanographic communications,

2.5 frequencies to be used by coast stations for wide band telegraphy, facsimile and special transmission systems.

3. Consequential revision of Appendices 15, 17 and 25 to the Radio Regulations.

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4. Possible revision of Appendix 18 to the Radio Regulations.

5. Classes of emission to be used on the international distress and calling frequencies 500 kc/s and 2182 kc/s.

6. Examination of the pertinent portions of the revised International Code of Signals.

7. Other matters relating to the Maritime Mobile Service :

7.1 data transmission from ship stations,

7.2 conditions for the use of emergency position-indicating beacons,

7.3 conditions for the use of selective calling devices,

7.4 hours of service for ship stations,

7.5 frequencies to be assigned for the transmission by television of port radar images,

7.6 the establishment of a separate category for mobile radiotelephone traffic on inland waterways."

However, Resolution No. 590 also states that agenda items 5, 7.2 and 7.3, which were questions under study by the C.C.I.R., would be dealt with by the Conference only if answers thereto were provided by the XIth Plenary Assembly of the C.C.I.R., Oslo, 1966.

The Plenary Assembly did, in fact, issue Recommendations and an Opinion on items 5 and 7.2 (see Document No. 2).

As regards item 7.3 on the conditions for the use of selective calling devices, it was not able to come to a conclusion, but the International Working Party of C.C.I.R. Study Group XIII (Mobile Services) has been reconvened in order to continue to study the question. The date of 1 April 1967 has been set for a progress report to be submitted.

M.B. SARWATE
Secretary-General

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Corrigendum to
Document No. 2-E
6 February 1967

PLENARY MEETING

Report by the Secretary-General

RECOMMENDATIONS AND OPINION OF THE C.C.I.R.
RELEVANT TO ITEMS 5 AND 7.2 OF THE AGENDA OF THE CONFERENCE

Does not concern the English text.

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 2-E
30 November 1966
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PLENARY MEETING

Report by the Secretary-General

RECOMMENDATIONS AND OPINION OF THE C.C.I.R.
RELEVANT TO ITEMS 5 AND 7.2 OF THE AGENDA OF THE CONFERENCE

The XIth Plenary Assembly of the C.C.I.R. adopted Recommendation 438, entitled "Use of classes of emission A2H and A3H on the distress frequencies 500 kHz and 2182 kHz respectively" which is relevant to item 5 of the agenda of the Conference (see Document No. 1). The text of this Recommendation appears in Annex 1 to this document.

The XIth Plenary also adopted Recommendation 439 entitled "Emergency position-indicating radio beacons operating on the frequency of 2182 kHz" and Opinion 25 entitled "Emergency position-indicating radio beacons" which are relevant to agenda item 7.2. Their texts will be found in Annexes 2.a) and 2.b) respectively.

M.B. SARWATE
Secretary-General

Annexes: 2

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ANNEX 1

RECOMMENDATION 438

USE OF CLASSES OF EMISSION A2H AND A3H ON THE DISTRESS FREQUENCIES 500 kHz AND 2182 kHz RESPECTIVELY

(Question 273 (XIII))

(1966)

The C.C.I.R.,

CONSIDERING

(a) that, for distress and safety purposes, the Convention for the Safety of Life at Sea (SOLAS) prescribes the use of classes of emission as assigned by the Radio Regulations, Geneva, 1959, (SOLAS London, 1960, Chapter IV, Regulations 9(e), 9(h) (i), 12(b), 12(f), 13(c), 13(f), 15(b) and 15(f));

(b) that for distress and safety purposes, the Radio Regulations, Geneva, 1959, prescribe for ships and survival craft:

- Class A2 emission on 500 kHz (see Nos. 974, 994, 995 and 1134);
- Class A3 emission on 2182 kHz (see Nos. 984, 994, 996 and 1337);

(c) that, to the maximum extent possible, amplitude-modulation systems should use single-sideband (SSB) emissions having characteristics in accordance with the relevant C.C.I.R. Recommendations (No. 670 of the Radio Regulations, Geneva, 1959) and that SSB operation be introduced as far as operationally required for radiotelephony in band 6 and band 7 (Recommendation No. 28 of the Administrative Radio Conference, Geneva, 1959);

(d) that in several countries, new marine transmitters are being designed which make use of SSB techniques;

(e) that SSB transmitters may easily and economically be adapted for Class A2H and Class A3H emission;

(f) that unless SSB emission is universally adopted in the MF maritime mobile service, there will be a need for communications between DSB and SSB stations;

(g) that practical and laboratory tests have proved that Class A2H emission on 500 kHz is as effective as Class A2, and Class A3H emission on 2182 kHz is as effective as Class A3 for alarm, distress, urgency and safety signals when received by stations equipped for DSB reception by aural means or automatic receiving equipment;

RECOMMENDS

1. that for alarm, distress, urgency and safety signals emission A2H on 500 kHz should be considered as effective as emission A2;

   Note: In order to ensure the correct operation of all types of radiotelegraphy automatic alarm equipments, both the carrier and modulating tone should be keyed;

2. that for alarm, distress, urgency and safety signals the emission A3H on 2182 kHz should be considered as effective as the emission A3.

Note: This Recommendation terminates the study of Question 273.

ANNEX 2.a)

RECOMMENDATION 439

EMERGENCY POSITION-INDICATING RADIO BEACONS
OPERATING ON THE FREQUENCY OF 2182 kHz

(Question 318(XIII))

(1966)

The C.C.I.R.,

CONSIDERING

(a) Recommendation 48 of the International Conference on Safety of Life at Sea, 1960;

(b) Report of the Inter-Agency Working Group (June, 1962), on Coordination of Safety at Sea and in the Air, reproduced in C.C.I.R. Doc. 393, Geneva, 1963;

(c) the Resolution A.91(IV), adopted on 27 September 1965 by the Fourth Session of the Assembly of the Inter-Governmental Maritime Consultative Organization (I.M.C.O.) and reproduced in C.C.I.R. Doc. XIII/71 (period 1963-1966);

(d) the Report of the Fourth Air Navigation Conference of the International Civil Aviation Organization (I.C.A.O.) (Montreal, 9 November - 3 December 1965) and reproduced in C.C.I.R. Doc. XIII/103 (period 1963-1966);

(e) that there is an urgent need for a beacon to indicate the position of survivors and to facilitate search and rescue operations at sea;

(f) that ships compulsorily fitted for radiotelephony are required to keep continuous watch on the frequency of 2182 kHz (see Regulation 7, Chapter IV of the International Convention for the Safety of Life at Sea, 1960);

(g) that it is desirable for the beacon signal to be received on the loudspeakers of the receiver which is equipped with filters for the two-tone alarm signal (1300 Hz and 2200 Hz respectively) and which is used for watch-keeping on 2182 kHz. This alarm signal is described in C.C.I.R. Recommendation 219 and Recommendation 33 of the International Conference of Safety of Life at Sea, 1960;

(h) that the type and sequence of the signal to be transmitted by the beacon should facilitate homing by ships as well as by SAR aircraft taking into account their different speeds;

(i) that the signal emitted by the beacon should as far as practicable be clearly distinguishable from the radiotelephone alarm signal transmitted by ships still afloat or by portable radio apparatus;

(j) that the signal emitted by the beacon should not create harmful interference to other distress calls and messages;

(k) that in the interest of high reliability and minimum expense the electronic and mechanical design of the beacon and especially of its keying device should be as simple as possible;

(l) that national and international trials under operational conditions have already been carried out successfully with such beacons;

RECOMMENDS

1. that Emergency Position-Indicating Radio Beacons operating on the frequency of 2182 kHz should be divided into two classes;

1.1 low power beacons designated "Type L" producing a field strength equal to or less than 10 microvolts per metre at a distance of 30 nautical miles at sea level;

1.2 high power beacons designated "Type H" producing a field strength greater than 10 microvolts per metre at a distance of 30 nautical miles at sea level;

2. that for both classes of beacon, class of emission A2 should be used;

3. that for both classes of beacon, the depth of modulation should be between 30 and 90 per cent;

4. that the keying signal for "Type L" beacons should consist of a keyed emission modulated by a tone of 1300 Hz (± 20 Hz) having a ratio of the period of the emission to the period of silence equal to or greater than 1, and an emission duration between 1 and 5 seconds;*

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* Beacons carried by ships of the U.S.A. may use instead of the signals given in paras. 4 and 5 a tone sweeping from 1400 Hz to 300 Hz not faster than twice a second.

5. that the keying signal for "Type H" beacons should either consist of the radiotelephone alarm signal (Radio Regulation 1465) or be the same as in section 4 above; if the radiotelephone alarm signal be used, the Morse letter "B" and/or the call sign of the ship to which the beacon belongs, should be included by keying a carrier modulated by a tone of 1300 Hz (± 20 Hz) or of 2200 Hz (± 35 Hz);*

6. that for "Type L" beacons the keying signal should be transmitted continuously;

7. that for "Type H" beacons the keying cycle should consist alternately of the keying signal having a duration between 30 and 50 seconds, followed by a period of silence having a duration between 30 and 60 seconds;

8. that the keying cycles given in paras. 6 and 7 may be interrupted by speech transmission if administrations permit such an additional facility;

9. that the minimum initial field strength produced by "Type L" beacons should be 2.5 microvolts per metre at a distance of 30 nautical miles at sea level;

10. that after a period of 48 hours continuous operation the radiated power should not be less than 20 per cent of the initial power;

11. that the beacons should be designed for the following temperature ranges:

    - when stowed, at least - 20°C to + 55°C;
    - when operating in the open air, at least - 10°C to + 45°C;
    - when operating afloat, at least - 3°C to + 35°C (water temperature);**

12. that if the beacons are designed to come into operation automatically when floating, then overriding facilities should be provided to enable them to be switched on and off manually;

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* Beacons carried by ships of the U.S.A. may use instead of the signals given in paras. 4 and 5 a tone sweeping from 1400 Hz to 300 Hz not faster than twice a second.

** Exceptionally, for radio beacons carried by ships operating in limited areas only, other temperature ranges may, due to special conditions in such areas, be accepted.

13. that beacons should be tested about every 12 months, care being taken to ensure that false alarms are not caused by radiating the signal;

14. that primary batteries for the beacons should have a minimum storage life of about 2 years, and primary batteries in the beacons should be replaced at intervals of about half the storage life;

15. that the mechanical design of the beacons should be such that it is small, light-weight, floatable, watertight and shock-resistant;

16. that the administrations be invited to make provision in the Radio Regulations for the operation of emergency position-indicating radio beacons on the frequency of 2182 kHz.

ANNEX 2.b)

OPINION 25

EMERGENCY POSITION-INDICATING
RADIO BEACONS

(Question 318(XIII))

(1966)

The C.C.I.R.

CONSIDERING

(a) that Recommendation 439 defines the characteristics of Emergency Position-Indicating Radio Beacons operating on the frequency of 2182 kHz to indicate the position of survivors and to facilitate search and rescue operations;

(b) that C.C.I.R. Doc. XIII/71 (period 1963-1966) contains Resolution A.91(IV) adopted on 27 September 1965 by the Fourth Session of the Assembly of the Inter-Governmental Maritime Consultative Organization (I.M.C.O.) confirming the views of the Maritime Safety Committee; and that, in particular, 2182 kHz is recommended as a first choice operational frequency but it rests, however, with administrations to determine whether the beacon should allow for the use of a second or more frequencies;

(c) that C.C.I.R. Doc. XIII/103 (period 1963-1966) contains the Report of the Fourth Air Navigation Conference of the International Civil Aviation Organization (I.C.A.O.), Montreal, 9 November - 3 December 1965 in which the frequencies of 121.5 MHz and 243 MHz and certain technical characteristics are recommended for Survival Radio Equipment;

IS OF THE OPINION

1. that the International Civil Aviation Organization be invited to advise C.C.I.R. if they wish C.C.I.R. to study characteristics of Emergency Position-Indicating Radio Beacons operating on the frequencies of 121.5 MHz and 243 MHz;

2. that the Director of C.C.I.R. be invited to transmit this Opinion to I.C.A.O.

Note: This Opinion together with Recommendation 439 terminates the study of Question 318(XIII).

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MARITIME CONFERENCE
GENEVA, 1967

Document No. 3-E
6 March 1967
Original : English

PLENARY MEETING

FEDERAL REPUBLIC OF GERMANY

Proposal concerning Agenda Item 2.3 relating to No. 1156 of the Radio Regulations

Ref. The present text should be modified as follows :

RFA/3(1) MOD 1156 § 20.(1) Each Administration shall determine for its sphere of competence which ship stations handling a large volume of traffic may use the high traffic band (see No. 1151).

Reasons:

It is considered inappropriate to classify the ship stations as in No. 1156 because many passenger ships as well as whaling factory vessels and tankers above 40,000 tons gross or cargo ships above 12,500 tons gross do not have to handle as much traffic on high frequencies as some ships which do not fall into this category.

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

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PLENARY MEETING

FEDERAL REPUBLIC OF GERMANY

Proposal concerning Agenda Item 1 relating to the modification of Article 35, No. 1325, of the Radio Regulations

Ref. Article 35

RFA/4(2) Section II - Bands between 1605 and 4000 kHz

A. Distress

NOC 1323

NOC 1324

MOD 1325 (3) Except for transmissions authorized on 2182 kHz, all transmissions on the frequencies between 2173.5 and 2190.5 kHz are forbidden.

NOC 1326

Reasons:

In view of the present stage of technical development we consider it appropriate to reduce the guard-band for the international distress frequency 2182 kHz to 17 kHz in order to thus obtain two single sideband frequencies each of 3.5 kHz bandwidth.

The World Administrative Radio Conference to deal with matters relating to the maritime mobile service should establish these two single sideband frequencies and include appropriate provisions in the Radio Regulations.

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

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PLENARY MEETING

FEDERAL REPUBLIC OF GERMANY

Proposal concerning Agenda Item 7.4,
Appendix 12 of the Radio Regulations

Ref.: Replace Section I by

RFA/5(3)

8 hours (H 8)	16 hours (H 16)
08.00 - 12.00 ship's local time	08.00 - 24.00 ship's local time
16.00 - 18.00 " " "	
20.00 - 22.00 " " "	

RFA/5(4) Replace the upper part of Section II (diagram) by the diagrams shown in Annexes 1 and 2

Reasons:

1. A more even traffic loading of the bands between 4000 and 27 500 kHz as mentioned in Recommendation No. 27 of the Radio Regulations will be achieved to an optimum extent by the proposed regulation of service hours which ensures a nearly uninterrupted succession of service hours all over the world since the operation of the stations are based on ships' local time.

2. In any given sea area with a diameter of about 500 nautical miles, i.e. within the normal range of a medium-wave transmitter, all ship stations of the second category are on watch at the same time. For the north-south direction this is even the case at an unlimited distance.

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Ref.

RFA/5(4) (cont.)

3. Transmissions from coast stations of a regional character (meteorological bulletins, traffic lists, etc.), are mainly effected during the proposed service hours (and in most cases even to a larger extent than in the past). Supra-regional transmissions - propagated mainly on short waves - cannot be covered by any regulation of service hours whatsoever.

4. Special consideration has been given to hours of dusk, which are favourable for short-wave communications.

5. The proposed hours of service are compatible with the various operations on board ships and with the watchkeeping system of all other officers. They will ensure a longer break during the day (12-16 hours) for the radio officer and give the ship's command a clearer conception of the hours of radio service to be observed.

RFA/5(5) Delete Recommendation No. 27 of the Radio Regulations.

Reasons:

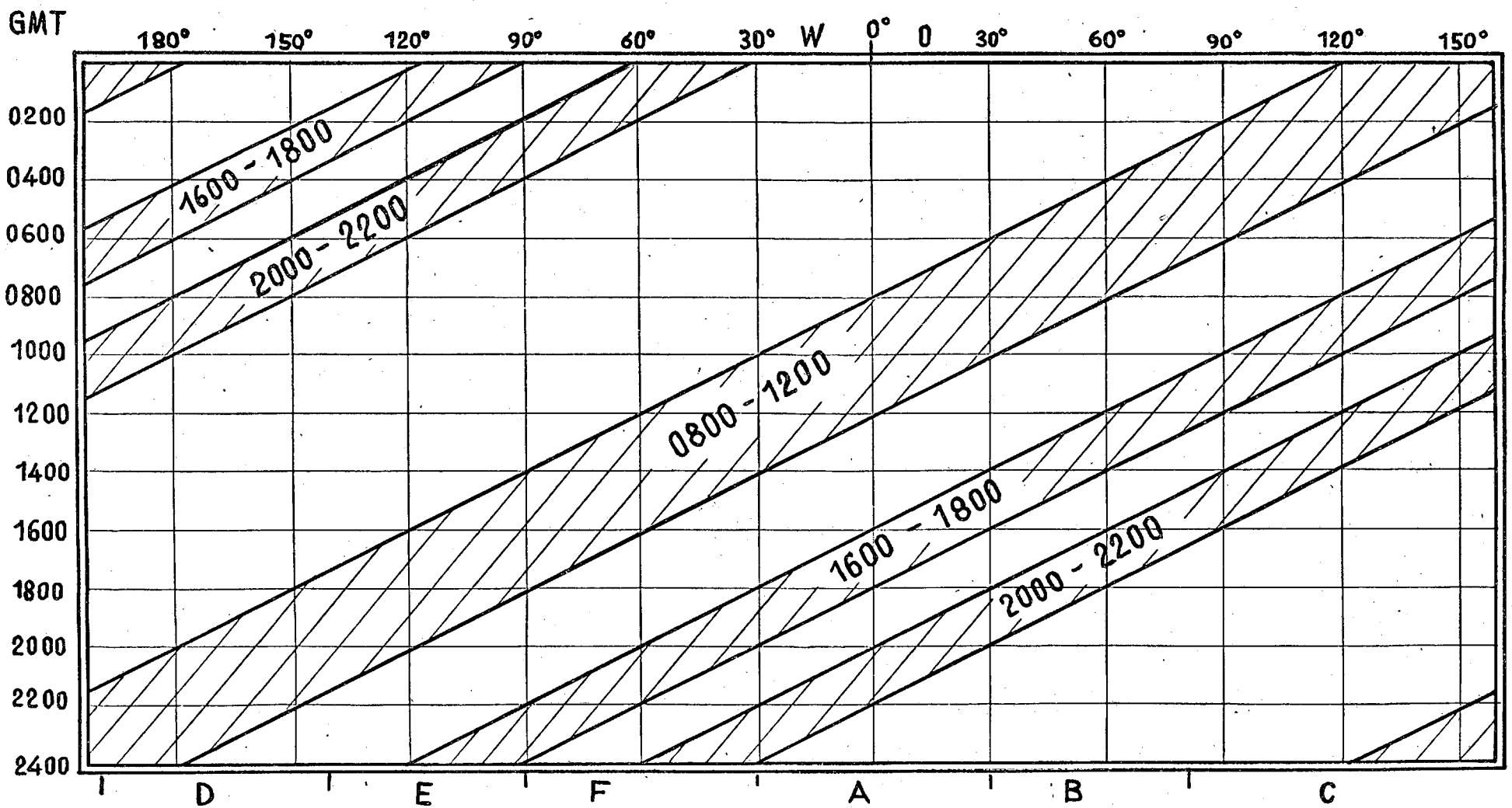
After the acceptance of proposals a) and b) Recommendation No. 27 becomes superfluous.

Annexes : 2

ANNEXE 1
ANNEX 1
ANEXO 1

H8

Hours of service for ship stations (0800-1200; 1600-1800; 2000-2200 ship's local time)
Vacations des stations de navire (0800-1200; 1600-1800; 2000-2200 heure de bord)
Horario de servicio de las estaciones de barco (0800-1200; 1600-1800; 2000-2200 hora local del barco)



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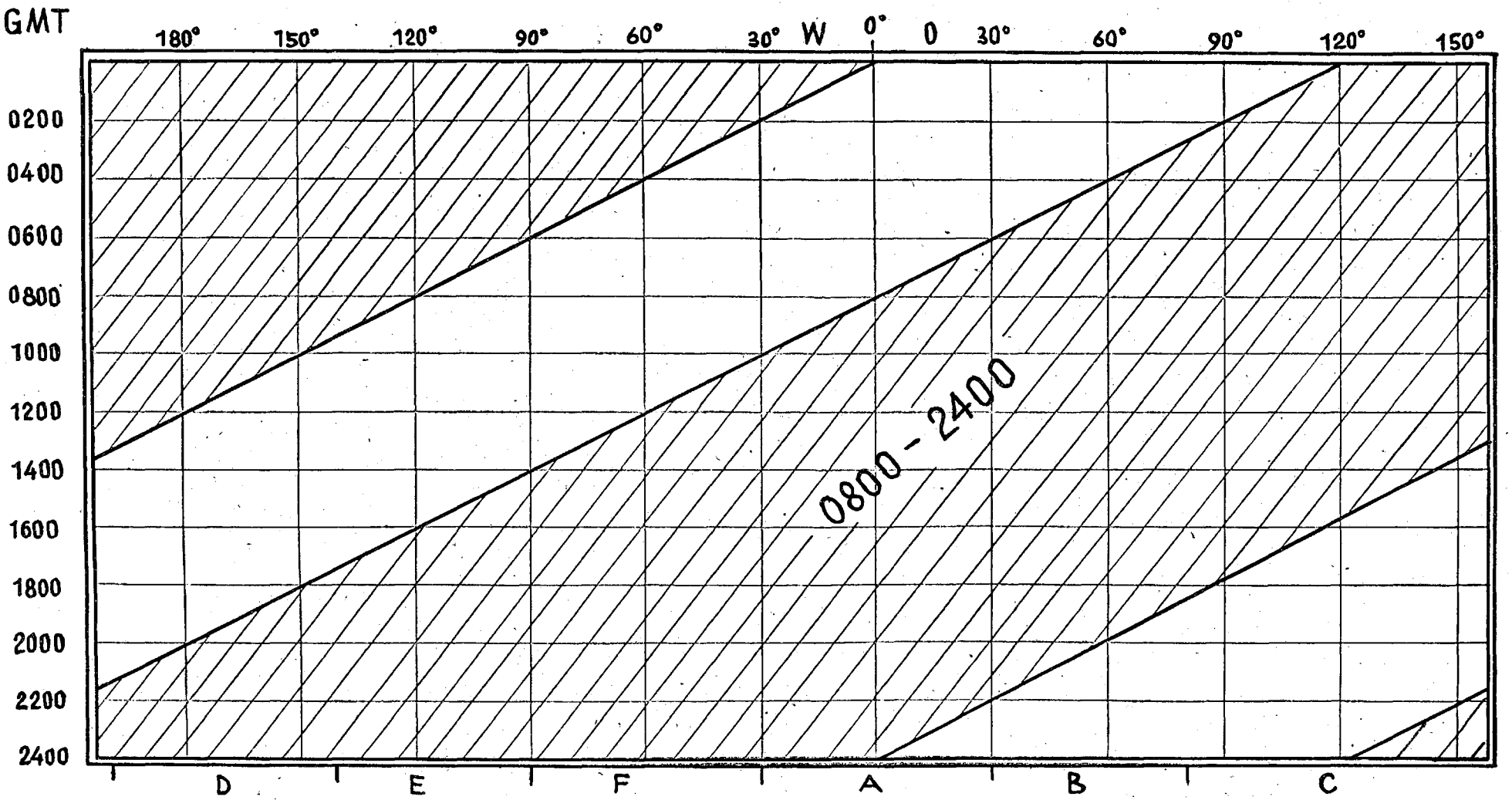
ANNEXE 2
ANNEX 2
ANEXO 2

H16

Hours of service for ship stations (0800-2400 ship's local time)
Vacations des stations de navire (0800-2400 heure de bord)
Horario de servicio de las estaciones de barco (0800-2400 hora local del barco)



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PLENARY MEETING

FEDERAL REPUBLIC OF GERMANY

Proposal concerning Agenda Item 6:

Appendix 13 of the Radio Regulations

Ref.

RFA/6(6) Title, read: Miscellaneous Abbreviations and Signals to be used in Radiotelegraphy and Radiotelephony Communications (See Articles 29 and 33)

RFA/6(7) Section I, number 3, read:

3. Certain Q code abbreviations may be given an affirmative or negative sense by sending, immediately following the abbreviation,

a) YES or NO in the case of radiotelegraphy communications,

b) the letter C (spoken as CHARLIE) or NO (spoken as NOVEMBER OSCAR) in the case of radiotelephony communications.

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RFA/6(8) Section I, number 5:

5. Q code abbreviations are given the form of a question when followed:

a) by a question mark in the case of radiotelegraphy communications,

b) by the letter T (spoken as TANGO) in the case of radiotelephone communications.

When an abbreviation is used as a question and is followed by additional or complementary information, the question mark or the letter T, as the case may be, should follow this information.

Ref.

RFA/6(9)

A. List of Abbreviations in Alphabetical Order

(changes underlined)

	Abbre-viation	Question	Answer or Advice
MOD	QRA	What is the name of your vessel (or station)?	The name of my vessel (or station) is .....
	QRC	By what private enterprise (or State Administration) are the accounts for the charges for your station settled?	The accounts for charges of my station are settled by the private enterprise ..... (or State Administration).
	QRG	Will you tell me my exact frequency (or that of ...)?	Your exact frequency (or that of ...) is ... kHz (or ....MHz).
	QRH	Does my frequency vary?	Your frequency varies.
	QRI	How is the tone of my transmission?	The tone of your transmission is ... 1. good 2. variable 3. bad
	QRJ	How many radiotelephone calls have you to book?	I have ... radiotelephone calls to book.
MOD	QRK	What is the intelligibility of my transmission (or that of ... (name or call sign))?	The intelligibility of your transmission (or that of ... (name or call sign)) is ... 1. bad 2. poor 3. fair 4. good 5. excellent
	QRL	Are you busy?	I am busy (or I am busy with ... (name or call sign)). Please do not interfere.

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(9) (cont.)	QRM	Are you being interfered with ?	I am being interfered with (1. nil 2. slightly 3. moderately 4. severely 5. extremely).
	QRN	Are you troubled by static?	I am troubled by static (1. nil 2. slightly 3. moderately 4. severely 5. extremely).
	QRO	Shall I increase transmitter power?	Increase transmitter power.
	QRP	Shall I decrease transmitter power?	Decrease transmitter power.
MOD	QRQ	Shall I send (or speak) faster?	Send (or speak) faster (... words per minute).
	QRR	Are you ready for automatic operation?	I am ready for automatic operation. Send at ... words per minute.
MOD	QRS	Shall I send (or speak) more slowly?	Send (or speak) more slowly.
MOD	QRT	Shall I stop transmission?	Stop transmission.
	QRU	Have you anything for me?	I have nothing for you.
	QRV	Are you ready?	I am ready.
	QRW	Shall I inform ... (name or call sign) that you are calling him on ... kHz (or ... MHz)?	Please inform ... (name or call sign) that I am calling him on ... kHz (or ... MHz).
	QRX	When will you call me again?	I will call you again at ... hours (on ... kHz (or ... MHz)).

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(9) (cont.)	QRY	What is my turn? (Relates to communication)	Your turn in Number ... (or according to any other indication). (Relates to communication)
	QRZ	Who is calling me?	You are called by ... (name or call sign) (on ... kHz (or ... MHz)).
MOD	QSA	What is the strength of my signals (or those of ... (name or call sign))?	The strength of your signals (or those of ... (name or call sign)) is ... 1. scarcely perceptible 2. weak 3. fairly good 4. good 5. very good
	QSB	Are my signals fading?	Your signals are fading.
	QSD	Is my keying defective?	Your keying is defective.
	QSG	Shall I send ... telegrams at a time?	Send ... telegrams at a time.
	QSH	Are you able to home on your direction-finding equipment?	I am able to home on my direction-finding equipment (on ... (name or call sign)).
	QSJ	What is the charge to be collected to ... including your internal charge?	The charge to be collected to ... including my internal charge is ... francs.
	QSK	Can you hear me between your signals and if so can I break in on your transmission?	I can hear you between my signals; break in on my transmission.
	QSL	Can you acknowledge receipt?	I am acknowledging receipt.
MOD	QSO	Can you communicate with ... (name or call sign)?	I can communicate with ... (name or call sign).

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(9) (cont.) MOD	QSP	Will you relay to (name or call sign) free of charge?	I will relay to ... (name or call sign) free of charge.
	QSR	Shall I repeat the call on the calling frequency?	Repeat your call on the calling frequency; did not hear you (or have interference).
MOD	QSS	What working frequency will you use?	I will use the working frequency ... kHz (or ... MHz) (when using A1 on high frequencies, normally only the last three figures of the frequency need be given).
	QSU	Shall I send or reply on this frequency (or on ... kHz (or ... MHz)); (with emissions of class ...)?	Send or reply on this frequency (or on ... kHz (or ... MHz)); (with emissions of class ....).
MOD	QSV	Shall I send a series of V's (or words) for adjustment on this frequency (or ... kHz (or ... MHz))?	Send a series of V's (or words) for adjustment on this frequency (or ... kHz (or ... MHz)).
	QSW	Will you send on this frequency (or ... kHz (or ... MHz)) (with emissions of class ...)?	I am going to send on this frequency (or ... kHz (or ... MHz)) (with emissions of class ...).
MOD	QSX	Will you listen to ... (name or call sign) on ... kHz (or ... MHz)?	I am listening to ... (name or call sign) on ... kHz (or ... MHz).
	QSY	Shall I change to transmission on another frequency?	Change to transmission on another frequency (or ... kHz (or ... MHz)).
MOD	QSZ	Shall I send (or speak) each word or group more than once?	Send (or speak) each word or group twice (or ... times).
	QTA	Shall I cancel telegram number ... (or message or signal)?	Cancel telegram number ... (or message or signal).

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(9) (cont.)	QTB	Do you agree with my counting of words?	I do not agree with your counting of words; I will repeat the first letter or digit of each word or group.
MOD	QTC	How many telegrams have you to send?	I have ... telegrams for you (or for ... (name or call sign)).
MOD	QTE	What is my TRUE bearing from you? or What is my TRUE bearing from ... (name or call sign)? or What is the TRUE bearing of ... (name or call sign) from ... (name or call sign)?	Your TRUE bearing from is ... degrees at ... hours. or Your TRUE bearing from ... (name or call sign) was ... degrees at ... hours. or The TRUE bearing of ... (name or call sign) from ... (name or call sign) was ... degrees at ... hours.
MOD	QTF	Will you give me my position according to the bearings taken by the direction-finding stations which you control?	Your position according to the bearings taken by the direction-finding stations which I control was ... latitude ... longitude (or other indication of position), class ... at ... hours.
MOD	QTG	Will you send two dashes (or carrier frequency) of ten seconds each followed by your call sign (or name) (repeated ... times) (on ... kHz (or ... MHz)? or Will you request ... (name or call sign) to send two dashes (or carrier frequency) of ten seconds each followed by his call sign (or name) (repeated ... times) on ... kHz (or ... MHz)?	I am going to send two dashes (or carrier frequency) of ten seconds each followed by my call sign (or name) (repeated ... times) (on ... kHz (or ... MHz)). or I have requested ... (name or call sign) to send two dashes (or carrier frequency) of ten seconds each followed by his call sign (or name) (repeated ... times) on ... kHz (or ... MHz).

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(9) (cont.)	QTH	What is your position in latitude and longitude (or according to any other indication)?	My position is ... latitude ... longitude (or according to any other indication).
	QTO	Have you left dock (or port)? or Are you airborne?	I have left dock (or port). or I am airborne.
	QTP	Are you going to enter dock (or port)? or Are you going to alight (or land)?	I am going to enter dock (or port). or I am going to alight (or land).
MOD	QTQ	Can you communicate with me by means of the International Code of Signals?	I am going to communicate with you by means of the International Code of Signals.
	QTR	What is the correct time?	The correct time is ... hours.
MOD	QTS	Will you send your call sign (or name) for tuning purposes or so that your frequency can be measured now (or at ... hours) on ... kHz (or ... MHz)?	I will send my call sign (or name) for tuning purposes or so that my frequency may be measured now (or at ... hours) on ... kHz (or ... MHz).
	QTU	What are the hours during which your station is open?	My station is open from ... to ... hours.
MOD	QTV	Shall I stand guard for you on ... kHz (or ... MHz) (from ... to ... hours)?	Stand guard for me on ... kHz (or ... MHz) (from ... to ... hours).
	QTX	Will you keep your station open for further communication with me until further notice (or until ... hours)?	I will keep my station open for further communication with you until further notice (or until ... hours).
MOD	QUA	Have you news of ... (name or call sign)?	Here is news of ... (name or call sign).

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(9) (cont.) MOD	QUD	Have you received the urgency signal sent by ... (name or call sign)?	I have received the urgency signal sent by ... (name or call sign) at ... hours.
	QUE	Can you use telephony in ... (language), with interpreter if necessary; if so, on what frequencies?	I can use telephony in ... (language) on ... kHz (or ... MHz).
MOD	QUF	Have you received the distress signal sent by ... (name or call sign)?	I have received the distress signal sent by ... (name or call sign) at ... hours.
	QUM	May I resume normal working?	Normal working may be resumed.

RFA/6(10)

B. List of Signals according to the nature of Questions, Answer or Advice

Abbre-viation	Question	Answer or Advice
	Name	
QRA	What is the name of your vessel (or station)?	The name of my vessel (or station) is ...
	Position	
QTH	What is your position in latitude and longitude (or according to any other indication)?	My position is ... latitude longitude (or according to any other indication).

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(10) (cont.)			
		Quality of Signals	
	QRI	How is the tone of my trans-mission?	The tone of your transmission is ... 1. good 2. variable 3. bad.
	QRK	What is the intelligibility of my transmission (or that of ... (name or call sign))?	The intelligibility of your transmission (or that of ... (name or call sign)) is ... 1. bad 2. poor 3. fair 4. good 5. excellent.
		Strength of Signals	
	QRO	Shall I increase transmitter power?	Increase transmitter power.
	QRP	Shall I decrease transmitter power?	Decrease transmitter power.
	QSA	What is the strength of my signals (or those of ... (name or call sign))?	The strength of your signals (or those of ... (name or call sign)) is ... 1. scarcely perceptible 2. weak 3. fairly good 4. good 5. very good.
	QSB	Are my signals fading?	Your signals are fading.
		Keying	
	QRQ	Shall I send (or speak) faster?	Send (or speak) faster (... words per minute).
	QRR	Are you ready for automatic operation?	I am ready for automatic oper-ation. Send at ... words per minute.

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(10) (cont.)	QRS	Shall I send (or speak) more slowly?	Send (or speak) more slowly.
	QSD	Is my keying defective?	Your keying is defective.
		Interference	
	QRM	Are you being interfered with?	I am being interfered with (1. nil 2. slightly 3. moderately 4. severely 5. extremely).
	QRN	Are you troubled by static?	I am troubled by static (1. nil 2. slightly 3. moderately 4. severely 5. extremely).
		Adjustment of frequency	
	QRG	Will you tell me my exact frequency (or that of ...)?	Your exact frequency (or that of ...) is ... kHz (or ... MHz).
	QRH	Does my frequency vary?	Your frequency varies.
	QTS	Will you send your call sign (or name) for tuning purposes or so that your frequency can be measured now (or at ... hours) on ... kHz (or ... MHz)?	I will send my call sign (or name) for tuning purposes or so that my frequency may be measured now (or at ... hours) on ... kHz (or ... MHz).
		Choice of frequency and/or class of emission	
	QSS	What working frequency will you use?	I will use the working frequency ... kHz (or ... MHz) (using A1 on high frequencies normally only the last three figures of the frequency need be given).

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(10) (cont.)	QSU	Shall I send or reply on this frequency (or on ... kHz (or ... MHz)); (with emissions of class ...)?	Send or reply on this frequency (or on ... kHz (or ... MHz)); (with emissions of class ...).
	QSV	Shall I send a series of V's (or words) for adjustment on this frequency (or ... kHz (or ... MHz))?	Send a series of V's (or words) for adjustment on this frequency (or ... kHz (or ... MHz)).
	QSW	Will you send on this frequency (or ... kHz (or ... MHz)) (with emissions of class ...)?	I am going to send on this frequency (or ... kHz (or ... MHz)) (with emissions of class ...).
	QSX	Will you listen to ... (name or call sign) on ... kHz (or ... MHz)?	I am listening to ... (name or call sign) on ... kHz (or ... MHz).
		Change of frequency	
	QSY	Shall I change to transmission on another frequency?	Change to transmission on another frequency (or ... kHz (or ... MHz)).
		Establishing communication	
	QRL	Are you busy?	I am busy (or I am busy with ... (name or call sign)). Please do not interfere.
	QRV	Are you ready?	I am ready.
	QRX	When will you call me again?	I will call you again at ... hours (on ... kHz (or ... MHz)).
	QRY	What is my turn? (Relates to communication)	Your turn is Number ... (or according to any other indication). (Relates to communication).

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(10) (cont.)	QRZ	Who is calling me?	You are called by ... (name or call sign) (on ... kHz (or ... MHz)).
	QSR	Shall I repeat the call on the calling frequency?	Repeat your call on the calling frequency; did not hear you (or have interference).
	QTQ	Can you communicate with me by means of the International Code of Signals?	I am going to communicate with you by means of the International Code of Signals.
	QUE	Can you use telephony in ... (language), with interpreter if necessary; if so, on what frequencies?	I can use telephony in ... (language) on ... kHz (or ... MHz).
		Time	
	QTR	What is the correct time?	The correct time is ... hours.
	QTU	What are the hours during which your station is open?	My station is open from ... to ... hours.
		Charges	
	QRC	By what private enterprise (or State Administration) are the accounts for the charges for your station settled?	The accounts for charges of my station are settled by the private enterprise ... (or State Administration).
	QSJ	What is the charge to be collected to ... including your internal charge?	The charge to be collected to ... including my internal charge is ... francs.
		Transit	
	QRW	Shall I inform ... (name or call sign) that you are calling him on ... kHz (or ... MHz)?	Please inform ... (name or call sign) that I am calling him on ... kHz (or ... MHz).

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(10) (cont.)	QSO	Can you communicate with ... (name or call sign)?	I can communicate with ... (name or call sign).
	QSP	Will you relay to ... (name or call sign) free of charge?	I will relay to ... (name or call sign) free of charge.
	QUA	Have you news of ... (name or call sign)?	Here is news of ... (name or call sign).
		Exchange of correspondence	
	QRJ	How many radiotelephone calls have you to book?	I have ... radiotelephone calls to book.
	QRU	Have you anything for me?	I have nothing for you.
	QSG	Shall I send ... telegrams at a time?	Send ... telegrams at a time.
	QSK	Can you hear me between your signals and if so can I break in on your transmission?	I can hear you between my signals; break in on my transmission.
	QSL	Can you acknowledge receipt?	I am acknowledging receipt.
	QSZ	Shall I send (or speak) each word or group more than once?	Send (or speak) each word or group twice (or ... times).
	QTA	Shall I cancel telegram number ... (or message or signal)?	Cancel telegram number ... (or message or signal).
	QTB	Do you agree with my counting of words?	I do not agree with your counting of words; I will repeat the first letter or digit of each word or group.

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(10) (cont.)	QTC	How many telegrams have you to send?	I have ... telegrams for you (or for ... (name or call sign)).
	QTV	Shall I stand guard for you on ... kHz (or ... MHz) (from ... to ... hours)?	Stand guard for me on ... kHz (or ... MHz) (from ... to ... hours).
	QTX	Will you keep your station open for further communication with me until further notice (or until ... hours)?	I will keep my station open for further communication with you until further notice (or until ... hours).
		Movement	
	QSH	Are you able to home on your direction-finding equipment?	I am able to home on my direction-finding equipment (on ... (name or call sign)).
	QTO	Have you left dock (or port)?	I have left dock (or port).
		or	or
		Are you airborne?	I am airborne.
	QTP	Are you going to enter dock (or port)?	I am going to enter dock (or port).
		or	or
		Are you going to alight (or land)?	I am going to alight (or land).

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(10) (cont.)		**Radio direction-finding**	
	QTE	What is my TRUE bearing from you? or What is my TRUE bearing from ... (name or call sign)? or What is the TRUE bearing of ... (name or call sign) from ... (name or call sign)?	Your TRUE bearing from me is ... degrees at ... hours. or Your TRUE bearing from ... (name or call sign) was ... degrees at ... hours. or The TRUE bearing of ... (name or call sign) from ... (name or call sign) was ... degrees at ... hours.
	QTF	Will you give me my position according to the bearings taken by the direction-finding stations which you control?	Your position according to the bearings taken by the direction-finding stations which I control was ... latitude ... longitude (or other indication of position), class ... at ... hours.
	QTG	Will you send two dashes (or carrier frequency) of ten seconds each followed by your call sign (or name) (repeated ... times) on ... kHz (or ... MHz)? or Will you request ... (name or call sign) to send two dashes (or carrier frequency) of ten seconds each followed by his call sign (or name) (repeated ... times) on ... kHz (or ... MHz)?	I am going to send two dashes (or carrier frequency) of ten seconds each followed by my call sign (or name) (repeated ... times)(on ... kHz (or ... MHz)). or I have requested ... (name or call sign) to send two dashes (or carrier frequency) of ten seconds each followed by his call sign (or name) (repeated ... times) on ... kHz (or ... MHz).
		Suspension of work	
	QRT	Shall I stop transmission?	Stop transmission.
	QUM	May I resume normal working?	Normal working may be resumed.

Ref.	Abbre-viation	Question	Answer or Advice
RFA/6(10) (cont.)			
		Urgency	
	QUD	Have you received the urgency signal sent by ... (name or call sign)?	I have received the urgency signal sent by ... (name or call sign) at ... hours.
		Distress	
	QUF	Have you received the distress signal sent by ... (name or call sign)?	I have received the distress signal sent by ... (name or call sign) at ... hours.
	QUM	May I resume normal working?	Normal working may be resumed.

Reasons for proposals Nos. 6 to 10:

Recommendation No. 22 of the Radio Regulations provides that in the case of language difficulties in radiotelephony a code shall be used for the exchange of communications which should cover at least :

a) distress, urgency, safety of navigation, search and rescue, and

b) establishment of communications.

As regards a) the Recommendation provides for code groups which are taken from the International Code of Signals (parts 2 to 4 of Annex 2 of Recommendation No. 22).

As regards b) Q code abbreviations according to Appendix 13 of the Radio Regulations are provided for.

The signal groups relating to distress, urgency, safety of navigation, and search and rescue fall within the competence of I.M.C.O.

The groups required for the exchange of radiocommunications fall within the competence of the I.T.U. Recommendation No. 22 of the Radio Regulations indicates that in the opinion of I.T.U. uniform Q code abbreviations shall be used for the exchange of radiocommunications.

Ref.

RFA/6(10) (cont.)

The aforementioned proposals :

1) amend and complete the Q groups listed in Appendix 13 in such a way that they can be used for radiotelegraphy and radiotelephony communications;

2) delete the Q groups which can be dispensed with for the exchange of radiocommunications. Of the 40 deleted Q groups*) 5 are not needed and the meaning of the remaining 35 groups relates to navigation, search and rescue.

In the opinion of the German Administration only such Q groups should be included in the Radio Regulations which are needed for the exchange of radiocommunications. The International Code of Signals revised by I.M.C.O. should continue to exist as a separate book and serve as a reference for the ship's command. The code groups for the exchange of communications contained in Section VII "Communications" of the revised International Code of Signals should only be used for flash lamp and flag signalling. In the opinion of the German Administration these code groups for the exchange of communications should not be used in radiotelephony the more so that about 25 important groups required for this purpose are not available. It is the opinion of the German Administration that the following arguments can be advanced against the use of the code groups for the exchange of communications listed in the International Code of Signals in radiotelephony communications :

1) The radiotelephonist is compelled to use both signal code groups and Q groups if there are no corresponding signal code groups for normal communications.

2) In some cases radiotelegraphists of coast and ship stations have to use signal code groups for communications with radiotelephonists, although the usual Q groups with the same meaning are available.

3) Thus, two different service aids have to be used in the aforementioned cases. This is not expedient for the exchange of communications, and furthermore uniformity in radio communications is not preserved.

Uniform abbreviations for the exchange of communications in the radiotelegraph and radiotelephone services simplify radio operations.

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*) See under Final Remarks, page 20

Ref.

RFA/6(11) Delete Recommendation No. 22 of the Radio Regulations

Reasons:

Recommendation No. 22 becomes superfluous after the realization of the proposals (6) to (10) and the revision of the International Code of Signals by I.M.C.O.

RFA/6(12) Change No. 1005 to read as follows:

MOD 1005 "(2) In the maritime mobile service, only the service abbreviations given in Appendix 13 are to be used for the exchange of communications. If, in addition, brief communications relating to navigational operations have to be transmitted, code groups of the International Code of Signals may be used in order to shorten the transmission of these communications; such transmissions should be introduced by the abbreviation "QTQ"."

Reasons:

Although communications composed of code groups of the International Code of Signals should, in principle, be transmitted in the form of radio telegrams because they come from or are addressed to the ship's command, it may be expedient in some cases to use code groups from the International Code of Signals for short communications between ship stations.

RFA/6(13) Insert after No. 1216:

ADD 1216a Stations of the maritime mobile service equipped for radiotelephony are to use in the case of language difficulties abbreviations and signals according to Appendix 13 for the exchange of correspondence. If, in addition, short communications relating to navigational operations have

Ref.

RFA/6(13) (cont.)

to be transmitted, they may also use groups of the International Code of Signals in order to shorten the transmission of such communications, a sequence of such groups being introduced by the word "INTERCO".

ADD 1216b The abbreviations and signals according to Appendix 13 and the groups of the International Code of Signals shall be spelled in accordance with the tables given in Appendix 16.

Reasons:

The proposals (6) to (10) of the German Administration amend or complete the abbreviations and signals of Appendix 13 in such a way that they can also be used for the maritime radiotelephone service.

The maritime radiotelephone stations are obliged by proposal ADD 1216a to use the abbreviations and signals given in Appendix 13 in the case of language difficulties.

As regards the use of code groups from the International Code of Signals see the motivation of proposal (12).

The maritime radiotelephone stations are obliged by proposal ADD 1216b to use the spelling table given in Appendix 16.

RFA/6(14) Nos. 1222; 1241; 1273; 1287; 1393; 1430; 1451; 1460

In each case insert after "THIS IS" : [1)]
and at the bottom of the respective pages insert the following foot-note:

"1) In the case of language difficulties the abbreviation DE (spoken as DELTA ECHO) is to be used instead of THIS IS."

Reasons:

In order to shorten the call in the case of language difficulties.

Ref.

RFA/6(15) Add to No. 1386:

MOD 1386 In the case of language difficulties see Nos. 1216a and 1216b.

Reasons:

In the case of distress, urgency or safety the faultless transmission of communications is particularly important. Delays in transmission caused by language difficulties have to be avoided.

Final remarks:

a) Until the entry into force of the revised International Signal Code the use of the following 35 Q abbreviations with the same meanings as before should be continued:

-QRB, -QRD, -QRE, -QRF,
-QSC, -QSE, -QSF, -QSQ,
-QTD, -QTI, -QTJ, -QTK, -QTL, -QTM, -QTN, -QTW, -QTY, -QTZ,
-QUB, -QUG, -QUH, -QUI, -QUJ, -QUK, -QUL, -QUN, -QUO, -QUP,
-QUQ, -QUR, -QUS, -QUT, -QUU, -QUW, -QUY.

b) The following five groups are not needed:

QSI, QSM, QSN, QTT, QUC

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 7-E
6 March 1967
Original : English

PLENARY MEETING

FEDERAL REPUBLIC OF GERMANY

Proposal concerning Appendix 16 of the Radio Regulations

Ref.

RFA/7(16) Delete under 1 the column "Figure or mark to be transmitted" and the corresponding footnote.

RFA/7(17) Add as new number 2 :

Figure or mark to be transmitted	Word to be used	Spoken as
0	NADAZERO	NAH-DAH-ZAY-ROH
1	UNAONE	OO-NAH-WUN
2	BISSOTWO	BEES-SOH-TOO
3	TERRATHREE	TAY-RAH-TREE
4	KARTEFOUR	KAR-TAY-FOWER
5	PANTAFIVE	PAN-TAH-FIVE
6	SOXISIX	SOK-SEE-SIX
7	SETTESEVEN	SAY-TAY-SEVEN
8	OKTOEIGHT	OK-TOH-AIT
9	NOVENINE	NO-VAY-NINER
Decimal point	DECIMAL	DAY-SEE-MAL

The compound words should be spoken without interruption.

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Ref.

RFA/7(18) Change number 2 into 3.

Reasons:

This phonetic figure table was recommended by I.M.C.O. It offers considerable advantages over the method used so far.

RFA/7(19) Delete Recommendation No. 30 of the Radio Regulations.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Corrigendum to
Document No. 8-E
10 August 1967

PLENARY MEETING

FRANCE

Replace draft Resolutions Nos. 1.A and 1.B (Proposals F/8 (52) and F/8 (53)), on pages 23 to 26 of Document No. 8-E, by the following :

Ref.

F/8(52 corr.)

DRAFT RESOLUTION No. 1.A RELATING TO THE TRANSFER OF INTERSHIP FREQUENCIES IN THE BANDS BETWEEN 1605 AND 4000 kc/s WHEN THE SEPARATION BETWEEN ADJACENT ASSIGNED FREQUENCIES IS EQUAL TO 5 kc/s

The Maritime Conference (Geneva, 1967),

considering

a) that during and after conversion to SSB, each DSB channel will be occupied by two SSB channels, one in the upper half and the other in the lower half of the DSB channel;

b) that the SSB channels must remain within the DSB channel limits but that the latter overlap with each other since the separation between adjacent assigned frequencies is less than the necessary bandwidth;

resolves

that in the bands between 1605 and 4000 kc/s the sub-division of the former DSB channels into two SSB channels for intership calls, when the separation between assigned frequencies is equal to 5 kc/s, shall conform to the following regulations concerning the carrier frequency arrangement and the necessary bandwidth:

1) the frequency assigned for SSB to a station working in the upper half of the DSB channel shall be 1.35 kc/s higher than the DSB carrier and the SSB carrier shall be equal to the DSB carrier (necessary bandwidth 2.7 kc/s) [1] ;

[1] These provisions could lead to limiting the receiver passband at audio frequencies to a value lower than 2.5 kc/s.

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Ref.

F/8(52 corr.)
(cont.)

2) the frequency assigned for SSB to a station working in the lower half of the DSB channel shall be 1.15 kc/s lower than the DSB carrier and the SSB carrier shall be 2.5 kc/s below the DSB carrier (necessary bandwidth 2.7 kc/s)[1] ;

3) when an administration asks for an entry in its name in the register to be altered to bring it into line with the regulations set out in paragraphs 1) and 2) above, and provided the power, expressed as the peak envelope power for SSB emissions, is not more than twice the mean power previously notified, the I.F.R.B. shall make the required change so that the status of the assignment in question is maintained.

4) in the month following the date of * entries in the Master International Frequency Register relating to a double sideband assignment in the maritime mobile MF radiotelephone service shall be the subject of an I.F.R.B. questionnaire.

If, within 2 months, the notifying administration has not sent a reply or announced that it is continuing to use the frequency in accordance with the existing entry, or if the amendments proposed for the assignment are such that the entry does not conform to the regulations set out in paragraphs 1) and 2) above, a special symbol shall be inserted in column 13C, indicating that the entry is not in accordance with the rules adopted by the present Conference and that it has been maintained for information only.

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[1] These provisions could lead to limiting the receiver passband at audio frequencies to a value lower than 2.5 kc/s.

* Date one month after the entry into force of the definitive provisions concerning the use of single sideband emissions for maritime MF radiotelephony.

Ref.

F/8(53 corr.)

DRAFT RESOLUTION No. 1.B RELATING TO THE TRANSFER OF FREQUENCY ASSIGNMENTS IN THE BANDS ALLOCATED EXCLUSIVELY TO THE MARITIME MOBILE SERVICE BETWEEN 4000 and 23 000 kc/s FOR COAST RADIOTELEGRAPH STATIONS

(see diagram in Annex II)

The Maritime Conference (Geneva, 1967),

considering

a) that the transfer to slightly lower frequencies of frequency assignments to coast radiotelegraph stations in the HF bands allows a larger number of 2-frequency channels to be cleared for radiotelephone links;

b) that the transfer method proposed below strictly preserves the relative position of all assignments to coast stations, thus avoiding any new operating difficulties;

c) that the transfer affects only a few stations and does not involve large expenditure for the administrations;

recognizing

a) that re-arrangement of the frequency bands allocated to the maritime mobile service should be carried out in several stages and that the transfer of coast radiotelegraph station frequency assignments conditions any subsequent arrangements - and should therefore be one of the first phases of the re-arrangement;

b) that, in the bands under consideration, assignments to stations of the fixed service may be made by some countries in certain conditions, and that the proposed transfer must not lead to an aggravation in the conditions of use of the frequencies concerned;

resolves

1. that the assignments made to coast radiotelegraph stations in the bands :

4238 - 4368 kc/s
6357 - 6525 kc/s
8476 - 8745 kc/s

Ref.

F/8(53 corr.)
(cont.)

12 714 - 13 130 kc/s
16 952 - 17 290 kc/s
22 400 - 22 650 kc/s

and entered in the Master International Frequency Register on the date of entry into force of the provisions contained in the Final Acts of this conference shall be transferred as follows :

- any frequency assignment f in the 4238 - 4368 kc/s band shall be transferred to the frequency f - 7 kc/s;

- any frequency assignment f in the 6357 - 6525 kc/s band shall be transferred to the frequency f - 11 kc/s;

- any frequency assignment f in the 8476 - 8745 kc/s band shall be transferred to the frequency f - 14 kc/s;

- any frequency assignment f in the 12 714 - 13 130 kc/s band shall be transferred to the frequency f - 21 kc/s;

- any frequency assignment f in the 16 952 - 17 290 kc/s band shall be transferred to the frequency f - 28 kc/s;

- any frequency assignment f in the 22 400 - 22 650 kc/s band shall be transferred to the frequency f - 30 kc/s.

2. At x hours GMT on * administrations shall change the transmitting frequencies of their radiotelegraph stations in accordance with the rules mentioned above and shall notify the I.F.R.B. of the changes made.

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* Date to be fixed by the Conference; it should, in the view of the French Administration, be as soon as possible after the date on which the Final Acts of the Conference come into force.

Ref.

F/8(53 corr.)
(cont.)

3. Provided no characteristic other than the designation of the transmitting frequency has been changed, the I.F.R.B. shall enter the change requested in the Master International Frequency Register. The other details of the entry - in particular the dates given in column 2 - shall not be altered.

4. Three months after * the I.F.R.B. shall send to any administrations which have not reported the transfer of frequencies assigned to their coast radiotelegraph stations an extract from the Master International Frequency Register showing the entries contained therein opposite their name, relating to stations of this category, accompanied by a reminder of the provisions of this resolution.

5. Two months after the despatch of these extracts, the I.F.R.B. shall re-examine any assignments contained in the Master Record in respect of which a change making the assignments in question conform with the present resolution has not been notified by the countries concerned; this re-examination shall be made as though the notification appearing in the Master Register had been sent to the I.F.R.B. on the date of the examination.

The Master Record shall be amended in the light of the findings reached by the Board.

6. Administrations under whose name frequency assignment notifications have been entered in the Master Record under Nos. 209, 211 or 213 of the Radio Regulations (Geneva, 1967) may, within the limits of the bands mentioned in the aforementioned numbers, make any frequency changes they consider necessary to prevent the assignments concerned being subjected to increased interference or causing more interference to stations of the maritime mobile service, or to reduce such interference.

7. When the Board notices, further to the notification of such frequency changes, that results in accordance with paragraph 6 above have been obtained or if the change has been the result of direct coordination by all the administrations concerned, the relevant entries in the Master Record shall be amended as mentioned in paragraph 3) above.

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* Date to be fixed by the Conference; it should, in the view of the French Administration, be as soon as possible after the date on which the Final Acts of the Conference come into force.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 8-E
9 March 1967
Original : French

PLENARY MEETING

FRANCE

Proposed Amendments to the Radio Regulations

(Item I of the agenda)

USE OF SINGLE SIDEBAND TECHNIQUE IN THE BANDS ALLOCATED TO THE MARITIME MOBILE SERVICE BETWEEN 1605 AND 4000 kc/s AND IN THE HF BANDS EXCLUSIVELY ALLOCATED TO THE MARITIME MOBILE RADIOTELEPHONE SERVICE

Ref. Article 7 - Section IV

F/8(1) No. 442 Replace :

- 2065 - 2170 kc/s by 2065 - 2173.5 kc/s
- 2170 - 2194 kc/s: Guard-band for the distress frequency 2182 kc/s by - 2173.5 - 2190.5 kc/s: Guard-band for the distress and calling frequency 2182 kc/s.

Add in the appropriate place :

- 2190.5 - 2194 kc/s : Selective calling of ship stations by coast stations

Reasons :

The improvement in the technical characteristics of the equipment may enable the guard-band of the frequency 2182 kc/s to be reduced to 17 kc/s. The gaining of two traffic channels does not allow for world-wide distribution. It is proposed that one of these channels should be assigned to ship-coast traffic (adjacent band)

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Ref.

F/8(1) (cont.) and the other to selective calling. See also proposal relating to No. 1344 (F/8(38)).

F/8(2) No. 443 Delete this number

Reasons :

As a result of SSB operation and the sub-division of the bands, the frequency separations become irregular and the recommendation in No. 443 is no longer of practical value. See draft Resolution No. 1A (F/8(52)) attached and Diagram No. I relating to the transfer of frequencies assigned to stations in the maritime mobile service in the 1605 - 3800 kc/s band.

F/8(3) No. 444 Delete this number

Reasons :

See proposal relating to No. 443 (F/8(2)).

F/8(4) No. 445 Replace the present text by the following :

(4) In Regions 2 and 3, the frequencies 2636.35 kc/s (carrier frequency 2635 kc/s) and 2639.65 kc/s (carrier frequency 2638.3 kc/s) are used, in addition to the frequencies prescribed for common use in certain services, as ship-ship working frequencies by ship radiotelephone stations. In Region 3 these frequencies are protected by a guard-band between 2634 and 2642 kc/s.

Reasons

See draft Resolution 1A (F/8(52)) relating to the transfer of frequencies assigned to maritime mobile service stations in the 1605 - 3800 kc/s band.

Ref.

F/8(5) No. 447 Replace the present text by the following :

a) Ship stations, telephony

4063 - 4140 kc/s
6200 - 6211 kc/s
8195 - 8280 kc/s
12330 - 12421 kc/s
16460 - 16558 kc/s
22000 - 22100 kc/s

Reasons :

Since all ship stations are eventually due to work on SSB, the "working frequencies" part of Appendix 15B no longer seems to be necessary and the channels shown there can be assimilated to the other radiotelephone channels in Appendix 17. Subject to the availability of associated frequencies for the direction land-ship (see Proposal No. F/8(6) relating to No. 448), an additional number of channels can be set up to meet the new maritime radio service requirements.

No. 449 RR is correspondingly deleted.

In the same way, the calling frequencies set out in No. 450 RR can be deleted because selective calling will be used.

These channels can also be incorporated in Appendix 17 as indicated above. No. 450 is correspondingly deleted (see diagram, Annex II).

F/8(6) No. 448 Replace the present text by the following :

b) Coast stations, telephony

4361 - 4438 kc/s
6514 - 6525 kc/s
8731 - 8815 kc/s
13109 - 13200 kc/s
17262 - 17360 kc/s
22620 - 22720 kc/s

Ref.

F/8(6) (cont.)

Reasons :

The frequency bandwidths reserved for coast radiotelephone stations are increased, in line with the amendments proposed for the frequency bandwidths for ship radiotelephone stations, thus providing pairs of associated frequencies.

The supplementary bandwidths are taken from the bands provided in No. 452 RR and Appendix 15 Section A for low-traffic ship radiotelegraph station transmissions. The frequencies reserved for coast-station radiotelegraph and facsimile traffic are all displaced by the same quantity to lower frequencies, without altering the separation between them and by transferring the assignment.

The number of working frequencies to be assigned to low-traffic ships is in general reduced from 98 to 84. This proposal is justified by the traffic-density in this band, which is at present tolerable, the increase in the number of large ships compared with small, and the expansion of radiotelephony (see diagram, Annex II).

F/8(7) No. 449 Delete this number

Reasons :

See Proposal No. F/8(5) relating to No. 447.

F/8(8) No. 450 Delete this number

Reasons :

See Proposal No. F/8(5) relating to No. 447.

Ref.

F/8(9) No. 451 Replace

- 16 562 - 16 622 kc/s by
- 16 558 - 16 622 kc/s

Reasons :

See Proposal No. F/8(5) relating to No. 447.

F/8(10) No. 452 Replace the present text by the following :

Ship stations, telegraphy

4160 - 4231 kc/s
6240 - 6346 kc/s
8320 - 8462 kc/s
12471 - 12693 kc/s
16622 - 16924 kc/s
22148 - 22370 kc/s
25070 - 25110 kc/s (1)

Reasons :

The frequency bands used for radiotelegraphy by low-traffic ship stations are reduced because of the increases in the frequency bands proposed in No. 448. This reduction entails a reduction in the number of working frequencies assigned in both Group A and Group B. See Proposal No. F/8(6) relating to No. 448 and diagram, Annex II.

F/8(11) No. 453 Replace the present text by the following :

Coast stations, wide-band radiotelegraph systems, facsimile, special transmission systems, teleprinters, data transmission and manual telegraphy.

Ref.

F/8(11) (cont.)

4231	-	4361 kc/s
6346	-	6514 kc/s
8462	-	8731 kc/s
12693	-	13109 kc/s
16924	-	17262 kc/s
22370	-	22620 kc/s

Reasons :

The result of the changes (F/8(6) and F/8(10)) proposed to Nos. 448 and 452. It is proposed that the frequency bands in No. 453 be shifted to lower frequencies. See the reason for the proposal relating to No. 448, and attached draft Resolution No. IB (Proposal No. F/8(53)) relating to the transfer of frequency assignments.

The title is, moreover, worded in the same way as the title of No. 451 so that ship stations and coast stations can use their respective bands for the same purposes. See also proposal relating to Point 7.1 of the agenda (Document No. 14).

F/8(12) No. 457 Delete the second sentence

Reasons :

This provision is met by the convening of the present Conference.

F/8(13) Article 23 - Section II

No. 863 Replace (at the beginning) :

- the carrier power of the transmitter does not exceed 50 watts;

by

- the peak envelope power of the transmitter does not exceed 200 watts;

Ref.

F/8(13) (cont.)

Replace (near the end) :

- the carrier power of the transmitter does not exceed 250 watts.

by

- the peak envelope power of the transmitter does not exceed 1 kilowatt.

Add the following footnote :-

(This applies to the French text only).

Reasons :

To replace the magnitudes of the carrier power of DSB transmitters by the corresponding magnitudes of the peak envelope power of SSB transmitters.

F/8(14) Article 23 - Section III

No. 903 Replace the present text by the following :

(2) For ship radiotelephone stations where the peak envelope power of the transmitter does not exceed 400 watts and for aircraft radiotelephone stations operating on frequencies allocated exclusively to the aeronautical mobile service.... (the rest unchanged).

Add the following footnote : (French text only)

Reasons :

See Proposal No. F/8(13) relating to No. 863.

Ref.

F/8(15) Article 28 - Section IV

No. 984 Replace the present text by the following :

a) send class A3H emissions and receive class A3 and A3H emissions on the carrier frequency 2182 kc/s;

Reasons :

To enable class A3H SSB emissions to be received on the DSB receivers of stations not compelled to convert to SSB operation (see No. 996).

F/8(16) No. 985 Replace the present text by the following :

b) send, in addition, Class A3A and A3J emissions on at least two working frequencies;(1)

Reasons :

Consequence of using SSB.

F/8(17) No. 986 Replace the present text by the following :

c) receive, in addition, class A3A, A3H and A3J emissions on all other frequencies necessary for their service.

Reasons :

Consequence of using SSB. Furthermore, coast stations must send class A3H emissions for the equipment provided solely for distress, urgency and safety traffic (Nos. 987 and 996) to be able to receive general messages (notices to mariners, meteorological bulletins). To avoid repetition of these messages with A3A or A3J, all ship stations must be able to receive with A3H.

Ref.

F/8(18) No. 987 Replace the present text by the following :

The provisions of Nos. 984, 985 and 986 do not apply to apparatus provided solely for distress, urgency and safety purposes, which need only be able to :

- send class A3 or A3H emissions on 2182 kc/s;
- receive class A3 and A3H emissions on the frequencies used for distress, urgency and safety purposes.

Reasons :

These provisions relate to simple apparatus installed on board small ships and intended solely for distress and safety traffic, for which conversion to SSB should not be compulsory.

F/8(19) Article 28 - Section V

No. 992 Replace the last two lines of this number by the following::

"of transmitting and receiving on the frequency 500 kc/s, preferably class A2 or A2H emissions, or, on the frequency 2182 kc/s, class A3 or A3H emissions."

Reasons :

Consequence of using SSB. See also Proposal F/12(71) relating to No. 974 concerning radiotelegraphy (Item 5 of the agenda), Document No. 12.

F/8(20) Article 28 - Section VI

No. 996 Replace the present text by the following :

- in the bands between 1605 and 2850 kc/s, be able to transmit on 2182 kc/s using class A3 or A3H emissions.

Ref.

F/8(20) (cont.) If a receiver is provided for any of these bands, it shall be able to receive class A3 and A3H emissions on 2182 kc/s;

Reasons :

Consequence of using SSB, not compulsory for survival craft stations.

F/8(21) Article 32 - Section V

No. 1173 Replace the table in this number by the following :

4231	-	4361 kc/s	
6346	-	6514 kc/s	
8462	-	8731 kc/s	
12693	-	13109 kc/s	
16924	-	17262 kc/s	
22370	-	22620 kc/s	(see No. 453-1)

Reasons :

See Proposal No. F/8(11) relating to No. 453.

F/8(22) No. 1182 Replace the present text by the following :

(2) In the band 4187 - 4231 kc/s, the working frequencies of low traffic ships are spaced 0.5 kc/s apart, the extreme frequencies assignable being 4188 and 4229.5 kc/s as indicated in Appendix 15.

Reasons :

See Proposal No. F/8(10) relating to No. 452.

Ref.

F/8(23) No. 1186 Replace :

22 395 kHz by : 22 365 kc/s.

Reasons :

See proposal relating to No. 452.

F/8(24) No. 1196 Replace the present table by the following :

4187	-	4231 kc/s
6280.5	-	6346 kc/s
8374	-	8462 kc/s
12561	-	12693 kc/s
16748	-	16924 kc/s
22270	-	22370 kc/s

Reasons :

See Proposal No. F/8(10) relating to No. 452.

F/8(25) Article 33 - Section III

No. 1236 Replace the present text by the following :

(1) A ship station calling a coast station by radiotelephony shall use the working frequency associated with that of the coast station, in accordance with Appendix 17.

Reasons :

Consequence of abolishing Appendix 15-B because of the amendments proposed for Nos. 447 (F/8(5) and 450 (F/8(8)).

Ref.

F/8(26) No. 1249 Replace the present text by the following :

(1) When a ship station is called by a coast station, it shall reply on the working frequency associated with that of the coast station, in accordance with Appendix 17.

Reasons :

Consequence of abolishing Appendix 15-B because of the amendments proposed for Nos. 447 (F/8(5)) and 450 (F/8(8)).

F/8(27) No. 1251 Replace the present text by the following :

(3) In the Tropical Zone of Region 3, when a station is called on 6205.35 kc/s (carrier frequency 6204 kc/s), it should reply on the same frequency.

Reasons :

To harmonize the designation of frequencies used with SSB (see F/8(30)).

F/8(28) No. 1255 Delete this number

Reasons :

Consequence of the deletion of No. 450 (F/8(8)).

Ref.

F/8(29) Article 33 - Section VI

No. 1295 Replace the present text by the following :

(2) Any signals sent for testing shall be kept to a minimum, particularly on the carrier frequency 2182 kc/s, the frequency 156.80 Mc/s and in the Tropical Zone of Region 3 on 6205.35 kc/s (carrier frequency 6204 kc/s).

Reasons :

To harmonize the designation of frequencies used with SSB (see F/8(30)).

F/8(30) Article 35 - Section I

After No. 1321 insert the following :

No. 1321a Frequencies on which SSB emissions are sent shall be designated by the assigned frequency followed, in brackets, by details of the carrier frequency.

Reasons :

To clarify the method of designating frequencies used for SSB emissions.

F/8(31) Article 35 - Section II

Under the title : Section II. Bands between 1606 and 4000 kc/s insert No. 1322a as follows :

No. 1322a Unless otherwise specified in the present Regulations (see Nos. 987, 996, 1323, 1336 and 1337), the class of emission to be used in the bands between 1605 and 4000 kc/s shall be class A3A or class A3J using the upper sideband and with the necessary bandwidth not exceeding 2.7 kc/s.

Ref.

F/8(31) (cont.) Reasons :

It seemed necessary to state that, for the section as a whole, the upper sideband must always be used in the SSB system.

Furthermore, it seems advisable to indicate the classes of emission to be used.

F/8(32) No. 1323 Replace the present text by the following :

(1) The frequency 2182 kc/s(1) is the international distress frequency for radiotelephony; it shall be used for this purpose by ship, aircraft and survival craft stations using frequencies in the authorized bands between 1605 and 4000 kc/s when requesting assistance from the maritime services. It is used for the distress call and distress traffic, for the urgency signal and urgency messages and for the safety signal. Safety messages shall be transmitted, where practicable, on a working frequency after a preliminary announcement on 2182 kc/s. The class of emission to be used for the frequency 2182 kc/s, subject to the cases covered by Nos. 987 and 996, shall be class A3H.

Add the following footnote :

1323.1 (1) Whatever the class of emission used, the value indicated, 2182 kc/s, always designates the carrier frequency of the emission.

Reasons :

The distress frequency must be used with class A3 or A3H. To avoid ambiguity it is preferable to designate it in every case by its carrier frequency.

Ref.

F/8(33) No. 1325 Replace the present text by the following :

(3) Except for transmissions authorized on 2182 kc/s, all transmissions on the frequencies between 2173.5 and 2190.5 kc/s are forbidden.

Reasons :

See Proposal No. F/8(1) relating to No. 442.

F/8(34) No. 1336 Add the following sentence to the present text :

This other frequency shall be capable of being used with class A3H for the transmission of messages concerning safety of shipping announced on 2182 kc/s (No. 1492).

Reasons :

See Proposal No. F/8(17) relating to No. 986.

F/8(35) No. 1337 Replace the present text by the following :

(2) Coast stations open to the public correspondence service on one or more frequencies between 1605 and 2850 kc/s shall be capable of sending class A3H emissions and receiving class A3 and A3H emissions on 2182 kc/s.

Reasons :

See Proposal No. F/8(15) relating to No. 984.

Ref.

F/8(36) No. 1341 Replace the present text by the following :

(2) The peak envelope power (1) of mobile stations operating in the authorized bands between 1605 and 2850 kc/s shall not exceed 400 watts.

Reasons :

To replace the expression of the carrier power of DSB transmitters by the expression of the peak envelope power of SSB transmitters.

F/8(37) No. 1342 Replace the present text by the following :

(3) The peak envelope power (1) of coast radiotelephone stations operating in the authorized bands between 1605 and 3800 kc/s shall be limited to :

- 8 kilowatts for coast stations located north of latitude 32°N;
- 14 kilowatts for coast stations located south of latitude 32°N.

Reasons :

See Proposal No. F/8(36) relating to No. 1341.

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(1) This note concerns the French text only.

Ref.

F/8(38) No. 1344 Replace the present text by the following :

a) at least one of the ship-shore working frequencies 2047.35 kc/s (carrier frequency 2046 kc/s), 2050.65 kc/s (carrier frequency 2049.3 kc/s) and 2172.15 kc/s (carrier frequency 2170.8 kc/s) if required by their service;

Reasons :

Consequence of the use of SSB.

F/8(39) No. 1345 Replace the present text by the following :

b) at least one of the intership frequencies 2054.35 kc/s (carrier frequency 2053 kc/s) and 2057.65 kc/s (carrier frequency 2056.3 kc/s) if required by their service; these frequencies may be used as supplementary "ship-shore" frequencies.

Reasons :

Consequence of using SSB.

F/8(40) No. 1350 Replace the present text by the following :

(2) During the periods mentioned above, except for the transmissions provided for in Article 36, transmissions shall cease on the frequencies between 2173.5 and 2190.5 kc/s.

Reasons :

See Proposal No. F/8(1) relating to No. 442.

Ref.

F/8(41) No. 1351 Replace the present text by the following :

All stations on ships making international voyages should be able to use the intership frequency 2639.65 kc/s (carrier frequency 2638.3 kc/s) if required by their service.

Reasons :

Although this question primarily concerns Regions 2 and 3, it is proposed that the two SSB frequencies replacing the DSB frequency 2638 kc/s should be used :

- one for intership traffic,
- the other for requirements to be defined in Regions 2 and 3.

F/8(42) Article 35 - Section III

Under the title : Section III - Bands between 4000 and 23000 kc/s, insert the following No. 1351a :

1351a Unless otherwise specified in the Regulations (see Nos. 1353 and 1355 bis), the class of emission to be used in the bands between 4000 and 23000 kc/s shall be class A3A or class A3J using the upper sideband and with the necessary bandwidth not exceeding 2.7 kc/s.

Reasons :

It seemed necessary to state that, for Section III as a whole, the upper sideband must always be used in the SSB system.

Furthermore, it seems advisable to indicate the classes of emission to be used.

Ref.

F/8(43) No. 1352 Delete this number.

Reasons :

See Proposal No. F/8(8) relating to No. 450.

F/8(44) No. 1353 Replace the present text by the following :

In that part of the Tropical Zone situated in Region 3, 6205.35 kc/s (carrier frequency 6204 kc/s), using class A3H emissions, is designated for call, reply and safety purposes. It may also ... (the rest of the number unchanged).

Reasons :

The carrier frequency of the DSB emission on 6204 kc/s would be retained for SSB emissions, as proposed for 2182 kc/s, Since 6204 kc/s is for use by stations operating with SSB or DSB, class A3H emissions are necessary.

F/8(45) No. 1354 Replace the present text by the following :

For each coast station open to public correspondence the List of Coast Stations shall indicate the frequencies on which watch is maintained.

Reasons :

Consequence of the deletion of No. 452 (F/8(10)).

Ref.

F/8(46) After No. 1355 add the following

1355a When the amount of traffic requires it and the frequency allotments permit it (Appendix 25), the use of class A3B emissions is authorized. The carrier frequency to be used is the highest carrier frequency in the two adjacent channels allotted.

Reasons :

To clarify the conditions for use of class A3B emissions.

F/8(47) No. 1356 Delete this number

Reasons :

See Proposal No. F/8(7) relating to No. 449.

F/8(48) No. 1357 Delete this number

Reasons :

See Proposal No. F/8(7) relating to No. 449.

F/8(49) No. 1358 Delete this number

Reasons :

The technical characteristics of SSB transmitters must be stated. See Proposal below (F/8(51)) relating to Appendix 17 A.

Ref.

F/8(50) Appendix 3

Amend the table of frequency tolerances as follows :

Band : 1605 to 4000 kc/s

2. Land stations :
after land stations, add the reference (h);

3. Mobile stations :
after a) ship stations, add the reference (i);

Band : 4 to 29.7 Mc/s

2. Land stations :
after a) coast stations, add the reference (j);

3. Mobile stations :
a) ship stations;
after 2. emissions other than class A1, add the reference (k).

At the end of Appendix 3, add the following footnotes :

h) For coast radiotelephone station transmitters installed after 1 January 1973 the tolerance is 20 c/s.

i) For ship radiotelephone station transmitters (other than those referred to in No. 987) installed after 1 January 1973 the tolerance is 100 c/s.

j) For coast radiotelephone station transmitters installed after 1 January 1970 the tolerance is 20 c/s.

k) For ship radiotelephone stations installed after 1 January 1970 the tolerance is 100 c/s.

Reasons :

To complete the table of frequency tolerances with respect to those applicable to coast and ship stations after the dates by which conversion to SSB is compulsory.

Ref.

F/8(51) Appendix 17 A

After Appendix 17 insert the following :

APPENDIX 17 A

Technical characteristics of single sideband transmitters used for the maritime mobile radiotelephone service in the bands 1605 to 4000 kc/s and 4000 to 23000 kc/s.

1. a) For class A3H emissions the carrier power shall be 3 to 6 db less than the peak envelope power (1) of the emission.

b) For class A3A emissions, the carrier power shall be 16 ± 2 db less than the peak envelope power of the emission (1)

c) For class A3J emissions, the carrier power shall be more than 40 db less than the peak envelope power (1) of the emission.

2. The upper sideband shall always be used.

3. The transmitted audio-frequency band shall be 350 to 2700 c/s, the amplitude variation with the frequency not exceeding 6 db.

4. The maximum short-term drift (of the order of 15 minutes) shall be less than ± 40 c/s.

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(1) This note concerns the French text only.

Ref.

F/8(52)

DRAFT RESOLUTION 1.A

RELATING TO THE TRANSFER OF RADIOTELEPHONE FREQUENCIES ASSIGNED TO THE MARITIME MOBILE SERVICE, IN THE BANDS BETWEEN 1605 AND 4000 kc/s, FOR COMMUNICATIONS BETWEEN COAST AND SHIP STATIONS (1)

(See diagram in Annex I)

The Maritime Conference (Geneva, 1967),

considering

a) that during and after conversion to SSB, each DSB channel will be occupied by two SSB channels, one in the upper half and the other in the lower half of the DSB channel;

b) that the SSB channels must remain within the DSB channel limits;

decides

that in the bands between 1605 and 4000 kc/s the subdivision of the former DSB channels into two SSB channels shall conform to the following regulations concerning the carrier frequency arrangement and the necessary bandwidth :

1) The frequency assigned for SSB to a station working in the upper half of the DSB channel shall be 1.65 kc/s higher than the DSB carrier and the SSB carrier shall be 0.3 kc/s above the DSB carrier (necessary bandwidth 2.7 kc/s).

2) The frequency assigned for SSB to a station working in the lower half of the DSB channel shall be 1.65 kc/s lower than the DSB carrier and the SSB carrier shall be 3 kc/s below the DSB carrier (necessary bandwidth 2.7 kc/s).

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(1) Later on the French Administration will propose a draft resolution relating to the transfer of intership frequencies.

Ref.

F/8(52) (contd.)

3) When an Administration asks for an entry in its name in the register to be altered to bring it into line with the regulations set out in paras. 1 and 2 above, and provided the power, expressed as the peak envelope power for SSB emissions, is not more than twice the mean power previously notified, the dates shown in Column 2 shall be maintained.

4) In the month following the date of .....*), entries in the Master International Frequency Register relating to a double sideband assignment in the maritime mobile MF radiotelephone service shall be the subject of an I.F.R.B. questionnaire.

If, within 2 months, the notifying Administration has not sent a reply or announced that it is continuing to use the frequency in accordance with the existing entry, or if the amendments proposed for the assignment are such that the entry does not conform to the regulations set out in paras. 1 and 2 above, the following procedure shall be applied :

a) an entry with a date in Column 2 a).

The I.F.R.B. shall transfer this date to Column 2b and a reference shall be entered in Column 13 c to the effect that the entry does not conform to the regulations adopted by the present conference.

b) an entry with a date in Column 2 b).

The reference mentioned in a) shall be entered in Column 13 c).

c) When, in accordance with Article 9 of the Regulations, the I.F.R.B. is examining notices concerning the entry of subsequent assignments, it shall not take these assignment notices into consideration.

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*) date one month after the entry into force of the definitive provisions concerning the use of single sideband emissions for maritime MF radiotelephony.

Ref.

F/8(53)

DRAFT RESOLUTION 1.B[1)]

RELATING TO THE TRANSFER OF FREQUENCY ASSIGNMENTS IN THE BANDS EXCLUSIVELY ALLOCATED TO THE MARITIME MOBILE SERVICE BETWEEN 4000 AND 23000 kc/s FOR COAST RADIOTELEGRAPH STATIONS

(See diagram in Annex II)

The Maritime Conference (Geneva, 1967),

decides

that the assignments made in the bands :

4238 - 4368 kc/s
6357 - 6525 kc/s
8476 - 8745 kc/s
12714 - 13130 kc/s
16952 - 17290 kc/s
22400 - 22650 kc/s

and entered in the Master International Frequency Register on the date of entry into force of the provisions contained in the Final Acts of this conference shall be transferred as follows :

1) Any frequency assignment f in the 4238-4368 kc/s band shall be transferred to the frequency f-7 kc/s;

any frequency assignment f in the 6357-6525 kc/s band shall be transferred to the frequency f-11 kc/s;

any frequency assignment f in the 8476-8745 kc/s band shall be transferred to the frequency f-14 kc/s;

any frequency assignment f in the 12714-13130 kc/s band shall be transferred to the frequency f-21 kc/s;

1) This draft covers only the more important principles governing the transfer operation. The French Administration proposes to supply a more detailed draft later on.

Ref.

F/8(53) (cont.)

any frequency assignment f in the 16952-17290 kc/s band shall be transferred to the frequency f-28 kc/s;

any frequency assignment f in the 22400-22650 kc/s band shall be transferred to the frequency f-30 kc/s.

2) The information entered in the various columns, and particularly the dates in Column 2, shall be retained.

Reasons:

With this method of transfer the relative positions of all the assignments are strictly observed, so that additional operating difficulties are avoided. Since the frequencies in question are assigned to coast stations, the transfer affects only a few transmitters, at little cost to the Administrations.

F/8(54)

DRAFT RESOLUTION 1.C

INTERIM PROVISIONS GOVERNING THE ENTRY INTO FORCE OF THOSE PARTS OF THE RADIO REGULATIONS WHICH RELATE TO THE USE OF SINGLE SIDEBAND SYSTEMS FOR RADIOTELEPHONY IN THE 1605 - 2300 kc/s BANDS

(See diagram in Annex III)

The Maritime Conference (Geneva, 1967),

decides

that the following interim provisions shall be applied :

I. Bands between 1605 and 4000 kc/s

a) The installation of new double sideband equipment on board ships shall cease to be authorized on 1 January 1973.

Ref.

F/8(54) (cont.)

b) Coast stations open to public correspondence shall be capable of sending single sideband emissions, on at least one working frequency, from 1 January 1973.

Coast stations shall cease to send double sideband emissions on 1 January 1975.

c) With the exception of the cases covered by Nos. 987 and 996, ship stations shall cease to send double sideband emissions on 1 January 1980.

d) Whenever it is necessary to establish a radiotelephone communication, coast and ship stations equipped for single sideband emission must be capable of using class A3H on their working frequencies. This provision will cease to be compulsory on 1 January 1980.

II. Bands between 4000 and 23000 kc/s

a) Frequency assignments already notified for SSB emissions in accordance with the provisions of the Radio Regulations (Geneva, 1959) shall be transferred to the channels in the new Appendix 17**) on .....*).

The channels to which, on this date, the frequency assignments to those DSB stations due to remain in service, and to which the frequencies in the table in Appendix 17 had been assigned, will be as set out in the following table :

---

*) date of entry into force of the Final Acts of the present conference.

**) See Document No. 10, proposal F/10(61).

Ref.

F/8(54)
(cont.)

Serial No. (1959 RR)	New Serial No.
1	2
2	4
3	6
4	8
5	10
6	12
7	14
8	16
9	18
10	20
11	22

b) The installation of new double sideband equipment on board ships will cease to be authorized on .....*).

c) Coast stations open to public correspondence shall be capable of sending single sideband emissions, on at least one working frequency, from .....*).

Double sideband emissions from coast stations shall cease on 1 January 1971.

d) Ship stations shall cease to send double sideband emissions on 1 January 1977.

e) Whenever it is necessary to establish a radiotelephone communication, coast and ship stations equipped for single sideband emission must be able to use class A3H on their working frequencies. This provision will cease to be compulsory on 1 January 1977.

---

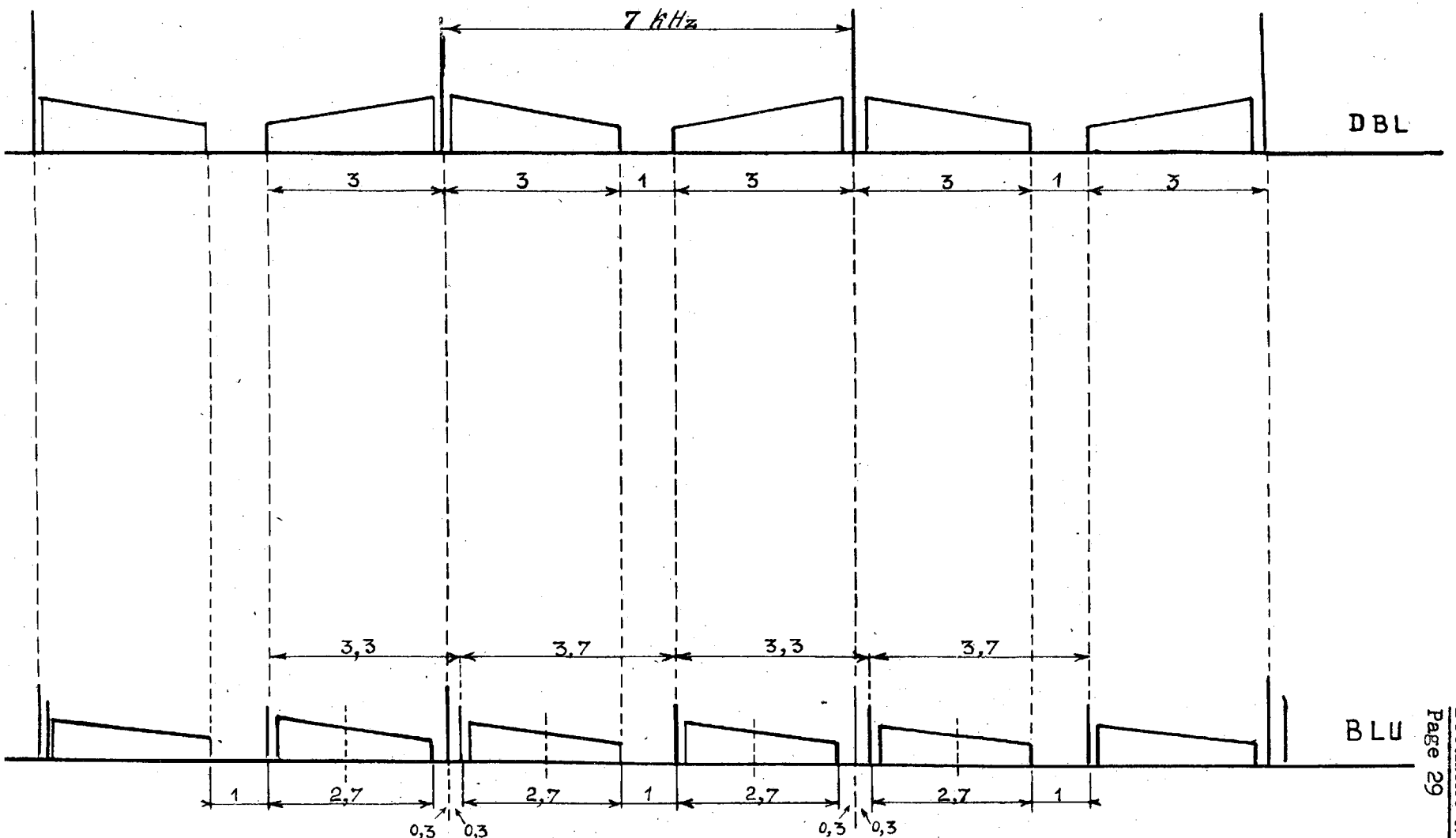
*) date of entry into force of the Final Acts of the present conference.

Annexes: 3

A N N E X E I - ESPACEMENT DES FREQUENCES BLU DANS LA BANDE 1605-4000 kHz

A N N E X I - SSB FREQUENCY SEPARATION IN THE 1605-4000 kHz BAND

A N E X O I - SEPARACIÓN DE LAS FRECUENCIAS DE BLU EN LA BANDA 1605-4000 kHz



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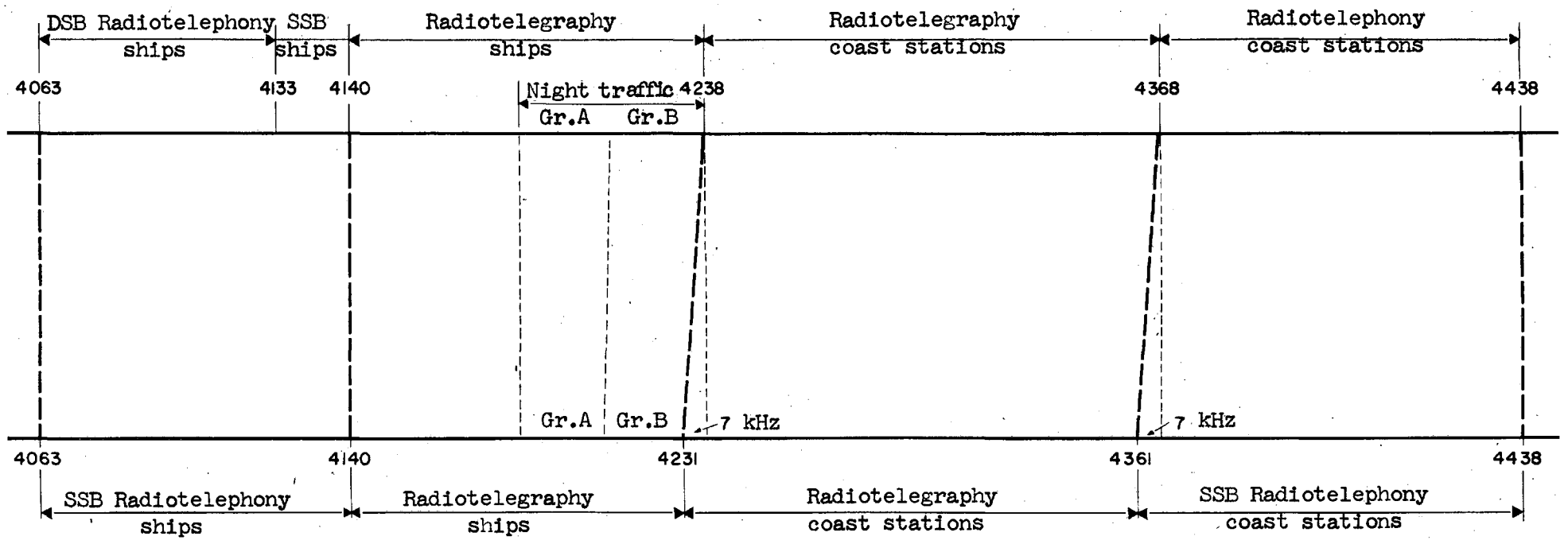
A N N E X II

DISTRIBUTION OF FREQUENCY BANDS ALLOCATED TO THE MARITIME MOBILE SERVICE BETWEEN 4 AND 27.5 MHz

(example in the 4 MHz band)



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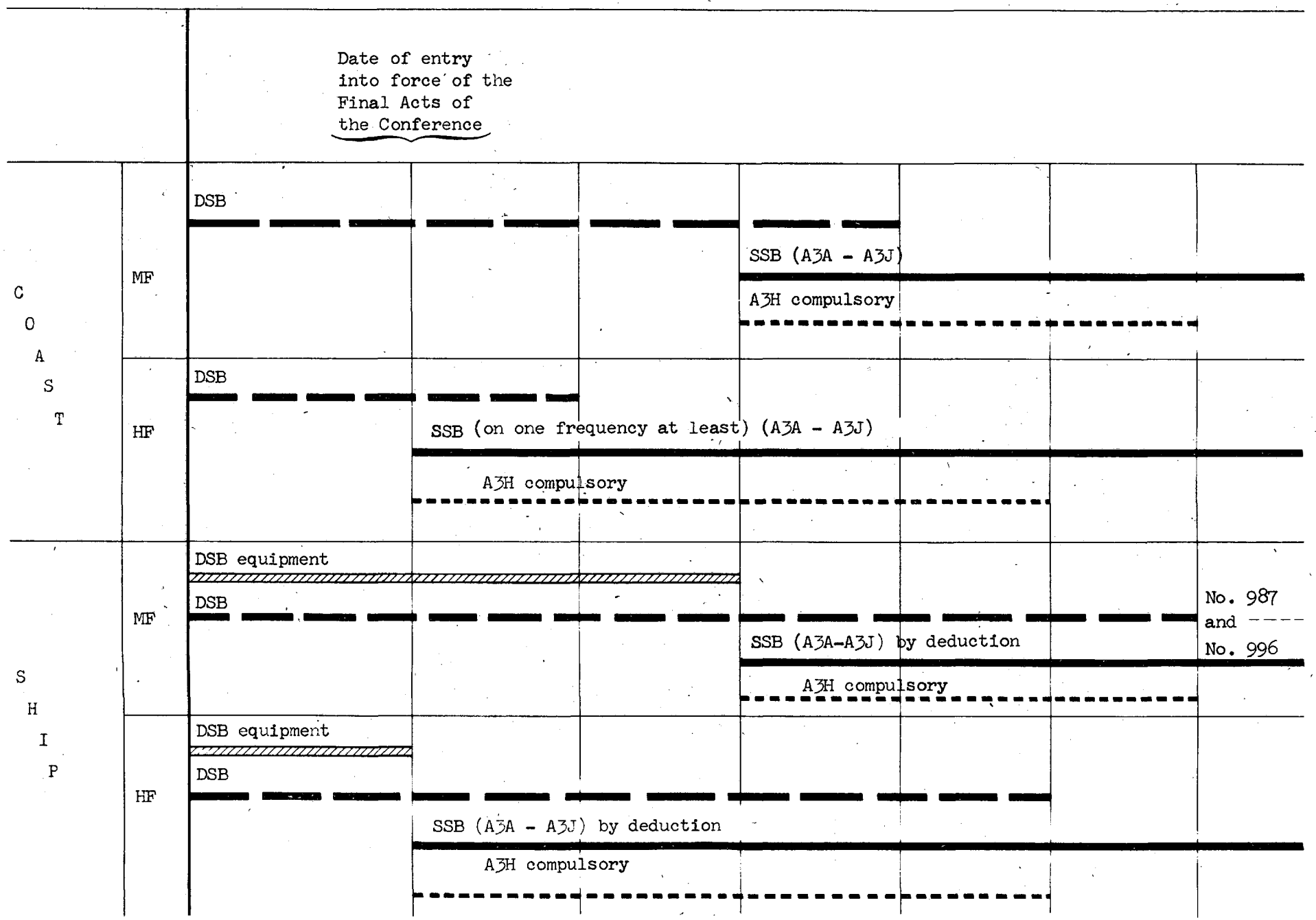
ANNEX III

(Draft resolution)

Dates of conversion to SSB



INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 9-E
9 March 1967
Original : French

PLENARY MEETING

FRANCE

Proposed amendments to the
Radio Regulations
(Item 2 of the Agenda)

Ref. 2.1 Frequency bands for coast and ship radiotelephone stations in the 6 MHz band

F/9(55) Proposal :

This question is settled by the amalgamation of Appendices 15 (Section B) and 17.

Reasons :

See Proposals Nos. F/8(5) to (7) relative to Nos. 447, 448 and 449 (item 1 of the Agenda), Document No. 8.

2.3 The possible use of the high traffic bands by tankers of 12,500 tons gross

F/9(56) No. 1156 - Replace the existing text by the following :

Stations installed on passenger ships shall use the high traffic band. Stations installed on cargo ships may also use this band (see No.1151), if the administrations responsible for them consider that this is justified by their traffic volume.

Reasons :

It is desirable to leave it to the administrations to determine the categories of ships that may use the high traffic band, depending on the volume of their traffic and not on a criterion of tonnage.

ARCHIVES U.I.T. GENÈVE

Ref. 2.5 Frequencies to be used by coast stations for wide band telegraphy facsimile and special transmission systems

F/9(57) Proposal :

This question is settled by the amendment to the heading of No. 453.

(See Proposal No. F/8(11) relative to this number under item 1 of the Agenda), Document No. 8.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 10-E
9 March 1967
Original : French

PLENARY MEETING

FRANCE

Proposed amendments to the Radio Regulations
(Item 3 of the Agenda)

3. Consequential revision of Appendices 15, 17 and 25 to the Radio Regulations

Ref.

F/10(58) No. 1145 Replace :

... "in section A of Appendix 15 .... by .... "in Appendix 15" .....

Reasons :

A consequence of the deletion of Appendix 15, Section B.

See proposal F/8(5) relative to No. 447 (Item 1 of the Agenda) Document No. 8).

F/10(59) Nos. 1146)
1158)
1175)
1180)
1181)
1182)
1184)
1187)
1189)
1191)
1193)
1197)

In each of these numbers replace :
"in Section A of Appendix 15"
by
"in Appendix 15".

Reasons :

A consequence of the deletion of Appendix 15-B.

ARCHIVES U.I.T. GENÈVE

Ref.

F/10(60)

Appendix 15

Appendix 15 - In the title, read as follows :

..... by ship radiotelegraph stations ...
... (see Article 32) ...

Replace paragraph 1 by the following :

1. For the use of frequencies in bands between 4 and 27.5 Mc/s for radiotelegraphy, see also **numbers 1174 to 1201 of Article 32.**

Replace paragraph 2 by the following :

2. In the table appearing in the present appendix :

a) the assignable frequencies ..... (rest unchanged).....

Delete paragraph 3

Replace the table in Appendix 15A by the table for Appendix 15 attached hereto

Delete the table in Appendix 15B

Reasons :

Appendix 15B is deleted as a consequence of proposals F/8(5) and F/8(8) relative to Nos. 447 and 450. Appendix 15A is replaced by the new Appendix 15 as a consequence of proposed amendments to Nos. 452 and 453 (proposals F/8(10) and (11) - Document No. 8). See also the proposals made under Item 7.1 of the agenda (Document No. 14) as regards working frequencies to be assigned to high-traffic ships for data transmission and teleprinter links.

Frequencies assignable to ship radiotelegraph stations using the maritime mobile service bands between 4 and 27.5 MHz

kHz

Band MHz	Limits	Assignable frequencies - Wide-band telegraphy, facsimile and special transmission systems	Assignable Working Frequencies for High-Traffic Ships: Teleprinters and data transmission	Assignable Working Frequencies for High-Traffic Ships: Manual telegraphy	Calling frequencies	Assignable Working Frequencies for Low-Traffic Ships: GROUP A	Assignable Working Frequencies for Low-Traffic Ships: GROUP B	Limits
4	4140	4142 - 4158 5 frequencies spaced 4	Limits 4160	Limits 4177	4178 - 4186 9 frequencies spaced 1	4188 - 4208,5 84 frequencies spaced 0.5	4209 - 4229,5	4231
6	6211	6213 - 6237 7 frequencies spaced 4	6240	6265,5	6267 - 6279 9 frequencies spaced 1.5	6282 - 6212,75 84 frequencies spaced 0.75	6213,5 - 6344,2	6346
8	8280	8282 - 8318 10 frequencies spaced 4	8320	8354	8356 - 8372 9 frequencies spaced 2	8376 - 8417 84 frequencies spaced 1	8418 - 8459	8462
12	12421	12424 - 12468 12 frequencies spaced 4	12471	12531	12534 - 12558 9 frequencies spaced 3	12564 - 12625,5 84 frequencies spaced 1.5	12627 - 12688,5	12693
16	16562	16564 - 16620 15 frequencies spaced 4	16622	16708	16712 - 16744 9 frequencies spaced 4	16752 - 16834 84 frequencies spaced 2	16836 - 16918	16924
22	22100	22102 - 22146 12 frequencies spaced 4	22148	22220	22225 - 22265 9 frequencies spaced 5	22272,5 - 22317,5 38 frequencies spaced 2.5	22320 - 22365	22370
25	25070	Assignable working frequencies to ships of all categories 25075 - 25105 11 frequencies spaced 3						25110

* For particular conditions concerning the use of 8,364 kHz, see No. 1179.

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Ref. Appendix 17

F/10(61) Appendix 17

- Paragraph 1 : (unchanged)
- Paragraph 2 : (unchanged)
- Paragraph 3 : delete
- Paragraph 4 : replace this paragraph by the following text:

4. If an administration assigns frequencies other than those indicated in the table below, its radiotelephone services shall not cause ..... (rest unchanged).

- Replace the table in Appendix 17 by the attached table.

Reasons :

A consequence of the use of SSB. See also proposals F/8(5) to (8) and F/8(30) relative to Nos. 447 to 450 and 1321a (Item 1 of the agenda); Document No. 8.

The table of transmitting frequencies in Appendix 17 has been drawn up in such a way as to keep an equal distance between adjacent frequencies: 3.2 kc/s in the 4 and 8 Mc/s bands; 3.5 kc/s in the 6, 12, 16 and 22 Mc/s.

The three pairs of frequencies of the 6 Mc/s band could, for allotment purposes, form a single group of 27 pairs with the 4 Mc/s band.

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Two-way radiotelephone channels in Maritime Mobile Service Bands
between 4,000 and 23,000 kc/s
Table of Transmitting Frequencies (kc/s)

Series No.	4 Mc/s		6 Mc/s		8 Mc/s		12 Mc/s		16 Mc/s		22 Mc/s	
	Coast	Ship	Coast	Ship	Coast	Ship	Coast	Ship	Coast	Ship	Coast	Ship
1	4 362,65 (4 361,3)	4 064,65 (4 063,3)	6 515,85 (6 514,5)	6 201,85 (6 200,5)	8 732,65 (8 731,3)	8 196,65 (8 195,3)	13 110,65 (13 109,3)	12 331,65 (12 330,3)	17 263,65 (17 262,3)	16 461,65 (16 460,3)	22 621,65 (22 620,3)	22 001,65 (22 000,3)
2	4 365,85 (4 364,5)	4 067,85 (4 066,5)	6 519,35 (6 518)	6 205,35 (6 204)	8 735,85 (8 734,5)	8 199,85 (8 198,5)	13 114,15 (13 112,8)	12 335,15 (12 333,8)	17 267,15 (17 265,8)	16 465,15 (16 463,8)	22 625,15 (22 623,8)	22 005,15 (22 003,8)
3	4 369,05 (4 367,7)	4 071,05 (4 069,7)	6 522,85 (6 521,5)	6 208,85 (6 207,5)	8 739,05 (8 737,7)	8 203,05 (8 201,7)	13 117,65 (13 116,3)	12 338,65 (12 337,3)	17 270,65 (17 269,3)	16 468,65 (16 467,3)	22 628,65 (22 627,3)	22 008,65 (22 007,3)
4	4 372,25 (4 370,9)	4 074,25 (4 072,9)			8 742,25 (8 740,9)	8 206,25 (8 204,9)	17 121,15 (13 119,8)	12 342,15 (12 340,8)	17 274,15 (17 272,8)	16 472,15 (16 470,8)	22 632,15 (22 630,8)	22 012,65 (22 010,8)
5	4 375,45 (4 374,1)	4 077,45 (4 076,1)			8 745,45 (8 744,1)	8 209,45 (8 208,1)	13 124,65 (13 123,3)	12 345,65 (12 344,3)	17 277,65 (17 276,3)	16 475,65 (16 474,3)	22 635,65 (22 634,3)	22 015,65 (22 014,3)
6	4 378,65 (4 377,3)	4 080,65 (4 079,3)			8 748,65 (8 747,3)	8 212,65 (8 211,3)	13 128,15 (13 126,8)	12 349,15 (12 347,8)	17 281,15 (17 279,8)	16 479,15 (16 477,8)	22 639,15 (22 637,8)	22 019,15 (22 017,8)
7	4 381,85 (4 380,5)	4 083,85 (4 082,5)			8 751,85 (8 750,5)	8 215,85 (8 214,5)	13 131,65 (13 130,3)	12 352,65 (12 351,3)	17 284,65 (17 283,3)	16 482,65 (16 481,3)	22 642,65 (22 641,3)	22 022,65 (22 021,3)
8	4 385,05 (4 383,7)	4 087,05 (4 085,7)			8 755,05 (8 753,7)	8 219,05 (8 217,7)	13 135,15 (13 133,8)	12 356,15 (12 354,8)	17 288,15 (17 286,8)	16 486,15 (16 484,8)	22 646,15 (22 644,8)	22 026,15 (22 024,8)
9	4 388,25 (4 386,9)	4 090,25 (4 088,9)			8 758,25 (8 756,9)	8 222,25 (8 220,9)	13 138,65 (13 137,3)	12 359,65 (12 358,3)	17 291,65 (17 290,3)	16 489,65 (16 488,3)	22 649,65 (22 648,3)	22 029,65 (22 028,3)
10	4 391,45 (4 390,1)	4 093,45 (4 092,1)			8 761,45 (8 760,1)	8 225,45 (8 224,1)	13 142,15 (13 140,8)	12 363,15 (12 361,8)	17 295,15 (17 293,8)	16 493,15 (16 491,8)	22 653,15 (22 651,8)	22 033,15 (22 031,8)
11	4 394,65 (4 393,3)	4 096,65 (4 095,3)			8 764,65 (8 763,3)	8 228,65 (8 227,3)	13 145,65 (13 144,3)	12 366,65 (12 365,3)	17 298,65 (17 297,3)	16 496,65 (16 495,3)	22 656,65 (22 655,3)	22 036,65 (22 035,3)
12	4 397,85 (4 396,5)	4 099,85 (4 098,5)			8 767,85 (8 766,5)	8 231,85 (8 230,5)	13 149,15 (13 147,8)	12 370,15 (12 368,8)	17 302,15 (17 300,8)	16 500,15 (16 498,8)	22 660,15 (22 658,8)	22 040,15 (22 038,8)
13	4 401,05 (4 399,7)	4 103,05 (4 101,7)			8 771,05 (8 769,7)	8 235,05 (8 233,7)	13 152,65 (13 151,3)	12 373,65 (12 372,3)	17 305,65 (17 304,3)	16 503,65 (16 502,3)	22 663,65 (22 662,3)	22 043,65 (22 042,3)
14	4 404,25 (4 402,9)	4 106,25 (4 104,9)			8 774,25 (8 772,9)	8 238,25 (8 236,9)	13 156,15 (13 154,8)	12 377,15 (12 375,8)	17 309,15 (17 307,8)	16 507,15 (16 505,8)	22 667,15 (22 665,8)	22 047,15 (22 045,8)
15	4 407,45 (4 406,1)	4 109,45 (4 108,1)			8 777,45 (8 776,1)	8 241,45 (8 240,1)	13 159,65 (13 158,3)	12 380,65 (12 379,3)	17 312,65 (17 311,3)	16 510,65 (16 509,3)	22 670,65 (22 669,3)	22 050,65 (22 049,3)

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Series	4 Mc/s		6 Mc/s		8 Mc/s		12 Mc/s		16 Mc/s		22 Mc/s	
	Coast	Ship	Coast	Ship	Coast	Ship	Coast	Ship	Coast	Ship	Coast	Ship
16	4 410,65 (4 409,3)	4 112,65 (4 111,3)			8 780,65 (8 779,3)	8 244,65 (8 243,3)	13 163,15 (13 161,8)	12 384,15 (12 382,8)	17 316,15 (17 314,8)	16 514,15 (16 512,8)	22 674,15 (22 672,8)	22 054,15 (22 052,8)
17	4 413,85 (4 412,5)	4 115,85 (4 114,5)			8 783,85 (8 782,5)	8 247,85 (8 246,5)	13 166,65 (13 165,3)	12 387,65 (12 386,3)	17 319,65 (17 318,3)	16 517,65 (16 516,3)	22 677,65 (22 676,3)	22 057,65 (22 056,3)
18	4 417,05 (4 415,7)	4 119,05 (4 117,7)			8 787,05 (8 785,7)	8 251,05 (8 249,7)	13 170,15 (13 168,8)	12 391,15 (12 389,8)	17 333,15 (17 321,8)	16 521,15 (16 519,8)	22 681,15 (22 679,8)	22 061,15 (22 059,8)
19	4 420,25 (4 418,9)	4 122,25 (4 120,9)			8 790,25 (8 788,9)	8 254,25 (8 252,9)	13 173,65 (13 172,3)	12 394,65 (12 393,3)	17 326,65 (17 325,3)	16 524,65 (16 523,3)	22 684,65 (22 683,3)	22 064,65 (22 063,3)
20	4 423,45 (4 422,1)	4 125,45 (4 124,1)			8 793,45 (8 792,1)	8 257,45 (8 256,1)	13 177,15 (13 175,8)	12 398,15 (12 396,8)	17 330,15 (17 328,8)	16 528,15 (16 526,8)	22 688,15 (22 686,8)	22 068,15 (22 066,8)
21	4 426,65 (4 425,3)	4 128,65 (4 127,3)			8 796,65 (8 795,3)	8 260,65 (8 259,3)	13 180,65 (13 179,3)	12 401,65 (12 400,3)	17 333,65 (17 332,3)	16 531,65 (16 530,3)	22 691,65 (22 690,3)	22 071,65 (22 070,3)
22	4 429,85 (4 428,5)	4 131,85 (4 130,5)			8 799,85 (8 798,5)	8 263,85 (8 262,5)	13 184,15 (13 182,8)	12 405,15 (12 403,8)	17 337,15 (17 335,8)	16 535,15 (16 533,8)	22 695,15 (22 693,8)	22 075,15 (22 073,8)
23	4 433,05 (4 431,7)	4 135,05 (4 133,7)			8 803,05 (8 801,7)	8 267,05 (8 265,7)	13 187,65 (13 186,3)	12 408,65 (12 407,3)	17 340,65 (17 339,3)	16 538,65 (16 537,3)	22 698,65 (22 697,3)	22 078,65 (22 077,3)
24	4 436,25 (4 434,9)	4 138,25 (4 136,9)			8 806,25 (8 804,9)	8 270,25 (8 268,9)	13 191,15 (13 189,8)	12 412,15 (12 410,8)	17 344,15 (17 342,9)	16 542,15 (16 540,8)	22 702,15 (22 700,8)	22 082,15 (22 080,8)
25					8 809,45 (8 808,1)	8 273,45 (8 272,1)	13 194,65 (13 193,3)	12 415,65 (12 414,3)	17 347,65 (17 346,3)	16 545,65 (16 544,3)	22 705,65 (22 704,3)	22 085,65 (22 084,3)
26					8 812,65 (8 811,3)	8 276,65 (8 275,3)	13 198,15 (13 196,8)	12 419,15 (12 417,8)	17 351,15 (17 349,8)	16 549,15 (16 547,8)	22 709,15 (22 707,8)	22 089,15 (22 087,8)
27									17 354,65 (17 353,3)	16 552,65 (16 551,3)	22 712,65 (22 711,3)	22 092,65 (22 091,3)
28									17 358,15 (17 356,8)	16 556,15 (16 554,8)	22 716,15 (22 714,8)	22 096,15 (22 094,8)

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Appendix 25

The proposals made by France concerning the division of the DSB channels appearing in Appendix 17 (1959) into two SSB channels and the inclusion in the new Appendix 17 of the channels in Appendix 15B (1959) would provide supplementary channels to meet new HF radiotelephone requirements of the Maritime Mobile Service

However, the French Administration considers that the number of frequencies made available in this way is not enough to permit countries to use a simple notification procedure without serious drawbacks.

The use, by all countries of the world and for the same purpose, of a very limited number of frequencies recorded in the Register with different dates further to the notification procedure would be a permanent source of serious disputes between Administrations which might lead eventually, as the result of complaints of harmful interference, to the point where some of them are forbidden to use the frequencies in question.

In any case, such a procedure would lead to a notification race.

Furthermore, the deletion of Appendix 25 would lead to the disappearance of rights which had been recognized in respect of countries that have not yet been able to notify the corresponding assignments.

It is quite certain that the use of a small number of frequencies by a large number of countries, under the best possible conditions, can be based only on reciprocal tolerance, which leads quite naturally to the idea of a plan.

However, the evolution of frequency management shows that planning procedure is a more elaborate process than the mere notification procedure.

Hence, the French Administration considers that the Conference should do its utmost to prepare a revised allotment plan (new Appendix 25) which would take both past allotments and new requirements into account.

As regards the technical bases to be considered in revising the allotment plan, the Conference could draw guidance from the standards used by the I.F.R.B. for examining frequency notices.

The French Administration feels that the Maritime Conference is in a position to revise Appendix 25. For this purpose it proposes :

1. A working document entitled "Procedure for the revision of Appendix 25" (Annex I)

2. A draft resolution (Annex II) relative to the conditions for the recording in the Master International Frequency Register :

   a) of allotments appearing in Appendix 25 (1959) and of entries relative to frequency assignment notices effected in accordance with the present Appendix;

   b) of new allotments and entries relative to frequency assignment notices which do not come under the above category.

3. Draft amendment of the pertinent portions of Article 9 of the Regulations, concerning action to be taken by the I.F.R.B. on frequency notices other than those referred to in the preceding point.

Annexes : 3

A N N E X I

PROCEDURE FOR THE REVISION OF APPENDIX 25 TO THE RADIO REGULATIONS

(Working Document)

The preparation of a new frequency allotment plan for the maritime mobile HF radiotelephone service will lead the Conference to consider in turn the old allotments appearing in Parts I and II of Appendix 25 (1959) plus all requirements which do not correspond to an allotment contained in this appendix. These requirements will be referred to hereinafter as "other requirements".

A. Old allotments

A.1 In an initial stage, the Conference will invite all Administrations having one or more DSB channel allotments in Part I of Appendix 25 (1959) to keep for each of these channels, under the new allotments contained in the amended plan, only one SSB channel corresponding, in the amended Appendix 17, either to the upper half or to the lower half of the DSB channel of Appendix 17 (1959).

These countries will also appreciably reduce the load on the other half-channel by stopping all traffic on it by the end of the transitional period at the latest (1). The choice may be made unilaterally by each Administration concerned, but it would appear to be very desirable for all the Administrations using one and the same allotment to agree on this matter.

The Conference should fix a deadline for this first phase to ensure that its work is not delayed.

A.2 Countries having an allotment under Part II of the plan (Appendix 25 - 1959) will do the same. However, this choice will lead to an allotment under Part II of the new plan only if the procedure outlined below under Section B does not cause the Conference to transfer the allotment in question to Part I of the new plan.

Unless the Conference decides that the power must be changed for a given allotment, the number expressing the maximum power (peak power) of each of the allotments shall be twice the number expressing the mean power in the old plan (Appendix 25 - 1959).

---

(1) This does not exclude the possibility of supplementary allotments for other requirements, as mentioned under Section B below.

Hence, the new allotment plan will first contain the SSB channel allotments resulting from the above procedure.

B. Other requirements

In a second stage, the Conference will continue the preparation of an allotment plan basing itself on the following rules :

B-1 Account will be taken of allotments already made under Section A above.

B-2 Requirements which it had been possible to meet in 1959 only by an allotment in Part II of the plan (Appendix 25 - 1959) will first be examined with a view to their transfer, where possible, to Part I of the new Plan.

B-3 Considering that the most urgent (new or supplementary) requirements have been or will be expressed by a frequency assignment notice, the Conference will continue the preparation of the allotment plan taking as a basis for requirements to be met :

In the first place :

Frequency notices sent to the I.F.R.B. between 3 December 1951 and 26 February 1967 giving rise to an entry in the M.I.F.R. with a date later than 4 December 1951 in column 2 b).

Frequency notices which were within the limits of an allotment appearing for an Administration in Appendix 25 (1959) but which were accessory assignments to main DSB assignments considered in the first phase of the work (Section A above).

Then the assignments notified to the I.F.R.B. since 26 February 1967 and the requirements expressed at the present Conference before *).....

The attached draft resolution indicates the changes which will be made by the I.F.R.B. in the entries appearing at present in the Master International Frequency Register or which will appear therein on the date when the Final Acts of this Conference come into force. These amendments concern :

---

*) Date to be fixed by the Conference (as close as possible to its opening date).

- allotments in the old and the new plans,
- assignments in accordance with the old allotment plan (1959),
- assignments not in accordance with the old allotment plan (1959) but which have led to an allotment in the new plan,
- assignments not in accordance with the old plan (1959) and which cannot have led to an allotment in the new plan (1967) on behalf of the notifying country but which are in accordance with the other provisions of the Regulations (Appendices 17 and 17 bis)*),
- assignments with all the characteristics specified above, but not in accordance with the other provisions of the Regulations (Appendices 17 and 17 bis).

*

* *

The attached draft amendment of Article 9 specifies the action which will be taken by the I.F.R.B. upon the entry into force of the Final Acts of this Conference, on assignment notices concerning frequencies in the HF bands allocated exclusively to the maritime mobile service for radiotelephony.

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*) See proposal F/8(51).

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A N N E X II

DRAFT RESOLUTION

Ref.

F/10(62) The Maritime Conference,

considering

that a new allotment plan has been prepared to replace the allotment plan in Appendix 25 to the Radio Regulations (Geneva 1959);

that the allotments on behalf of certain countries in the old allotment plan (Appendix 25 - 1959) have been transferred to the new plan (Appendix 25 - 1967), subject to changes regarding the class of emission, the necessary bandwidth and the maximum usable power;

that the frequency assignments not in accordance with the old allotment plan (Appendix 25 - 1959), which have formed the subject of frequency notices sent to the I.F.R.B. between 4 December 1951 and the present Conference, have been considered in assessing requirements with a view to the preparation of the new plan;

that some countries have thereby benefited from new allotments and that the corresponding entries in the Master International Frequency Register (M.I.F.R.) may therefore be backdated in columns 2 a) and 2 b) of the Register, subject to certain transfer rules to make the entries in accordance with the new allotment plan;

resolves

a) that after .....*) the Master International Frequency Register shall include the allotments appearing in the Plan contained in Appendix 25 (revised) to the Radio Regulations (Geneva 1967);

b) that on this same date entries in the Master International Frequency Register concerning allotments in the plan contained in former Appendix 25 (1959) shall be deleted;

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*) Date of entry into force of the Final Acts of the Maritime Conference.

Ref.

F/10(62) (contd.)

c) that, at the request of the Administrations concerned, the I.F.R.B. shall proceed to change in the Master International Frequency Register those entries which related :

- either to frequency assignments involving the use of double sideband operation, which were in accordance with an allotment in Appendix 25 (1959) - Part I;

- or to frequency assignments involving the use of single sideband operation, which were contained within the limits of an allotment in Appendix 25 (1959) - Part I.

The modification, which shall apply only to one of the entries referred to above from all those relating to a channel allotted under the old plan (Appendix 25 - 1959), may concern only:

- the designation of the frequency which shall correspond to the new channel allotted in the new plan in exchange for the former allotment (column 1 of the Master Register);

- the designation of the class of emission and the necessary bandwidth which will satisfy the rules laid down at this Conference (column 7 of the Master Register);

- the power, expressed as peak power (1), which may not exceed the power indicated in the revised allotment plan.

The date of 3 December 1951 in column 2 a) shall be kept.

d) that, at the request of the Administrations concerned, the I.F.R.B. shall proceed, in accordance with the same rules, to modify the entries appearing in the Master International Frequency Register corresponding to allotments in Part II of the allotment plan (Appendix 25 - 1959) having formed the subject of an exchange allotment in Part II of the new allotment plan (Appendix 25 - 1967).

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(1) In accordance with C.C.I.R. Recommendation 326 (Geneva 1963) the term used in French to designate this power should be "puissance en crête de modulation".

Ref.

F/10(62) (contd.)

For these entries, the date 4 December 1951 shall be kept in column 2 b).

e) that, at the request of the Administrations concerned, the I.F.R.B. shall proceed, in accordance with the same rules, to modify the entries appearing in the Master International Frequency Register or under examination on ....*) concerning assignments involving the use of DSB or SSB provided they have given rise to the allotment, by the Conference, of a new or supplementary channel to the Administration concerned.

The modified entries shall be in accordance with the rules laid down by this Conference and with the new allotment plan. They shall bear the date 3 December 1951 in column 2 a) or 4 December 1951 in column 2 b), depending on whether they relate to an allotment in Part I or Part II of the new plan;

f) that the I.F.R.B. shall circulate a questionnaire during the month following ....**) for entries concerning assignments in accordance with Appendix 25 (1959) but not modified so as to be in accordance with the new plan.

If, within two months, the notifying administration states that the assignment in question has been modified to make it in accordance with the new plan, the procedure referred to under e) above shall be applied.

If, at the expiry of this period, the notifying administration has not replied or has announced that it is continuing to use the frequency not in accordance with the new plan, the question shall be dealt with by the I.F.R.B. as described under point h) below.

g) That the assignments notified to the I.F.R.B. between 4 December 1951 and the date of entry into force of the Final Acts of the present Conference, which have not given rise to a new allotment, shall be dealt with as follows :

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*) Deadline for handing in requests, to be fixed by the Conference and which should be shortly after its meeting date.

**) Dates one month after the entry into force of the definitive provisions relative to the use of SSB for HF radiotelephony, by coast stations and ship stations respectively.

Ref.

F/10(62) (contd.)

g.1) DSB assignments which were in accordance with Appendix 17 (1959).

The notifying Administration shall have up to ....*) to request the I.F.R.B. that the entry be modified and transferred as SSB to one of the channels chosen by it corresponding in the new Appendix 17 to the upper part or the lower part of the formerly occupied DSB channel in Appendix 17. The peak power (1) shall not be more than twice the mean power notified for the DSB emission.

- The I.F.R.B. shall then make the requested change and the date in column 2 b) shall be kept.

- If the notifying Administration does not make use of this possibility, the matter will be dealt with by the I.F.R.B. as mentioned under h) below.

g.2) SSB assignments which were in accordance with Appendix 17 (1959) or, where applicable, with Appendix 25, and to which the above provisions do not apply.

The provisions of paragraph g.1) above shall apply. However, the frequency of the entry may be modified only to the extent that it may be transferred to the channel of the new Appendix 17 corresponding to the half-channel of the former Appendix (1959) occupied by the assignment in question. If the entry carries the date 3 December 1951 in column 2 a), the date when the assignment in question was notified to the I.F.R.B. shall be entered in column 2 b).

g.3) SSB or DSB assignments which were not in accordance with Appendix 17 (1959).

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*) Dates one month after the entry into force of the definitive provisions relative to the use of SSB for HF radiotelephony, by coast stations and ship stations respectively.

(1) In accordance with C.C.I.R. Recommendation 326 (Geneva 1963), the term used in French to designate this power should be "puissance en crête de modulation".

Ref.

F/10(62) (end)

Until ....*) the notifying Administration shall have the possibility of transferring the assignment so that the frequency concerned may keep the same position with respect to the channels of the new Appendix 17 as the original entry had with respect to the corresponding channels of former Appendix 17 (1959). Furthermore, in the case of a DSB assignment, the notifying Administration may request that the DSB assignment be changed into an SSB assignment with a peak power (1) not more than twice the mean power notified for the DSB emission.

Once the above-mentioned procedure has been put into effect, the I.F.R.B. shall proceed to modify the assignment without changing the date appearing in column 2 b).

If the notifying Administration does not make use of this possibility, it shall be questioned by the I.F.R.B. as mentioned in the third sub-paragraph of paragraph g.1) above. The I.F.R.B. shall take the action specified in that sub-paragraph with regard to the entry in question.

h) Treatment by the I.F.R.B., as a result of the foregoing, of certain entries referred to in paragraphs f), g.1), g.2) and g.3) above.

The I.F.R.B. shall make a new examination of the frequency notices relating to these entries in accordance with Article 9, as if these notices had been sent to it on ....*).

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*) Dates one month after the entry into force of the definitive provisions relative to the use of SSB for HF radiotelephony, by coast stations and ship stations respectively.

(1) In accordance with C.C.I.R. Recommendation 326 (Geneva 1963), the term used in French to designate this power should be "puissance en crête de modulation".

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A N N E X III

ARTICLE 9 - SECTION II

Ref.

F/10(63) No. 541 - Replace the present text by the following :

Paragraph 19 (1) Examination of frequency notices concerning frequency assignments to coast radiotelephone stations operating in accordance with numbers 1351a or 1355a (see Proposals F/8(42) and F/8(46) respectively, Document No. 8), in the bands allocated exclusively to the maritime mobile service between 4000 kc/s and 23 000 kc/s for coast radiotelephone stations (see No. 500).

Reasons :

To keep the procedure now in force relative to the examination by the I.F.R.B. and entry in the Master Registry of assignments to coast stations only for SSB emissions with a necessary bandwidth of not more than 2.7 kc/s. The effect of the proposed amendment is to make the general procedure mentioned in Nos. 501 et seq. applicable to DSB assignment notices. In particular, the provisions of Nos. 530 or 531 apply in most cases. Moreover, the entry of a date in column 2 b), coupled with an unfavourable finding under Nos. 523 to 531, will not allow such an entry to enjoy the protection referred to in No. 608 since the notification will not be in accordance with sub-paragraph 2) of No. 502, i.e. it will definitively not be in accordance with No. 501 (conflict with a clause of the Regulations - in this case No. 1351a, which states that A3A and A3J emissions are to be used in the maritime mobile service). No. 541 would apply as soon as the Final Acts come into force, subject to exceptions relative to transitional arrangements specified in draft resolutions.

F/10(64) No. 544 - Replace the words :

"... (including the frequency) of the emission of a radiotelephone coast station, without extending the necessary bandwidth beyond the upper or lower limits of the band provided for double sideband emissions in accordance with the Table in Appendix 17, the original assignment ....".

Ref.

F/10(64) (contd.) By the following :

"... (without a change in the carrier frequency) of the emission of a radiotelephone coast station, without extending the necessary bandwidth beyond the upper or lower limits of the band provided for single sideband emissions in accordance with Appendices 17 and 17bis (see proposal F/8(51), Document No. 8, the original assignment ....".

Reasons :

To align the provisions of Article 9 with the rules for using SSB. In particular, to specify that the shift of a carrier within the emission spectrum is a change requiring the application of No. 545.

F/10(65) No. 547 - Replace the present text by the following :

Paragraph 20 (1) Examination of notices concerning frequencies used by radiotelephone coast stations for reception of emissions in accordance with No. 1351a or 1355a in the bands allocated exclusively to the maritime mobile service between 4000 and 23 000 kc/s for radiotelephone ship stations (see Nos. 487 and 500).

Reasons :

The reasons given under No. 541 (F/10(63)) are valid for the reception frequencies of coast stations.

F/10(66) No. 581 - Replace the present text by the following

(5) For assignments to radiotelephone coast stations which do not meet the conditions mentioned in No. 541 and assignments to stations other than radiotelephone coast stations, the relevant date shall be entered in column 2 b) (see Nos. 525, 526, 530 and 531).

Reasons :

To provide for stations not in accordance with No. 541 the same status as that provided by No. 581 of the Radio Regulations (1959) for stations not in accordance with the Regulations.

Ref.

F/10(67) No. 586 - Replace the present text by the following

(5) For assignments other than assignments of frequencies for reception meeting the conditions specified in No. 547, the relevant date shall be entered in Column 2 b) (see Nos. 525, 526, 530 and 531).

Reasons :

The reasons given under No. 581 are valid for the frequencies for reception by coast stations.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 11-E
9 March 1967
Original : French

PLENARY SESSION

FRANCE

Proposed amendments to the
Radio Regulations
(Item 4 of the Agenda)

4. POSSIBLE REVISION OF APPENDIX 18 TO THE RADIO REGULATIONS

The French Administration considers that it will become desirable to reduce the separation between adjacent channels in Appendix 18 from 50 to 25 kHz.

However, premature application of such a measure would lead to considerable difficulties and it would seem reasonable for this Conference to rest content with making preparatory arrangements.

The proposals set out below relative to Appendices 3 and 19, and the attached draft Resolution have been prepared in this context.

Ref.

F/11(68) Appendix 3 - Amend the table of frequency tolerances to read as follows :

Band : 100 to 470 MHz

3 mobile stations :

a) ship stations and survival craft stations :

after - in the band 156 - 174 MHz - insert a reference (1)

At the end of Appendix 3, insert the following footnote :

1) The tolerance is 10 parts in 10^6 for ship station transmitters brought into service after 1 January 1970.

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Ref.

F/11(68) (cont).

Reasons :

To provide for a frequency tolerance such that ship station transmitters will be able to operate with a separation of 25 kHz between adjacent channels (see also the draft Resolution below).

F/11(69)

Appendix 19 - Amplify paragraph 2 by the following :

All transmitters brought into service after 1 January 1970 shall be so designed as to permit of easy reduction of the maximum frequency deviation from 15 to 5 kHz.

Reasons :

To ensure that transmitters brought into service after this date will be able to operate in due course with a separation of 25 kHz between adjacent channels.

(See draft Resolution below).

F/11(70)

DRAFT RESOLUTION

RELATIVE TO THE SEPARATION BETWEEN ADJACENT CHANNELS ASSIGNED IN THE VHF BAND (156 - 174 MHz) FOR THE MARITIME MOBILE SERVICE

(See Appendix 18)

The Maritime Conference,

considering

that it will be desirable to envisage a separation of 25 kHz instead of 50 kHz between adjacent channels assigned in the 156 - 174 MHz band for use by the Maritime Mobile Service :

that it is desirable to make the necessary arrangements for smooth passage from a separation of 50 kHz to a separation of 25 kHz between adjacent assigned channels;

Ref.

F/11(70)
(cont).

resolves

that equipment operating in the VHF band (156 - 174 MHz) brought into service on board ships after 1 January 1970 must be capable, after simple conversion, of operating with a separation of 25 kHz between adjacent assigned channels. The transmitters of such equipment must meet the necessary conditions of stability as soon as they are brought into service.

Reasons :

The maritime mobile service on VHF is expanding rapidly. It seems premature to amend Appendix 18 with a view to providing twice the number of channels with a spacing of 25 kHz instead of 50 kHz.

However, it would appear to be desirable for this conference to contemplate the conversion of equipment which will have to work with a narrower separation between adjacent channels with class of emission 16 F3 rather than 36 F3. This operation should not raise any difficulties, since land mobile services are already being developed in the same frequency band with a separation of 25 or 20 kHz between adjacent channels.

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GENEVA, 1967

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PLENARY MEETING

FRANCE

Proposed amendments to the
Radio Regulations

(Item 5 of the Agenda)

5. CLASSES OF EMISSION TO BE USED ON THE INTERNATIONAL DISTRESS AND CALLING FREQUENCIES 500 kHz AND 2182 kHz

Ref. Article 28 - Section III

F/12(71) No. 974 - Replace the present text by the following :

a) send and receive class A2 or A2H emissions on 500 kHz;

Reasons :

To allow the optional use of class A2H emissions on 500 kHz.

F/12(72) No. 975 - Replace the present text by the following :

b) send, in addition, class A1 and A2 (or A2H) emissions on at least two working frequencies.

Reasons :

To permit the optional use of class A2H emissions even on frequencies other than the international calling and distress frequency.

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Ref.

F/12(73) No. 976 - Replace the present text by the following :

c) receive, in addition, class A1, A2 and A2H emissions on all the other frequencies necessary for their service.

Reasons :

See proposal No. F/12(72) relative to No. 975.

Article 28 - Section V

No. 992 See proposal No. F/8(19) relative to this number under item 1 of the Agenda (Document No. 8).

F/12(74) Article 28 - Section VI

No. 995 - Replace the present text by the following

- in the bands between 405 and 535 kHz, be able to transmit on 500 kHz using class A2 or A2H emissions. If a receiver is provided for any of these bands, it shall be able to receive class A2 and A2H emissions on 500 kHz.

Reasons :

See proposal No. F/12(71) relative to No. 974.

F/12(75) Article 32 - Section II

No. 1106a After No. 1106, insert the following No. 1106a :

Whenever the class of emission A2 or A2H is mentioned in the present Regulations for use in the maritime mobile service, the type of transmission shall be telegraphy by on-off keying of the modulated emission, to the exclusion of on-off keying of the modulating audio frequencies only.

Ref.

F/12(75) (cont.)

Reasons :

To avoid blocking of automatic equipment for the reception of alarm signals which operate by detecting the carrier frequency.

F/12(76)

No. 1134 - Replace the present text by the following :

Stations of the maritime mobile service open to public correspondence and using frequencies in the authorized bands between 405 and 535 kHz shall, during their hours of service, remain on watch on 500 kHz. This watch is obligatory only for class A2 and A2H emissions.

Reasons :

See proposal No. F/12(71) relative to No. 974.

Proposed amendments concerning the classes of emission to be used on 2182 kHz have already been included in the proposals made under item 1 of the Agenda (see Document No. 8).

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PLENARY MEETING

FRANCE

Proposed amendments to the
Radio Regulations
(Item 6 of the Agenda)

6. Examination of the pertinent portions of the revised International Code of Signals

Ref. Nos. 1287 and 1430

F/13(77) Throughout the texts of these numbers, replace the word "received" by the letter "R" (ROMEO).

Reasons :

The letter "R" (ROMEO) which is already used in radiotelegraphy (Appendix 13, section II) and contemplated for use in radiotelephony in the I.M.C.O. revised International Code of Signals seems to be phonetically preferable to the word "received", and has the advantage of international usage.

Nos. 1302 and 1451

F/13(78) Throughout the texts of these numbers, replace the words "hullo all stations" by "CQ" (CHARLIE QUEBEC)

Reasons :

The abbreviation "CQ" is already used in radiotelegraphy (Appendix 13, section II) and contemplated for use in the revised International Code of Signals, and it offers the advantage of international usage.

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Ref. Appendix 16

F/13(79) Replace Appendix 16 by the following :

Phonetic Alphabet and Figure Code (see Article 33).

1. When it is necessary to spell out call signs, service abbreviations and words, the following table shall be used :

A. Phonetic Alphabet Code

Letter to be transmitted	Word to be used	Spoken as *)
A	Alfa	AL FAH
B	Bravo	BRA VO
C	Charlie	TCHAH LI or CHAR LI
D	Delta	DEL TAH
E	Echo	ÉK O
F	Foxtrot	FOX TROTT
G	Golf	GOLF
H	Hotel	HO TELL
I	India	IN DI AH
J	Juliett	DJOU LI ETT
K	Kilo	KI LO
L	Lima	LI MAH
M	Mike	MA IK
N	November	NO VEMM BER
O	Oscar	OSS KAR
P	Papa	PAH PAH
Q	Quebec	KÉ BEK
R	Romeo	RO MI O
S	Sierra	SI ÉR RAH
T	Tango	TANG GO
U	Uniform	YOU NI FORM or OU NI FORM
V	Victor	VIK TAR

*) The syllables to be stressed are underlined.

Ref.	Letter to be transmitted	Word to be used	Spoken as *)
F/13(79) (cont.)	W	Whiskey	OUISS KI
	X	X-ray	ÉKSS RÉ
	Y	Yankee	YANG KI
	Z	Zoulou	ZOU LOU

B. Phonetic Figure Code

Figure to be transmitted	Word to be used	Spoken as
0	Nadazero	NAH-DAH-ZERO
1	Unaone	OO-NA-ONE
2	Bissotwo	BIS-SO-TWO
3	Terrathree	TEH-RAH-THREE
4	Kartefour	KAH-TEH-FOUR
5	Pantafive	PAN-TAH-FIVE
6	Soxisix	SO-XI-SIX
7	Setteseven	SEH-TEH-SEVEN
8	Oktoeight	OK-TO-EIGHT
9	Novenine	NO-VEH-NINE
comma decimal	Decimal	DEH-SI-MAL

Note. Each syllable should be given an equal stress. The second half of each code word is the code word used by the Aeronautical Mobile Service.

2. However, stations of the same country may use, when communicating between themselves, any other table recognized by their administration.

Reasons :

To adopt the figure code appearing in the I.M.C.O. revised International Code of Signals.

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*) The syllables to be stressed are underlined.

Ref.
F/13(80)

DRAFT RESOLUTION

RELATIVE TO THE EXAMINATION OF PERTINENT PORTIONS OF THE REVISED INTERNATIONAL CODE OF SIGNALS OF THE INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION

The Maritime Conference (Geneva 1967),

considering

a) that the Maritime Safety Committee of the Inter-Governmental Maritime Consultative Organization (I.M.C.O.) has prepared a revised International Code of Signals which constitutes a radiotelephone code;

b) that some aspects of this radiotelephone code differ from the provisions of the 1959 Radio Regulations (see Annex I);

c) that the present Conference has amended certain points of the Radio Regulations to bring those parts which relate exclusively to the Maritime Mobile Service into line with the revised International Code of Signals of I.M.C.O.;

d) that the Radio Regulations are the responsibility of the International Telecommunication Union;

e) that it is desirable to define the responsibility and competence of the I.T.U. and I.M.C.O. regarding the usage of international signals in radiocommunication;

resolves

1) that the International Telecommunication Union is competent to determine the choice and conditions of use of international signals relating to radiocommunication procedures;

2) that it should be left to the Inter-Governmental Maritime Consultative Organization (I.M.C.O.) to determine the choice and conditions of use of signals relating to matters other than radiocommunication procedures;

3) that there is no objection to the adoption of the revised International Code of Signals; however, the attention of I.M.C.O. should be drawn to the existence of abbreviations having a different

Ref. F/13(80) (cont.)

meaning in the Code and Radio Regulations, which may - in radiotelegraphy only - involve certain drawbacks;

requests the Secretary-General of the International Telecommunication Union to send the Secretary-General of I.M.C.O. the report prepared by the World Maritime Radio Conference (Geneva 1967) annexed hereto.

Annex to the draft Resolution relative to the examination of the pertinent portions of the revised International Code of Signals of I.M.C.O.

Material submitted to the Conference with a view to the preparation of the Report to be sent to I.M.C.O.

1. The list of amendments made by the Conference to the Radio Regulations to allow for the revised International Code of Signals will be forwarded to I.M.C.O.

2. The report will also contain comments by the Conference on certain signals in the revised International Code of Signals :

- the practical application of which involves certain drawbacks (Chapter VIII),

- which have a different meaning from that attributed to them in the Radio Regulations (Chapter X).

With regard to these latter signals, it would be desirable for I.M.C.O. to draw attention to the possible confusion which might arise if they are used. It could do so for example by including an appropriate note to this effect.

CHAPTER VIII - Radiotelephony

- Paragraph 3 "Method of attack" and paragraph 4 "Reply to calls"

Use of the abbreviation "DE" (DELTA ECHO) in the procedure used in radiotelephony for calling and for answering calls might be

Ref. F/13(80) (cont.)

a source of confusion if the call signs of the called or calling stations end or begin with "DE".

CHAPTER X - Procedure signals

- General section - Two-letter signals

Signals having a different meaning in the Radio Regulations and the revised International Code of Signals of I.M.C.O.

Signal	RR	Code of signals
BK	Interruption in transmission	You are above me
BQ	Reply to RQ	Aircraft speed
CL	I am closing my station	Assistance refused
CP	Call to 2 or more specified stations.	Am coming to your assistance
DF	Bearing at ... hours	Vessel ready to serve
DO	Bearing doubtful	Watch vessel situated
ER	Here ...	Position at time indicated
NW	Now	Draught in ballast
OL	Ocean letter	Radar piloting
TU	Thank you	Am cutting the ropes
WD	Word(s) or Group(s)	Ice breaker not available
XQ	Note in the fixed service	What kind of weather do you have?

Medical section - Three-letter signals

Signals having a different meaning in the Radio Regulations and the revised International Code of Signals of I.M.C.O.

Signal	RR	Code of signals
MIN	Minute (or minutes)	Very dark stools
MPH	Statute miles per hour	Is no longer suffering
MSG	Message	Slight movements and massage every day

Ref. F/13(80) (cont.)

3. Comparison between the revised International Code of Signals and the "Q" code (Appendix 13, section I)

A number of signals included in the revised International Code of Signals have the same meaning as certain signals included in Appendix 13, Section I to the R.R. (Q Code).

The conference considered that it was not competent to amend the latter code which is used by services other than the Maritime Mobile Service.

INTERNATIONAL TELECOMMUNICATION UNION
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GENEVA, 1967

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PLENARY MEETING

FRANCE

Proposed amendments to the Radio Regulations

(Item 7 of the Agenda)

Other questions relating to the Maritime Mobile Service

7.1 Data transmissions from ship stations

Appendix 15A

This question is solved by Proposal F/10(60) to replace the table in Appendix 15A by the new table in Appendix 15 (see Item 3 of the agenda, Document No. 10).

Reasons :

To permit sharing of the working frequency bands assigned to high traffic ships, in order to separate data and teleprinter transmissions from manual telegraph transmissions.

Frequency separations may be the subject of a subsequent proposal.

See Proposal F/8(11) relating to No. 453 (Item 1 of the agenda, Document No. 9).

Reasons :

Results from the proposal to amend Appendix 15.

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Ref. 7.2 Conditions for the use of emergency position-indicating beacons

F/14(81) Article 28 - Section VI

Add the following number :

999a - No. 24 - Survival craft stations used in the maritime mobile service and intended primarily as beacons for locating an emergency or the position of survivors shall be able to transmit on 2182 kHz the signals defined in Nos. 1476 b or 1476 c (see F/14(84) and (85)). If the transmitter is such that the field produced at sea-level at a distance of 30 nautical miles exceeds 10 microvolts per metre, its operating cycle shall consist of a transmission lasting from 30 to 50 seconds followed by a silence lasting from 30 to 60 seconds.

F/14(82) Article 36 - Section VIII

No. 1470

Replace the present text by the following :

(1) These signals shall only be used to announce (see also Nos. 1476 c, 1476 e and 1476 f).

Add the following numbers :

F/14(83) No.1476a No. 44A (1) The signals to be used by the position-indicating beacons referred to in No. 999a (see F/14(81)) are as follows :

Ref.

F/14(84) No.1476b a) either a keyed signal composed of a series of dashes modulated at 1300 Hz of a constant duration of 1 to 5 seconds with intervals lasting, at a maximum, for the same time as the dashes;

F/14(85) No.1476c b) or a radiotelephone alarm signal (No.1465) transmitted for about 30 seconds and followed by the transmission in Morse in Class A2 with a modulating frequency of 1300 Hz or 2200 Hz of either :

- the letter B; or
- the call sign of the ship to which the beacon belongs; or
- the above two groups of signals.

F/14(86) No.1476d (2) The signals from the position-indicating beacons are produced automatically; their transmission may be interrupted for the sending or receiving of radiotelephone messages if the apparatus is so equipped.

F/14(87) No.1476e No. 44B (1) The signals defined in paragraph 44A above indicate that one or more people, a ship or an aircraft is in distress and may have no other transmitting medium and no receiving media.

Ref.

F/14(88) No.1476f (2) Any mobile service station receiving one of these signals, while no distress or urgent traffic is being passed, shall consider that the circumstances are as described in No. 1453.

Reasons :

Insertion in the Regulations of provisions relating to emergency position-indicating beacons (see C.C.I.R. Recommendation No. 439).

7.6 Establishment of a separate category for mobile radiotelephone traffic on inland waterways

F/14(89) No. 287

Add the following to the third paragraph of this number :

However, the frequency bands in which priority is given to the maritime mobile service may be used for shipping on inland waterways, subject to agreement between the administrations concerned and those whose services, having had the band assigned to them, are likely to be affected.

Reasons :

To permit the regular use of the frequencies appearing in Appendix 18 for shipping on inland waterways.

Table of transmitting frequencies

F/14(90) Appendix 18

Replace the footnote under *) by the following :

*) For assistance in understanding the Table, see notes a) to h) below :

Ref.

F/14(90)
(cont.)

Notes referring to the table

Add the following note h) :

h) The frequencies in this table may also be used for shipping on inland waterways, in the conditions specified in No. 287.

Reasons :

See Proposal F/14(89) relating to No. 287.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 15-E
9 March 1967
Original : French

PLENARY SESSION

FRANCE

Proposed amendments to the Radio Regulations

(Proposals submitted in accordance with Administrative Council Resolution No. 590, paragraph I, sub-paragraph 2, which do not come under items 1 to 7)

Ref. Use on board ships of frequencies of the order of 27 MHz

F/15(91) Article 35 - Insert the following Section III bis :

Section III bis - Bands between 26.1 and 27.5 MHz

1358 a) Frequencies in the 26.960 - 27.280 MHz band may be used for radiotelephony between different parts of a ship. The carrier wave power may not exceed 0.05 watt. The provisions of No. 225 shall apply.

Reasons :

To permit the use of low-power portable equipment operating in the 27 MHz band for very short-distance intercommunication on board ship.

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 16-E
16 March 1967
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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item 1

The use of single sideband technique in the Maritime Mobile Service in the bands available to that service between 1605 and 4000 kc/s and in the exclusive HF Maritime Mobile Radiotelephone bands.

U.S. Proposals

a) Amend Article 35, Section II - Bands between 1605 and 4000 kc/s.

b) Amend Article 35, Section III - Bands between 4000 and 23 000 kc/s.

c) Amend Article 28, Section IV.

d) Amend Article 5, No. 201.

ARTICLE 35

Section II. - Bands between 1605 and 4000 kc/s

A. Distress

NOC	1323	§ 3.	(1)
NOC	1324		(2)

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Ref.

USA/16(1)	MOD	1325	(3) Except for transmissions authorized on 2182 kc/s, all transmissions on the frequencies between ~~2170~~ 2173.5 and ~~2194~~ 2190.5 kc/s are forbidden.1)
	NOC	1326	(4)
			B. Call and Reply
	NOC	1327	§ 4.
		through	
	NOC	1331	§ 5.
			C. Watch
	NOC	1332	§ 6.
		through	
	NOC	1335	§ 7.

USA/16(2)	ADD	1325.1	1) Transmissions on the two channels of 3.5 kc/s bandwidth each, with carrier frequencies at 2170 and 2190.5 kc/s, formed by reduction of the band 2170-2194 kc/s to 2173.5-2190.5 kc/s, are limited to single sideband emissions A3A and A3J (see Nos. 1339BA through 1339BX) (Proposal No. USA/16(6)).
			D. Traffic
	NOC	1336	§ 8. (1)

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Ref.

USA/16(3)	MOD	1337	(2) Coast stations open to the public correspondence service on one or more frequencies between 1605 and 2850 kc/s shall also be capable of transmitting and receiving ~~class A3 emissions~~ on 2182 kc/s. Coast stations shall be capable of transmitting and receiving on 2182 kc/s with classes A3 or A3H emissions until 1 January, 1970. After 1 January 1970 coast stations shall be capable of transmitting on 2182 kc/s with class A3H emissions and be capable of receiving classes A3 and A3H emissions on 2182 kc/s.
	NOC	1338	(3)
	NOC	1339	(4)

USA/16(4)	ADD	1339A	(5) The power supplied to the antenna transmission line by transmitters operating on carrier frequencies 2170 and 2190.5 kc/s shall not exceed 400 watts (P_p).

Reasons :

To specify the class of emission capability of coast stations on 2182 kc/s, to reduce the guard band on that frequency, and to stipulate a power limitation for the two single sideband frequencies thereby provided.

Background :

The guard band for the distress frequency 2182 kc/s is proposed to be reduced to 17 kc/s per second and the remaining seven kc/s divided into 2 assignable channels which would be limited to stations employing single sideband emissions. The amendment of No. 1325 (USA/16(1)) provides for this reduction. The amendment of No. 1337 (USA/16(3)) is a consequential amendment resulting from the proposed mandatory transition of the maritime mobile service to single sideband. It may be necessary to defer use of these channels until conversion is completed.

Ref.

USA/16(5)

D(bis). Conversion to Single Sideband

ADD 1339AA § 8(bis).(1) The following schedule shall be applicable in converting coast and ship stations on maritime mobile radiotelephone channels from double sideband to single sideband :

ADD 1339AB a) Discontinue installation of double sideband equipment on ship stations by 1 January 1970;

ADD 1339AC b) Discontinue use by coast stations of double sideband emission (see No. 1339BC) by 1 January 1970;

ADD 1339AD c) Discontinue use by ship stations of double sideband emission and by coast stations of full carrier (A3H) emission on 1 January 1975, except that coast stations shall retain the capability of operating with class A3H emission on 2182 kc/s.[1]

ADD 1339AE (2) During the period of transition from double sideband to single sideband, coast stations and single sideband ship stations shall have the capability of using full carrier (A3H) emission to permit communication with both double sideband and single sideband radiotelephone stations.

ADD 1339.1AD 1) Where necessary to meet circumstances peculiar to domestic operations of an administration, the discontinuance by ship and coast stations of double sideband emission may be extended to 1 January 1977.

Ref.

USA/16(5) (contd.)

Reasons :

To provide a specific schedule for the mandatory transition from double to single sideband in the band 1605 - 4000 kc/s.

Background :

The new sub-section "D(bis)" is proposed for addition to Article 35 as a means of including in the Radio Regulations mandatory provisions covering the transition of the maritime mobile service from double sideband to single sideband and the discontinuance of double sideband in accordance with a specific schedule. The date of 1975 has been selected in order to allow a period of eight years, from the date of the W.A.R.C., for completion of the transition to single sideband.

USA/16(6)

D(ter). Technical and Operational Provisions Relating to use of Single Sideband

ADD 1339BA § 8(ter).(1) Definitions of carrier modes :

Carrier mode		Level N(db) of the carrier with respect to peak envelope power
Full carrier	(A3H)	$0 \geq N \geq -6$
Reduced carrier	(A3A)	$-6 > N \geq -26$
Suppressed carrier	(A3J)	$-26 > N$

ADD 1339BB (2) Mode of operation :

Ref.

USA/16(6) (contd.)

ADD 1339BC

a) Coast station transmitters operating on frequencies other than 2182 kc/s shall be capable of operating with class A3A emissions having a carrier reduction of 16 ± 2 db below peak envelope power and class A3J emission having a carrier reduction of not less than 40 db below peak envelope power. Coast station transmitters shall be capable of operating with class A3H emissions when authorized to operate on 2182 kc/s.

ADD 1339BD

b) Ship station transmitters shall be capable of operating with class A3H emission, class A3A emission having a carrier reduction of 16 ± 2 db below peak envelope power, and class A3J emission having a carrier reduction of not less than 40 db below peak envelope power.

ADD 1339BE

c) In actual operation, ship and coast stations shall utilize the carrier levels indicated, respectively, for A3H, A3A and A3J modes.

ADD 1339BF

d) Notwithstanding the provisions of a), b) and c) above, stations operating solely in systems employing

Ref.

USA/16(6)
(contd.)

fewer than the three defined single sideband modes need not be equipped to operate in the unused modes.

ADD 1339BG (3) The carrier frequency of transmitters shall be maintained within the following tolerances :

ADD 1339BH a) Coast stations : + 20 c/s per second;

ADD 1339BI b) Ship stations : ± 100 c/s per second;

ADD 1339BJ i) The short term limits (of the order of 15 minutes) of ship stations shall be ± 40 c/s per second.

ADD 1339BK (4) Coast and ship stations shall use upper sideband emissions.

ADD 1339BL (5) The transmitter audio-frequency band shall be 350 to 2700 c/s per second, with a permitted amplitude variation of 6 db.

ADD 1339BM (6) The unwanted frequency modulation of the carrier shall be sufficiently low to prevent harmful distortion.

ADD 1339BN (7) When using single sideband A3H, A3A or A3J emission the mean power of any emission supplied to the antenna transmission line of a coast or ship station on any discrete frequency, shall be less than the mean power (Pm) of the transmitter in accordance with the following table :

Ref.

USA/16(6) (contd.)

ADD 1339BO

Frequency separation Δ from the assigned frequency kc/s	Minimum attenuation below mean power (Pm) db
$1.75 < \Delta \leq 5.25$	25
$5.25 < \Delta \leq 8.75$	35
$8.75 < \Delta$	$43+10 \log_{10} Pm(\text{Watts})$

ADD 1339BP § 8(quater). Channel utilization

ADD 1339BQ (9) In the transition to single sideband, as provided by Nos. 1339AA through 1339AE, each double sideband frequency of at least six kc/s bandwidth will comprise two single sideband frequencies of at least three kc/s each.

ADD 1339BR (10) The division between the two single sideband frequencies, thus formed, will be at the double sideband carrier frequency. For the purpose of these regulations during the transition to single sideband, these two frequencies, relative to the double sideband carrier frequency are designated as follows :

ADD 1339BS a) higher in frequency : upper channel; and

ADD 1339BT b) lower in frequency : lower channel

ADD 1339BU (11) Stations using single sideband single channel emissions A3H, A3A and A3J in accordance with Nos. 1339BP through 1339BT shall operate either in the upper channel or in the lower channel.

ADD 1339BV § 8(quinquies). Assigned and carrier frequencies

Ref.

USA/16(6) (contd.)

ADD 1339BW (12) The assigned frequency of a station operating in the upper channel would be 1400 c/s per second higher than the carrier frequency of the double sideband channel, and the carrier frequency would be the same as the carrier frequency of the double sideband channel.

ADD 1339BX (13) The assigned frequency of a station operating in the lower half channel would be 1600 c/s per second lower than the carrier frequency of the double sideband channel, and the carrier frequency would be three thousand cycles per second below the carrier frequency of the double sideband channel.

ADD 1339BY (14) If an administration assigns frequencies other than as indicated above, its radiotelephone service shall not cause harmful interference to radiotelephone stations of the maritime mobile service which use frequencies assigned to them in accordance with this Article.

ADD 1339BZ (15) The classes of emission used as the normal methods of operation for each coast station shall be indicated in the List of Coast Stations.

E. Additional provisions applying to Region 1

NOC 1340 through 1348

F. Additional provisions applying to Regions 1 and 3

NOC 1349 § 12. (1)

Ref.

USA/16(7) MOD 1350 (2) During the periods mentioned above, except for the transmission provided for in Article 36, transmissions shall cease within the band ~~2170~~ 2173.5 - ~~2194~~ 2190.5 kc/s.

G. Additional provisions applying to Regions 2 and 3

USA/16(8) 1351 § 13. All stations on ships making international voyages should be able to use the intership frequency 2638 kc/s and, when using single sideband, the intership frequencies whose carriers are 2170 and 2190.5 kc/s, if required by their service.

Reasons :

To include in the Radio Regulations technical and operational provisions necessary to support the transition to single sideband in the bands between 1605 and 4000 kc/s; to make a consequential amendment to No. 1350; to amend No. 1351 to provide for the use that can be made in Regions 2 and 3, of the two single sideband frequencies obtained by the reduction of the guard band of 2182 kc/s.

Background :

The technical characteristics follow those developed by the C.C.I.R. XI Plenary Assembly, Oslo, 1966.

Section III. Bands between 4000 and 23,000 kc/s

NOC 1352 and 1353 A. Call, reply and safety

NOC 1354 B. Watch

Ref.

USA/16(9) C. Traffic

NOC 1355

SUP 1356

MOD 1357 (2) Administrations may assign ~~these~~ the frequencies of Section B of Appendix 15 to ships of any category according to traffic requirements and to coast stations for single sideband single channel simplex operation. Such stations shall not use power in excess of 1 kW P_p.

SUP 1358

Reasons :

To provide for the simplex use by coast stations of the frequencies of Appendix 15B to the Radio Regulations. To delete No. 1358, consequential to the insertion of Section E below (USA/16(11)).

USA/16(10) ADD D. Conversion to Single Sideband

ADD 1358AA 17(bis). (1) The following schedule shall be applicable in converting coast and ship stations on maritime mobile radiotelephone channels from double sideband to single sideband :

ADD 1358AB a) Discontinue installation of double sideband equipment on ship stations by 1 January 1970;

Ref.

USA/16(10) (contd.)

ADD 1358AC b) Discontinue use by coast stations of double sideband emission by 1 January 1970;

ADD 1358AD c) Discontinue use by ship stations of double sideband emission and by coast stations of full carrier (A3H) emission on 1 January 1974.

ADD 1358AE (2) During the period of transition from double sideband to single sideband, coast stations shall have the capability of using full carrier (A3H) emission to permit communication with both double sideband and single sideband radiotelephone ship stations.

Reasons :

To provide a specific schedule for the mandatory transition from double to single sideband.

Background :

The new sub-Section "D" is proposed for addition to Article 35 as a means of including in the Radio Regulations mandatory provisions for the transition of the maritime mobile service to single sideband and the discontinuance of double sideband in accordance with a specific schedule. The date of 1974 has been selected to allow a period of seven years, from the date of the W.A.R.C., for completion of the transition to single sideband.

The national regulations of the U.S. provide for the transition from double to single sideband to be completed by 1 January 1974, on a mandatory basis.

Ref.

USA/16(11) ADD E. Technical and operational provisions relating to use of single sideband

ADD 1358BA § 17(ter).(1) Definitions of carrier modes :

Carrier mode	Level N(db) of the carrier with respect to peak envelope power
Full carrier (A3H)	$0 \geq N \geq -6$
Reduced carrier (A3A)	$-6 > N \geq -26$
Suppressed carrier (A3J)	$-26 > N$

ADD 1358BB (2) Mode of operation :

ADD 1358BC a) Coast station transmitters shall be capable of operation with class A3A emission having a carrier reduction of 16 ± 2 db below peak envelope power and class A3J emission having a carrier reduction of not less than 40 db below peak envelope power.

ADD 1358BD b) Ship station transmitters shall be capable of operation with class A3A emission having a carrier reduction of 16 ± 2 db below peak envelope power and class A3J emission having a carrier reduction of not less than 40 db below peak envelope power.

Ref.

USA/16(11) (contd.)

ADD 1358BE c) In actual operation, ship and coast stations shall utilize the carrier levels indicated respectively for the modes employed.

ADD 1358BF d) Notwithstanding the provisions of a), b) and c) above, stations operating solely under the provision of No. 1357 may be equipped for class A3J emission only.

ADD 1358BG (3) The carrier frequency of transmitters shall be maintained within the following tolerances :

ADD 1358BH a) Coast stations : ± 20 c/s per second;

ADD 1358BI b) Ship stations : ± 100 c/s per second;

i) The short term limits (of the order of 15 minutes) of ship stations shall be ± 40 c/s per second.

ADD 1358BJ (4) Coast and ship stations shall use upper sideband emissions.

ADD 1358BK (5) The transmitter audio-frequency band shall be 350 to 2700 c/s per second, with a permitted amplitude variation of 6 db.

ADD 1358BL (6) The unwanted frequency modulation of the carrier shall be sufficiently low to prevent harmful distortion.

Ref.

USA/16(11) (contd.)

ADD 1358BM

(7) When using single sideband A3H, A3A or A3J emission the mean power of any emission supplied to the antenna transmission line of a coast or ship station on any discrete frequency, shall be less than the mean power (Pm) of the transmitter in accordance with the following table :

ADD 1358BN

Frequency separation Δ from the assigned frequency kc/s	Minimum attenuation below mean power (Pm) db
$1.75 < \Delta \leq 5.25$	25
$5.25 < \Delta \leq 8.75$	35
$8.75 < \Delta$	$43+10 \log_{10}$ Pm(Watts)

ADD 1358BO 17(quater). (1) Channel utilization

MOD 1358BP /Transferred from Appendix 17, paragraph 3/

a) ~~Assignments to~~ A stations utilizing single sideband ~~or independent sideband~~ emissions shall be considered to be in accordance with the Table of Appendix 17 if the necessary bandwidth does not extend beyond the upper or lower limits of the bandwidth provided for ~~double~~ single sideband emissions in accordance with the Table of Appendix 17.

MOD 1358BQ /Transferred from Appendix 17, paragraph 3/

b) ~~Assignments to~~ A stations utilizing ~~single sideband or~~ independent sideband emissions shall

Ref.

USA/16(11)
(contd.).

be considered to be in accordance with the Table of Appendix 17 if the necessary bandwidth does not extend beyond the upper or lower limits of the bandwidth provided for double sideband emissions in accordance with the Table of Appendix 17.

MOD 1358BR
/Transferred from Appendix 17, paragraph 3.1/

c) Stations employing double sideband emissions (A3) or two channel independent sideband emissions (A3B) ~~should~~ shall operate with assigned frequencies at the appropriate values listed in column 4 or 9 of the Table of Appendix 17.

MOD 1358BS
/Transferred from Appendix 17, paragraph 3.2/

d) Stations using single sideband single channel emissions (A3A, A3H or A3J) ~~should~~ shall operate either in the upper ~~half~~ or in the lower ~~half of the~~ channels ~~designated by the center~~ with assigned frequencies at the appropriate values listed in columns 2, 5, 7 or 10 of the Table of Appendix 17.1)

ADD 1358.1BS 1) Independent sideband emission may be used by agreement between administrations concerned and affected in those instances where adjacent single sideband channels are assigned to a coast station.

Ref.

USA/16(11) (contd.)

ADD 1358BT (2) Assigned frequency.

ADD 1358BU a) The assigned frequency of a station employing single sideband (A3A, A3H or A3J) will be 1400 c/s per second higher than the carrier frequency. Both assigned and carrier frequencies are shown in the Table of Appendix 17.

MOD 1358BV /Transferred from Appendix 17, paragraph 4/ b) If an administration assigns frequencies other than those indicated above, its radiotelephone service shall not cause harmful interference to radiotelephone stations of the maritime mobile service which use frequencies assigned to them in accordance with ~~this~~ Appendix 17.

ADD 1358BW 18(quinquies) The classes of emission used as the normal methods of operation for each coast station shall be indicated in the List of Coast Stations.

Reasons :

To include in the Radio Regulations technical and operational provisions necessary to support the transition to single sideband in the bands between 4000 and 23 000 kc/s.

Background :

The technical characteristics follow those developed by the C.C.I.R. XI Plenary Assembly, Oslo, 1966.

Ref.

ARTICLE 28

USA/16(12) Amend Article 28 as follows :

NOC 983

MOD 984 a) send and receive class A3 or A3H emissions with carrier frequency on 2182 kc/s;

MOD 985 b) send, in addition, ~~class A3 emissions~~ on at least two working frequencies;[1)]

MOD 986 c) receive, in addition, ~~class A3 emissions~~ on all the other frequencies necessary for their service.

ADD 986A § 19bis. The class of emissions employed by ship stations shall be consistent with the provisions of Nos. 1339AA through 1339AE.

NOC 985.1 1) In certain areas, administrations may reduce this requirement to one working frequency.

Reasons :

Consequential to the proposed amendment of Article 35 (USA/16(1) - (11)).

ARTICLE 5

Amend Article 5 as follows :

USA/16(13) MOD 201 The frequency 2182 kc/s is the international distress and calling frequency for radiotelephony. The conditions for the use of ~~this frequency~~ the band 2170-2194 kc/s are prescribed in Article 35.

Reasons :

Consequential to the proposed amendment of Article 35 (USA/16(1) - (11)).

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 17-E
16 March 1967
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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the conference

Ref. Agenda Item 2.1

Frequency bands for coast and ship radiotelephone stations in the 6 Mc/s band.

USA/17(14) U.S. Proposal :

Amend No. 1357 to permit the use of the 6 Mc/s SSB channels contained in Appendix 15, Section B, by both coast and ship radiotelephone stations on a simplex basis. (See U.S. proposals in response to Agenda Item 1, Document No. 16).

Reasons :

The 6 Mc/s SSB frequencies referred to in No. 449 and in Appendix 15, Section B, are available only to ship stations and are therefore of limited usefulness to administrations having little or no requirement for HF intership communication. Amendment of No. 1357 as indicated would provide for both coast and ship stations using SSB radiotelephony.

Background :

Except as provided in No. 449, Geneva, 1959, no specific accommodation has been made in the Radio Regulations for 6 Mc/s radiotelephony since the Atlantic City Conference in 1947. Any expansion of spectrum space for radiotelephony in the maritime mobile band at 6 Mc/s would be at the expense of radiotelegraph users. The need for such expansion has not been demonstrated.

Within the U.S., the frequencies 6236.9, 6240, 6451.9 and 6455 kc/s have been used extensively for radiotelephony on the inland waterways for many years, under No. 115. Such use has been limited to the hours between 1100 and 0200 GMT and has resulted in no reports of harmful interference from other administrations. It is intended that such use be continued under No. 115, without benefit of allocation status.

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Ref.

USA/17(14) (contd.)

On the other hand, the single sideband 6 Mc/s ship frequencies of Appendix 15, Section B, have been authorized within the U.S. for use on a simplex basis by both coast and ship stations and allocation status is desired for these coast stations. In this case, the use by coast stations is not limited to inland waters and there is a greater potential for interference to other administrations.

Ref. Agenda Item 2.2 :

Frequencies for intership radiotelephone traffic.

USA/17(15) U.S. Proposal :

The U.S. does not plan to support additional frequencies for intership radiotelephone traffic in the high frequency portion of the spectrum.

Reasons :

The single sideband ship frequencies contained in Appendix 15, Section B, may be used for intership radiotelephony. In the view of the U.S., the number of channels now available for such use is more than adequate.

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Ref. Agenda Item 2.3 :

Consider possible use of the high traffic bands by tankers of 12,500 tons gross.

USA/17(16) U.S. Proposal : Amend Radio Regulations as follows :

MOD 1156 Para. 20. (1) Stations installed on ~~passenger~~ ships ~~shall use the high traffic band and whaling factory vessels, tankers above 40,000 tons gross and other cargo ships above 12,500 tons gross~~ handling a large volume of traffic shall ~~may also~~ use ~~this band~~ the high traffic band for class A1 emission (see No. 1151A). For teleprinter and data transmission the band designated in No. 1151 for this purpose shall be used. (See Proposal No. USA/22(46), Document No. 22)

Reasons :

To permit additional types of vessels having a large volume of message traffic to use the high traffic bands, which are not now being fully utilized.

Background :

The present provisions of No. 1156 are believed to be unduly restrictive. Many types of ships which handle a telegraphic traffic volume as high or higher than that of ships presently authorized to use the high traffic bands under No. 1156 are restricted from these bands and must use the low traffic bands. The increased traffic in the low-traffic bands, together with the decreased passenger ship traffic in the high-traffic bands, has resulted in a traffic density unbalance. Although studies indicate that 6 or more times as many messages are handled on the low traffic frequencies, there are approximately 9 times as many frequencies in the low traffic bands. Nevertheless, there is also disparity between the Group A and Group B low traffic frequencies with approximately 4 times the traffic being handled on Group A frequencies as on Group B, according to the study. As a result, more interference is experienced in the low traffic bands than in the high traffic bands and a shift of some vessels to high traffic frequencies would be desirable. In addition, equalizing the loading of the Group A and B frequencies is desirable.

Ref.

USA/17(16) (contd.)

Tonnage and other size criteria are no longer considered to be an accurate measure of radio traffic volume. Assignment of ships by administrations to appropriate bands based upon their actual volume of traffic is believed to be a superior way of balancing ship traffic loading.

Ref. Agenda Item 2.4 :

The desirability of accommodating requirements for oceanographic communications in the exclusive HF Maritime Mobile bands.

Note : The United States has in preparation a representative distribution plan to serve as technical substantiation for their proposal on Agenda Item 2.4.

U.S. Proposal : Amend Articles 1, 7 and 32 of the Radio Regulations and Appendices 10 and 15 thereto as follows :

ARTICLE 1

Terms of Definitions

USA/17(17) MOD 36 Maritime Mobile Service : A mobile service between coast stations and ship stations, or between ship stations, in which survival craft stations may also participate, and exceptionally between ocean data and ocean data telecommand stations.

USA/17(18) ADD 84A Ocean Data Telecommand Station : A station in the maritime mobile service intended to telecommand ocean data stations.

USA/17(19) ADD 84B Ocean Data Station : A station in the maritime mobile service intended for the transmission of data collected at the site of the station.

ARTICLE 7

Special Rules Relating to Particular Services

USA/17(20) MOD 449 (c) Ship stations and coast stations operating in accordance with No. 1357, telephony (single side-band only)

	4133 - ~~4140~~	4136.5 kc/s
	6200 - ~~6211~~	6207.5 kc/s
8265	~~8273~~ - ~~8280~~	8276.5 kc/s
12400	~~12407~~ - ~~12421~~	12417.5 kc/s
16530	~~16537~~ - ~~16562~~	16558.5 kc/s
22070	~~22078~~ - ~~22100~~	22096.5 kc/s

Ref.

USA/17(21) SUP 450

USA/17(22) ADD 450A (d) Ocean data and ocean data telecommand stations, telegraphy

4136.5 - 4140 kc/s
6207.5 - 6211 kc/s
8276.5 - 8280 kc/s
12417.5 - 12421 kc/s
16558.5 - 16562 kc/s
22096.5 - 22100 kc/s

ARTICLE 32

Use of Frequencies for Radiotelegraphy in the Maritime Mobile and Aeronautical Mobile Services

(After No. 1206)

USA/17(23) ADD (g) Frequencies for Ocean Data Stations

ADD 1206A Para. 45(bis) The frequencies assigned to ocean data and ocean data telecommand stations using telegraphy systems are included within the following band limits :

4136.5 - 4140 kc/s
6207.5 - 6211 kc/s
8276.5 - 8280 kc/s
12417.5 - 12421 kc/s
16558.5 - 16562 kc/s
22096.5 - 22100 kc/s

ADD 1206B Para. 45(ter) (1) Each administration may assign to each ocean data and ocean data telecommand station under its jurisdiction and employing a telegraphy system, one or more of the assignable frequencies designated in Section C of Appendix 15.

Ref.

USA/17(23) (contd.) ADD 1206C (2) However, within the limits of the bands given in No. 1206A, administrations may assign frequencies in a different manner from that shown in Section C of Appendix 15. Nevertheless, administrations shall take into account, as far as possible, the provisions of Section C of Appendix 15 concerning channelling and 300 c/s spacing.

APPENDIX 10

USA/17(24) Service Document Symbols

ADD OD Ocean Data Station

ADD OE Ocean Data Telecommand Station

APPENDIX 15

Refer to Agenda Item 3 for revision of Appendix 15 (Document No. 18)

Reasons :

To accommodate requirements for oceanographic communications in the exclusive HF maritime mobile bands.

Background :

The capability of the sea to serve mankind in many ways has created diverse enterprises whose activities are of necessity marine oriented and therefore highly vulnerable to the physical changes which characterize the ocean. As a consequence there is an urgent need to describe and predict the future state of the environment so that activities taking place therein can be conducted safely and efficiently.

The world oceans constitute a sparse data area which has handicapped man's attempt to understand more fully and thereby to predict more accurately the processes occurring at the air-sea interface. One of the most promising solutions to

Ref.

USA/17(24) (contd.)

this distressing dilemma is the deployment of unmanned automatic observational stations at sea to acquire routinely this vital meteorological and oceanographic data on a real-time basis. In view of the interaction between the atmosphere and the ocean, stations now being planned will be equipped with meteorological and oceanographic sensors. This is essential since the state of surface and immediate sub-surface of the oceans is linked directly to the action of the overlying atmosphere.

The maritime industry, as an important element in national and international commerce, has a heavy capital investment in the Merchant Marine. This investment is subjected annually to significant financial losses due to ship damage caused by storms at sea. It is estimated that the average dollar costs to the world's ocean shipping from weather damage is in the order of $156 million a year. The importance of warning and forecast services to oceanic shipping has been recognized by the World Meteorological Organization and the Safety of Life at Sea Convention (1960) by allocating responsibility to various nations for the provision of meteorological and oceanographic services over the ocean areas assigned.

Off-shore oil and sea mining activity has emerged from its embryonic stages and is now being conducted in an ever-increasing tempo on the Continental Shelf. The nature of the complex operations associated with such exploitation of the sea is extremely sensitive to environmental changes particularly at the air-sea interface. It is once more apparent that operational safety and efficiency of this newly-emerging sea industry is dependent upon the availability of detailed meteorological and oceanographic information.

Commercial fishing fleets are constantly ranging the high seas in pursuit of lucrative fisheries. Operating over remote oceanic areas in ships having minimum sea-keeping capabilities in heavy weather makes this group extremely dependent upon warning and forecast services. In addition studies now being conducted indicate that certain relationships may exist between ocean conditions and the concentration of catchable fish. Consequently the provision of meteorological and oceanographic information to these fleets not only ensures a high degree of operational safety but also has the potential of reducing the cost of fishing as a result of more productive

Ref.

USA/17(24) (contd.)

employment of time spent at sea. The resultant economic advantages to producers and consumers of this increasingly important food source would be quite significant.

The coastal belt of most maritime nations normally contains vast industrial complexes as well as one of such countries' most valuable resources - their coastline. Potential damages from coastal storms will undoubtedly increase significantly in the future as development of coastal areas proceeds. To ensure the adoption of the most rational preventative programme of adjustment to the marine environment, climatological data will be required for long-range planning purposes as well as routine warnings and forecasts of storm surges, abnormal tides and damaging surf conditions.

The lack of global meteorological data, particularly over ocean areas, represents one of the greatest obstacles to the improvement of weather forecasting capability throughout the world. The availability of such data from ocean data stations will not only result in more accurate weather forecasts for maritime nations but because what occurs in the atmosphere over one nation affects the atmosphere of adjacent nations, a significant improvement in weather forecasts will accrue equally as well to inland nations.

There thus exists an urgent need for ocean data stations to provide those basic environmental observations which will permit administrations to provide essential environmental services which are responsive to their various needs.

The matter of frequency provision for ocean data communications in the HF bands has been under consideration for some time. It appears most appropriate to consider the prospects of providing frequency support for these communications from within the HF maritime mobile frequency allocations, particularly as ocean data stations are to be located at sea for the purpose of transmitting data which are essential to programmes which primarily serve marine interests.

In connection with No. 1356, (see Proposal No. USA/16(9), Document No. 16), the single sideband working frequencies given in Section B of Appendix 15 for ship radiotelephone stations were

Ref.

USA/17(24) (contd.)

carved out of the bands formerly available for ship radiotelegraph stations at Geneva 1959, for the express purpose of encouraging the use of radiotelephone single sideband operation.

In the intervening period since 1959, single sideband operation has been encouraged under the provisions of No. 1356. A review of the International Frequency List indicates that single sideband operation has been introduced extensively within the ship stations telephony and coast stations telephony subdivided categories of the bands exclusively allocated to the maritime mobile service between 4000 and 27 500 kc/s under the provisions of Appendix 17.

As No. 1356 has already accomplished its intended purpose to a considerable degree and its need therefore has been reduced, it appears that a portion of the allotment in Appendix 15, Section B, for radiotelephone single sideband operations might well be made available at this time for other operations serving maritime interests. This is considered to be particularly appropriate inasmuch as the number of available ship and coast radiotelephone channels are effectively doubled under the provision of Appendix 17 as double sideband operation is converted to single sideband operation.

It is considered that the foreseeable HF needs of ocean data communications could be accommodated within a minimum of 3.5 kc/s of spectrum space in each of the 4, 6, 8, 12, 16 and 22 Mc/s bands.

This proposal would permit the foregoing needs to be satisfied from a portion of the maritime mobile allotment presently contained in Section B of Appendix 15.

It is recognized there does not exist at this time an international agreement on the precise technical system to be used by administrations in providing essential environmental services responsive to their needs. Accordingly, this proposal subdivides each 3.5 kc/s allotment into 10 assignable frequencies spaced 300 c/s apart and additionally, contains provisions for assigning frequencies in a different manner within the limits of the 3.5 kc/s allotment.

Plans for an ocean data system to meet national requirements are being developed within the United States. It is understood that other administrations are also proceeding so that, in the aggregate, these will serve as a basis for formulating an agreed international system.

Ref. Agenda Item 2.5 :

Frequencies to be used by coast stations for wideband telegraphy, facsimile and special transmission systems.

U.S. Proposal

Amend Radio Regulations as follows :

USA/17(25) MOD 453 (g) Coast stations, telegraphy, and facsimile, including wideband telegraphy and special transmission systems

4238 - 4368 kc/s
6357 - 6525 kc/s
8476 - 8745 kc/s
12714 - 13130 kc/s
16952 - 17290 kc/s
22400 - 22650 kc/s[1]

NOC 453.1

Reasons :

While No. 453 already provides bands in which wideband telegraphy and special transmission systems may be accommodated, it is desirable to change the title to make this more clear.

Background :

No. 1188 provides working frequencies in the 4 to 27.5 Mc/s range for ship stations using wideband telegraphy, facsimile and special transmission systems. However, the Radio Regulations do not specify the frequencies on which coast stations should employ these emissions.

No. 453 provides for the use of telegraphy and facsimile in the coast telegraph bands between 4 and 27.5 Mc/s. No. 1147 prohibits coast telegraph stations from using Type 2 emission. Thus, such stations may use Types 1, 4, 6, 7, and, in some cases, Type 9 emissions and the U.S. proposal is intended to clarify this use.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 18-E
16 March 1967
Original : English

PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item 3 : Revision of Appendix 15

U.S. Proposal : a) Revise Section A, Appendix 15, in respect of frequencies assignable to high traffic ships; and /see proposal in response to Agenda Item 7.1, (Document No. 22)/

b) Revise Section B, Appendix 15, by footnote, to permit coast station use of SSB ship frequencies; and /see proposal No. USA/16(9) in response to Agenda Item 1, particularly No. 1357 MOD/

c) Revise Section B, Appendix 15, to accommodate the requirements of ocean data communications. /see proposal No. USA/17(17)-(24) in response to Agenda Item 2.4/

d) Revise Article 9, No. 488, to exempt from technical examination by the Board coast stations referred to paragraph b) above.

Ref.
USA/18(26)

APPENDIX 15

MOD Table of Frequencies to be used by
Ship, Ocean Data and Ocean Data Telecommand
Stations in the Bands between 4 and 27.5 Mc/s
Allocated Exclusively to the Maritime Mobile Service
(See Articles 32, 35 and Appendix 17)

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Ref.

USA/18(26) (cont.)

MOD 1. This Appendix contains ~~two~~ three Sections A, ~~and~~ B and C.

NOC For the use of frequencies ... for radiotelegraphy (Section A) ... etc.

NOC For the use of frequencies ... for radiotelephony (Section B) ... etc.

ADD For the use of frequencies in the Band 4 to 27.5 Mc/s for radiotelegraphy (Section C) see also Nos. 1206A to 1206C of Article 32 (proposal No. USA/17(23), Document No. 23)

NOC 2.

NOC 3.

ADD 4. In the table of Section C :

the assignable frequencies in a given band are :

- indicated by the lowest and highest frequency, in heavy type, assigned in that band;

- regularly spaced, the number of assignable frequencies and the spacing in kc/s being indicated in italics.

SECTION A

Frequencies Assignable to Ship Radiotelegraph Stations using the Maritime Mobile Service Bands between 4 and 27.5 Mc/s

kc/s

Band (Mc/s)	Limits	Assignable frequencies, wide-band telegraphy, facsimile and special transmission systems	Assignable working frequencies for high traffic ships: teleprinter and data transmission	Assignable working frequencies for high traffic ships: manual transmission	Calling frequencies	Assignable working frequencies for low traffic ships: GROUP A	Assignable working frequencies for low traffic ships: GROUP B	Limits
4	4140	4142 --------- 4158 5 Frequencies spaced 4	4161--------4167.75 **)	4168 .5----------4176 11 Frequencies spaced 0.75	4178---------- 4186 9 Frequencies spaced 1	4188-------4212 98 Frequencies spaced 0.5	4212.5---4236.5	4238
6	6211	6213---------- 6237 7 Frequencies spaced 4	6241.5-----6251.625 **)	6252.75----------6264 11 Frequencies spaced 1.125	6267---------- 6279 9 Frequencies spaced 1.5	6282-------6318 98 Frequencies spaced 0.75	6318.75--6354.75	6357
8	8280	8282----------8318 10 Frequencies spaced 4	8322-------8335.5 **)	8337----------8352 11 Frequencies spaced 1.5	8356----*)------ 8372 9 Frequencies spaced 2	8376-------8424 98 Frequencies spaced 1	8425-----8473	8476
12	12421	12424--------- 12468 12 Frequencies spaced 4	12474-----12503.25 **)	12505.5----------12528 11 Frequencies spaced 2.25	12534---------- 12558 9 Frequencies spaced 3	12564-------12636 98 Frequencies spaced 1.5	12637.5--12709.5	12714
16	16562	16564---------- 16620 15 Frequencies spaced 4	16626-----16671 **)	16674----------16704 11 Frequencies spaced 3	16712---------- 16744 9 Frequencies spaced 4	16752-------16848 98 Frequencies spaced 2	16850----16946	16952
22	22100	22102----------22 146 12 Frequencies spaced 4	22151-----22184 **)	22187----------22217 11 Frequencies spaced 3	22225----------22265 9 Frequencies spaced 5	22272.5--22332.5 50 Frequencies spaced 2.5	22335----22395	22400
25	25070	Assignable working frequencies to ships of all categories 25 075 ---------- 25 105 11 Frequencies spaced 3						25 110

*) For particular conditions concerning the use of 8364 kc/s see No. 1179.

**) The spacing between assignable frequencies is under study.

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APP 15

SECTION B

Carrier Frequencies in kc/s for Ship Radiotelephone Stations using the Maritime Mobile Service Bands between 4 and 23 Mc/s

Band (Mc/s)	Limits	kc/s			Limits
		Radiotelephone ~~(double-sideband) calling frequencies~~	Radiotelephone (single sideband) **) upper sideband carrier frequencies		
4	4133		4133 ~~and~~ ~~4136.5~~		~~4140~~ 4136.5
6	6200		6200.5 and ~~6207.5~~ 6204 *) 2 ~~3~~ Frequencies spaced 3.5		~~6211~~ 6207.5
8	8265	~~8269~~	~~8273~~ ~~8276.5~~ 8266----------8273 3 frequencies spaced 3.5		~~8280~~ 8276.5
12	12400	~~12403.5~~	12400 12414 ~~12407~~----------~~12417.5~~ 5 ~~4~~ Frequencies spaced 3.5		~~12421~~ 12417.5
16	16530	~~16533.5~~	16530 16554.5 ~~16537~~----------~~16558~~ 8 ~~7~~ Frequencies spaced 3.5		~~16562~~ 16558.5
22	22070	~~22074~~	22070 22091 ~~22078~~----------~~22095.5~~ 7 ~~6~~ Frequencies spaced 3.5		~~22100~~ 22096.5

*) For particular conditions concerning the use of 6204 kc/s see No. 1353.

**) Frequencies in this category may be assigned also to coast stations in accordance with the provisions of No. 1357 (proposal No. USA/16(9))

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Ref.
USA/18(26) (cont.) ADD SECTION C APP 15

Frequencies assignable to Ocean Data and Ocean Data Telecommand Stations using the Maritime Mobile Service Bands between 4 and 27.5 Mc/s

kc/s

Band Mc/s	Limits ↓	Assignable frequencies*)	Limits ↓
4	4136.5	4136.9 — 4139.6 10 frequencies spaced 0.3	4140
6	6207.5	6207.9 — 6210.6 10 frequencies spaced 0.3	6211
8	8276.5	8276.9 — 8279.6 10 frequencies spaced 0.3	8280
12	12417.5	12417.9 — 12420.6 10 frequencies spaced 0.3	12421
16	16558.5	16558.9 — 16561.6 10 frequencies spaced 0.3	16562
22	22096.5	22096.9 — 22099.6 10 frequencies spaced 0.3	22100

*) For use of other frequencies within these band limits see No. 1206C (Proposal No. USA/17(23)).

Ref. Amend Article 9 of the Radio Regulations as follows :

USA/18(27) MOD 488 Paragraph (3) Specific frequencies prescribed by these Regulations for common use by stations of a given service (for example, international distress frequencies 500 kc/s and 2182 kc/s, frequencies of ship radiotelegraph stations operating in their exclusive high frequency bands, frequencies of ship and coast stations used for single sideband single channel simplex operation in accordance with No. 1357 etc.), shall not be notified to the Board.

Reasons

To provide that stations assigned the frequencies of Section B of Appendix 15 are not to be notified to the I.F.R.B.

Agenda Item 3 : Consequential revision of Appendix 17

U.S. Proposal : Modify Appendix 17

Reasons :

To provide an equitable and efficient means of meeting growing requirements for frequencies in the international maritime mobile radiotelephone service, anticipating eventual and exclusive use of single sideband (SSB) emissions.

Background :

In addition to providing the technical specifications for duplex channelling of the maritime mobile radiotelephone bands between 4000 and 23000 kc/s, Appendix 17 contains the Table of Transmitting Frequencies which lists the assignable double sideband (DSB) radiotelephone ship and coast station frequencies.

It is proposed that Appendix 17 and associated Table (page 434) be revised by transferring the technical characteristics for single sideband to Article 35, amended to be in accord with the recommendations of the C.C.I.R. XIth Plenary Assembly, Oslo, 1966, and inclusion in the Table of Appendix 17

Ref.
USA/18(27)
(cont.)

of assignable and carrier frequencies for double and single sideband emissions. The amendments to Article 35 appear elsewhere in the U.S. proposals and are responsive to WARC Agenda Item 1 (see Document No. 16)

In connection with the transition from double sideband to single sideband, it is administratively and operationally desirable to include in the Table of Appendix 17 (page 434) both the assignable and carrier frequencies for single sideband, as well as the carrier frequencies for double sideband.

The carrier frequencies for double sideband appearing in the revised Table of Appendix 17 are unchanged from the Radio Regulations, Geneva 1959. The single sideband assignable and carrier frequencies appearing in the revised Table of Appendix 17 are based on the provisions currently appearing in sub-Sections 3.2.1 and 3.2.2 of Appendix 17 to the Radio Regulations, Geneva 1959.

USA/18(28)

APPENDIX 17

Duplex channelling of the maritime mobile radiotelephone bands between 4000 and 23000 kc/s

(see Article 35)

MOD 1. The following Table (pages 434 and 434A) indicates the frequencies to be used by coast and ship stations in the bands allocated to the maritime mobile radiotelephone service between 4000 and 23000 kc/s.

NOC 2. One or more series of frequencies are assigned to each coast station, which uses these frequencies associated, as far as possible, in pairs; each pair comprising a transmitting and a receiving frequency. The series shall be selected with due regard to the areas served and so as to avoid, as far as possible, harmful interference between the services of different coast stations.

Ref.

USA/18(28) (cont.)

SUP

/See 1358-BP and 1358-BQ/*)

SUP ~~3.1~~

/See 1358-BR/*)

SUP ~~3.2~~

/See 1358-BS/*)

SUP ~~3.2.1~~

/See 1358-BJ and 1358-BT/*)

SUP ~~3.2.2~~

/See 1358-BJ and 1358-BT/*)

SUP ~~4~~

/See 1358-BV and 1338-BX/*)

*) Document No. 16

Series No.	COAST STATION FREQUENCY					SHIP STATION FREQUENCY				
	Single Sideband		Double Sideband	Single Sideband		Single Sideband		Double Sideband	Single Sideband	
	Assigned	Carrier		Assigned	Carrier	Assigned	Carrier		Assigned	Carrier
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
					4 Mc/s band					
1			4371.1					4066.1		
A	4369.4	4368.0				4064.4	4063.0			
B				4372.5	4371.1				4067.5	4066.1
2			4377.4					4072.4		
A	4375.7	4374.3				4070.7	4069.3			
B				4378.8	4377.4				4073.8	4072.4
3			4383.8					4078.8		
A	4382.1	4380.7				4077.1	4075.7			
B				4385.2	4383.8				4080.2	4078.8
4			4390.2					4085.2		
A	4388.5	4387.1				4083.5	4082.1			
B				4391.6	4390.2				4086.6	4085.2
5			4396.6					4091.6		
A	4394.9	4393.5				4089.9	4088.5			
B				4398.0	4396.6				4093.0	4091.6
6			4403.0					4098.0		
A	4401.3	4399.9				4096.3	4094.9			
B				4404.4	4403.0				4099.4	4098.0
7			4409.4					4104.4		
A	4407.7	4406.3				4102.7	4101.3			
B				4410.8	4409.4				4105.8	4104.4
8			4415.8					4110.8		
A	4414.1	4412.7				4109.1	4107.7			
B				4417.2	4415.8				4112.2	4110.8
9			4422.2					4117.2		
A	4420.5	4419.1				4115.5	4114.1			
B				4423.6	4422.2				4118.6	4117.2
10			4428.6					4123.6		
A	4426.9	4425.5				4121.9	4120.5			
B				4430.0	4428.6				4125.0	4123.6
11			4434.9					4129.9		
A	4433.2	4431.8				4128.2	4126.8			
B				4436.3	4434.9				4131.3	4129.9

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Series No.	COAST STATION FREQUENCY					SHIP STATION FREQUENCY				
	Single Sideband		Double Sideband	Single Sideband		Single Sideband		Double Sideband	Single Sideband	
	Assigned	Carrier		Assigned	Carrier	Assigned	Carrier		Assigned	Carrier
				8 Mc/s Band						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1			8748.1					8198.1		
A	8746.4	8745.0				8196.4	8195.0			
B				8749.5	8748.1				8199.5	8198.1
2			8754.4					8204.4		
A	8752.7	8751.3				8202.7	8201.3			
B				8755.8	8754.4				8205.8	8204.4
3			8760.8					8210.8		
A	8759.1	8757.7				8209.1	8207.7			
B				8762.2	8760.8				8212.2	8210.8
4			8767.2					8217.2		
A	8765.5	8764.1				8215.5	8214.1			
B				8768.6	8767.2				8218.6	8217.2
5			8773.6					8223.6		
A	8771.9	8770.5				8221.9	8220.5			
B				8775.0	8773.6				8225.0	8223.6
6			8780.0					8230.0		
A	8778.3	8776.9				8228.3	8226.9			
B				8781.4	8780.0				8231.4	8230.0
7			8786.4					8236.4		
A	8784.7	8783.3				8234.7	8233.3			
B				8787.8	8786.4				8237.8	8236.4
8			8792.8					8242.8		
A	8791.1	8789.7				8241.1	8239.7			
B				8794.2	8792.8				8244.2	8242.8
9			8799.2					8249.2		
A	8797.5	8796.1				8247.5	8246.1			
B				8800.6	8799.2				8250.6	8249.2
10			8805.6					8255.6		
A	8803.9	8802.5				8253.9	8252.5			
B				8807.0	8805.6				8257.0	8255.6
11			8811.9					8261.9		
A	8810.2	8808.8				8260.2	8258.8			
B				8813.3	8811.9				8263.3	8261.9

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Series No.	COAST STATION FREQUENCY					SHIP STATION FREQUENCY				
	Single Sideband		Double	Single Sideband		Single Sideband		Double	Single Sideband	
	Assigned	Carrier	Sideband	Assigned	Carrier	Assigned	Carrier	Sideband	Assigned	Carrier
	12 Mc/s Band									
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1			13133.5					12333.5		
A	13131.6	13130.2				12331.6	12330.2			
B				13134.9	13133.5				12334.9	12333.5
2			13140.5					12340.5		
A	13138.6	13137.2				12338.6	12337.2			
B				13141.9	13140.5				12341.9	12340.5
3			13147.5					12347.5		
A	13145.6	13144.2				12345.6	12344.2			
B				13148.9	13147.5				12348.9	12347.5
4			13154.5					12354.5		
A	13152.6	13152.2				12352.6	12351.2			
B				13155.9	13154.5				12355.9	12354.5
5			13161.5					12361.5		
A	13159.6	13158.2				12359.6	12358.2			
B				13162.9	13161.5				12362.9	12361.5
6			13168.5					12368.5		
A	13166.6	13165.2				12366.6	12365.2			
B				13169.9	13168.5				12369.9	12368.5
7			13175.5					12375.5		
A	13173.6	13172.2				12373.6	12372.2			
B				13176.9	13175.5				12376.9	12375.5
8			13182.5					12382.5		
A	13180.6	13179.2				12380.6	12379.2			
B				13183.9	13182.5				12383.9	12382.5
9			13189.5					12389.5		
A	13187.6	13186.2				12387.6	12386.2			
B				13190.9	13189.5				12390.9	12389.5
10			13196.5					12396.5		
A	13194.6	13193.2				12394.6	12393.2			
B				13197.9	13196.5				12397.9	12396.5

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Series No.	COAST STATION FREQUENCY					SHIP STATION FREQUENCY				
	Single Sideband		Double	Single Sideband		Single Sideband		Double	Single Sideband	
	Assigned	Carrier	Sideband	Assigned	Carrier	Assigned	Carrier	Sideband	Assigned	Carrier
				16 Mc/s Band						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1			17293.5					16463.5		
A	17291.6	17290.2				16461.6	16460.2			
B				17294.9	17293.5				16464.9	16463.5
2			17300.5					16470.5		
A	17298.6	17297.2				16468.6	16467.2			
B				17301.9	17300.5				16471.9	16470.5
3			17307.5					16477.5		
A	17305.6	17304.2				16475.6	16474.2			
B				17308.9	17307.5				16478.9	16477.5
4			17314.5					16484.5		
A	17312.6	17311.2				16482.6	16481.2			
B				17315.9	17314.5				16485.9	16484.5
5			17321.5					16491.5		
A	17319.6	17318.2				16489.6	16488.2			
B				17322.9	17321.5				16492.9	16491.5
6			17328.5					16498.5		
A	17326.6	17325.2				16496.6	16495.2			
B				17329.9	17328.5				16499.9	16498.5
7			17335.5					16505.5		
A	17333.6	17332.2				16503.6	16502.2			
B				17336.9	17335.5				16506.9	16505.5
8			17342.5					16512.5		
A	17340.6	17339.2				16510.6	16509.2			
B				17343.9	17342.5				16513.9	16512.5
9			17349.5					16519.5		
A	17347.6	17346.2				16517.6	16516.2			
B				17350.9	17349.5				16520.9	16519.5
10			17356.5					16526.5		
A	17354.6	17353.2				16524.6	16523.2			
B				17357.9	17356.5				16527.9	16526.5

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22 Mc/s Band

Series No.	COAST STATION FREQUENCY					SHIP STATION FREQUENCY				
	Single Sideband		Double Sideband	Single Sideband		Single Sideband		Double Sideband	Single Sideband	
	Assigned	Carrier		Assigned	Carrier	Assigned	Carrier		Assigned	Carrier
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1			22653.5					22003.5		
A	22651.6	22650.2				22001.6	22000.2			
B				22654.9	22653.5				22004.9	22003.5
2			22660.5					22010.5		
A	22658.6	22657.2				22008.6	22007.2			
B				22661.9	22660.5				22011.9	22010.5
3			22667.5					22017.5		
A	22665.6	22664.2				22015.6	22014.2			
B				22668.9	22667.5				22018.9	22017.5
4			22674.5					22024.5		
A	22672.6	22671.2				22022.6	22021.2			
B				22675.9	22674.5				22025.9	22024.5
5			22681.5					22031.5		
A	22679.6	22678.2				22029.6	22028.2			
B				22682.9	22681.5				22032.9	22031.5
6			22688.5					22038.5		
A	22686.6	22685.2				22036.6	22035.2			
B				22689.9	22688.5				22039.9	22038.5
7			22695.5					22045.5		
A	22693.6	22692.2				22043.6	22042.2			
B				22696.9	22695.5				22046.9	22045.5
8			22702.5					22052.5		
A	22700.6	22699.2				22050.6	22049.2			
B				22703.9	22702.5				22053.9	22052.5
9			22709.5					22059.5		
A	22707.6	22706.2				22057.6	22056.2			
B				22710.9	22709.5				22060.9	22059.5
10			22716.5					22066.5		
A	22714.6	22713.2				22064.6	22063.2			
B				22717.9	22716.5				22067.9	22066.5

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Ref.

USA/18(28)
(cont.)

Agenda Item 3 :

Consequential revision of Appendix 25

U.S. Proposal :

a) Delete Appendix 25
b) Consequential amendment of Article 9
c) Resolution covering the interim procedure during the transition period.

Reasons :

To provide an equitable and efficient means of meeting growing requirements for frequencies in the international maritime mobile radiotelephone service, anticipating eventual and exclusive use of single sideband (SSB) emissions.

Background :

The deletion of Appendix 25 and conversion to single sideband will require the preparation of instructions to the I.F.R.B. in regard to the handling of notifications received by the I.F.R.B. during the interim period. The United States has under study such a procedure, which will be submitted to the Conference.

Revision of Appendix 25 would present a complex problem if existing and foreseen additional requirements not now included in the Appendix were to be accommodated. The original allotment plan was contained in Volume VI of the Final Acts of the 1951 Geneva Extraordinary Administrative Radio Conference. The plan was revised at the 1959 Geneva Radio Conference to reflect channel allotments designated at that Conference. Additionally, it was annexed to the Radio Regulations as Appendix 25. In taking this action, the Conference perpetuated the 3 and 4 December 1951 dates. New allotments received either a date of 3 December 1951, in Column 2a of the International Frequency List, or a date of 4 December 1951, in Column 2b of the I.F.L., depending on whether they were inserted in Section I or Section II of Appendix 25. However, some allotments appearing previously in Volume VI, Section II, of the Final Acts of the 1951 Geneva E.A.R.C. were transferred to Appendix 25, Section I, with a column 2a date of

Ref.

USA/18(28) (cont.)

3 December 1951. The remaining original allotments were transferred from Volume VI to their respective Sections of Appendix 25 without change. If Appendix 25 were again to be modified by the forthcoming Conference, it presumably would add a new series of allotments in Sections I and II, and perhaps in a new Section III.

The disadvantages of retaining Appendix 25 would be several. First, if the allotment plan were to be amended, new allotments would be superimposed on the previous allotments. While the original allotment plan was based on engineering considerations, emphasis would be placed eventually on the necessity for providing for all indicated requirements whether active or not, recognizing that some individual allotments may never be brought into use. It is obvious that there are not enough channels to meet all needs if each country were to be represented equally in the plan, noting that there are now 131 Members of the I.T.U. as compared with 101 in 1959 when the last revision to Appendix 25 was made.

In addition to perpetuating an out-dated allotment plan, its retention would mean that new stations activated between conferences must be relegated to Column 2b date status in the International Frequency List (I.F.L.) until such time as the Appendix is revised by a duly authorized conference. Then, based on past procedure, every new operation would be given the same date in Column 2a or 2b regardless of when each individual station comes into existence. Therefore, the allotment plan eventually would become composed of at least two priority groups, i.e. those with a date of 3 or 4 December 1951 and perhaps a third group with some agreed upon later date. Under the group priority system, a station bearing a date of 4 December 1951, for example, which was not activated until 1967 would have equal priority with all other stations with the same priority date, including those which may have been activated as early as 1952.

This proposal recognizes the precedent established by the 1959 Geneva O.A.R.C. when, for similar reasons, it abolished the coast telegraph allotment plan developed by the 1951 Geneva E.A.R.C., instituted Article 9 procedures for dealing with new assignments, and directed the Board to list in the I.F.L. with a Column 2a date based on the date of notification, those coast telegraph station assignments not included in the original plan but found satisfactory after technical examination. Accordingly, the same procedure is proposed for disposing of Appendix 25, to

Ref.

USA/18(28) (cont.) give recognition to out-of-plan stations now in operation, and to provide for future needs in an orderly fashion under Article 9.

Amend Article 9 of the Radio Regulations as follows :

USA/18(29) MOD 500 Paragraph 9 (1) Except for notices referred to in Nos. ~~541, 547~~, 552, 561 and 568, the Board shall examine each notice with respect to

---

USA/18(30) MOD 540*) Paragraph (5) The provisions of Nos. 537 to 539 do not apply to frequency assignments which are in conformity with the Allotment Plans appearing in Appendices ~~25~~, 26 and 27 to these Regulations; such frequency assignments shall be entered in the Master Register on receipt of the notice by the Board.

USA/18(31) SUP 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551

USA/18(31a) MOD 573 Paragraph 26 (1) Frequency Bands :

10	-	2850 kc/s
3155	-	3400 kc/s
3500	-	3900 kc/s in Region 1
3500	-	4000 kc/s in Region 2
3500	-	3950 kc/s in Region 3
4063	-	4133 kc/s
4238	-	4368 kc/s
4368	-	4438 kc/s

*) As amended by the E.A.R.C. Aeronautical Mobile (R) (1966)

Ref.

USA/18(31a) (cont.)

6357	-	6525	kc/s
8195	-	8265	kc/s
8476	-	8745	kc/s
8745	-	8815	kc/s
12330	-	12400	kc/s
12714	-	13130	kc/s
13130	-	13200	kc/s
16460	-	16530	kc/s
16952	-	17290	kc/s
17290	-	17360	kc/s
22000	-	22070	kc/s
22400	-	22650	kc/s
22650	-	22720	kc/s

USA/18(32) SUP 577, 578, 579, 580, 581, 582, 583, 584, 585, 586

USA/18(32a) MOD 635*) Paragraph 47. The provisions of Sections V, VI (excepting No. 619) and VII of this Article shall not be applied to frequency assignments in conformity with the Allotment Plans contained in Appendices ~~25~~ 26 and 27 to these Regulations.

Reasons :

Consequential to the abrogation of Appendix 25. Since the special provisions of Article 9 applicable to the maritime mobile coast telephone allotment plan would no longer be relevant, they should be replaced by the basic provisions of the Article governing technical examination and the assignment of 2a or 2b dates for the engineered portions of the International Frequency List.

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*) As amended by the E.A.R.C. Aeronautical Mobile (R) (1966)

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 19-E
16 March 1967
Original : English

PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item 4 :

Possible revision of Appendix 18 to the Radio Regulations.

U.S. Proposal :

The United States is preparing a proposal looking toward a reduction in the spacing between assignable frequencies. The proposal will include a programme for an orderly transition from 50 kc/s to 25 kc/s channelling.

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INTERNATIONAL TELECOMMUNICATION UNION
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GENEVA, 1967

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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Ref.	Agenda Item 5 :	Consider classes of emission to be used on the international distress and calling frequencies 500 kc/s and 2182 kc/s.
	U.S. Proposal	Amend Radio Regulations as follows :
USA/20(33)	MOD 974	a) send and receive class A2 or A2H emissions with carrier frequency*) on 500 kc/s.
USA/20(34)	MOD 984	a) send and receive class A3 or A3H emissions with carrier frequency*) on 2182 kc/s.
USA/20(35)	MOD 992	22.(1) Any aircraft following a maritime course and required by national or international regulations to communicate, for safety purposes, with stations of the maritime mobile service shall be capable of transmitting class A2 or A2H and receiving class A2 and A2H emissions on the frequency 500 kc/s ~~preferably class A2 emissions~~, or, on the frequency 2182 kc/s, transmitting class A3 or A3H and receiving class A3 and A3H emissions.

*) Similar amendment of the Radio Regulations will be necessary wherever the frequencies 500 kc/s and 2182 kc/s appear in connection with the use of SSB emissions.

ARCHIVES U.I.T. GENÈVE

Ref.

USA/20(36) MOD 995 – in the bands between 405 and 535 kc/s, be able to transmit on 500 kc/s using class A2 or A2H emissions, but see No. 677. If a receiver is provided for any of these bands, it shall be able to receive class A2 and A2H emissions on 500 kc/s;

USA/20(37) MOD 996 in the bands between 1605 and 2850 kc/s, be able to transmit on 2182 kc/s using class A3 or A3H emissions. If a receiver is provided for any of these bands, it shall be able to receive class A3 and A3H emissions on 2182 kc/s;

USA/20(38) MOD 1134 13.(1) Stations of the maritime mobile service open to public correspondence and using frequencies in the authorized bands between 405 and 535 kc/s shall, during their hours of service, remain on watch on 500 kc/s. This watch is obligatory only for class A2 and A2H emissions.

USA/20(39) MOD 1337 (2) Coast stations open to the public correspondence service on one or more frequencies between 1605 and 2850 kc/s shall also be capable of transmitting and receiving ~~class A3 emissions~~ on 2182 kc/s. Coast stations shall be capable of transmitting and receiving on 2182 kc/s with classes A3 or A3H emissions until 1 January 1970. After 1 January 1970 coast stations shall be capable of transmitting on 2182 kc/s with class A3H emissions and be capable of receiving classes A3 and A3H emissions on 2182 kc/s.

Ref.

USA/20(39)
(cont.)

Reasons :

To provide for the permissive use of full carrier single sideband (SSB) emissions on the distress and calling frequencies 500 kc/s and 2182 kc/s for stations using SSB transmitting equipment. The C.C.I.R. has determined that the emissions A2H and A3H are as effective as A2 or A3 emissions for use as alarm, distress, urgency and safety signals.

Background :

Increasing use of single sideband (SSB) emission in the maritime mobile service requires that provision be made for SSB compatibility with existing double sideband (DSB) systems associated with the distress and safety uses of 500 kc/s and 2182 kc/s. The C.C.I.R. has carefully examined the technical aspects of the use of full carrier SSB emissions, A2H and A3H, and has found them to be compatible, including the use of the alarm signal. Either emission, A2 or A2H; A3 or A3H, may be used with equal effectiveness where A2 or A3 emissions are specified in the Radio Regulations for distress and safety uses.

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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Ref. Agenda Item 6 : Examination of the pertinent portions of the revised International Code of Signals.

U.S. Proposals: (1) Amend the Radio Regulations as follows :

USA/21(40) SUP 760

USA/21(41) Add as a footnote to Nos. 1222, 1241, 1273, 1287, 1302, 1393, 1430, 1451, 1460 :

ADD 1) Where language difficulty is encountered, International Code of Signals DELTA ECHO may be used in lieu of THIS IS.

USA/21(42) APPENDIX 13

SECTION I

Q CODE

SUP

QRD	QTH	QUA	QUP
QRE	QTI	QUB	QUQ
QRF	QTJ	QUG	QUR
QSE	QTK	QUH	QUS
QSF	QTL	QUI	QUT
QSH	QTM	QUJ	QUU
QSQ	QTN	QUK	QUW
QTD	QTW	QUL	QUY
QTE	QTY	QUN	
QTF	QTZ	QUO	

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Ref.

USA/21(42)
(contd.)

APPENDIX 13

SECTION II

Miscellaneous Abbreviations and signals

SUP

DF	ER	KTS	N	W
DO	ETA	MIN	NW	
E	KMH	MPH	S	

USA/21(43)

APPENDIX 16

Phonetic Alphabet and Figure Code

(See Article 33)

MOD

1. When it is necessary to spell out call signs, service abbreviations and words, the following letter spelling table shall be used :

~~Figure or Mark to be transmitted~~ *)	Letter to be transmitted	Word to be used	Spoken as**)
~~1~~	A	Alfa	AL FAH
~~2~~	B	Bravo	BRAH VOH
~~3~~	C	Charlie	CHAR LEE or SHAR LEE
~~4~~	D	Delta	DELL TAH
~~5~~	E	Echo	ECK OH
~~6~~	F	Foxtrot	FOKS TROT
~~7~~	G	Golf	GOLF
~~8~~	H	Hotel	HOH TELL

---

*) ~~Each transmission of figures or marks is preceded and followed by the words "as a number" or "as a mark" respectively, spoken twice; e.g., the number 1959 will read: "as a number, as a number Alfa, India, Echo, India, as a number, as a number".~~

**) The syllabels to be emphasized are underlined.

Ref.

USA/21(43)
(contd.)

~~Figure or Mark to be transmitted~~ *)	Letter to be transmitted	Word to be used	Spoken as**)
~~9~~	I	India	IN DEE AH
~~0~~	J	Juliett	JEW LEE ETT
~~Comma~~	K	Kilo	KEY LOH
~~Fraction Bar~~	L	Lima	LEE MAH
~~Break Signal~~	M	Mike	MIKE
~~Full Stop (period)~~	N	November	NO VEM BER
	O	Oscar	OSS CAH
	P	Papa	PAH PAH
	Q	Quebec	KEH BECK
	R	Romeo	ROW ME OH
	S	Sierra	SEE AIR RAH
	T	Tango	TANG GO
	U	Uniform	YOU NEE FORM or OO NEE FORM
	V	Victor	VIK TAH
	W	Whiskey	WISS KEY
	X	X-ray	ECKS RAY
	Y	Yankee	YANG KEY
	Z	Zulu	ZOO LOO

*) ~~Each transmission of figures or marks is preceded and followed by the words "as a number" or "as a mark" respectively, spoken twice; -- e.g., the number 1959 will read: "as a number, as a number Alfa, India, Echo, India, as a number, as a number."~~

**) The syllables to be emphasized are underlined.

Ref.

USA/21(43) (contd.) ADD

2. When it is necessary to use figure spelling, the following table shall be used :

Figure to be transmitted	Code Word	Spoken as
0	NADAZERO	NAH-DAH-ZAY-ROH
1	UNAONE	OO-NAH-WUN
2	BISSOTWO	BEES-SOH-TOO
3	TERRATHREE	TAY-RAH-TREE
4	KARTEFOUR	KAR-TAY-FOWER
5	PANTAFIVE	PAN-TAH-FIVE
6	SOXISIX	SOK-SEE-SIX
7	SETTESEVEN	SAY-TAY-SEVEN
8	OKTOEIGHT	OK-TOH-AIT
9	NOVENINE	NO-VAY-NINER
Decimal point	DECIMAL	DAY-SEE-MAL

Note : Each syllable should be equally emphasized. The second component of each code word is the code word used in the Aeronautical Mobile Service.

MOD

~~2.~~ 3. However, stations of the same country may use, when communicating between themselves, any other table recognized by their administration.

USA/21(44)

(2) Adopt a Resolution Relating to Responsibility for International Signals.

Ref.

USA/21(44)
(contd.)

Reasons :

To amend pertinent portions of the Radio Regulations which are in conflict with the revised International Code of Signals adopted by the Inter-Governmental Maritime Consultative Organization (I.M.C.O.).

Background :

The present International Code of Signals was adopted by the I.T.U. at Madrid in 1932. At the Atlantic City Conference (1947), I.M.C.O. was proposed as the appropriate agency to be responsible for a revised Code. As a result of I.M.C.O.'s work, a revised Code has been prepared. I.M.C.O. adopted it to be effective on 1 January 1969, provided the I.T.U. examines and adopts applicable portions. Pertinent portions of this revised Code will be considered by the I.T.U. at Geneva in September 1967.

The revised Code is intended for use primarily in situations related to safety of navigation and persons, especially when language difficulties arise. It is suitable for transmission by all means of communication, including radiotelephony and radiotelegraphy, thus obviating the necessity for a separate radiotelephone code and dispensing with Volume II for radiotelegraphy. The revised Code embodies the principle that each signal has a complete meaning. It thus leaves out the vocabulary method which was part of the old Code. The geographic section, not being considered essential, was omitted. By these means it was possible to reduce considerably the volume of the Code and achieve simplicity.

Recognition has been given to the principle that the I.T.U. will have cognizance over communication procedures and abbreviations while the I.M.C.O. will have cognizance through the International Code of Signals of other signals and abbreviations, such as those pertaining to safety of navigation, medical assistance and search and rescue. Certain portions of the two publications, the Radio Regulations and the International Code of Signals, will be duplicated; but these are limited to general communication procedure signals and to the distress, urgency and safety signals.

Deletion of No. 760 (Proposal No. USA/21(40)) reflects the absence of four letter combinations in the revised Code.

Ref.

USA/21(44)
(contd.)

Revisions to certain Radio Regulations consist of a footnote indicating that the procedure of the revised Code, i.e., using "DELTA ECHO" vice "THIS IS" will be used when the Code is being used while the radiotelephony procedure of the RR will continue to be used when there is no language problem.

Appendix 13 is composed of two sections, one containing the Q Code and the second the Miscellaneous Abbreviations and Signals.

The Q Code contains signals which are duplicated in the revised Code. These are in the subject area of distress, navigation, and search and rescue. Following the principle that the Radio Regulations contain only communication procedures, the Q signals pertaining to other subjects are proposed to be deleted. Signals in the Revised Code contain adequate parallel meaning to the deleted Q signals.

Section II of Appendix 13 contains 60 abbreviations and procedure signals, meant primarily for telegraphy use. Of these, 16 are duplicated in the revised Code plus 4 others which are the safety and distress signals. Of the remaining 40 signals, 13 have been proposed to be deleted, since they do not deal with communication procedures.

A considerable effort has been made by I.M.C.O. in improving the figure spelling table (Appendix 16) to produce one which is more intelligible for radiotelephone use and which would be agreed to by both the aeronautical and maritime mobile services. However, at the present time, I.C.A.O. will continue to use their present phonetic figure spelling tables, but may use the I.M.C.O. adopted table for air-sea rescue operations.

Action by the W.A.R.C. is essential to permit the revised International Code of Signals to come into effect as planned by I.M.C.O. on 1 January 1969. With the revisions herein proposed, Recommendations 22 and 30 will have served their purpose, and may be deleted from the Radio Regulations. Recommendation 29 concerning phonetic alphabet records may require new records reflecting the changes to Appendix 16.

Ref.

USA/21(44)
(contd.)

Resolution No. .... - Relating to Responsibility for International Signals

The World Administrative Radio Conference, Geneva, 1967,

considering

(a) that the Administrative Radio Conference, Atlantic City, 1947, suggested that the International Code of Signals should fall within the responsibility of the Inter-Governmental Maritime Consultative Organization (I.M.C.O.);

(b) that the I.M.C.O. has prepared a revised International Code of Signals;

(c) that the revised International Code of Signals was adopted by the Fourth Assembly of the I.M.C.O. in 1965, to come into effect on 1 January 1969;

(d) that this Conference has amended the Radio Regulations to make them consistent with the revised International Code of Signals;

(e) that the regulation of radiocommunication is within the responsibility of the International Telecommunication Union (I.T.U.);

(f) that it is necessary to determine the responsibility for those signals in international usage which may be used in both radiocommunication and in other methods of signalling;

resolves

1. that those signals identified primarily with radiocommunication should be the responsibility of the I.T.U.;

2. that those signals identified primarily with other aspects such as navigation and search and rescue activities should be the responsibility of the I.M.C.O.;

3. that where considered desirable, signals within the responsibility of one organization may be included for information in the publications of the other organization, suitably annotated as to indicate their source;

Ref.

USA/21(44) (contd.) 4. that the respective Secretaries General should, where doubt exists, confer and decide as to which organization will assume the responsibility for a particular signal;

requests the Secretary-General

1. to refer to the I.M.C.O. the substance of this Resolution for its concurrence.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Addendum to
Document No. 22-E
21 September 1967
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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item 7.1 :

Data transmission from ship stations

Ref.			Article 32
USA/Add.22(85)	ADD	1159A	21 bis Mobile station transmitters operating on working frequencies for high traffic ships for teleprinter and data transmission shall have frequency tolerance of 100 c/s long term and 40 c/s short term (on the order of 15 minutes) on and after 1 January, 1974.
		1159B	Coast radiotelegraph station transmitters operating in radio-teleprinter or data transmission service shall have frequency tolerance of 40 c/s on and after 1 January, 1970.

ARCHIVES U.I.T. GENÈVE

INTERNATIONAL TELECOMMUNICATION UNION
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GENEVA, 1967

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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item 7.1 : Data transmission from ship stations

U.S. Proposal :

a) Reduce by half the spacing between assignable working frequencies for high traffic ships, as shown in Appendix 15, Section A; and designate the lower half of the modified band for teleprinter and data transmissions and the upper half for manual operations. (See also the U.S. proposal No. USA/17(16) in respect of Agenda Item 2.3, Document No. 17).

b) Amend Section V of Article 32 and Appendix 3 as a consequence of a) above.

Reasons :

To provide additional frequencies in sufficient quantity to accommodate the increasing number of ships eligible to use high traffic frequencies and to permit a separation of manual and automatic operations within the overall band.

Background :

In many areas of the world, present usage of frequencies designated for wideband telegraphy is such that the addition of data transmissions and teleprinters would be detrimental. The loading on high traffic ship frequencies, although increasing, is such as to permit the accommodation of additional users, particularly in light of the feasibility of approximately doubling the number of assignable frequencies by halving the separation between currently assignable frequencies.

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Section V. Bands between 4,000 and 27 500 kc/s

A. General Provisions

Ref.

USA/22(45) MOD 1145 Paragraph 17 (1) Mobile radiotelegraph stations equipped to operate in the bands specified in Nos. 1174, 1192 and 1196 shall employ only class A1 emission. ~~However, other classes of emission are not precluded from the bands specified in No. 1192 provided that such emission can be contained within the normal working channels indicated in Section A of Appendix 15.~~ Survival craft stations may use class A2 emissions in these bands (see Nos. 994 and 997).

USA/22(46) MOD 1149 Paragraph 18 (1) Each of the bands reserved for ship radio-telegraph stations, except for the band 25 070-25 110 kHz, shall be divided into <u>five</u> ~~four~~ parts, beginning at the low frequency end :

NOC 1150

MOD 1151 b) a band of working frequencies for the use of high traffic ship stations <u>for teleprinter and data transmission</u>;

ADD 1151A <u>b bis</u>) <u>a band of working frequencies for the use of high traffic ship stations for class A1 emission manual telegraphy</u>;

NOC 1152

NOC 1153

NOC 1154

Ref.

USA/22(47) MOD 1157 Stations installed on ships other than those mentioned in No. 1156 shall use the low traffic band when using class A1 emission (see No. 1153). For teleprinter and data transmission the band designated in No. 1151 for this purpose shall be used.

---

c) Working frequencies for high traffic ships

USA/22(48) MOD 1192 Paragraph 39 The working frequencies assigned to high traffic ships for teleprinter and data transmission are included within the following band limits :

4160	to	4168.125	~~4177~~	kc/s
6240	to	6252.1975	~~6265.5~~	kc/s
8320	to	8336.25	~~8354~~	kc/s
12471	to	12504.375	~~12531~~	kc/s
16622	to	16672.5	~~16708~~	kc/s
22148	to	22185.5	~~22220~~	kc/s

ADD 1192A Paragraph 39 bis) The working frequencies assigned to high traffic ships for manual telegraphy are included within the following band limits :

4168.125	to	4177	kc/s
6252.1875	to	6265.5	kc/s
8336.25	to	8354	kc/s
12504.375	to	12531	kc/s
16672.5	to	16708	kc/s
22185.5	to	22220	kc/s

Ref.

USA/22(49)

APPENDIX 3

Change Table of Frequency Tolerances*) applicable to high traffic ship stations using Class A1 emission from 200 parts per million to 50 parts per million, as indicated hereinafter :

Frequency Bands (lower limit exclusive, upper limit inclusive) and Categories of Stations	Tolerances applicable until 1 January 1966[1] to transmitters in use and to those to be installed before 1 January 1964	Tolerances applicable to new transmitters installed after 1 January 1964 and to all transmitters after 1 January 1966[1]
	1) 1 January 1970 in the case of all tolerances marked with an asterisk	
b) Aeronautical Stations:		
-power 500 W or less	100	100
-power above 500 W	50	50
c) Base Stations:		
-power 500 W or less	100	100
-power above 500 W	50	50
3. Mobile Stations:		
a) Ship Stations:		
1) Class A1 emission	~~200~~	~~200~~
Low traffic ships	200	200
High traffic ships		50**)
2) Emission other than Class A1:		
-power 50 W or less	50 c)	50 c)
-power above 50 W	50	50
b) Survival Craft Stations	200	200
c) Aircraft Stations	200*)	100*)
d) Land Mobile Stations	200	200
4. Broadcasting Stations	30	15

*) As amended by the E.A.R.C. Space (1963)

**) Effective upon the entry into force of the revised Regulations

Ref.

Agenda Item 7.2 : Consider conditions for the use of emergency position-indicating beacons

U.S. Proposal :

Amend the Radio Regulations as follows :

USA/22(50) MOD 41 Survival Craft Station: A mobile station in the maritime or aeronautical mobile service intended solely for survival purposes and located on any lifeboat, life-raft or other survival equipment.[1)]

ADD 41.1 [1)] Survival craft stations include devices which are intended to facilitate search and rescue through the functions of alerting, position-indicating beaconry, or communications, the emissions of which are non-directional. Such devices may be small, lightweight, floatable, watertight, shock resistant, self energizing and capable of continuous operations over extended periods.

ARTICLE 28

Conditions to be observed by Mobile Stations

Section VI. Survival Craft Stations

USA/22(51) ADD 999A Paragraph 24. Exceptionally, however, survival craft stations intended primarily as beacons to indicate the positions of survivors or the location of a mobile station in distress shall be capable of transmitting:

ADD 999B a) with the carrier on 2182 kc/s using the emission specified in 1476B (Proposal No. USA/22(52)). Class A3 or A3H emission may also be transmitted. If a receiver is provided, it shall be able to receive class A3 and A3H emissions, or

Ref.

USA/22(51) (cont.) ADD 999C b) with carriers on 121.5 and/or 243 Mc/s using the emission specified in 1476C (Proposal No. USA/22(52)). Class A3 emission may also be transmitted. If a receiver is provided it shall be able to receive class A3 emissions.

ARTICLE 36

USA/22(52) ADD

Section VIIIA

Survival craft beacon signals

ADD 1476A Paragraph 44 (bis) (1) The position indicating beacon signals employed by survival craft stations consists of:

ADD 1476B a) a keyed emission modulated by a tone of 1300 cycles per second having a ratio of the period of the emission to the period of silence equal to or greater than one, and an emission duration of between 1 and 5 seconds; or

ADD 1476C b) a swept tone modulation sweeping downward over a range of not less than 700 cycles per second within the range 1600 to 300 cycles per second with a repetition rate of between two and three sweeps per second.

ADD 1476D (2) The position-indicating beacon signal shall be generated automatically and normally shall be sent continuously. It may be interrupted for radiotelephone transmissions or reception when this capability is provided.

ADD 1476E Paragraph 44 (ter) This signal shall indicate that a person(s) is in a distress situation, may no longer be on an aircraft or ship and that receiving facilities may not be available.

Ref.

USA/22(52)
(cont.)

Reasons :

To provide for world-wide conditions of use, definitions and frequencies for emergency position-indicating beacons.

Background :

The beacon under consideration is already in use in various forms and under various names throughout much of the world. To derive maximum benefit from these beacons, which supplement the distress systems, international regulation concerning frequencies and emission characteristics are required. Because the beacons are considered to be a special type of survival radio equipment, the term "survival beacon" is proposed rather than the term "emergency position-indicating beacon" set forth in the W.A.R.C. agenda.

In considering necessary amendments to the Radio Regulations, which will provide for internationally regulated survival beacon use, agreement must be reached concerning its fundamental function. The beacon is considered to primarily assist rescue vehicles in locating survivors either aboard a distressed ship or aircraft, or in the water, after alerting has taken place. For this reason, it is the proposal of the U.S. that the survival beacon (or position-indicating beacon) be considered as a special class or type of survival craft station; one that supplements other survival radio equipment whose primary purpose is for alerting and communication. It is noted that in some segments of the aeronautical service, this alerting function is provided through flight-regulating systems which require frequent reporting from aircraft. In a somewhat similar but less definite service, ships which participate in merchant vessel reporting systems may have some alerting functions carried out for them. The beacon, of course, has a secondary capability for short range alerting, where, for any reason, a distress message could not be transmitted.

With regard to the frequencies proposed, two general concepts have been advanced :

a) 2182 kc/s - Most appropriate in regions of restricted water areas and with heavy maritime traffic which primarily utilizes radiotelephony.

Ref.

USA/22(52) (cont.)

b) 121.5/243 Mc/s- Considered most appropriate for regions with large ocean areas and extended coast lines where search by aircraft is most effectively used.

International organizations such as I.C.A.O., I.M.C.O. and C.C.I.R. which have considered the use of frequencies and characteristics of survival or emergency-position-indicating beacons, have recommended only these frequencies.

The use of the most appropriate of the survival frequencies for beacon signals depends upon the conditions in a particular area. An arbitrary designation of one beacon frequency as maritime and the other as aeronautical is undesirable since it does not take into account different environments and bars the use of the most appropriate beacon frequency as determined by administrations. The proposed changes to the Radio Regulations would permit each administration to examine the provisions for use of the beacons in the light of its own distress system requirements. At the same time, the beacons would be restricted to the three frequencies, and two characteristic signals; namely, the swept tone and the dashed tone emissions, permitting more universal recognition, and thereby improve its effectiveness.

The U.S. does not consider the use of the radiotelephone alarm signal recommended by the C.C.I.R. to be as appropriate as the above emissions, since the survival beacon is intended to assist in locating rather than alerting. Transmission of the alarm signal assumes that a distress message will follow and that communications would normally be available. However, the beacon would not normally provide communications, has extremely short range as compared to other survival craft radioequipment, and must be simple, inexpensive and reliable to permit its widespread acceptance throughout the world. Use of the three frequencies (2182kc/s, 121.5 and 243 Mc/s) in a single beacon is also considered undesirable because of its cost and complexity, but could be permissive.

The U.S. has conducted tests using beacons similar to the proposed 121.5/243 Mc/s survival beacon. Representative operational data from tests made by the U.S. Coast Guard resulted in the following :

Ref.

USA/22(52)
(cont.)

Aircraft Altitude (ft):	Distance Signal First Received (km):	Distance Homing Capability Received (km):
500	40	20
1000	45	40
5000	105	80
10000	140	115
20000	150	125

Evaluations based on the findings of these tests, plus actual search and rescue operations involving a survival beacon on 243 Mc/s which materially assisted in location of survivors, have enabled the U.S. to conclude that these beacons are very effective for rapid search of large ocean areas by aircraft and short range accurate location of survivors in the water.

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Agenda Item 7.3 : Conditions for the use of selective calling devices

U.S. Proposal :

No proposal is offered at this time with respect to selective calling devices. The U.S. is awaiting the report from C.C.I.R. Study Group XIII before submitting proposals. The U.S. considers it important that the W.A.R.C. reach agreement on the technical specifications of selective calling devices.

Agenda Item 7.4 : Review of service hours for ship stations

U.S. Position :

The U.S. considers that the provisions now in the Radio Regulations concerning ships of the third category (No. 932) are appropriate, provided the optional provisions contained in No. 933 are maintained.

Background :

In the U.S., radiotelegraph equipped cargo ships which carry one radio officer, are licensed in the third category as specified in the Radio Regulations, No. 932. Such U.S. ships may select their own particular hours of watch or hours of service so long as the required eight hours watch by the radio officer is maintained. (This is permitted under No. 933). No set schedule can be specified, therefore, that is applicable to all ships. The generalization can be made, however, that, in implementing the Radio Regulations, U.S. ships normally maintain an aggregate of eight hours watch during the period 9 a.m. until 9 p.m. ship's local time.

Agenda Item 7.5 : Frequencies to be assigned for the transmission by television of port radar images.

The United States has no proposal to submit on this item.

Agenda Item 7.6 : The establishment of a separate category for mobile radiotelephone traffic on inland waterways.

The United States has no proposal to submit on this item.

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MARITIME CONFERENCE
GENEVA, 1967

Document No. 23-E
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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item US - A *) : Amend Article 32, Radio Regulations, to permit use of 512 kc/s as a Supplementary Ship Calling Frequency in Region 2.

U.S. Proposal : Amend the Radio Regulations as follows :

MOD 1123 11. (1) Ship stations employing class A1 or A2 emissions in the authorized bands between 405 and 535 kc/s shall use working frequencies chosen from the following : 425, 454, 468, ~~and~~ 480 and 512 kc/s, except as permitted by No. 418. ~~In addition, ship stations may use 512 kc/s in Regions 1 and 3, and 448 kc/s in Region 2.~~

MOD 1124 (2) Coast stations are prohibited from transmitting on the working frequencies designated for the use of ship stations on a world-wide basis ~~or on the working frequency designated for the use of ship stations in the Region in which the coast station is situated.~~

MOD 1125 (3) ~~In Regions 1 and 3~~ The frequency 512 kc/s may be used by ship stations as a supplementary calling frequency when 500 kc/s is being used for distress.

Reasons :

To provide for the world-wide use of 512 kc/s as a supplementary calling frequency when 500 kc/s is being used for distress traffic. The use of 512 kc/s for this purpose at the present time is limited to Regions 1 and 3.

*) Item not now on the agenda of the W.A.R.C. but which the United States proposes that the Conference consider.

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Background :

The Radio Regulations now provide for the use of 512 kc/s as a calling (and reply) frequency in Regions 1 and 3 when 500 kc/s is in use for distress traffic. This permissive use allows continuation of non-distress radio traffic between coast stations and ships not involved with the distress but who might cause harmful interference to 500 kc/s through its use for calling.

Region 2 was excluded from this additional provision for the calling use in 1959 because of the aeronautical mobile service operations on 512 kc/s. During the interim, the aeronautical use has been greatly reduced and should no longer be a bar to maritime mobile use of this frequency both for calling when 500 kc/s is occupied with distress traffic and for use as a ship working frequency.

This change to the Radio Regulations would make the use of 512 kc/s the same in all Regions, i.e., ship working and permissive supplementary calling uses.

The proposed revision would also delete the use of 448 kc/s as a ship working frequency in Region 2 and make it available for coast station assignment.

Increasing powers of coast stations in the band 415 - 535 kc/s have caused interference patterns not experienced when lower powers were used. Considering that ship working frequencies are adequate, the frequency 448 kc/s would provide the maximum benefit for coast station assignment.

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MARITIME CONFERENCE
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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item US-B *) : Amend No. 981 of the Radio Regulations to allow more flexibility in the time for frequency changes in shipboard transmitting apparatus.

U.S. Proposal : Amend the Radio Regulations as follows :

MOD 981 b) changes of frequency in transmitting apparatus shall be effected as quickly as practicable, but within fifteen seconds in any event; ~~within five seconds if the frequencies are in the same and within fifteen seconds if the frequencies are in different bands;~~

Reasons :

To provide a time period for changes of frequency in ship station transmitters which takes into account characteristics of equipment employing automatic tuning.

Background :

The requirement for rapid frequency shift of ship telegraph transmitters (5 seconds within the same band and 15 seconds between bands) now contained in No. 981, first appeared as a requirement in No. 592 of the Atlantic City Radio Regulations. This provision was adopted as the result of a proposal made by the U.S. based on the needs of the calling-working concept. It is applicable, however, only to the use of A1 emission. There are available today multi-purpose transmitters of high stability using automatic tuning and frequency synthesis techniques which are adaptable to A1, F1, SSB, data transmission, etc. Such transmitters can be shifted readily to any frequency in the 2 - 30 Mc/s range and tend to minimize human error in the tuning process. However, the time required for complete cycling of automatic tuning systems which have been evaluated, range from 6 to 12 seconds. Clearly, such devices comply with the spirit of the Radio

*) Item not now on the agenda of the W.A.R.C. but which the United States proposes that the Conference consider.

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Regulations. Their use is inhibited in that they fail to meet the precise letter of the Radio Regulations in one aspect only, i.e., the five second limitation now in the regulations. This five second limitation was chosen arbitrarily in 1947 and need not be perpetuated at the expense of improved technology.

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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item US-C *)

Amend Article No. 5 of the Radio Regulations to provide for use of A7J emission in the maritime mobile service between 14 and 160 kc/s.

U.S. Proposal - Amend the Radio Regulations as follows :

MOD 158 Limited to coast telegraph stations (A1, A7J, and F1 only).

MOD 167 Only classes A1 or F1, A4 or F4 emissions are authorized in the band 90 - 160 kc/s for stations of the fixed and maritime mobile services. Exceptionally, A7J emission is also authorized in the band 90 - 160 kc/s for stations of the maritime mobile service.

Reasons :

To provide for use of A7J emission for stations of the maritime mobile service in maritime mobile bands between 14 and 160 kc/s.

Background :

A requirement has developed to use single sideband, suppressed carrier, multichannel voice-frequency telegraph emission (A7J) in the maritime mobile service between 14 and 160 kc/s.

Number 158 concerning 14 - 110 kc/s, and number 167, concerning 90 - 160 kc/s, do not presently provide for use of A7J emission in the maritime mobile service.

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*) Item not now on the agenda of the W.A.R.C. but which the United States proposes that the Conference consider.

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The Radio Regulations have been amended in the past to recognize use of additional emissions in the maritime mobile service below 160 kc/s. Number 158, Geneva, 1959, recognized F1 emission not previously provided for in number 233, Atlantic City, 1947.

It is proposed that this Conference, following past procedents, provide for use of the telegraph emission A7J in the maritime mobile service between 14 and 160 kc/s, by making necessary revisions to numbers 158 and 167.

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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item US- D *) : Examination of the need for the retention of the calling frequency 143 kc/s and its associated guard band, 140 - 146 kc/s.

U.S. Proposal : Amend the Radio Regulations as follows :

SUP 171

SUP ARTICLE 32

~~Section I~~

~~Bands between 90 and 160 kc/s~~

~~A. Call and Reply~~

SUP 1095

SUP 1096

SUP 1097

SUP 1098

SUP 1099

SUP 1100

SUP 1101

SUP 1102

SUP 1103

*) Item not now on the agenda of the W.A.R.C. but which the United States proposes that the Conference consider.

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SUP 1104

SUP 1105

Reasons

Use of 143 kc/s by ships for calling is no longer sufficient to justify its retention.

Background :

The frequency 143 kc/s was at one time used as a calling frequency in the band 90 - 160 kc/s by many ships, particularly large passenger vessels. For that reason, it was designated in the Radio Regulations as an exclusive calling frequency and, in addition, was protected by a guard band of six kc/s. The use of this band by ships has gradually diminished to the vanishing point so that the need for the calling frequency no longer exists. With the present limited usage, working frequencies should be adequate for ship calling and working and this band would then be made available for the increasing requirements for other purposes.

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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item US-E *)

Consider modification of the maximum power authorized for coast telegraph stations when using other than A1 and single channel F1 emissions.

U.S. Proposal - Amend the Radio Regulations as follows :

ADD 1148A Exceptionally, and subject to the provisions of Article No. 9, powers in excess of the limits specified in number 1148 may be authorized for coast radiotelegraph stations employing multi-channel telegraph emissions, provided a level of 2.5 kW P_p effective radiated power per intelligence channel is not exceeded.

Reasons :

To provide for powers required for the use of multi-channel emissions.

Background :

Number 1148 limits the maximum mean powers which may be used by coast radiotelegraph stations in bands between 4 and 27.5 Mc/s. Those power limits are considered as reasonable in relation to A1 and single channel F1 emissions. However, certain telegraph emissions are now being used as a means of making more efficient use of the coast telegraph bands by employing bandwiths greater than that used for A1 and single channel F1. With such emissions, although the total power required may be greater than the maximum mean power limits specified in number 1148, the spectral power density expressed in watts per cycle per second may be, and normally is, less than that of A1 and single channel F1 systems operating within the power ceilings of number 1148.

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*) Item not now on the agenda of the W.A.R.C. but which the United States proposes that the Conference consider.

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Specific provisions were made in number 72 of the Final Acts of the E.A.R.C., Geneva 1951, for making exceptions to the maximum power limitations of number 70 on an individual statiom basis. The 1959 Geneva Conference adopted as number 1148 the maximum power limitations of the E.A.R.C. number 70, but did not bring forward the provisions for making adjustments exceeding the maximum limits. At the time most stations were using A1 or single channel F1 emission and the technology then in use did not require powers in excess of the limits shown in number 1148.

Number 1148A, as proposed, is a step forward in providing for emissions which will facilitate better utilization of the frequency bands allocated for use by coast radiotelegraph stations.

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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item US-F *) :

Provide for establishment and use of a Manual for Use by the Maritime Mobile Service.

U.S. Proposal :

1. Amend the Radio Regulations as follows :

ARTICLE 20

ADD 806A (V)bis List V bis. Manual for use by the maritime mobile service

This Manual shall contain those Radio Regulations, Additional Radio Regulations, and portions of the Convention necessary and useful to stations of the maritime mobile service.

APPENDIX 11, Section I :

MOD 8. The Radio Regulations and Additional Radio Regulations, plus ~~also~~ such provisions of the Convention as relate to the radio communication service aboard ship, or the Manual for use by the maritime mobile service.

*) Item not on the agenda of the W.A.R.C. but which the United States proposes that the Conference consider.

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APPENDIX 11, Section III

MOD 5. The provisions of the Radio Regulations and Additional Regulations applicable to the maritime mobile radiotelephone service - or the manual for use by the maritime mobile service.

2. Adopt a Resolution Relating to the Establishment of a Manual for use by the maritime mobile service.

Reasons :

To permit use of a more compact and inexpensive publication for use by the maritime mobile service on board those ship stations where the Radio Regulations and additional Radio Regulations are required by Appendix 11.

Background :

Documents required by compulsorily equipped radiotelegraph ship stations are enumerated in Appendix 11 of the Radio Regulations. Among the required documents are the Radio Regulations, additional Radio Regulations and certain portions of the Convention. To fully comply with these requirements, both the Radio Regulations and the Convention must be carried by the ship station. Coast station operators need the regulations applicable to the maritime mobile service available.

A Manual for Use by the mobile services was prepared by the Secretary General pursuant to Resolution No.12 of the administrative Radio Conference, Geneva, 1959. It contains those Radio Regulations applicable to all of the mobile services, and portions of the Convention. However, there does not appear to be any need for the use of this manual by the other mobile services, particularly the aeronautical mobile service. To provide for a specific use where the distribution will be great enough to make the manual inexpensive (compared to the Radio Regulations), the preparation of a Manual for use by the maritime mobile service is required and will meet these needs.

It is considered that by using the present Manual for use by the mobile services for a guide, the Secretary General can in a short time prepare the new manual, enabling its early use and at the same time, reflecting the changes made to the Radio Regulations by the W.A.R.C., 1967.

Resolution No.....

Relating to the Establishment of a manual for use by the maritime mobile service

The World Administrative Radio Conference, Geneva, 1967,

considering,

a) that the provisions of the Radio Regulations, Geneva, 1959, applicable to the maritime mobile service include, in particular :

- provisions directly related to the operation of the maritime mobile service,

- other provisions not directly related to this service;

b) that it would be useful to administrations to have available to stations in the maritime mobile service a compact publication containing those Radio Regulations, Additional Radio Regulations, and portions of the Convention necessary and useful for operation of those stations;

c) that a manual for use by the mobile services (1961) was prepared by the Secretary General pursuant to Resolution No. 12 of the Administrative Radio Conference, Geneva, 1959, and that it, with minor revisions could form a basis for the manual for use by the maritime mobile service;

d) that the other mobile services have not indicated a need for a manual similar to that which would be useful to the maritime mobile service;

resolves

1. that the provisions of the Radio Regulations, the additional radio regulations and portions of the Convention applicable and useful to stations in the maritime mobile service be compiled into a compact manual, designated as the manual for use by the maritime mobile service, by the Secretary General in consultation with administrations as necessary;

2. that the Secretary General publish the manual as soon as practicable after the conclusion of this Conference to insure its availability as an official publication of the I.T.U. as of the date the Final Acts of this Conference come into force;

3. that the Secretary General revise the manual as required to keep it current with the Radio Regulations.

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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item US G: *)

Amendment of Nos. 863 and 903 of the Radio Regulations relating to operator certificates to include power levels for single sideband transmitters.

U.S. Proposal: Amend the Radio Regulations as follows:

MOD 863 (3) The holder of a radiotelephone operator's restricted certificate may carry out the radiotelephone service of any ship or aircraft station, when working on freuqencies of the maritime mobile service, provided that:

- the ~~carrier~~ power of the transmitter does not exceed ~~50 watts~~ the following:

  50 watts (P_c) for emission A3,

  200 watts (P_p) for emissions A3A, A3H and A3J;

  or

- the operation of the transmitter requires only the use of simple external switching devices, excluding all manual adjustment of frequency determining elements with the stability of the frequencies maintained by the transmitter itself within the limits of tolerance specified by Appendix 3, and the ~~carrier~~ power of the transmitter does not exceed ~~250 watts~~ the following:

*) Item not on the agenda of the WARC but which the United States proposes that the Conference consider.

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250 watts (Pc) for emission A3,

1000 watts (Pp) for emissions A3A, A3H and A3J.

MOD 903 (2) For ship radiotelephone stations where the ~~carrier~~ power of the transmitter does not exceed ~~100 watts~~ the following:

100 watts (Pc) for emission A3,

400 watts (Pp) for emissions A3A, A3H and A3J.

and for aircraft radiotelephone stations operating on frequencies allocated exclusively to the aeronautical mobile service, each administration may itself fix the conditions for obtaining a restricted radiotelephone operator's certificate, provided that the operation of the transmitter requires only the use of simple external switching devices, excluding all manual adjustment of frequency determining elements, and that the stability of the frequencies is maintained by the transmitter itself within the limits of tolerance specified in Appendix 3. However, in fixing the conditions, administrations shall ensure that the operator has an adequate knowledge of radiotelephone operation and procedure particularly as far as distress, urgency and safety are concerned. This in no way contravenes the provisions of No. 906.

Reasons:

To provide in the Radio Regulations for equal use of double sideband and single sideband emissions under the restricted radiotelephone operator's certificate, and to bring more closely into accord the provisions of Nos. 863 and 903 with those of Appendix 27.

Background:

The revised Radio Regulations should not impose upon the licensee of aircraft or ship stations need for a plurality of radio operator certificates, arising out of a situation where, in radiotelephone operation, the radiated power of the different SSB modes in a single installation is both above and below the power level applicable to the restricted radiotelephone operator's certificate. Thus, the power level selected and included in the Radio Regulations should be above the transmitter power level routinely encountered in the maritime mobile service.

The relationships between the peak envelope power, the mean power and the carrier power of a radio transmitter have been studied in depth by the C.C.I.R. The most recent result of these studies is contained in C.C.I.R. Oslo, 1966 (Document I/1017).

Customarily, the output power rating of AM transmitters has been specified in terms of "carrier" power -the average output under conditions of no modulation. However, this method of rating is not conveniently applicable to single sideband transmitters where reduced carrier power is employed. Single sideband transmitters are usually rated in terms of "Peak Envelope Power" which is a term defined in No. 95 of the Radio Regulations.

When searching for some criterion of equivalence with respect to DSB and SSB emissions, we first must decide whether we are concerned with (a) equivalent interferring effects of the emissions, (b) equivalent communication ranges or (c) equivalent circuit capacities. These each depend to some extent upon the power of the emission, but also upon other factors, so that there is no simple equivalence which satisfies all of these aspects simultaneously. That is, transmitter powers which may provide equivalent communication ranges as between SSB and DSB do not necessarily provide equivalent interference effects or equivalent circuit capacities.

It appears that, from the standpoint of I.T.U., the matter of equivalence should be determined by the interference potential of the emission. The new SSB facilities should cause no more interference to other services, either on the same channel or on adjacent frequencies, than do the existing DSB facilities.

Although there is no rigid relationship between power and interference potential, experience indicates that the most meaningful index of interference potential is provided by the mean power of the emission. It would seem then, that if Nos. 863 and 903 are to be amended to include a comparable power level (to the 100 and 250 watts now appearing therein) for single sideband emission, this can best be done on the basis of mean power. Single sideband transmitters, however, are usually rated in terms of peak envelope power (P_p). Although certain relationships can be derived between peak and mean powers, these relationships do not give us fully satisfactory answers to the two questions set forth above.

The power level of 250 watts carrier power (P_c) appearing in No. 863 was selected on the basis of airborne equipment then available and planned future equipment which would be available aboard scheduled air

transport aircraft, which would have a capability of 1000 watts peak envelope power. Aviation interests have developed airborne SSB equipment specifications which call for a minimum power output with suppressed carrier of 400 watts (P_p) and a maximum power output with suppressed carrier of 650 watts (P_p). Nonetheless, earlier models of airborne SSB equipment continue in use with 1000 watts (P_p).

National regulations within the United States provide for the licensing of ship and aircraft SSB stations on the basis of peak envelope power.

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PLENARY MEETING

DENMARK, NORWAY AND ICELAND

Proposals for the work of the Conference

Agenda Item 7.2

Ref.			Amend the Radio Regulations as follows:
DNK/ISL/NOR/30(1)			Article 28
			Conditions to be Observed by Mobile Stations Section VI. Survival Craft Stations
	ADD	999A	§ 24. However, survival craft stations intended primarily as beacons to indicate the positions of survivors or the location of a mobile station in distress shall be capable of transmitting :
	ADD	999B	a) with the carrier on 2182 kc/s using the following types of emission depending upon the power of the beacon:
	ADD	999C	i) beacons producing a field strength equal to or less than 10 microvolts per metre at a distance of 30 nautical miles at sea level (Type L) — the emission specified in 1476B*) transmitted continuously.
	ADD	999D	ii) beacons producing a field strength greater than 10 microvolts per metre at a distance of 30 nautical miles at sea level (Type H) — the emission specified in 1476B*) or 1476C*) with a keying cycle consisting alternatively of the keying signal having a duration between 30 and 50 seconds and a

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*) Proposal DNK/ISL/NOR/30(2)

Ref.

DNK/ISL/NOR/30(1)
(cont.)

period of silence having a duration between 30 and 60 seconds.

ADD 999E Class A3 or A3H emissions may also be transmitted. If a receiver is provided, it shall be able to receive class A3 and A3H emissions.

or,

ADD 999F b) with carriers on 121.5 and/or 243 Mc/s using the emission specified in 1476D*). Class A3 emissions may also be transmitted. If a receiver is provided, it shall be able to receive class A3 emissions.

DNK/ISL/NOR/30(2) Article 36

Distress Signal and Traffic
Alarm, Urgency and Safety Signals
Section VIII (bis). Survival Craft Beacon Signals

ADD 1476A § 44 (bis). (1) The position-indicating beacon signal employed by survival craft stations consists of:

ADD 1476B a) a keyed emission modulated by a tone of 1300 c/s (± 20 c/s) having a ratio of the period of the emission to the period of silence equal to or greater than 1, and an emission duration between 1 and 5 seconds:

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*) Proposal DNK/ISL/NOR/30(2)

Ref.

DNK/ISL/NOR/30(2)
(cont.)

or,

ADD 1476C b) the radiotelephone alarm signal. The Morse letter "B" and/or the call sign of the ship to which the beacon belongs, should be included by keying the carrier modulated by a tone of 1300 c/s (± 20 c/s) or of 2200 c/s (± 35 c/s);

or,

ADD 1476D c) a swept tone modulation sweeping downward over a range of not less than 700 c/s, within the range 1600 to 300 c/s, with a repetition rate between two and three sweeps per second.

ADD 1476E (2) The position-indicating beacon signal shall be generated automatically and shall normally be sent continuously. It may be interrupted for radiotelephone transmissions or reception when such a facility is provided.

ADD 1476F § 44 (ter). This signal shall indicate that a person(s) is in a distress situation, may no longer be on board an aircraft or ship and that receiving facilities may not be available.

Reasons:

To give international regulatory effect to the C.C.I.R. Recommendation concerning emergency position-indicating beacons on 2182 kc/s, as adopted at the XIth Plenary Assembly of the C.C.I.R., Oslo, 1966, and to the Standards and recommended practices adopted by I.C.A.O. concerning survival radio equipment on the frequencies 121.5 and 243 Mc/s. By definition such beacons are considered to fall under the category "Survival Craft Stations" mentioned in No. 41 of the Radio Regulations.

Ref.

DNK/ISL/NOR/30(3)

Appendix 10

Service Document Symbols
(See Article 20 and Appendix 9)

ADD

A ship which carries survival craft stations intended primarily as beacons to indicate the positions of survivors or the location of a mobile station in distress.

The letter(s) inside the square means:

A The equipment is intended for operation on 2182 kc/s in accordance with No. 1476B*).

B The equipment is intended for operation on 2182 kc/s in accordance with No. 1476C*).

C The equipment is intended for operation on 121.5 Mc/s in accordance with No. 1476D*).

D The equipment is intended for operation on 243 Mc/s in accordance with No. 1476D*).

The number following the letter(s) shows the number of apparatus of the various types on board the ship.

Example:

WXYZ Union [A8 CD3] CP H16

40 1) ABC xyz t

Meaning: 8 units of type L on 2182 kc/s
3 units of equipment on 121.5 and 243 Mc/s.

*) Proposal DNK/ISL/NOR/30(2)

Ref.

DNK/ISL/NOR/30(3)
(cont.)

Reasons:

It is highly desirable to have available during distress situations or search and rescue operations information about which ships are carrying survival craft stations intended primarily as beacons to indicate the positions of survivors or the location of a mobile station in distress and the number of such apparatus on board the ships.

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ITALY

Proposals for the work of the Conference

Agenda Item No. 1

Page 2, replace ADD 1227 AA and ADD 1233 AA as follows :

ADD	1227 AA	c) the assigned frequency 2191.9 kc/s with single sideband emissions and peak envelope power not exceeding 400 W (see No. 1330 AA). (Proposal No. I/31 (2)).
ADD	1233 AA	(5 bis) When using selective calling coast stations shall use the assigned frequency 2171.4 kc/s with single sideband emissions (see No. 1330 AA). (Proposal No. I/31 (2)).

Page 3, ADD 1339 AA 4th line, replace :

.... 2171.4 kc/s ....

by

.... 2191.9 kc/s ....

Page 5, ADD 1339 BE 2nd line, replace :

.... at least in A3H and A3A.

by

.... in A3H, A3A and A3J.

Page 10 ADD 1358 BE 2nd line, replace :

.... at least in A3H and A3J.

by

.... in A3H, A3A and A3J.

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Proposals for the work of the Conference

Agenda Item No. 1

The use of single sideband technique in the maritime mobile service in the bands available to that service between 1605 and 4000 kc/s and in the exclusive HF maritime mobile radiotelephone bands.

Foreword

In the presence of the growing development of radiotelephony in the mobile maritime service the Italian Administration feels that it would be essential to resort to the adoption of more advanced techniques with the aim to reducing interference, improving the quality of the service and increasing the number of available channels.

While for short distance links such results may be reached by expanding the employment of VHF, for medium and long distances it appears more suitable to resort to single sideband technique which, in comparison with the double sideband amplitude modulation technique, offers the following advantages :

- the signal/noise ratio being equal, a lower effective radiated power is required;
- the occupied bandwidth is reduced to about one half; consequently the available frequency bands may be better exploited;
- because of the restriction of the occupied bandwidth, more channels become available and therefore interference is more easily avoided.

On the other hand, however, the single sideband technique requires for transmitters and receivers technical characteristics stricter than the double sideband technique, chiefly in so far as transmitter and receiver frequency tolerances are concerned; characteristics which it is felt are to be included in the Radio Regulations.

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A great many of the above-mentioned advantages would become void if some of the mobile maritime service stations keep on working on double sideband and - taking into account the high number of coast and ship stations involved - since the transition from the double sideband to the single sideband technique must be scheduled, it is necessary that time limits be fixed for its implementation, bearing in mind the opportunity to promote such a conversion and - on the same time - to make the transition less expensive.

Therefore, the Italian Administration proposes the following modifications to the Radio Regulations.

Ref.

I/31(1)

ARTICLE 33

A - Bands between 1605 and 4000 kc/s

ADD 1227-AA c) the assigned frequency 2171.4 kc/s with single sideband emissions (see No. 1330-AA) (Proposal No. I/31(2)).

ADD 1233-AA (5 bis) When calling ship stations of their own nationality, coast stations may use the assigned frequency 2191.9 kc/s with single sideband emissions (see No. 1330-AA) (Proposal No. I/31(2)).

Reasons :

As a consequence of guard bandwidth reduction (see Proposal No. I/31(2)) two single sideband channels are available.

It would be advisable to use them for calling purposes, in order to avoid excessive use of the frequency 2182 kc/s for purposes other than distress traffic

---

I/31(2)

Modify Section II of Article 35 as follows :

MOD 1325 (3) Except for transmissions authorized on 2182 kc/s, all transmissions on the frequencies between 2173.5 and 2190.5 kc/s are forbidden.

Ref.

I/31(2) (contd.)

ADD 1330-AA (3) Transmissions on the two channels of 3.5 kc/s bandwidth each, with assigned frequencies 2171.4 and 2191.9 kc/s, are limited to single sideband emissions (see Nos. 1339-BA through 1339-BY) (Proposal No. I/31(4)).

ADD 1339-AA (5) During the transition period from double sideband to single sideband operation, in order to facilitate single sideband communications, the assigned frequency 2171.4 kc/s may also be used by ship stations for the exchange of traffic.

Reasons :

Bearing in mind the technical developments during the past years, the actual guard band of 2182 kc/s is no longer necessary and it may be reduced in order to improve utilization of the 1605 - 4000 kc/s band.

The proposed reduction is compatible with transmitter frequency tolerance and receiver selectivity of survival craft stations.

I/31(3)

Add to Section II of Article 35 the new paragraph D.bis

D.(bis) - Conversion to single sideband

ADD 1339-AA Para. 8(bis) (1) The following schedule shall be applicable when converting coast and ship stations on maritime radiotelephone channels from double sideband to single sideband :

ADD 1339-AB a) date from which coast stations shall be able to transmit with single sideband : 1 January 1971;

ADD 1339-AC b) date on which coast stations shall discontinue A3 emissions : 1 January 1973;

Ref.

I/31(3) (contd.)

ADD 1339-AD c) date from which no more new double sideband equipments on board ship shall be installed 1 January 1971;

ADD 1339-AE d) date on which ship stations shall discontinue A3 emissions : 1 January 1980;

ADD 1339-AF (2) During the period of transition from double sideband to single sideband, coast and ship stations shall be able to use full carrier (A3H) emissions to permit communication with both double sideband and single sideband radiotelephone stations.

I/31(4)

Add to Section II of Article 35 the following paragraph D(ter)

D(ter). Technical and operational provisions relating to use of single sideband

ADD 1339-BA Para. 8(ter). (1) Definitions of carrier modes :

Carrier mode	Level N (db) of the carrier with respect to peak envelope power
Full carrier (A3H)	$0 \geq N \geq -6$
Reduced carrier (A3A)	$-6 > N \geq -26$
Suppressed carrier (A3J)	$-26 > N$

ADD 1339-BB (2) Mode of operation

ADD 1339-BC Coast and ship station transmitters shall be capable of reducing carriers to the following levels below peak envelope power :

a) 16 db ± 2 db for A3A emissions;

b) not less than 40 db for A3J emissions.

Ref.

I/31(4) (contd.)

ADD 1339-BD c) In actual operation, ship and coast stations shall utilize the carrier levels indicated, respectively, for A3H, A3A and A3J modes.

ADD 1339-BE Coast and ship station transmitters shall be capable of operating at least in A3H and A3A.

ADD 1339-BF After 1 January 1980, A3H will no longer be required for coast station transmitters not fitted to operate on 2182 kc/s.

ADD 1339-BG (3) Transmitter carrier frequencies shall be maintained within the following tolerances :

ADD 1339-BH (a) Coast stations : ± 20 cycles per second;

ADD 1339-BI (b) Ship stations: ± 100 cycles per second;

ADD 1339-BJ (i) The short-term limits (of the order of 15 minutes) of ship stations shall be ± 40 cycles per second.

ADD 1339-BK (4) Coast and ship stations shall use upper sideband emissions.

ADD 1339-BL (5) The transmitter audio-frequency band shall be 350 to 2700 cycles per second, with a permitted amplitude variation of 6 db.

ADD 1339-BM (6) The unwanted frequency modulation of the carrier shall be sufficiently low to prevent harmful distortion.

ADD 1339-BN (7) When using single sideband A3H, A3A or A3J transmission the mean power of any emission supplied to the antenna transmission line of a coast or ship station on any discrete frequency, shall be less than the mean power (Pm) of the transmitter in accordance with the following table :

Ref.

I/31(4) (contd.) ADD 1339-BO

Frequency separation Δ from the assigned frequency kc/s	Minimum attenuation below mean power (Pm) db
$1.75 < \Delta \leq 5.25$	25
$5.25 < \Delta \leq 8.75$	35
$8.75 < \Delta$	$43+10 \log_{10}$ Pm(Watts)

ADD 1339-BP Para. 8(quater). Channel utilization

ADD 1339-BQ (9) In the transition to single sideband, as provided by Nos. 1339-AA through 1339-AE (Proposal No. I/31(3)), each double sideband frequency bandwidth will comprise two single sideband frequencies of at least three kc/s each.

ADD 1339-BR (10) The division between the two single sideband frequencies, thus formed, will be at the double sideband carrier frequency. For the purpose of these regulations, during the transition to single sideband, these two frequencies, relative to the double sideband carrier frequency, are designated as follows :

ADD 1339-BS (a) higher in frequency : upper channel; and

ADD 1339-BT (b) lower in frequency : lower channel.

ADD 1339-BU (11) Stations using single sideband single channel emissions A3H, A3A and A3J in accordance with Nos. 1339-BO through 1339-BS shall operate either in the upper channel or in the lower channel.

Ref.

I/31(4) (contd.)

ADD 1339-BV Para. 8(quinquies). Assigned and carrier frequencies

ADD 1339-BW (12) The assigned frequency of a station operating in the upper channel would be 1400cycles per second higher than the carrier frequency of the double sideband channel, and the carrier frequency would be the same as the carrier frequency of the double sideband channel.

ADD 1339-BY (13) The assigned frequency of a station operating in the lower channel would be 1600 cycles per second lower than the carrier frequency of the double sideband channel, and the carrier frequency would be 3000 cycles per second below the carrier frequency of the double sideband channel.

I/31(5) Modify Section II - paras. E and F - of Article 35 as follows :

MOD 1341 (2) The power of mobile radiotelephone stations, operating in the authorized bands between 1605 and 2850 kc/s, shall not exceed :

100 watts (carrier power) for A3 emissions;

300 watts (p.e.p.) for A3A, A3H, A3J emissions.

MOD 1342 (3) The power of coast radiotelephone stations, operating in the authorized bands between 1605 and 3800 kc/s, shall be limited as follows :

Ref.

I/31(5)
(contd.)

a) for coast stations located north of latitude 32° N :

- 2 kilowatts (carrier power) for A3 emissions;
- 6 kilowatts (p.e.p.) for A3A, A3H, A3J emissions;

b) for coast stations located south of latitude 32° N :

- 3.5 kilowatts (carrier power) for A3 emissions;
- 10.5 kilowatts (p.e.p.) for A3A, A3H, A3J emissions.

MOD 1350 (2) During the period mentioned above, except for the transmissions provided for in Article 36, transmissions within the band 2173.5 - 2190.5 kc/s shall cease.

Reasons :

The proposal aims to take into account the power limits for single sideband emissions and the reduction of guard bandwidth of 2182 kc/s.

The above-mentioned power limits are calculated on the basis of the equivalent interfering effect of emissions, it having been shown by experience that the most important factor of the interference potential is provided by the mean power of the emissions.

From the table in the C.C.I.R. Doc. I/1017 (Oslo, 1966) it results that, as far as interference potential is concerned, the peak envelope power/mean power ratio for A3H emission is more unfavourable than the one for A3A and A3J emissions, considering the case of modulation by smoothly read text.

The value of this ratio would be 6 db but, taking into consideration the fact that single sideband transmitters are frequently fitted with limiters or dynamic compressors, it seems to be more convenient to adopt the reduced value 5 db.

Ref.

I/31(6) In Section III of Article 35 delete Nos. 1356, 1357 and 1358

Reasons :

Consequently to the new arrangement of Appendices 15 and 17 proposed under Agenda item No. 3, (Document No. 33) prescriptions of Nos. 1356 through 1358 are to be deleted.

I/31(7) Add to Section III of Article 35 the following new para. D

D. Conversion to single sideband

ADD 1358-AA Para. 17(bis) (1) The following schedule shall be applicable when converting coast and ship stations on maritime radiotelephone channels from double to single sideband :

ADD 1358-AB a) date from which coast stations shall be able to transmit with single sideband : 1 January 1971;

ADD 1358-AC b) date on which coast stations shall discontinue A3 emissions : 1 January 1971;

ADD 1358-AD c) date from which no more new double sideband equipments on board ships shall be installed : 1 January 1971;

ADD 1358-AE d) date on which ship stations shall discontinue A3 emissions : 1 January 1977.

ADD 1358-AF During the period of transition from double sideband to single sideband, coast stations shall be able to use full carrier (A3H) emissions to permit communication with both double sideband and single sideband radiotelephone stations.

Ref.

I/31(8)

Add to Section III of Article 35 the following new para. E

E. Technical and operational provisions relating to use of single sideband

ADD 1358-BA Para. 17(ter). (1) Definitions of carrier modes :

Carrier mode		Level N (db) of the carrier with respect to peak envelope power
Full carrier	(A3H)	$0 \geq N \geq -6$
Reduced carrier	(A3A)	$-6 > N \geq -26$
Suppressed carrier	(A3J)	$-26 > N$

ADD 1358-BB (2) Mode of operation

ADD 1358-BC Coast and ship station transmitters shall be capable of reducing carriers to the following levels below peak envelope power :

a) 16 db ± 2 db for A3A emissions;

b) not less than 40 db for A3J emissions.

ADD 1358-BD c) In actual operation, ship and coast stations shall utilize the carrier levels indicated, respectively, for A3H, A3A and A3J.

ADD 1358-BE Coast and ship station transmitters shall be capable of operating at least in A3H and A3J.

ADD 1358-BF After 1 January 1977, A3H will no longer be required.

ADD 1358-BG (3) The carrier frequency of transmitters shall be maintained within the following tolerances :

Ref.

I/31(8) (contd.)

ADD 1358-BH

a) Coast stations : ± 20 cycles per second;

ADD 1358-BI

b) Ship stations : ± 100 cycles per second.

ADD 1358-BJ

i) The short-term limits (of the order of 15 minutes) of ship stations shall ± 40 cycles per second.

ADD 1358-BK

(4) Coast and ship stations shall use upper sideband emissions.

ADD 1358-BL

(5) The transmitter audio-frequency band shall be 350 to 2700 c/s per second, with a permitted amplitude variation of 6 db.

ADD 1358-BM

(6) The unwanted frequency modulation of the carrier shall be sufficiently low to prevent harmful distortion.

ADD 1358-BN

(7) When using single sideband A3H, A3A or A3J transmissions the mean power of any emission supplied to the antenna transmission line of a coast or ship station on any discrete frequency, shall be less than the mean power (Pm) of the transmitter in accordance with the following table :

ADD 1358-BO

Frequency separation Δ from the assigned frequency kc/s	Minimum attenuation below mean power (Pm) db
$1.75 < \Delta \leq 5.25$	25
$5.25 < \Delta \leq 8.75$	35
$8.75 < \Delta$	$43+10 \log_{10}$ Pm(Watts)

Ref.

I/31(8) (contd.)

ADD 1358-BP Para. 17(quater) (1) Channel utilization

ADD 1358-BQ /Transferred from Appendix 17, para. 3 and modified/ a) A station employing single sideband emissions shall be considered to be in accordance with the Table of Appendix 17 if the necessary bandwidth does not extend beyond the upper or lower limits of the bandwidth provided for single sideband emissions in accordance with the Table.

ADD 1358-BR /Transferred from Appendix 17, para. 3 and modified/ b) A station employing independent sideband emissions shall be considered to be in accordance with the Table of Appendix 17 if the necessary bandwidth does not extend beyond the upper or lower limits of the bandwidth provided for double sideband emissions in accordance with the Table.

ADD 1358-BS /Transferred from Appendix 17, para. 3 and modified/ c) Stations employing double sideband emissions (A3) or two channel independent sideband emissions (A3B) shall operate with assigned frequencies of the appropriate values listed in the Table of Appendix 17 for A3 emissions.

ADD 1358-BT /Transferred from Appendix 17, para. 3.2 and modified/ d) Stations employing single sideband single channel emissions (A3A, A3H or A3J) shall operate with assigned frequencies at the appropriate values listed in the Table of Appendix 17.[1)]

ADD 1358-BU (2) Assigned frequency.

ADD 1358-BV a) The assigned frequency of a station employing single sideband (A3A, A3H or A3J) will be 1400 c/s per second higher than the carrier frequency. Both assigned and carrier frequencies are shown in the Table of Appendix 17.

ADD 1358.1-BT Independent sideband emission may be used by agreement between the administrations concerned and affected in those instances where adjacent single sideband channels are assigned to a coast station.

Ref.

I/31(8) (contd.)

ADD 1358-BW /Transferred from Appendix 17, para. 4/

b) If an administration assigns frequencies other than those indicated above, its radiotelephone service shall not cause harmful interference to radiotelephone stations of the maritime mobile service which use frequencies assigned to them in accordance with Appendix 17.

I/31(9)

Amend No. 443 of Article 7 as follows :

MOD 443

(2) In these bands, the frequencies assigned to the maritime mobile service are spaced, as far as possible, by :

- 7 kc/s when two adjacent frequencies are used for radiotelephony (class A3 emissions);
- 3 kc/s when two adjacent frequencies are used for radiotelegraphy;
- 5 kc/s when one frequency is used for radiotelephony (class A3 emissions) and the adjacent frequency is used for radiotelegraphy.

ADD 443

(2 bis) For spacing between assigned frequencies to the maritime mobile service for radiotelephony class A3H, A3A, A3J emissions, see Article 35, Nos. 1339-BW and 1339-BY (Proposal No. I/31(4)).

Reasons :

Such modifications are a consequence of the conversion to single sideband technique of maritime mobile stations operating in the band between 1605 and 4000 kc/s.

Ref.

I/31(10) Amend Article 28 as follows :

MOD 985 b) send in addition class A3 or A3H and A3A emissions on at least two working frequencies; 1, 2)

MOD 986 c) receive in addition class A3 or A3H and A3A emissions on all the other frequencies necessary for their service. 2)

ADD 985.2 2) After 1 January 1980, class A3 and A3H emissions are no longer required.

Reasons :

Proposed modifications are a direct consequence of the conversion to single sideband technique.

As to classes of emission on the distress frequency 2182 kc/s, see Proposal No. I/35(25) under Agenda Item 5 (Document No. 35).

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Ref. Agenda Item No. 2.3 : Consider possible use of the high traffic bands by tankers of 12,500 tons gross.

I/32(11) Modify No. 1156 as follows :

MOD 1156 Para. 20 (1) Stations installed on passengers ships shall use the high traffic band and any other ship handling a large volume of traffic may also be authorized by Administrations to use this band.

Reasons :

The Italian Administration feels that the criterion adopted up to now to assume ship tonnage as an index of traffic volume does not correspond to reality and therefore it does not allow a rational traffic distribution between the high traffic and the low traffic bands.

It is therefore deemed more convenient to leave to individual Administrations the responsibility to appreciate which ships, other than passengers ships, may be admitted to use the high traffic band.

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Ref.

I/32(11)
(cont.)

Agenda Item No. 2.4 : The desirability of accommodating requirements for oceanographic communications in the exclusive HF maritime mobile bands.

Foreword

Oceanographic data transmission involves a great scientific interest for the knowledge of various phenomena which develop in the sea area nearer to the atmosphere; such phenomena, while providing indications about resources, which may be extracted from the sea, enable to better know weather conditions which may result in storms or hurricanes.

Consequently, oceanographic data communications have a remarkable social importance and are useful to improve the safety of navigation as well.

Oceanographic data transmission may be effected by ship stations or by buoy stations. Since buoys are not free to move on the sea surface, they should not be considered as falling within the maritime mobile service; however, bearing in mind that oceanographic communications are effected also by ships and that they are important for the safety of navigation and hence for the safeguard of human life at sea, the Italian Administration feels that it would be desirable to accommodate frequency requirements of the above-mentioned transmissions in the exclusive maritime mobile service bands.

This may be achieved :

- by specifying the frequency bands to be used by ship stations for oceanographic data transmission;

- by allowing that the same frequencies be employed by buoy stations only for oceanographic data transmission and, in case of automatic transmission, also by stations for telecommand of buoys.

The proposed procedure seems to be compatible with the Conference mandate, since it limits itself to allow that some maritime mobile service frequencies be utilized, for the same purpose, not only by ship stations but - in the very interest of the maritime mobile service itself - also by floating objects.

To this end the following it is proposed :

Ref.

I/32(12) To allot the following bands for transmission of oceanographic communications by ship stations :

4136.5 - 4140 kc/s
6207.5 - 6211 kc/s
8276.5 - 8280 kc/s
12417.5 - 12421 kc/s
16558.5 - 16562 kc/s
22096.5 - 22100 kc/s

(see also ADD 449AA, Proposal No. I/33(18), Document No. 33.)

I/32(13) To insert in an appropriate Section of Appendix 15 the channelling of frequency bands for oceanographic communications transmission (see Proposal No. I/33(15) Document No. 33).

I/32(14) In order to allow the use of the same frequencies for oceanographic communications by ship, buoy and for telecommand of buoys stations, to insert appropriate specifications in Section IV of Article No. 7 (see Proposal No. I/33(18) Document No. 33).

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ITALY

Proposals for the work of the Conference

Agenda Item 3

Page 18, 22nd line, replace :	... 197..... by ... 1971, ...
25th line, replace :	... 197.. ;... by ... 1977;.....
30th line, replace :	... 197...;... by ... 1977;.....
Page 19, 4th line, replace :	... 197...,... by ... 1971, ...
14th line, replace :	... 197...,... by ... 1971, ...
41st line, replace :	... 197...,... by ... 1971,.....

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Page 21, 2nd line from the bottom, replace : ... 197...,...
by
... 1971,.....

Page 22, 2nd line, replace : ... 197...,...
by
... 1971, ...

9th line, replace : ... 197...,...
by
... 1971, ...

11th line, replace : ... 197...,...
by
... 1971, ...

26th line, replace : ... 197...,...
by
1977, ...

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Proposals for the work of the Conference

Agenda item 3 : Consequential revision of Appendices 15, 17 and 25 of the Radio Regulations

FOREWORD

a) Revision of Appendix 15

As a consequence of the conversion of maritime mobile service telephony to single sideband, it is deemed that Section B of Appendix 15 should no longer be maintained, since its provisions aimed to promote the use of the single sideband technique.

In view of the fact that all frequencies specified in this Section are included among those employed for telephony and telegraphy by ship stations, the frequencies may be used to allocate oceanographic communications and to extend - at the same time - the available band for ship telephony.

Of course, the extension of the ship telephony band also involves a corresponding extension of the coast stations telephony band, in order to associate a ship frequency with a coast station frequency.

This implies that the lower limit of the band utilized by coast stations for telephony be moved downwards and carved out of the band utilized by these stations for telegraphy. Furthermore, since it is not suitable to restrict the latter band, the lower limit thereof must consequently be moved downwards, thus reducing the band available for ship stations.

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Accordingly, some radiotelegraph coast stations shall be otherwise allocated and new directions shall be issued so that their frequency assignments maintain the recording date in the master register.

The restricted availability of frequencies for ship telephony can be balanced by a better sharing of traffic between high traffic and low traffic bands as well as by adopting narrower channel spacing.

As regards the division of ship telegraphy bands, the Italian Administration is of the opinion that it would be more suitable to adopt the following criteria :

- keep unchanged the band for wide-band telegraphy, facsimile and special transmission systems;

- sub-divide the band for high traffic ships separating the teleprinter and data transmission systems from manual ones, thus reducing the spacing between the frequencies of the latter in order to obtain the same number of frequencies in a narrower band;

- leave unchanged the bands and the spacing of calling frequencies in view of the fact that a narrower spacing would make more difficult the duty of coast station operators charged with watch in the calling bands;

- reduce the number of frequencies available to low traffic ships, as this reduction can be balanced by the better sharing of traffic due to modification of No. 1156 of the Radio Regulations (see proposal No. I/32(11), Document No. 32).

It is not deemed advisable to establish a channelling of teleprinter and data transmission systems while waiting for the results of the C.C.I.R. studies on their technical characteristics.

Bandwidths of 3.5 kc/s are believed to be sufficient for oceanographic communications, and the spacing between the relative frequencies can be limited to 300 c/s.

b) Revision of Appendix 17

In view of the fact that after the conversion to single sideband the present provisions of Appendix 17 for single sideband systems must be more numerous and important, it is deemed more desirable and convenient to insert them in the appropriate place of the Radio Regulations themselves.

Proposals Nos. I/31(4) and (8) listed under Agenda Item 1 (Document No. 31) are based on this principle.

It will be noted that in the present distribution of coast and ship station frequencies in the 4 and 8 Mc/s bands there is no uniform spacing which is desirable.

In order to achieve this it is necessary to change as follows the frequencies listed below :

coast stations	4371.1 kc/s into 4371.0 kc/s
	4434.9 kc/s into 4435.0 kc/s
	8748.1 kc/s into 8748.0 kc/s
	8811.9 kc/s into 8812.0 kc/s
ship stations	4066.1 kc/s into 4066.0 kc/s
	4129.9 kc/s into 4130.0 kc/s
	8198.1 kc/s into 8198.0 kc/s
	8261.9 kc/s into 8262.0 kc/s

No difficulties are foreseen as these are only minor changes; as for the frequency assignments to coast stations the recording date could be maintained in the master register according to the provisions of No. 534 of the Radio Regulations.

c) Revision of Appendix 25

Considering the practical impossibility to maintain Appendix 25 in its present form as well as the difficulty the Conference would encounter in order to establish a new plan in view of the short time available and also the lack of technical data; taking furthermore into account the unfeasibility to prepare in 1967 a plan which would only become effective at the end of the conversion period, that is in 1977, the Italian Administration feels that Appendix 25 should be suppressed.

Ref. As concerns the frequency assignments to radiotelephone coast stations, the provisions of Article 7 of the Radio Regulations shall apply; of course, new instructions shall be issued for the assignments of frequencies recorded in the Master Register and already in service, to maintain the recording date as well as the corresponding entry in Column 2.

In view of the above, the Italian Administration proposes the following :

I/33(15) Modify Appendix 15 as follows :

APPENDIX 15

Table of Frequencies to be used by ship stations in the bands between 4 and 27.5 Mc/s Allocated exclusively to the Maritime Mobile Service

(see Articles 32 and 35)

1. This Appendix contains two Sections, A and B. For the use of frequencies in the band between 4 and 27.5 Mc/s for radiotelegraphy (Section A), see also Nos. 1174 through 1201 of Article 32.

For the use of frequencies for ocean data transmissions (Section B), see also Article 7 No. 449 AA (Proposal No. I/33(18)).

2. In the Table in Section A :

a) the assignable frequencies in a given band for each usage are,

- indicated by the lowest and the highest frequency, in heavy type, assigned in that band;

- regularly spaced, the number of assignable frequencies and the spacing in kc/s being indicated in italics;

I/33(15)
(cont.)

b) the vertical arrows indicate the harmonic relationship between the frequencies assigned in the different bands.

3. In the Table in Section B :

The frequencies in a given band are :

- indicated by the lowest and the highest frequency, in heavy type, assigned in that band;

- regularly spaced, the number of assignable frequencies and the spacing in kc/s being indicated in italics.

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SECTION A

Frequencies Assignable to Ship Radiotelegraph Stations using the Maritime Mobile Service Bands between 4 and 27.5 Mc/s

APP.15

Kc/s

BAND (Mc/s)	LIMITS	Assignable Frequencies Wide-Band Telegraphy Facsimile and Special Transmission Systems	Assignable Working Frequencies for High Traffic Ships		Calling Frequencies	Assignable Working Frequencies for Low Traffic Ships		LIMITS
			Printer & Data	Manual		GROUP A	GROUP B	
4	4140	4142 --------- 4158 5 Frequencies spaced 4	4160 ---- 4168	4168.5 --- 4176 11 Frequencies spaced 0.75	4178 ---------- 4186 9 Frequencies spaced 1	4188-42085	4209-4229.5 84 Frequencies spaced 0.5	4231
6	6211	6213 ---------- 6237 7 Frequencies spaced 4	6240 ---- 6252	6252.75 -- 6264 11 Frequencies spaced 1.125	6267 ---------- 6279 9 Frequencies spaced 1.5	6282-6312.75	6313.5-6344.25 84 Frequencies 42 spaced 0.75	6346
8	8280	8282 ---------- 8318 10 Frequencies spaced 4	8320 ---- 8336	8337 ----- 8352 11 Frequencies spaced 1.5	8356 ---------- 8372 9 Frequencies spaced 2	8376-8417	8418-8459 84 Frequencies spaced 1	8461
12	12421	12424 --------- 12468 12 Frequencies spaced 4	12471----12504	12505.5---12528 11 Frequencies spaced 7.25	12534 ---------- 12558 9 Frequencies spaced 3	12564-12625.5	12627-12688.5 84 Frequencies spaced 1.5	12692
16	16562	16564 ---------- 16620 15 Frequencies spaced 4	16622----16672	16674 --- 16704 11 Frequencies spaced 3	16712 ---------- 16744 9 Frequencies spaced 4	16752-16834	16836-16918 84 Frequencies spaced 2	16922
22	22100	22102 ---------- 22146 12 Frequencies spaced 4	22148 ---22185	22187 --- 22217 11 Frequencies spaced 3	22.225 -------22.265 9 Frequencies spaced 5	22272.5-223175	22320-22365 38 Frequencies spaced 2.5	22368
25	25070		Assignable Working Frequencies to Ships of all Categories 25075 ---------- 25 105 13 Frequencies spaced 2.5					25 110

*) For particular conditions concerning the use of 8364 Kc/s see No. 1179

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SECTION B APP. 15

Frequencies assignable for Ocean Data transmissions
in the bands between 4 and 27.5 Mc/s

Band Mc/s	Limits kc/s	Assignable Frequencies	Limits kc/s
4	4136.5	4136.9- - - - - - - - - - - - - 4139.6 10 frequencies spaced 0.3	4140
6	6207.5	6207.9- - - - - - - - - - - - - 6210.6 10 frequencies spaced 0.3	6211
8	8276.5	8276.9- - - - - - - - - - - - - 8279.6 10 frequencies spaced 0.3	8280
12	12417.5	12417.9- - - - - - - - - - - - -12420.6 10 frequencies spaced 0.3	12421
16	16558.5	16558.9- - - - - - - - - - - - -16561.6 10 frequencies spaced 0.3	16562
22	22096.5	22096.9- - - - - - - - - - - - -22099.6 10 frequencies spaced 0.3	22100

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Ref.

1/33(16) Modify Appendix 17 as follows :

APPENDIX 17

Duplex channelling of the maritime mobile radiotelephone band between 4000 and 23000 kc/s

(see Article 35)

NOC 1. The following Table indicates the frequencies to be used by coast stations in the bands allocated to the maritime mobile radiotelephone service between 4000 and 23 000 kc/s.

NOC 2. One or more series of frequencies are assigned to each coast station, which uses these frequencies associated, as far as possible, in pairs; each pair comprises a transmitting and receiving frequency. The series shall be selected with due regard to the areas served and so as to avoid, as far as possible, harmful interference between the services of different coast stations.

SUP 3

SUP 3.1

SUP 3.2

SUP 3.2.1

SUP 3.2.2

SUP 4

APPENDIX 17

Band Mc/s	A3 Emission		A3A, A3H, A3J Emissions			
	Coast	Ship	Coast		Ship	
	Carrier frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s
			4369.2	4367.8	4064.4*)	4063.0*)
4	4371.0	4066.0	4372.4	4371.0	4067.4	4066.0
			4375.6	4374.2	4070.6	4069.2
	4377.4	4072.4	4378.8	4377.4	4073.8	4072.4
			4382.0	4380.6	4077.0	4075.6
	4383.8	4078.8	4385.2	4383.8	4080.2	4078.8
			4388.4	4387.0	4083.4	4082.0
	4390.2	4085.2	4391.6	4390.2	4086.6	4085.2
			4394.8	4393.4	4089.8	4088.4
	4396.6	4091.6	4398.0	4396.6	4093.0	4091.6
			4401.2	4399.8	4096.2	4094.8
	4403.0	4098.0	4404.4	4403.0	4099.4	4098.0
			4407.6	4406.2	4102.6	4101.2
	4409.4	4104.4	4410.8	4409.4	4105.8	4104.4
			4414.0	4412.6	4109.0	4107.6
	4415.8	4110.8	4417.2	4415.8	4112.2	4110.8
			4420.4	4419.0	4115.4	4114.0
	4422.2	4117.2	4423.6	4422.2	4118.6	4117.2
			4426.8	4425.4	4121.8	4120.4
	4428.6	4123.6	4430.0	4428.6	4125.0	4123.6
			4432.2	4431.8	4128.2	4126.8
	4435.0	4130.0	4436.4	4435.0	4131.4	4130.0
			4366.0	4364.6	4134.6	4133.2

*) A3J only

Band Mc/s	A3 Emission		A3A, A3H, A3J Emissions			
	Coast	Ship	Coast		Ship	
	Carrier frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s
6			6519.9	6518.5	6202.4	6201.0
			6523.1	6521.7	6205.7	6204.3
8			8746.2	8744.8	8196.4*)	8195.0*)
	8748.0	8198.0	8749.4	8748.0	8199.4	8198.0
			8752.6	8751.2	8202.6	8201.2
	8754.4	8204.4	8755.8	8754.4	8205.8	8204.4
			8759.0	8757.6	8209.0	8207.6
	8760.8	8210.8	8762.2	8760.8	8212.2	8210.8
			8765.4	8764.0	8215.4	8214.0
	8767.2	8217.2	8768.6	8767.2	8218.6	8217.2
			8771.8	8770.4	8221.8	8220.4
	8773.6	8223.6	8775.0	8773.6	8225.0	8223.6
			8778.2	8776.8	8228.2	8226.8
	8780.0	8230.0	8781.4	8780.0	8231.4	8230.0
			8784.6	8783.2	8234.6	8233.2
	8786.4	8236.4	8787.8	8786.4	8237.8	8236.4
			8791.0	8789.6	8241.0	8239.6
	8792.8	8242.8	8794.2	8792.8	8244.2	8242.8
			8797.4	8796.0	8247.4	8246.0
	8799.2	8249.2	8800.6	8799.2	8250.6	8249.2
			8803.8	8802.4	8253.8	8252.4
	8805.6	8255.6	8807.0	8805.6	8257.0	8255.6
			8810.2	8808.8	8260.2	8258.8

*) A3J only

Band Mc/s	A3 Emission		A3A, A3H, A3J Emissions			
	Coast	Ship	Coast		Ship	
	Carrier frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s
8	8812.0	8262.0	8813.4	8812.0	8263.4	8262.0
			8736.6	8735.2	8266.6	8265.2
			8739.8	8738.4	8269.8	8268.4
			8743.0	8741.6	8273.0	8271.6
12			13131.4	13130.0	12331.4	12330.0
	13133.5	12333.5	13134.9	13133.5	12334.9	12333.5
			13138.4	13137.0	12338.4	12337.0
	13140.5	12340.5	13141.9	13140.5	12341.9	12340.5
			13145.4	13144.0	12345.4	12344.0
	13147.5	12347.5	13148.9	13147.5	12348.9	12347.5
			13152.4	13151.0	12352.4	12351.0
	13154.5	12354.5	13155.9	13154.5	12355.9	12354.5
			13159.4	13158.0	12359.4	12358.0
	13161.5	12361.5	13162.9	13161.5	12362.9	12361.5
			13166.4	13165.0	12366.4	12365.0
	13168.5	12368.5	13169.9	13168.5	12369.9	12368.5
			13173.4	13172.0	12373.4	12372.0
	13175.5	12375.5	13176.9	13175.5	12376.9	12375.5
			13180.4	13179.0	12380.4	12379.0
	13182.5	12382.5	13183.9	13182.5	12383.9	12382.5
			13187.4	13186.0	12387.4	12386.0
	13189.5	12389.5	13190.9	13189.5	12390.9	12389.5
			13194.6	13193.0	12394.4	12393.0

Band Mc/s	A3 Emission		A3A, A3H, A3J Emissions			
	Coast	Ship	Coast		Ship	
	Carrier frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s
12	13196.5	12396.5	13197.9	13196.5	12397.9	12396.5
			13113.9	13112.5	12401.4	12400.0
			13117.4	13116	12404.9	12403.5
			13120.9	13119.5	12408.4	12407.0
			13124.4	13123	12411.9	12410.5
			13127.9	13126.5	12415.4	12414.0
			17291.4	17290.0	16461.4	16460.0
16	17293.5	16463.5	17294.9	17293.5	16464.9	16463.5
			17298.4	17297.0	16468.4	16467.0
	17300.5	16470.5	17301.9	17300.5	16471.9	16470.5
			17305.4	17304.0	16475.4	16474.0
	17307.5	16477.5	17308.9	17307.5	16478.9	16477.5
			17312.4	17311.0	16482.4	16481.0
	17314.5	16484.5	17315.9	17314.5	16485.9	16484.5
			17319.4	17318.0	16489.4	16488.0
	17321.5	16491.5	17322.9	17321.5	16492.9	16491.5
			17326.4	17325.0	16496.4	16495.0
	17328.5	16498.5	17329.9	17328.5	16499.9	16498.5
			17333.4	17332.0	16503.4	16502.0
	17335.5	16505.5	17336.9	17335.5	16506.9	16505.5
			17340.4	17339.0	16510.4	16509.0
	17342.5	16512.5	17343.9	17342.5	16513.9	16512.5
			17367.4	17346.0	16517.4	16516.0

Band Mc/s	A3 Emission		A3A, A3H, A3J Emissions			
	Coast	Ship	Coast		Ship	
	Carrier frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s
16	17349.5	16519.5	17350.9	17349.5	16520.9	16519.5
			17354.4	17353.0	16524.4	16523.0
	17356.5	16526.5	17357.9	17356.5	16527.9	16526.5
			17263.4	17262.0	16531.4	16530.0
			17266.9	17265.5	16534.9	16533.5
			17270.4	17269.0	16538.4	16537.0
			17273.9	17272.5	16541.9	16540.5
			17277.4	17276.0	16545.4	16544.0
			17280.9	17279.5	16548.9	16547.5
			17284.4	17283.0	16552.4	16551.0
			17287.9	17286.5	16555.9	16554.5
			22651.4	22650.0	22001.4	22000.0
22	22653.5	22003.5	22654.9	22653.5	22004.9	22003.5
			22658.4	22657.0	22008.4	22007.0
	22660.5	22010.5	22661.9	22660.5	22011.9	22010.5
			22665.4	22664.0	22015.4	22014.0
	22667.5	22017.5	22668.9	22667.5	22018.9	22017.5
			22672.4	22671.0	22022.4	22021.0
	22674.5	22024.5	22675.9	22674.5	22025.9	22024.5
			22679.4	22678.0	22029.4	22028.0
	22681.5	22031.5	22682.9	22681.5	22032.9	22031.5
			22686.4	22685.0	22036.4	22035.0
	22688.5	22038.5	22689.9	22688.5	22039.9	22038.5
			22693.4	22692.0	22043.4	22042.0

Band Mc/s	A3 Emission		A3A, A3H, A3J Emissions			
	Coast	Ship	Coast		Ship	
	Carrier frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s	Assigned frequency kc/s	Carrier frequency kc/s
22	22695.5	22045.5	22696.9	22695.5	22046.9	22045.5
			22700.4	22699.0	22050.4	22049.0
	22702.5	22052.5	22703.9	22702.5	22053.9	22052.5
			22707.4	22706.0	22057.4	22056.0
	22709.5	22059.5	22710.9	22709.5	22060.9	22059.5
			22714.4	22713.0	22064.4	22063.0
	22716.5	22066.5	22717.9	22716.5	22067.9	22066.5
			22626.9	22625.5	22071.4	22070.0
			22630.4	22629.0	22074.9	22073.5
			22633.9	22632.5	22078.4	22077.0
			22637.4	22636.0	22081.9	22080.5
			22640.9	22639.5	22085.4	22084.0
			22644.4	22643.0	22088.9	22087.5
			22647.9	22646.5	22092.4	22091.0

Ref.

I/33(17) Withdraw Appendix 25 from the Radio Regulations

As a consequence of the suppression of Appendix 25, insert into the Radio Regulations the following Resolution to ensure that the assignments to coast radiotelephone stations recorded in the Master Register and already in service maintain the date in the appropriate entering of column 2.

RESOLUTION No. ...

RELATING TO THE TREATMENT OF NOTICES CONCERNING FREQUENCY ASSIGNMENTS TO RADIOTELEPHONE SHIP AND COAST STATIONS IN THE BANDS LISTED IN NOS. 447 AND 448 OF THE RADIO REGULATIONS

The World Administrative Radio Conference, Geneva, 1967,

considering

a) that the Final Acts of this Conference will enter into force on 1 January 1969;

b) that the frequency allotment plan for radiotelephone coast stations contained in Appendix 25 to the Radio Regulations will be abrogated on that date;

c) that radiotelephone coast stations in the bands listed in No. 448 must be equipped for single sideband operation by 1 January 197.., and must have the capability of using full carrier (A3H) emission to permit communication with both double sideband and single sideband radiotelephone ship stations until 1 January 197..;

d) that the use of double sideband emission by radiotelephone ship stations in the bands listed in No. 447, and the use of A3H emission by radiotelephone coast stations in the bands listed in No. 448, must be discontinued by 1 January 197..;

Ref.

I/33(17) (contd.)

e) that some administrations will convert their radiotelephone coast stations for single sideband operation, or bring new frequencies or stations for single sideband operation into use, before 1 January 197.., where this can be done without causing harmful interference to radiotelephone coast stations using class A3 emission in accordance with the Table in Appendix 17;

f) that it will therefore be necessary to provide an interim procedure to facilitate the transition from double sideband to single sideband operation;

resolves

1. that during the period between the date of the entry into force of the Final Acts of this Conference and 1 January 197.., notices of frequency assignments to stations in the bands listed in No. 448 of the Radio Regulations shall be treated by the I.F.R.B. as follows :

1.1 the provisions of Nos. 496 to 540 shall be applied;

1.2 where such assignments are to be recorded in the Master International Frequency Register, the relevant date shall be entered in Column 2a or 2b in accordance with No. 574 or 575 as appropriate;

1.3 any frequency assignment to a radiotelephone coast station with classes A3A, A3H and A3J emissions found to be satisfactory in respect of No. 501, whose assigned frequency is in conformity with a frequency listed in the table in Appendix 17, and whose necessary bandwidth is confined within either the upper or lower limits of the bandwidth provided for double sideband emissions in that table, shall be so indicated by an appropriate symbol in the remarks column of the Master Register;

2. that on 1 January 197...., the I.F.R.B. shall reexamine the frequency assignments which are contained in the Master Register for the bands listed in No. MOD 448 (Proposal No. I/33(18)) of the Radio Regulations, particularly in respect of their conformity with Appendix 17, and shall record against them a date in Column 2a or 2b as follows :

Ref.

I/33(17)
(contd.)

2.1 for each listing for a radiotelephone coast station satisfactory in respect of No. 501 and with classes A3A, A3H and A3J emission, whose assigned frequency is in conformity with a frequency listed in the table in Appendix 17, whose necessary bandwidth is confined within either the upper or lower limits of the bandwidth provided for double sideband emissions in that table, and which is the conversion to single sideband operation of an allotment in Section I of Appendix 25 to the Radio Regulations previously notified to the Board as having been brought into use, the date of 3 December 1951, shall be entered in Column 2a. If the corresponding double sideband listing is still in the Master Register, it shall thereupon be deleted.

This procedure is to be applied only to one of the two channels resulting from the conversion to single sideband operation of an allotment in Section I of Appendix 25 to the Radio Regulations; as to the other channel resulting from this conversion, the procedure under 2.4 below is to be applied.

In principle, in the conversion to single sideband operation the radiotelephone coast stations operating in accordance with frequency assignments listed in Appendix 25 to the Radio Regulations shall have an assigned frequency in the upper channel provided in the table, Appendix 17. However, if harmful interferences have been experienced, in order to avoid such interferences the lower channel may be assigned by agreement between the administrations concerned;

2.2 for each listing for a radiotelephone coast station satisfactory in respect of No. 501 and with classes A3A, A3H and A3J emission, whose assigned frequency is in conformity with a frequency listed in the table in Appendix 17, whose necessary bandwidth is confined within either the upper or lower limits of the bandwidth provided for double sideband emissions in that table, and which is the conversion to single sideband operation of an allotment in Section II of Appendix 25 to the Radio Regulations previously notified to the Board as having been brought into use, the provisions of Nos. 496 to 540 shall be applied in the order in which the corresponding notice was received by the Board except that no account shall be taken of listings with class A3 or A3B emission.

Ref.

I/33(17)
(contd.)

The date of 4 December 1951, shall be entered in Column 2a or 2b, depending upon the finding of the Board resulting from the re-examination.

If the corresponding double sideband listing is still in the Master Register, it shall thereupon be deleted.

This procedure is to be applied only to one of the two channels resulting from the conversion to single sideband operation of an allotment in Section 11 of Appendix 25 to the Radio Regulations; as to the other channel resulting from the above said conversion, the procedure under 2.4 below is to be applied.

In principle, in the conversion to single sideband operation the radiotelephone coast stations operating in accordance with frequency assignments listed in Appendix 25 to the Radio Regulations shall have an assigned frequency in the upper channel provided in the table in Appendix 17. However, if harmful interferences have been experienced, in order to avoid such interferences the lower channel may be assigned by agreement between the administrations concerned;

2.3 for each listing for a radiotelephone coast station satisfactory in respect of No. 501 and with classes A3A, A3H and A3J emission, whose assigned frequency is in conformity with a frequency listed in the table in Appendix 17, whose necessary bandwidth of emission is confined within the upper or lower limits of the bandwidth provided for double sideband emissions in that table, but which is not the conversion to single sideband of an allotment in Section I or II of Appendix 25, the provisions of Nos. 496 to 540 shall be applied in the order in which the corresponding notice was received by the Board, except that no account shall be taken of those listings with class A3 or A3B emission. The date to be entered in Column 2a or 2b, depending upon the finding of the Board resulting from the re-examination, shall be that which was relevant at the time No. 579 or 580 was applied.

2.4 for each remaining listing for a radiotelephone coast station, the date of 1 January 197..., shall be entered in Column 2b;

Ref.

I/33(17) (contd.)

2.5 for assignments to stations other than radiotelephone coast stations, the date of 2 January 197..., shall be entered in Column 2b;

2.6 those entries resulting from the application of No. 2.1(c) of Resolution No. 1 of the Administrative Radio Conference, Geneva, 1959, shall be deleted;

3. that each listing for a radiotelephone coast station using A3 or A3B emission remaining in the Master Register on 1 January 197..., and each radiotelephone coast station using A3H emission after 1 January 197..., shall thereafter be treated as an assignment in contravention of the Radio Regulations. Exceptionally however, where two adjacent single sideband channels for a particular station have received satisfactory findings by the Board, independent sideband operation whose necessary bandwidth of emission is confined within the limits of those two channels shall not be considered as being in contravention of the Radio Regulations, where used by agreement between the administrations concerned and affected.

4. that, by analogy, the Board shall apply the above provisions, as appropriate, to the notices concerning frequencies in the bands listed in No. MOD 447 (Proposal No. I/33(18)) of the Radio Regulations, to be used for reception by particular radiotelephone coast stations, except that the interim period shall extend to 1 January 197..., and the re-examination of the listings in the Master Register shall take place on that date;

invites

administrations to notify to the I.F.R.B. as soon as possible the cancellation of frequency assignments to radiotelephone stations employing double sideband emission released as a consequence of the conversion of the corresponding stations for the use of single sideband emission.

Ref.

I/33(18) Modify Section IV of Article 7 as follows :

MOD 447 a) Ship stations, telephony :

4063 - 4136.5 kc/s
6200 - 6207 kc/s
8195 - 8276.5 kc/s
12 330 - 12 417.5 kc/s
16 460 - 16 558.5 kc/s
22 000 - 22 096.5 kc/s

MOD 448 b) Coast stations, telephony :

4364.5 - 4438 kc/s
6518 - 6525 kc/s
8735 - 8815 kc/s
13 112.4 - 13 200 kc/s
17 261.9 - 17 360 kc/s
22 625.4 - 22 720 kc/s

ADD 449 AA c) Ship stations, ocean data transmission :

4136.5 - 4140 kc/s
6207.5 - 6211 kc/s
8276.5 - 8280 kc/s
12 417.5 - 12 421 kc/s
16 558.5 - 16 562 kc/s
22 096.5 - 22 100 kc/s

ADD 449 AB The frequency bands listed under No. 449 AA may also be used by buoy stations for ocean data transmission and by stations telecommanding these buoys.

SUP 449

SUP 450

Ref.

I/33(18) (contd.) - MOD 452 f) Ship stations, telegraphy :

4160 - 4231 kc/s
6240 - 6346 kc/s
8320 - 8461 kc/s
12 471 - 12 692 kc/s
16 622 - 16 922 kc/s
22 148 - 22 368 kc/s
25 070 - 25 110 kc/s 1)

MOD 453 g) Coast stations, wideband telegraphy, telegraphy, facsimile and special transmission systems:

4231 - 4364.5 kc/s
6346 - 6518 kc/s
8461 - 8735 kc/s
12 692 - 13 112.4 kc/s
16 922 - 17 261.9 kc/s
22 368 - 22 625.4 kc/s

Reasons :

The above-listed modifications are a consequence of the new sub-division of frequency bands resulting from the tables in Appendices 15 and 17.

The modification of the title of No. 453 aims to fill a gap in the present text of the Radio Regulations. As a matter of fact, while for ship stations the text indicates frequency bands to be used for special transmission systems and for wideband telegraphy, such an indication does not exist for coast stations. Since for radiotelegraph coast stations no frequency bands other than those listed under No. 453 exist, it is necessary to include in the title of this number the systems not mentioned therein.

Ref.

I/33(19) As a consequence of the revision of Appendices 15 and 17 and of the withdrawal of Appendix 25, amend Article 9 as follows :

MOD 500 Para. 9 (1) Except for notices referred to in Nos. 552, 561 and 568, the Board shall examine each notice with respect to

MOD 540*) (5) The provisions of Nos. 537 to 539 do not apply to frequency assignments which are in conformity with the Allotment Plans appearing in Appendices 26 and 27 to these Regulations; such frequency assignments shall be entered in the Master Register on receipt of the notice by the Board.

SUP 541

through

SUP 551

MOD 573 Para. 26 (1) Frequency bands

10	-	2850	kc/s	
3155	-	3400	kc/s	
3500	-	3900	kc/s	in Region 1
3500	-	4000	kc/s	in Region 2
3500	-	3950	kc/s	in Region 3
4063	-	4136.5	kc/s	
4231	-	4364.5	kc/s	
4364.5	-	4438	kc/s	
6200	-	6207.5	kc/s	
6346	-	6518	kc/s	
6518	-	6525	kc/s	
8195	-	8276.5	kc/s	
8461	-	8735	kc/s	
8735	-	8815	kc/s	

*) As amended by the E.A.R.C. Aeronautical (R) (Geneva, 1966)

Ref.

I/33(19)
(contd.)

12 330	- 12 417.5 kc/s
12 692	- 13 112.4 kc/s
13 112.4	- 13 200 kc/s
16 460	- 16 558.5 kc/s
16 922	- 17 261.9 kc/s
17 261.9	- 17 360 kc/s
22 000	- 22 096.5 kc/s
22 368	- 22 625.4 kc/s
22 625.4	- 22 720 kc/s

SUP 577

through

SUP 586

MOD 635*) Para. 47. The provisions of Sections V, VI (excepting No. 619) and VII of this Article shall not be applied to frequency assignments in conformity with the Allotment Plans contained in Appendices 26 and 27 to these Regulations.

I/33(20) As a consequence of modifications introduced in the sub-division of radiotelegraphy bands between 4000 and 27 500 kc/s, modify Article 32 as follows:

MOD 1173 (3) Working frequencies assigned to coast stations using the bands between 4000 and 27 500 kc/s are included within the following band limits :

*) As amended by the E.A.R.C. Aeronautical (R) (Geneva, 1966).

Ref.

I/33(20)
(contd.)

4231 - 4364.5 kc/s
6346 - 6518 kc/s
8461 - 8735 kc/s
12 692 - 13 112.4 kc/s
16 922 - 17 261.9 kc/s
22 368 - 22 625.4 kc/s (see No. 453.1)

MOD 1181 Para. 33. (1) The working frequencies for manual telegraphy for high traffic ships in the band 4168 to 4177 kc/s are so spaced as to provide channels 0.75 kc/s wide, the extreme frequencies assignable being 4168.5 and 4176 kc/s as shown in Section A of Appendix 15.

MOD 1182 (2) In the band 4187 to 4231 kc/s, the working frequencies of low traffic ships are spaced 0.5 kc/s apart, the extreme frequencies assignable being 4188 and 4229.5 kc/s as indicated in Section A of Appendix 15.

MOD 1185 a) in the high traffic band, the working frequencies are spaced 3 kc/s apart, the extreme frequencies assignable being 22 187 and 22 217 kc/s;

MOD 1186 b) in the low traffic band, the working frequencies are spaced 2.5 kc/s apart, the extreme frequencies assignable being 22 272.5 and 22 365 kc/s.

MOD 1192 Para. 39. The working frequencies assigned to high traffic ships for manual telegraphy are included within the following band limits :

4168 - 4177 kc/s
6252 - 6265.5 kc/s
8336 - 8354 kc/s
12 504 - 12 531 kc/s
16 672 - 16 708 kc/s
22 185 - 22 220 kc/s

Ref.

I/33(20) (contd.) MOD 1196 Para. 42. The working frequencies assigned to low traffic ships shall be included within the following band limits :

4187 - 4231 kc/s
6280.5 - 6346 kc/s
8374 - 8461 kc/s
12 561 - 12 692 kc/s
16 748 - 16 922 kc/s
22 270 - 22 368 kc/s

I/33(21) As a consequence of the suppression of Section B of present Appendix 15, delete No. 1352 in Article 35.

In Proposal No. I/33(18) it is suggested that the band limits for radiotelegraph coast stations be modified. It is therefore necessary to adopt provisions to allow for the maintaining of the date in the appropriate part of Column 2 to these of the assignments recorded in the Master Register, that must be reallotted. To this end, insert the following Resolution in the Radio Regulations.

Ref.

I/33(22)

RESOLUTION No. ...

RELATING TO THE CHANGE OF FREQUENCY BAND LIMITS FOR RADIOTELEGRAPH COAST STATIONS IN THE BANDS BETWEEN 4000 AND 27 500 KC/S

The World Administrative Radio Conference, Geneva, 1967,

considering

a) that pursuant to the revision of Appendices 15 and 17 the frequency band limits for radiotelegraph coast stations have been modified;

b) that the existing assignments of the radiotelegraph coast stations comprised within the limits from

4364.5 - 4368 kc/s
6518 - 6525 kc/s
8735 - 8745 kc/s
13 112.4 - 13 130 kc/s
17 261.9 - 17 290 kc/s
22.625.4 - 22 650 kc/s

must be reallocated to make such frequencies available to radiotelephone coast stations;

c) that pursuant to the revision of Section A of Appendix 15 the frequencies comprised within the limits from

4231 - 4238 kc/s
6346 - 6357 kc/s
8461 - 8476 kc/s
12 692 - 12 714 kc/s
16 922 - 16 952 kc/s
22 368 - 22 400 kc/s.

are now available for radiotelegraph coast stations;

Ref.

I/33(22)
(contd.)

noting

- that the frequency bands under considering c) are wider than those under considering b);

- that for this reason it is possible to ensure the frequency reallocation to radiotelegraph coast stations, which must make their frequencies available for radiotelephone coast stations.

resolves

- that the radiotelegraph coast stations assignments already entered in the Master Register and operating in the frequency bands under considering b) be reallocated in the frequency bands under considering c);

- that the above assignments enter the appropriate part of Column 2 bearing the same date they now have in the Master Register.

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PLENARY MEETING

ITALY

Proposals for the work of the Conference

Agenda Item 4 - Possible revision of Appendix 18 to the Radio Regulations.

Foreword

The Mobile Maritime Service in the VHF field is at present ruled by Appendix 18 to the Radio Regulations with a channel spacing of 50 kc/s.

While this spacing was justified by the status of the technique existing ten years ago, it could certainly be reduced today to 25 kc/s, thus doubling the number of available channels.

However, as the channels now available are more than sufficient to meet the present requirements of the Mobile Maritime Service and to satisfy the growing demand in the near future, the reduction of the spacing from 50 to 25 kc/s would not seem justified.

The possibility can be foreseen however that in the future the development of the Mobile Maritime Service in VHF might require a greater number of channels and therefore make necessary the adoption of a 25 kc/s spacing.

Although establishing at the present time the conversion date from 50 to 25 kc/s would be premature, it would nevertheless be desirable - in order to make less onerous the consequences of the conversion - that the Administrations take into account this possibility and equip coast and ship stations with apparatus easily adaptable to the 25 kc/s spacing.

Therefore, it is proposed to insert the following Recommendation in the Radio Regulations.

ARCHIVES U.I.T. GENÈVE

Ref.

I/34(23) Insert in the Radio Regulations the following Recommendation :

Recommendation No. ...

Relating to equipments for Mobile Maritime Radiotelephone Service in the 156-174 Mc/s band

The World Administrative Radio Conference, Geneva, 1967,

considering

a) that the Mobile Maritime Service in the 156-174 Mc/s band is rapidly increasing;

b) that the 2 Mc/s band is considerably congested : drawback that can be minimized but not completely suppressed by the conversion from DSB to SSB;

c) that as a result of the conversion from DSB to SSB the present radiotelephone equipment of the stations operating in the 2 Mc/s band shall be substituted;

d) that several ships will find it convenient to change from the 2 Mc/s to the 156-174 Mc/s band for small-distance communications;

e) that the saturation of channels available at present with a 50 kc/s spacing in the 156-174 Mc/s band can be foreseen in the not-too-distant future; so that it will be necessary to increase the number of channels by adopting a 25 kc/s spacing;

f) that for the 25 kc/s spacing, the equipment should have characteristics similar to those listed below for information purposes :

1) transmitter frequency tolerance not above 10.10^{-6};

2) receiver frequency tolerance not above 10.10^{-6};

3) maximum frequency deviation $\pm$ 5 kc/s;

Ref.

I/34(23)
(cont.)

g) that equipment for 50 kc/s spacing can be adapted to 25 kc/s spacing by :

1) reducing the frequency tolerance of transmitter and receiver;

2) reducing the transmitter's frequency deviation;

3) reducing the IF bandwidth of the receiver in order to increase its selectivity;

4) increasing the receiver's AF gain.

Recommends Administrations

to consider the opportunity to utilize, for the new installations in coast and ship stations of the Mobile Maritime Service in the 156-174 Mc/s band, equipments built in such a way to make as simple as possible their adaptation to 25 kc/s spacing.

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ITALY

Proposals for the work of the Conference

Ref. Agenda Item 5 : Classes of emission to be used on the international distress and calling frequencies 500 kc/s and 2182 kc/s.

I/35(24) Amend Article 28 as follows :

MOD 974 a) send and receive class A2 or A2H emissions with carrier frequency on 500 kc/s;

MOD 984 a) send and receive class A3 or A3H emissions with carrier frequency on 2182 kc/s;

MOD 992 § 22. (1) Any aircraft following a maritime course and required by national or international regulations to communicate, for safety purposes, with stations of the maritime mobile service shall be capable of transmitting class A2 or A2H and receiving class A2 and A2H emissions on the frequency 500 kc/s, or, on the frequency 2182 kc/s, transmitting class A3 or A3H and receiving class A3 and A3H emissions.

MOD 995 - in the bands between 405 and 535 kc/s, be able to transmit on 500 kc/s using class A2 or A2H emissions, but see No. 677. If a receiver is provided for any of these bands, it shall be able to receive class A2 and A2H emissions on 500 kc/s;

ARCHIVES U.I.T. GENEVE

Ref.

I/35(24) (cont.)

MOD 996

- in the bands between 1605 and 2850 kc/s, be able to transmit on 2182 kc/s using class A3 or A3H emissions. If a receiver is provided for any of these bands, it shall be able to receive class A3 and A3H emissions on 2182 kc/s.

Reasons :

To provide, on distress and calling frequencies 500 kc/s and 2182 kc/s, permissive use of single sideband emissions compatible with class A2 and A3 double sideband emissions.

I/35(25)

Amend No. 1134 of Article 32 as follows :

MOD 1134

§ 13 (1) Stations of the maritime mobile service open to public correspondence and using frequencies in the authorized bands between 405 and 535 kc/s shall, during their hours of service, remain on watch on 500 kc/s. This watch is obligatory only for class A2 and A2H emissions.

Reasons :

As a consequence of the modification introduced in No. 974 of Article No. 28 (Proposal No. I/35(24).

I/35(26)

Amend No. 1337 of Article 35 as follows :

MOD 1337

(2) Coast stations open to the public correspondence service on one or more frequencies between 1605 and 2850 kc/s shall also be capable of transmitting class A3 or A3H emissions, and receiving class A3 and A3H emissions on 2182 kc/s.

Reasons :

As a consequence of the modification introduced in No. 984 of Article No. 28 (Proposal No. I/35(24)).

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PLENARY MEETING

ITALY

Proposals for the work of the Conference

Ref. Agenda Item 7.2 : Consider conditions for the use of emergency position-indicating beacons.

I/36(27) Amend Article 28 of the Radio Regulations as follows :

ADD 999 AA § 24. However, survival craft stations intended primarily for use as beacons to indicate the position of survivors or the location of a mobile station in distress shall be capable of transmitting :

ADD 999 AB a) with the carrier on 2182 kc/s using the emissions specified in No. 1476 AB*), if the beacon is provided for producing at sea a fie field intensity minor or equal to 10 µV/m at the distance of 30 nautical miles, or in No. 1476 AC*), if the beacon is provided for producing at sea a field intensity higher than 10 µV/m at the distance of 30 nautical miles. If the receiver is provided, it shall be able to receive A3 and A3H emissions;

ADD 999 AC b) with carriers on 121.5 and/or 243 Mc/s using the emissions specified in No. 1476 AD*). Class A3 emission may also be transmitted. If a receiver is provided, it shall be capable to receive class A3 emissions.

Background :

The distinction between emissions in respect of field intensity produced at the distance of 30 nautical miles results from C.C.I.R. Recommendation (Doc. XIII/1008 - Oslo, 1966).

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*) Proposal No. I/36(28)

ARCHIVES U.I.T. GENEVE

Ref.

I/36(28) Add to Article 36 the following new Section VIII (bis)

Section VIII (bis). Survival craft beacon signals

ADD 1476AA § 44 (bis) (1) The position-indicating beacon signal employed by survival craft stations consists of :

ADD 1476AB a) a keyed emission modulated by a tone of 1300 c/s (± 20 c/s) having a ratio of the period of the emission to the period of silence equal to or greater than 1, and an emission duration between 1 and 5 seconds.

Or

ADD 1476AC b) the radiotelephone alarm signal. The Morse letter "B" and/or the call sign of the ship to which the beacon belongs, should be included by keying the carrier modulated by a tone of 1300 c/s (± 20 c/s) or of 2200 c/s (± 35 c/s). The keying cycle should consist alternatively of the keying signal having a duration between 30 and 50 seconds, and a period of silence having a duration between 30 and 60 seconds.

Or

ADD 1476AD c) a swept tone modulation sweeping downward over a range of not less than 700 c/s, within the range 1600 to 300 c/s, with a repetition rate between two and three sweeps per second.

ADD 1476AE (2) The position-indicating beacon signal shall be generated automatically and normally shall be sent continuously. It may be interrupted for radiotelephone transmissions or reception when this capability is provided.

ADD 1476B § 44 (ter) This signal shall indicate that a person(s) is in a distress situation, may no longer be on an aircraft or ship and that receiving facilities may not be available.

Background :

The position-indicating beacon signal characteristics specified above are in accordance with C.C.I.R. Recommendation (Doc. XIII/1008 -- Oslo, 1966).

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PLENARY MEETING

DENMARK / ICELAND / NORWAY / SWEDEN

Proposals for the work of the Conference

Ref.

DNK/ISL/NOR/S/37(1)

Point 3 of the Agenda : Revision of Appendix 17 to the Radio Regulations

Duplex channelling of the maritime mobile radiotelephone bands between 4000 and 23000 kc/s.

In the present Appendix 17 to the Radio Regulations the Table of Transmitting Frequencies indicates the carrier frequencies for double sideband operation. Stations operating in the upper half of the channels, when using single sideband emission, are in accordance with the appendix when the carrier frequencies used are the same as those indicated for double sideband operation. When the lower half of the present double sideband channels are used for single sideband operation, carrier frequencies to be selected should, according to Appendix 17, be 3100 c/s lower than the double sideband carrier frequencies in the bands of 4 and 8 Mc/s, and 3300 c/s lower than the double sideband carrier frequencies in the bands of 12, 16 and 22 Mc/s.

The channel separation in the present DSB frequency table is in general 6.4 kc/s in the 4 and 8 Mc/s bands and 7.0 kc/s in the bands 12, 16 and 22 Mc/s (between the two lower channels and the two higher channels in the 4 and 8 Mc/s bands the separation is 6.3 kc/s).

When the double sideband channels eventually are split and single sideband operation becomes obligatory it seems operationally and technically advantageous to have an even distribution of the channels.

ARCHIVES U.I.T. GENÈVE

Ref.

DNK/ISL/NOR/S/37(1)
(cont.)

It is therefore suggested that Appendix 17 to the Radio Regulations be altered in order to obtain an equal separation between the carrier frequencies of the new SSB channels.

In the 12, 16 and 22 Mc/s bands this can be obtained simply by choosing carrier frequencies for the lowerhalf of the present DSB channels 3.5 kc/s below the midband frequencies listed in the table.

In the 4 and 8 Mc/s bands an even distribution with a minimum of amendments of the present frequencies is obtained by changing the carrier frequencies of the lowest and highest DSB channels in each of the bands 100 c/s downwards and 100 c/s upwards respectively. The carrier frequencies of the new SSB channels could then be evenly distributed with a spacing of 3.2 kc/s.

In the annex a revised "Table of Transmitting Frequencies" is proposed, indicating the upper sideband carrier frequencies (A3A/A3J). As a result of the proposed adjustment the carrier frequencies of the lowest 4 and 8 Mc/s SSB channels will be situated 200 c/s outside the limits of the respective maritime mobile bands. However, taking into account that the emission on the said two carrier frequencies will be reduced or suppressed, it is felt that this solution should be considered.

With regard to the text of the present Appendix 17, it is proposed to maintain the two first paragraphs and delete the rest.

Annex : 1

A N N E X

TABLE OF TRANSMITTING FREQUENCIES (IN KC/S)

(Single sideband) Upper sideband carrier frequencies

Series No.	4 Mc/s Band		8 Mc/s Band		12 Mc/s Band		16 Mc/s Band		22 Mc/s Band	
	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency
1	4367.8	4062.8	8744.8	8194.8	13130.0	12330.0	17290.0	16460.0	22650.0	22000.0
2	4371.0	4066.0	8748.0	8198.0	13133.5	12333.5	17293.5	16463.5	22653.0	22003.5
3	4374.2	4069.2	8751.2	8201.2	13137.0	12337.0	17297.0	16467.0	22657.0	22007.0
4	4377.4	4072.4	8754.4	8204.4	13140.5	12340.5	17300.5	16470.5	22660.5	22010.5
5	4380.6	4075.6	8757.6	8207.6	13144.0	12344.0	17304.0	16474.0	22664.0	22014.0
6	4383.8	4078.8	8760.8	8210.8	13147.5	12347.5	17307.5	16477.5	22667.5	22017.5
7	4387.0	4082.0	8764.0	8214.0	13151.0	12351.0	17311.0	16481.0	22671.0	22021.0
8	4390.2	4085.2	8767.2	8217.2	13154.5	12354.5	17314.5	16484.5	22674.5	22024.5
9	4393.4	4088.4	8770.4	8220.4	13158.0	12358.0	17318.0	16488.0	22678.0	22028.0
10	4396.6	4091.6	8773.6	8223.6	13161.5	12361.5	17321.5	16491.5	22681.5	22031.5
11	4399.8	4094.8	8776.8	8226.8	13165.0	12365.0	17325.0	16495.0	22685.0	22035.0
12	4403.0	4098.0	8780.0	8230.0	13168.5	12368.5	17328.5	16498.5	22688.5	22038.5
13	4406.2	4101.2	8783.2	8233.2	13172.0	12372.0	17332.0	16502.0	22692.0	22042.0
14	4409.4	4104.4	8786.4	8236.4	13175.5	12375.5	17335.5	16505.5	22695.5	22045.5
15	4412.6	4107.6	8789.6	8239.6	13179.0	12379.0	17339.0	16509.0	22699.0	22049.0
16	4415.8	4110.8	8792.8	8242.8	13182.5	12382.5	17342.5	16512.5	22702.5	22052.5
17	4419.0	4114.0	8796.0	8246.0	13186.0	12386.0	17346.0	16516.0	22706.0	22056.0
18	4422.2	4117.2	8799.2	8249.2	13189.5	12389.5	17349.5	16519.5	22709.5	22059.5
19	4425.4	4120.4	8802.4	8252.4	13193.0	12393.0	17353.0	16523.0	22713.0	22063.0
20	4428.6	4123.6	8805.6	8255.6	13196.5	12396.5	17356.5	16526.5	22716.5	22066.5
21	4431.8	4126.8	8808.8	8258.8						
22	4435.0	4130.0	8812.0	8262.0						

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PLENARY MEETING

DENMARK

Proposals for the work of the Conference

Agenda Item 6 : Examination of the pertinent portions of the revised International Code of Signals.

Ref.

ARTICLE 33

Section I. General Provisions

1216 After this No. add the following new paragraph :

DNK/38(1) ADD 1216A Para. 5bis. In case of language difficulties, stations of the mobile service shall use the service abbreviations given in Appendix 13, Section I and II. Letters and figures are to be spelled in accordance with the spelling tables given in Appendix 16.

Reasons :

To provide ways and means of communication in radiotelephony when language difficulties arise.

Section III. Calls, reply to calls and signal preparatory to traffic

Method of calling

1222 Para. 7, read :

DNK/38(2) MOD 1222 – the words THIS IS (or DE spoken as DELTA ECHO in case of language difficulties)

ARCHIVES U.I.T. GENÈVE

Ref.

Form of reply to calls

1241 Para.11. Read :

DNK/38(3) MOD 1241 – the words THIS IS (or DE spoken as DELTA ECHO in case of language difficulties);

Difficulties in Reception

1266 Para. 20. Read :

DNK/38(4) MOD 1266 .... "Wait ..... minutes" (or AS spoken as ALFA SIERRA ..... (minutes) in case of language difficulties);

Section IV. Forwarding (routing) of traffic

Traffic frequency

1273 Read :

DNK/38(5) MOD 1273 – the words THIS IS (or DE spoken as DELTA ECHO in case of language difficulties);

Ref.

		1280	Para. 23 (1) After this No. add the following new sub-paragraph :
DNK/38(6)	ADD	1280A	(1bis). However, in case of language difficulties, the transmission of a radiotelegram should be made as follows : - $\overline{KA}$ spoken as KILO ALFA - PBL spoken as PAPA BRAVO LIMA ..... (name of ship) ..... (serial number) ..... (number of words) ..... (date) ..... (time of handing-in) ..... (service indicators, if any) - $\overline{BT}$ spoken as BRAVO TANGO - (paid service indicators (if any)) - ADS spoken as ALFA DELTA SIERRA ..... - $\overline{BT}$ spoken as BRAVO TANGO - TXT spoken as TANGO X-RAY TANGO ..... - $\overline{BT}$ spoken as BRAVO TANGO - SIG spoken as SIERRA INDIA GOLF (if any) ... - $\overline{AR}$ spoken as ALFA ROMEO - K spoken as KILO

Reasons :

To provide ways and means of communication in radiotelephony when language difficulties arise.

Ref.

		1287	Para. 24. (i) Read :
DNK/38(7)	MOD	1287	– the words THIS IS (or DE spoken as DELTA ECHO in case of language difficulties); – "Your No. ... received, over" (or R spoken as ROMEO ... (number), K spoken as KILO in case of language difficulties); or – "Your No. ... to No. ... received, over" (or R spoken as ROMEO ... (numbers), K spoken as KILO in case of language difficulties).
		1289	(3) Read, in fine :
DNK/38(8)	MOD	1289	.... the word "Out" (or VA spoken as VICTOR ALFA in case of language difficulties.

ARTICLE 36

Section III. Distress call and message

		1393	(2) Read :
DNK/38(9)	MOD	1393	– the words THIS IS (or DE spoken as DELTA ECHO in case of language difficulties);

Section V. Acknowledgment of receipt of a distress message

1430 Read :

DNK/38(10) MOD 1430 – the words THIS IS (or DE spoken as DELTA ECHO in case of language difficulties);

– the word RECEIVED (or RRR spoken as ROMEO ROMEO ROMEO in case of language difficulties);

Section VI. Distress traffic

1451 (3) Read :

DNK/38(11) MOD 1451 – the words THIS IS (or DE spoken as DELTA ECHO in case of language difficulties);

Section VII. Transmission of a distress message by a station not itself in distress

1460 Read :

DNK/38(12) MOD 1460 – the words THIS IS (or DE spoken as DELTA ECHO in case of language difficulties);

Ref.

APPENDIX 13

Miscellaneous abbreviations and signals
to be used in radiotelegraphy communications

(See Article 29)

Replace the heading by :

DNK/38(13) MOD

Miscellaneous abbreviations and signals
to be used in radiocommunications

(See Articles 29 and 33)

Reasons :

To permit the use of the abbreviations in Appendix 13, Sections I and II also in radiotelephony. It is not found necessary to select certain abbreviations for the purpose of establishing an independent telephone code, since almost all abbreviations may be possible in telephony when language difficulties arise. To provide better coverage of the conditions of service in radiotelephony, the introduction of a number of new abbreviations has been proposed both in Section I (Q code) and in Section II (Miscellaneous abbreviations and signals). The abbreviations to be used in Section I may presumably be taken from the QV series.

On condition that all mobile stations are provided with the International Code of Signals, there will be no need for abbreviations in respect of safety of navigation, meteorology, and search and rescue in the International Radio Regulations. However, as long as the question as to the mobile stations in which the International Code of Signals is to be found has not been definitely settled, it may be appropriate to retain such abbreviations as relate to conditions of navigation and search and rescue of a more general nature, which will be applicable in rescue operations in which in particular small mobile stations are involved, and which in many cases will be sufficient. Hence it follows that the abbreviations :

Ref.

DNK/38(13) (contd.) QSH, QTI, QTJ, QTK, QTL, QTM, QUB, QUH, QUI, QUJ, QUK, QUL, QUQ and QUU may presumably be deleted. It is not believed that the use of abbreviations having one meaning in the Radio Regulations and another in the International Code of Signals will cause any confusion. This point of view also applies to the abbreviations of Section II (Miscellaneous Abbreviations and Signals).

Recommendation No. 22 may now be considered superfluous.

Section I. Q Code

Introduction. Replace the sub-paragraph 5 by :

DNK/38(14) MOD 5. Q code abbreviations are given the form of a question when followed by a question mark in radiotelegraphy and RQ (ROMEO QUEBEC) in radiotelephony. When an abbreviation is used as a question and is followed by additional or complementary information, the question mark (or RQ) should follow this information.

Reasons :

To permit the use of the abbreviations in radiotelephony when language difficulties arise.

Ref.

DNK/38(15)

Abbreviations available for all services

A. List of abbreviations in alphabetical order

		Question	Answer or advice
MOD	QSN	Replace : (or ... (call sign)) by : (or ... (name and/or call sign)).	Replace : (or ... (call sign)) by : (or ... (name and/or call sign)).

Reasons :

To make the signal usable in radiotelephony in case of language difficulties.

MOD	QSX	Replace : (call signs(s)) by : (name(s) and/or call (sign(s)).	Replace : (call sign(s)) by : (name(s) and/or call signs(s)).

Reasons :

Same as for QSN.

MOD	QTE	Replace : (call sign) by : (name and/or call sign).	Replace : (call sign) by: (name and/or call sign).

Reasons :

Same as for QSN.

MOD	QUA	Read : Have you news of ... (name and/or call sign)?	Read : I have received the following from ... (name and/or call sign).

Reasons :

Same as for QSN. To widen the scope of the signal.

Ref.			Question	Answer or advice
DNK/38(15) (contd.)	MOD	QUC	Replace : (call sign) by : (name and/or call sign).	Replace : (call sign) by: (name and/or call sign).

Reasons :

Same as for QSN.

	MOD	QUD	Replace : (call sign of the mobile station) by : (name and/or call sign).	Replace : (call sign) by : (name and/or call sign).

Reasons :

Same as for QSN.

	MOD	QUF	Replace : (call sign of mobile station) by : (name and/or call sign).	Replace : (call sign of mobile station) by : (name and/or call sign).

Reasons :

Same as for QSN.

New abbreviations

	ADD	Q..	Can you communicate by radiotelegraphy (500 kc/s)?	I can communicate by radiotelegraphy (500 kc/s).

Reasons :

To provide new signals for use in radiotelephony in case of language difficulties.

	ADD	Q..	Can you communicate by radiotelephony (2182 kc/s)?	I can communicate by radiotelephony (2182 kc/s).

Reasons :

To provide a signal for use in radiotelephony in case of language difficulties.

Ref.		Question	Answer or advice
DNK/38(15) (contd.)	ADD Q..	Can you communicate by radiotelephony (channel 16-156.80 Mc/s)?	I can communicate by radiotelephony (channel 16-156.80 Mc/s).

Reasons :

To provide a signal for use in radiotelephony in case of language difficulties.

ADD Q..	Can you communicate in..		I can communicate in..	
	0. Dutch	5. Italian	0. Dutch	5. Italian
	1. English	6. Japanese	1. English	6. Japanese
	2. French	7. Norwegian	2. French	7. Norwegian
	3. German	8. Russian	3. German	8. Russian
	4. Greek	9. Spanish?	4. Greek	9. Spanish

Reasons :

To provide signals for use in radiotelephony in case of language difficulties. The figures have the same meaning as in the International Code of Signals for reasons of simplicity.

ADD Q.. The groups which follow are from the International Code of Signals.

Reasons :

To permit the use of signals from the International Code of Signals.

ADD Q.. The words which follow are in plain language.

Reasons :

To avoid confusion when using the spelling tables.

Ref.		Question	Answer or advice
DNK/38(15) (contd.)	ADD	Q.. Have you received the security signal sent by ... (name and/or call sign)?	I have received the security signal sent by ... (name and/or call sign).

Reasons :

To provide a signal for this situation.

ADD	Q..	What is your ship charge?	My ship charge is ... fr. per word/minute
		(1. for radiotelegrams 2. for radiotelephone calls (if necessary)).	(1. for radiotelegrams 2. for radiotelephone calls (if necessary)).

Reasons :

To provide a signal for this situation.

ADD	Q..	What is your coast station charge?	My coast station charge is ... fr. per word/minute
		(1. for radiotelegrams 2. for radiotelephone calls (if necessary)).	(1. for radiotelegrams 2. for radiotelephone calls (if necessary)).

Reasons :

To provide a signal for this situation.

ADD	Q..	What is the land line charge?	The land line charge is ... fr. per word/minute
		(1. for radiotelegrams 2. for radiotelephone calls (if necessary)).	(1. for radiotelegrams 2. for radiotelephone calls (if necessary)).

Reasons :

To provide a signal for this situation.

ADD	Q..	What is the charge for ... (the facility in question)?	The charge for ... (the facility in question) is ... fr.

Reasons :

To provide a signal for this situation.

Ref.		Question	Answer or advice
DNK/38(15) (contd.)	ADD	Q.. How many minutes are you charging?	I am charging ... (minutes).

Reasons :

To provide a signal for this situation in case of language difficulties.

ADD	Q..	I have a radiotelephone call for ... (name of the required person on board the ship).

Reasons :

To provide a signal for this situation in radiotelephony in case of language difficulties.

ADD	Q..	I have an ordinary radiotelephone call for ... (telephone number or name and exact address of the subscriber); or I have ... 1. an urgent radiotelephone call for ... (telephone number); 2. a préavis (personal) radiotelephone call for ... (telephone number) ... (name of the required person); 3. an avis d'appel (a messenger) radiotelephone call for ... (name and exact address of the required person) from ... (name of the caller);

Ref.	Question	Answer or Advice
DNK/38(15) (contd.)		4. a collect radiotelephone call from ... (name of the caller) for ... (telephone number) ... (name of the required person in case of an avis d'appel (a messenger) radiotelephone call).

Reasons :

To provide signals for these situations in radiotelephony.

ADD	Q..	... (telephone number) ...
		1. does not answer
		2. is busy. I shall call you later
		3. is out of order.

Reasons :

To provide signals for these situations in radiotelephony in case of language difficulties.

ADD	Q..	... (name of the required person) ...
		1. is expected at ... (hours)
		2. is not present. Will call as soon as possible
		3. has gone away without leaving his new address
		4. has changed his residence
		5. is on holiday
		6. is unknown.

Reasons :

To provide signals for these situations in radiotelephony in case of language difficulties.

Ref.		Question	Answer or advice
DNK/38(15) (contd.)	ADD	Q..	The collect radiotelephone call ... 1. has been accepted 2. has been refused.

Reasons :

To provide signals for these situations in radiotelephony in case of language difficulties.

ADD	Q..	Shall I cancel? or	Cancel. or
		Shall I cancel ... (telephone number of the radiotelephone call)?	Cancel ... (telephone number of the radiotelephone call).

Reasons :

To provide signals for this situation in radiotelephony in case of language difficulties.

DNK/38(16)

Section II. Miscellaneous abbreviations and signals

MOD AA, AB, ADS, BN, PBL, SIG, TXT, WA and WB

Replace : (used after a question mark to request a repetition) by :

(used after a question mark in radiotelegraphy and after RQ in radiotelephony (in case of language difficulties) to request a repetition.)

Reasons :

To make the signals usable in radiotelephony in case of language difficulties.

Ref.

DNK/38(16)
(contd.)

MOD DE Replace : (used to precede the call sign of the calling station) by :

(used to precede the call sign (or name in case of language difficulties) of the calling station).

Reasons :

To make the signal usable in radiotelephony in case of language difficulties.

Add, in alphabetical order :

ADD $\overline{BT}$ Double hyphen (separation signal) (-...- to be sent as one signal).

Reasons :

To provide a separation signal to be used by the transmission of radiotelegrams and in other cases in radiotelephony in case of language difficulties.

ADD $\overline{KA}$ Starting signal (-.-.- to be sent as one signal).

Reasons :

To provide a starting signal to be used by the transmission of radiotelegrams in radiotelephony in case of language difficulties.

Ref.

APPENDIX 16

DNK/38(17)

Phonetic alphabet and figure code

(See Article 33)

SUP 1. Delete first column : Figure or mark to be transmitted*) and footnote*).

2. Read :

MOD 2. When it is necessary to use figure spelling, the following table shall be used :

Figure to be transmitted	Code word	Spoken as
0	NADAZERO	NAH-DAH-ZAY-ROH
1	UNAONE	OO-NAH-WUN
2	BISSOTWO	BEES-SOH-TOO
3	TERRATHREE	TAY-RAH-TREE
4	KARTEFOUR	KAR-TAY-FOWER
5	PANTAFIVE	PAN-TAH-FIVE
6	SOXISIX	SOK-SEE-SIX
7	SETTESEVEN	SAY-TAY-SEVEN
8	OKTOEIGHT	OK-TOH-AIT
9	NOVENINE	NO-VAY-NINER
Decimal point	DECIMAL	DAY-SEE-MAL

3. However, stations of the same country may, when communicating between themselves, use any other table recognized by their administration.

Note : Each syllable should be equally emphasized.

Reasons :

To introduce the new phonetic figure table proposed by I.M.C.O. It follows that Recommendation No. 30 will thereby be superfluous.

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PLENARY MEETING

CANADA

Proposals for the work of the Conference

Agenda Item 1

The use of single sideband technique in the Maritime Mobile Service in the bands available to that service between 1605 and 4000 kc/s and in the exclusive HF Maritime Mobile Radiotelephone bands.

Comments

For a number of years Canada has encouraged Canadian users of radio to implement single sideband techniques in the maritime mobile service. In 1961 Canada instituted a programme to implement single sideband in the 2 and 4 Mc/s bands at Canadian coast stations, and this plan is now expected to be completed in 1969. In addition, some Canadian coast stations are equipped for SSB operation in the 8, 13, 17 and 22 Mc/s bands. It is considered that the introduction of SSB in the maritime mobile service should not derogate the effectiveness of the distress and calling frequency 2182 kc/s or discourage the voluntary fitting of radiotelephone equipment in ships for participation in the general safety service. In accordance with this philosophy Canadian use of SSB has been implemented using A3H and A3J emissions. Canada's proposal concerning this item is contained in our suggested revision of Article 7 of the Radio Regulations and it is considered that the provisions set forth therein would provide for a logical evolutionary introduction of SSB in the maritime mobile service.

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Proposals

ARTICLE 7

Ref.			Special Rules relating to particular services
			Add a new section following Section IV to read :
CAN/39(1).	ADD		Section IV-A. Technical provisions relating to the use of single sideband radiotelephone emissions in the Maritime Mobile Service.
	ADD	457A	Para. 13(bis)(1). Modes of operation :
	ADD	457B	(2). Stations fitted only with single sideband equipment and requiring communication with double sideband stations shall be capable of operation in the full carrier (A3H) mode.
	ADD	457C	(3). Single sideband transmitters shall have a carrier level below peak envelope power in accordance with the following : A3H - 8 ± 2 db A3A - 16 ± 2 db A3J - at least 40 db
	ADD	457D	(4). The carrier (reference) frequencies of the transmitters shall be maintained within the following tolerances : Coast stations ± 20 c/s Ship stations ± 50 c/s
	ADD	457E	(5). In a single sideband A3H, A3A or A3J transmission, the mean power of any emission supplied to the antenna transmission line of a station on a discrete frequency, shall be less than the mean power (P_m) of the transmitter in accordance with the following table :

Ref.

CAN/39(1) (contd.)

ADD 457F (6).

Frequency separation Δ from the assigned frequency kc/s	Minimum attenuation below mean power (P_m) db
$1.50 < \Delta \leq 5.25$	25
$5.25 < \Delta \leq 8.75$	35
$8.75 < \Delta$	43+10 Log 10 P_m (Watts)

ADD 457G Para. 13(ter).(1). Channel utilization

A station using single sideband emissions shall be considered to be operating in accordance with these Regulations if the necessary bandwidth is confined within either the upper or lower half of a channel provided for double sideband emissions.

ADD 457H (2). When operating in the upper half of a double sideband channel the station shall use upper sideband emissions with the carrier (reference) frequency at the centre of the double sideband channel.

ADD 457I (3). When operating in the lower half of a double sideband channel the station shall use upper sideband emissions with the carrier (reference) frequency in accordance with the following :

Band	Carrier (reference) frequency below the centre of the double sideband channel
Below 4 Mc/s	3000 c/s
4 and 8 Mc/s	3100 c/s
above 8 Mc/s	3300 c/s

ADD 457J (4). Stations employing single sideband emissions on 2182 kc/s shall be restricted to the upper half of the double sideband channel with the carrier (reference) frequency of 2182 kc/s.

Ref.

CAN/39(1) (contd.)	ADD	457K	(5). A station using single sideband emissions shall have an assigned frequency 1400 cycles per second higher than the carrier (reference) frequency.
	ADD	457L	(6). The single sideband working frequencies given in Section B of Appendix 15 may be assigned for ship to shore, shore to ship, and intership simplex operations.
	ADD	457M	(7). Administrations are urged to discontinue, in the maritime mobile service, the use of double sideband radiotelephone transmissions if possible by 1 January 1973. As from 1 January 1970 new double sideband installations shall no longer be permitted. As from 1 January 1974 double sideband emissions shall be prohibited except on 2182 kc/s.

Reasons :

The advantages of single sideband have been recognized as a means of alleviating the congestion in the frequency bands allocated to the maritime mobile service. It is also recognized that there are disadvantages from an economic viewpoint and it will require a number of years before full implementation of SSB is possible. It is considered that the foregoing technical principles which are generally in accordance with those adopted by the C.C.I.R. would provide for an orderly transition to SSB.

Ref.

APPENDIX 17

CAN/39(2)

Duplex channelling of the Maritime Mobile Radiotelephone bands between 4000 and 23 000 kc/s.

MOD (See Articles 7 and 35).

NOC 1.

NOC 2.

NOC 3.

NOC 3.1

SUP 3.2

SUP 3.2.1

SUP 3.2.2

SUP 4.

Reasons :

The provisions proposed for deletion are contained in the Canadian proposal for revision of Article 7.

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PLENARY MEETING

CANADA

Proposals for the work of the Conference

Agenda Item 2.1*) - Frequency bands for coast and ship radiotelephone stations in the 6 Mc/s band

Comments

Canada is in need of additional radiotelephone channels for coast stations, however, considering the congestion which exists in the spectrum allocated to the maritime mobile service it is not envisaged that additional frequencies can be obtained unless it is at the expense of other maritime mobile categories. In order to satisfy coast station requirements in Canada we have utilized the SSB frequencies contained in Section B of Appendix 15 and accordingly the Canadian proposal relating to Agenda Item 1 as contained in the suggested revision of Article 7 would permit the use of these channels by coast stations. In addition to the foregoing the Conference may also wish to consider the use of double sideband calling channels in Section B of Appendix 15 to provide SSB channels which could be assigned to satisfy the requirement for additional frequencies for ship radiotelephone stations.

Agenda Item 2.2*) - Frequencies for intership radiotelephone traffic.

Considering the frequency spectrum allocated to the maritime mobile service and the frequency bands which are available for intership radiotelephone traffic, Canada does not support this need. It is suggested, however, that the Conference may also wish to consider in relation to this item the possibility that such a requirement may be satisfied by the use of the double sideband calling channels in Section B of Appendix 15 to provide channels for this purpose.

Agenda Item 2.3*) - The possible use of the high traffic bands by tankers of 12 500 tons gross

Considering that these tankers need reliable ship-to-shore communications and taking into account the traffic loading on these bands, Canada is prepared to support the amendment of the pertinent regulations to permit the use of these bands by tankers of 12.500 tons gross.

*) (No specific proposals for items 2.1, 2.2 and 2.3.)

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Agenda Item 2.4 - The desirability of accommodating requirements for oceanographic communications

The frequency requirements for the ocean data service has been given much consideration by Administrations prior to and during several international meetings. Canada is of the opinion that although this requirment is not exclusively related to the maritime mobile service, it is more closely related to the maritime service than to any of the other radio services. Therefore, Canada proposes, as contained in the suggested revision to Article 7, that the upper family of SSB frequencies in existing Appendix 15, Section B, be allocated to the ocean data service on an exclusive basis. As a consequence of this proposal and also in relation to this agenda item Canada proposes that Article 1 of the Radio Regulations be amended in accordance with the suggested provisions contained in these proposals to define the ocean data service and an ocean data station.

Proposals

Ref.

ARTICLE 1

Terms and Definitions

Section II. Radio Systems, Services and Stations

Add the following new definitions :

CAN/40(3)	ADD	76A	Ocean data service : A radiocommunication service intended for the exchange of data between ocean data stations.
	ADD	76B	Ocean data station: A station in the ocean data service.

Reasons :

Consequential to the establishment of this new service.

Ref.

ARTICLE 5

Section IV. Table of Frequency Allocations - 10 kc/s to 40 Gc/s

Amend as follows :

CAN/40(4) MOD

4063 - 4438 kc/s band

4063 - 4136.5	MARITIME MOBILE 208 209
4136.5 - 4140	OCEAN DATA 209
4140 - 4438	MARITIME MOBILE 208 209

CAN/40(5) MOD

6200 - 6525 kc/s band

6200 - 6207.5	MARITIME MOBILE 211
6207.5 - 6211	OCEAN DATA 211
6211 - 6525	MARITIME MOBILE 211

Ref.

CAN/40(6) MOD

8195 - 8815 kc/s band

8195 - 8276.5	MARITIME MOBILE
8276.5 - 8280	OCEAN DATA
8280 - 8815	MARITIME MOBILE
	213

CAN/40(7) MOD

12 330 - 13 200 kc/s band

12 330 - 12 417.5	MARITIME MOBILE
12 417.5 - 12 421	OCEAN DATA
12 421 - 13 200	MARITIME MOBILE
	213

CAN/40(8) MOD

16 460 - 17 360 kc/s band

16 460 - 16 558.5	MARITIME MOBILE
16 558.5 - 16 562	OCEAN DATA
16 562 - 17 360	MARITIME MOBILE
	213

CAN/40(9) MOD

22 000 - 22 720 kc/s band

22 000 - 22 096.5	MARITIME MOBILE
22 096.5 - 22 100	OCEAN DATA
22 100 - 22 720	MARITIME MOBILE

Ref.

CAN/40(10) MOD 209 On condition that harmful interference is not caused to the maritime mobile service, or the ocean data service, the frequencies between 4063 and 4438 kc/s may be used exceptionally by fixed stations communicating only within the boundary of the country in which they are located, with a mean power not exceeding 50 watts; however, in Regions 2 and 3, between 4238 and 4368 kc/s, a mean power not exceeding 500 watts may be used by such fixed stations.

CAN/40(11) MOD 211 On condition that harmful interference is not caused to the maritime mobile service, or the ocean data service, the frequencies between 6200 and 6525 kc/s may be used exceptionally by fixed stations, communicating only within the boundary of the country in which they are located, with a mean power not exceeding 50 watts. At the time of notification of these frequencies, the attention of the International Frequency Registration Board will be drawn to the above conditions.

Reasons :

To provide for the exclusive allocation of frequencies to the ocean data service.

Ref.

ARTICLE 7

Special Rules Relating to Particular Services

Section IV. Maritime Mobile Service

Before 438 add the following new paragraphs :

CAN/40(12) ADD 437A Para. 7(bis)(1). Administrations are urged to discontinue in the maritime mobile service, the use of double sideband radiotelegraph transmissions, if possible by 1 January 1973.

ADD 437B (2). Stations of the maritime mobile service employing single sideband radiotelegraph transmissions shall use upper sideband emissions. Stations using single sideband radiotelegraph emissions on the designated frequencies 410, 425, 448, 454, 468, 480, 500, 512 and 8364 kc/s shall use carrier (reference) frequencies of the same value.

CAN/40(13) MOD 449 (c). Ship stations, telephony (single sideband only).

4133 - 4136.5 kc/s

6200 - 6207.5 kc/s

8273 - 8276.5 kc/s

12 407 - 12 417.5 kc/s

16 537 - 16 558.5 kc/s

22 078 - 22 096.5 kc/s

Reasons :

Consequential to the Canadian proposal to allocate the upper channels of Appendix 15, Section B to the ocean data service.

Ref.			After 464 add the following new section :
CAN/40(14)	ADD		Section V-A. Ocean Data Service
	ADD	464A	Para. 14(bis)(1). The bands exclusively allocated to the ocean data service between 4000 and 27 500 kc/s are as follows :
			4136.5 - 4140 kc/s
			6207.5 - 6211 kc/s
			8276.5 - 8280 kc/s
			12 417.5 - 12 421 kc/s
			16 558.5 - 16 562 kc/s
			22 096.5 - 22 100 kc/s
	ADD	464B	(2). These channels shall be used for multi-channel telegraphy systems only.

Reasons :

It is considered that the requirement of the ocean data service is justified and in view of the benefits which may be derived from it by the maritime mobile service it is appropriate that the above frequencies be allocated for ocean data purposes.

Agenda Item 2.5 - Frequencies to be used by coast stations for wideband telegraphy, facsimile and special transmission systems.

Comments

Canada does not have any proposals concerning this item to present to the Conference. It is considered that the Radio Regulations now permit the implementation of emissions which would allow coast radiotelegraph stations to transmit in the modes used for wideband telegraphy, facsimile and special transmission systems.

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CANADA

Proposals for the work of the Conference

Agenda Item 3 - Consequential revision of Appendices 15, 17 and 25 to the Radio Regulations

Comments

As a consequence of Canadian proposals in relation to Agenda items 2.4 and 1 Appendices 15 and 17 have been revised and are contained herein.

Canada is of the opinion that Appendix 25 should be revised on the basis of SSB operation. Such a revision would make available additional frequencies to provide for the needs of new and developing countries and also to satisfy requirements of existing users. Such a plan will greatly increase the sharing possibilities of the frequencies available.

Canada is of the opinion that there is sufficient time for this Conference to revise the plan providing Member countries are prepared to state their requirements. This could be achieved by the following procedure :

1) Replace existing Appendix 25 DSB allotments which have been implemented and listed in the International Frequency List with new SSB channels.

2) Replace those frequency assignments already in use and listed in the International Frequency List but not allotted in existing Appendix 25 with new SSB channels.

3) Satisfy new requirements.

4) Agree on implementation date.

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Ref. | Proposals

CAN/41(15) MOD

APPENDIX 15

Section B

Carrier (Reference) Frequencies in kc/s for Ship Radiotelephone Stations using the Maritime Mobile Service Bands between 4 and 23 Mc/s.

Band (Mc/s)	limits	kc/s		limits
		Radiotelephone (Double sideband) Calling frequencies	Radiotelephone (Single sideband) Upper sideband Carrier reference frequencies	
4	4133		4133	4136.5
6	6200		6200——6204*) 2 frequencies spaced 3.5	6207.5
8	8265	8269	8273	8276.5
12	12400	12403.5	12407——12414 3 frequencies spaced 3.5	12417.5
16	16530	16533.5	165537——16554.5 6 frequencies spaced 3.5	16558.5
22	22070	22074	22078——22092 5 frequencies spaced 3.5	22096.5

*) For particular conditions concerning the use of 6204 kc/s see No. 1353.

Note – The single sideband frequencies above may be assigned to coast stations in accordance with provisions contained in Article 7

Reasons: Consequential to Canadian proposal for Agenda Item 2.4 to allocate frequencies for the Ocean Data Service.

APPENDIX 17

(See Proposal N° CAN/39(2), Doc. No. 39)

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PLENARY MEETING

CANADA

Proposals for the work of the Conference

Agenda Item 4 - Possible revision of Appendix 18 to the Radio Regulations

Comments

Canada is of the opinion that the Maritime Mobile frequencies in the band 156 - 174 Mc/s as outlined in Appendix 18 of the Radio Regulations should be retained on the basis that the function of those channels presently spaced 50 kc/s will not be changed. Recognizing the need for additional VHF channels, Canada is prepared to support the adoption of a revision to this Appendix which would permit the inclusion of 25 kc/s channels to be implemented on a national or regional basis provided full protection is given to 50 kc/s channel operations designated above and on an agreed date all frequencies would be used on a 25 kc/s channel separation.

(No specific proposals for this item.)

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PLENARY MEETING

CANADA

Proposals for the work of the Conference

Agenda Item 5 - Classes of emission to be used on the international distress and calling frequencies 500 kc/s and 2182 kc/s

Comments:

The C.C.I.R. XIth Plenary Assembly considered that A2H on 500 kc/s is as effective as A2 and that A3H on 2182 kc/s is as effective as A3. Therefore, in order that the use of single sideband emissions on these frequencies may be permitted Canada has proposed the revision of Articles 28, 32 and 35.

Proposals

Amend Articles 28, 32 and 35 of the Radio Regulations as follows

ARTICLE 28

Conditions to be observed by Mobile Stations

Ref.			
CAN/43(16)	MOD	974	a) send and receive class A2 or A2H emissions on 500 kc/s;
CAN/43(17)	MOD	984	a) send and receive class A2 or A3H emissions on 2182 kc/s;

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Ref.

CAN/43(18) MOD 992 § 22.(1) **Any aircraft following a maritime course** and required by national or international regulations to communicate, for safety purposes, with stations of the maritime mobile service shall be capable of transmitting and receiving on the frequency 500 kc/s, preferably class A2 or A2H emissions, or, on the frequency 2182 kc/s class A3 or A3H emissions;

CAN/43(19) MOD 995 in the bands between 405 and 535 kc/s, be able to transmit on 500 kc/s using class A2 or A2H emissions, but see No.677. If a receiver is provided for any of these bands, it shall be able to receive class A2 and A2H emissions on 500 kc/s;

CAN/43(20) MOD 996 in the bands between 1605 and 2850 kc/s, be able to transmit on 2182 kc/s using class A3 or A3H emissions. If a receiver is provided for any of these bands, it shall be able to receive class A3 and A3H emissions on 2182 kc/s;

Reasons:

To provide for the use of single sideband emissions on 500 and 2182 kc/s.

ARTICLE 32

Use of Frequencies for Radiotelegraphy in the Maritime Mobile and Aeronautical Mobile Services

Section II. Bands between 405 and 535 kc/s

D. Watch

Ref.			
CAN/43(21)	MOD	1134 § 13.(1)	Stations of the maritime mobile service open to public correspondence and using frequencies in the authorized bands between 405 and 535 kc/s shall, during their hours of service, remain on watch on 500 kc/s. This watch is obligatory only for class A2 and A2H emissions.

Reasons :

To provide for the use of single sideband emissions on 500 kc/s.

ARTICLE 35

Use of Frequencies for Radiotelephony in the Maritime Mobile Service

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Section II. Bands between 1605 and 4000 kc/s

Ref.			D. Traffic
CAN/43(22)	MOD	1337(2)	Coast stations open to the public correspondence service on one or more frequencies between 1605 and 2850 kc/s shall also be capable of transmitting Class A3 or A3H and receiving Class A3 and A3H emissions on 2182 kc/s.

Reasons:

To provide for the use of single sideband emissions on 2182 kc/s.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Corrigendum to
Document No. 44-E
9 August, 1967
Original: English

PLENARY MEETING

CANADA

Page 3 - paragraph 1, amend the phonetic alphabet table, third column, as follows:

BRAH VOH	- replace with		BRAH VOH
FOKSTROT	"	"	FOKS TROT
SEE AIR RAH	"	"	SEE AIRRAH
ECKS RAY	"	"	ECKS RAY

Page 4 - paragraph 2, amend the figure spelling table, third column, as follows:

FOWER	- replace with		FOW er
SEVEN	"	"	SEV en
NINER	"	"	NIN er
DAY SEE MAL	"	"	DAY SEE MAL

Page 4 - paragraph 2, amend the figure spelling table by adding the following:

Column 2	Column 3
Thousand	TOU SAND

Page 4 - paragraph 3, amend the figure spelling table, third column, as follows;

NAH DAY ZE RO - replace with NAH DAH ZAY ROH

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 44-E
27 April 1967
Original : English

PLENARY MEETING

CANADA

Proposals for the work of the Conference

Agenda Item 6 - Examination of the pertinent portions of the revised international code of signals

Comments

In accordance with a decision that the International Code of Signals should become the responsibility of the Intergovernmental Maritime Consultative Orgnization, a Sub-Committee of the I.M.C.O. Maritime Safety Committee was formed in 1962 to prepare a revised Code. This work was completed in 1964 and the revised Code was adopted by the I.M.C.O. Fourth Assembly in 1965. Generally speaking, the new Code recognizes that I.M.C.O. has primary responsibility for maritime signals and abbreviations relating to distress, search and rescue, safety of navigation and medical assistance, while the I.T.U. retains general responsibility for signals and abbreviations relating to radiocommunication procedures.

Recommendation 22 of the I.T.U. Ordinary Administrative Radio Conference (Geneva, 1959) contains a proposed International radiotelephone Code for the Maritime Mobile Service. As requested in that Recommendation, the I.M.C.O. Sub-Committee studied the Code and took it into account in their revision of the International Code of Signals. It is believed that the new International Code of Signals, prepared by experts in their field, contains all the essential elements of the Recommendation. Therefore, it is considered that Recommendation 22 has served its purpose insofar as I.M.C.O. is concerned.

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Recommendation 22 also invites Administrations, if the Code is generally adopted, to propose its inclusion in the Radio Regulations at the next I.T.U. Administrative Radio Conference. It is considered that the International Code of Signals is the proper place for radiotelephone code signals to be used in cases of language difficulties, and there does not appear to be a need to include such signals in the Radio Regulations.

The I.T.U. World Administrative Radio Conference must examine pertinent portions of the International Code of Signals, and make consequential amendments to the Radio Regulations.

Concerning Appendix 13 of the Radio Regulations, the series of Q Code groups contained in Section 1 are for use by all Services, therefore, it is beyond the competence of this W.A.R.C. to propose any amendments or deletions thereto. The series QAA to QNZ, reserved for the aeronautical service, have been implemented, whereas the series QOA to QQZ, reserved for the maritime service, have not been included in the revised International Code of Signals (the W.A.R.C. may wish to forward a recommendation in this regard to I.M.C.O.) Section II of Appendix 13 contains miscellaneous abbreviations and signals for use by all services and no revision should be undertaken by the W.A.R.C.

The only significant discrepancy between the revised Code and the Radio Regulations is in the figure spelling Table of Appendix 16. Canada's proposal for revision of Appendix 16 contained herein favours the adoption of the I.C.A.O. figure spelling table where there is no language difficulty. Furthermore in recognition of the figure spelling table contained in the revised Code of Signals, Canada's proposal includes a second figure spelling table from the revised Code, to be used only in cases where language difficulties arise.

Proposals

Amend Appendix 16 of the Radio Regulations as follows :

APPENDIX 16

Phonetic alphabet and figure code

(see Article 33)

Ref.

CAN/44(23) MOD

1. When it is necessary to spell out call signs, service abbreviations and words, and in cases of language difficulties, the following table shall be used :

Letter to be transmitted	Word to be used	Spoken as *)
A	Alfa	AL FAH
B	Bravo	BRAH VOH
C	Charlie	CHAR LEE or SHAR LEE
D	Delta	DELL TAH
E	Echo	ECK OH
F	Foxtrot	FOKSTROT
G	Golf	GOLF
H	Hotel	HOH TELL
I	India	IN DEE AH
J	Juliett	JEW LEE ETT
K	Kilo	KEY LOH
L	Lima	LEE MAH
M	Mike	MIKE
N	November	NO VEM BER
O	Oscar	OSS CAH
P	Papa	PAH PAH
Q	Quebec	KEH BECK
R	Romeo	ROW ME OH
S	Sierra	SEE AIR RAH
T	Tango	TANG GO
U	Uniform	YOU NEE FORM or OO NEE FORM
V	Victor	VIK TAH
W	Whiskey	WISS KEY
X	X-ray	ECKS RAY
Y	Yankee	YANG KEY
Z	Zulu	ZOO LOO

*) The syllables to be emphasized are underlined.

Ref.

CAN/44(23) (cont.) MOD

2. When it is necessary to use figure spelling and there is no language difficulty, the following table shall be used :

Figure to be transmitted	Word to be used	Spoken as *)
0	Zero	ZE RO
1	One	WUN
2	Two	TOO
3	Three	TREE
4	Four	FOWER
5	Five	FIFE
6	Six	SIX
7	Seven	SEVEN
8	Eight	AIT
9	Nine	NINER
Decimal point	Decimal	DAY SEE MAL

3. The following figure spelling table shall be used in cases of language difficulties :

Figure to be transmitted	Word to be used	Spoken as **)
0	Nadazero	NAH DAY ZE RO
1	Unaone	OO NAH WUN
2	Bissotwo	BEES SO TOO
3	Terrathree	TAY RAH TREE
4	Kartefour	KAR TAY FOWER
5	Pantafive	PAN TAH FIFE
6	Soxisix	SOK SEE SIX
7	Setteseven	SAY TAY SEVEN
8	Oktoeight	OK TOH AIT
9	Novenine	NO VAY NINER
Decimal point	Decimal	DAY SEE MAL

*) The syllables to be emphasized are underlined.

**) Each syllable should be equally emphasized.

Ref.

CAN/44(23) (cont.) MOD 4. However, stations of the same country may use, when communicating between themselves, any other table recognized by their administrations.

Reasons :

To accommodate the figure spelling table contained in the revised International Code of Signals and at the same time to resolve the differences between the maritime mobile and aeronautical mobile services where figure spelling is concerned.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 45-E
27 April 1967
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PLENARY MEETING

CANADA

Proposals for the work of the Conference

Agenda Item 7.1 - Data transmission from ship stations

Comments

Canada recognizes that there is a requirement for data transmissions from ships and considers that this requirement should be satisfied through the use of frequencies from the high traffic bands in Appendix 15, Section A of the Radio Regulations, Geneva 1959. In view of the possibility of harmful interference being caused by intermixing data and A1 transmissions it is considered that it would be desirable to keep these emissions separate. Canada does not have any plan in mind for the separation of these different modes of emission but would be prepared to support a plan which is compatible with Administrations' utilization of these high traffic bands.

Agenda Item 7.2 - Conditions for the use of emergency position-indicating beacons

Comments

Canada does not have a proposal to present at this time. In our opinion the two most important factors involved concerning conditions for the use of emergency indicating beacons are :

1) the frequencies to be used; and

2) the characteristic beacon signal.

Recognizing the differences that exist between the aeronautical and maritime mobile interests and considering that the I.T.U. Regulations pertain to both the aeronautical and maritime services, Canada favours the adoption of regulations which would permit the use of these beacons on either 2182 kc/s, 121.5 Mc/s or 243 Mc/s. In so far as the beacon signal is concerned it is considered that a swept-tone modulation is the most satisfactory signal.

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Agenda Item 7.3 - Conditions for the use of selective calling devices

Comments

Canada does not have any proposal to submit to the Conference at this time but it is possible that a discussion paper will be developed at a later date. Generally speaking our position in relation to this item is :

1) The system should cater to the basic function of calling an individual ship at any time for public correspondence purposes.

2) The system should have the capability of operating in all radiotelephony and radiotelegraphy bands allocated to maritime mobile service.

3) Channels for calling on a world-wide basis should be 500 kc/s, 2182 kc/s and 156.8 Mc/s. Additional calling arrangements may be adopted by the W.A.R.C.

4) Time sharing on calling frequencies is not considered necessary.

5) The minimum data should be that necessary to alert a particular ship. Additional information such as coast station identification, answering frequency, device activation, etc. should be included if considered technically and economically feasible.

6) The call system should use the ship's call sign.

7) A direct printing telegraph system on a ship should be capable of being activated by a selective call.

8) The selective calling system should not react to conventional distress, urgency or safety signals.

9) The use of selective calling should be voluntary for all classes of ships.

Agenda Item 7.4 - Hours of service for ship stations

Comments

Canada does not have a proposal to present to the Conference concerning this item and is of the opinion that existing provisions are quite satisfactory. It is considered that the traffic loading referred to in Recommendation 27 of the Radio Regulations could be reduced by the use of selective calling systems.

(No specific proposals for items 7.1 to 7.4.)

Agenda Item 7.5 - Frequencies to be assigned for the transmission by television of port radar images

Proposal

Since there are no world-wide allocations available to the maritime mobile service for the purpose nor are there any existing port-radar image transmission systems suitable for international acceptance, Canada considers that the need and operational requirements should be studied by Administrations, the I.M.C.O. and the C.C.I.R. as suggested in the following Recommendation :

Recommendation

Transmission by television of port radar images to ships
The World Administrative Radio Conference 1967

Considering

a) that there may be a future requirement, for the transmission by television of port radar images from shore to ships, in congested waters;

b) that the table of frequency allocations does not provide spectrum for this purpose.

Recommends

a) that as a matter of urgency, Administrations, and the Inter-Governmental Maritime Consultative Organization study the operational need and the parameters for such systems and inform the Secretary-General of the results of these studies;

b) that if such an operational need does exist the C.C.I.R. be invited to determine the most suitable order of frequencies required for this purpose, and the technical parameters to be met by such systems;

c) that Administrations be prepared to take a decision in this matter at the next competent W.A.R.C.

Agenda Item 7.6 - The establishment of a separate category for mobile radiotelephone traffic on inland waterways

Comments

In so far as Canadian inland waterways are concerned, Canada does not foresee a requirement to establish a separate category for mobile radiotelephone traffic. It may be that such requirements do exist elsewhere in which case it is our opinion that this would then be satisfied on a Regional or sub-Regional basis.

(No specific proposals for this item)

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 46-E
27 April 1967
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PLENARY MEETING

CANADA

Proposals for the work of the Conference

Agenda Item CAN-A *) : Amendment of Nos. 158 and 167 of the Radio Regulations.

Ref.

ARTICLE 5

Frequency Allocations 10 kc/s to 40 Gc/s

CAN/46(24)	MOD	158	Limited to coast telegraph stations (A1, A7J and F1 only).
CAN/46(25)	MOD	167	Only classes A1, A7J or F1, A4 or F4 emissions are authorized in the band 90 - 160 kc/s for stations of the fixed and maritime mobile services.

Reasons :

Frequencies in the bands where these footnotes apply are used by stations in Canada for A7J emission. It is considered the multichannel systems using A7J make efficient use of the spectrum and there is no technical reason why this class of emission should be prohibited.

*) This item contains additional proposals concerning Maritime Mobile matters which are not specifically spelled out in the Agenda but which could be considered within the competence of the Conference.

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 47-E
1 May 1967
Original : French

PLENARY MEETING

MALAGASY REPUBLIC

Proposals for the work of the Conference

The Administration of the Malagasy Republic has no specific proposals to make concerning the work of the forthcoming World Administrative Radio Conference.

However, should the Conference decide to revise Appendix 25 to the Radio Regulations, the Malagasy Administration would request that account be taken of :

1) the frequencies already allocated to the Malagasy Republic in the 4-8 and 12 Mc/s bands, appearing in the Frequency Allotment Plan for Coast Radiotelephone Stations;

2) new frequency requirements in the 16 and 22 Mc/s bands (one frequency per band).

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No.48-E
8 May 1967
Original : Russian

PLENARY MEETING

UNION OF SOVIET SOCIALIST REPUBLICS

Proposals for the work of the Conference

Ref.

Agenda Item 1 : The use of single sideband technique in the Maritime Mobile Service in the bands available to that service between 1605 and 4000 kc/s and in the exclusive HF Maritime Mobile Radiotelephone bands.

Comments

In view of the progress made with single sideband equipment and the need to increase the possibilities of using the radio frequencies allocated to the Maritime Mobile Service the Soviet Administration considers that ship and coast radiotelephone stations should be converted to single sideband operation over the next few years. 1 January 1972 is proposed as the date after which double sideband radio equipment should no longer be installed, and 1 January 1977 as the deadline for complete cessation of the use of double sideband radio equipment.

Proposal

It is proposed that the transfer to single sideband operation be effected in the following order and by the following dates :

USSR/48(1)

- from 1 January 1972 onwards : no further installation of double sideband equipment in ships and coast stations;

- from 1 January 1977 onwards : the use of double sideband equipment by ships and coast stations must cease.

It is proposed to reduce the interference guard band for frequency 2182 kc/s to ± 5 kc/s, keeping the bands 2170 - 2177 and 2187 - 2194 kc/s for the exclusive use of radiotelephone stations of the Maritime Mobile Service.

ARCHIVES U.I.T. GENÈVE

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No.49-E
8 May 1967
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PLENARY MEETING

UNION OF SOVIET SOCIALIST REPUBLICS

Proposals for the work of the Conference

Ref.

Agenda Item 2.1 : Frequency bands for coast and ship radiotelephone stations in the 6 Mc/s band.

Agenda Item 2.2 : Frequencies for intership radiotelephone traffic.

Comments

Since the sea-going fleet has been greatly improved in the last 10 - 15 years by more up-to-date ships capable of high speeds, it really has become possible for ships in distress to be effectively helped by other ships situated a long way from the area concerned (1000 - 1500 km). The Radio Regulations do not provide, on a world-wide basis, special frequencies in the 3 and 6 Mc/s bands for intership radiotelephone traffic in emergencies. The Soviet Administration therefore proposes that the possibility be considered of allocating a frequency in the 3155 - 3200 kc/s range on a world-wide basis and that the right to use frequency 6204 kc/s for this service be extended to all regions of the world.

Proposals

USSR/49(2) Item 2.1 :

It is proposed to consider the possibility of taking channels for ship and coast radiotelephone stations away from the AF portion of the 6123 - 6237 kc/s band, allocated to wideband telegraphy, facsimile and special transmissions (see also the proposal concerning Agenda Item 3).

ARCHIVES U.I.T. GENÈVE

Ref.

USSR/49(3) Item 2.2 :

It is recommended that the possibility be considered of improving the safety service by allocating for radiotelephone traffic between ships engaged in search and rescue operations an additional frequency in the 3155 - 3200 kc/s band, for example 3158 ± 3 kc/s, used exclusively by the Maritime Mobile Service; this would be at the expense of the mobile and fixed stations. It is also recommended that the right to use frequency 6204 kc/s for this service (see No. 1353 of the Radio Regulations) be extended to all regions of the world.

Ref.

Agenda Item 2.4 : The desirability of accommodating requirements for oceanographic communications.

Comments

In view of the importance of creating a world system for the transmission of oceanographic data, the need for radio frequencies for this system could be met at the expense of the bands allotted at present to the Maritime Mobile Service. However, specific frequencies cannot be allocated until certain organizational and technical questions have been settled and an international legal code governing a world system for the transmission of oceanographic data has been established. In this connection, we consider it advisable to recommend to the Inter-Governmental Oceanographical Commission (I.O.C.), and the World Meteorological Organization (W.M.O.) to prepare, for the next Administrative Conference of the I.T.U., a definite plan for the creation of a network of oceanographic stations to collect and transmit information, an international legal code for the system, and other essential data so that a sound technical assessment and examination can be made of the system's working frequency requirements.

Proposal

USSR/49(4) It is proposed that the question of allocating frequency bands for the oceanographic service be examined after the competent organizations, (I.O.C., W.M.O.), have drawn up a legal code for the system, a plan showing the location of oceanographic stations, their system of operation, the systems for collecting and transmitting oceanographic information, and other technical questions. It will then be possible to make a proper assessment of its radio frequency requirements.

Ref.

Agenda Item 2.5 : Frequencies to be used by coast stations for wideband telegraphy, facsimile, and special transmission systems.

Proposal

USSR/49(5) It is proposed that existing arrangements for the registration and use of frequencies in these services be maintained.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 50-E
8 May 1967
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PLENARY MEETING

UNION OF SOVIET SOCIALIST REPUBLICS

Proposals for the work of the Conference

Ref. Agenda Item 3: Revision of Appendices 15, 17 and 25 to the Radio Regulations.

Comments

In view of positive experience gained in the use of frequencies for coast radiotelephone stations, in accordance with Appendix 25 to the Radio Regulations (Geneva 1959), the Soviet Administration considers that planned system for the use of frequencies by these stations must be retained. In this connection, it is considered that some essential corrections must be made to Appendix 25, in accordance with the wishes of administrations, and provision made therein for the prospective use of single-sideband operation. After the conversion to single-sideband operation has been completed, Appendix 25 will have to be reviewed once more in order to redistribute single-sideband channels among the various countries.

Proposal

USSR/50(6) It is proposed that Appendix 15 be revised taking into account the higher frequency stability obtained with radio equipment, and that the spacing between radiotelegraph channels be slightly reduced (1.5 - 2 times). For the allocation of new telegraph channels, the frequency limits should be equal to 100 c/s. It is also proposed that the possibility be examined of allocating channels for radiotelephone stations of the maritime mobile service from the AF portions of the frequency bands assigned to ships for wideband telegraphy, facsimile, and special transmissions.

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Ref.

USSR/50(6) (cont.)

It is proposed that Appendix 25 be maintained, but adjusted to take into account the wishes of administrations and the projected transfer to single-sideband operation, keeping strictly to the planned allocation of frequencies for coast radiotelephone stations.

Once the transfer to single-sideband operation has been completed, Appendix 25 should again be revised in order to redistribute single-sideband channels among the various countries.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 51-E
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PLENARY MEETING

UNION OF SOVIET SOCIALIST REPUBLICS

Proposals for the work of the Conference

Ref. Agenda Item 5 : Classes of emission to be used on the international distress and calling frequencies 500 kc/s and 2182 kc/s.

Proposal

USSR/51(7) It is proposed that the classes of emission recommended by the C.C.I.R. be adopted (Recommendation 438, Oslo 1966).

ARCHIVES U.I.T. GENEVE

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 52-E
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PLENARY MEETING

UNION OF SOVIET SOCIALIST REPUBLICS

Proposals for the work of the Conference

Ref. Agenda Item 6 : Examination of the pertinent portions of the revised International Code of Signals.

Proposal

USSR/52(8) It is proposed that the proposals prepared by I.M.C.O. for the amendment of the code of signals be adopted.

ARCHIVES U.I.T. GENÈVE

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 53-E
8 May 1967
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PLENARY MEETING

UNION OF SOVIET SOCIALIST REPUBLICS

Proposals for the work of the Conference

Ref. Agenda Item 7.4: Hours of service for ship stations

Comments

With regard to the hours of service of ship radio stations, it is proposed that present arrangements be maintained. Years of experience in the application of these hours do not suggest that there is any need to change them. Moreover, it should be remembered that the operation of coast radio stations which provide a communications service with ships at sea is organized in the light of ships' hours of operation and that any change in the latter would involve changing the system of operation of coast stations; new working frequencies would also be needed and the existing distribution of frequencies among the coast stations of the world would be disturbed.

USSR/53(9)

Proposal

It is proposed that the existing arrangements for hours of service of ship stations be maintained.

ARCHIVES U.I.T. GENÈVE

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 54-E
19 May 1967
Original : English

PLENARY MEETING

COMMONWEALTH OF AUSTRALIA

Proposals for the work of the Conference

Ref.

ARTICLE 1

Terms and Definitions

AUS/54(1) MOD 37. Port Operations Service : A maritime mobile service in or near a port, between ~~coast~~ port stations and ship stations, or between ship stations, in which messages are restricted to those relating to the movement and the safety of ships and, in emergency, to the safety of persons.

AUS/54(2) ADD 37A. Port Station : A Coast Station in the Port Operations Service

Reasons :

Appendix 10 shows the service document symbol FP meaning Port Station which is not defined. There is a need to retain the symbol FP in service documents particularly in the List of Coast Stations to enable the coast stations providing only a port operations service to be readily identified.

ARCHIVES U.I.T. GENÈVE

Ref.

ARTICLE 5

Frequency Allocations 10 kc/s to 40 Gc/s

AUS/54(3) MOD 197. In Australia, North Borneo, Brunei, Sarawak, Singapore, China, Indonesia, Malaya, New Zealand and the Philippines, the band 1605 - 1800 kc/s is also allocated on a permitted basis to the aeronautical radionavigation service, the stations of which shall use a mean power not exceeding 2 kW.

Reasons :

In Australia, it has been necessary to utilise the 1605 - 1800 kc/s band for the aeronautical radionavigation service in addition to the Fixed and Mobile Services. This sharing arrangement is still required.

ARTICLE 7

Special Rules Relating to Particular Services

AUS/54(4) MOD 455 (3) In Regions 2 ~~and 3~~ the band 2088.5 - 2093.5 kc/s is reserved exclusively for calling (telegraphy only).

ARTICLE 23

Operators' Certificates for Ship and Aircraft Stations

AUS/54(5) MOD 861 §6 (1) The holder of a first or second class radiotelegraph operator's certificate may carry out the radiotelegraph or radiotelephone service of any ship or aircraft ~~radiotelephone~~ station.

Ref.

AUS/54(5) (contd.)

Reasons :

To clarify that the holder of a first or second class radiotelegraph operator's certificate is not debarred from carrying out the service of radiotelegraph stations.

ARTICLE 25

Working Hours of Stations in the Maritime and Aeronautical Mobile Services

AUS/54(6) ADD 937.1 However ship stations of the third category operating within Zone C shall provide service at least during the first half-hour of the second period of service for ships of the second category performing an eight hour service in accordance with the provisions of Appendix 12.

Reasons :

There have been many instances in the Australian area where ships of the third category, known to be within the service range of a coast station, have failed to reply to calls directed to them and repeated at the times specified in No. 937. Messages for these ships have therefore been delayed, and in several cases, some anxiety has arisen for the safety of the ships concerned.

ARTICLE 28

Conditions to be observed by Mobile Stations

AUS/54(7) MOD 978 817. In Regions 2 ~~and 3~~, any radiotelegraph station installed on board a ship which uses frequencies in the band 2088.5 - 2093.5 kc/s for call and reply shall be provided with at least one other frequency in the authorized bands between 1605 and 2850 kc/s.

Ref.

ARTICLE 32

Use of Frequencies for Radiotelegraphy in the Maritime Mobile and Aeronautical Mobile Services

Section II. Bands between 405 and 535 kc/s

AUS/54(8) MOD 1122.1 Furthermore, subject to the conditions specified in No. 1122, the transmission of a single short radiotelegram on 500 kc/s is permitted within the service areas of certain coast stations of ~~Australia~~, India, Indonesia and Pakistan. These countries shall endeavour to meet in full the provisions of this Article before the next Administrative Radio Conference.

Reasons :

This provision is not now required for Australian coast stations.

AUS/54(9) SUP Section IV. Additional provisions applicable in Region 3 only

SUP 1139

SUP 1140

SUP 1141

SUP 1142

SUP 1143

SUP 1144

(MOD) Section ~~V~~ IV. Bands between 4000 and 27 500 kc/s

(MOD) Section ~~VI~~ V. Aeronautical Mobile Service

Ref.

AUS/54(9)
(contd.)

Reasons :

The 2 Mc/s maritime mobile radiotelegraph service is not required in Australia and since there are no assignments listed between 2088.5 and 2093.5 kc/s in the I.F.L. for coast stations in Region 3 it is believed that the service is also not required in other Region 3 countries. As the band 2065 - 2107 kc/s will still remain allocated to the maritime mobile service, the amendments proposed would not prohibit an Administration in Region 3 from utilising channels in the 2088.5 - 2093.5 kc/s band for radiotelegraph calling purposes.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

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29 May 1967
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PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item 4 :

Possible Revision of Appendix 18 to the Radio Regulations.

U.S. Proposal :

a) Amend Article 1,
Article 35, and
Appendix 18;

b) Amend Appendix 18,
Appendix 19, and
Adopt Draft Resolution No. ___;

c) Amend Article 5, and
Article 35.

d) Information only. Designation of 156.80 Mc/s - in U.S. Waters - as the VHF Distress Frequency;

Ref.	Article 1	
USA/55(45)	ADD 37A	Navigation Communications. Safety communications in the maritime mobile service pertaining to the manoeuvring of vessels or the directing of vessel movements. Such communications are primarily for the exchange of information between ship stations and secondarily between ship stations and coast stations.

ARCHIVES U.I.T. GENÈVE

Ref.	Article 35		
USA/55(46)	ADD	1363A	(6) The frequency 156.65 Mc/s is designated as the navigational communication channel (see Nos. 37A, 1363B and 1363C).
	ADD	1363B	(7) The navigational communication channel (see No. 1363A) may be used for both calling and working and may be specified for such use by administrations.
	ADD	1363C	(8) To facilitate a continuous watch on the navigational communication channel 156.65 Mc/s, administrations should encourage the provision by their ship stations of a separate capability for this purpose.

Reasons :

To designate 156.65 Mc/s for use on a world-wide basis for navigational communications.

Background :

Coordination is currently in process to include in U.S. statutes, applicable to various classes of vessels when underway or engaged in operations on certain of the navigable waters of the U.S., a mandatory requirement to carry VHF radiotelephone equipment capable of operating on a frequency within the band 156 to 174 Mc/s for the exchange of navigational information. This channel would be designated exclusively for navigational communications and would include the following uses :

a) To enable persons directing the movement of vessels to communicate with one another, with the operators of bridges, locks or other shore based installations and floating plants that physically restrict or affect vessel movements, so as to inform one another of their intentions and resolve manoeuvring situations between approaching vessels.

b) To enable shore stations to relay navigational information between approaching vessels whenever physical conditions prevent direct communication between them and the information is necessary for navigational safety.

Ref.

USA/55(46)
(cont.)

Brief transmissions containing the following types of information are necessary for safety of navigation and are contemplated for :

1) Departure from a pier, dock or anchorage;

2) Entry into a confined waterway;

3) Estimated time of arrival at a pier, dock or anchorage;

4) Taking on and discharging of pilots.

c) To enable all stations to communicate as necessary while on the scene during a maritime distress or emergency.

The usage of the radiotelephone on the navigational information frequency would be limited to persons engaged in piloting and directing the movement of the vessel. Such vessels would be required to maintain a listening watch on the navigational communications channel. VHF equipment installed aboard such vessels would be required to be maintained in effective operating condition. The proposed amendment of Appendix 18 and the inclusion in Article 1 (No. 37A) of the definition of "navigational communications" is intended to provide world-wide availability of a common channel for this purpose.

Ref.

USA/55(47) MOD APPENDIX 18

Table of Transmitting Frequencies for the Band 156-174 Mc/s * for Radiotelephony in the International Maritime Mobile Service

(See Article 35)

Channel designators	Transmitting Frequencies (Mc/s)		Inter-ship	Port Operations		Public Correspondence	Navigational
	Ship Stations	Coast Stations		Single Frequency	Two Frequency		
1	156.05**	160.65			10	8	
2	156.10	160.70			8	10	
3	156.15**	160.75			9	9	
4	156.20	160.80			11	7	
5	156.25	160.85			6	12	
6	156.30		1				
7	156.35	160.95			7	11	
8	156.40		2				
9	156.45	156.45	5	5			
10	156.50		3	***			
11	156.55	156.55		3			
12	156.60	156.60		1			
13	156.65	156.65	~~4~~	~~4~~			1
14	156.70	156.70		2			
15	Guard band 156.725 - 156.775 Mc/s						
16	156.80	156.80	CALLING AND SAFETY				
17	Guard band 156.825 Mc/s - 156.875 Mc/s						
18	156.90	161.50			3		
19	156.95	161.55			4		
20	157.00	161.60			1		
21	157.05	156.05** or 161.65			5		
22	157.10	161.70			2		
23	157.15	156.15** or 161.75				5	
24	157.20	161.80				4	
25	157.25	161.85				3	
26	157.30	161.90				1	
27	157.35	161.95				2	
28	157.40	162.00				6	

*/ For assistance in understanding the Table, see notes a) to h) below.
** See Note e) *** See Note f).

Ref.

USA/55(47)
(cont.)

APPENDIX 18

Notes referring to the Table

NOC a) The figures in the column headed "Intership" indicate the normal sequence in which channels should be taken into use by mobile stations.

NOC b) The figures in the columns headed "Port Operations" and "Public Correspondence" indicate the normal sequence in which channels should be taken into use by each coast station. However, in some cases, it may be necessary to omit channels in order to avoid harmful interference between the services of neighbouring coast stations.

NOC c) During ice seasons, ship stations shall avoid harmful interference to communications on 156.30 Mc/s (Channel 6) between icebreakers and assisted ships.

NOC d) Administrations should, as far as possible, arrange that ship stations fitted with the channels corresponding to the figures in a circle can obtain a reasonably adequate use of available services.

NOC e) The frequencies 156.05 and 156.15 Mc/s marked ** are used as ship station frequencies in Channels 1 and 3 respectively and as coast station frequencies in Channels 21 and 23 respectively when these latter are used in the special semi-duplex public correspondence systems employed by France and Belgium, with 1 Mc/s separation between transmit and receive frequencies.

NOC f) Channel 10 marked *** is also available for port operations in Region 2.

MOD g) In the United States of America, the frequencies 156.35, 156.90, 156.95, 157.05, 157.10, and 157.15 ~~157.20~~ Mc/s are not available for use in accordance with this Table. These frequencies will be used for other functions in the maritime mobile service.

Ref.

USA/55(47) (cont.) ADD h) The intermediate frequencies between (spaced 25 kc/s from) those listed in the Table may be assigned to stations in the maritime mobile service for radiotelephony to meet national requirements. In assigning these intermediate frequencies, administrations shall give full consideration to adequate technical measures for preventing harmful interference to stations operating on frequencies listed in the Table.

APPENDIX 19

USA/55(48)

Technical characteristics for transmitters and receivers used in the maritime mobile service in the 156-174 Mc/s band

(See Articles 28 and 35 and Appendix 18)

NOC 1. Only frequency modulation with a pre-emphasis of 6 db/octave (phase modulation) shall be used.

MOD 2. The frequency deviation corresponding to 100% modulation shall approach ~~15~~ 5 kc/s as nearly as practicable. In no event shall the frequency deviation exceed ± ~~15~~ 5 kc/s. However, it is recognized that under certain conditions, the percentage of modulation may be decreased to avoid adjacent channel interference.

NOC 3. When transmitting on any of the frequencies designated in the Table in Appendix 18, the emission of each station shall be polarized vertically at the source.

NOC 4. The audio frequency bandwidth shall be limited to 3000 c/s.

Ref.

USA/55(49)

Draft Resolution No. ___

Relating to permissive use of the intermediate (25 kc/s) channels between the (50 kc/s) channels listed in Appendix 18 in the band 156-174 Mc/s for radiotelephony in the maritime mobile service

The World Administrative Radio Conference, Geneva, 1967,

considering,

a) the trend towards congestion and saturation on the maritime mobile radiotelephony frequencies at 2 Mc/s, and above, in various areas of the world;

b) the capability of VHF to fulfil many of the short-distance communication requirements, both national and international, in the maritime mobile service;

c) the rapidly expanding use of VHF which is being made to meet national and international short-distance communication needs in the maritime mobile service, which cannot be fully met by the existing channels;

d) that a reduction in the spacing between channels from 50 kc/s to 25 kc/s would approximately double the number of assignable maritime mobile radiotelephony channels in the 156-174 Mc/s band;

e) that the need for additional VHF channels is not uniformly distributed throughout the world, a situation such that some administrations require access to an increased number of channels, while other administrations do not, and will not in the near future, require additional VHF channels;

f) that, on the one hand, those administrations which need additional VHF channels should not be precluded from their use by the lack of need by other administrations;

g) that, on the other hand, those administrations which do not need additional VHF channels should not be unduly inconvenienced in order that an increased number of channels may be made available to other administrations;

believing,

that full encouragement should be given to the use of VHF in order to lessen the congestion on maritime mobile service frequencies at 2 Mc/s, and above;

Ref.
USA/55(49) (cont.)

resolves,

1. That assignments to stations of the intermediate (25 kc/s) channels between those appearing in Appendix 18 shall be on a national basis; or, as appropriate, by area or regional agreement;

2. That those channels of Appendix 18 which were in use by an administration for radiotelephony in the maritime mobile service on the effective date of the Final Acts of this Conference should be accorded protection from harmful interference from use of the intermediate (25 kc/s) channels between those (50 kc/s) channels heretofore listed in Appendix 18;

3. That, where use of the intermediate (25 kc/s) channels between those listed in Appendix 18 is required by an administration, adequate technical measures should be employed to avoid harmful interference to operations on the (50 kc/s) channels heretofore listed in Appendix 18;

and noting,

i) that the reduction of frequency deviation of ship and coast station transmitters from ± 15 kc/s to ± 5 kc/s is an essential step to maintaining compatibility between ship and coast station equipments in an environment where channel bandwidths of both 50 kc/s and 25 kc/s are employed;

ii) that the reduction of frequency deviation of ship and coast station transmitters from ± 15 kc/s to ± 5 kc/s will permit those administrations desiring to do so to equip their ship and coast stations with new or modified receiving equipment having the capability of operating in a channel spacing environment of 25 kc/s;

further resolves,

to urge administrations to reduce the frequency deviation of ship and coast station transmitters from ± 15 kc/s to ± 5 kc/s at the earliest practicable date, to the end that all such changes shall have been accomplished by the effective date of the Final Acts of this Conference.

Reasons :

To provide for the permissive use of intermediate channels between those appearing in Appendix 18; amendment of associated technical criteria; and other consequential amendments.

Ref.
USA/55(49)
(cont.)

Background :

The United States proposes amendment of Appendix 18 and Appendix 19 and the adoption of Draft Resolution No. ___ to permit those administrations desiring to do so to employ a reduced channel spacing of 25 kc/s on frequencies used for VHF radiotelephony in the international maritime mobile service.

The United States has in excess of 4,000,000 registered craft for non-commercial or pleasure purposes of which perhaps 10% will wish to use radio in the maritime safety system. Although the communications are of a short-distance nature, the needs for and use of frequencies by these craft differ in substance from the needs and use of frequencies by commercial vessels. More than 100,000 of these craft are authorized to employ VHF, or frequencies at 2 Mc/s. The United States has considered (a) how best to meet the growing need of these craft for short-distance communications, and (b) various means for reducing the present congestion on frequencies at 2 Mc/s.

While the mandatory transition at 2 Mc/s from double sideband to single sideband emission will increase the number of channels available, that number will not be sufficient to effectively reduce the current congestion. Since much of the short-distance communications of these non-commercial craft can be accommodated on VHF, and since use of VHF permits effective reduction in this congestion, the United States plans to meet this growing need through the use of VHF. Such use, coupled with the mandatory transition to single sideband, is expected to substantially reduce the congestion at 2 Mc/s. The number of frequencies available in the United States in the VHF radiotelephony maritime mobile band 156-174 Mc/s, however, is insufficient to accommodate the expanded use of VHF by the non-commercial craft. It is necessary, therefore, to increase the number of available frequencies by channel splitting, that is, to reduce the channel bandwidth from 50 kc/s to 25 kc/s and, within the United States, to re-allot the intermediate (or new) channels.

It is recognized that this United States requirement may differ from requirements of other administrations with respect to the demand for and use of additional channels. VHF operations by non-commercial craft to satisfy this United States requirement will occur in the same waters as those used by commercial transport vessels and on the same or adjacent frequencies. To the extent practicable, therefore, the two types of operation should be compatible.

Ref.
USA/55(49)
(cont.)

Based on informal discussions with representatives of other administrations during the two years prior to the W.A.R.C. (Marine) it is apparent that not all administrations favour a reduction in channel spacing from 50 kc/s to 25 kc/s. On the one hand, administrations which desire not to reduce channel spacing should not be required to do so. On the other hand, administrations which require more VHF channels should be permitted to reduce channel spacing.

Technical considerations :

From the technical point of view, based on many thousands of equipments in the United States at 150 Mc/s and at 450 Mc/s, the reduction in spacing to 25 kc/s is well within the state of the art and, in the practical sense, is readily attainable. Examination of the technical factors bearing on permissive conversion to a reduced channel spacing, indicates that if international agreement can be obtained to change of only one technical criterion - the reduction of frequency deviation to ± 5 kc/s - this will be sufficient to permit those administrations which favour, and those which do not favour, channel reduction to pursue their separate courses. System performance, the measure of whether the system performs satisfactorily or poorly, could then be left to the national regulations of the various administrations during the transition period prior to inclusion in the Radio Regulations of technical criteria appropriate to 25 kc/s channelling.

With regard to system performance, to facilitate use of a channel spacing of 25 kc/s, the United States has under consideration the amendment of its national regulations to provide the following technical criteria. These criteria are deemed necessary to assure a satisfactory system performance.

1. Frequency deviation of ship and coast station transmitters : ± 5 kc/s;

2. Frequency tolerance: ship stations : ± 10 parts per million;

   coast stations : ± 2.5 parts per million;

3. Transmitter post-limiter audio roll-off filter :

   "An audio low-pass filter shall be installed between the modulation limiter and the modulated (radio frequency) stage and, at audio frequencies between 3 kc/s and 20 kc/s,

Ref.
USA/55(49)
(cont.)

shall have an attenuation greater than the attenuation at 1 kc/s by at least 60 $\log_{10}$ (f/3) decibels, where "f" is the audio frequency in kc/s. At audio frequencies above 20 kc/s the attenuation shall be at least 50 decibels greater than the attenuation at 1 kc/s."

In accord with the foregoing, within its national regulations, the United States will leave to the discretion of the user the alternative of accepting adjacent channel interference in receiving equipment, or modification of that equipment to reduce the acceptance bandwidth to such that adjacent channel transmissions are not interfering. The reduction of transmitter frequency deviation, the installation of a post-limiter audio roll-off filter, and the tightening of ship and coast station frequency tolerances, will adequately limit the transmitted energy to within a 25 kc/s bandwidth. This satisfies the requirement, where regulation is limited to transmitting equipment alone.

From an operational point of view, however, the selectivity and frequency stability of receiving equipment are essential elements of system performance. In the United States, as in the I.T.U., these receiver elements are not regulated, but are left to the discretion of the user. The receiver frequency stability may, however, reasonably be assumed to be the same as the frequency stability of the transmitter at the same station.

As an integral part of its proposal to amend Appendix 19, paragraph No. 2, to reduce the frequency deviation from ± 15 kc/s to ± 5 kc/s, the United States proposes also that the W.A.R.C. adopt a schedule for completing the conversion to ± 5 kc/s. Since the modification of transmitting equipment to reduce the frequency deviation to ± 5 kc/s is technically uncomplicated, the United States proposes the W.A.R.C. adopt an effective date of 1 January, 1969.

The reduction in transmitter frequency deviation to ± 5 kc/s will permit those coast and ship stations desiring to do so to modify receiving equipment for operation with a channel spacing of 25 kc/s. Also, those administrations which desire to do so may then place the intermediate (or new) channels in service as necessary to fulfil their operational requirements.

In regard to receiving equipment which is adjusted for a frequency deviation of ± 15 kc/s, it is noted that a signal having a frequency deviation of ± 5 kc/s will produce an output, at the detector,

Ref.
USA/55(49)
(cont.)

which is 9 to 10 decibels lower than a comparable signal having a frequency deviation of ± 15 kc/s. It is also noted that the audio frequency gain (volume) control of the receivers generally provide a margin substantially in excess of 10 decibels. On this basis, it would not be essential that the audio gain of receiving equipment be modified in advance of the decrease in frequency deviation to ± 5 kc/s.

In regard to reception of signals having a frequency deviation of ± 15 kc/s by receiving equipment which is adjusted for a frequency deviation of ± 5 kc/s, it is anticipated that unsatisfactory distortion may occur. The Unites States proposal to reduce the frequency deviation of transmitters to ± 5 kc/s will avoid this situation.

Ref.	Article 5		
USA/55(50)	MOD	287	The frequency 156.80 Mc/s is the international Safety and calling frequency for the maritime mobile VHF radiotelephone service. Administrations shall ensure that a guard-band of ~~75~~ 37.5 kc/s on each side of the frequency 156.80 Mc/s is provided. The conditions for the use of this frequency are contained in Article 35. In the bands 156.025-157.425 Mc/s, 160.625-160.975 Mc/s and 161.475-162.025 Mc/s, each administration shall give priority to the maritime mobile service on only such frequencies as are assigned to stations of the maritime mobile service by that administration (see Article 35). Any use of the frequencies in these bands by stations of other services to which they are allocated, should be avoided in areas where such use might cause harmful interference to the maritime mobile VHF radiotelephone service.

Ref.	Article 35		
USA/55(51)	MOD	1363	(5) All emissions in the band ~~156.725~~ 156.7625 - ~~156.875~~ 156.8375 Mc/s capable of causing harmful interference to the authorized transmissions of stations of the maritime mobile service on 156.80 Mc/s are forbidden.

Reasons :

To provide for the reduction of the guard band on each side of 156.80 Mc/s.

Ref.

USA/55(51)
(cont.)

Background :

Nos. 287 and 1363 of the Radio Regulations, Geneva, 1959, provide guard bands, including the communication channel of 156.80 Mc/s, from 156.725 to 156.875 Mc/s. With inclusion in the Radio Regulations of provision for permissible use of the intermediate channels between those appearing in Appendix 18, it is appropriate to also reduce the guard bands of 156.80 Mc/s. Accordingly, it is proposed that Article 5 (No. 287) and Article 35 (No. 1363) be amended to reduce the guard bands to 37.5 kc/s either side of 156.80 Mc/s in lieu of the existing 75 kc/s.

Information only :

Designation of 156.80 Mc/s - in United States waters - as the VHF distress frequency

In the United States there are more than 100,000 vessels of the non-commercial or pleasure craft category, which are currently authorized to operate on VHF and/or frequencies at 2 Mc/s. Coordination is currently in process which looks to the establishment of national regulations to more adequately fulfil the growing requirements of this category of vessel on very high frequencies. As a part of that coordination, consideration is being given to encouraging the use of VHF and, to the extent practicable, to discouraging the use of 2 Mc/s frequencies, where VHF will fulfil the requirement.

Further, in the mandatory transition from double sideband to single sideband (at 2 Mc/s) it is anticipated that, wherever practicable, current double sideband equipment would be replaced by VHF equipment. In consequence, there will be a large number of United States vessels which operate primarily in United States territorial waters and which will have only VHF equipments.

Further, an extensive programme is nearing completion to install VHF at coast stations throughout the United States coast line and on inland waters, which includes both reception

Ref.

USA/55(51) (cont.)

and transmission capability on 156.80 Mc/s. This major transition to VHF, coupled with the compulsory conversion to SSB, is expected to provide relief to the current congestion on 2 Mc/s frequencies, while improving communications of both commercial and non-commercial vessels.

Since there will be a large number of United States registry vessels which have only the capability to operate on VHF, it is necessary to provide a common VHF distress frequency. To fulfil that need, the United States has under consideration amendment of its national regulations to designate 156.80 Mc/s, in addition to its current uses, as the national VHF distress frequency.

Reasons :

To apprise other administrations of United States plans to designate 156.80 Mc/s, in addition to its other uses, as the VHF distress frequency in United States waters. No amendment of the Radio Regulations, Geneva, 1959, is proposed.

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Ref. Agenda Item 2 - Questions concerning the exclusive HF Maritime Mobile bands.

G/56(1) 2.1 Frequency bands for coast and ship radiotelephone stations in the 6 Mc/s band

The HF radiotelephone service has operated for many years without a 6 Mc/s allocation and experience on radiotelegraphy shows that, because of long-standing interference from out-of-band broadcasting stations during the hours of darkness, 6 Mc/s frequencies have a very limited value when both 4 and 8 Mc/s frequencies are available, although they would provide additional communication channels during daylight hours. However, in Appendix 15, Section B 11 kc/s are allocated for ship channels operating in the SSB mode. As a result of other proposals submitted under Agenda Item 3, it is possible to make available a corresponding coast station allocation and it is proposed that 6514.5 kc/s to 6525 kc/s be allocated for this purpose. Fur full details see Agenda Item 3, to follow.

Agenda Item 2.2 - Frequencies for intership radiotelephone traffic

No proposal is submitted.

Reasons :

Such information as is available to the United Kingdom suggests that intership communications are of a national rather than an international nature and consequently there seems to be little justification for a specific allocation of frequencies for this purpose on an international basis. The existing arrangements (see RR 1255) are adequate.

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Ref.

2.3 The possible use of the high traffic bands by tankers of 12,500 tons gross

Proposal :

G/56(2) MOD 1156 § 20. (1) Stations installed on ships handling a large volume of traffic shall use the high traffic band at the discretion of the Administration controlling the ship station concerned (see No. 1151).

Reasons :

To permit Administrations to decide for themselves the ship stations that shall use this band.

At the Administrative Radio Conference, Atlantic City, 1947, a band of working frequencies in each of the ship telegraph bands was set aside for use by passenger ships and whaling factory vessels. The use of these bands was extended at the Administrative Radio Conference, Geneva, 1959, to include tankers above 40,000 gross tons and other cargo ships above 12,500 gross tons handling a large volume of traffic and they were renamed "high traffic" ship bands.

Since that date the amount of traffic dealt with has fallen considerably with the result that the bands are now lightly loaded. An analysis of the United Kingdom long distance service indicates that approximately five times as much traffic is handled in the "low traffic" bands as is handled in the "high traffic" bands, i.e. a ratio of 5 : 1.

In the "low traffic" bands there is a very uneven distribution of traffic between the assignable working frequencies in Group A and those in Group B. It would seem that all ships offer their frequency in Group A for the passing of traffic and only use the corresponding frequency in Group B when it is not possible to use the first choice.

Any relationship that there may have been between the gross tonnage of a ship and the traffic handled, no longer holds and it is thought that if any division between high and low traffic ships is still required it might well be left to Administrations to decide on whatever grounds they think fit. There is therefore no objection to tankers of 12,500 tons gross being included.

Ref.

2.5 Frequencies to be used by coast stations for wideband telegraphy, facsimile and special transmission systems

Proposal :

Amend heading of No. 453 to read :

G/56(3) MOD 453 (g) Coast stations, telegraphy, facsimile and special transmission systems.

Reasons :

To make it clear that the bands concerned can be used for wideband telegraphy, facsimile, special transmission systems, teleprinter, data transmission and manual telegraphy.

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Agenda Item 4 :

Possible revision of Appendix 18 to the Radio Regulations

Comments

Operational experience of port operations services has shown the desirability of providing for :

a) the use by both ships and coast stations of more single frequency channels;

b) the use, on low power, of specific channels for berthing communications.

These requirements could be met as follows :

i) Channels 8 and 10 to be designated as 6th and 7th choice for Port Operations Single Frequency use in addition to their present designation for intership communications;

ii) Channels 9 and 13 to be designated for berthing communications using low power (1 watt) in addition to their present use.

In addition there is a need of channels for "on board" communications which could be met by the use of 161.35 Mc/s (the complementary frequency to 156.75 Mc/s, Channel 15) and 161.45 Mc/s (the complementary frequency to 156.85 Mc/s, Channel 17) with a maximum power of 250 milliwatts.

Although these frequencies are not in that part of the mobile band in which the maritime mobile service has priority (RR287) they have been chosen because they are the complementary frequencies to the ship frequencies (Channels 15 and 17) in the guard-band for 156.80 Mc/s and may not have been assigned nationally to other mobile services.

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Detailed proposals are the following :

The channels in Appendix 18 are based on 50 kc/s spacing. The development of maritime mobile services on VHF is increasing rapidly and is likely to lead eventually to saturation of these channels. It is desirable, therefore, that provision should be made by the Conference, for reducing the channel spacing when necessary.

Detailed proposals to follow.

Ref. **Proposals**

G/57(4) MOD APPENDIX 18

Table of Transmitting Frequencies for the Band 156-174 Mc/s for Radiotelephony in the International Maritime Mobile Service *)
(See Article 35)

Amend to read :

	Channel designators	Transmitting Frequencies (Mc/s)		Inter-ship	Port Operations		Public Correspondence
		Ship Stations	Coast Stations		Single Frequency	Two Frequencies	
	1	156.05**)	160.65			10	8
	2	156.10	160.70			8	10
	3	156.15**)	160.75			9	9
	4	156.20	160.80			11	7
	5	156.25	160.85			6	12
	6	156.30		(1)			
	7	156.35	160.95			7	11
MOD	8	156.40		(2)	6		
MOD	9	156.45	156.45	5	5****)		
MOD	10	156.50		3	7		
	11	156.55	156.55		3		
	12	156.60	156.60		(1)		
MOD	13	156.65	156.65	4	4****)		
	14	156.70	156.70		(2)		
MOD	15	Guard band 156.725 - 156.775 Mc/s *****)					
	16	156.80	156.80	CALLING AND SAFETY			
MOD	17	Guard band 156.825 - 156.875 Mc/s *****)					
	18	156.90	161.50			3	
	19	156.95	161.55			4	
	20	157.00	161.60			(1)	
	21	157.05	156.05**) or 161.65			5	
	22	157.10	161.70			(2)	
	23	157.15	156.15**) or 161.75				5
	24	157.20	161.80				4
	25	157.25	161.85				(3)
	26	157.30	161.90				(1)
	27	157.35	161.95				(2)
	28	157.40	162.00				6

*) For assistance in understanding the Table, see notes a) to i) below.
MOD **) See Note e). ****) See Note h). *****) See Note i).

Ref.

G/57(4) (cont.) MOD Notes referring to the Table (page 436)

Note f) - Delete

Reasons :

Consequential upon amendment to Channel 10 - see Table .

Add new :

Note h) - Channels 9 and 13 marked ****) may be used, on low power (1 watt), for berthing operations.

Reasons :

To provide for berthing operations.

Add new :

Note i) - The complementary frequencies 161.35 Mc/s and 161.45 Mc/s are available, on low power (250 milliwatts), for use "on board" ship.

Reasons :

To provide for internal communications on ships.

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Agenda Item 5

Classes of emission to be used on the international distress and calling frequencies 500 kc/s and 2182 kc/s

Comments

a) The use of A2H and A3H emissions on 500 kc/s and 2182 kc/s respectively are agreed.

b) In order to obviate difficulties in the operation of automatic devices for the reception of the radiotelegraph auto-alarm signal, caused by the use of strong class A1 signals on 500 kc/s, emissions on this frequency should be limited to classes A2 and A2H which shall be by the on-off keying of the modulated emission (see Article 2).

c) The necessary amendments to Articles 28 and 32 in respect of 2182 kc/s are contained in proposals for Agenda Item 1 to follow; those in respect of 500 kc/s are the following :

Proposals

ARCHIVES U.I.T. GENÈVE

Ref.

G/58(5) Article No.28

MOD	974	a) Send Class A2 or A2H emissions on 500 kc/s;[1]
ADD	974A	aa) Receive Class A2 and A2H emissions on 500 kc/s;[1]

Reasons :

To provide for the use of Class A2H emissions on 500 kc/s.

Ref.

G/58(5)
(Cont.)

ADD 974.1 [1]The type of A2 and A2H used shall be by the on-off keying of the modulated emission.

Reasons :

To ensure the correct operation of all types of radiotelegraph automatic devices for the reception of the radiotelegraph auto alarm signal.

ADD 976A. §15(bis) Only class A2 and A2H emissions shall be used in the band between 490-510 kc/s.

Reasons :

To protect auto-alarm equipment designed for A2 reception from strong A1 signals which can render reception inoperative.

MOD 992 §22(1) Any aircraft following a maritime course and required by national or international regulations to communicate, for safety purposes, with stations of the maritime mobile service shall be capable of transmitting and receiving on the frequency 500 kc/s, class A2 or A2H emissions, or on the frequency 2182 kc/s, class A3 or A3H emissions.

Reasons :

To provide for the use of class A2H and A3H emissions.

G/58(6) Article No. 32

MOD 1134 §13(1) Stations of the maritime mobile service open to public correspondence and using frequencies in the authorised bands between 405 and 535 kc/s shall, during their hours of service, remain on watch on 500 kc/s.

Reasons :

Last sentence deleted consequential upon amendment to No. 974 and new No. 974A.

Ref.

G/58(7) Appendix 20

MOD 1. a) Replace present text by:

a) The equipment shall respond to the alarm signal transmitted by the telegraphic emissions of at least Class A2 (see 974.1) or A2H.

Reasons :

To delete Class B (the permissive use of this type of emission ceased on 1 January, 1966; to provide for class A2H emissions, and in order to ensure the correct operation of all types of radiotelegraphy automatic alarm equipments.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
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Corrigendum No. 1 to
Document No. 59-E
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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Page 17, Ref. G/59(11), line 5

after "transmit"

insert "figures"

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Agenda Item 6 :

Examination of the pertinent portions of the revised International Code of Signals

Comments

Appendices 13 and 16

The United Kingdom proposes amendments to Appendices 13 and 16 and the relevant Radio Regulations to make provision for the use of the I.M.C.O. Phonetic Figure Spelling Table, and of a number of procedural signals recommended by I.M.C.O.

The principles that the I.T.U. "Q" Code should be limited to communication procedural signals and that duplication of codes should be avoided, are accepted. However, it is thought that deletion of those sections of the "Q" Code dealing with safety of navigation, medical assistance and search and rescue would inevitably result in an increase rather than a decrease of signalling as it would encourage the passing of messages in plain language or alternatively it would enforce use of the International Code of Signals between ships of the same nationality. The carriage of the International Code of Signals has been recommended by I.M.C.O. but it remains for administrations to decide whether or not its carriage should be compulsory and to what classes of ship this should apply, whereas the carriage of the Radio Regulations is compulsory on all ships fitted with radiotelegraph equipment. Until the carriage of the International Code of Signals becomes general it would seem desirable to retain at least some of the "Q" Codes dealing with safety of navigation, medical assistance and search and rescue.

Amendments to Articles 33 and 36, to Appendix 13 and Appendix 16 are the following :

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Ref. | Proposals

G/59(8)

Article 33

ADD 1216A To facilitate radiocommunications the service abbreviations given in Appendix 13 may be used.

Reasons :

To extend the use of these abbreviations to radiotelephony.

ADD 1216B When it is necessary to spell out certain expressions, difficult words, service abbreviations, figures, etc., the phonetic spelling tables in Appendix 16 shall be used.

Reaons :

To permit the use of the phonetic spelling table in Appendix 16 under more general conditions and the use of the proposed figure spelling table.

SUP 1284

Reasons :

No longer required - replaced by 1216A and 1216B.

MOD 1285 Delete last sentence.

Reasons :

Included in new 1216B.

G/59(9)

Article 36

ADD 1433A §24(bis) When there are language difficulties, the International Code of Signals should be used.

Reasons :

To provide for the use of the International Code of Signals.

Ref.

G/59(10)

APPENDIX 13

Amend heading to read :

MOD Miscellaneous Abbreviations and Signals to be used in Radio Communications

(See Articles 29 and 33)

Reasons :

To extend the use of these abbreviations to radiotelephony. Consequential upon new 1216A.

SECTION I

Q Code

Introduction

NOC 1 to 7

ADD 8. The Q code abbreviations marked "*" are not used in the maritime mobile service.

Reasons :

To denote those abbreviations which are no longer used in the maritime mobile service.

Abbreviations available for all services

List A. Proposed additions, amendments and deletions.

MOD Add "*" to the following :

QRE, QRF, QSE, QSN, QSU, QTK, QTL, QTM, QTN, QUG, QUI, QUJ, QUK, QUL, QUQ and QUW.

Reasons :

Consequential upon new paragraph 8 in the introduction.

Ref.

G/59(10) (contd.)

MOD QRM Insert :

(Maritime mobile service only)

Question :

Is my transmission being interferred with?

Answer or advice :

Your transmission is being interferred with :

(1. Nil
2. Slightly
3. Moderately
4. Severely
5. Extremely)

Reasons :

Clarification.

SUP QSC

Reasons :

Serves no useful purpose.

MOD QSD Insert :

(maritime mobile service only)

Question :

Are my signals mutilated?

Answer or advice :

Your signals are mutilated.

Reasons :

To include defects additional to bad keying, e.g., defects in automatic transmission.

Ref.

G/59(10) (contd.)

MOD QTI

Insert :

(Maritime mobile service only)

Question :

What is your TRUE course?

Answer or advice :

My TRUE course is ..... degrees.

Reasons :

The word "course" is more appropriate in maritime communications.

MOD QTQ

Question :

Can you communicate with my station by means of the International Code of Signals (INTERCO)?

Answer or advice :

I am going to communicate with your station by means of the International Code of Signals (INTERCO).

Reasons :

Consequential upon the introduction of the abbreviation INTERCO in Section II.

MOD QTS

Insert :

(Maritime mobile service only)

Question :

Will you send your call-sign for ..... seconds?

Answer or advice :

I will send my call-sign for ..... seconds.

Ref.

G/59(10)
(contd.)

Reasons :

To permit transmission of the call-sign for purposes other than for tuning or frequency measurement.

MOD QUN Question :

1. When directed to all stations :

   Will vessels in my immediate vicinity ..... or

   (in the vicinity of ..... latitude ..... longitude) or

   (in the vicinity of .....)

   Please indicate their position, TRUE course and speed?

2. When directed to a single station.

   Please indicate your position TRUE course and speed.

Answer or advice :

My position, TRUE course and speed are .....

Reasons :

For clarification.

ADD QUZ Question :

What is your MAGNETIC course?

Answer or advice :

My MAGNETIC course is ..... degrees.

Reasons :

To differentiate between True and Magnetic course.

Ref.

G/59(10) (contd.)

ADD QVA

Question :

What is the commercial value of my signals?

Answer or advice :

Your signals are :

(1. Uncommercial
2. Commercial with difficulty
3. Commercial)

ADD QVB

Question :

How many tapes have you to send?

Answer or advice :

I have ..... tapes to send.

ADD QVC

Question :

Shall I send a phasing signal for ..... seconds?

Answer or advice :

Send a phasing signal for ..... seconds.

ADD QVD

Question :

Shall I send my tape?

Answer or advice :

Send your tape.

Reasons :

To meet requirements of new services.

Ref.

G/59(10)
(contd.)

List B. Proposed additions, amendments and deletions.

MOD

Add "*" to the following :

QTN, QSN, QSU, QRE, QRF, QTK, QTL, QTM, QTN, QUG, QUJ, QUK, QUL, QSE, QUI, QUQ and QUW.

Reasons :

Consequential upon new paragraph 8 in the Introduction.

Quality of signals

ADD QVA

Question :

What is the commercial value of my signals?

Answer or advice :

Your signals are :

(1. Uncommercial
2. Commercial with difficulty
3. Commercial)

Reasons :

To meet requirements of new services.

Keying

MOD QSD

Insert :

(Maritime mobile service only)

Question :

Are my signals mutilated?

Answer or advice :

Your signals are mutilated.

Ref.

G/59(10)
(contd.)

Reasons :

To include defects additional to bad keying, e.g., defects in automatic transmission.

Interference

MOD QRM Insert :

(Maritime mobile service only)

Question :

Is my transmission being interferred with?

Answer or advice :

Your transmission is being interferred with :

(1. Nil
2. Slightly
3. Moderately
4. Severely
5. Extremely)

Reasons :

Clarification.

Adjustment of frequency

MOD QTS Insert :

(Maritime mobile service only)

Question :

Will you send your call-sign for ..... seconds?

Answer or advice :

I will send my call-sign for ..... seconds.

Ref.

G/59(10)
(contd.)

Reasons :

To permit transmission of the call-sign for purposes other than tuning or frequency adjustment.

ADD QVC Question :

Shall I send a phasing signal for ..... seconds?

Answer or advice :

Send a phasing signal for ..... seconds.

Reasons :

To meet requirements of new services.

Establishing communication

SUP QSC

Reasons :

Serves no useful purpose.

MOD QTQ Question :

Can you communicate with my station by means of the International Code of Signals (INTERCO)?

Answer or advice :

I am going to communicate with your station by means of the International Code of Signals (INTERCO).

Reasons :

Consequential upon the introduction of the abbreviation INTERCO in Section II.

Ref.

G/59(10)
(contd.)

Exchange of correspondence

ADD QVB

Question :

How many tapes have you to send?

Answer or advice :

I have ..... tapes to send.

ADD QVD

Question :

Shall I send my tape?

Answer or advice :

Send your tape.

Reasons :

To meet requirements of new services.

Movement

MOD QTI

Insert :

(Maritime Mobile Service only)

Question :

What is your true course?

Answer or advice :

My true course is ..... degrees.

Reasons :

The word "course" is more appropriate in maritime communications.

Ref.

G/59(10) (contd.) MOD QUN Question :

1. When directed to all stations :

   Will vessels in my immediate vicinity ..... or

   (in the vicinity of ..... latitude ..... longitude) or

   (in the vicinity of .....)

   please indicate their position, TRUE course and speed?

2. When directed to a single station.

   Please indicate your position, TRUE course and speed.

Answer or advice :

My position, TRUE course and speed are .....

Reasons :

Clarification.

ADD QUZ Question :

What is your MAGNETIC course?

Answer or advice :

My MAGNETIC course is ..... degrees.

Reasons :

To differentiate between True and Magnetic course.

Ref.

G/59(10)
(contd.)

Search and rescue

MOD QUN

1. When directed to all stations :

Will vessels in my immediate vicinity ..... or

(in the vicinity of ..... latitude ..... longitude) or

(in the vicinity of .....)

please indicate their position, TRUE course and speed?

2. When directed to a single station :

Please indicate your position, TRUE course and speed.

Answer or advice :

My position, TRUE course and speed are .....

Reasons :

For clarification.

ADD QUZ

Question :

What is your MAGNETIC course?

Answer or advice :

My MAGNETIC course is ..... degrees.

Reasons :

To differentiate between TRUE and MAGNETIC course.

SECTION II

Add "*" to the following :

MOD

DF, DO, ER, MPH and NW.

Ref.

G/59(10)
(contd.)

Reasons :

To indicate abbreviations no longer used in the Maritime Mobile Service - see Note 2.

MOD $\overline{AR}$ End of transmission.

Reasons :

To extend the use to radiotelephony - consequential upon proposed new 1216A.

MOD $\overline{AS}$ Waiting period.

Reasons :

Consequential upon new 1216A.

ADD C Affirmative - yes or "The significance of the previous group should be read in the affirmative".

Reasons :

Consequential upon its adoption in the International Code of Signals.

ADD CORRECTION (KOR-REK-SHUN) Cancel my last word or group. The correct word or group follows.

Reasons :

Consequential upon its adoption in the International Code of Signals.

MOD CQ General call to all stations (see Articles 31 and 33 (No. 1302)).

Reasons :

To extend the use to radiotelephony - consequential upon new 1216A.

SUP $\overline{DDD}$

Reasons :

Serves no useful purpose in this section.

Ref.

G/59(10) (contd.)

MOD	DE	"From ....." (used to precede the name or other identification of the calling station) - see No. 1216B.

Reasons :

To extend the use to radiotelephony - consequential upon new 1216A and 1216B.

ADD	INTERCO (IN-TER-CO)	The code expressions in the following message appear in the International Code of Signals (I.M.C.O.)

Reasons :

Consequential upon adoption by I.M.C.O. in the international Code of Signals.

ADD	I SPELL	Indicates that the following word will be spelled out.

Reasons :

To provide a clear indication that the next word will be spelled out in accordance with Appendix 16.

ADD	PDH	Prefix indicating a private radiotelegram for a crew member.

Reasons :

In common use.

SUP SOS

Reasons :

Serves no useful purpose in this section.

SUP SS

Reasons :

Unnecessary.

Ref.

G/59(10) (contd.)

MOD	TR	Used by land station to request the position and next port of call of a mobile station (see Nos. 1083 and 1314); used also as a prefix to the reply.

Reasons :

To extend the use to radiotelephony - consequential upon proposed new 1216A.

SUP TTT

Reasons :

Serves no useful purpose in this section.

MOD $\overline{\text{VA}}$ End of work.

Reasons :

To extend the use to radiotelephony - consequential upon new 1216A.

ADD WX Weather report follows.

Reasons :

In common use.

SUP XXX

Reasons :

Serves no useful purpose in this section.

SUP YES

Reasons :

No longer used (replaced by C).

ADD Note 1 : When used in radiotelegraphy a bar over the letters composing a signal denotes that the letters are to be sent as one symbol.

Ref.

G/59(10) (contd.)

Reasons :

Clarification.

ADD Note 2 : The abbreviations marked "*" are not used in the maritime mobile service.

Reasons :

To denote those abbreviations which are no longer used in the maritime mobile service.

APPENDIX 16

G/59(11) MOD Paragraph 1 - Delete column 1.

SUP Footnote "*" on page 430.

Reasons :

Covered by new paragraph 1 bis.

ADD Paragraph 1 bis. When it is necessary to transmit the following table shall be used :

Figure	Code word	Pronunciation
0	NADAZERO	NAH-DAH-ZAY-ROH
1	UNAONE	OO-NAH-WUN
2	BISSOTWO	BEES-SOH-TOO
3	TERRATHREE	TAY-RAH-TREE
4	KARTEFOUR	KAR-TAY-FOWER
5	PANTAFIVE	PAN-TAH-FIVE
6	SOXISIX	SOK-SEE-SIX

Ref.	Figure	Code word	Pronunciation
G/59(11) (contd.)	7	SETTESEVEN	SAY-TAY-SEVEN
	8	OKTOEIGHT	OK-TOH-AIT
	9	NOVENINE	NO-VAY-NINER
	Decimal point	DECIMAL	DAY-SEE-MAL
	Full stop	STOP	STOP

Note : Each syllable should be equally emphasised. The second component of each code word is the code word used in the Aeronautical Mobile Service.

Reasons :

To provide an improved figure spelling table for use in radiotelephony.

INTERNATIONAL TELECOMMUNICATION UNION
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GENEVA, 1967

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND, THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Agenda Item 7.1

Data transmission from ship stations

Comments

It is proposed to set aside part of each of the high traffic bands for direct printing telegraph systems using channels spaced at 500 c/s, class F1 emissions with 170 c/s shift. The reasons for adopting these standards are the following.

Our experimental service which has been in operation for over two years has indicated the essential need for both coast and ship stations to use high grade equipment, single-sideband emission, space or polarization diversity reception, forward acting error detecting equipment and for the ship frequencies used to be allotted to individual countries so that strict control can be exercised over their use to avoid interference.

The necessary amendments to Articles Nos. 28, 29 and 32 and a new proposed Appendix 20B are in the following proposals.

Reasons :

DIRECT PRINTING TELEGRAPH SERVICES IN BAND 7

1. General

The United Kingdom experimental Data Service and other tests have shown the practicability of operating direct printing telegraph (teleprinter) circuits over long-distance HF radio links in the maritime mobile service. These tests have been made using either the SSB (A3A) or the DSB Mode and the frequency exchange method of modulation with a frequency spacing of 340 c/s between the two tones. Either method, however,

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is wasteful of the restricted spectrum likely to be available for the service and C.C.I.R. has now recommended that, as the modulation rate should not exceed 100 bauds, the total bandwidth required per channel need not exceed 340 c/s (Recommendation 440). Consequently, the United Kingdom has proposed to the C.C.I.R. and the special meeting of Study Group XIII has agreed that class of emission F1 with a frequency shift of 170 c/s, should be the recommended method of modulation for the service.

It is necessary, therefore, to examine proposals for a direct printing teleprinter service and the revision of the sub-bands in the exclusive maritime mobile frequency bands in the light of the above.

2. Generation of F1 emissions and channel bandwidth

The simplest method of generating a stable F1 emission is probably by means of a frequency modulated (FM) baseband oscillator with conversion to radio frequency by SSB techniques. The "flat response" baseband limits for maritime mobile SSB equipment (R/T) given by the C.C.I.R. are 350-2700 c/s, and baseband channelling equipment for 170 c/s shift and 340 c/s channel spacing utilizing channel centre frequencies in the series 510, 850, 1190 c/s etc. are known to exist. Assuming such equipment were used, the lowest practicable baseband centre frequency for generating the 170 c/s F1 emission would be 850 c/s. In accordance with the C.C.I.R. Recommendation the signal would be fully contained within a band of not more than plus and minus 170 c/s about this centre frequency but it is necessary to allow for radio-frequency instability and the maximum frequency variation may reasonably be taken as that of the C.C.I.R. recommended long-term stability of ± 100 c/s (Recommendation 258) and would lead to a channel bandwidth of 540 c/s. If, however, a frequency tolerance allowance of plus and minus 80 c/s were assumed, it might be expected that a very high proportion of emissions would be within these limits and that the risk of adjacent channel interference, requiring the frequency difference between emissions to be less than 170 c/s, i.e. movement in contrary directions, would be very slight and this would lead to channel bandwidths of 500 c/s.

3. Channel frequencies and r.f. equipment

The choice of baseband channel mid-frequency from the series quoted or any series based on 340 c/s channel separation, makes it impossible to operate a multi-channel transmission based on the economical use of the spectrum with 500 c/s separation between F1 allocations. Channel selection would need to be achieved by shifting the suppressed r.f.

carrier frequencies in multiples of 500 c/s and any frequency allocation plan should, desirably, be such that the suppressed carriers are based on radio frequencies ending in 1 or 0.5 kc/s, thus easing the design of frequency synthesizers with their attendant advantages. Although only the baseband method of deriving the final channel frequencies has been considered in this paper, any other method maintaining the foregoing standards would, of course, be suitable. For reception, demodulation to audio frequency and the use of baseband channel equipment can be used but may lead to difficulties in tuning in and maintaining tune to within about 20 c/s. If this method be used the possibility of improving ship reception by using 2 tone baseband receiving equipment should be borne in mind. The most suitable method is likely to be by the use of an F1 telegraph receiver with automatic frequency and gain control and, where possible, some form of aerial diversity.

Although equipment providing a baseband channel using a centre frequency of 850 c/s is known to exist, a better choice would be 750 c/s, thereby placing the "suppressed" carrier at the mid point between channels and minimizing any possible difficulties due to excessive carrier leak. This advantage would, of course, only be gained if all users adopted the same equipment and method of radio frequency derivation. Little, if any, advantage seems to be attached to the idea of multi-channel operation but, if a new channelling equipment were developed on 750 c/s centre frequency it would, presumably, be possible to have other channels based on 1250 c/s and 1750 c/s for multi channel working.

5. Conclusions

The method of modulation agreed by the Special Meeting of C.C.I.R. Study Group XIII (i.e. F1. 170 c/s shift), together with a channel spacing of 500 c/s, will permit the channels to be economically generated by existing conventional "SSB" techniques. Alternative methods of generation may, of course, be used.

Proposals

Ref.

Article 28

G/60(12) ADD 964A Equipment intended for use on narrow-band direct-printing telegraph systems should conform to the Recommendations of the C.C.I.R. and other technical standards in Appendix 20B.

Reasons :

To provide for direct-printing telegraph systems.

Article 29

G/60(13) ADD 1015A (3) However, when using direct printing telegraphy or similar systems, the call may, by prior arrangement, be made on a working frequency in the bands reserved for such systems.

Reasons :

To permit calls and preparatory signals on working frequencies when direct printing telegraphy or similar systems are being used.

Article 32

G/60(14) ADD 1150A (aa) a band of working frequencies for ship stations using narrow-band direct-printing telegraph systems.

Reasons :

To provide for direct-printing telegraph systems (see also Agenda Item 3, to follow).

Ref.

G/60(15) ADD 1179A § 31 (bis) The working frequencies for ship stations equipped to use narrow-band direct-printing telegraph systems are so spaced to provide channels 500 c/s wide. The frequencies assignable are shown in Appendix 15.

Reasons :

To provide for direct-printing telegraph systems (see also Agenda Item 3, to follow).

G/60(16) ADD 1191A The working frequencies assigned to ships for narrow-band direct-printing telegraph systems are included within the following band limits :

4160 to 4170 kc/s
6240 to 6250 kc/s
8320 to 8330 kc/s
12471 to 12491 kc/s
16622 to 16642 kc/s
22148 to 22168 kc/s

ADD 1191B (2) Assignments shall be made in accordance with the channel spacing given in Appendix 15.

Reasons :

To provide for the use, and assignment, of frequencies for narrow-band direct-printing telegraph services (see also Agenda Item 3, to follow).

Ref.

G/60(17) ADD

APPENDIX 20B

Narrow-band direct printing telegraph equipment

(see Articles 28, 29 and 32)

1. The equipment for narrow-band direct printing telegraphy in the maritime mobile service shall fulfil the following conditions :

a) Equipment intended for interconnection with the Public Telegraph Network shall accept signals conforming to International Telegraph Alphabet No. 2 at a modulation rate of 50 bauds and shall provide similar signals at its output.

b) The modulation rate over the radio path shall not exceed 100 bauds.

c) Class F1 emission shall be used, with a frequency shift of 170 c/s.

d) For ship stations, the centre of the frequency band occupied by the emission shall at all times be maintained within ± 100 c/s of the assigned frequency, and for short periods (of the order of 15 minutes), within ± 40 c/s.

e) For coast stations, the centre of the frequency band occupied by the emission shall at all times be maintained within ± 20 c/s of the assigned frequency.

Ref. Agenda Item 7.2 :

Conditions for the use of emergency position-indicating radio beacons

Comments

The C.C.I.R. Recommendation has been noted and provision for the operation of emergency position-indicating radio beacons on 2182 kc/s is contained in the following proposals for Articles Nos.1, 19, 28 and 36 and for a new Appendix 20A.

Article 1

G/60(18) ADD 68A Emergency position-indicating radio beacon station : A station in the mobile service the emissions of which are intended to facilitate search and rescue operations.

Reasons :

New definition required following the introduction of emergency position-indicating radio beacons.

Article 19

G/60(19) MOD 736 (2) However, the requirements of identification need not apply to :

- survival craft stations when transmitting distress signals automatically, or
- emergency position-indicating radio-beacons

Reasons :

To cover the introduction of emergency position-indicating radio-beacons.

Ref.

Section III - Formation of call signs

G/60(20) Insert sub-heading :

ADD Emergency position-indicating radio-beacons

ADD 768A - the morse letter B and/or the call-sign of the ship to which the beacon belongs.

Reasons :

To provide for the use of emergency position-indicating radio-beacons.

ADD 777A (4) Emergency position-indicating radio-beacons

- the morse letter B and/or the call sign of the ship to which the beacon belongs.

Reasons :

To provide for the use of emergency position-indicating radio-beacons.

Article 28

G/60(21) ADD Section VII - Emergency position-indicating radio beacons

ADD 999A Emergency position-indicating radio beacons when transmitting on 2182 kc/s shall use Class A2 emissions.

Reasons :

To provide for the use of A2 by emergency position-indicating radio beacons.

Ref.

Article 36

G/60(22) ADD 1388A §5(bis) The characteristics of the emergency position-indicating radio-beacon signals are given in Nos. 1476B and 1476C.

Reasons :

Consequential upon the introduction of emergency position-indicating radio-beacon stations.

G/60(23) ADD

Section VIIIA - Emergency position-indicating radio-beacon signals

ADD 1476A §44(bis) (1) The emergency position-indicating radio-beacon signal consists of :

ADD 1476B - a keyed emission modulated by a tone of 1300 cycles per second having a ratio of the period of the emission to the period of silence equal to or greater than one, and an emission duration between one and five seconds;

or

ADD 1476C - the radiotelephone alarm signal (see No. 1465) followed by the morse letter 'B' and/or the call-sign of the ship to which the beacon belongs transmitted by keying a carrier modulated by a tone of 1300 cycles per second or of 2200 cycles per second.

ADD 1476D (2) The signal in No. 1476B shall be sent continuously or as in No. 1476C.

ADD 1476E (3) The keying cycle of the signal in No. 1476C shall consist alternately of the keying signal having a duration between thirty and fifty seconds followed by a period of silence having a duration between thirty and sixty seconds.

Ref.

G/60(23) (cont.)

ADD 1476F (4) However, the keying cycles in Nos. 1476D and 1476E may be interrupted for speech transmission if administrations so desire.

ADD 1476G (5) The purpose of the emergency position-indicating radio-beacon signals is to indicate the position of survivors and to facilitate search and rescue operations.

ADD 1476H (6) These signals shall only be used to assist in the location of survivors either aboard a ship or survival craft in the water.

ADD 1476I (7) Equipment designed to transmit emergency position-indicating radio-beacon signals shall meet the requirements specified in Appendix 20A.

Reasons :

To provide for use of emergency position-indicating radio-beacons.

Ref.

G/60(24) ADD

APPENDIX 20A

Technical characteristics of emergency position-indicating radio-beacons operating on the frequency 2182 kc/s

(See Section VIIIA of Article 36)

1. Emergency position-indicating radio-beacons shall fulfil the following conditions :

a) Low power beacon (Type L)

1) the power radiated shall be of a value necessary to produce at a distance of 30 nautical miles at sea level

- a minimum initial field strength of 2.5 microvolts per metre;
- a field strength equal to or less than 10 microvolts per metre.

2) After a period of 48 hours continuous operation the radiated power shall not be less than 20 per cent of the initial power.

b) High power beacon (Type H)

1) the power radiated shall be of a value necessary to produce a field strength greater than 10 microvolts per metre at a distance of 30 nautical miles at sea level.

c) shall be capable of Class A2 emission, with a depth of modulation between 30 and 90 per cent.

d) The keying signal for Type L beacon shall consist of a keyed emission modulated by a tone of 1300 cycles per second (± 20 cycles per second), having a ratio of the period of the emission to the period of silence equal to or greater than one, and an emission duration between one and five seconds.

Ref.

G/60(24)
(cont.)

e) The keying signal for a Type H beacon shall either consist of the radiotelephone alarm signal (see No. 1465) or be the same as in d) above; if the radiotelephone alarm signal be used, the morse letter 'B' and/or the call-sign of the ship to which the beacon belongs, shall be included by keying a carrier modulated by a tone of 1300 cycles per second (± 20 c/s) or of 2200 cycles per second (± 35 c/s).

f) Speech transmission may be provided if administrations so desire.

g) Equipment shall be so designed as to comply with relative C.C.I.R. recommendations.

Agenda Item 7.4 :

Hours of service for ship stations

This item has been extensively studied and it is considered that no major change is practicable in the hours of watchkeeping specified in Article 25. Consequently no proposal is submitted.

Agenda Item 7.5 :

Frequencies to be assigned for the transmission by television of port radar images

It is considered that there is no operational need for this type of service, and consequently no proposal is submitted.

Agenda Item 7.6 :

The establishment of a separate category for mobile radiotelephone traffic on inland waterways

It is considered that there is no need in the United Kingdom to establish a separate category for mobile radiotelephone traffic on inland waterways and consequently no proposal is submitted.

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Additional Agenda Item UK2 : *)

Relating to the use of 143 kc/s

Article 5

SUP 171-172

Reasons :

In view of the declining use of the band 90 to 160 kc/s by ships, it is no longer considered necessary to retain 143 kc/s as a calling frequency for stations in the maritime mobile service using this band, nor to give preference to ships in the band 130-150 kc/s.

Article 28

SUP 971

Reasons :

Consequential upon proposed deletion of Nos. 171-172 and 1095-1105.

Article 32

Section 1

SUP 1095-1105

Reasons :

No longer necessary.

*) Item not in the agenda of the W.A.R.C. but which the United Kingdom proposes that the Conference consider.

ARCHIVES U.I.T. GENEVE

Article 29

SUP 1024 and 1025

Reasons :

No longer necessary.

INTERNATIONAL TELECOMMUNICATION UNION
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GENEVA, 1967

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Additional Agenda Item UK3 : *)

Relating to the Establishment of a Manual for use by the Maritime Mobile Services

(Resolution No. 12 of the Administrative Radio Conference, Geneva, 1959)

Comments

1. As the result of Resolution No. 12 of the Administrative Radio Conference, Geneva, 1959, a Manual for Use by the Mobile Services was prepared and published. However, provision for its carriage as an alternative to the Radio Regulations and the Additional Radio Regulations was not made : neither was provision made for the revision of the Manual following a revision of the Radio Regulations and the Additional Radio Regulations.

2. It will be necessary therefore for authority to be given either for the preparation and issue of a new Manual after each revision of the Radio Regulations and Additional Radio Regulations or alternatively for its revision.

3. An amendment to Appendix 11, and a Resolution to give effect to these proposals follow.

*) Item not in the Agenda of the W.A.R.C. but which the United Kingdom proposes that the Conference consider.

ARCHIVES U.I.T. GENÈVE

Proposals

Appendix 11

Section 1

MOD 8 Radio Regulations and Additional Radio Regulations, also such provisions of the Convention as relate to the radiocommunication service on board ship, or Manual for use by the Maritime Mobile Service.

Reasons :

To provide for the carriage of the Manual.

Resolution No.

Relating to the Establishment of a Manual
for use by the Maritime Mobile Service

The World Administrative Radio Conference, Geneva, 1967,

considering

a) that the provisions of the Radio Regulations, Geneva, 1959, applicable to the maritime mobile service include :

- provisions directly related to the operation of the meritime mobile service,

- other provisions not directly related to these services;

b) that administrations have submitted to the World Administrative Conference, Geneva, 1967, proposals to revise and reclassify those provisions directly related to the operation of the maritime mobile service;

c) that a new layout for the provisions facilitating the understanding of the technical stipulations and service procedure regulations concerning radiotelegraphy and radiotelephony, as well as the rules regarding radiotelegrams, radiotelephone calls, and distress traffic has been provided;

d) that this new layout would be of great value to the maritime mobile service, and would enable administrations to issue, if they wish to do so, national regulations based upon internationally self-contained sets of rules for the different services;

e) that it would be very useful to publish in a manual those provisions relating directly to the operation of the maritime mobile services;

f) that a manual for use by the mobile services was prepared and published by the Secretary-General in accordance with Resolution No.12 of the Administrative Radio Conference, Geneva, 1959;

g) that this manual revised to incorporate the amendments agreed at the World Administrative Radio Conference, Geneva, 1967, could form a basis for the manual for use by the Maritime Mobile Services;

h) that provision has been made in Appendix 11 for the carriage of the Manual by ship stations as an alternative to the Radio Regulations and Additional Radio Regulations and such provisions of the Convention as relate to the radiocommunications service on board ship;

i) that the other mobile services have not expressed a need for a manual applicable only to those services;

resolves

1. that the provisions of the Radio Regulations and the Additional Radio Regulations which deal with the operation of the Maritime Mobile Service as revised by the World Administrative Radio Conference, Geneva, 1967, together with those provisions of the International Telecommunication Convention, lists of certain provisions of the Telegraph Regulations and of the Telephone Regulations shall be assembled by the Secretary-General in a manual entitled "Manual for Use by the Maritime Mobile Service";

2. that the Secretary-General shall, as soon as possible after the conclusion of this Conference, publish the Manual to ensure its availability, by the date the revised Radio Regulations and Additional Radio Regulations come into force;

3. that the Secretary-General revise the Manual as necessary to keep it up-to-date.

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND, THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Additional Agenda Item UK4 : *)

Deletion of Class B emissions

Article 12

MOD 677 **§8. The use of Class B emissions is forbidden in all stations.**

MOD Appendix 20

Delete reference to Class B emissions.
(See UK proposals for Agenda Item 5, Document No. 58).

Reasons :

The permissive use of Class B emissions by existing stations for distress calls and distress traffic ceased on 1 January, 1966.

Article 28

SUP 956

Reasons :

Consequential upon **amendment** of No. 677.

*) Item not in the agenda of the W.A.R.C. but which the United Kingdom proposes that the Conference consider.

ARCHIVES U.I.T. GENÈVE

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Additional Agenda Item UK5 : *)

Relating to a Re-classification of International

Public Correspondence Categories of Ship Stations

(Recommendation No. 26 of the Administrative
Radio Conference, Geneva, 1959)

1. There appears to be no valid reason why it should be necessary to differentiate between ships fitted exclusively with radiotelegraphy or radiotelephony or ships equipped with both. So far as public correspondence is concerned, communication can be established either by one or other system by both coast stations and ships suitably fitted. It is proposed, therefore, that four public correspondence categories only are required, viz:

Category 1	24 hours of service	(H24)
Category 2	16 " " "	(H16);
Category 3	8 " " "	(H8);
Category 4	No fixed hours	(HX).

2. The categories in which a ship is placed should be determined by each Administration for ships under its jurisdiction.

3. Amendments to Article 25 and Appendix 12 to take account of this proposal are the following :

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*) Item not in the agenda of the W.A.R.C. but which the United Kingdom proposes that the Conference consider.

ARCHIVES U.I.T. GENÈVE

Article No. 25

Section No. IV

MOD 929 § 6 (1) For the international public correspondence service, ship stations are divided into four categories :

Reasons :

To include ships fitted with radiotelephony and to introduce a fourth category.

MOD 931 Stations of the second category : these stations maintain a service for 16 hours a day.

Reasons :

To provide a separate category for ships maintaining a service for 16 hours a day.

ADD 931A - Stations of the third category : these stations maintain a service for 8 hours a day.

Reasons :

To provide a separate category for ships maintaining a service for 8 hours a day.

MOD 932 - Stations of the fourth category : these stations maintain a service the duration of which is either shorter than that of stations of the third category, or is not fixed by these Regulations.

Reasons :

Consequent upon the introduction of a fourth category.

MOD 933 (2) Each administration shall itself determine the rules under which ship stations subject to it are to be placed in one or other of the above four categories.

Reasons :

To include ships fitted with radiotelephony and to take account of the introduction of a fourth category.

MOD 934 § 7 (1) Ship stations of the second and third categories shall provide service at least during the hours fixed by Appendix 12. These hours shall be mentioned in the licence.

Reasons :

Consequent upon the introduction of a fourth category.

NOC 935

SUP 936

Reasons :

Unnecessary. Not observed in practice.

SUP 937

Reasons :

Not observed in practice, and satisfied by No. 1065 and No. 1067.

SUP 938

Reasons :

Consequential upon the preceding proposals, and covered by Nos. 929-933 as amended.

Appendix 12

Amend heading to read :

MOD Hours of Service for Ship Stations of the Second and Third Categories.

Reasons :

Consequent upon the separation of H16 and H8 ships into separate categories.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Additional Agenda Item UK6 : *

Relating to a revision of calling procedure

The calling procedures in the maritime mobile service have been reviewed in an effort to speed up communications.

The necessary amendments to Articles 29, 30, 33 and 34 are the following :

Article 29

ADD 1012A (1) bis. However, in the maritime mobile service in the bands between 4000 and 27,500 kc/s the call consists of :

- the call sign of the station called, not more than three times;
- the word DE;
- the call sign of the calling station, not more than three times;
- the signal $\overline{AR}$;
- the call sign of the station called, once only;
- the letter K.

*) Item not in the agenda of the W.A.R.C. but which the United Kingdom proposes that the Conference consider.

ARCHIVES U.I.T. GENEVE

Reasons :

Experience has shown that the addition of the call sign of the called station sent once after that of the calling station materially speeds up replies to incompletely received calls.

ADD 1013A (3) However, in the maritime mobile service in the bands between 4000 and 27,500 kc/s when the requirements of No. 1162 have been met, the call may be repeated at intervals of not less than one minute for a period not exceeding five minutes and shall not be renewed until after an interval of ten minutes.

Reasons :

To allow for more frequent calling in the HF bands.

MOD 1017 (2) When, in the aeronautical mobile service, as an exception to this rule, the call is not followed by an indication of the frequency to be used for the traffic, this indicates :

Reasons :

Consequential upon new No. 1019A.

ADD 1019A (3) When, in the maritime mobile service, as an exception to No. 1016 the call is not followed by an indication of the frequency to be used for the traffic, this indicates that the calling station is a coast station and that it proposes to use for traffic its normal working frequency shown in the appropriate list of stations.

Reasons :

To make it obligatory for ship stations to indicate the working frequency to be used and so reduce signalling.

MOD 1023 §11. (1) Except as otherwise provided for in these regulations, for transmitting the reply to calls and to preparatory signals, the station called shall use the frequency on which the calling station keeps watch, unless the calling station has specified a frequency for the reply.

Reasons :

Consequential upon deletion of No. 1024. (See Additional Agenda Item UK2, Document No. 61).

SUP 1026

Reasons :

To avoid needless repetition - already covered in No. 1165-1167.

Article 30

ADD 1068A (2) bis. However, in the bands between 4000 and 27,500 kc/s a coast station may transmit its call sign at intervals of not less than one minute to enable mobile stations to select the calling band with the most favourable propagational characteristics for effecting reliable communication (see No. 1162).

Reasons :

To improve efficiency of communications and to obviate the existing contradiction between the requirements of No. 1068 and No. 1162.

MOD 1071 (5) The provisions of No. 1070 :

ADD 1071A a) are obligatory when 500 kc/s is used;

(MOD) 1072 b) do not apply when frequencies in the bands between 4000 and 27,500 kc/s are used.

Reasons :

Clarification.

MOD 1077 §5. (1) When a station called does not reply, the call may be repeated at three-minute intervals.

Reasons :

To expedite communications by reducing the interval between calls.

ADD 1077A (1) bis. However, in the bands between 4000 and 27,500 kc/s when the requirements of No. 1162 have been met, the call may be repeated at intervals of not less than one minute for a period not exceeding five minutes and shall not be renewed until after an interval of ten minutes.

Reasons :

To allow for more frequent calling in the HF bands.

SUP 1078

Reasons :

Consequential upon revision of No. 1077.

SUP 1080

Reasons :

Unnecessary in view of revision of No. 1077.

Article 33

MOD 1239 §10.(1) In the bands between 156 and 174 Mc/s used for the maritime mobile services, coast and ship stations should, as a general rule, call on 156.80 Mc/s. However, calling may be conducted on a working channel or on a two-frequency calling channel, which has been implemented in accordance with No. 1361.

Reasons :

To permit alternative calling arrangements to be made in a port operations service. (See also Additional Item UK9 to follow - new No. 1367A.)

MOD 1290 §25. (1) Calling and signals preparatory to traffic shall not exceed two minutes when made on 2182 kc/s or on 156.80 Mc/s, except in cases of distress, urgency or safety to which the provisions of Article 36 apply.

Reasons :

For clarification.

Article 34

MOD 1302 (3) They may, however, announce this transmission by the following brief preamble sent on a calling frequency :

- "Hello all ships" not more than three times;
- the words "THIS IS";
- "... radio" not more than three times;
- "Listen for my traffic list on ... kc/s".

In no case may this preamble be repeated.

Reasons :

To conform to the French text. ("Appel a tous les navires".)

ADD 1308A a) However, in the maritime mobile service when a station called does not reply, the call may be repeated at three-minute intervals.

Reasons :

To speed up communications by reducing the permitted intervals between calls.

ADD 1311A (5) However, in the maritime mobile service, before renewing the call, the calling station shall ascertain that further calling is unlikely to cause interference to other communications in progress and that the station called is not in communication with another station.

Reasons :

Consequential upon the insertion of new No. 1308A.

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Additional Agenda Item UK7*) :

Relating to the use of class A2H emissions on working frequencies

Article 28 (See also Document No. 58)

MOD 975 b) send, in addition, class A1 and either A2 or A2H emissions on at least two working frequencies;

MOD 976 c) receive, in addition, class A1, A2 and A2H emissions on all other frequencies necessary to their service.

Reasons :

To provide for the use of class A2H emission.

MOD 992 § 22.(1) Any aircraft following a maritime course and required **by national or international regulations to** communicate for safety purposes, with stations of the maritime mobile service shall be capable of transmitting and receiving on the frequency 500 kc/s, class A2 or A2H emissions, or, on the frequency 2182 kc/s, class A3 or A3H emissions.

Reasons :

To provide for the use of class A2H and A3H emissions.

MOD 995 - in the bands between 405 and 535 kc/s, be able to transmit on 500 kc/s using Class A2 or A2H emissions. If a receiver is provided for any of these bands, it shall be able to receive Class A2 and A2H emissions on 500 kc/s.

*) Item not in the agenda of the W.A.R.C. but which the United Kingdom proposes that the Conference consider.

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Reasons :

To provide for the use of Class A2H emission and consequent on amendement of No. 677 (see under Article 12, Additional Agenda Item UK4, Document No. 63).

Article 32

MOD 1123 § 11. 1) Ship stations operating in the authorised bands between 405 and 535 kc/s shall use working frequencies chosen frome the following : 425, 454, 468 and 480 kc/s except as permitted by No. 418. In addition, ship stations may use 512 kc/s in Regions 1 and 3, and 448 kc/s in Region 2.

Reasons :

Consequential upon provision for the use of Class A2H emission - covered in amended Nos. 975 and 976.

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Additional Agenda Item UK8 :*)

Relating to amendments to the Additional Radio Regulations

Article 8

MOD 2126 b) a radiotelegram not bearing this service indication within a period of two days following the date of handing-in.

Reasons :

To provide for an earlier advice of radiotelegrams not transmitted to a ship station.

Article 11

MOD 2160 **a2. When a radiotelegram received at a mobile station cannot** be delivered, that station so informs the office or mobile station of origin by a service advice. In the case of a radiotelegram originating on land, this service advice is sent, whenever possible, to the land station through which the radiotelegram passed, or, if necessary, to another land station of the same country, or of a neighbouring country quoting the name or call sign of the station from which the radiotelegram was received, as far as existing conditions or special arrangements permit.

Reasons :

To ensure that advices of non-delivery of a radiotelegram, or query on a radiotelegram, is routed back to the station from which it was received by the mobile station.

*) Item not in the agenda of the W.A.R.C. but which the United Kingdom proposes that the Conference consider.

ARCHIVES U.I.T. GENE

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UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Page 1, under Comments, point 1, 6th line, replace :

... should be the minimum necessary ...

by

... should be those necessary ...

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Additional Agenda Item U.K.1*

Proposals relating to Operators' Certificates for Ship Stations
(see Recommendation No. 18, Radio Regulations, Geneva, 1959)

Comments

1. The purpose of the Regulations laid down in Articles 23 and 24 of the Radio Regulations is to ensure the efficient operation of the maritime mobile public correspondence and safety radiocommunication services with which the International Telecommunication Union is concerned. In order that all countries should be able to subscribe fully to these regulations it is essential that the requirements called for should be the minimum necessary for the efficient operation of these services. Any additional or more stringent requirements of specialized services should be left to individual administrations to introduce as necessary.

2. Development in radiotelegraph services since 1959 has been mainly in the introduction of various forms of machine telegraphy on board some ships and in the increased complexity of equipment. The United Kingdom has reviewed the requirements of the Radio Regulations in the light of these developments and Recommendation 18 of the Administrative Radio Conference, Geneva, 1959, and has come to the following conclusions :

a) The majority of morse communications at sea are conducted by holders of second class certificates who in the case of the United Kingdom comprise 70% of operators. Moreover, operating conditions (e.g. increased congestion and difficult HF propagation conditions) frequently make speeds higher than 20 words per minute impracticable. It would, therefore, be realistic to fix the morse requirement at, say, 20 words per minute for all classes of certificate. The time needed in training to reach

* Item not on the agenda of the W.A.R.C. but which the United Kingdom proposes that the Conference consider.

ARCHIVES U.I.T. GENEVE

the higher speed of 25 words per minute could more usefully be devoted to additional technical tuition:

b) The concept that the operator's technical function on board should be related to damage at sea (RRs 874 and 883) seems out-dated. The requirement is rather that the operator should, within reasonable limits, be able to keep his station in service. The emphasis should be on finding and remedying faults and the Regulations should specify that operators should demonstrate their ability to clear faults.

Assuming that there is a need for only one morse standard, viz. 20 w.p.m. for both 1st and 2nd Class of certificates and that the remedying of faults is common to both, the differences in the technical requirements of Article 23, Sections III A and B, are so small that they can be disregarded. However, for both classes of certificate, a higher practical standard is necessary. Therefore, it is proposed that the first and second class radiotelegraph operators' certificates should be combined into one "Radiocommunication Operators' General Certificate" based on revised requirements more closely related to the operation and practical maintenance of the radiocommunications, radio direction-finding and safety services.

No change is necessary in the requirements for the radiotelegraph operator's special certificate.

3. So far as radiotelephone certificates are concerned no basic changes are proposed but to ensure effective and efficient operation of automatic communication devices it is considered that each administration should ensure that the operator controlling such a device should have adequate knowledge of the practical operation and adjustment of the apparatus.

4. Amendments to Articles 23 and 24 to give effect to these proposals are the following :

Proposals

Article 23

Section I

NOC 848-858

Section II

Insert sub-title :

ADD A - Aircraft Stations

Reasons :

To segregate maritime and aeronautical requirements, arising from the proposed 866A-866H and 888A-888J.

NOC 859-860

MOD 861 § 6. (1) The holder of a first or second class radiotelegraph operator's certificate may carry out the service of any aircraft radiotelephone station.

MOD 862 (2) The holder of a radiotelephone operator's general certificate may carry out the radiotelephone service of any aircraft station.

Reasons :

Consequent on segregation of maritime and aeronautical requirements.

MOD 863 (3) The holder of a radiotelephone operator's restricted certificate may carry out the radiotelephone service of any aircraft station, when working on frequencies of the maritime mobile service, provided that :

- the operation of the transmitter requires only the use of simple external controls, and excludes all manual adjustment of frequency determining elements, with the stability of the frequencies maintained by the transmitter itself within the limits of tolerance specified by Appendix 3 and the power of the transmitter does not exceed the following :

250 watts (Pc) for emission A3
1000 watts (Pp) for emissions A3H, A3A and A3J.

Reasons :

Consequent on segregation of the maritime and aeronautical requirements; to minimize the risk of harmful interference at long-range in view of the increasing use of HF for radiotelephony, and to take account of single-sideband operation.

NOC 864

MOD 865 (5) The radiotelephone service of aircraft stations for which only a restricted radiotelephone operator's certificate is required, may be carried out by an operator holding a radiotelegraph operator's special certificate.

Reasons :

Consequent on the segregation of maritime and aeronautical requirements.

NOC 866

NOC 859.1

New sub-section

ADD B - Ship Stations

ADD 866A § 7 bis. (1) There are two categories of radiocommunication operator's certificate, general and special.[1]

ADD 866B (2) First and second class radiotelegraph operators' certificates issued prior to the date of implementation of these Regulations [or some later date to be specified] shall, for the purpose of these Regulations, continue to be accepted for the conduct of the radiocommunication service.[1]

ADD 866C (3) There are two categories of radiotelephone operators' certificates, general and restricted.[1]

ADD 866D § 7 ter. (1) The holder of a radiocommunication operator's general certificate may, subject to the provisions of Nos. 907-909, carry out the service of any ship radiotelegraph or radiotelephone station.

ADD 866E (2) The holder of a radiotelephone operator's general certificate may carry out the radiotelephone service of any ship station.

ADD 866F (3) The holder of a radiotelephone operator's restricted certificate may carry out the radiotelephone service of any ship station, provided that :

ADD 866A.1 [1] As regards the employment of operators holding the different certificates, see Article 24.

the operation of the transmitter requires only the use of simple external controls, and excludes all manual adjustment of frequency determining elements, with the stability of the frequencies maintained by the transmitter itself within the limits of tolerance specified by Appendix 3 and the power of the transmitter does not exceed the following :

250 watts (Pc) for emission A3
1000 watts (Pp) for emissions A3, A3H and A3J.

ADD 866G (4) The radiotelegraph service of ships for which a radiotelegraph installation is not made compulsory by international agreements, as well as the radiotelephone service of ship stations for which only a radiotelephone operator's restricted certificate is required, may be carried out by an operator holding a radiocommunication operator's special certificate.

ADD 866H Exceptionally, the radiocommunication operator's general or special certificates may be limited exclusively to the radiotelegraph service. In such cases the certificate shall be suitably endorsed.

Reasons :

Consequential upon the segregation of aeronautical and maritime requirements, to enable the latter to be amended to include the service of radiotelegraph stations and use of the radiocommunication operator's general certificate referred to in 888A-888J.

Section III

NOC 867-870

MOD A - First Class Radiotelegraph Operator's Certificate - Aeronautical

Reasons :

Consequential upon the proposed 888A-888J.

NOC 871-879

MOD B - Second Class Radiotelegraph Operator's Certificate - Aeronautical

Reasons :

As above.

NOC 880-888

ADD New section :

BA - Radiocommunication Operator's General Certificate-Maritime

ADD 888A § 11 bis. (1) The radiocommunication general certificate is issued to candidates who have given proof of the technical and professional knowledge and qualifications enumerated below :

ADD 888B (a) Knowledge of the principles of electricity, the theory of radio and marine aerial systems, sufficient to meet the requirements of Nos. 888C, 888D and 888E.

ADD 888C (b) Theoretical knowledge of marine radiotelegraph and radiotelephone transmitters and receivers; automatic alarm devices; radio equipment for lifeboats and other survival craft; direction-finding equipment; together with all auxiliary items, including power supply auxiliaries (such as motors, alternators, generators, inverters, rectifiers and accumulators) with particular reference to maintaining the equipment in service.

ADD 888D (c) Practical knowledge of the operation, adjustment and maintenance of the apparatus mentioned in 888C; including the taking of direction-finding bearings and the calibration of radio direction-finding apparatus.

ADD 888E (d) Practical knowledge necessary for the location and remedying (with the means available on board), of faults which may occur during a voyage, in the apparatus mentioned in No. 888C.

ADD 888F (e) Ability to send correctly by hand and to receive correctly by ear, in the Morse code, code groups

(mixed letters, figures and punctuation marks), at a speed of sixteen groups a minute, and a plain language text at the speed of twenty words a minute. Each code group shall comprise five characters, each figure or punctuation mark counting as two characters. The average word of the text in plain language shall contain five characters. The duration of each test of sending and receiving shall be, as a rule, five minutes.

ADD 888G (f) Ability to send correctly and to receive correctly by telephone.

ADD 888H (g) Knowledge of the Regulations applying to radiocommunications, knowledge of the documents relating to charges for radiocommunications, knowledge of the provisions of the Convention for the Safety of Life at Sea which relate to radio.

ADD 888I (h) A sufficient knowledge of world geography, especially the principal shipping and air routes and the most important telecommunication routes.

ADD 888J (i) Knowledge of one of the working languages of the Union. Candidates should be able to express themselves satisfactorily in that language, both orally and in writing. Each administration shall decide for itself the language or languages required.

Reasons :

To replace the present maritime first and second class radiotelegraph operators' certificates by one category of certificate more closely related to present-day needs.

NOC 889-893

MOD 894 § 13. The general radiotelephone operator's certificate is issued to candidates who have given proof of the knowledge and professional qualifications enumerated below (see also Nos. 861 and 866E) :

Reasons :

Consequential upon 866E.

NOC 895

MOD 896 (b) For aircraft radiotelephone stations, detailed knowledge of the practical operation and adjustment of radiotelephone apparatus.

Reasons :

Consequential upon 896A.

ADD 896A (b) bis For ship radiotelephone stations a practical knowledge of the operation and adjustment of radiotelephone apparatus and ability to remedy minor faults which may occur during a voyage.

Reasons :

To meet present-day needs and in the interests of safety of life at sea and efficient service.

NOC 897-904

ADD 904A § 14 bis. Each administration shall ensure that a radiotelephone operator controlling automatic devices installed in a ship has adequate knowledge of the practical operation and adjustment of the apparatus.

Reasons :

To ensure effective and efficient operation and to avoid interference with other services.

NOC 905-906

Section IV

MOD Requirements for Chief Operator

Reasons :

Consequential upon the revision of Nos. 908 and 909.

MOD 907 § 17. (1) An operator holding a radiocommunication operator's general certificate or a first or second class radiotelegraph operator's certificate is authorized to embark as chief operator of a ship station of the fourth category (see No. 932).

MOD 908 (2) Before becoming chief operator of a ship station of the second or third category (see Nos. 931 and 931A), an operator shall hold a radiocommunication operator's general certificate or a first or second class radiotelegraph operator's certificate and shall have had at least six months' experience as operator on board ship or in a coast station.

MOD 909 (3) Before becoming chief operator of a ship station of the first category (see No. 930) an operator shall hold either :

ADD 909A (a) a radiocommunication operator's general certificate, and shall have had at least two years' experience as operator on board ship or in a coast station; or

ADD 909B (b) a first class radiotelegraph operator's certificate and shall have had at least one year's experience as operator on board ship or in a coast station.

Reasons :

For clarification of the requirements to become chief operator of a Category 1 ship; consequential upon Nos. 888A-888J, and to provide for additional experience for the holder of a radiocommunication operator's general certificate.

SUP 910

Reasons :

Consequential upon the revision of No. 907.

SUP 911

Reasons :

Consequential upon the revision of No. 908.

Article 24

NOC 912-913

MOD 914 (a) ship stations of the first category; a chief operator holding a radiocommunication operator's general certificate, or a first class radiotelegraph operator's certificate.

Reasons :

For clarification and consequential upon 888A-888J, and the revision of No. 909.

MOD 915 (b) ship stations of the second and third categories: one operator holding a radiocommunication operator's general certificate or a first or a second class radiotelegraph operator's certificate.

Reasons :

Consequential upon Nos. 888A-888J and the revision of Nos. 931 and 931A.

MOD 916 (c) ship stations of the fourth category, except in the case provided for in No. 917: one operator holding a radiocommunication operator's general certificate or a first or a second class radiotelegraph operator's certificate.

Reasons :

Consequential upon Nos. 888A-888J and the revision of No. 932.

MOD 917 (d) ship stations in which a radiotelegraph installation is provided but not prescribed by international agreements: one operator holding a radiocommunication operator's general certificate or a first or second class radiotelegraph operator's certificate or a radiotelegraph operator's special certificate.

Reasons :

Consequential upon Nos. 888A-888J.

NOC 918

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 69-E
5 June 1967
Original : English

PLENARY MEETING

UNITED STATES OF AMERICA

Proposals for the work of the Conference

Agenda Item 2.4 : (Addendum - See Document No. 17)

Ref.
USA/69(52)

The desirability of accommodating requirements for oceanographic communications

The attached has been prepared as an annex to the U.S. Proposals on this agenda item. It provides details for fulfillment of a representative segment of oceanographic requirements. No attempt has been made to include all U.S. requirements or to indicate exact locations and numbers of ocean stations. The annex should provide the conference, however, with sufficient technical detail on which to consider the merits of the U.S. proposal.

Annex 1 : Written explanation of Annex 2.

Annex 2 : Chart - Title "Representative Distribution of Segments of a World-wide International Operational Ocean Data Buoy Network".

Annex 3 : Report - Title "Theoretical Evaluation of Band 7 (HF) Frequency Complements for Ocean Data Communications".

Annexes : 3

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ANNEX 1

REPRESENTATIVE DISTRIBUTION OF SEGMENTS OF A WORLD WIDE INTERNATIONAL OPERATIONAL OCEAN DATA BUOY NETWORK

Increased activity within the marine environment has created new and exciting opportunities to meet the insatiable demands of a rapidly expanding twentieth-century world. Experience gained from operating in this hostile and abrasive environment makes it apparent that certain basic problems involving the state of the sea must be solved if its enriching potential is to be realized without undue loss of life and property.

Recent developments confirm that a close interrelationship exists between the upper ocean and the lower atmosphere. Consequently, the atmosphere and the ocean can be considered as continually interacting parts of a single unified global fluid system. The oceans, as solar heated reservoirs of moisture, critically influence weather and climate. The weather, in turn, plays an important role in driving the currents of the oceans and determining the sea state. The influence of the Gulf Stream in moderating the weather of Western Europe exemplifies how the oceans can establish patterns of climate. A comprehensive understanding of the interplay is essential to describing and predicting the future states of the marine environment. The timely dissemination of processed information to marine user groups will not only enhance the safety of men and material but will also contribute significantly to achieving an operational efficiency which can be measured in economic benefits.

To support a viable marine environmental service programme which is responsive to a wide variety of users, large quantities of environmental data are needed. The perishable nature of these data also requires that they be transmitted to processing centres very soon after they have been observed. Moreover, the data acquisition system must also be capable of collecting global data at specified intervals of time on a daily basis.

The need to understand, describe and predict the marine environment dictates that the data acquisition base over the world's oceans be greatly expanded. The urgency for real-time delivery of these data to processing centres for analysis, synthesis and dissemination of the finished product back to the user, makes it mandatory that an appropriate system of communication be established for this purpose. In addition to the manifold service requirements that such a communications system would meet, it will also allow the international exchange of observational data among all nations as may be required.

Covering about 70% of the earth's surface, the oceans have traditionally constituted a sparse data zone which has always plagued the meteorologist in the preparation of marine weather forecasts. The added requirement for predicting oceanographic parameters makes it self-evident that a new technology must be applied to eliminate this serious deficiency.

Current advances in buoy development indicate that it is feasible for a system of unmanned platforms, both moored and free-floating, complemented by ships where necessary, to provide the required surface weather and oceanographic observations. Planning studies completed by the World Meteorological Organization (W.M.O.) in connection with the World Weather Watch have also affirmed the general feasibility of this concept.

The attached chart depicts a representative distribution of segments of a world wide international operational ocean data buoy network. It is based on consensus within the U.S. on how best to meet certain stated requirements of marine interests for environmental services. The spatial distribution also includes requirements accruing from international agreements such as the W.M.O. and Safety of Life at Sea Conventions. The system of buoys shown in the Southern Oceans is taken from a W.M.O. study made in conjunction with plans for the World Weather Watch (W.W.W.).

It must be emphasized that the chart does not purport to indicate a specific number of buoys since it is recognized that an optimum deployment scheme can only result from experience obtained during network implementation. The chart commits no administration with respect to any future action relating to the deployment of platforms and unmanned buoys.

It can be anticipated that acquisition of ocean data on a global scale will lead to improved predictions of many ocean conditions. This will directly benefit coastal communities, high seas and coastal shipping, offshore oil, gas and other resource exploitation activies by minimizing the destructive effects of the forces of hurricanes, tsunamis, storm surges, seiches and severe tropical and extra-tropical storms. Predictions of sea temperatures, currents, sea ice and sea state conditions on the high seas would reduce the excessive annual toll in human life and ship casualties. For example, the Loss Book of the Liverpool Underwriters Association shows that, on a world-wide basis, heavy weather damages during 1965 caused the loss of 8 vessels and partial losses to an additional 1087. Prediction of these ocean properties will also lead to accelerated development of world fishery resources which are much needed as food by many nations of the world.

There is also the promise that an adequate global coverage will lead to improved accuracy and extended time range of weather forecasts - a boon not only to maritime nations but also to inland nations, as it would permit improved flood warnings, better planning of water conservation measures for crops and enlightened management of municipal water supplies.

April 1967

INSTITUTES FOR ENVIRONMENTAL RESEARCH
Institute for Telecommunication Sciences and Aeronomy
Boulder, Colorado
April, 1967

Theoretical Evaluation of Band 7 Frequency Complements for Ocean Data Communications

GEORGE W. HAYDON

ARCHIVES
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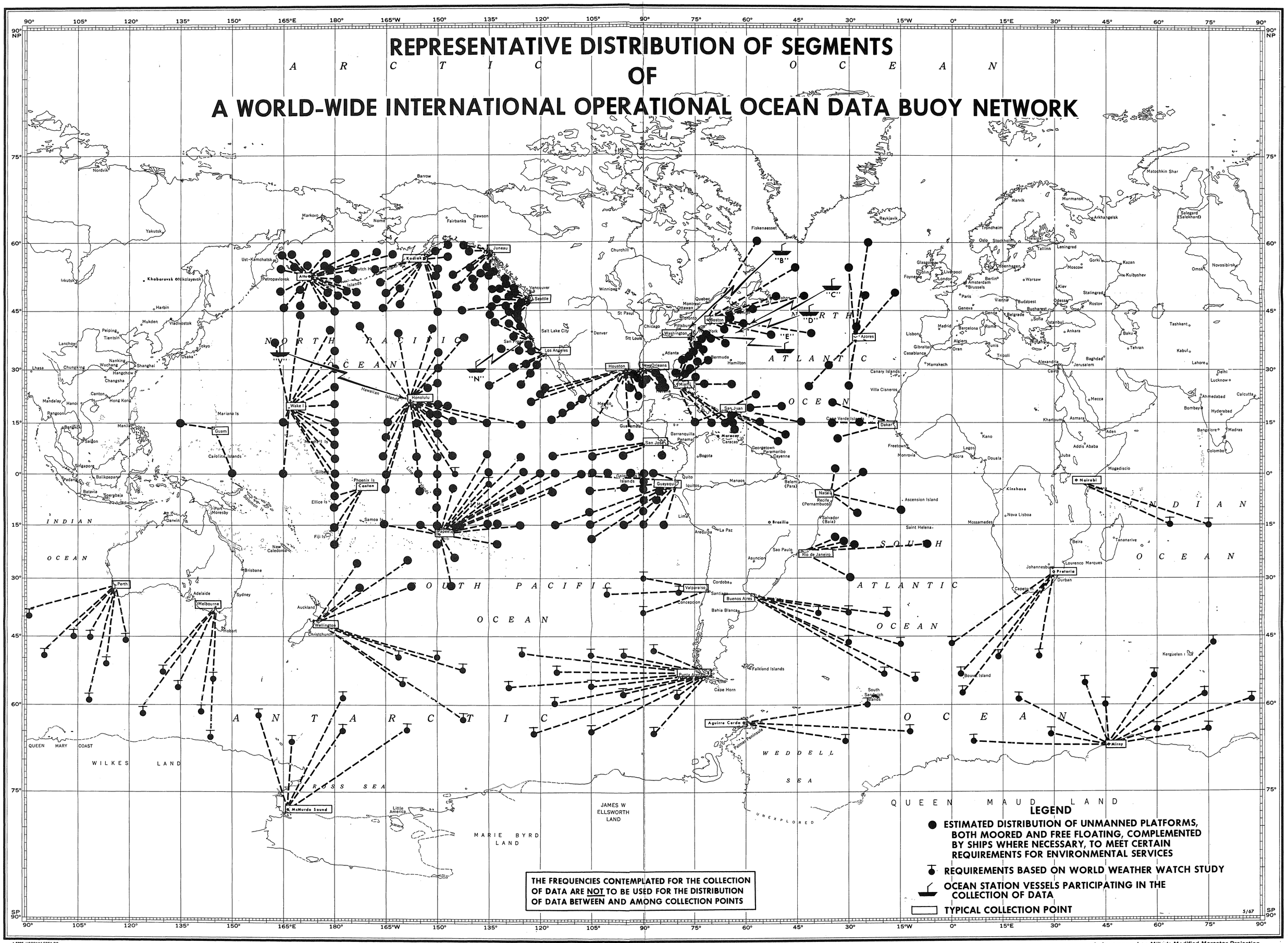
Technical Memorandum IERTM-ITSA 54

U.S. DEPARTMENT OF COMMERCE / ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION

REPRESENTATIVE DISTRIBUTION OF SEGMENTS OF A WORLD-WIDE INTERNATIONAL OPERATIONAL OCEAN DATA BUOY NETWORK



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Index prepared on Miller's Modified Mercator Projection

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ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
INSTITUTES FOR ENVIRONMENTAL RESEARCH

Institutes for Environmental Research Technical Memorandum ITSA-54

THEORETICAL EVALUATION OF BAND 7 FREQUENCY COMPLEMENTS FOR OCEAN DATA COMMUNICATIONS

by

George W. Haydon

INSTITUTE FOR TELECOMMUNICATION SCIENCES AND AERONOMY
TECHNICAL MEMORANDUM NO. 54

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TABLE OF CONTENTS

		Page
FOREWORD		vii
ABSTRACT		1
I.	INTRODUCTION	1
II.	EVALUATION OF FREQUENCY COMPLEMENTS	2
	A. Assumptions	2
	B. Discussion	3
	C. Results	6
III.	GEOGRAPHIC SHARING OF FREQUENCIES	8
	A. Assumptions	8
	B. Discussion	8
	C. Results	9
IV.	TIME SHARING OF FREQUENCIES	12
	A. Assumption	12
	B. Discussion	12
	C. Results	13
V.	CONCLUSIONS	15
VI.	ACKNOWLEDGMENTS	34
VII.	REFERENCES	35
Appendix I.	Basic Computations for the Evaluation of Frequency Complements	36
Appendix II.	Computations to Estimate the Feasibility of Frequency Sharing Through Geographic Separation	85
Appendix III.	Vertical Radiation Pattern of Buoy Antenna Used in the Calculations	147

LIST OF FIGURES

		Page
1.	Sample of basic calculations used to evaluate frequency complements	7
2.	Sample of calculations to estimate the feasibility of frequency sharing through geographic separation	11
3.	Example of the use of basic calculations to estimate the feasibility of time sharing	14
4.	Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length	16-31
5.	Average reliability of ocean data communications as a function of available frequency complement and geographic latitude, including worldwide average reliability	32-33
	Basic computations for the evaluation of frequency complements. (Numbers in body of the table below are figure numbers in Appendix I)	36

Latitude	Distance - Kilometers					
Degrees	200	500	800	1000	2000	3000
0-20 N	I-1	I-2	I-3	I-4	I-5	I-6
20-40 N	I-7	I-8	I-9	I-10	I-11	I-12
40-60 N	I-13	I-14	I-15	I-16	I-17	I-18
60-80 N	I-19	I-20	I-21	I-22	I-23	I-24
0-20 S	I-25	I-26	I-27	I-28	I-29	I-30
20-40 S	I-31	I-32	I-33	I-34	I-35	I-36
40-60 S	I-37	I-38	I-39	I-40	I-41	I-42
60-80 S	I-43	I-44	I-45	I-46	I-47	I-48

Computations to estimate the feasibility of frequency sharing through geographical separation. (Numbers in body of the table below are figure numbers in Appendix II) ... 85

Transmitter Latitude	Day or Night	Frequency - MHz					
		4.2	6.2	8.3	12.4	16.6	22.1
0° N	Day	II-1	II-2	II-3	II-4	II-5	II-6
	Night	II-7	II-8	II-9	II-10	II-11	II-12
20° N	Day	II-13	II-14	II-15	II-16	II-17	II-18
	Night	II-19	II-20	II-21	II-22	II-23	II-24
40° N	Day	II-25	II-26	II-27	II-28	II-29	II-30
	Night	II-31	II-32	II-33	II-34	II-35	II-36
60° N	Day	II-37	II-38	II-39	II-40	II-41	II-42
	Night	II-43	II-44	II-45	II-46	II-47	II-48
80° N	Day	II-49	II-50	II-51	II-52	II-53	II-54
	Night	II-55	II-56	II-57	II-58	II-59	II-60

Appendix III, Figure III-1. Vertical radiation pattern of buoy antenna used in the calculations 147

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FOREWORD

This report was prepared by the Institute for Telecommunication Sciences and Aeronomy, Environmental Science Services Administration, Boulder, Colorado, for use at the World Administrative Radio Conference to deal with matters relating to the Maritime Mobile Service, to be held in Geneva, Switzerland, from September 18 through November 4, 1967.

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THEORETICAL EVALUATION OF BAND 7 FREQUENCY COMPLEMENTS FOR OCEAN DATA COMMUNICATIONS

George W. Haydon

A study has been conducted to evaluate selected complements of Band 7 frequencies (3-30 MHz) by the application of radio propagation data to a hypothetical deployment of ocean buoys about base stations in various geographic areas. The relative utility of selected frequencies and the utility of these frequencies in combinations of 4, 5, or 6 is considered as a function of latitude and distances to the buoys. Data to estimate the feasibility of frequency sharing by geographic or time separation are included in the report.

I. INTRODUCTION

A World Administrative Radio Conference to deal with matters related to the Maritime Mobile Service is scheduled to be held in the fall of 1967. The worldwide radio frequency requirements for ocean data communications are now sufficiently defined to merit the consideration of these requirements at this conference. This report develops pertinent technical information for use at the conference with emphasis on these ocean data communication requirements. The International Radio Consultative Committee has developed basic technical data for predicting the likelihood of sky-wave propagation [CCIR, 1966] and the noise with which the high frequency signals must compete [CCIR Report 322], and is studying the use of these data in the prediction of sky-wave circuit performance [CCIR, 1963]. Techniques for anticipating the sky-wave performance of high frequency ocean data circuits from these predictable characteristics of the ionosphere and atmospheric noise have been developed [JTAC, 1964; Lucas and Haydon, 1966]. This report includes detailed calculations of the likelihood of successful data collection as a function of the frequencies available, length of the circuit, and the geographic latitude, and summarizes these calculations to evaluate the relative utility of various high frequency complements in ocean data communications. In the development of frequency allocation plans, it is also necessary to consider the feasibility of frequency sharing by geographic or time separation.

II. EVALUATION OF FREQUENCY COMPLEMENTS

A. Assumptions

1. A theoretical evaluation of the adequacy of the proposed frequency complement may be made by selecting base station locations over the geographic latitudes of interest. It is recognized that there are longitude variations in propagation conditions and in atmospheric noise levels, but the latitude variation is normally the more pronounced, and is considered adequate for this analysis.

2. Specific distances to buoys need not be considered if the analysis extends over the range of typical distances between base stations and the ocean buoys.

3. Sampling along a north-south line from the base station will approximate the deployment of buoys from a propagation viewpoint.

4. A single frequency complement is required, i.e., there will be no revision of the frequency complement within the solar cycle. Computations at solar activity levels of sunspot number indices of 20 and 120 are considered to provide an adequate approximation of solar activity variations.

5. The bands being considered for ocean data communications may be evaluated by a consideration of the following frequencies: 4.2, 6.2, 8.3, 12.4, 16.6, and 22.1 MHz.

6. The buoy-to-base station link will normally be weaker than the base station-to-buoy link and computations of system performance based on the buoy-to-base station link will provide a conservative evaluation of the expected performance of ocean data communications.

7. A typical buoy may be expected to deliver 100 W average power to its antenna.

8. The efficiency of the buoy antenna will be a function of frequency. For the purpose of these computations, an antenna equal in performance to a 5-m vertical whip over sea water is assumed. The gain of the buoy antenna as used in the analysis is shown in Appendix III.

9. The base station will employ an antenna with a gain of 10 dB relative to an isotropic antenna.

10. Typical transmission rates will not exceed 100 bits per second.

11. Communication reliability may be estimated from the likelihood that the signal-to-noise (S/N) ratio will be adequate for a 100 bit per second service. It is recognized that lower data rates may sometimes be desirable due to multipath on certain frequencies.

12. A S/N ratio of 40 dB (hourly median signal power in occupied bandwidth relative to hourly median noise in a 1 Hz bandwidth) will be adequate to provide the quality of service required. This corresponds to a 15 dB S/N ratio for a signal in a 300-Hz bandwidth, competing with noise in a 300-Hz bandwidth.

13. There will be no requirement for sky-wave coverage within the ground-wave range. The reliability of sky-wave communication at the minimum range can be estimated by computation from a 200-km path.

14. The maximum distance need not exceed 3000 km.

15. The reliability of sky-wave communications will vary with distance. Calculations at distance ranges of 200, 500, 800, 1000, 2000, and 3000 km will be adequate to permit interpolation at any distance of interest.

16. The requirement for communication is independent of the time of day and the season of year. Computations at 2-hr intervals for the months of June and December will represent diurnal and seasonal variations.

B. Discussion

In this report the expected performance of sky-wave circuits for the collection of ocean data at various latitudes is estimated for circuits of various distances by a time sampling of the theoretical reliability of the communication links.

Reliability in each sample is defined as the percentage of days within the month that a specified S/N ratio may be expected to be equaled or exceeded. The time samples are combined to obtain an average reliability for the individual frequencies under consideration and for combinations of 4, 5, or 6 frequencies. This average is an estimate of the percentage of hours within a solar cycle that buoy-to-base station circuits would have a binary error rate of less than one per thousand for unrepeated transmission, e.g., an FSK system with diversity reception. Separate

predictions are prepared for base stations at 80° N, 60° N, 40° N, 20° N, 20° S, 40° S, 60° S, and 80° S, and for buoy locations at distances of 200, 500, 800, 1000, and 3000 km. All predictions are made for paths along the 0° Meridian and since these calculations consider the more important propagation variables (circuit latitude and distance), it is assumed they may be used to anticipate the general utility of various frequency complements if these frequencies were used worldwide. For other longitudes, the expected performance may be approximated by noting the predictions are in local time (GMT at 0° longitude).

Figure 1 is a sample of the basic predictions from which the average reliabilities are calculated. The detailed computations are included in Appendix I of this report.

In each basic computation the propagation conditions are examined to determine the fraction of days per month that sky-wave propagation may be expected, the monthly median of the hourly median S/N ratio for those days, and the theoretical reliability of the circuit.

Predictions are made for frequencies of 3.0, 4.2, 6.2, 8.3, 12.4, 16.6, 22.1, 23, 25, 26, 27, 28, and 30 MHz at 2-hr intervals in the body of the table. Frequencies below 4.2 and above 22.1 MHz are included only to permit the use of a standard computer output format.

The fraction of days (F. Days) is the fraction of days within the month that sky-wave propagation is expected. The S/N ratio (S/N·dB) is a median of the hourly median at the receiver input terminals and is expressed as the ratio of the signal in the occupied bandwidth relative to the expected noise in a 1-Hz bandwidth. The theoretical reliability (Rel.) is the fraction of days within the month that the required S/N ratio may be expected to be equaled or exceeded. This fraction is estimated by (1) predicting the fraction of days that a sky-wave path is expected, (2) estimating the fraction of these days that an adequate S/N ratio will be available, and (3) combining these fractions to estimate the reliability.

A general description of the circuit parameters used in the calculations is shown in the heading of each computer print-out. Starting at the top of

the page and reading left to right, the heading may be described as follows:

Line 1: Numerical sequence in which the computation was made; the month for which the prediction applies; the solar activity level in 12-month moving average Zurich Sunspot Number for which the prediction applies; a circuit code number showing the bearing of the transmitter location in tens of degrees before the decimal, and the distance in hundreds of nautical miles following the decimal.

Lines 2 and 3: Identification of the circuit, e.g., 2000-km path to 20° N. with the transmitter and the receiver locations to the nearest hundredth of a degree; the bearing of the receiver at the transmitter and the bearing of the transmitter at the receiver in degrees East of North, and the great-circle distance in kilometers.

Line 4: The transmitting antenna. The receiving antenna. An antenna equivalent to a 5-m vertical whip transmitting antenna is assumed for the buoy and the antenna having a 10-dB gain relative to an isotropic antenna is assumed at the base terminal.

Line 5: The bearing of the main beam of the transmitting antenna relative to the great-circle path between the transmitter and receiver. The minimum vertical angle of arrival and departure considered in the selection of possible propagation modes. The bearing of the main beam of the receiver antenna relative to the great-circle path between the transmitter and receiver. For the simple antenna assumed in these calculations, the main beam may be considered to be along the great-circle path and 0 DEG is shown. A minimum vertical angle of 0 DEG is also used, indicating that the foreground of the antennas is unobstructed.

Line 6: Power at the transmitter antenna input. The man-made noise level in the receiving area. The required S/N ratio. For the power at the transmitting antenna input, 100 W average power is assumed. The man-made noise is about 15 dB above the CCIR noise for a quiet location [CCIR, 1963].

In the operating frequency caption, the frequencies of 4.2, 6.2, 8.3, 12.4, 16.6, and 22.1 MHz are truncated and appear as 4, 6, 8, 12, 16, and 22, respectively.

C. Results

Figure 4, based on the information contained in Appendix I, illustrates the theoretical reliability of various frequency complements as a function of circuit distance and geographic latitude. Figure 5 further summarizes this information by eliminating the circuit distance variable to better illustrate the latitude dependence. The last column of figure 5 shows the theoretical reliability of the various frequency complements if the frequencies were to be used worldwide, and provides the best single estimate of the theoretical reliability of the various frequency complements, assuming a uniform distribution in latitude and circuit length.

To evaluate any frequency or combination of frequencies in a specific data collection complex, select the geographic latitude which most nearly approximates the circuit latitudes and note the average reliability for all buoy-to-base station distances of interest. An average of these reliabilities will give an estimate of the percentage of hours within the solar cycle that data collection may be expected.

It is also possible to assign weights to the various distances to the buoys or latitudes of the buoys, e.g., assume 10 times as many buoys will be located at a distance of 500 km than at a distance of 200 km, or that twice as many will be located in 0-20° N as 60-80° N. These weights would permit a reevaluation of the utility of the various complements at a given latitude or worldwide. This exercise can be carried out manually and the use of a computer would not be essential.

```
        1              JUN                 SSN=  120                 18.011
    2000 KM PATH     TO     20 DEGREES N          AZIMUTHS          N.MILES
   2.01N -    0.00W       20.00N -    0.00W       0.0 180.0         1079.4
 VERTICAL    5H    0L    0DEG                                      ANT= 10DB
 OFF AZIMUTH    0 DEG.     MIN. ANGLE=  0 DEG.     OFF AZIMUTH    0 DEG.
 PWR=  0.10KW          3 MC/S MAN. NOISE = -148 DBW          REQ.S/N= 40DB
                              OPERATING FREQUENCIES
GMT          3    4    6    8   12   16   22   23   25   26   27   28   30
 2          .99  .99  .99  .99  .87  .29    -    -    -    -    -    -    -   F.DAYS
             26   34   45   53   66   70    -    -    -    -    -    -    -   S/N..DB
            .10  .30  .82  .99  .87  .29    -    -    -    -    -    -    -   REL.

 4          .99  .99  .99  .97  .44    -    -    -    -    -    -    -    -   F.DAYS
             34   41   50   57   67    -    -    -    -    -    -    -    -   S/N..DB
            .30  .55  .92  .97  .43    -    -    -    -    -    -    -    -   REL.

 6          .99  .99  .99  .99  .97  .30    -    -    -    -    -    -    -   F.DAYS
             15   28   43   56   65   69    -    -    -    -    -    -    -   S/N..DB
            .00  .16  .66  .98  .97  .30    -    -    -    -    -    -    -   REL.

 8          .99  .99  .99  .99  .99  .99  .55  .39  .12  .06    -    -    -   F.DAYS
            -71  -30    9   31   57   63   68   68   69   70    -    -    -   S/N..DB
            .00  .00  .00  .20  .99  .99  .54  .39  .12  .06    -    -    -   REL.

10          .99  .99  .99  .99  .99  .99  .16  .09    -    -    -    -    -   F.DAYS
           -145  -82  -21   18   41   60   67   67    -    -    -    -    -   S/N..DB
            .00  .00  .00  .01  .57  .99  .16  .09    -    -    -    -    -   REL.

12          .99  .99  .99  .99  .99  .99    -    -    -    -    -    -    -   F.DAYS
           -174 -102  -30   15   51   60    -    -    -    -    -    -    -   S/N..DB
            .00  .00  .00  .00  .95  .99    -    -    -    -    -    -    -   REL.

14          .99  .99  .99  .99  .99  .99  .13  .08    -    -    -    -    -   F.DAYS
           -146  -82  -22   20   53   61   67   67    -    -    -    -    -   S/N..DB
            .00  .00  .00  .01  .97  .99  .13  .08    -    -    -    -    -   REL.

16          .99  .99  .99  .99  .99  .92  .25  .17  .06    -    -    -    -   F.DAYS
            -73  -31   18   33   57   64   69   68   69    -    -    -    -   S/N..DB
            .00  .00  .02  .26  .99  .91  .25  .17  .06    -    -    -    -   REL.

18          .99  .99  .99  .99  .99  .86  .32  .24  .11  .06    -    -    -   F.DAYS
              7   25   39   53   60   68   71   70   71   72    -    -    -   S/N..DB
            .01  .12  .49  .94  .98  .86  .32  .24  .10  .06    -    -    -   REL.

20          .99  .99  .99  .99  .96  .67  .10  .06    -    -    -    -    -   F.DAYS
             33   40   49   55   63   70   71   71    -    -    -    -    -   S/N..DB
            .26  .53  .89  .99  .96  .66  .10  .06    -    -    -    -    -   REL.

22          .99  .99  .99  .99  .92  .42    -    -    -    -    -    -    -   F.DAYS
             29   37   46   54   64   69    -    -    -    -    -    -    -   S/N..DB
            .13  .38  .88  .99  .92  .42    -    -    -    -    -    -    -   REL.

24          .99  .99  .99  .99  .92  .40    -    -    -    -    -    -    -   F.DAYS
             27   36   46   53   65   70    -    -    -    -    -    -    -   S/N..DB
            .11  .35  .85  .99  .91  .40    -    -    -    -    -    -    -   REL.
```

Figure 1. Sample of basic calculations used to evaluate frequency complements.

III. GEOGRAPHIC SHARING OF FREQUENCIES

It will probably be necessary to use the same frequency simultaneously in several geographic areas to collect the desired data with the limited number of frequencies being considered. The feasibility of simultaneous operations will vary markedly with frequency of operation, time of operation, base station location, as well as season of year and solar activity level.

As base stations and buoy locations become well defined, radio propagation data may be used to develop detailed plans for simultaneous operations. For broad planning at the Maritime Conference some initial guidance on feasibility of simultaneous operations is desirable.

A. Assumptions

1. For broad planning purposes the feasibility of simultaneous frequency usage on the basis of an adequate geographic separation may be estimated by calculating the geographic variation of factors which may be used in the frequency sharing criteria for the frequencies of interest.

2. Useful frequency sharing criteria include (a) the fraction of days that sky-wave propagation is expected, (b) the median available S/N ratio at the receivers, and (c) median receiver input power.

3. Latitude variations may be anticipated by calculations at 0°, 20°, 40°, 60°, and 80° in the Northern Hemisphere.

4. Diurnal variations may be anticipated by considering the diurnal extremes of noon and midnight at the transmitter locations.

5. Other parameters in the broad planning of sharing feasibility may be based on average conditions, i.e., average month (March), average solar activity (12-month Zurich Sunspot Number 70).

B. Discussion

Figure 2 is a sample computation designed for guidance in estimating the feasibility of simultaneous operations by geographic separation of the circuits. In this format the time, operating frequency, and transmitter location are fixed and the receiving location is the variable.

At each receiving location the fraction of days which sky-wave propagation may be expected and the S/N ratio are calculated as in basic computations of Appendix I. In addition, the median receiver input power in decibels below 1 W is also shown. When the available S/N ratio is less than -20 dB an asterisk is shown and when the fraction of days is less than .05 a hyphen is shown.

C. Results

Computations for broad planning purposes as described in the Assumptions above are contained in Appendix II. The computations are directly applicable to the buoy-to-base station links when the base station antenna is not directed toward the potentially interfering buoy. To use these computations it is necessary to establish the minimum S/N ratio or the receiver input power, which is expected to cause harmful interference. A signal no stronger than the expected noise is often a useful criteria. Since the S/N ratios shown in these computations are for noise in a reference bandwidth of 1 Hz, it is necessary to consider the bandwidth of the receiver, e.g., for a 300-Hz bandwidth receiver the interfering signal could be expected to be equal or less than the noise for all S/N ratios of 25 dB or less. If the base station antennas were directed toward the buoy, or if powers other than 100 W were used (e.g., base stations to buoys) appropriate adjustments in the available S/N ratio are required. The fraction of days that sky-wave paths may be expected may also be used as a criterion for frequency sharing on the basis of geographic separation.

Day and night distance separation for each frequency as a function of latitude, as determined from the charts in Appendix II, may be used as estimates of the geographic separation generally necessary to permit frequency duplication. Due to the greater attenuation rates at the lower frequencies, especially in the daytime, the geographic separation required is least at the lower frequencies during daylight hours. For example, see figure 1 in Appendix II.

Note the charts are limited to noon and midnight, to the month of March at a solar activity index of Sunspot Number 70. A first approximation to other months and times may be made by noting that the chart for a transmitter at 1200 GMT at 0° latitude is at the subsolar point, the transmitter at 20° N is 20° from the subsolar point, etc., until the transmitter at 0° latitude 2400 GMT is at antipode of the subsolar point.

If the charts in Appendix II are used as first approximations of the distance separation required for other months and times, the available receiver input power will be the most applicable parameter, with available S/N ratio and the fraction of days of an expected sky-wave path following in that order.

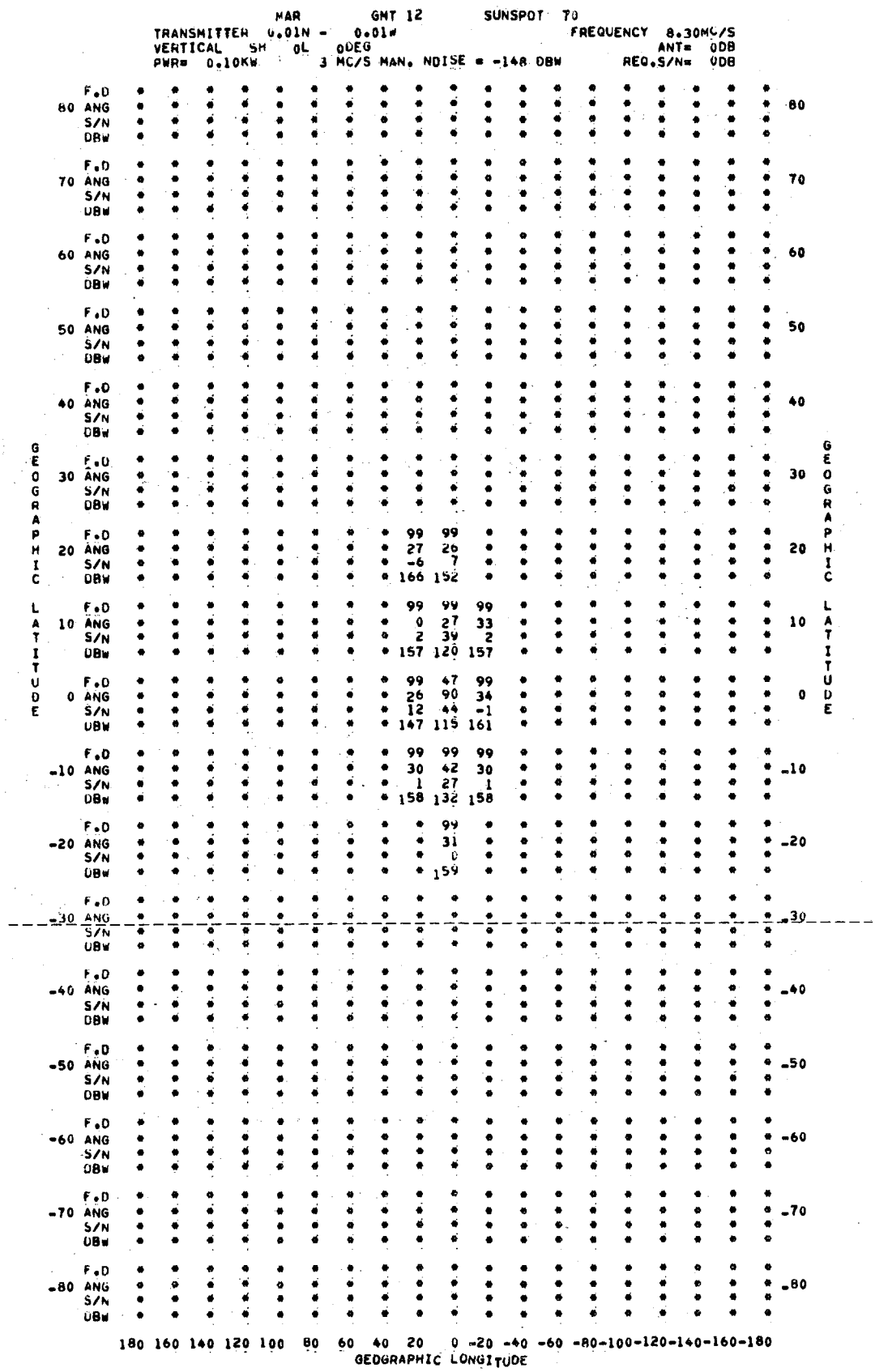

Figure 2. Sample of calculations to estimate the feasibility of frequency sharing through geographic separation.

IV. TIME SHARING OF FREQUENCIES

Time sharing, although related to geographic sharing as discussed in part III, depends upon the likelihood that a frequency will be useful at different times of the day in different locations and not upon the likelihood that the signal will fail to propagate between the locations. The expectation that a frequency may not operate satisfactorily at a given local time can therefore be exploited by scheduling to take advantage of local time changes. Time sharing of frequencies due to changes in propagation conditions (primarily with local time, but also with season) augments the obvious time sharing arrangements such as the sequential interrogation of buoys from a base station and the systematic rotation of frequencies between base stations during periods when the frequency is expected to be usable. Within a given data collection complex there is also time sharing between different distances, e.g., frequency changes between day and night.

A. Assumption

Since the basic predictions (Appendix I) are made in local time (GMT at 0° longitude), time differences may be examined to anticipate the likelihood of frequency sharing by time separation.

B. Discussion

Figure 3 illustrates a typical diurnal variation in the reliability of the various frequencies. Note that 12 MHz is expected to be useful on 80% or more of the days only between the hours of 1400 and 1800 Local Time, i.e., about a 4-hr time difference should permit a time sharing of the frequency due to the diurnal variation in its usefulness. When various distances are involved, as in ocean data communications, there is normally considerable flexibility in the time sharing of frequencies, both within and between data collection complexes. Due to the diurnal variation in the upper frequency which will be propagated by the ionosphere, time sharing is usually most feasible at the higher frequencies, but is also often possible at the lower frequencies due to higher daytime

attenuation. In summary, due to variation in propagation conditions, the lower frequencies are most useful at night and the higher frequencies are most useful in the daytime, and these changes can be used to develop frequency sharing plans on the basis of time differences.

C. Results

Appendix I contains the basic data from which the feasibility of frequency sharing through time separation may be estimated. The basic computations of Appendix I are illustrative of the degree that time sharing is probable and more applicable to broad rather than specific time sharing considerations.

1 DEC SSN= 20 18.005

1000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES

11.01N - 0.00W 20.00N - 0.00W 0.0 180.0 539.4

VERTICAL 5H 0L 0DEG ANT= 10DB

OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB

OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.98	.88	.60	.09	-	-	-	-	-	-	-	-	F.DAYS
	50	56	64	69	72	-	-	-	-	-	-	-	-	S/N..DB
	.93	.97	.88	.60	.09	-	-	-	-	-	-	-	-	REL.
4	.92	.66	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.65	.13	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.42	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.42	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.61	-	-	-	-	-	-	-	-	F.DAYS
	14	32	56	63	70	-	-	-	-	-	-	-	-	S/N..DB
	.00	.22	.99	.99	.60	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.79	.21	-	-	-	-	-	-	-	F.DAYS
	-21	7	35	58	67	71	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.32	.99	.79	.21	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.77	.17	-	-	-	-	-	-	-	F.DAYS
	-35	-2	29	56	66	71	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.14	.99	.76	.17	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.87	.37	-	-	-	-	-	-	-	F.DAYS
	-21	7	35	58	67	71	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.33	.99	.87	.37	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.94	.57	.06	-	-	-	-	-	-	F.DAYS
	14	32	56	63	70	73	75	-	-	-	-	-	-	S/N..DB
	.00	.22	.99	.99	.93	.57	.06	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.89	.40	-	-	-	-	-	-	-	F.DAYS
	52	58	64	69	73	74	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.89	.40	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.72	.20	-	-	-	-	-	-	-	F.DAYS
	52	58	64	69	73	74	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.72	.20	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.98	.58	.14	-	-	-	-	-	-	-	F.DAYS
	51	56	63	69	72	74	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.99	.97	.58	.14	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.94	.37	-	-	-	-	-	-	-	-	F.DAYS
	51	56	64	69	72	-	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.99	.94	.37	-	-	-	-	-	-	-	-	REL.

Figure 3. Example of the use of basic calculations to estimate the feasibility of time sharing.

V. CONCLUSIONS

The theoretical utility of various individual frequencies and combinations of these frequencies for worldwide ocean data communications is shown in figure 5 under the worldwide column. If the communication equipment or data transmission requirements differ somewhat from the assumptions stated, it is likely the absolute magnitude of the theoretical utility may change, but it is unlikely that the relative magnitude will change significantly. However, if the distribution of buoys, either by distance or by latitude varies substantially from the uniform distribution assumed, a reexamination of the average reliability may be in order.

Although 16 and 22 MHz appear to contribute very little to the average overall reliability, these frequencies are useful over 50% of the time at some latitudes and distances and their availability may contribute significantly to an adequate frequency complement by improving time sharing opportunity. Likewise, although 3 MHz appears to contribute significantly to the overall average reliability, it should be noted the 3 MHz requirement exists primarily for the short distance communication circuits at certain latitudes during limited time periods. Therefore, if the use of 3 MHz poses severe equipment design problems it should be possible to develop interrogation schedules to avoid this short distance problem during times the 3 MHz is the only useful frequency.

All reliability computations assume interrogation from and data transmission to a single base terminal. This reliability will markedly improve if more than one base terminal is involved due primarily to the relationship between frequency of operation and circuit distance.

Frequency sharing through geographic and/or time separation is feasible, and as specific buoy locations and base stations become established, detailed plans may be developed to fully exploit the frequencies available for ocean data communications.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

0 DEGREES TO 20 DEGREES NORTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
3	68	50	43	39	19	2
4	75	62	54	50	35	20
6	66	78	76	63	52	42
8	43	59	76	81	63	56
12	8	23	40	51	80	72
16	0	1	11	21	57	75
22	0	0	0	0	12	38
3- 4- 6- 8	88	92	84	68	59	67
3- 4- 6-12	88	92	84	68	59	67
3- 4- 6-16	88	92	84	68	59	67
3- 4- 6-22	88	92	84	68	59	67
3- 4- 8-12	86	86	94	94	68	77
3- 4- 8-16	86	86	94	94	68	77
3- 4- 8-22	86	86	94	94	68	77
3- 4-12-16	82	73	76	79	88	81
3- 4-12-22	82	73	76	79	88	81
3- 4-16-22	82	66	60	62	73	81
3- 6- 8-12	86	92	93	94	69	78
3- 6- 8-16	86	92	93	94	69	78
3- 6- 8-22	86	92	93	94	69	78
3- 6-12-16	86	91	88	84	93	83
3- 6-12-22	86	91	88	84	93	83
3- 6-16-22	86	91	83	73	85	88
3- 8-12-16	79	82	90	91	93	85
3- 8-12-22	79	82	90	91	93	85
3- 8-16-22	79	82	90	90	87	93
3-12-16-22	69	62	67	71	84	88
4- 6- 8-12	81	89	94	94	69	78
4- 6- 8-16	81	89	94	94	69	78
4- 6- 8-22	81	89	94	94	69	78
4- 6-12-16	81	88	89	84	94	83
4- 6-12-22	81	88	89	84	94	83
4- 6-16-22	81	88	84	73	86	88
4- 8-12-16	79	82	92	93	94	85
4- 8-12-22	79	82	92	93	94	85

Figure 4. Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

0 DEGREES TO 20 DEGREES NORTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
4- 8-16-22	79	82	92	93	88	93
4-12-16-22	75	69	74	78	89	90
6- 8-12-16	66	79	87	90	94	86
6- 8-12-22	66	79	87	90	94	86
6- 8-16-22	66	79	87	90	88	94
6-12-16-22	66	78	82	80	94	92
8-12-16-22	43	59	76	82	93	94
3- 4- 6- 8-12	88	93	96	95	95	78
3- 4- 6- 8-16	88	93	96	95	89	94
3- 4- 6- 8-22	88	93	96	95	70	79
3- 4- 6-12-16	88	92	90	85	95	92
3- 4- 6-12-22	88	92	90	85	94	84
3- 4- 6-16-22	88	92	86	74	86	88
3- 4- 8-12-16	86	86	94	94	95	94
3- 4- 8-12-22	86	86	94	94	94	86
3- 4- 8-16-22	86	86	94	94	88	93
3- 4-12-16-22	82	73	76	79	89	90
3- 6- 8-12-16	86	92	93	94	96	94
3- 6- 8-12-22	86	92	93	94	94	87
3- 6- 8-16-22	86	92	93	94	88	94
3- 6-12-16-22	86	91	88	84	94	92
3- 8-12-16-22	79	82	90	91	94	94
4- 6- 8-12-16	81	89	94	94	96	94
4- 6- 8-12-22	81	89	94	94	95	87
4- 6- 8-16-22	81	89	94	94	89	94
4- 6-12-16-22	81	88	89	84	95	92
4- 8-12-16-22	79	82	92	93	95	94
6- 8-12-16-22	66	79	87	90	95	95
3- 4- 6- 8-12-16	88	93	96	95	96	94
3- 4- 6- 8-12-22	88	93	96	95	95	87
3- 4- 6- 8-16-22	88	93	96	95	89	94
3- 4- 6-12-16-22	88	92	90	85	95	92
3- 4- 8-12-16-22	86	86	94	94	95	94
3- 6- 8-12-16-22	86	92	93	94	96	95
4- 6- 8-12-16-22	81	89	94	94	96	95
ALL FREQUENCIES	88	93	96	95	96	95

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

20 DEGREES TO 40 DEGREES NORTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
3	80	63	51	47	27	4
4	72	72	64	58	42	27
6	39	66	71	68	59	46
8	11	30	62	71	71	57
12	0	1	14	30	76	72
16	0	0	0	5	58	70
22	0	0	0	0	25	54
3- 4- 6- 8	90	96	87	76	76	85
3- 4- 6-12	90	96	87	76	76	85
3- 4- 6-16	90	96	87	76	76	85
3- 4- 6-22	90	96	87	76	76	85
3- 4- 8-12	89	86	96	95	81	89
3- 4- 8-16	89	86	96	95	81	89
3- 4- 8-22	89	86	96	95	81	89
3- 4-12-16	89	79	72	78	90	89
3- 4-12-22	89	79	72	78	90	89
3- 4-16-22	89	79	65	62	85	84
3- 6- 8-12	86	95	97	95	82	90
3- 6- 8-16	86	95	97	95	82	90
3- 6- 8-22	86	95	97	95	82	90
3- 6-12-16	86	95	87	84	94	92
3- 6-12-22	86	95	87	84	94	92
3- 6-16-22	86	95	86	77	92	93
3- 8-12-16	81	77	92	94	92	93
3- 8-12-22	81	77	92	94	92	93
3- 8-16-22	81	77	92	93	92	95
3-12-16-22	80	64	63	70	87	90
4- 6- 8-12	73	89	97	96	82	90
4- 6- 8-16	73	89	97	96	82	90
4- 6- 8-22	73	89	97	96	82	90
4- 6-12-16	73	89	87	85	94	92
4- 6-12-22	73	89	87	85	94	92
4- 6-16-22	73	89	86	78	92	93
4- 8-12-16	73	79	95	97	94	93
4- 8-12-22	73	79	95	97	94	93

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

20 DEGREES TO 40 DEGREES NORTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
4- 8-16-22	73	79	95	95	93	95
4-12-16-22	72	72	72	78	93	92
6- 8-12-16	40	67	82	90	94	94
6- 8-12-22	40	67	82	90	94	94
6- 8-16-22	40	67	82	88	94	95
6-12-16-22	40	67	72	77	97	95
8-12-16-22	13	32	64	73	96	95
3- 4- 6- 8-12	90	96	98	98	94	80
3- 4- 6- 8-16	90	96	98	96	94	90
3- 4- 6- 8-22	90	96	98	96	80	88
3- 4- 6-12-16	90	96	88	85	97	90
3- 4- 6-12-22	90	96	88	85	94	91
3- 4- 6-16-22	90	96	87	78	92	91
3- 4- 8-12-16	89	86	96	97	97	91
3- 4- 8-12-22	89	86	96	97	93	91
3- 4- 8-16-22	89	86	96	95	93	93
3- 4-12-16-22	89	79	72	78	93	90
3- 6- 8-12-16	86	95	97	97	98	91
3- 6- 8-12-22	86	95	97	97	94	92
3- 6- 8-16-22	86	95	97	95	94	94
3- 6-12-16-22	86	95	87	84	97	93
3- 8-12-16-22	81	77	92	94	96	94
4- 6- 8-12-16	73	89	97	98	98	91
4- 6- 8-12-22	73	89	97	98	94	92
4- 6- 8-16-22	73	89	97	96	94	94
4- 6-12-16-22	73	89	87	85	97	93
4- 8-12-16-22	73	79	95	97	97	94
6- 8-12-16-22	39	66	82	90	98	94
3- 4- 6- 8-12-16	90	96	98	98	98	91
3- 4- 6- 8-12-22	90	96	98	98	94	92
3- 4- 6- 8-16-22	90	96	98	96	94	94
3- 4- 6-12-16-22	90	96	88	85	97	93
3- 4- 8-12-16-22	89	86	96	97	97	94
3- 6- 8-12-16-22	86	95	97	97	98	94
4- 6- 8-12-16-22	73	89	97	98	98	94
ALL FREQUENCIES	90	96	98	98	98	94

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

40 DEGREES TO 60 DEGREES NORTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
3	66	59	53	48	28	6
4	50	57	57	57	46	27
6	13	38	58	55	63	49
8	5	9	38	53	63	61
12	0	2	6	9	58	60
16	0	0	1	4	28	48
22	0	0	0	0	7	22
3- 4- 6- 8	69	80	86	77	67	65
3- 4- 6-12	69	80	86	77	67	65
3- 4- 6-16	69	80	86	77	67	65
3- 4- 6-22	69	80	86	77	67	65
3- 4- 8-12	69	71	83	89	76	70
3- 4- 8-16	69	71	83	89	76	70
3- 4- 8-22	69	71	83	89	76	70
3- 4-12-16	69	71	67	65	86	72
3- 4-12-22	69	71	67	65	86	72
3- 4-16-22	69	71	66	63	68	69
3- 6- 8-12	66	73	89	90	76	72
3- 6- 8-16	66	73	89	90	76	72
3- 6- 8-22	66	73	89	90	76	72
3- 6-12-16	66	73	84	75	90	81
3- 6-12-22	66	73	84	75	90	81
3- 6-16-22	66	73	84	75	76	82
3- 8-12-16	66	60	76	84	85	81
3- 8-12-22	66	60	76	84	85	81
3- 8-16-22	66	60	76	84	76	83
3-12-16-22	66	59	56	54	79	68
4- 6- 8-12	51	66	82	87	77	72
4- 6- 8-16	51	66	82	87	77	72
4- 6- 8-22	51	66	82	87	77	72
4- 6-12-16	51	66	77	72	92	81
4- 6-12-22	51	66	77	72	92	81
4- 6-16-22	51	66	77	72	77	82
4- 8-12-16	51	57	74	84	92	81
4- 8-12-22	51	57	74	84	92	81

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

40 DEGREES TO 60 DEGREES NORTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
4- 8-16-22	51	57	74	84	83	83
4-12-16-22	51	57	58	60	89	76
6- 8-12-16	14	40	64	71	92	82
6- 8-12-22	14	40	64	71	92	82
6- 8-16-22	14	40	64	71	82	85
6-12-16-22	14	40	59	56	93	85
8-12-16-22	6	10	39	54	82	85
3- 4- 6- 8-12	69	80	91	92	93	82
3- 4- 6- 8-16	69	80	91	92	84	83
3- 4- 6- 8-22	69	80	91	92	77	71
3- 4- 6-12-16	69	80	86	77	94	85
3- 4- 6-12-22	69	80	86	77	92	81
3- 4- 6-16-22	69	80	86	77	77	82
3- 4- 8-12-16	69	71	83	89	94	85
3- 4- 8-12-22	69	71	83	89	92	81
3- 4- 8-16-22	69	71	83	89	83	83
3- 4-12-16-22	69	71	67	65	89	76
3- 6- 8-12-16	66	73	89	90	94	86
3- 6- 8-12-22	66	73	89	90	92	83
3- 6- 8-16-22	66	73	89	90	82	85
3- 6-12-16-22	66	73	84	75	93	86
3- 8-12-16-22	66	60	76	84	88	85
4- 6- 8-12-16	50	66	82	87	95	86
4- 6- 8-12-22	50	66	82	87	93	83
4- 6- 8-16-22	50	66	82	87	84	85
4- 6-12-16-22	50	66	77	72	94	86
4- 8-12-16-22	50	57	74	84	94	85
6- 8-12-16-22	13	38	63	70	94	87
3- 4- 6- 8-12-16	69	80	91	92	95	86
3- 4- 6- 8-12-22	69	80	91	92	93	83
3- 4- 6- 8-16-22	69	80	91	92	84	85
3- 4- 6-12-16-22	69	80	86	77	94	86
3- 4- 8-12-16-22	69	71	83	89	94	85
3- 6- 8-12-16-22	66	73	89	90	94	87
4- 6- 8-12-16-22	50	66	82	87	95	87
ALL FREQUENCIES	69	80	91	92	95	87

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

60 DEGREES TO 80 DEGREES NORTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
3	70	56	47	44	22	6
4	45	63	56	52	38	30
6	4	17	57	64	52	52
8	0	1	16	39	59	57
12	0	0	0	1	43	47
16	0	0	0	0	4	23
22	0	0	0	0	0	5
3- 4- 6- 8	71	77	86	83	54	53
3- 4- 6-12	71	77	86	83	54	53
3- 4- 6-16	71	77	86	83	54	53
3- 4- 6-22	71	77	86	83	54	53
3- 4- 8-12	71	76	71	78	66	61
3- 4- 8-16	71	76	71	78	66	61
3- 4- 8-22	71	76	71	78	66	61
3- 4-12-16	71	76	62	55	66	60
3- 4-12-22	71	76	62	55	66	60
3- 4-16-22	71	76	62	55	38	45
3- 6- 8-12	70	59	82	87	67	63
3- 6- 8-16	70	59	82	87	67	63
3- 6- 8-22	70	59	82	87	67	63
3- 6-12-16	70	59	81	81	73	69
3- 6-12-22	70	59	81	81	73	69
3- 6-16-22	70	59	81	81	53	61
3- 8-12-16	70	56	57	70	77	67
3- 8-12-22	70	56	57	70	77	67
3- 8-16-22	70	56	57	70	63	62
3-12-16-22	70	56	47	44	55	51
4- 6- 8-12	45	64	81	86	68	64
4- 6- 8-16	45	64	81	86	68	64
4- 6- 8-22	45	64	81	86	68	64
4- 6-12-16	45	64	80	80	75	70
4- 6-12-22	45	64	80	80	75	70
4- 6-16-22	45	64	80	80	54	61
4- 8-12-16	45	63	66	75	81	71
4- 8-12-22	45	63	66	75	81	71

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

60 DEGREES TO 80 DEGREES NORTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
4- 8-16-22	45	63	66	75	66	65
4-12-16-22	45	63	56	52	66	62
6- 8-12-16	4	17	58	70	81	73
6- 8-12-22	4	17	58	70	81	73
6- 8-16-22	4	17	58	70	67	68
6-12-16-22	4	17	57	64	73	71
8-12-16-22	0	1	17	39	73	68
3- 4- 6- 8-12	71	77	87	89	83	73
3- 4- 6- 8-16	71	77	87	89	68	68
3- 4- 6- 8-22	71	77	87	89	68	64
3- 4- 6-12-16	71	77	86	83	75	71
3- 4- 6-12-22	71	77	86	83	75	70
3- 4- 6-16-22	71	77	86	83	54	61
3- 4- 8-12-16	71	76	71	78	81	71
3- 4- 8-12-22	71	76	71	78	81	71
3- 4- 8-16-22	71	76	71	78	66	65
3- 4-12-16-22	71	76	62	55	66	62
3- 6- 8-12-16	70	59	82	87	81	74
3- 6- 8-12-22	70	59	82	87	81	73
3- 6- 8-16-22	70	59	82	87	67	68
3- 6-12-16-22	70	59	81	81	73	71
3- 8-12-16-22	70	56	57	70	77	68
4- 6- 8-12-16	45	64	81	86	83	74
4- 6- 8-12-22	45	64	81	86	83	73
4- 6- 8-16-22	45	64	81	86	68	68
4- 6-12-16-22	45	64	80	80	75	71
4- 8-12-16-22	45	63	66	75	81	71
6- 8-12-16-22	4	17	58	70	81	74
3- 4- 6- 8-12-16	71	77	87	89	83	74
3- 4- 6- 8-12-22	71	77	87	89	83	73
3- 4- 6- 8-16-22	71	77	87	89	68	68
3- 4- 6-12-16-22	71	77	86	83	75	71
3- 4- 8-12-16-22	71	76	71	78	81	71
3- 6- 8-12-16-22	70	59	82	87	81	74
4- 6- 8-12-16-22	45	64	81	86	83	74
ALL FREQUENCIES	71	77	87	89	83	74

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

0 DEGREES TO 20 DEGREES SOUTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
3	65	55	50	50	29	9
4	65	57	54	55	48	33
6	50	65	61	59	57	53
8	23	43	64	70	65	60
12	0	3	24	39	75	75
16	0	0	0	7	61	77
22	0	0	0	0	28	58
3- 4- 6- 8	85	92	80	72	78	90
3- 4- 6-12	85	92	80	72	78	90
3- 4- 6-16	85	92	80	72	78	90
3- 4- 6-22	85	92	80	72	78	90
3- 4- 8-12	81	86	95	96	83	92
3- 4- 8-16	81	86	95	96	83	92
3- 4- 8-22	81	86	95	96	83	92
3- 4-12-16	78	69	75	82	92	90
3- 4-12-22	78	69	75	82	92	90
3- 4-16-22	78	67	59	63	88	88
3- 6- 8-12	83	92	95	95	83	92
3- 6- 8-16	83	92	95	95	83	92
3- 6- 8-22	83	92	95	95	83	92
3- 6-12-16	83	91	87	87	95	94
3- 6-12-22	83	91	87	87	95	94
3- 6-16-22	83	91	79	74	92	96
3- 8-12-16	75	82	93	95	92	94
3- 8-12-22	75	82	93	95	92	94
3- 8-16-22	75	82	93	94	91	96
3-12-16-22	65	58	69	78	87	89
4- 6- 8-12	72	82	91	93	84	92
4- 6- 8-16	72	82	91	93	84	92
4- 6- 8-22	72	82	91	93	84	92
4- 6-12-16	72	82	83	85	95	94
4- 6-12-22	72	82	83	85	95	94
4- 6-16-22	72	82	75	73	93	96
4- 8-12-16	68	76	90	94	95	94
4- 8-12-22	68	76	90	94	95	94

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

0 DEGREES TO 20 DEGREES SOUTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
4- 8-16-22	68	76	90	93	94	96
4-12-16-22	65	59	70	80	94	92
6- 8-12-16	50	66	78	83	94	95
6- 8-12-22	50	66	78	83	94	95
6- 8-16-22	50	66	78	82	94	97
6-12-16-22	50	65	70	74	96	96
8-12-16-22	24	43	64	71	91	96
3- 4- 6- 8-12	85	93	97	97	95	84
3- 4- 6- 8-16	85	93	97	96	95	96
3- 4- 6- 8-22	85	93	97	96	82	91
3- 4- 6-12-16	85	92	89	88	97	96
3- 4- 6-12-22	85	92	89	88	96	93
3- 4- 6-16-22	85	92	80	75	93	96
3- 4- 8-12-16	81	86	95	97	96	96
3- 4- 8-12-22	81	86	95	97	95	93
3- 4- 8-16-22	81	86	95	96	94	96
3- 4-12-16-22	78	69	75	82	94	92
3- 6- 8-12-16	83	92	95	96	96	96
3- 6- 8-12-22	83	92	95	96	95	94
3- 6- 8-16-22	83	92	95	95	94	97
3- 6-12-16-22	83	91	87	87	96	96
3- 8-12-16-22	75	82	93	95	93	96
4- 6- 8-12-16	72	82	91	94	97	96
4- 6- 8-12-22	72	82	91	94	96	94
4- 6- 8-16-22	72	82	91	93	95	97
4- 6-12-16-22	72	82	83	85	97	96
4- 8-12-16-22	68	76	90	94	96	96
6- 8-12-16-22	50	66	78	83	96	97
3- 4- 6- 8-12-16	85	93	97	97	97	96
3- 4- 6- 8-12-22	85	93	97	97	96	94
3- 4- 6- 8-16-22	85	93	97	96	95	97
3- 4- 6-12-16-22	85	92	89	88	97	96
3- 4- 8-12-16-22	81	86	95	97	96	96
3- 6- 8-12-16-22	83	92	95	96	96	97
4- 6- 8-12-16-22	72	82	91	94	97	97
ALL FREQUENCIES	85	93	97	97	97	97

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

20 DEGREES TO 40 DEGREES SOUTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
3	68	59	52	49	30	9
4	60	57	55	56	46	33
6	33	55	59	55	58	51
8	9	23	50	61	63	57
12	0	0	10	20	64	63
16	0	0	0	2	42	56
22	0	0	0	0	13	35
3- 4- 6- 8	81	93	87	77	71	80
3- 4- 6-12	81	93	87	77	71	80
3- 4- 6-16	81	93	87	77	71	80
3- 4- 6-22	81	93	87	77	71	80
3- 4- 8-12	78	86	94	96	80	83
3- 4- 8-16	78	86	94	96	80	83
3- 4- 8-22	78	86	94	96	80	83
3- 4-12-16	78	75	72	75	92	84
3- 4-12-22	78	75	72	75	92	84
3- 4-16-22	78	74	64	61	82	80
3- 6- 8-12	79	91	96	97	80	85
3- 6- 8-16	79	91	96	97	80	85
3- 6- 8-22	79	91	96	97	80	85
3- 6-12-16	79	91	88	86	94	91
3- 6-12-22	79	91	88	86	94	91
3- 6-16-22	79	91	86	77	88	91
3- 8-12-16	71	76	91	94	88	88
3- 8-12-22	71	76	91	94	88	88
3- 8-16-22	71	76	91	94	85	90
3-12-16-22	68	59	62	68	81	77
4- 6- 8-12	63	76	89	94	81	85
4- 6- 8-16	63	76	89	94	81	85
4- 6- 8-22	63	76	89	94	81	85
4- 6-12-16	63	76	81	84	95	91
4- 6-12-22	63	76	81	84	95	91
4- 6-16-22	63	76	79	75	89	91
4- 8-12-16	60	69	86	93	95	89
4- 8-12-22	60	69	86	93	95	89

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

20 DEGREES TO 40 DEGREES SOUTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
4- 8-16-22	60	69	86	93	91	91
4-12-16-22	60	57	64	72	93	86
6- 8-12-16	34	55	69	75	94	92
6- 8-12-22	34	55	69	75	94	92
6- 8-16-22	34	55	69	75	91	93
6-12-16-22	34	55	61	64	95	93
8-12-16-22	11	24	50	61	85	91
3- 4- 6- 8-12	81	93	97	97	96	84
3- 4- 6- 8-16	81	93	97	97	92	91
3- 4- 6- 8-22	81	93	97	97	81	85
3- 4- 6-12-16	81	93	89	86	96	91
3- 4- 6-12-22	81	93	89	86	95	91
3- 4- 6-16-22	81	93	87	78	89	91
3- 4- 8-12-16	78	86	94	96	96	89
3- 4- 8-12-22	78	86	94	96	95	89
3- 4- 8-16-22	78	86	94	96	91	91
3- 4-12-16-22	78	75	72	75	93	86
3- 6- 8-12-16	79	91	96	97	96	92
3- 6- 8-12-22	79	91	96	97	95	91
3- 6- 8-16-22	79	91	96	97	91	93
3- 6-12-16-22	79	91	88	86	95	93
3- 8-12-16-22	71	76	91	94	90	91
4- 6- 8-12-16	63	76	89	95	97	92
4- 6- 8-12-22	63	76	89	95	96	91
4- 6- 8-16-22	63	76	89	94	92	93
4- 6-12-16-22	63	76	81	84	96	93
4- 8-12-16-22	60	69	86	93	96	92
6- 8-12-16-22	33	55	69	75	96	94
3- 4- 6- 8-12-16	81	93	97	97	97	92
3- 4- 6- 8-12-22	81	93	97	97	96	91
3- 4- 6- 8-16-22	81	93	97	97	92	93
3- 4- 6-12-16-22	81	93	89	86	96	93
3- 4- 8-12-16-22	78	86	94	96	96	92
3- 6- 8-12-16-22	79	91	96	97	96	94
4- 6- 8-12-16-22	63	76	89	95	97	94
ALL FREQUENCIES	81	93	97	97	97	94

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

40 DEGREES TO 60 DEGREES SOUTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
3	69	65	57	51	28	9
4	57	60	62	63	49	30
6	22	48	62	60	66	54
8	2	12	42	57	68	63
12	0	0	3	9	62	64
16	0	0	0	0	28	52
22	0	0	0	0	6	20
3- 4- 6- 8	76	89	90	81	69	71
3- 4- 6-12	76	89	90	81	69	71
3- 4- 6-16	76	89	90	81	69	71
3- 4- 6-22	76	89	90	81	69	71
3- 4- 8-12	75	79	91	93	80	75
3- 4- 8-16	75	79	91	93	80	75
3- 4- 8-22	75	79	91	93	80	75
3- 4-12-16	75	76	70	69	91	79
3- 4-12-22	75	76	70	69	91	79
3- 4-16-22	75	76	70	66	73	73
3- 6- 8-12	72	87	94	94	81	79
3- 6- 8-16	72	87	94	94	81	79
3- 6- 8-22	72	87	94	94	81	79
3- 6-12-16	72	87	88	81	95	88
3- 6-12-22	72	87	88	81	95	88
3- 6-16-22	72	87	88	80	83	89
3- 8-12-16	69	69	85	89	88	85
3- 8-12-22	69	69	85	89	88	85
3- 8-16-22	69	69	85	89	82	88
3-12-16-22	69	65	59	58	79	73
4- 6- 8-12	57	73	88	93	81	79
4- 6- 8-16	57	73	88	93	81	79
4- 6- 8-22	57	73	88	93	81	79
4- 6-12-16	57	73	83	79	95	88
4- 6-12-22	57	73	83	79	95	88
4- 6-16-22	57	73	83	78	84	89
4- 8-12-16	57	63	83	91	95	85
4- 8-12-22	57	63	83	91	95	85

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

40 DEGREES TO 60 DEGREES SOUTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
4- 8-16-22	57	63	83	91	88	88
4-12-16-22	57	60	62	66	91	84
6- 8-12-16	22	48	68	74	95	89
6- 8-12-22	22	48	68	74	95	89
6- 8-16-22	22	48	68	74	89	92
6-12-16-22	22	48	62	61	95	93
8-12-16-22	4	13	43	57	83	90
3- 4- 6- 8-12	76	89	95	95	96	88
3- 4- 6- 8-16	76	89	95	95	89	91
3- 4- 6- 8-22	76	89	95	95	81	79
3- 4- 6-12-16	76	89	90	82	96	92
3- 4- 6-12-22	76	89	90	82	95	88
3- 4- 6-16-22	76	89	90	81	84	89
3- 4- 8-12-16	75	79	91	93	96	89
3- 4- 8-12-22	75	79	91	93	95	86
3- 4- 8-16-22	75	79	91	93	88	88
3- 4-12-16-22	75	76	70	69	91	84
3- 6- 8-12-16	72	87	94	94	96	93
3- 6- 8-12-22	72	87	94	94	95	89
3- 6- 8-16-22	72	87	94	94	89	92
3- 6-12-16-22	72	87	88	81	95	93
3- 8-12-16-22	69	69	85	89	89	90
4- 6- 8-12-16	57	73	88	93	97	93
4- 6- 8-12-22	57	73	88	93	96	89
4- 6- 8-16-22	57	73	88	93	89	92
4- 6-12-16-22	57	73	83	79	96	93
4- 8-12-16-22	57	63	83	91	96	90
6- 8-12-16-22	22	48	68	74	96	94
3- 4- 6- 8-12-16	76	89	95	95	97	93
3- 4- 6- 8-12-22	76	89	95	95	96	89
3- 4- 6- 8-16-22	76	89	95	95	89	92
3- 4- 6-12-16-22	76	89	90	82	96	93
3- 4- 8-12-16-22	75	79	91	93	96	90
3- 6- 8-12-16-22	72	87	94	94	96	94
4- 6- 8-12-16-22	57	73	88	93	97	94
ALL FREQUENCIES	76	89	95	95	97	94

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

60 DEGREES TO 80 DEGREES SOUTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
3	54	44	39	37	19	8
4	42	49	45	44	34	26
6	6	27	51	54	47	50
8	0	1	24	43	52	60
12	0	0	0	0	48	55
16	0	0	0	0	8	39
22	0	0	0	0	0	6
3- 4- 6- 8	56	64	76	75	49	52
3- 4- 6-12	56	64	76	75	49	52
3- 4- 6-16	56	64	76	75	49	52
3- 4- 6-22	56	64	76	75	49	52
3- 4- 8-12	56	62	63	74	60	61
3- 4- 8-16	56	62	63	74	60	61
3- 4- 8-22	56	62	63	74	60	61
3- 4-12-16	56	62	53	48	68	64
3- 4-12-22	56	62	53	48	68	64
3- 4-16-22	56	62	53	48	37	55
3- 6- 8-12	54	53	77	79	62	64
3- 6- 8-16	54	53	77	79	62	64
3- 6- 8-22	54	53	77	79	62	64
3- 6-12-16	54	53	75	73	73	74
3- 6-12-22	54	53	75	73	73	74
3- 6-16-22	54	53	75	73	48	71
3- 8-12-16	54	44	54	71	71	73
3- 8-12-22	54	44	54	71	71	73
3- 8-16-22	54	44	54	71	56	73
3-12-16-22	54	44	40	38	60	61
4- 6- 8-12	42	50	69	76	63	64
4- 6- 8-16	42	50	69	76	63	64
4- 6- 8-22	42	50	69	76	63	64
4- 6-12-16	42	50	68	70	74	74
4- 6-12-22	42	50	68	70	74	74
4- 6-16-22	42	50	68	70	50	71
4- 8-12-16	42	49	55	69	75	73
4- 8-12-22	42	49	55	69	75	73

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

60 DEGREES TO 80 DEGREES SOUTH

FREQUENCY	DATA COLLECTION CIRCUIT DISTANCE 200 KM	500 KM	800 KM	1000 KM	2000 KM	3000 KM
4- 8-16-22	42	49	55	69	60	73
4-12-16-22	42	49	45	44	68	69
6- 8-12-16	7	27	53	60	77	76
6- 8-12-22	7	27	53	60	77	76
6- 8-16-22	7	27	53	60	62	76
6-12-16-22	7	27	51	54	72	78
8-12-16-22	0	2	24	43	67	77
3- 4- 6- 8-12	56	64	78	81	78	76
3- 4- 6- 8-16	56	64	78	81	63	76
3- 4- 6- 8-22	56	64	78	81	63	64
3- 4- 6-12-16	56	64	76	75	74	78
3- 4- 6-12-22	56	64	76	75	74	74
3- 4- 6-16-22	56	64	76	75	50	71
3- 4- 8-12-16	56	62	63	74	75	77
3- 4- 8-12-22	56	62	63	74	75	73
3- 4- 8-16-22	56	62	63	74	60	73
3- 4-12-16-22	56	62	53	48	68	69
3- 6- 8-12-16	54	53	77	79	77	80
3- 6- 8-12-22	54	53	77	79	77	76
3- 6- 8-16-22	54	53	77	79	62	76
3- 6-12-16-22	54	53	75	73	73	78
3- 8-12-16-22	54	44	54	71	71	77
4- 6- 8-12-16	42	50	69	76	78	80
4- 6- 8-12-22	42	50	69	76	78	76
4- 6- 8-16-22	42	50	69	76	63	76
4- 6-12-16-22	42	50	68	70	74	78
4- 8-12-16-22	42	49	55	69	75	77
6- 8-12-16-22	6	27	53	60	77	80
3- 4- 6- 8-12-16	56	64	78	81	78	80
3- 4- 6- 8-12-22	56	64	78	81	78	76
3- 4- 6- 8-16-22	56	64	78	81	63	76
3- 4- 6-12-16-22	56	64	76	75	74	78
3- 4- 8-12-16-22	56	62	63	74	75	77
3- 6- 8-12-16-22	54	53	77	79	77	80
4- 6- 8-12-16-22	42	50	69	76	78	80
ALL FREQUENCIES	56	64	78	81	78	80

Figure 4 (Cont.). Average reliability of ocean data communications as a function of available frequency complement, geographic latitude, and circuit length.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

200 TO 3000 KILOMETERS IN LENGTH

FREQUENCY MCS	LATITUDE 0-20 N.	20-40 N.	40-60 N.	60-80 N.	0-20 S.	20-40 S.	40-60 S.	60-80 S.	WORLD WIDE
3	36	45	43	40	43	44	46	33	41
4	49	55	49	47	52	51	53	40	49
6	62	58	46	41	57	51	52	39	50
8	63	50	38	28	54	43	40	30	43
12	45	32	22	15	36	26	23	17	27
16	27	22	13	4	24	16	13	7	15
22	8	13	4	0	14	8	4	1	6
3- 4- 6- 8	76	85	74	70	82	81	79	62	76
3- 4- 6-12	76	85	74	70	82	81	79	62	76
3- 4- 6-16	76	85	74	70	82	81	79	62	76
3- 4- 6-22	76	85	74	70	82	81	79	62	76
3- 4- 8-12	84	89	76	70	88	86	82	62	79
3- 4- 8-16	84	89	76	70	88	86	82	62	79
3- 4- 8-22	84	89	76	70	88	86	82	62	79
3- 4-12-16	79	82	71	65	81	79	76	58	73
3- 4-12-22	79	82	71	65	81	79	76	58	73
3- 4-16-22	70	77	67	57	73	73	72	51	67
3- 6- 8-12	85	90	77	71	90	88	84	64	81
3- 6- 8-16	85	90	77	71	90	88	84	64	81
3- 6- 8-22	85	90	77	71	90	88	84	64	81
3- 6-12-16	87	89	78	72	89	88	85	67	81
3- 6-12-22	87	89	78	72	89	88	85	67	81
3- 6-16-22	84	88	76	67	85	85	83	62	78
3- 8-12-16	86	88	75	66	88	84	80	61	78
3- 8-12-22	86	88	75	66	88	84	80	61	78
3- 8-16-22	86	88	74	63	88	84	80	58	77
3-12-16-22	73	75	63	53	74	69	67	49	65
4- 6- 8-12	84	87	72	68	85	81	78	60	76
4- 6- 8-16	84	87	72	68	85	81	78	60	76
4- 6- 8-22	84	87	72	68	85	81	78	60	76
4- 6-12-16	86	86	73	69	85	81	79	63	77
4- 6-12-22	86	86	73	69	85	81	79	63	77
4- 6-16-22	83	85	70	64	81	78	77	58	74
4- 8-12-16	87	88	73	66	86	82	79	60	77
4- 8-12-22	87	88	73	66	86	82	79	60	77

Figure 5. Average reliability of ocean data communications as a function of available frequency complement and geographic latitude, including worldwide average reliability.

AVERAGE RELIABILITY OF OCEAN DATA COLLECTION CIRCUITS

200 TO 3000 KILOMETERS IN LENGTH

FREQUENCY MCS	LATITUDE 0-20 N.	20-40 N.	40-60 N.	60-80 N.	0-20 S.	20-40 S.	40-60 S.	60-80 S.	WORLD WIDE
4- 8-16-22	87	88	72	63	86	81	78	58	76
4-12-16-22	79	79	65	57	76	72	70	52	68
6- 8-12-16	83	77	60	50	77	69	66	50	66
6- 8-12-22	83	77	60	50	77	69	66	50	66
6- 8-16-22	84	77	59	47	77	69	65	47	65
6-12-16-22	82	74	57	47	75	67	63	48	64
8-12-16-22	74	62	46	33	64	53	48	35	51
3- 4- 6- 8-12	90	92	84	80	91	91	89	72	86
3- 4- 6- 8-16	92	94	83	76	93	91	89	69	85
3- 4- 6- 8-22	86	91	80	76	90	89	85	67	83
3- 4- 6-12-16	90	91	81	77	91	89	87	70	84
3- 4- 6-12-22	88	90	80	77	90	89	86	69	83
3- 4- 6-16-22	85	89	78	72	86	86	84	65	80
3- 4- 8-12-16	91	92	81	74	91	89	87	67	84
3- 4- 8-12-22	90	92	80	74	91	89	86	67	83
3- 4- 8-16-22	90	92	79	71	91	89	85	64	82
3- 4-12-16-22	81	83	72	65	81	79	77	59	74
3- 6- 8-12-16	92	94	83	75	93	91	89	70	85
3- 6- 8-12-22	91	93	82	75	92	91	88	69	85
3- 6- 8-16-22	91	93	80	72	92	91	88	66	84
3- 6-12-16-22	89	90	79	72	90	88	86	67	82
3- 8-12-16-22	88	89	76	66	89	85	81	61	79
4- 6- 8-12-16	91	91	77	72	88	85	83	65	81
4- 6- 8-12-22	90	90	76	72	88	85	82	65	81
4- 6- 8-16-22	90	90	75	68	88	84	82	62	79
4- 6-12-16-22	88	87	74	69	85	82	80	63	78
4- 8-12-16-22	89	89	74	66	86	82	80	61	78
6- 8-12-16-22	85	78	60	50	78	70	67	50	67
3- 4- 6- 8-12-16	93	95	85	80	94	92	90	72	87
3- 4- 6- 8-12-22	92	94	84	80	93	92	90	72	87
3- 4- 6- 8-16-22	92	94	83	76	93	92	89	69	86
3- 4- 6-12-16-22	90	91	82	77	91	89	87	70	84
3- 4- 8-12-16-22	91	93	81	74	91	90	87	67	84
3- 6- 8-12-16-22	92	94	83	75	93	92	89	70	86
4- 6- 8-12-16-22	91	91	77	72	88	85	83	65	81
ALL FREQUENCIES	93	95	85	80	94	93	91	72	87

Figure 5 (Cont.). Average reliability of ocean data communications as a function of available frequency complement and geographic latitude, including worldwide average reliability.

VI. ACKNOWLEDGMENTS

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APPENDIX I

BASIC COMPUTATIONS FOR THE EVALUATION OF FREQUENCY COMPLEMENTS

Latitude	Distance - Kilometers					
Degrees	200	500	800	1000	2000	3000
0-20 N	I-1	I-2	I-3	I-4	I-5	I-6
20-40 N	I-7	I-8	I-9	I-10	I-11	I-12
40-60 N	I-13	I-14	I-15	I-16	I-17	I-18
60-80 N	I-19	I-20	I-21	I-22	I-23	I-24
0-20 S	I-25	I-26	I-27	I-28	I-29	I-30
20-40 S	I-31	I-32	I-33	I-34	I-35	I-36
40-60 S	I-37	I-38	I-39	I-40	I-41	I-42
60-80 S	I-43	I-44	I-45	I-46	I-47	I-48

1 JUN SSN= 20 18.001
200 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
18.20N - 0.00W 20.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.85	.29	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	43	45	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.59	.23	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.49	.06	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.44	.06	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.96	.57	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.56	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.95	.35	-	-	-	-	-	-	-	-	-	-	F.DAYS
	45	51	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.76	.90	.35	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.95	.32	-	-	-	-	-	-	-	-	-	-	F.DAYS
	33	43	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.23	.64	.31	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.98	.54	-	-	-	-	-	-	-	-	-	-	F.DAYS
	29	41	49	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.12	.55	.50	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.88	.31	-	-	-	-	-	-	-	-	-	F.DAYS
	33	44	52	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.23	.72	.85	.31	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.96	.61	-	-	-	-	-	-	-	-	-	F.DAYS
	45	51	57	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.76	.94	.95	.61	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.92	.62	-	-	-	-	-	-	-	-	-	F.DAYS
	50	54	58	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.91	.90	.61	-	-	-	-	-	-	-	-	-	REL.
20	.99	.97	.67	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	51	52	55	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.91	.66	.12	-	-	-	-	-	-	-	-	-	REL.
22	.97	.67	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	45	47	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.77	.59	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.94	.46	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	46	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.38	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.001
200 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
18.20N - 0.00W 20.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.93	.71	.18	-	-	-	-	-	-	-	-	-	-	F.DAYS
	60	60	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.71	.18	-	-	-	-	-	-	-	-	-	-	REL.
4	.20	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.20	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.74	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.74	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.93	.18	-	-	-	-	-	-	-	-	-	F.DAYS
	53	57	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.93	.18	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.95	.68	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	59	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.93	.94	.68	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.95	.70	-	-	-	-	-	-	-	-	-	F.DAYS
	39	48	56	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.45	.88	.95	.70	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.97	.77	.06	-	-	-	-	-	-	-	-	F.DAYS
	43	51	59	64	67	-	-	-	-	-	-	-	-	S/N..DB
	.66	.94	.97	.76	.06	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.98	.79	.07	-	-	-	-	-	-	-	-	F.DAYS
	53	58	64	67	70	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.97	.79	.07	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.95	.56	-	-	-	-	-	-	-	-	-	F.DAYS
	62	63	66	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.94	.55	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.86	.34	-	-	-	-	-	-	-	-	-	F.DAYS
	61	63	64	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.85	.34	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.79	.28	-	-	-	-	-	-	-	-	-	F.DAYS
	60	60	63	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.78	.28	-	-	-	-	-	-	-	-	-	REL.
24	.99	.98	.59	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	60	60	63	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.97	.59	.14	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.001
200 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
18.20N - 0.00W 20.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.97	.52	-	-	-	-	-	-	-	-	-	-	F.DAYS
	43	46	48	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.68	.80	.48	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.83	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	52	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.78	.10	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.42	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	56	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.96	.42	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.93	.22	-	-	-	-	-	-	-	-	-	F.DAYS
	38	46	54	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.42	.81	.92	.22	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.96	.22	-	-	-	-	-	-	-	-	-	F.DAYS
	21	38	47	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.02	.42	.84	.22	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.75	-	-	-	-	-	-	-	-	-	F.DAYS
	15	34	45	52	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.26	.80	.73	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.89	.06	-	-	-	-	-	-	-	-	F.DAYS
	21	38	48	55	60	-	-	-	-	-	-	-	-	S/N..DB
	.02	.42	.90	.88	.06	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.94	.16	-	-	-	-	-	-	-	-	F.DAYS
	37	46	53	59	61	-	-	-	-	-	-	-	-	S/N..DB
	.38	.81	.97	.94	.16	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.93	.17	-	-	-	-	-	-	-	-	F.DAYS
	47	51	54	58	60	-	-	-	-	-	-	-	-	S/N..DB
	.75	.86	.94	.92	.17	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.79	-	-	-	-	-	-	-	-	-	F.DAYS
	49	51	54	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.92	.96	.78	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.94	.44	-	-	-	-	-	-	-	-	-	F.DAYS
	45	47	50	52	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.88	.92	.44	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.86	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	44	47	50	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.73	.87	.83	.23	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.001
200 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
18.20N - 0.00W 20.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.89	.57	.06	-	-	-	-	-	-	-	-	F.DAYS
	60	60	64	65	68	-	-	-	-	-	-	-	-	S/N..DB
	.99	.98	.88	.57	.06	-	-	-	-	-	-	-	-	REL.
4	.96	.76	.19	-	-	-	-	-	-	-	-	-	-	F.DAYS
	60	61	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.75	.19	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	60	61	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.10	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	50	54	60	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.98	.99	.99	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.30	-	-	-	-	-	-	-	-	F.DAYS
	35	45	55	62	65	-	-	-	-	-	-	-	-	S/N..DB
	.29	.77	.99	.99	.30	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.38	-	-	-	-	-	-	-	-	F.DAYS
	29	41	51	58	62	-	-	-	-	-	-	-	-	S/N..DB
	.12	.56	.95	.99	.38	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.45	-	-	-	-	-	-	-	-	F.DAYS
	35	44	53	60	63	-	-	-	-	-	-	-	-	S/N..DB
	.29	.72	.97	.99	.45	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.59	-	-	-	-	-	-	-	-	F.DAYS
	50	53	59	64	65	-	-	-	-	-	-	-	-	S/N..DB
	.92	.97	.99	.99	.59	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.44	-	-	-	-	-	-	-	-	F.DAYS
	60	62	64	66	66	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.99	.43	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.48	-	-	-	-	-	-	-	-	F.DAYS
	60	62	63	66	66	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.99	.48	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.98	.53	.10	-	-	-	-	-	-	-	F.DAYS
	59	60	62	66	66	67	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.97	.53	.10	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.95	.37	-	-	-	-	-	-	-	-	F.DAYS
	59	60	64	67	67	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.94	.37	-	-	-	-	-	-	-	-	REL.

Figure I-1

1 JUN SSN= 20 18.003
500 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
15.50N - 0.00W 20.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.95	.50	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	40	45	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.50	.39	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.75	.18	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	52	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.62	.17	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.89	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.86	.08	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.82	.13	-	-	-	-	-	-	-	-	-	F.DAYS
	24	41	58	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.06	.56	.81	.13	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.09	-	-	-	-	-	-	-	-	-	F.DAYS
	2	26	52	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.96	.09	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.22	-	-	-	-	-	-	-	-	-	F.DAYS
	-6	20	50	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.94	.22	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.64	-	-	-	-	-	-	-	-	-	F.DAYS
	2	26	53	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.97	.63	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.87	.10	-	-	-	-	-	-	-	-	F.DAYS
	24	47	58	65	69	-	-	-	-	-	-	-	-	S/N..DB
	.06	.85	.99	.87	.10	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.98	.86	.20	-	-	-	-	-	-	-	-	F.DAYS
	45	53	60	64	68	-	-	-	-	-	-	-	-	S/N..DB
	.70	.89	.97	.86	.20	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.89	.53	-	-	-	-	-	-	-	-	-	F.DAYS
	47	53	59	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.95	.89	.52	-	-	-	-	-	-	-	-	-	REL.
22	.99	.91	.21	-	-	-	-	-	-	-	-	-	-	F.DAYS
	42	48	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.63	.83	.21	-	-	-	-	-	-	-	-	-	-	REL.
24	.98	.79	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	47	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.57	.69	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.003
500 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
15.50N - 0.00W 20.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.98	.90	.51	.13	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	66	70	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.89	.51	.12	-	-	-	-	-	-	-	-	-	REL.
4	.54	.11	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.54	.10	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.41	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	61	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.40	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.82	-	-	-	-	-	-	-	-	-	F.DAYS
	40	54	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.98	.99	.81	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.91	.24	-	-	-	-	-	-	-	-	F.DAYS
	19	38	57	65	70	-	-	-	-	-	-	-	-	S/N..DB
	.01	.42	.98	.90	.24	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.90	.22	-	-	-	-	-	-	-	-	F.DAYS
	11	32	55	64	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.20	.99	.90	.22	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.95	.37	-	-	-	-	-	-	-	-	F.DAYS
	19	38	57	65	71	-	-	-	-	-	-	-	-	S/N..DB
	.01	.42	.99	.94	.37	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.97	.50	-	-	-	-	-	-	-	-	F.DAYS
	40	54	63	69	73	-	-	-	-	-	-	-	-	S/N..DB
	.49	.98	.99	.96	.50	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.93	.30	-	-	-	-	-	-	-	-	F.DAYS
	58	63	68	72	74	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.92	.29	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.98	.80	.12	-	-	-	-	-	-	-	-	F.DAYS
	57	63	68	71	73	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.98	.79	.12	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.97	.69	.08	-	-	-	-	-	-	-	-	F.DAYS
	56	61	67	71	73	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.96	.68	.08	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.91	.46	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	67	70	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.91	.46	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.003
500 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
15.50N - 0.00W 20.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.80	.21	-	-	-	-	-	-	-	-	-	F.DAYS
	40	46	53	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.52	.83	.79	.21	-	-	-	-	-	-	-	-	-	REL.
4	.99	.95	.40	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.90	.40	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.91	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	46	55	62	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.95	.90	.17	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.79	-	-	-	-	-	-	-	-	-	F.DAYS
	10	31	55	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.19	.99	.79	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.76	-	-	-	-	-	-	-	-	-	F.DAYS
	-19	10	47	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.87	.75	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.96	-	-	-	-	-	-	-	-	-	F.DAYS
	-31	2	45	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.80	.95	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.97	.29	-	-	-	-	-	-	-	-	F.DAYS
	-19	10	47	58	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.87	.96	.29	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.50	-	-	-	-	-	-	-	-	F.DAYS
	10	31	54	62	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.19	.98	.98	.50	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.98	.53	-	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	65	-	-	-	-	-	-	-	-	S/N..DB
	.60	.83	.97	.98	.53	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.94	.17	-	-	-	-	-	-	-	-	F.DAYS
	46	51	58	61	66	-	-	-	-	-	-	-	-	S/N..DB
	.75	.92	.99	.93	.17	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.76	-	-	-	-	-	-	-	-	-	F.DAYS
	42	47	54	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.63	.88	.98	.76	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.97	.58	-	-	-	-	-	-	-	-	-	F.DAYS
	41	47	54	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.57	.87	.96	.58	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.003
500 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
15.50N - 0.00W 20.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.96	.82	.26	-	-	-	-	-	-	-	-	F.DAYS
	56	60	67	71	73	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.96	.82	.26	-	-	-	-	-	-	-	-	REL.
4	.99	.92	.51	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	57	62	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.91	.51	.11	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.85	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	62	66	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.84	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.62	-	-	-	-	-	-	-	-	F.DAYS
	31	50	60	67	71	-	-	-	-	-	-	-	-	S/N..DB
	.19	.93	.99	.99	.62	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.91	-	-	-	-	-	-	-	-	F.DAYS
	3	26	53	62	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.97	.99	.91	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.89	-	-	-	-	-	-	-	-	F.DAYS
	-7	19	50	60	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.94	.99	.88	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.92	.05	-	-	-	-	-	-	-	F.DAYS
	3	26	53	62	68	70	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.97	.99	.91	.05	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.96	.11	-	-	-	-	-	-	-	F.DAYS
	31	50	60	66	71	71	-	-	-	-	-	-	-	S/N..DB
	.19	.93	.99	.99	.96	.11	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.81	.12	-	-	-	-	-	-	-	F.DAYS
	56	62	67	70	72	72	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.99	.80	.12	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.83	.14	-	-	-	-	-	-	-	F.DAYS
	56	61	66	70	72	72	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.99	.83	.14	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.82	.30	-	-	-	-	-	-	-	F.DAYS
	55	60	66	70	73	72	-	-	-	-	-	-	-	S/N..DB
	.98	.99	.99	.99	.81	.30	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.70	.19	-	-	-	-	-	-	-	F.DAYS
	56	60	67	71	73	73	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.98	.70	.19	-	-	-	-	-	-	-	REL.

Figure 1-2

1 JUN SSN= 20 18.004
800 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
12.80N - 0.00W 20.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.82	.18	-	-	-	-	-	-	-	-	-	-	F.DAYS
	38	45	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.44	.65	.17	-	-	-	-	-	-	-	-	-	-	REL.
4	.92	.40	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.70	.36	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.65	-	-	-	-	-	-	-	-	-	-	F.DAYS
	42	54	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.94	.65	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.72	-	-	-	-	-	-	-	-	-	F.DAYS
	3	25	54	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.98	.72	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-29	2	48	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.90	.99	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-41	-6	45	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.80	.99	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.11	-	-	-	-	-	-	-	-	F.DAYS
	-29	2	48	58	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.90	.99	.11	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.97	.43	-	-	-	-	-	-	-	-	F.DAYS
	3	25	54	62	68	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.98	.97	.43	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.96	.62	.08	-	-	-	-	-	-	-	F.DAYS
	35	50	57	63	68	73	-	-	-	-	-	-	-	S/N..DB
	.38	.83	.97	.96	.62	.08	-	-	-	-	-	-	-	REL.
20	.99	.99	.97	.84	.16	-	-	-	-	-	-	-	-	F.DAYS
	44	50	58	62	69	-	-	-	-	-	-	-	-	S/N..DB
	.67	.90	.97	.84	.16	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.72	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	40	47	54	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.50	.87	.72	.10	-	-	-	-	-	-	-	-	-	REL.
24	.99	.95	.39	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	46	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.47	.80	.38	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.004
800 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
12.80N - 0.00W 20.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.97	.80	.43	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	66	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.96	.79	.42	-	-	-	-	-	-	-	-	-	REL.
4	.84	.44	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.82	.44	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.97	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.97	.10	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.27	-	-	-	-	-	-	-	-	F.DAYS
	24	40	59	66	71	-	-	-	-	-	-	-	-	S/N..DB
	.06	.50	.99	.99	.26	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.66	.07	-	-	-	-	-	-	-	F.DAYS
	-5	18	52	61	69	72	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.96	.99	.65	.07	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.63	.05	-	-	-	-	-	-	-	F.DAYS
	-17	10	49	59	68	72	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.92	.99	.62	.05	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.76	.18	-	-	-	-	-	-	-	F.DAYS
	-5	18	52	61	69	72	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.96	.99	.75	.18	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.86	.34	-	-	-	-	-	-	-	F.DAYS
	24	40	58	66	72	74	-	-	-	-	-	-	-	S/N..DB
	.06	.50	.99	.99	.86	.34	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.74	.21	-	-	-	-	-	-	-	F.DAYS
	54	60	66	70	74	75	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.99	.73	.21	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.97	.47	.07	-	-	-	-	-	-	-	F.DAYS
	54	60	66	70	73	75	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.97	.47	.07	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.94	.37	-	-	-	-	-	-	-	-	F.DAYS
	53	58	65	70	73	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.94	.37	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.85	.20	-	-	-	-	-	-	-	-	F.DAYS
	53	58	66	70	73	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.98	.85	.20	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.004
800 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
12.80N - 0.00W 20.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.95	.65	-	-	-	-	-	-	-	-	-	F.DAYS
	38	45	53	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.44	.79	.94	.64	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.79	.20	-	-	-	-	-	-	-	-	-	F.DAYS
	46	52	58	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.76	.93	.79	.20	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.78	-	-	-	-	-	-	-	-	-	F.DAYS
	35	51	59	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	.89	.99	.77	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.29	-	-	-	-	-	-	-	-	F.DAYS
	-17	11	50	59	68	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.94	.99	.29	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.11	-	-	-	-	-	-	-	-	F.DAYS
	-61	-19	19	54	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.01	.98	.11	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.37	-	-	-	-	-	-	-	-	F.DAYS
	-78	-31	12	52	63	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.96	.37	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.68	-	-	-	-	-	-	-	-	F.DAYS
	-61	-19	19	54	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.01	.98	.67	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.83	.14	-	-	-	-	-	-	-	F.DAYS
	-17	10	50	60	67	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.94	.99	.82	.14	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.85	.20	-	-	-	-	-	-	-	F.DAYS
	28	47	55	61	66	71	-	-	-	-	-	-	-	S/N..DB
	.21	.75	.95	.99	.84	.20	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.58	-	-	-	-	-	-	-	-	F.DAYS
	44	49	57	61	67	-	-	-	-	-	-	-	-	S/N..DB
	.67	.88	.99	.98	.57	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.95	.21	-	-	-	-	-	-	-	-	F.DAYS
	40	46	54	60	68	-	-	-	-	-	-	-	-	S/N..DB
	.50	.85	.99	.94	.21	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.90	.10	-	-	-	-	-	-	-	-	F.DAYS
	39	46	54	60	69	-	-	-	-	-	-	-	-	S/N..DB
	.47	.84	.99	.90	.10	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.004
800 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
12.80N - 0.00W 20.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.94	.57	.15	-	-	-	-	-	-	-	F.DAYS
	53	58	66	70	73	74	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.98	.93	.57	.15	-	-	-	-	-	-	-	REL.
4	.99	.98	.83	.44	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.97	.82	.43	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.62	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.62	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.24	-	-	-	-	-	-	-	F.DAYS
	10	30	56	64	71	73	-	-	-	-	-	-	-	S/N..DB
	.00	.16	.99	.99	.99	.23	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.55	-	-	-	-	-	-	-	F.DAYS
	-30	2	32	57	68	71	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.22	.99	.99	.55	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.37	-	-	-	-	-	-	-	F.DAYS
	-46	-9	25	56	66	69	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.06	.99	.99	.37	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.45	-	-	-	-	-	-	-	F.DAYS
	-30	1	47	58	67	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.87	.99	.99	.45	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.61	-	-	-	-	-	-	-	F.DAYS
	10	30	56	64	70	72	-	-	-	-	-	-	-	S/N..DB
	.00	.16	.99	.99	.99	.61	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.96	.45	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	73	73	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.99	.96	.44	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.97	.47	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	73	73	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.99	.96	.47	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.94	.56	.12	.08	-	-	-	-	-	F.DAYS
	53	58	64	70	73	74	74	74	-	-	-	-	-	S/N..DB
	.97	.99	.99	.99	.94	.56	.12	.08	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.92	.47	.08	-	-	-	-	-	-	F.DAYS
	53	58	66	70	74	74	75	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.99	.91	.47	.08	-	-	-	-	-	-	REL.

Figure 1-3

1 JUN SSN= 20 18.005
1000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
11.01N - 0.00W 20.00N - 0.00W 0.0 180.0 539.4
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.92	.32	-	-	-	-	-	-	-	-	-	-	F.DAYS
	36	43	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.37	.64	.31	-	-	-	-	-	-	-	-	-	-	REL.
4	.96	.52	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.47	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.84	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	37	46	59	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.38	.76	.83	.17	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.06	-	-	-	-	-	-	-	-	F.DAYS
	-8	18	40	60	68	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.54	.99	.06	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-47	-10	24	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.05	.99	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-61	-21	20	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.02	.97	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.25	-	-	-	-	-	-	-	-	F.DAYS
	-47	-10	24	55	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.05	.98	.24	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.64	.07	-	-	-	-	-	-	-	F.DAYS
	-8	18	51	60	67	71	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.95	.99	.64	.07	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.98	.78	.25	-	-	-	-	-	-	-	F.DAYS
	30	47	55	61	67	73	-	-	-	-	-	-	-	S/N..DB
	.25	.75	.95	.98	.78	.25	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.93	.42	-	-	-	-	-	-	-	-	F.DAYS
	42	48	56	61	68	-	-	-	-	-	-	-	-	S/N..DB
	.59	.86	.98	.92	.42	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.90	.41	-	-	-	-	-	-	-	-	-	F.DAYS
	38	45	53	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.42	.80	.89	.41	-	-	-	-	-	-	-	-	-	REL.
24	.99	.98	.68	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	37	44	53	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.39	.74	.67	.07	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.005
1000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
11.01N - 0.00W 20.00N - 0.00W 0.0 180.0 539.4
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.98	.88	.60	.09	-	-	-	-	-	-	-	-	F.DAYS
	50	56	64	69	72	-	-	-	-	-	-	-	-	S/N..DB
	.93	.97	.88	.60	.09	-	-	-	-	-	-	-	-	REL.
4	.92	.66	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.65	.13	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.42	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.42	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.61	-	-	-	-	-	-	-	-	F.DAYS
	14	32	56	63	70	-	-	-	-	-	-	-	-	S/N..DB
	.00	.22	.99	.99	.60	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.79	.21	-	-	-	-	-	-	-	F.DAYS
	-21	7	35	58	67	71	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.32	.99	.79	.21	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.77	.17	-	-	-	-	-	-	-	F.DAYS
	-35	-2	29	56	66	71	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.14	.99	.76	.17	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.87	.37	-	-	-	-	-	-	-	F.DAYS
	-21	7	35	58	67	71	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.33	.99	.87	.37	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.94	.57	.06	-	-	-	-	-	-	F.DAYS
	14	32	56	63	70	73	75	-	-	-	-	-	-	S/N..DB
	.00	.22	.99	.99	.93	.57	.06	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.89	.40	-	-	-	-	-	-	-	F.DAYS
	52	58	64	69	73	74	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.89	.40	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.72	.20	-	-	-	-	-	-	-	F.DAYS
	52	58	64	69	73	74	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.72	.20	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.98	.58	.14	-	-	-	-	-	-	-	F.DAYS
	51	56	63	69	72	74	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.99	.97	.58	.14	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.94	.37	-	-	-	-	-	-	-	-	F.DAYS
	51	56	64	69	72	-	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.99	.94	.37	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.005
1000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
11.01N - 0.00W 20.00N - 0.00W 0.0 180.0 539.4
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.98	.84	.09	-	-	-	-	-	-	-	-	F.DAYS
	36	43	52	59	70	-	-	-	-	-	-	-	-	S/N..DB
	.37	.69	.97	.84	.09	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.92	.48	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.89	.91	.48	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.95	.08	-	-	-	-	-	-	-	-	F.DAYS
	29	41	57	64	71	-	-	-	-	-	-	-	-	S/N..DB
	.14	.57	.98	.95	.08	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.70	-	-	-	-	-	-	-	-	F.DAYS
	-32	-0	30	56	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.18	.99	.70	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.44	-	-	-	-	-	-	-	-	F.DAYS
	-84	-37	14	50	63	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.93	.44	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-104	-51	9	48	62	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.89	.99	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.83	.15	-	-	-	-	-	-	-	F.DAYS
	-84	-37	14	50	63	68	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.93	.83	.15	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.92	.34	-	-	-	-	-	-	-	F.DAYS
	-33	-0	30	57	66	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.18	.99	.92	.34	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.93	.43	-	-	-	-	-	-	-	F.DAYS
	22	45	53	60	66	71	-	-	-	-	-	-	-	S/N..DB
	.10	.69	.93	.99	.93	.43	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.77	.11	-	-	-	-	-	-	-	F.DAYS
	42	48	56	60	67	72	-	-	-	-	-	-	-	S/N..DB
	.59	.86	.98	.99	.77	.11	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.98	.45	-	-	-	-	-	-	-	-	F.DAYS
	38	45	53	59	67	-	-	-	-	-	-	-	-	S/N..DB
	.42	.80	.99	.98	.45	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.97	.32	-	-	-	-	-	-	-	-	F.DAYS
	37	44	53	59	69	-	-	-	-	-	-	-	-	S/N..DB
	.39	.75	.98	.96	.32	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.005
1000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
11.01N - 0.00W 20.00N - 0.00W 0.0 180.0 539.4
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.97	.73	.29	-	-	-	-	-	-	-	F.DAYS
	51	56	64	69	73	74	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.99	.96	.72	.29	-	-	-	-	-	-	-	REL.
4	.99	.99	.92	.66	.10	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	72	-	-	-	-	-	-	-	-	S/N..DB
	.96	.98	.91	.66	.10	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.96	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.95	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.69	-	-	-	-	-	-	-	F.DAYS
	-1	22	53	61	69	72	-	-	-	-	-	-	-	S/N..DB
	.00	.04	.97	.99	.99	.69	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.88	-	-	-	-	-	-	-	F.DAYS
	-49	-12	23	54	65	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.04	.98	.99	.87	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.73	-	-	-	-	-	-	-	F.DAYS
	-69	-26	18	52	64	69	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.01	.96	.99	.73	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.78	-	-	-	-	-	-	-	F.DAYS
	-50	-12	23	55	65	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.04	.98	.99	.78	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.87	-	-	-	-	-	-	-	F.DAYS
	-1	22	53	61	69	72	-	-	-	-	-	-	-	S/N..DB
	.00	.04	.97	.99	.99	.87	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.66	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	72	73	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.98	.65	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.99	.65	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	72	73	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.98	.65	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.97	.71	.21	.15	.07	-	-	-	-	F.DAYS
	51	56	63	68	72	74	74	74	74	-	-	-	-	S/N..DB
	.95	.99	.99	.99	.96	.71	.20	.15	.07	-	-	-	-	REL.
24	.99	.99	.99	.99	.96	.65	.16	.12	.05	-	-	-	-	F.DAYS
	51	56	64	69	73	74	75	74	75	-	-	-	-	S/N..DB
	.95	.99	.99	.99	.95	.64	.16	.12	.05	-	-	-	-	REL.

Figure I-4

1 JUN SSN= 20 18.011
2000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
2.01N - 0.00W 20.00N - 0.00W 0.0 180.0 1079.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.90	.49	-	-	-	-	-	-	-	-	-	F.DAYS
	26	34	45	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.10	.30	.74	.48	-	-	-	-	-	-	-	-	-	REL.
4	.99	.84	.26	-	-	-	-	-	-	-	-	-	-	F.DAYS
	34	41	50	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.30	.47	.24	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.94	.08	-	-	-	-	-	-	-	-	F.DAYS
	25	35	48	58	66	-	-	-	-	-	-	-	-	S/N..DB
	.07	.35	.84	.93	.08	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.58	-	-	-	-	-	-	-	F.DAYS
	-39	-7	22	40	59	65	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.04	.52	.99	.57	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.21	-	-	-	-	-	-	-	F.DAYS
	-94	-45	0	29	56	63	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.13	.99	.21	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	F.DAYS
	-115	-60	-9	26	55	62	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.07	.98	.99	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.20	-	-	-	-	-	-	-	F.DAYS
	-94	-46	0	29	56	63	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.13	.99	.20	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.55	.07	-	-	-	-	-	-	F.DAYS
	-39	-7	25	40	59	66	69	-	-	-	-	-	-	S/N..DB
	.00	.00	.08	.52	.99	.55	.07	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.94	.76	.25	.17	.05	-	-	-	-	F.DAYS
	18	31	44	54	61	68	71	71	72	-	-	-	-	S/N..DB
	.06	.25	.69	.95	.94	.75	.25	.17	.05	-	-	-	-	REL.
20	.99	.99	.99	.99	.89	.60	.06	-	-	-	-	-	-	F.DAYS
	32	39	49	54	63	70	72	-	-	-	-	-	-	S/N..DB
	.23	.48	.89	.97	.89	.60	.06	-	-	-	-	-	-	REL.
22	.99	.99	.99	.97	.65	.07	-	-	-	-	-	-	-	F.DAYS
	28	36	46	53	64	70	-	-	-	-	-	-	-	S/N..DB
	.11	.34	.88	.96	.64	.07	-	-	-	-	-	-	-	REL.
24	.99	.99	.98	.87	.17	-	-	-	-	-	-	-	-	F.DAYS
	27	35	46	53	65	-	-	-	-	-	-	-	-	S/N..DB
	.11	.32	.84	.87	.16	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.011
2000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
2.01N - 0.00W 20.00N - 0.00W 0.0 180.0 1079.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.98	.89	.41	.08	-	-	-	-	-	-	-	F.DAYS
	40	47	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.50	.89	.97	.88	.41	.07	-	-	-	-	-	-	-	REL.
4	.99	.98	.83	.44	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.88	.82	.44	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.97	.06	-	-	-	-	-	-	-	-	F.DAYS
	37	46	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.38	.81	.99	.97	.06	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.80	.05	-	-	-	-	-	-	F.DAYS
	-16	8	32	46	62	67	70	-	-	-	-	-	-	S/N..DB
	.00	.00	.24	.82	.99	.79	.05	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.72	-	-	-	-	-	-	-	F.DAYS
	-68	-28	10	32	58	64	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.21	.99	.72	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.64	-	-	-	-	-	-	-	F.DAYS
	-88	-42	2	28	56	63	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.11	.99	.64	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.85	-	-	-	-	-	-	-	F.DAYS
	-68	-27	10	32	57	64	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.21	.99	.85	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.98	.34	.21	-	-	-	-	-	F.DAYS
	-16	8	32	46	62	67	70	70	-	-	-	-	-	S/N..DB
	.00	.00	.24	.82	.99	.98	.33	.21	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.87	.28	.19	.07	-	-	-	-	F.DAYS
	37	46	57	62	67	70	72	71	72	-	-	-	-	S/N..DB
	.38	.81	.99	.99	.99	.86	.28	.19	.07	-	-	-	-	REL.
20	.99	.99	.99	.99	.97	.66	.06	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	72	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.99	.96	.66	.06	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.88	.52	.07	-	-	-	-	-	-	F.DAYS
	41	47	56	62	67	70	72	-	-	-	-	-	-	S/N..DB
	.59	.87	.99	.98	.87	.52	.07	-	-	-	-	-	-	REL.
24	.99	.99	.99	.97	.75	.26	-	-	-	-	-	-	-	F.DAYS
	40	47	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.52	.88	.99	.97	.75	.26	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.011
2000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
2.01N - 0.00W 20.00N - 0.00W 0.0 180.0 1079.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.87	.29	-	-	-	-	-	-	-	F.DAYS
	26	34	45	53	66	70	-	-	-	-	-	-	-	S/N..DB
	.10	.30	.82	.99	.87	.29	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.97	.44	-	-	-	-	-	-	-	-	F.DAYS
	34	41	50	57	67	-	-	-	-	-	-	-	-	S/N..DB
	.30	.55	.92	.97	.43	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.97	.30	-	-	-	-	-	-	-	F.DAYS
	15	28	43	56	65	69	-	-	-	-	-	-	-	S/N..DB
	.00	.16	.66	.98	.97	.30	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.55	.39	.12	.06	-	-	-	F.DAYS
	-71	-30	9	31	57	63	68	68	69	70	-	-	-	S/N..DB
	.00	.00	.00	.20	.99	.99	.54	.39	.12	.06	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.16	.09	-	-	-	-	-	F.DAYS
	-145	-82	-21	18	41	60	67	67	-	-	-	-	-	S/N..DB
	.00	.00	.00	.01	.57	.99	.16	.09	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	F.DAYS
	-174	-102	-30	15	51	60	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.95	.99	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.99	.13	.08	-	-	-	-	-	F.DAYS
	-146	-82	-22	20	53	61	67	67	-	-	-	-	-	S/N..DB
	.00	.00	.00	.01	.97	.99	.13	.08	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.92	.25	.17	.06	-	-	-	-	F.DAYS
	-73	-31	18	33	57	64	69	68	69	-	-	-	-	S/N..DB
	.00	.00	.02	.26	.99	.91	.25	.17	.06	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.86	.32	.24	.11	.06	-	-	-	F.DAYS
	7	25	39	53	60	68	71	70	71	72	-	-	-	S/N..DB
	.01	.12	.49	.94	.98	.86	.32	.24	.10	.06	-	-	-	REL.
20	.99	.99	.99	.99	.96	.67	.10	.06	-	-	-	-	-	F.DAYS
	33	40	49	55	63	70	71	71	-	-	-	-	-	S/N..DB
	.26	.53	.89	.99	.96	.66	.10	.06	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.92	.42	-	-	-	-	-	-	-	F.DAYS
	29	37	46	54	64	69	-	-	-	-	-	-	-	S/N..DB
	.13	.38	.88	.99	.92	.42	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.92	.40	-	-	-	-	-	-	-	F.DAYS
	27	36	46	53	65	70	-	-	-	-	-	-	-	S/N..DB
	.11	.35	.85	.99	.91	.40	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.011
2000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
2.01N - 0.00W 20.00N - 0.00W 0.0 180.0 1079.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.97	.74	.19	.13	-	-	-	-	-	F.DAYS
	41	47	57	62	67	70	72	72	-	-	-	-	-	S/N..DB
	.56	.89	.99	.99	.96	.73	.19	.13	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.85	.33	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.89	.99	.99	.84	.33	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.21	-	-	-	-	-	-	-	F.DAYS
	37	46	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.38	.81	.99	.99	.98	.21	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.78	.63	.30	.18	.10	-	-	F.DAYS
	-40	-8	24	40	60	65	69	69	70	71	71	-	-	S/N..DB
	.00	.00	.07	.52	.99	.99	.77	.62	.30	.18	.10	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.68	.49	.19	.10	-	-	-	F.DAYS
	-111	-58	-7	24	54	62	67	68	69	69	-	-	-	S/N..DB
	.00	.00	.00	.05	.98	.99	.68	.49	.19	.10	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	.40	.25	.06	-	-	-	-	F.DAYS
	-139	-77	-19	21	53	61	67	67	68	-	-	-	-	S/N..DB
	.00	.00	.00	.02	.97	.99	.40	.25	.06	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.99	.40	.27	.08	-	-	-	-	F.DAYS
	-111	-58	-7	25	55	62	68	68	68	-	-	-	-	S/N..DB
	.00	.00	.00	.06	.98	.99	.39	.27	.08	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.99	.43	.30	.09	-	-	-	-	F.DAYS
	-41	-9	26	39	60	66	69	69	70	-	-	-	-	S/N..DB
	.00	.00	.10	.47	.99	.99	.43	.30	.09	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.90	.43	.15	-	-	-	-	-	F.DAYS
	37	51	57	63	67	70	71	71	-	-	-	-	-	S/N..DB
	.38	.94	.99	.99	.99	.90	.43	.15	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.99	.72	.07	-	-	-	-	-	-	F.DAYS
	43	50	57	63	67	69	71	-	-	-	-	-	-	S/N..DB
	.67	.93	.99	.99	.99	.72	.07	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.99	.81	.11	.06	-	-	-	-	-	F.DAYS
	42	48	56	62	67	70	71	71	-	-	-	-	-	S/N..DB
	.64	.90	.99	.99	.99	.81	.11	.06	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.99	.87	.17	.10	-	-	-	-	-	F.DAYS
	41	47	57	62	67	70	72	71	-	-	-	-	-	S/N..DB
	.58	.88	.99	.99	.99	.86	.17	.10	-	-	-	-	-	REL.

Figure 1-5

1 JUN SSN= 20 18.016
3000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
6.98S - 0.00W 20.00N - 0.00W 0.0 180.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.92	.38	.05	-	-	-	-	-	-	-	F.DAYS
	10	28	39	48	62	66	-	-	-	-	-	-	-	S/N..DB
	.00	.13	.48	.86	.37	.05	-	-	-	-	-	-	-	REL.
4	.98	.98	.72	.26	-	-	-	-	-	-	-	-	-	F.DAYS
	18	35	44	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.02	.31	.53	.25	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.74	-	-	-	-	-	-	-	-	F.DAYS
	3	19	39	52	61	-	-	-	-	-	-	-	-	S/N..DB
	.00	.04	.48	.95	.74	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.90	.96	.56	.44	.14	.06	-	-	-	F.DAYS
	-113	-60	0	18	46	59	64	64	65	66	-	-	-	S/N..DB
	.00	.00	.00	.01	.74	.95	.56	.44	.14	.06	-	-	-	REL.
10	.99	.99	.99	.99	.99	.95	.42	.35	.21	.16	.11	.08	-	F.DAYS
	-213	-130	-52	3	39	56	63	63	64	65	65	66	-	S/N..DB
	.00	.00	.00	.00	.46	.94	.41	.35	.21	.16	.11	.08	-	REL.
12	.99	.99	.99	.99	.99	.79	.21	.15	.07	-	-	-	-	F.DAYS
	-252	-158	-68	-1	37	55	62	62	63	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.38	.78	.21	.15	.07	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.83	.23	.17	.07	-	-	-	-	F.DAYS
	-213	-131	-52	4	40	57	63	63	64	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.51	.82	.23	.17	.07	-	-	-	-	REL.
16	.99	.99	.99	.99	.84	.95	.44	.36	.21	.15	.11	.07	-	F.DAYS
	-114	-61	2	31	46	60	65	65	66	67	67	68	-	S/N..DB
	.00	.00	.00	.20	.69	.94	.44	.36	.21	.15	.11	.07	-	REL.
18	.99	.99	.99	.99	.98	.89	.61	.55	.37	.27	.19	.13	-	F.DAYS
	-3	24	35	49	56	63	67	67	68	69	69	69	-	S/N..DB
	.00	.11	.36	.87	.96	.89	.61	.55	.37	.27	.19	.13	-	REL.
20	.99	.99	.99	.99	.96	.83	.43	.33	.15	.09	.05	-	-	F.DAYS
	16	32	42	48	58	65	68	68	68	69	69	-	-	S/N..DB
	.01	.24	.62	.91	.95	.82	.43	.33	.15	.09	.05	-	-	REL.
22	.99	.99	.99	.99	.93	.63	.06	-	-	-	-	-	-	F.DAYS
	12	29	40	47	59	65	68	-	-	-	-	-	-	S/N..DB
	.00	.13	.55	.92	.93	.62	.06	-	-	-	-	-	-	REL.
24	.99	.99	.99	.98	.78	.20	-	-	-	-	-	-	-	F.DAYS
	11	29	40	48	61	66	-	-	-	-	-	-	-	S/N..DB
	.00	.14	.51	.93	.77	.20	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.016
3000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
6.98S - 0.00W 20.00N - 0.00W 0.0 180.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.96	.69	.27	-	-	-	-	-	-	-	F.DAYS
	25	40	50	56	62	66	-	-	-	-	-	-	-	S/N..DB
	.09	.54	.96	.95	.68	.26	-	-	-	-	-	-	-	REL.
4	.99	.99	.97	.85	.33	-	-	-	-	-	-	-	-	F.DAYS
	26	42	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.08	.61	.93	.85	.33	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.79	-	-	-	-	-	-	-	-	F.DAYS
	20	36	51	56	63	-	-	-	-	-	-	-	-	S/N..DB
	.02	.35	.95	.99	.79	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.48	.36	.16	.09	-	-	-	F.DAYS
	-88	-43	7	34	55	61	65	65	66	67	-	-	-	S/N..DB
	.00	.00	.00	.29	.98	.99	.48	.36	.16	.09	-	-	-	REL.
10	.99	.99	.99	.99	.99	.91	.13	.06	-	-	-	-	-	F.DAYS
	-186	-111	-12	9	42	58	64	64	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.62	.91	.13	.06	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.89	.10	-	-	-	-	-	-	F.DAYS
	-224	-138	-56	3	39	56	63	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.46	.88	.09	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.94	.14	.07	-	-	-	-	-	F.DAYS
	-186	-111	-13	9	42	58	64	64	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.62	.94	.14	.07	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.99	.54	.39	.14	.07	-	-	-	F.DAYS
	-89	-43	8	35	56	61	66	66	67	67	-	-	-	S/N..DB
	.00	.00	.00	.32	.99	.99	.54	.39	.14	.07	-	-	-	REL.
18	.99	.99	.99	.99	.99	.95	.55	.45	.24	.16	.10	.06	-	F.DAYS
	28	37	52	57	63	65	68	68	68	69	69	70	-	S/N..DB
	.12	.38	.96	.99	.99	.94	.54	.44	.24	.16	.10	.06	-	REL.
20	.99	.99	.99	.99	.99	.87	.29	.20	.07	-	-	-	-	F.DAYS
	27	43	51	57	63	66	68	68	68	-	-	-	-	S/N..DB
	.10	.67	.95	.99	.99	.86	.29	.20	.07	-	-	-	-	REL.
22	.99	.99	.99	.99	.96	.78	.33	.25	.13	.09	.05	-	-	F.DAYS
	26	41	50	57	62	65	68	68	68	69	69	-	-	S/N..DB
	.12	.61	.94	.99	.95	.78	.33	.25	.13	.09	.05	-	-	REL.
24	.99	.99	.99	.99	.90	.59	.11	.07	-	-	-	-	-	F.DAYS
	25	40	50	56	62	65	68	68	-	-	-	-	-	S/N..DB
	.09	.55	.95	.99	.90	.59	.11	.07	-	-	-	-	-	REL.

1 JUN SSN= 120 18.016
3000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
6.98S - 0.00W 20.00N - 0.00W 0.0 180.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.97	.70	.09	.05	-	-	-	-	-	F.DAYS
	11	28	39	48	62	66	68	68	-	-	-	-	-	S/N..DB
	.00	.13	.48	.93	.97	.70	.09	.05	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.70	.09	-	-	-	-	-	-	-	F.DAYS
	19	35	44	52	63	66	-	-	-	-	-	-	-	S/N..DB
	.03	.31	.73	.96	.70	.09	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.92	.11	-	-	-	-	-	-	F.DAYS
	-11	11	35	51	60	64	67	-	-	-	-	-	-	S/N..DB
	.00	.00	.33	.94	.99	.91	.11	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.99	.95	.90	.84	.76	.54	F.DAYS	
	-169	-100	-34	8	41	57	62	63	64	65	65	66	67	S/N..DB
	.00	.00	.00	.00	.57	.99	.99	.98	.94	.90	.84	.75	.53	REL.
10	.99	.99	.99	.99	.99	.92	.99	.99	.92	.83	.71	.56	.33	F.DAYS
	-305	-195	-90	-10	32	45	60	61	62	64	64	65	66	S/N..DB
	.00	.00	.00	.00	.20	.74	.99	.98	.91	.83	.71	.56	.33	REL.
12	.99	.99	.99	.99	.99	.99	.76	.61	.32	.22	.14	.08	-	F.DAYS
	-359	-232	-112	-13	31	53	60	61	62	64	64	65	-	S/N..DB
	.00	.00	.00	.00	.17	.97	.76	.61	.32	.22	.13	.08	-	REL.
14	.99	.99	.99	.99	.99	.99	.63	.50	.31	.22	.16	.10	-	F.DAYS
	-307	-196	-91	-6	34	54	62	62	63	64	65	66	-	S/N..DB
	.00	.00	.00	.00	.27	.98	.63	.50	.30	.22	.15	.10	-	REL.
16	.99	.99	.99	.99	.99	.99	.72	.60	.38	.29	.21	.15	.06	F.DAYS
	-172	-102	-7	25	42	59	64	64	65	66	66	67	67	S/N..DB
	.00	.00	.00	.07	.63	.99	.72	.60	.38	.29	.21	.15	.06	REL.
18	.99	.99	.99	.99	.99	.96	.63	.54	.36	.27	.20	.14	.06	F.DAYS
	-3	21	32	48	56	64	68	67	68	69	69	69	69	S/N..DB
	.00	.07	.27	.84	.98	.95	.63	.54	.35	.27	.20	.14	.06	REL.
20	.99	.99	.99	.99	.99	.86	.33	.25	.11	.07	-	-	-	F.DAYS
	19	34	44	50	59	66	68	68	68	69	-	-	-	S/N..DB
	.02	.30	.72	.95	.98	.86	.33	.24	.11	.07	-	-	-	REL.
22	.99	.99	.99	.99	.99	.78	.19	.13	-	-	-	-	-	F.DAYS
	14	31	41	49	60	66	68	68	-	-	-	-	-	S/N..DB
	.00	.18	.62	.96	.98	.77	.18	.13	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.98	.75	.17	.11	-	-	-	-	-	F.DAYS
	12	29	40	48	61	66	68	68	-	-	-	-	-	S/N..DB
	.00	.14	.51	.94	.98	.75	.16	.11	-	-	-	-	-	REL.

1 DEC SSN= 120 18.016
3000 KM PATH TO 20 DEGREES N AZIMUTHS N.MILES
6.98S - 0.00W 20.00N - 0.00W 0.0 180.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.99	.94	.60	.52	.35	.27	.20	.15	.07	F.DAYS
	26	41	51	57	62	65	68	68	68	69	69	70	69	S/N..DB
	.10	.60	.97	.99	.99	.93	.60	.52	.34	.27	.20	.14	.07	REL.
4	.99	.99	.99	.99	.99	.87	.39	.31	.16	.11	.07	-	-	F.DAYS
	26	43	51	57	62	65	68	68	68	69	69	-	-	S/N..DB
	.08	.66	.95	.99	.98	.86	.39	.31	.16	.11	.07	-	-	REL.
6	.99	.99	.99	.99	.99	.93	.07	-	-	-	-	-	-	F.DAYS
	15	34	50	56	62	65	68	-	-	-	-	-	-	S/N..DB
	.00	.28	.94	.99	.99	.92	.07	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.99	.96	.83	.70	.53	.39	.17	F.DAYS
	-136	-76	-3	28	45	59	64	64	65	66	67	68	68	S/N..DB
	.00	.00	.00	.13	.78	.99	.98	.96	.82	.69	.53	.39	.17	REL.
10	.99	.99	.99	.99	.99	.99	.92	.82	.46	.31	.19	.10	-	F.DAYS
	-269	-169	-75	-2	36	55	62	62	64	65	65	66	-	S/N..DB
	.00	.00	.00	.00	.34	.99	.91	.82	.46	.31	.19	.10	-	REL.
12	.99	.99	.99	.99	.99	.99	.86	.73	.36	.22	.12	.06	-	F.DAYS
	-321	-206	-96	-8	33	54	61	62	63	64	64	66	-	S/N..DB
	.00	.00	.00	.00	.23	.98	.85	.72	.36	.22	.12	.06	-	REL.
14	.99	.99	.99	.99	.99	.99	.84	.71	.38	.25	.15	.08	-	F.DAYS
	-270	-170	-75	-0	37	55	62	63	64	65	65	66	-	S/N..DB
	.00	.00	.00	.00	.38	.99	.83	.70	.38	.25	.15	.08	-	REL.
16	.99	.99	.99	.99	.99	.99	.90	.81	.48	.35	.23	.14	-	F.DAYS
	-138	-78	0	30	54	60	65	65	66	67	67	68	-	S/N..DB
	.00	.00	.00	.17	.98	.99	.90	.80	.48	.35	.23	.14	-	REL.
18	.99	.99	.99	.99	.99	.98	.57	.46	.25	.17	.11	.06	-	F.DAYS
	27	35	51	57	63	66	68	68	68	69	69	70	-	S/N..DB
	.10	.31	.95	.99	.99	.98	.57	.45	.25	.17	.11	.06	-	REL.
20	.99	.99	.99	.99	.99	.88	.19	.12	-	-	-	-	-	F.DAYS
	29	44	52	58	63	66	68	68	-	-	-	-	-	S/N..DB
	.14	.72	.96	.99	.99	.88	.19	.12	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.99	.92	.29	.19	.06	-	-	-	-	F.DAYS
	27	42	51	58	63	66	68	68	68	-	-	-	-	S/N..DB
	.14	.66	.96	.99	.99	.92	.29	.19	.06	-	-	-	-	REL.
24	.99	.99	.99	.99	.99	.97	.48	.37	.16	.10	.05	-	-	F.DAYS
	26	41	51	57	63	66	68	68	68	69	69	-	-	S/N..DB
	.11	.60	.96	.99	.99	.96	.48	.37	.16	.09	.05	-	-	REL.

Figure I-6

1 JUN SSN= 20 18.001
200 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
38.20N - 0.00W 40.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.50	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	53	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.96	.49	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.98	.37	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.97	.37	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.77	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	58	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.98	.77	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.93	.15	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	52	57	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.81	.89	.15	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.91	.07	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	46	53	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.37	.74	.07	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.93	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	33	43	52	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.23	.63	.10	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.97	.15	-	-	-	-	-	-	-	-	-	-	F.DAYS
	36	45	52	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.33	.75	.15	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.98	.25	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	55	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.81	.93	.25	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.67	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	60	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.97	.99	.67	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.80	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	59	60	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.98	.99	.79	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.95	.26	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	52	53	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.96	.93	.25	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.82	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	53	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.97	.80	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.001
200 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
38.20N - 0.00W 40.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.88	.19	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.87	.19	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.73	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	-	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.73	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.50	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	-	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.50	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.96	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	61	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.95	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.42	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	62	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.96	.99	.42	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.63	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	60	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.92	.98	.63	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.58	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	61	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.96	.99	.58	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	61	64	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.99	.11	-	-	-	-	-	-	-	-	-	-	REL.
18	.92	.41	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	61	61	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.92	.41	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.87	.26	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	60	61	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.86	.25	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.80	.11	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	58	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.80	.11	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.84	.14	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.84	.14	-	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.001
200 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
38.20N - 0.00W 40.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.97	.56	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	53	55	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.96	.95	.56	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.95	.44	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	59	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.95	.44	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.97	.64	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	51	55	58	61	-	-	-	-	-	-	-	-	-	S/N,.DB
	.94	.96	.63	.14	-	-	-	-	-	-	-	-	-	REL.
8	.99	.98	.70	.19	-	-	-	-	-	-	-	-	-	F.DAYS
	38	46	53	59	-	-	-	-	-	-	-	-	-	S/N,.DB
	.42	.80	.68	.19	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.58	.09	-	-	-	-	-	-	-	-	-	F.DAYS
	25	41	49	57	-	-	-	-	-	-	-	-	-	S/N,.DB
	.05	.56	.54	.09	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.67	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	20	38	47	56	-	-	-	-	-	-	-	-	-	S/N,.DB
	.01	.41	.58	.14	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.81	.16	-	-	-	-	-	-	-	-	-	F.DAYS
	25	41	49	55	-	-	-	-	-	-	-	-	-	S/N,.DB
	.05	.56	.75	.16	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.83	.19	-	-	-	-	-	-	-	-	-	F.DAYS
	38	46	53	57	-	-	-	-	-	-	-	-	-	S/N,.DB
	.42	.81	.81	.18	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.94	.26	-	-	-	-	-	-	-	-	-	F.DAYS
	51	55	59	59	-	-	-	-	-	-	-	-	-	S/N,.DB
	.94	.98	.93	.26	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.94	.26	-	-	-	-	-	-	-	-	-	F.DAYS
	58	58	59	59	-	-	-	-	-	-	-	-	-	S/N,.DB
	.98	.98	.93	.26	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.85	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	50	52	53	56	-	-	-	-	-	-	-	-	-	S/N,.DB
	.95	.98	.85	.14	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.79	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	51	52	54	57	-	-	-	-	-	-	-	-	-	S/N,.DB
	.96	.97	.78	.06	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.001
200 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
38.20N - 0.00W 40.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.72	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.72	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.94	.22	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	59	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.93	.22	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.25	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.25	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.43	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	63	65	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.99	.99	.43	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.97	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	61	65	-	-	-	-	-	-	-	-	-	S/N,.DB
	.88	.98	.99	.97	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.96	-	-	-	-	-	-	-	-	-	F.DAYS
	44	51	58	63	-	-	-	-	-	-	-	-	-	S/N,.DB
	.72	.94	.99	.96	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.89	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	59	63	-	-	-	-	-	-	-	-	-	S/N,.DB
	.88	.97	.99	.88	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.77	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	63	66	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.99	.99	.77	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.94	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	61	62	63	65	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.99	.93	.12	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.38	-	-	-	-	-	-	-	-	-	-	F.DAYS
	60	61	61	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.99	.38	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.95	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	58	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.95	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.84	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	-	-	-	-	-	-	-	-	-	-	-	S/N,.DB
	.99	.84	-	-	-	-	-	-	-	-	-	-	-	REL.

Figure 1-7

1 JUN SSN= 20 18.003
500 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
35.50N - 0.00W 40.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.92	.12	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	54	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.91	.12	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.84	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	61	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.83	.06	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.97	.35	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	57	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.96	.35	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.73	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	25	41	58	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.07	.56	.73	.06	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	7	29	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.98	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	1	24	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.04	.96	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	7	29	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.98	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.84	.09	-	-	-	-	-	-	-	-	-	F.DAYS
	25	47	58	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.07	.85	.84	.08	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.98	.46	-	-	-	-	-	-	-	-	-	F.DAYS
	46	57	64	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.99	.98	.45	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.57	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	64	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.98	.57	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.72	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	58	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.98	.72	.06	-	-	-	-	-	-	-	-	-	REL.
24	.99	.96	.35	-	-	-	-	-	-	-	-	-	-	F.DAYS
	40	53	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.95	.35	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.003
500 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
35.50N - 0.00W 40.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.98	.68	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.68	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.95	.42	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.42	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.96	.13	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	61	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.13	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.85	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	60	66	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.84	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.49	-	-	-	-	-	-	-	-	-	F.DAYS
	38	53	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.41	.97	.99	.48	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.57	-	-	-	-	-	-	-	-	-	F.DAYS
	32	46	61	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.19	.81	.99	.56	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.54	-	-	-	-	-	-	-	-	-	F.DAYS
	38	53	62	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.41	.97	.99	.54	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.98	.13	-	-	-	-	-	-	-	-	-	F.DAYS
	53	60	67	70	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.98	.13	-	-	-	-	-	-	-	-	-	REL.
18	.99	.88	.18	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	63	67	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.88	.18	-	-	-	-	-	-	-	-	-	-	REL.
20	.98	.75	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	62	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.74	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.97	.51	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.51	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.98	.55	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.54	-	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.003
500 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
35.50N - 0.00W 40.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.81	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	50	53	59	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.97	.81	.14	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.76	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	64	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.98	.75	.06	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.87	.43	-	-	-	-	-	-	-	-	-	F.DAYS
	40	54	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.98	.87	.43	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.52	-	-	-	-	-	-	-	-	-	F.DAYS
	10	31	55	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.19	.99	.52	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.40	-	-	-	-	-	-	-	-	-	F.DAYS
	-12	15	49	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.92	.40	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.51	-	-	-	-	-	-	-	-	-	F.DAYS
	-21	8	46	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.84	.50	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.64	-	-	-	-	-	-	-	-	-	F.DAYS
	-12	15	49	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.92	.64	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.65	-	-	-	-	-	-	-	-	-	F.DAYS
	10	31	54	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.19	.98	.65	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.82	-	-	-	-	-	-	-	-	-	F.DAYS
	40	54	62	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.98	.99	.81	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.78	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	63	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.99	.77	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.97	.61	-	-	-	-	-	-	-	-	-	F.DAYS
	47	52	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.98	.96	.60	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.95	.49	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	58	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.98	.94	.48	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.003
500 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
35.50N - 0.00W 40.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.95	.15	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.95	.15	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.72	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.71	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.89	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	61	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.88	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.98	-	-	-	-	-	-	-	-	-	F.DAYS
	47	58	65	70	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.99	.99	.97	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.48	-	-	-	-	-	-	-	-	F.DAYS
	28	44	60	67	72	-	-	-	-	-	-	-	-	S/N..DB
	.10	.72	.99	.99	.48	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.23	-	-	-	-	-	-	-	-	F.DAYS
	20	38	57	65	70	-	-	-	-	-	-	-	-	S/N..DB
	.01	.42	.99	.99	.23	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.13	-	-	-	-	-	-	-	-	F.DAYS
	28	49	59	66	71	-	-	-	-	-	-	-	-	S/N..DB
	.10	.90	.99	.99	.13	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	47	58	65	70	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.99	.99	.99	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.82	-	-	-	-	-	-	-	-	-	F.DAYS
	57	63	67	70	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.81	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.95	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	57	62	66	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.94	.14	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.52	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.99	.51	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.23	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.99	.23	-	-	-	-	-	-	-	-	-	-	REL.

Figure I-8

1 JUN SSN= 20 18.004
800 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
32.80N - 0.00W 40.00N - 0.00W 0.0 180.0 436.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.55	.05	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	59	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.97	.55	.05	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.40	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.40	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.87	.21	-	-	-	-	-	-	-	-	-	F.DAYS
	35	53	61	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	.97	.86	.21	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.63	-	-	-	-	-	-	-	-	-	F.DAYS
	3	25	54	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.98	.62	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-21	7	35	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.32	.99	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-31	0	31	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.19	.99	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-22	7	35	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.32	.99	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.76	-	-	-	-	-	-	-	-	-	F.DAYS
	3	25	54	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.98	.76	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.97	.08	-	-	-	-	-	-	-	-	F.DAYS
	35	53	61	65	70	-	-	-	-	-	-	-	-	S/N..DB
	.31	.97	.99	.96	.08	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.97	.11	-	-	-	-	-	-	-	-	F.DAYS
	52	57	63	66	71	-	-	-	-	-	-	-	-	S/N..DB
	.91	.98	.99	.97	.11	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.95	.55	-	-	-	-	-	-	-	-	-	F.DAYS
	45	51	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.80	.97	.94	.55	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.82	.15	-	-	-	-	-	-	-	-	-	F.DAYS
	46	52	58	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.97	.82	.15	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.004
800 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
32.80N - 0.00W 40.00N - 0.00W 0.0 180.0 436.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.95	.31	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.95	.31	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.86	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.86	.09	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.87	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.86	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.85	-	-	-	-	-	-	-	-	-	F.DAYS
	42	55	63	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.98	.99	.84	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.09	-	-	-	-	-	-	-	-	F.DAYS
	20	37	57	64	72	-	-	-	-	-	-	-	-	S/N..DB
	.01	.37	.99	.99	.09	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.09	-	-	-	-	-	-	-	-	F.DAYS
	12	31	55	63	71	-	-	-	-	-	-	-	-	S/N..DB
	.00	.17	.99	.99	.09	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.09	-	-	-	-	-	-	-	-	F.DAYS
	20	37	57	65	71	-	-	-	-	-	-	-	-	S/N..DB
	.01	.37	.99	.99	.09	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	42	55	63	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.98	.99	.98	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.78	.20	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	66	70	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.98	.77	.19	-	-	-	-	-	-	-	-	-	REL.
20	.99	.97	.51	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.96	.51	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.93	.19	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.92	.19	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.93	.20	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.92	.19	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN. SSN= 120 18.004
800 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
32.80N - 0.00W 40.00N - 0.00W 0.0 180.0 436.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.95	.65	-	-	-	-	-	-	-	-	-	F.DAYS
	48	52	60	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.96	.94	.65	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.93	.58	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.93	.58	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.79	.14	-	-	-	-	-	-	-	-	F.DAYS
	25	41	59	66	71	-	-	-	-	-	-	-	-	S/N..DB
	.07	.56	.99	.79	.14	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.22	-	-	-	-	-	-	-	-	F.DAYS
	-17	10	49	59	68	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.92	.99	.21	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.11	-	-	-	-	-	-	-	-	F.DAYS
	-51	-13	22	54	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.03	.98	.11	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.20	-	-	-	-	-	-	-	-	F.DAYS
	-65	-23	17	52	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.96	.19	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.21	-	-	-	-	-	-	-	-	F.DAYS
	-51	-13	22	54	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.03	.98	.21	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.21	-	-	-	-	-	-	-	-	F.DAYS
	-17	10	50	59	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.94	.99	.21	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.34	-	-	-	-	-	-	-	-	F.DAYS
	25	41	59	64	68	-	-	-	-	-	-	-	-	S/N..DB
	.07	.56	.99	.99	.34	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.98	.23	-	-	-	-	-	-	-	-	F.DAYS
	52	57	62	65	70	-	-	-	-	-	-	-	-	S/N..DB
	.91	.98	.99	.98	.23	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.91	.05	-	-	-	-	-	-	-	-	F.DAYS
	45	51	57	63	70	-	-	-	-	-	-	-	-	S/N..DB
	.80	.97	.99	.91	.05	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.87	-	-	-	-	-	-	-	-	-	F.DAYS
	46	52	58	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.97	.99	.86	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.004
800 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
32.80N - 0.00W 40.00N - 0.00W 0.0 180.0 436.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.79	.05	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.79	.05	-	-	-	-	-	-	-	-	-	REL.
4	.99	.96	.19	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.95	.19	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.41	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.40	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.78	-	-	-	-	-	-	-	-	-	F.DAYS
	35	47	61	67	72	-	-	-	-	-	-	-	-	S/N..DB
	.31	.85	.99	.99	.78	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.27	-	-	-	-	-	-	-	F.DAYS
	6	27	54	62	70	73	-	-	-	-	-	-	-	S/N..DB
	.00	.08	.98	.99	.99	.26	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.98	-	-	-	-	-	-	-	-	F.DAYS
	-5	18	52	61	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.96	.99	.97	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.91	-	-	-	-	-	-	-	-	F.DAYS
	5	26	54	62	70	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.98	.99	.90	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.88	-	-	-	-	-	-	-	-	F.DAYS
	35	47	61	67	72	-	-	-	-	-	-	-	-	S/N..DB
	.31	.85	.99	.99	.88	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.30	-	-	-	-	-	-	-	-	F.DAYS
	54	60	66	70	73	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.99	.30	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.89	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.89	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.98	.34	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.97	.34	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.91	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.90	.11	-	-	-	-	-	-	-	-	-	REL.

Figure I-9

1 JUN SSN= 20 18.005
1000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
31.01N - 0.00W 40.00N - 0.00W 0.0 180.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.98	.99	.89	.22	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	59	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.95	.88	.22	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.76	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.76	.12	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.60	-	-	-	-	-	-	-	-	-	F.DAYS
	29	42	59	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.14	.61	.99	.60	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-8	16	39	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.49	.99	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-39	-5	26	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.08	.98	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-58	-13	22	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.03	.98	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-39	-5	26	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.08	.98	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.09	-	-	-	-	-	-	-	-	F.DAYS
	-8	18	39	60	68	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.49	.99	.09	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.49	-	-	-	-	-	-	-	-	F.DAYS
	29	42	59	63	69	-	-	-	-	-	-	-	-	S/N..DB
	.14	.62	.99	.99	.49	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.49	-	-	-	-	-	-	-	-	F.DAYS
	58	55	61	65	70	-	-	-	-	-	-	-	-	S/N..DB
	.87	.97	.99	.99	.49	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.80	-	-	-	-	-	-	-	-	-	F.DAYS
	43	49	56	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.94	.98	.79	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.94	.50	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.76	.95	.93	.50	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.005
1000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
31.01N - 0.00W 40.00N - 0.00W 0.0 180.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.66	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.98	.66	.06	-	-	-	-	-	-	-	-	-	REL.
4	.99	.96	.34	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.95	.34	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.98	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.98	.14	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.98	.13	-	-	-	-	-	-	-	-	F.DAYS
	35	47	60	66	72	-	-	-	-	-	-	-	-	S/N..DB
	.31	.85	.99	.98	.13	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.72	-	-	-	-	-	-	-	-	F.DAYS
	10	29	47	61	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.87	.99	.71	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.70	-	-	-	-	-	-	-	-	F.DAYS
	-5	22	43	60	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.71	.99	.69	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.75	-	-	-	-	-	-	-	-	F.DAYS
	10	29	47	62	70	-	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.87	.99	.74	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.45	-	-	-	-	-	-	-	-	F.DAYS
	35	47	60	66	72	-	-	-	-	-	-	-	-	S/N..DB
	.31	.85	.99	.99	.45	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.94	.58	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.93	.57	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.80	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.80	.23	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.51	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.98	.51	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.50	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.98	.50	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.005
1000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
31.01N - 0.00W 40.00N - 0.00W 0.0 180.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.98	.83	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	59	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.95	.98	.83	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.97	.79	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.97	.79	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.91	.33	-	-	-	-	-	-	-	-	F.DAYS
	18	34	57	64	70	-	-	-	-	-	-	-	-	S/N..DB
	.01	.28	.99	.91	.33	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.44	-	-	-	-	-	-	-	-	F.DAYS
	-33	-1	29	56	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.99	.44	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.30	-	-	-	-	-	-	-	-	F.DAYS
	-74	-30	15	50	63	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.93	.30	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-90	-41	10	31	62	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.18	.99	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.57	-	-	-	-	-	-	-	-	F.DAYS
	-74	-30	15	51	63	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.95	.57	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.57	-	-	-	-	-	-	-	-	F.DAYS
	-33	-1	29	56	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.99	.57	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.77	-	-	-	-	-	-	-	-	F.DAYS
	17	34	57	62	68	-	-	-	-	-	-	-	-	S/N..DB
	.01	.28	.99	.99	.76	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.64	-	-	-	-	-	-	-	-	F.DAYS
	58	55	61	64	70	-	-	-	-	-	-	-	-	S/N..DB
	.87	.97	.99	.99	.63	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.97	.35	-	-	-	-	-	-	-	-	F.DAYS
	43	49	56	62	70	-	-	-	-	-	-	-	-	S/N..DB
	.69	.94	.99	.97	.35	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.96	.21	-	-	-	-	-	-	-	-	F.DAYS
	44	50	57	63	71	-	-	-	-	-	-	-	-	S/N..DB
	.76	.95	.99	.95	.20	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.005
1000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
31.01N - 0.00W 40.00N - 0.00W 0.0 180.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.95	.46	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.99	.94	.45	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.61	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.60	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.87	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.86	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.98	.29	-	-	-	-	-	-	-	F.DAYS
	27	41	58	65	71	73	-	-	-	-	-	-	-	S/N..DB
	.10	.56	.99	.99	.98	.29	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.90	-	-	-	-	-	-	-	F.DAYS
	-7	16	40	59	68	72	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.54	.99	.99	.89	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.58	-	-	-	-	-	-	-	F.DAYS
	-21	6	34	57	67	71	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.29	.99	.99	.57	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.41	-	-	-	-	-	-	-	F.DAYS
	-7	16	40	59	68	72	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.54	.99	.99	.40	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.39	-	-	-	-	-	-	-	F.DAYS
	27	41	58	65	71	73	-	-	-	-	-	-	-	S/N..DB
	.10	.56	.99	.99	.99	.39	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.82	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	69	73	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.81	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.15	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	72	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.15	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.83	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.99	.99	.83	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.59	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.99	.99	.59	-	-	-	-	-	-	-	-	-	REL.

Figure I-10

1 JUN SSN= 20 18.011
2000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
22.01N - 0.00W 40.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.98	.40	-	-	-	-	-	-	-	-	F.DAYS
	37	43	52	60	67	-	-	-	-	-	-	-	-	S/N..DB
	.40	.70	.97	.98	.40	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.94	.24	-	-	-	-	-	-	-	-	F.DAYS
	42	50	56	61	67	-	-	-	-	-	-	-	-	S/N..DB
	.61	.93	.98	.94	.24	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.74	.08	-	-	-	-	-	-	-	F.DAYS
	12	28	44	57	64	68	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.76	.99	.74	.08	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.47	-	-	-	-	-	-	-	F.DAYS
	-42	-10	20	38	59	65	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.03	.43	.99	.47	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.20	-	-	-	-	-	-	-	F.DAYS
	-88	-42	1	27	48	62	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.09	.88	.20	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	F.DAYS
	-105	-54	-6	23	46	62	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.04	.82	.99	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.75	.09	-	-	-	-	-	-	F.DAYS
	-88	-42	1	27	48	62	68	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.09	.88	.75	.09	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.85	.19	.12	-	-	-	-	-	F.DAYS
	-43	-10	20	38	59	65	69	69	-	-	-	-	-	S/N..DB
	.00	.00	.03	.43	.99	.84	.19	.12	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.94	.47	.37	.18	.11	.07	-	-	F.DAYS
	12	28	44	55	62	68	71	71	71	72	72	-	-	S/N..DB
	.00	.12	.76	.97	.99	.93	.47	.37	.18	.11	.07	-	-	REL.
20	.99	.99	.99	.99	.99	.84	.21	.13	-	-	-	-	-	F.DAYS
	40	46	54	58	65	70	72	72	-	-	-	-	-	S/N..DB
	.50	.78	.97	.99	.99	.83	.21	.13	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.78	.12	-	-	-	-	-	-	-	F.DAYS
	34	41	49	56	66	70	-	-	-	-	-	-	-	S/N..DB
	.28	.59	.96	.99	.78	.12	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.98	.57	-	-	-	-	-	-	-	-	F.DAYS
	35	42	50	57	67	-	-	-	-	-	-	-	-	S/N..DB
	.34	.65	.96	.98	.57	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.011
2000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
22.01N - 0.00W 40.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.98	.87	.27	-	-	-	-	-	-	-	-	F.DAYS
	40	47	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.52	.87	.98	.87	.27	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.91	.56	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.91	.55	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.73	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.72	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.87	.08	-	-	-	-	-	-	F.DAYS
	13	29	44	54	64	68	71	-	-	-	-	-	-	S/N..DB
	.00	.14	.76	.98	.99	.87	.08	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.98	.61	.50	.25	.16	.09	-	-	F.DAYS
	-25	1	27	43	60	65	69	69	70	71	71	-	-	S/N..DB
	.00	.00	.10	.69	.99	.97	.60	.49	.25	.16	.09	-	-	REL.
12	.99	.99	.99	.99	.99	.97	.59	.48	.24	.15	.08	-	-	F.DAYS
	-41	-9	21	39	59	64	69	69	70	71	71	-	-	S/N..DB
	.00	.00	.02	.47	.99	.97	.59	.47	.23	.15	.08	-	-	REL.
14	.99	.99	.99	.99	.99	.99	.66	.53	.26	.15	.08	-	-	F.DAYS
	-25	1	27	43	60	65	69	69	70	71	71	-	-	S/N..DB
	.00	.00	.10	.69	.99	.99	.66	.53	.26	.15	.08	-	-	REL.
16	.99	.99	.99	.99	.99	.99	.56	.43	.17	.09	-	-	-	F.DAYS
	13	29	44	54	64	68	71	71	71	72	-	-	-	S/N..DB
	.00	.14	.76	.98	.99	.98	.56	.42	.17	.09	-	-	-	REL.
18	.99	.99	.99	.99	.91	.45	-	-	-	-	-	-	-	F.DAYS
	42	49	56	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.99	.91	.45	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.98	.62	.11	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.98	.61	.11	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.95	.29	-	-	-	-	-	-	-	-	F.DAYS
	42	48	56	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.62	.89	.99	.95	.29	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.94	.25	-	-	-	-	-	-	-	-	F.DAYS
	41	48	56	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.60	.89	.99	.93	.25	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.011
2000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
22.01N - 0.00W 40.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.89	.40	-	-	-	-	-	-	-	F.DAYS
	37	43	52	60	67	69	-	-	-	-	-	-	-	S/N..DB
	.40	.70	.97	.99	.89	.40	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.84	.21	-	-	-	-	-	-	-	F.DAYS
	43	50	56	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.67	.93	.98	.99	.83	.21	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.98	.66	.10	.06	-	-	-	-	-	F.DAYS
	-1	18	38	50	63	67	71	70	-	-	-	-	-	S/N..DB
	.00	.01	.45	.93	.98	.66	.10	.06	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.82	.21	.15	.06	-	-	-	-	F.DAYS
	-76	-34	6	29	50	63	68	68	69	-	-	-	-	S/N..DB
	.00	.00	.00	.15	.93	.82	.21	.15	.06	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.67	-	-	-	-	-	-	F.DAYS
	-138	-78	-20	18	41	60	66	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.01	.57	.99	.67	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	.33	.23	.09	-	-	-	-	F.DAYS
	-161	-94	-30	6	38	58	65	66	67	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.42	.99	.32	.23	.09	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.99	.50	.39	.17	.09	-	-	-	F.DAYS
	-138	-78	-20	18	41	60	66	66	68	69	-	-	-	S/N..DB
	.00	.00	.00	.01	.57	.99	.50	.38	.16	.09	-	-	-	REL.
16	.99	.99	.99	.99	.99	.94	.53	.41	.19	.11	.06	-	-	F.DAYS
	-77	-34	5	30	57	63	68	68	69	70	70	-	-	S/N..DB
	.00	.00	.00	.17	.99	.94	.52	.41	.18	.11	.06	-	-	REL.
18	.99	.99	.99	.99	.99	.99	.66	.55	.28	.17	.09	-	-	F.DAYS
	-2	18	38	48	61	67	71	70	71	72	72	-	-	S/N..DB
	.00	.01	.45	.86	.99	.98	.66	.55	.28	.17	.09	-	-	REL.
20	.99	.99	.99	.99	.99	.94	.33	.21	.05	-	-	-	-	F.DAYS
	41	47	54	58	65	70	72	71	72	-	-	-	-	S/N..DB
	.54	.82	.97	.99	.99	.94	.32	.21	.05	-	-	-	-	REL.
22	.99	.99	.99	.99	.99	.77	.07	-	-	-	-	-	-	F.DAYS
	34	41	49	57	66	70	71	-	-	-	-	-	-	S/N..DB
	.28	.59	.96	.99	.98	.76	.07	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.98	.70	-	-	-	-	-	-	-	F.DAYS
	35	42	50	58	67	70	-	-	-	-	-	-	-	S/N..DB
	.34	.65	.96	.99	.98	.70	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.011
2000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
22.01N - 0.00W 40.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.82	.29	-	-	-	-	-	-	-	F.DAYS
	41	48	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.58	.90	.99	.99	.81	.29	-	-	-	-	-	-	-	REL.
4	.99	.99	.98	.86	.18	-	-	-	-	-	-	-	-	F.DAYS
	43	50	57	63	67	-	-	-	-	-	-	-	-	S/N..DB
	.67	.93	.98	.86	.18	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.28	-	-	-	-	-	-	-	-	F.DAYS
	43	50	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.67	.93	.99	.99	.28	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.97	.93	.72	.56	.39	.25	.07	F.DAYS
	-0	19	38	50	63	67	70	70	71	72	72	73	72	S/N..DB
	.00	.02	.45	.93	.99	.99	.96	.92	.72	.56	.39	.25	.07	REL.
10	.99	.99	.99	.99	.99	.99	.99	.99	.98	.96	.90	.80	.50	F.DAYS
	-53	-18	15	35	53	63	68	68	69	70	70	71	71	S/N..DB
	.00	.00	.00	.31	.97	.99	.99	.99	.98	.95	.89	.80	.50	REL.
12	.99	.99	.99	.99	.99	.99	.99	.97	.83	.69	.50	.30	.06	F.DAYS
	-75	-33	6	29	50	63	68	68	69	70	70	71	71	S/N..DB
	.00	.00	.00	.13	.93	.99	.99	.97	.83	.68	.50	.30	.06	REL.
14	.99	.99	.99	.99	.99	.99	.95	.90	.69	.53	.36	.21	-	F.DAYS
	-54	-18	15	35	58	64	69	69	70	71	70	71	-	S/N..DB
	.00	.00	.00	.31	.99	.99	.95	.90	.68	.53	.36	.21	-	REL.
16	.99	.99	.99	.99	.99	.99	.97	.94	.78	.65	.49	.33	.10	F.DAYS
	-0	19	38	50	63	67	70	70	71	72	72	73	72	S/N..DB
	.00	.02	.45	.93	.99	.99	.97	.94	.78	.65	.49	.33	.09	REL.
18	.99	.99	.99	.99	.99	.99	.72	.60	.28	.16	.08	-	-	F.DAYS
	42	49	57	62	67	70	72	72	72	73	73	-	-	S/N..DB
	.61	.90	.99	.99	.99	.99	.72	.59	.28	.16	.08	-	-	REL.
20	.99	.99	.99	.99	.99	.95	.20	.10	-	-	-	-	-	F.DAYS
	43	50	57	62	67	70	72	71	-	-	-	-	-	S/N..DB
	.67	.93	.99	.99	.99	.95	.19	.10	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.99	.69	.08	-	-	-	-	-	-	F.DAYS
	42	48	56	62	67	70	72	-	-	-	-	-	-	S/N..DB
	.62	.89	.99	.99	.98	.69	.08	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.97	.50	-	-	-	-	-	-	-	F.DAYS
	41	48	56	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.60	.89	.99	.99	.97	.50	-	-	-	-	-	-	-	REL.

Figure I-11

1 JUN SSN= 20 18.016
3000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
13.02N - 0.00W 40.00N - 0.00W 0.0 180.0 1618.8
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.81	.23	-	-	-	-	-	-	-	F.DAYS
	22	37	47	54	63	66	-	-	-	-	-	-	-	S/N..DB
	.05	.41	.87	.99	.81	.23	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.51	.08	-	-	-	-	-	-	-	F.DAYS
	27	43	50	56	63	66	-	-	-	-	-	-	-	S/N..DB
	.10	.67	.92	.99	.51	.08	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.97	.93	.48	-	-	-	-	-	-	-	F.DAYS
	-21	3	35	44	58	63	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.34	.72	.92	.48	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.69	.84	.21	.13	-	-	-	-	-	F.DAYS
	-126	-70	-16	15	44	58	64	64	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.51	.83	.21	.13	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.71	.08	-	-	-	-	-	-	F.DAYS
	-213	-131	-53	3	39	56	62	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.46	.71	.08	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.14	.45	.34	.16	.10	.06	-	-	F.DAYS
	-247	-155	-67	-3	35	47	61	61	63	64	64	-	-	S/N..DB
	.00	.00	.00	.00	.30	.13	.44	.34	.16	.10	.06	-	-	REL.
14	.99	.99	.99	.99	.99	.54	.79	.71	.51	.40	.30	.22	.09	F.DAYS
	-213	-132	-53	1	37	49	62	62	64	65	65	66	66	S/N..DB
	.00	.00	.00	.00	.38	.50	.78	.71	.51	.40	.30	.21	.09	REL.
16	.99	.99	.99	.99	.99	.99	.90	.85	.71	.62	.52	.42	.24	F.DAYS
	-127	-71	-17	15	44	59	64	64	65	66	66	67	67	S/N..DB
	.00	.00	.00	.00	.72	.99	.89	.85	.70	.61	.51	.42	.24	REL.
18	.99	.99	.99	.99	.99	.99	.94	.91	.81	.74	.67	.58	.41	F.DAYS
	-21	3	35	42	56	62	66	66	67	68	68	69	69	S/N..DB
	.00	.00	.34	.63	.98	.99	.93	.90	.80	.74	.66	.58	.41	REL.
20	.99	.99	.99	.99	.99	.97	.63	.53	.32	.23	.15	.10	-	F.DAYS
	25	40	47	52	59	65	68	68	68	69	69	70	-	S/N..DB
	.08	.51	.83	.97	.99	.96	.82	.53	.32	.23	.15	.10	-	REL.
22	.99	.99	.99	.99	.90	.35	-	-	-	-	-	-	-	F.DAYS
	19	34	43	51	62	66	-	-	-	-	-	-	-	S/N..DB
	.01	.28	.76	.98	.90	.35	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.84	.19	-	-	-	-	-	-	-	F.DAYS
	20	36	45	52	63	66	-	-	-	-	-	-	-	S/N..DB
	.03	.36	.84	.98	.83	.19	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.016
3000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
13.02N - 0.00W 40.00N - 0.00W 0.0 180.0 1618.8
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.98	.70	.20	-	-	-	-	-	-	-	F.DAYS
	25	41	51	57	62	65	-	-	-	-	-	-	-	S/N..DB
	.09	.57	.97	.97	.69	.20	-	-	-	-	-	-	-	REL.
4	.99	.99	.93	.64	-	-	-	-	-	-	-	-	-	F.DAYS
	27	43	51	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.10	.67	.90	.63	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.97	.06	-	-	-	-	-	-	-	-	F.DAYS
	27	43	50	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.10	.67	.94	.97	.06	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.75	.63	.34	.22	.13	.07	-	F.DAYS
	-36	-6	21	41	53	58	65	65	66	67	67	67	-	S/N..DB
	.00	.00	.03	.57	.97	.99	.74	.62	.34	.22	.13	.07	-	REL.
10	.99	.99	.99	.99	.99	.99	.97	.95	.87	.81	.74	.66	.47	F.DAYS
	-112	-60	-11	17	44	53	59	59	62	63	64	65	66	S/N..DB
	.00	.00	.00	.00	.73	.97	.96	.94	.87	.81	.74	.66	.47	REL.
12	.99	.99	.99	.99	.99	.99	.97	.95	.88	.83	.76	.68	.50	F.DAYS
	-143	-82	-24	10	42	56	61	61	63	64	65	66	66	S/N..DB
	.00	.00	.00	.00	.62	.99	.96	.95	.88	.82	.76	.68	.50	REL.
14	.99	.99	.99	.99	.99	.99	.99	.98	.95	.91	.85	.78	.59	F.DAYS
	-112	-60	-11	17	44	56	60	61	63	64	64	66	66	S/N..DB
	.00	.00	.00	.00	.73	.99	.99	.98	.94	.90	.85	.78	.58	REL.
16	.99	.99	.99	.99	.99	.99	.99	.98	.94	.90	.84	.76	.56	F.DAYS
	-35	-6	21	40	52	58	61	61	62	63	64	66	67	S/N..DB
	.00	.00	.03	.52	.96	.99	.99	.98	.93	.89	.83	.75	.55	REL.
18	.99	.99	.99	.99	.99	.95	.61	.52	.36	.29	.22	.17	.09	F.DAYS
	26	41	46	53	58	61	67	67	67	68	68	69	68	S/N..DB
	.08	.56	.84	.97	.99	.94	.60	.51	.36	.29	.22	.17	.09	REL.
20	.99	.99	.99	.99	.97	.73	.19	.14	.06	-	-	-	-	F.DAYS
	27	43	50	56	61	65	68	67	68	-	-	-	-	S/N..DB
	.10	.67	.94	.99	.97	.73	.19	.13	.06	-	-	-	-	REL.
22	.99	.99	.99	.99	.95	.48	.06	-	-	-	-	-	-	F.DAYS
	26	41	50	57	62	66	68	-	-	-	-	-	-	S/N..DB
	.11	.59	.94	.99	.95	.48	.06	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.92	.39	-	-	-	-	-	-	-	F.DAYS
	26	41	50	57	63	66	-	-	-	-	-	-	-	S/N..DB
	.12	.58	.96	.99	.91	.39	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.016
3000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
13.02N - 0.00W 40.00N - 0.00W 0.0 180.0 1618.8
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.98	.80	.16	.08	-	-	-	-	-	F.DAYS
	23	37	47	55	63	66	68	68	-	-	-	-	-	S/N..DB
	.06	.41	.87	.99	.97	.80	.16	.08	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.95	.63	-	-	-	-	-	-	-	F.DAYS
	28	44	51	56	63	66	-	-	-	-	-	-	-	S/N..DB
	.12	.72	.94	.99	.94	.63	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.92	.37	.29	.15	.10	.06	-	-	F.DAYS
	-45	-13	18	40	58	62	66	66	67	68	68	-	-	S/N..DB
	.00	.00	.02	.52	.99	.92	.37	.29	.15	.10	.06	-	-	REL.
8	.99	.99	.99	.99	.99	.98	.66	.56	.37	.29	.22	.16	.08	F.DAYS
	-188	-114	-43	5	39	57	63	63	64	65	65	66	66	S/N..DB
	.00	.00	.00	.00	.47	.98	.66	.55	.37	.29	.22	.16	.08	REL.
10	.99	.99	.99	.99	.99	.24	.58	.48	.27	.18	.12	.07	-	F.DAYS
	-307	-197	-93	-12	31	45	60	60	62	63	63	65	-	S/N..DB
	.00	.00	.00	.00	.17	.19	.58	.48	.27	.18	.12	.07	-	REL.
12	.99	.99	.99	.99	.99	.69	.89	.84	.69	.59	.50	.40	.23	F.DAYS
	-351	-229	-112	-47	27	42	58	59	61	62	63	64	64	S/N..DB
	.00	.00	.00	.00	.08	.45	.88	.83	.68	.59	.49	.40	.23	REL.
14	.99	.99	.99	.99	.99	.85	.94	.92	.84	.78	.72	.65	.48	F.DAYS
	-306	-197	-93	-11	31	44	60	60	62	63	63	65	65	S/N..DB
	.00	.00	.00	.00	.17	.64	.94	.91	.83	.78	.71	.64	.48	REL.
16	.99	.99	.99	.99	.99	.99	.96	.94	.87	.82	.77	.70	.55	F.DAYS
	-189	-115	-43	6	40	57	62	63	64	65	65	66	67	S/N..DB
	.00	.00	.00	.00	.51	.99	.95	.93	.86	.82	.76	.70	.55	REL.
18	.99	.99	.99	.99	.99	.99	.99	.98	.93	.89	.84	.78	.61	F.DAYS
	-46	-13	18	39	56	62	66	66	67	68	68	69	69	S/N..DB
	.00	.00	.02	.49	.98	.99	.98	.97	.93	.89	.84	.77	.60	REL.
20	.99	.99	.99	.99	.99	.99	.90	.85	.68	.58	.46	.34	.14	F.DAYS
	26	41	49	53	61	65	68	68	68	69	69	70	70	S/N..DB
	.10	.56	.89	.97	.99	.99	.90	.85	.68	.57	.46	.34	.14	REL.
22	.99	.99	.99	.99	.99	.97	.60	.49	.23	.14	.08	-	-	F.DAYS
	20	35	44	52	62	66	68	68	69	69	69	-	-	S/N..DB
	.02	.31	.81	.98	.99	.96	.59	.49	.23	.14	.08	-	-	REL.
24	.99	.99	.99	.99	.99	.96	.51	.39	.16	.08	-	-	-	F.DAYS
	21	36	45	53	63	66	68	68	68	69	-	-	-	S/N..DB
	.04	.36	.84	.99	.99	.95	.51	.38	.15	.08	-	-	-	REL.

1 DEC SSN= 120 18.016
3000 KM PATH TO 40 DEGREES N AZIMUTHS N.MILES
13.02N - 0.00W 40.00N - 0.00W 0.0 180.0 1618.8
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.99	.90	.48	.40	.24	.18	.13	.08	-	F.DAYS
	26	41	51	57	62	65	68	68	68	69	69	70	-	S/N..DB
	.11	.57	.97	.99	.98	.90	.48	.40	.24	.18	.12	.08	-	REL.
4	.99	.99	.99	.98	.65	.12	-	-	-	-	-	-	-	F.DAYS
	28	43	51	57	63	66	-	-	-	-	-	-	-	S/N..DB
	.12	.67	.95	.97	.65	.12	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.19	-	-	-	-	-	-	-	F.DAYS
	27	43	51	57	63	66	-	-	-	-	-	-	-	S/N..DB
	.10	.67	.95	.99	.98	.19	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.97	.88	F.DAYS
	-65	-27	10	36	55	59	63	63	65	66	66	67	67	S/N..DB
	.00	.00	.00	.36	.98	.99	.99	.99	.99	.99	.98	.96	.87	REL.
10	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	F.DAYS
	-169	-101	-35	5	39	55	60	60	62	63	63	64	65	S/N..DB
	.00	.00	.00	.00	.46	.99	.99	.99	.99	.99	.99	.99	.99	REL.
12	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.97	F.DAYS
	-212	-130	-52	0	37	55	61	61	63	64	64	65	66	S/N..DB
	.00	.00	.00	.00	.38	.99	.99	.99	.99	.99	.99	.99	.96	REL.
14	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.98	.92	F.DAYS
	-171	-101	-35	7	40	57	62	62	64	65	65	66	66	S/N..DB
	.00	.00	.00	.00	.51	.99	.99	.99	.99	.99	.99	.97	.92	REL.
16	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.96	F.DAYS
	-66	-28	11	36	56	60	64	64	65	66	66	67	67	S/N..DB
	.00	.00	.00	.36	.99	.99	.99	.99	.99	.99	.99	.99	.95	REL.
18	.99	.99	.99	.99	.99	.99	.99	.99	.98	.97	.94	.90	.76	F.DAYS
	27	43	51	56	61	64	67	67	68	68	68	69	69	S/N..DB
	.10	.67	.95	.99	.99	.99	.99	.99	.98	.96	.93	.89	.75	REL.
20	.99	.99	.99	.99	.99	.99	.99	.98	.94	.89	.83	.74	.51	F.DAYS
	28	43	51	57	62	65	68	67	68	69	69	70	70	S/N..DB
	.12	.67	.95	.99	.99	.99	.99	.98	.93	.89	.82	.73	.51	REL.
22	.99	.99	.99	.99	.99	.99	.95	.92	.81	.73	.64	.54	.37	F.DAYS
	27	41	51	57	63	65	68	68	68	69	69	70	70	S/N..DB
	.13	.59	.95	.99	.99	.99	.95	.92	.81	.73	.64	.53	.36	REL.
24	.99	.99	.99	.99	.99	.99	.90	.85	.68	.58	.47	.39	.23	F.DAYS
	26	41	50	57	62	65	68	68	68	69	69	70	70	S/N..DB
	.12	.58	.96	.99	.99	.99	.90	.85	.68	.57	.47	.38	.23	REL.

Figure I-12

1 JUN SSN= 20 18.001
200 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
58.20N - 0.00W 60.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.96	.24	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.24	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.97	.32	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.31	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.52	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	52	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.86	.49	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.69	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	47	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.54	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.73	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	45	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.54	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.76	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	44	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.52	-	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.77	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	45	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.47	.57	-	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.79	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	45	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.53	.55	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.82	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	49	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.67	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.91	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	53	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.83	.06	-	-	-	-	-	-	-	-	-	-	REL.
22	.96	.75	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.73	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.92	.54	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.52	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.001
200 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
58.20N - 0.00W 60.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.25	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.25	-	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.06	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.05	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	-	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	-	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	-	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.70	.09	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.63	.08	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.79	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.78	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.93	.12	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	59	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.92	.12	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.91	.07	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	61	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.90	.07	-	-	-	-	-	-	-	-	-	-	REL.
16	.94	.26	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.26	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.32	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	-	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.06	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.06	-	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.09	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	-	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.28	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.27	-	-	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.001
200 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
58.20N - 0.00W 60.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.84	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.83	.08	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.83	.07	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	55	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.81	.07	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.83	.18	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	50	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.75	.17	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.85	.20	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	43	49	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.42	.53	.17	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.86	.12	-	-	-	-	-	-	-	-	-	-	F.DAYS
	30	40	48	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.21	.43	.10	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.12	-	-	-	-	-	-	-	-	-	-	F.DAYS
	27	41	47	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.15	.55	.10	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.92	.15	-	-	-	-	-	-	-	-	-	-	F.DAYS
	30	40	47	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.25	.46	.12	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.95	.25	-	-	-	-	-	-	-	-	-	-	F.DAYS
	34	41	46	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.32	.51	.19	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.97	.39	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	47	50	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.73	.34	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.98	.45	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	52	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.82	.88	.42	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.94	.31	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	54	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.91	.30	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.90	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	55	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.88	.14	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.001
200 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
58.20N - 0.00W 60.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.89	.27	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.27	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.76	.10	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.71	.10	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.34	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.93	.22	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	55	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.87	.20	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.96	.58	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	62	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.99	.96	.58	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.85	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	62	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.84	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.81	-	-	-	-	-	-	-	-	-	F.DAYS
	57	60	63	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.98	.80	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.89	.20	-	-	-	-	-	-	-	-	-	F.DAYS
	58	60	61	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.99	.88	.19	-	-	-	-	-	-	-	-	-	REL.
18	.99	.92	.18	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.90	.18	-	-	-	-	-	-	-	-	-	-	REL.
20	.91	.24	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.24	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.74	.12	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.73	.12	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.84	.23	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.23	-	-	-	-	-	-	-	-	-	-	-	REL.

Figure I-13

1 JUN SSN= 20 18.003
500 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
55.50N - 0.00W 60.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.75	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.74	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.80	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.79	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	40	52	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.93	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.12	-	-	-	-	-	-	-	-	-	-	F.DAYS
	24	45	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.17	.71	.11	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.16	-	-	-	-	-	-	-	-	-	-	F.DAYS
	15	33	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.02	.29	.15	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	10	30	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.21	.94	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	14	33	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.04	.32	.10	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	22	42	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	.58	.12	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.38	-	-	-	-	-	-	-	-	-	-	F.DAYS
	36	48	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.37	.78	.36	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.65	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.92	.64	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.92	.46	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	55	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.90	.46	-	-	-	-	-	-	-	-	-	-	REL.
24	.97	.81	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	56	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.80	.09	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.003
500 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
55.50N - 0.00W 60.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.65	.05	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.63	.05	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.38	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.34	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.18	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.16	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.97	.55	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.52	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.58	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	60	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.98	.58	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.82	.10	-	-	-	-	-	-	-	-	-	F.DAYS
	51	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.99	.81	.10	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.74	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	60	66	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.73	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.87	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.87	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.69	.14	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.14	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.32	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	-	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.35	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.34	-	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.60	.08	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.58	.08	-	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.003
500 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
55.50N - 0.00W 60.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.95	.41	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	57	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.93	.40	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.94	.39	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.92	.39	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.49	-	-	-	-	-	-	-	-	-	-	F.DAYS
	32	48	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.32	.84	.48	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	11	31	51	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.04	.30	.90	.07	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	-2	11	49	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.06	.88	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	-7	17	47	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.03	.83	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	-2	21	48	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.10	.86	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.05	-	-	-	-	-	-	-	-	-	F.DAYS
	9	28	48	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.18	.80	.05	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.79	.15	-	-	-	-	-	-	-	-	-	F.DAYS
	28	45	53	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.17	.69	.73	.15	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.83	.20	-	-	-	-	-	-	-	-	-	F.DAYS
	45	52	57	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.89	.81	.20	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.72	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	51	54	58	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.95	.72	.06	-	-	-	-	-	-	-	-	-	REL.
24	.99	.97	.58	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.95	.57	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.003
500 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
55.50N - 0.00W 60.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.96	.56	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.55	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.92	.36	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.34	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.72	.07	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.64	.06	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.72	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	53	56	59	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.94	.70	.11	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.94	.17	-	-	-	-	-	-	-	-	F.DAYS
	54	57	64	69	71	-	-	-	-	-	-	-	-	S/N..DB
	.91	.98	.99	.93	.17	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.98	.51	-	-	-	-	-	-	-	-	F.DAYS
	45	55	63	68	71	-	-	-	-	-	-	-	-	S/N..DB
	.74	.97	.99	.98	.51	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.97	.42	-	-	-	-	-	-	-	-	F.DAYS
	51	58	65	69	72	-	-	-	-	-	-	-	-	S/N..DB
	.93	.99	.99	.97	.42	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.81	-	-	-	-	-	-	-	-	-	F.DAYS
	55	60	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.98	.81	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.60	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.98	.59	.07	-	-	-	-	-	-	-	-	-	REL.
20	.99	.63	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.62	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.91	.36	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.36	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.94	.47	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.46	-	-	-	-	-	-	-	-	-	-	-	REL.

Figure I-14

1 JUN SSN= 20 18.004
800 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
52.80N - 0.00W 60.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.98	.24	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.97	.24	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.28	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.97	.28	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	27	40	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.22	.50	.98	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	4	24	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.17	.90	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-10	14	48	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.85	.98	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-16	9	47	51	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.83	.91	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-10	14	49	52	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.04	.88	.93	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	2	22	49	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.08	.83	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.19	-	-	-	-	-	-	-	-	-	F.DAYS
	23	37	53	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	.41	.91	.18	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.96	.55	-	-	-	-	-	-	-	-	-	F.DAYS
	41	51	58	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.54	.87	.94	.54	-	-	-	-	-	-	-	-	-	REL.
22	.99	.98	.82	.32	-	-	-	-	-	-	-	-	-	F.DAYS
	49	53	59	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.94	.82	.31	-	-	-	-	-	-	-	-	-	REL.
24	.99	.95	.59	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.92	.59	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.004
800 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
52.80N - 0.00W 60.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.92	.43	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.43	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.82	.19	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.18	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.67	.08	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.59	.07	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.96	.36	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.88	.35	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.96	.59	-	-	-	-	-	-	-	-	-	F.DAYS
	43	55	62	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.97	.96	.58	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.81	-	-	-	-	-	-	-	-	-	F.DAYS
	38	53	61	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.43	.96	.98	.80	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.72	-	-	-	-	-	-	-	-	-	F.DAYS
	44	56	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.70	.98	.98	.71	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.67	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.98	.66	-	-	-	-	-	-	-	-	-	-	REL.
18	.93	.55	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.54	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.73	.18	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.68	.17	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.73	.17	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.17	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.88	.38	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.38	-	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.004
800 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
52.80N - 0.00W 60.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.78	.15	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	61	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.97	.78	.15	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.78	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	40	53	60	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.95	.77	.14	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.32	-	-	-	-	-	-	-	-	-	F.DAYS
	15	32	55	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.07	.32	.97	.32	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-14	11	47	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.04	.90	.96	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-35	-3	27	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.95	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-44	-9	23	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.10	.94	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-35	-3	44	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.72	.96	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-16	8	45	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.71	.92	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.64	-	-	-	-	-	-	-	-	-	F.DAYS
	11	29	51	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.20	.87	.62	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.98	.71	-	-	-	-	-	-	-	-	-	F.DAYS
	36	49	56	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.39	.82	.94	.70	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.94	.56	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	58	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.95	.93	.56	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.88	.32	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	59	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.96	.87	.31	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.004
800 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
52.80N - 0.00W 60.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.86	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.85	.13	-	-	-	-	-	-	-	-	-	-	REL.
4	.98	.74	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.86	.71	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.96	.41	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.39	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.98	.65	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	59	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.92	.96	.65	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.80	.12	-	-	-	-	-	-	-	F.DAYS
	37	53	61	66	71	73	-	-	-	-	-	-	-	S/N..DB
	.40	.96	.99	.99	.79	.12	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.93	.41	-	-	-	-	-	-	-	F.DAYS
	30	44	59	65	71	73	-	-	-	-	-	-	-	S/N..DB
	.21	.70	.99	.99	.92	.41	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.90	.25	-	-	-	-	-	-	-	F.DAYS
	37	53	61	67	72	73	-	-	-	-	-	-	-	S/N..DB
	.38	.96	.99	.99	.89	.25	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.98	.53	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	67	70	-	-	-	-	-	-	-	-	S/N..DB
	.92	.98	.99	.97	.53	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.96	.48	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.98	.95	.47	-	-	-	-	-	-	-	-	-	REL.
20	.99	.95	.26	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.94	.26	-	-	-	-	-	-	-	-	-	-	REL.
22	.98	.74	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.73	.06	-	-	-	-	-	-	-	-	-	-	REL.
24	.98	.79	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.78	.10	-	-	-	-	-	-	-	-	-	-	REL.

Figure I-15

ARCHIVES U.I.T. GENÈVE

1 JUN SSN= 20 18.005
1000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
51.01N - 0.00W 60.00N - 0.00W 0.0 180.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1VKW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.62	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.97	.61	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.65	-	-	-	-	-	-	-	-	-	-	F.DAYS
	42	54	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.68	.96	.65	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.08	-	-	-	-	-	-	-	-	-	F.DAYS
	19	35	55	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.11	.38	.97	.08	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-6	17	37	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.09	.44	.97	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-25	2	30	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.23	.96	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-33	-2	27	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.95	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-25	2	30	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.27	.97	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-9	15	46	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.74	.92	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.61	-	-	-	-	-	-	-	-	-	F.DAYS
	15	31	51	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.02	.24	.87	.59	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.85	-	-	-	-	-	-	-	-	-	F.DAYS
	38	50	56	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.44	.85	.96	.84	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.92	.64	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	57	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.92	.91	.63	-	-	-	-	-	-	-	-	-	REL.
24	.99	.98	.79	.22	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	58	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.82	.93	.78	.22	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.005
1000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
51.01N - 0.00W 60.00N - 0.00W 0.0 180.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1VKW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.97	.72	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.70	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.94	.50	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.77	.47	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.90	.29	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.74	.28	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.73	.16	-	-	-	-	-	-	-	-	-	F.DAYS
	46	52	58	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.88	.71	.16	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.88	-	-	-	-	-	-	-	-	-	F.DAYS
	37	48	60	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.86	.99	.88	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.96	.21	-	-	-	-	-	-	-	-	F.DAYS
	31	44	58	64	70	-	-	-	-	-	-	-	-	S/N..DB
	.23	.70	.99	.95	.20	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.94	.11	-	-	-	-	-	-	-	-	F.DAYS
	38	48	60	66	71	-	-	-	-	-	-	-	-	S/N..DB
	.42	.86	.99	.94	.11	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.93	.31	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.96	.92	.31	-	-	-	-	-	-	-	-	-	REL.
18	.97	.78	.16	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.86	.76	.16	-	-	-	-	-	-	-	-	-	-	REL.
20	.88	.42	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.41	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.88	.40	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.82	.39	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.95	.63	.05	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.62	.05	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.005
1000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
51.01N - 0.00W 60.00N - 0.00W 0.0 180.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1VKW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.90	.46	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	61	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.97	.90	.46	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.90	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	36	52	59	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.93	.90	.45	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	6	25	52	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.02	.19	.94	.99	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-29	-0	28	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.25	.94	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-55	-18	19	51	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.05	.91	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-65	-25	16	49	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.03	.87	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-55	-18	19	51	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.09	.92	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-31	-2	25	51	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.13	.86	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.08	-	-	-	-	-	-	-	-	F.DAYS
	2	21	48	56	62	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.80	.94	.08	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.90	.12	-	-	-	-	-	-	-	-	F.DAYS
	32	48	55	60	64	-	-	-	-	-	-	-	-	S/N..DB
	.30	.80	.95	.89	.12	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.98	.80	-	-	-	-	-	-	-	-	-	F.DAYS
	47	51	57	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.82	.92	.97	.79	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.95	.65	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	58	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.82	.94	.95	.64	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.005
1000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
51.01N - 0.00W 60.00N - 0.00W 0.0 180.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1VKW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.95	.35	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.93	.35	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.89	.18	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.82	.85	.18	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.73	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.82	.69	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.91	.14	-	-	-	-	-	-	-	-	F.DAYS
	46	52	58	62	65	-	-	-	-	-	-	-	-	S/N..DB
	.72	.88	.97	.90	.14	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.95	.52	-	-	-	-	-	-	-	F.DAYS
	29	42	58	64	70	72	-	-	-	-	-	-	-	S/N..DB
	.19	.61	.99	.99	.95	.51	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.98	.76	.10	-	-	-	-	-	-	F.DAYS
	21	37	56	63	69	72	74	-	-	-	-	-	-	S/N..DB
	.06	.40	.98	.99	.98	.76	.10	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.97	.71	-	-	-	-	-	-	-	F.DAYS
	30	43	59	65	71	73	-	-	-	-	-	-	-	S/N..DB
	.16	.66	.99	.99	.97	.70	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.82	.06	-	-	-	-	-	-	-	F.DAYS
	47	56	62	66	70	71	-	-	-	-	-	-	-	S/N..DB
	.79	.96	.99	.99	.82	.06	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.82	.07	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	66	69	-	-	-	-	-	-	-	-	S/N..DB
	.87	.96	.99	.82	.07	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.56	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	60	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.97	.56	.06	-	-	-	-	-	-	-	-	-	REL.
22	.99	.89	.22	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.87	.22	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.90	.26	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.89	.26	-	-	-	-	-	-	-	-	-	-	REL.

Figure 1-16

1 JUN SSN= 20 18.011
2000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
42.01N - 0.00W 60.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.93	.06	-	-	-	-	-	-	-	-	F.DAYS
	41	48	55	60	65	-	-	-	-	-	-	-	-	S/N..DB
	.55	.85	.98	.92	.06	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.94	.08	-	-	-	-	-	-	-	-	F.DAYS
	34	44	55	60	65	-	-	-	-	-	-	-	-	S/N..DB
	.35	.70	.98	.94	.08	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.39	-	-	-	-	-	-	-	-	F.DAYS
	0	19	37	49	62	-	-	-	-	-	-	-	-	S/N..DB
	.00	.09	.44	.89	.39	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-38	-8	20	37	57	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.08	.42	.97	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.06	-	-	-	-	-	-	-	F.DAYS
	-69	-30	7	29	55	61	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.17	.97	.05	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-81	-38	2	27	54	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.13	.96	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-70	-30	6	30	54	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.23	.96	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-41	-11	21	34	55	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.07	.33	.95	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.88	.11	-	-	-	-	-	-	-	F.DAYS
	-2	16	34	46	59	63	-	-	-	-	-	-	-	S/N..DB
	.00	.03	.34	.75	.87	.11	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.98	.50	-	-	-	-	-	-	-	F.DAYS
	32	41	52	57	62	65	-	-	-	-	-	-	-	S/N..DB
	.29	.54	.92	.97	.97	.50	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.79	.16	-	-	-	-	-	-	-	F.DAYS
	38	44	51	56	63	66	-	-	-	-	-	-	-	S/N..DB
	.45	.71	.93	.98	.78	.16	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.94	.41	-	-	-	-	-	-	-	-	F.DAYS
	39	46	52	59	63	-	-	-	-	-	-	-	-	S/N..DB
	.47	.78	.95	.94	.40	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.011
2000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
42.01N - 0.00W 60.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.91	.43	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	56	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.60	.88	.90	.43	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.83	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.91	.82	.22	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.72	-	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.60	.88	.71	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.58	-	-	-	-	-	-	-	-	F.DAYS
	35	44	54	59	64	-	-	-	-	-	-	-	-	S/N..DB
	.34	.69	.96	.99	.57	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.72	-	-	-	-	-	-	-	F.DAYS
	15	30	45	54	64	68	-	-	-	-	-	-	-	S/N..DB
	.01	.18	.76	.96	.99	.72	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.87	-	-	-	-	-	-	-	F.DAYS
	5	23	40	51	63	67	-	-	-	-	-	-	-	S/N..DB
	.00	.06	.54	.92	.99	.86	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.75	-	-	-	-	-	-	-	F.DAYS
	14	30	44	54	64	68	-	-	-	-	-	-	-	S/N..DB
	.00	.15	.74	.97	.99	.74	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.77	-	-	-	-	-	-	-	-	F.DAYS
	36	45	55	60	65	-	-	-	-	-	-	-	-	S/N..DB
	.36	.73	.97	.99	.77	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.94	.59	-	-	-	-	-	-	-	-	-	F.DAYS
	41	48	55	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.54	.84	.91	.59	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.77	.21	-	-	-	-	-	-	-	-	-	F.DAYS
	41	48	55	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.54	.83	.75	.21	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.70	.13	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.91	.70	.13	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.85	.29	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.91	.85	.29	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.011
2000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
42.01N - 0.00W 60.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.97	.59	-	-	-	-	-	-	-	-	F.DAYS
	41	48	55	60	65	-	-	-	-	-	-	-	-	S/N..DB
	.55	.85	.98	.97	.59	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.97	.61	-	-	-	-	-	-	-	-	F.DAYS
	28	39	54	59	65	-	-	-	-	-	-	-	-	S/N..DB
	.22	.47	.97	.97	.60	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.28	-	-	-	-	-	-	-	F.DAYS
	-17	6	30	44	60	65	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.28	.71	.99	.27	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.39	-	-	-	-	-	-	-	F.DAYS
	-70	-31	6	29	55	61	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.22	.96	.39	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	F.DAYS
	-112	-61	-11	20	42	59	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.04	.61	.99	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	F.DAYS
	-128	-72	-18	18	40	58	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.02	.51	.99	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	F.DAYS
	-113	-61	-11	21	42	59	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.08	.61	.99	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.27	-	-	-	-	-	-	-	F.DAYS
	-73	-34	3	27	52	59	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.16	.90	.26	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.52	-	-	-	-	-	-	-	F.DAYS
	-20	3	27	41	57	62	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.17	.55	.96	.52	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.99	.61	-	-	-	-	-	-	-	F.DAYS
	26	36	51	56	62	65	-	-	-	-	-	-	-	S/N..DB
	.17	.39	.90	.96	.98	.61	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.91	.36	-	-	-	-	-	-	-	F.DAYS
	39	44	51	57	63	66	-	-	-	-	-	-	-	S/N..DB
	.48	.71	.93	.99	.91	.35	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.81	.09	-	-	-	-	-	-	-	F.DAYS
	40	47	53	59	63	65	-	-	-	-	-	-	-	S/N..DB
	.49	.81	.96	.99	.80	.09	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.011
2000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
42.01N - 0.00W 60.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.98	.72	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	56	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.91	.97	.72	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.96	.54	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.91	.95	.54	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.95	.30	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.91	.94	.29	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.80	.06	-	-	-	-	-	-	F.DAYS
	30	40	53	58	63	66	68	-	-	-	-	-	-	S/N..DB
	.21	.50	.95	.98	.99	.80	.06	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.98	.97	.87	.79	.67	.54	.24	F.DAYS
	1	20	39	50	62	67	70	70	71	72	71	72	72	S/N..DB
	.00	.03	.49	.90	.99	.99	.98	.96	.87	.78	.67	.53	.24	REL.
12	.99	.99	.99	.99	.99	.99	.99	.99	.95	.91	.85	.76	.52	F.DAYS
	-11	11	33	46	61	66	70	70	70	71	71	72	72	S/N..DB
	.00	.00	.29	.78	.99	.99	.99	.99	.95	.91	.85	.76	.52	REL.
14	.99	.99	.99	.99	.99	.99	.98	.96	.89	.82	.75	.65	.39	F.DAYS
	1	20	39	50	63	67	70	70	71	72	71	72	72	S/N..DB
	.00	.02	.49	.92	.99	.99	.97	.95	.88	.82	.74	.65	.39	REL.
16	.99	.99	.99	.99	.99	.99	.79	.69	.40	.20	.08	-	-	F.DAYS
	31	41	54	59	65	68	70	70	70	71	71	-	-	S/N..DB
	.21	.55	.96	.99	.99	.99	.78	.69	.40	.20	.08	-	-	REL.
18	.99	.99	.99	.99	.99	.48	-	-	-	-	-	-	-	F.DAYS
	41	48	55	61	.66	68	-	-	-	-	-	-	-	S/N..DB
	.54	.84	.97	.99	.98	.48	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.22	-	-	-	-	-	-	-	-	F.DAYS
	41	48	55	60	65	-	-	-	-	-	-	-	-	S/N..DB
	.54	.84	.97	.98	.22	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.68	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.91	.98	.68	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.98	.60	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.91	.98	.60	-	-	-	-	-	-	-	-	-	REL.

Figure I-17

1 JUN SSN= 20 18.016
3000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
33.02N - 0.00W 60.00N - 0.00W 0.0 180.0 1618.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.48	-	-	-	-	-	-	-	-	F.DAYS
	27	41	49	55	61	-	-	-	-	-	-	-	-	S/N..DB
	.13	.55	.89	.97	.47	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.52	-	-	-	-	-	-	-	-	F.DAYS
	26	34	48	54	59	-	-	-	-	-	-	-	-	S/N..DB
	.17	.34	.85	.95	.51	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.92	.28	-	-	-	-	-	-	-	F.DAYS
	-43	-13	16	38	54	59	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.05	.45	.89	.28	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.42	.74	-	-	-	-	-	-	-	F.DAYS
	-121	-68	-18	13	42	55	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.01	.25	.71	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.69	-	-	-	-	-	-	-	F.DAYS
	-181	-110	-42	4	38	55	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.43	.67	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.58	-	-	-	-	-	-	-	F.DAYS
	-205	-127	-52	2	37	54	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.40	.56	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.50	-	-	-	-	-	-	-	F.DAYS
	-183	-112	-43	5	38	54	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.45	.49	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.10	.49	-	-	-	-	-	-	-	F.DAYS
	-120	-66	0	29	44	58	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.18	.07	.48	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.84	.08	-	-	-	-	-	-	F.DAYS
	-41	-11	18	40	56	61	65	-	-	-	-	-	-	S/N..DB
	.00	.00	.03	.51	.98	.83	.08	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.99	.96	.36	.24	.06	-	-	-	-	F.DAYS
	25	33	47	53	58	61	63	63	64	-	-	-	-	S/N..DB
	.13	.30	.81	.93	.98	.95	.36	.24	.06	-	-	-	-	REL.
22	.99	.99	.99	.99	.95	.67	.05	-	-	-	-	-	-	F.DAYS
	25	39	46	52	59	62	65	-	-	-	-	-	-	S/N..DB
	.15	.47	.81	.96	.94	.67	.05	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.81	.20	-	-	-	-	-	-	-	F.DAYS
	26	41	48	54	60	63	-	-	-	-	-	-	-	S/N..DB
	.17	.55	.89	.95	.80	.19	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.016
3000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
33.02N - 0.00W 60.00N - 0.00W 0.0 180.0 1618.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.91	.17	-	-	-	-	-	-	-	-	F.DAYS
	28	43	50	56	62	-	-	-	-	-	-	-	-	S/N..DB
	.15	.66	.93	.89	.17	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.83	.07	-	-	-	-	-	-	-	-	F.DAYS
	27	42	50	55	61	-	-	-	-	-	-	-	-	S/N..DB
	.11	.60	.91	.81	.07	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.73	-	-	-	-	-	-	-	-	-	F.DAYS
	26	42	49	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	.60	.89	.71	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.98	.57	-	-	-	-	-	-	-	F.DAYS
	11	30	46	50	57	62	-	-	-	-	-	-	-	S/N..DB
	.02	.24	.80	.90	.97	.57	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.98	.49	.32	.08	-	-	-	-	F.DAYS
	-37	-7	20	39	51	57	64	64	65	-	-	-	-	S/N..DB
	.00	.00	.06	.47	.93	.98	.49	.32	.08	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	.63	.50	.18	.08	-	-	-	F.DAYS
	-56	-21	11	36	53	58	64	64	65	66	-	-	-	S/N..DB
	.00	.00	.01	.38	.95	.99	.63	.50	.17	.08	-	-	-	REL.
14	.99	.99	.99	.99	.99	.98	.51	.34	.09	-	-	-	-	F.DAYS
	-36	-7	20	40	55	59	65	65	65	-	-	-	-	S/N..DB
	.00	.00	.03	.52	.98	.97	.50	.34	.08	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.69	-	-	-	-	-	-	-	F.DAYS
	12	31	48	52	58	63	-	-	-	-	-	-	-	S/N..DB
	.00	.19	.87	.94	.99	.69	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.93	.35	-	-	-	-	-	-	-	-	F.DAYS
	27	42	50	55	61	-	-	-	-	-	-	-	-	S/N..DB
	.10	.60	.91	.91	.35	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.98	.82	.11	-	-	-	-	-	-	-	-	F.DAYS
	27	42	50	56	61	-	-	-	-	-	-	-	-	S/N..DB
	.10	.61	.91	.81	.11	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.98	.72	-	-	-	-	-	-	-	-	-	F.DAYS
	26	41	49	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.12	.55	.88	.71	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.82	.09	-	-	-	-	-	-	-	-	F.DAYS
	26	41	49	55	60	-	-	-	-	-	-	-	-	S/N..DB
	.12	.55	.89	.81	.09	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.016
3000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
33.02N - 0.00W 60.00N - 0.00W 0.0 180.0 1618.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.91	.51	-	-	-	-	-	-	-	F.DAYS
	27	42	50	55	60	63	-	-	-	-	-	-	-	S/N..DB
	.13	.60	.91	.97	.91	.50	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.92	.53	-	-	-	-	-	-	-	F.DAYS
	24	32	47	53	59	62	-	-	-	-	-	-	-	S/N..DB
	.13	.29	.82	.94	.91	.52	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.96	.76	.28	.22	.11	.08	-	-	-	F.DAYS
	-75	-35	8	33	53	58	62	62	63	64	-	-	-	S/N..DB
	.00	.00	.01	.32	.91	.75	.28	.22	.11	.08	-	-	-	REL.
8	.99	.99	.99	.99	.99	.84	.42	.35	.22	.16	.12	.08	-	F.DAYS
	-186	-110	-43	3	37	53	59	59	60	62	62	63	-	S/N..DB
	.00	.00	.00	.00	.40	.80	.42	.35	.21	.16	.12	.08	-	REL.
10	.99	.99	.99	.99	.99	.13	.38	.30	.16	.11	.07	-	-	F.DAYS
	-262	-168	-77	-8	32	45	59	59	61	62	62	-	-	S/N..DB
	.00	.00	.00	.00	.25	.10	.38	.30	.16	.11	.07	-	-	REL.
12	.99	.99	.99	.99	.99	.12	.36	.28	.14	.10	.06	-	-	F.DAYS
	-294	-190	-91	-12	29	43	58	59	60	61	62	-	-	S/N..DB
	.00	.00	.00	.00	.17	.08	.36	.28	.14	.10	.06	-	-	REL.
14	.99	.99	.99	.99	.99	-	.27	.18	.06	-	-	-	-	F.DAYS
	-264	-169	-78	-8	31	-	58	58	60	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.26	-	.27	.18	.06	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.88	.27	.18	.06	-	-	-	-	F.DAYS
	-179	-108	-41	7	40	56	62	62	63	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.51	.86	.27	.18	.06	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.97	.47	.36	.16	.09	-	-	-	F.DAYS
	-72	-33	10	35	55	60	64	64	65	66	-	-	-	S/N..DB
	.00	.00	.00	.34	.97	.97	.47	.36	.15	.09	-	-	-	REL.
20	.99	.99	.99	.99	.99	.98	.51	.39	.18	.11	.06	-	-	F.DAYS
	22	31	46	52	58	61	64	63	64	65	64	-	-	S/N..DB
	.09	.25	.78	.92	.98	.97	.50	.39	.18	.11	.06	-	-	REL.
22	.99	.99	.99	.99	.99	.88	.24	.14	-	-	-	-	-	F.DAYS
	25	39	47	53	60	63	65	65	-	-	-	-	-	S/N..DB
	.15	.47	.84	.97	.99	.87	.24	.13	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.98	.76	.05	-	-	-	-	-	-	F.DAYS
	27	41	48	55	60	63	65	-	-	-	-	-	-	S/N..DB
	.19	.55	.89	.97	.97	.75	.05	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.016
3000 KM PATH TO 60 DEGREES N AZIMUTHS N.MILES
33.02N - 0.00W 60.00N - 0.00W 0.0 180.0 1618.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.97	.40	-	-	-	-	-	-	-	-	F.DAYS
	29	43	51	56	62	-	-	-	-	-	-	-	-	S/N..DB
	.17	.66	.94	.96	.40	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.93	.17	-	-	-	-	-	-	-	-	F.DAYS
	28	42	50	56	61	-	-	-	-	-	-	-	-	S/N..DB
	.13	.60	.91	.92	.17	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.95	.08	-	-	-	-	-	-	-	-	F.DAYS
	27	42	50	56	61	-	-	-	-	-	-	-	-	S/N..DB
	.11	.60	.91	.94	.08	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.81	.72	.48	.36	.24	.16	-	F.DAYS
	-3	25	37	51	57	61	64	64	65	66	66	66	-	S/N..DB
	.00	.14	.43	.92	.98	.99	.81	.72	.48	.35	.24	.15	-	REL.
10	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.97	.91	F.DAYS
	-67	-29	8	34	54	57	62	62	63	64	65	66	66	S/N..DB
	.00	.00	.00	.32	.96	.99	.99	.99	.99	.99	.98	.97	.90	REL.
12	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.98	.94	F.DAYS
	-94	-48	2	30	53	58	62	62	63	64	65	66	66	S/N..DB
	.00	.00	.00	.22	.95	.99	.99	.99	.99	.99	.99	.98	.93	REL.
14	.99	.99	.99	.99	.99	.99	.99	.99	.99	.98	.96	.94	.86	F.DAYS
	-67	-29	9	35	54	59	63	63	64	66	66	67	67	S/N..DB
	.00	.00	.00	.32	.97	.99	.99	.99	.98	.97	.96	.93	.86	REL.
16	.99	.99	.99	.99	.99	.99	.99	.97	.92	.88	.82	.74	.54	F.DAYS
	-2	16	38	51	58	61	64	64	65	66	66	67	67	S/N..DB
	.00	.01	.45	.92	.99	.99	.98	.97	.92	.87	.81	.73	.54	REL.
18	.99	.99	.99	.99	.99	.98	.45	.35	.16	.10	.06	-	-	F.DAYS
	27	42	50	55	61	63	66	66	67	67	67	-	-	S/N..DB
	.10	.60	.91	.97	.99	.98	.45	.34	.16	.10	.06	-	-	REL.
20	.99	.99	.99	.99	.96	.30	-	-	-	-	-	-	-	F.DAYS
	28	42	50	56	61	64	-	-	-	-	-	-	-	S/N..DB
	.12	.61	.92	.98	.95	.30	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.44	-	-	-	-	-	-	-	-	F.DAYS
	27	41	49	55	60	-	-	-	-	-	-	-	-	S/N..DB
	.14	.55	.90	.97	.44	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.98	.27	-	-	-	-	-	-	-	-	F.DAYS
	27	41	49	55	60	-	-	-	-	-	-	-	-	S/N..DB
	.14	.55	.90	.96	.26	-	-	-	-	-	-	-	-	REL.

Figure 1-18

1 JUN SSN= 20 18.001
200 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
78.20N - 0.00W 80.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.95	.45	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.44	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.96	.53	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.86	.51	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.62	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.56	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.72	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	50	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.63	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.69	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	47	49	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.80	.60	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.59	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	49	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.76	.51	-	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.63	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	47	49	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.55	-	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.66	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	49	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.56	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.94	.54	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	47	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.74	.48	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.93	.48	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	52	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.77	.43	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.86	.47	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.75	.44	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.86	.45	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.77	.42	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.001
200 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
78.20N - 0.00W 80.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.56	.10	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.54	.09	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.28	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.23	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.23	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.19	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.25	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.20	-	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.44	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.43	-	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.58	.09	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.57	.09	-	-	-	-	-	-	-	-	-	-	-	REL.
14	.53	.07	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.53	.07	-	-	-	-	-	-	-	-	-	-	-	REL.
16	.52	.07	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.51	.07	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.63	.18	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.18	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.70	.25	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.68	.24	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.66	.26	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.64	.26	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.63	.23	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.62	.23	-	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.001
200 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
78.20N - 0.00W 80.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.95	.62	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	52	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.59	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.67	.05	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	50	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.60	.05	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.82	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	48	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.77	.69	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.84	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	43	47	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.63	.66	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.74	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	40	45	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.54	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.80	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	44	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.47	.55	-	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.78	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	45	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.55	.58	.05	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.83	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	42	45	50	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.58	.59	.07	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.79	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	45	47	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.71	.62	.08	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.75	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	49	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.80	.62	.06	-	-	-	-	-	-	-	-	-	-	REL.
22	.95	.68	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	47	50	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.75	.59	.07	-	-	-	-	-	-	-	-	-	-	REL.
24	.95	.65	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	47	57	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.75	.56	.06	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.001
200 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
78.20N - 0.00W 80.00N - 0.00W 0.0 180.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.97	.80	.19	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	57	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.78	.18	-	-	-	-	-	-	-	-	-	-	REL.
4	.93	.64	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.77	.55	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.87	.39	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.34	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.83	.34	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.67	.28	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.91	.61	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.61	.13	-	-	-	-	-	-	-	-	-	-	REL.
12	.94	.73	.23	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.72	.23	-	-	-	-	-	-	-	-	-	-	REL.
14	.90	.64	.15	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.64	.15	-	-	-	-	-	-	-	-	-	-	REL.
16	.88	.58	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.86	.57	.10	-	-	-	-	-	-	-	-	-	-	REL.
18	.95	.64	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	57	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.63	.14	-	-	-	-	-	-	-	-	-	-	REL.
20	.97	.75	.21	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.74	.21	-	-	-	-	-	-	-	-	-	-	REL.
22	.93	.75	.26	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.74	.26	-	-	-	-	-	-	-	-	-	-	REL.
24	.93	.75	.27	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.74	.26	-	-	-	-	-	-	-	-	-	-	REL.

Figure I-19

1 JUN SSN= 20 18.003
500 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
75.50N - 0.00W 80.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1UKW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB

OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.82	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.80	.08	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.12	-	-	-	-	-	-	-	-	-	-	F.DAYS
	43	53	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.64	.94	.12	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	38	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.45	.91	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	32	49	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.34	.84	.08	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	28	47	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.19	.80	.08	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	27	46	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.17	.76	.06	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	28	47	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.21	.81	.13	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.15	-	-	-	-	-	-	-	-	-	-	F.DAYS
	31	47	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.24	.78	.15	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	36	50	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.37	.87	.13	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	51	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.54	.88	.10	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.74	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	53	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.75	.69	.12	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.73	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	47	53	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.78	.68	.10	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.003
500 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
75.50N - 0.00W 80.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1UKW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB

OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.72	.25	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.67	.24	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.47	.05	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.36	.04	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.36	.05	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.28	.04	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.43	.08	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	52	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.33	.07	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.78	.26	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.77	.26	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.88	.43	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.86	.43	-	-	-	-	-	-	-	-	-	-	-	REL.
14	.81	.36	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.36	-	-	-	-	-	-	-	-	-	-	-	REL.
16	.77	.29	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.73	.28	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.79	.37	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.75	.36	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.82	.41	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.40	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.77	.41	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.73	.40	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.76	.39	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.38	-	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.003
500 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
75.50N - 0.00W 80.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1UKW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB

OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.20	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	52	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.55	.94	.20	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.24	-	-	-	-	-	-	-	-	-	-	F.DAYS
	36	49	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.87	.23	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.20	-	-	-	-	-	-	-	-	-	-	F.DAYS
	29	47	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.25	.81	.19	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.23	-	-	-	-	-	-	-	-	-	-	F.DAYS
	22	44	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.17	.67	.22	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	16	34	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.04	.33	.08	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	14	33	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.03	.30	.92	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.27	-	-	-	-	-	-	-	-	-	-	F.DAYS
	16	34	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.05	.34	.26	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.35	-	-	-	-	-	-	-	-	-	-	F.DAYS
	20	42	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.06	.59	.33	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.37	-	-	-	-	-	-	-	-	-	-	F.DAYS
	28	46	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.18	.75	.36	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.31	-	-	-	-	-	-	-	-	-	-	F.DAYS
	34	48	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.37	.80	.30	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.27	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	50	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.47	.87	.26	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.23	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	51	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.67	.89	.23	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.003
500 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
75.50N - 0.00W 80.00N - 0.00W 0.0 180.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1UKW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB

OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.98	.89	.40	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	57	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.87	.40	-	-	-	-	-	-	-	-	-	-	REL.
4	.96	.78	.17	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	52	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.75	.69	.16	-	-	-	-	-	-	-	-	-	-	REL.
6	.93	.54	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	50	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.45	.08	-	-	-	-	-	-	-	-	-	-	REL.
8	.93	.56	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	51	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.71	.46	.08	-	-	-	-	-	-	-	-	-	-	REL.
10	.97	.84	.38	.08	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.83	.38	.07	-	-	-	-	-	-	-	-	-	REL.
12	.98	.91	.54	.18	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.90	.53	.17	-	-	-	-	-	-	-	-	-	REL.
14	.96	.85	.45	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	57	61	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.85	.45	.10	-	-	-	-	-	-	-	-	-	REL.
16	.94	.79	.32	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.78	.32	-	-	-	-	-	-	-	-	-	-	REL.
18	.98	.83	.30	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.82	.30	-	-	-	-	-	-	-	-	-	-	REL.
20	.98	.86	.34	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	54	57	60	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.85	.34	.06	-	-	-	-	-	-	-	-	-	REL.
22	.95	.83	.41	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	54	57	60	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.81	.40	.06	-	-	-	-	-	-	-	-	-	REL.
24	.95	.84	.43	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	53	57	60	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.82	.43	.07	-	-	-	-	-	-	-	-	-	REL.

Figure I-20

1 JUN SSN= 20 18.004
800 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
72.80N - 0.00W 80.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.45	-	-	-	-	-	-	-	-	-	-	F.DAYS
	38	53	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.45	.95	.44	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.51	-	-	-	-	-	-	-	-	-	-	F.DAYS
	32	50	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	.89	.51	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	23	38	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.15	.45	.98	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	15	32	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	.34	.95	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	8	27	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.17	.95	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	6	26	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.15	.93	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	9	28	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.21	.96	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	14	31	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.02	.24	.93	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	22	37	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	.41	.96	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.55	-	-	-	-	-	-	-	-	-	-	F.DAYS
	30	48	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.30	.80	.53	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.52	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	36	51	58	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.89	.51	.06	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.47	-	-	-	-	-	-	-	-	-	-	F.DAYS
	38	51	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.45	.89	.46	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.004
800 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
72.80N - 0.00W 80.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.85	.50	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.77	.49	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.68	.20	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.17	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.56	.16	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.14	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.70	.26	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.22	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.95	.69	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.68	.10	-	-	-	-	-	-	-	-	-	-	REL.
12	.98	.84	.26	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.83	.26	-	-	-	-	-	-	-	-	-	-	REL.
14	.95	.75	.19	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.74	.19	-	-	-	-	-	-	-	-	-	-	REL.
16	.92	.63	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.62	.09	-	-	-	-	-	-	-	-	-	-	REL.
18	.91	.62	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.61	.12	-	-	-	-	-	-	-	-	-	-	REL.
20	.91	.63	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.62	.13	-	-	-	-	-	-	-	-	-	-	REL.
22	.86	.60	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.59	.14	-	-	-	-	-	-	-	-	-	-	REL.
24	.86	.59	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.78	.58	.14	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.004
800 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
72.80N - 0.00W 80.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	30	50	58	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.27	.90	.99	.07	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.09	-	-	-	-	-	-	-	-	-	F.DAYS
	22	37	56	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.13	.42	.98	.09	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	11	29	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.03	.25	.95	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-0	21	51	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.16	.91	.96	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-9	14	49	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.03	.88	.94	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-12	12	49	52	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.88	.93	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-9	15	49	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.04	.89	.99	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-1	20	50	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.06	.88	.97	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.19	-	-	-	-	-	-	-	-	-	F.DAYS
	10	28	52	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.18	.92	.18	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.15	-	-	-	-	-	-	-	-	-	F.DAYS
	20	35	54	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.14	.39	.94	.14	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.13	-	-	-	-	-	-	-	-	-	F.DAYS
	28	48	56	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.24	.82	.97	.13	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.56	.10	-	-	-	-	-	-	-	-	-	F.DAYS
	31	49	56	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.30	.84	.54	.10	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.004
800 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
72.80N - 0.00W 80.00N - 0.00W 0.0 180.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.95	.66	.16	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	61	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.93	.66	.16	-	-	-	-	-	-	-	-	-	REL.
4	.98	.90	.44	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.70	.77	.41	-	-	-	-	-	-	-	-	-	-	REL.
6	.97	.77	.21	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.70	.66	.20	-	-	-	-	-	-	-	-	-	-	REL.
8	.98	.84	.29	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.70	.27	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.95	.73	.35	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.95	.72	.34	-	-	-	-	-	-	-	-	-	REL.
12	.99	.97	.85	.53	.08	-	-	-	-	-	-	-	-	F.DAYS
	54	59	65	68	72	-	-	-	-	-	-	-	-	S/N..DB
	.96	.97	.84	.52	.08	-	-	-	-	-	-	-	-	REL.
14	.99	.95	.78	.44	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.95	.78	.44	-	-	-	-	-	-	-	-	-	REL.
16	.98	.92	.65	.27	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.91	.65	.27	-	-	-	-	-	-	-	-	-	REL.
18	.99	.95	.55	.18	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.93	.54	.18	-	-	-	-	-	-	-	-	-	REL.
20	.99	.94	.53	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.93	.53	.17	-	-	-	-	-	-	-	-	-	REL.
22	.97	.90	.60	.20	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.88	.60	.20	-	-	-	-	-	-	-	-	-	REL.
24	.97	.90	.63	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	61	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.89	.62	.23	-	-	-	-	-	-	-	-	-	REL.

Figure I-21

1 JUN SSN= 20 18.005
1000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
71.01N - 0.00W 80.00N - 0.00W 0.0 180.0 539.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.13	-	-	-	-	-	-	-	-	-	F.DAYS
	33	51	58	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.34	.92	.99	.13	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	26	39	56	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.19	.47	.98	.16	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	15	32	54	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.06	.31	.96	.06	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	5	24	52	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.03	.20	.92	.98	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-3	19	50	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.06	.90	.98	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-6	18	49	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.05	.88	.98	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-2	20	50	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.09	.91	.99	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	3	23	50	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.09	.88	.97	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	14	31	53	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.02	.24	.93	.23	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.21	-	-	-	-	-	-	-	-	-	F.DAYS
	24	37	54	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.20	.43	.94	.21	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	31	43	56	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.30	.63	.97	.23	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.67	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	34	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.36	.87	.66	.17	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.005
1000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
71.01N - 0.00W 80.00N - 0.00W 0.0 180.0 539.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.90	.64	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.78	.62	.11	-	-	-	-	-	-	-	-	-	-	REL.
4	.76	.35	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.51	.29	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.69	.26	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.45	.21	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.83	.41	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.53	.33	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.98	.86	.31	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.86	.31	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.94	.54	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.93	.54	.11	-	-	-	-	-	-	-	-	-	REL.
14	.98	.88	.44	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.88	.44	.06	-	-	-	-	-	-	-	-	-	REL.
16	.96	.79	.25	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.77	.25	-	-	-	-	-	-	-	-	-	-	REL.
18	.95	.75	.25	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.73	.24	-	-	-	-	-	-	-	-	-	-	REL.
20	.94	.74	.23	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.72	.23	-	-	-	-	-	-	-	-	-	-	REL.
22	.90	.70	.24	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.80	.67	.24	-	-	-	-	-	-	-	-	-	-	REL.
24	.90	.70	.25	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.80	.68	.25	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.005
1000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
71.01N - 0.00W 80.00N - 0.00W 0.0 180.0 539.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	25	39	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.18	.47	.98	.23	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.25	-	-	-	-	-	-	-	-	-	F.DAYS
	14	31	54	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.05	.29	.96	.25	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	0	21	51	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.92	.99	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-13	15	48	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.10	.84	.97	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-24	3	30	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.25	.96	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-29	0	28	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.21	.96	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-24	3	30	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.27	.98	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-14	13	47	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.81	.96	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-0	20	50	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.06	.88	.97	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.39	-	-	-	-	-	-	-	-	-	F.DAYS
	13	29	52	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.07	.28	.91	.38	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.32	-	-	-	-	-	-	-	-	-	F.DAYS
	23	37	54	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.16	.43	.95	.32	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.26	-	-	-	-	-	-	-	-	-	F.DAYS
	26	47	55	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.21	.79	.96	.26	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.005
1000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
71.01N - 0.00W 80.00N - 0.00W 0.0 180.0 539.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.97	.78	.33	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	60	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.94	.78	.33	-	-	-	-	-	-	-	-	-	REL.
4	.99	.94	.61	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	55	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.64	.78	.57	.11	-	-	-	-	-	-	-	-	-	REL.
6	.99	.87	.33	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.64	.72	.30	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.93	.46	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	55	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.63	.76	.43	.11	-	-	-	-	-	-	-	-	-	REL.
10	.99	.98	.87	.57	.10	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	67	71	-	-	-	-	-	-	-	-	S/N..DB
	.93	.97	.86	.57	.10	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.93	.76	.24	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	68	71	-	-	-	-	-	-	-	-	S/N..DB
	.93	.98	.93	.75	.24	-	-	-	-	-	-	-	-	REL.
14	.99	.98	.89	.67	.16	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	71	-	-	-	-	-	-	-	-	S/N..DB
	.94	.97	.89	.67	.16	-	-	-	-	-	-	-	-	REL.
16	.99	.96	.80	.48	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.93	.80	.47	-	-	-	-	-	-	-	-	-	REL.
18	.99	.98	.74	.32	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.95	.74	.32	-	-	-	-	-	-	-	-	-	REL.
20	.99	.97	.69	.28	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	61	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.94	.69	.28	-	-	-	-	-	-	-	-	-	REL.
22	.98	.93	.70	.32	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	61	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.90	.69	.32	-	-	-	-	-	-	-	-	-	REL.
24	.98	.93	.73	.36	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	61	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.90	.72	.36	-	-	-	-	-	-	-	-	-	REL.

Figure 1-22

1 JUN SSN= 20 18.011
2000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
62.01N - 0.00W 80.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.13	-	-	-	-	-	-	-	-	F.DAYS
	22	34	45	55	61	-	-	-	-	-	-	-	-	S/N..DB
	.21	.39	.75	.96	.13	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.16	-	-	-	-	-	-	-	-	F.DAYS
	10	26	40	54	61	-	-	-	-	-	-	-	-	S/N..DB
	.09	.27	.53	.95	.15	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.08	-	-	-	-	-	-	-	-	F.DAYS
	-7	12	32	44	59	-	-	-	-	-	-	-	-	S/N..DB
	.01	.11	.37	.70	.08	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-29	-3	23	37	55	-	-	-	-	-	-	-	-	S/N..DB
	.00	.05	.27	.46	.92	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-42	-12	21	34	55	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.18	.39	.95	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-48	-16	14	33	55	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.11	.37	.95	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-41	-11	21	35	56	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.15	.39	.97	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-28	-2	24	38	56	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.45	.96	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.42	-	-	-	-	-	-	-	-	F.DAYS
	-8	11	31	43	58	-	-	-	-	-	-	-	-	S/N..DB
	.00	.03	.29	.64	.41	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.45	-	-	-	-	-	-	-	-	F.DAYS
	7	22	37	50	57	-	-	-	-	-	-	-	-	S/N..DB
	.07	.21	.46	.85	.44	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.41	-	-	-	-	-	-	-	-	F.DAYS
	20	32	43	53	59	-	-	-	-	-	-	-	-	S/N..DB
	.16	.34	.65	.91	.40	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.86	.25	-	-	-	-	-	-	-	-	F.DAYS
	24	35	48	54	59	-	-	-	-	-	-	-	-	S/N..DB
	.21	.40	.82	.80	.25	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.011
2000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
62.01N - 0.00W 80.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.95	.62	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	38	45	52	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.45	.67	.57	.13	-	-	-	-	-	-	-	-	-	REL.
4	.99	.84	.26	-	-	-	-	-	-	-	-	-	-	F.DAYS
	28	35	42	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.21	.31	.15	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.74	.16	-	-	-	-	-	-	-	-	-	-	F.DAYS
	28	35	42	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.21	.27	.09	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.96	.54	.15	-	-	-	-	-	-	-	-	-	F.DAYS
	31	38	45	50	-	-	-	-	-	-	-	-	-	S/N..DB
	.35	.45	.37	.12	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.98	.82	.10	-	-	-	-	-	-	-	-	F.DAYS
	37	48	55	60	65	-	-	-	-	-	-	-	-	S/N..DB
	.44	.83	.95	.82	.10	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.95	.41	-	-	-	-	-	-	-	-	F.DAYS
	37	46	55	60	65	-	-	-	-	-	-	-	-	S/N..DB
	.44	.77	.97	.94	.40	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.90	.25	-	-	-	-	-	-	-	-	F.DAYS
	38	49	56	61	66	-	-	-	-	-	-	-	-	S/N..DB
	.42	.88	.97	.89	.25	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.93	.60	-	-	-	-	-	-	-	-	-	F.DAYS
	39	46	53	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.73	.86	.58	-	-	-	-	-	-	-	-	-	REL.
18	.99	.97	.76	.33	-	-	-	-	-	-	-	-	-	F.DAYS
	39	46	53	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.71	.70	.32	-	-	-	-	-	-	-	-	-	REL.
20	.99	.94	.62	.19	-	-	-	-	-	-	-	-	-	F.DAYS
	37	44	51	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.43	.63	.55	.18	-	-	-	-	-	-	-	-	-	REL.
22	.99	.93	.62	.20	-	-	-	-	-	-	-	-	-	F.DAYS
	39	46	53	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.71	.58	.20	-	-	-	-	-	-	-	-	-	REL.
24	.99	.95	.69	.28	-	-	-	-	-	-	-	-	-	F.DAYS
	39	46	53	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.72	.65	.27	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.011
2000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
62.01N - 0.00W 80.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.33	-	-	-	-	-	-	-	-	F.DAYS
	13	27	41	54	61	-	-	-	-	-	-	-	-	S/N..DB
	.12	.28	.58	.95	.33	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.32	-	-	-	-	-	-	-	-	F.DAYS
	-3	16	34	52	60	-	-	-	-	-	-	-	-	S/N..DB
	.02	.14	.40	.93	.32	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-28	-1	26	39	58	-	-	-	-	-	-	-	-	S/N..DB
	.00	.03	.28	.48	.98	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-56	-22	16	30	53	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.20	.36	.89	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-75	-35	3	28	53	-	-	-	-	-	-	-	-	S/N..DB
	.06	.00	.04	.28	.93	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-82	-40	0	27	52	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.02	.27	.91	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-74	-34	3	29	54	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.02	.27	.96	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-55	-21	17	31	54	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.07	.28	.94	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.07	-	-	-	-	-	-	-	F.DAYS
	-28	-2	24	37	56	61	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.43	.96	.07	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.60	.06	-	-	-	-	-	-	-	F.DAYS
	-6	12	31	48	56	60	-	-	-	-	-	-	-	S/N..DB
	.02	.11	.36	.80	.57	.06	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.48	-	-	-	-	-	-	-	-	F.DAYS
	11	25	39	52	58	-	-	-	-	-	-	-	-	S/N..DB
	.07	.23	.49	.90	.47	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.36	-	-	-	-	-	-	-	-	F.DAYS
	16	29	41	53	59	-	-	-	-	-	-	-	-	S/N..DB
	.11	.29	.57	.91	.35	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.011
2000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
62.01N - 0.00W 80.00N - 0.00W 0.0 180.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.98	.86	.20	-	-	-	-	-	-	-	-	F.DAYS
	38	45	52	57	61	-	-	-	-	-	-	-	-	S/N..DB
	.45	.70	.89	.83	.20	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.95	.71	-	-	-	-	-	-	-	-	-	F.DAYS
	29	35	42	47	-	-	-	-	-	-	-	-	-	S/N..DB
	.23	.37	.55	.49	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.83	.34	-	-	-	-	-	-	-	-	-	F.DAYS
	28	35	42	47	-	-	-	-	-	-	-	-	-	S/N..DB
	.21	.37	.48	.23	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.98	.84	.20	-	-	-	-	-	-	-	-	F.DAYS
	31	38	45	50	55	-	-	-	-	-	-	-	-	S/N..DB
	.35	.46	.66	.66	.18	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.87	.49	.08	-	-	-	-	-	-	F.DAYS
	37	49	55	60	65	67	70	-	-	-	-	-	-	S/N..DB
	.44	.86	.97	.98	.87	.49	.07	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.96	.77	.31	.24	.13	.09	.06	-	-	F.DAYS
	37	45	55	60	65	68	70	69	70	71	70	-	-	S/N..DB
	.44	.73	.97	.99	.95	.76	.30	.24	.13	.09	.06	-	-	REL.
14	.99	.99	.99	.99	.94	.70	.08	-	-	-	-	-	-	F.DAYS
	38	49	56	61	66	68	70	-	-	-	-	-	-	S/N..DB
	.42	.88	.98	.99	.93	.70	.08	-	-	-	-	-	-	REL.
16	.99	.99	.99	.98	.78	.19	-	-	-	-	-	-	-	F.DAYS
	39	46	53	58	63	65	-	-	-	-	-	-	-	S/N..DB
	.46	.73	.92	.95	.78	.19	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.94	.36	-	-	-	-	-	-	-	-	F.DAYS
	39	46	53	58	63	-	-	-	-	-	-	-	-	S/N..DB
	.46	.73	.92	.91	.36	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.98	.79	.14	-	-	-	-	-	-	-	-	F.DAYS
	37	44	51	56	60	-	-	-	-	-	-	-	-	S/N..DB
	.43	.66	.87	.75	.13	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.94	.74	.14	-	-	-	-	-	-	-	-	F.DAYS
	39	46	53	58	62	-	-	-	-	-	-	-	-	S/N..DB
	.46	.75	.88	.73	.14	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.95	.80	.22	-	-	-	-	-	-	-	-	F.DAYS
	39	46	53	58	62	-	-	-	-	-	-	-	-	S/N..DB
	.46	.75	.90	.79	.22	-	-	-	-	-	-	-	-	REL.

Figure I-23

1 JUN SSN= 20 18.016
3000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
53.02N - 0.00W 80.00N - 0.00W 0.0 180.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.58	-	-	-	-	-	-	-	-	F.DAYS
	23	32	48	54	60	-	-	-	-	-	-	-	-	S/N..DB
	.06	.24	.88	.97	.58	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.64	-	-	-	-	-	-	-	-	F.DAYS
	-17	9	33	48	56	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.32	.83	.62	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.71	-	-	-	-	-	-	-	-	F.DAYS
	-57	-23	13	35	53	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.02	.36	.67	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	.07	-	-	-	-	-	-	-	F.DAYS
	-99	-53	3	30	-	57	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.23	-	.07	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.06	.16	-	-	-	-	-	-	-	F.DAYS
	-131	-75	-3	27	39	57	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.15	.03	.16	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.17	-	-	-	-	-	-	-	F.DAYS
	-144	-84	-6	13	38	57	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.01	.44	.17	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.07	.17	-	-	-	-	-	-	-	F.DAYS
	-132	-76	-4	26	38	56	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.16	.03	.17	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	.18	-	-	-	-	-	-	-	F.DAYS
	-97	-51	4	32	-	59	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.25	-	.18	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.85	.27	-	-	-	-	-	-	-	F.DAYS
	-53	-20	15	38	56	61	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.01	.44	.84	.27	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.88	.34	-	-	-	-	-	-	-	F.DAYS
	-15	10	34	50	57	61	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.35	.90	.86	.33	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.97	.78	.28	-	-	-	-	-	-	-	F.DAYS
	22	31	47	53	59	63	-	-	-	-	-	-	-	S/N..DB
	.09	.26	.84	.93	.77	.28	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.95	.64	.10	-	-	-	-	-	-	-	F.DAYS
	25	41	49	54	60	63	-	-	-	-	-	-	-	S/N..DB
	.14	.55	.89	.92	.64	.10	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 18.016
3000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
53.02N - 0.00W 80.00N - 0.00W 0.0 180.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.97	.98	.82	.40	-	-	-	-	-	-	-	-	-	F.DAYS
	28	42	50	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.15	.61	.78	.39	-	-	-	-	-	-	-	-	-	REL.
4	.92	.94	.58	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	26	40	48	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	.47	.49	.10	-	-	-	-	-	-	-	-	-	REL.
6	.89	.92	.40	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	26	40	48	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	.46	.34	.06	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.92	.57	.07	-	-	-	-	-	-	-	-	F.DAYS
	25	40	48	54	59	-	-	-	-	-	-	-	-	S/N..DB
	.12	.50	.78	.54	.07	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.98	.72	.14	-	-	-	-	-	-	-	F.DAYS
	28	43	49	55	61	65	-	-	-	-	-	-	-	S/N..DB
	.18	.66	.91	.97	.71	.14	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.90	.47	-	-	-	-	-	-	-	F.DAYS
	24	33	47	53	60	64	-	-	-	-	-	-	-	S/N..DB
	.11	.30	.85	.96	.90	.46	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.83	.31	-	-	-	-	-	-	-	F.DAYS
	29	44	50	56	62	65	-	-	-	-	-	-	-	S/N..DB
	.13	.71	.93	.98	.82	.31	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.91	.30	-	-	-	-	-	-	-	-	F.DAYS
	28	42	50	56	61	-	-	-	-	-	-	-	-	S/N..DB
	.11	.60	.91	.90	.30	-	-	-	-	-	-	-	-	REL.
18	.98	.99	.88	.56	.05	-	-	-	-	-	-	-	-	F.DAYS
	28	43	51	56	62	-	-	-	-	-	-	-	-	S/N..DB
	.11	.65	.83	.55	.05	-	-	-	-	-	-	-	-	REL.
20	.95	.96	.73	.29	-	-	-	-	-	-	-	-	-	F.DAYS
	28	43	51	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.13	.63	.68	.29	-	-	-	-	-	-	-	-	-	REL.
22	.95	.96	.73	.32	-	-	-	-	-	-	-	-	-	F.DAYS
	26	40	48	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.10	.48	.62	.31	-	-	-	-	-	-	-	-	-	REL.
24	.97	.97	.83	.47	-	-	-	-	-	-	-	-	-	F.DAYS
	26	40	48	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.11	.49	.70	.45	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 18.016
3000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
53.02N - 0.00W 80.00N - 0.00W 0.0 180.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.79	.22	-	-	-	-	-	-	-	F.DAYS
	17	27	46	53	60	63	-	-	-	-	-	-	-	S/N..DB
	.02	.12	.82	.95	.78	.22	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.92	.79	.22	-	-	-	-	-	-	-	F.DAYS
	-38	2	28	39	55	59	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.20	.44	.76	.22	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.80	.19	-	-	-	-	-	-	-	F.DAYS
	-93	-49	4	31	51	57	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.26	.73	.19	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.31	-	-	-	-	-	-	-	F.DAYS
	-151	-90	-7	24	41	56	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.11	.56	.30	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.33	-	-	-	-	-	-	-	F.DAYS
	-195	-121	-49	5	38	55	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.44	.32	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.32	-	-	-	-	-	-	-	F.DAYS
	-213	-133	-56	4	38	54	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.44	.31	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.39	-	-	-	-	-	-	-	F.DAYS
	-196	-122	-50	6	38	54	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.44	.38	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.47	-	-	-	-	-	-	-	F.DAYS
	-149	-88	-6	25	42	57	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.09	.61	.47	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.31	.57	.05	-	-	-	-	-	-	F.DAYS
	-89	-45	7	33	47	60	64	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.28	.26	.57	.05	-	-	-	-	-	-	REL.
20	.99	.99	.99	.98	.94	.57	.05	-	-	-	-	-	-	F.DAYS
	-36	3	29	40	56	61	64	-	-	-	-	-	-	S/N..DB
	.00	.00	.23	.51	.92	.57	.05	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.88	.43	-	-	-	-	-	-	-	F.DAYS
	5	26	45	52	59	62	-	-	-	-	-	-	-	S/N..DB
	.00	.15	.77	.94	.88	.43	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.82	.28	-	-	-	-	-	-	-	F.DAYS
	21	38	47	53	60	63	-	-	-	-	-	-	-	S/N..DB
	.08	.44	.84	.95	.82	.28	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 18.016
3000 KM PATH TO 80 DEGREES N AZIMUTHS N.MILES
53.02N - 0.00W 80.00N - 0.00W 0.0 180.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.94	.43	-	-	-	-	-	-	-	-	F.DAYS
	28	42	50	56	61	-	-	-	-	-	-	-	-	S/N..DB
	.15	.62	.95	.93	.43	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.98	.86	.20	-	-	-	-	-	-	-	-	F.DAYS
	26	40	48	54	59	-	-	-	-	-	-	-	-	S/N..DB
	.09	.50	.83	.82	.20	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.94	.56	-	-	-	-	-	-	-	-	-	F.DAYS
	26	40	48	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	.50	.79	.53	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.73	.23	-	-	-	-	-	-	-	F.DAYS
	25	40	48	53	59	62	-	-	-	-	-	-	-	S/N..DB
	.12	.50	.84	.93	.72	.23	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.91	.62	.55	.40	.34	.27	.22	.13	F.DAYS
	24	41	49	55	60	64	67	67	67	68	68	69	68	S/N..DB
	.11	.55	.91	.98	.98	.91	.62	.55	.40	.33	.27	.22	.13	REL.
12	.99	.99	.99	.99	.99	.97	.84	.80	.70	.64	.58	.51	.39	F.DAYS
	18	28	46	53	59	63	66	66	67	67	67	68	68	S/N..DB
	.04	.18	.82	.96	.99	.96	.83	.80	.69	.64	.57	.51	.39	REL.
14	.99	.99	.99	.99	.99	.96	.80	.76	.64	.57	.51	.39	.19	F.DAYS
	24	41	49	55	61	64	67	67	67	68	68	69	69	S/N..DB
	.05	.55	.91	.98	.99	.96	.80	.75	.63	.57	.50	.39	.19	REL.
16	.99	.99	.99	.99	.99	.83	.34	.23	.07	-	-	-	-	F.DAYS
	28	42	50	55	61	64	66	66	67	-	-	-	-	S/N..DB
	.11	.60	.91	.97	.96	.83	.34	.23	.07	-	-	-	-	REL.
18	.99	.99	.99	.99	.80	.29	-	-	-	-	-	-	-	F.DAYS
	28	43	50	56	61	64	-	-	-	-	-	-	-	S/N..DB
	.11	.65	.91	.98	.80	.29	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.92	.31	-	-	-	-	-	-	-	-	F.DAYS
	28	43	50	56	61	-	-	-	-	-	-	-	-	S/N..DB
	.13	.65	.92	.91	.31	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.96	.83	.27	-	-	-	-	-	-	-	-	F.DAYS
	26	40	48	53	59	-	-	-	-	-	-	-	-	S/N..DB
	.11	.50	.82	.78	.26	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.97	.88	.39	-	-	-	-	-	-	-	-	F.DAYS
	26	40	48	53	59	-	-	-	-	-	-	-	-	S/N..DB
	.11	.50	.83	.83	.39	-	-	-	-	-	-	-	-	REL.

Figure I-24

1 JUN SSN= 20 0.001
200 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
18.20S - 0.00W 20.30S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.43	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.42	-	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.09	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.39	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.38	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.97	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.97	.10	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.93	.38	-	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.87	.38	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.93	.36	-	-	-	-	-	-	-	-	-	-	F.DAYS
	38	47	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.41	.79	.36	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.96	.49	-	-	-	-	-	-	-	-	-	-	F.DAYS
	43	50	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.90	.48	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.95	.42	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.95	.42	-	-	-	-	-	-	-	-	-	-	REL.
18	.98	.67	.07	-	-	-	-	-	-	-	-	-	-	F.DAYS
	61	62	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.67	.07	-	-	-	-	-	-	-	-	-	-	REL.
20	.51	.06	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.51	.06	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.46	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	-	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.35	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.35	-	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.001
200 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
18.20S - 0.00W 20.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.98	.67	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.67	.08	-	-	-	-	-	-	-	-	-	-	REL.
4	.84	.27	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.27	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.94	.45	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.45	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.95	.34	-	-	-	-	-	-	-	-	-	-	F.DAYS
	45	50	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.76	.88	.34	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.98	.61	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	32	43	51	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.19	.66	.59	.07	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.86	.29	-	-	-	-	-	-	-	-	-	F.DAYS
	27	41	51	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	.56	.82	.29	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.92	.44	-	-	-	-	-	-	-	-	-	F.DAYS
	32	44	53	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.19	.72	.90	.43	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.93	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	45	51	57	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.76	.94	.92	.45	-	-	-	-	-	-	-	-	-	REL.
18	.99	.98	.81	.31	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	61	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.98	.81	.30	-	-	-	-	-	-	-	-	-	REL.
20	.99	.97	.72	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	59	61	61	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.97	.72	.17	-	-	-	-	-	-	-	-	-	REL.
22	.99	.98	.62	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	61	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.97	.62	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.91	.21	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	61	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.90	.21	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.001
200 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
18.20S - 0.00W 20.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.85	.42	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.41	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.39	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.39	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.26	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.26	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.37	-	-	-	-	-	-	-	-	-	F.DAYS
	49	54	60	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.98	.99	.36	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.87	-	-	-	-	-	-	-	-	-	F.DAYS
	34	45	56	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.26	.77	.99	.86	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.76	-	-	-	-	-	-	-	-	-	F.DAYS
	28	41	52	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.10	.56	.96	.76	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.82	-	-	-	-	-	-	-	-	-	F.DAYS
	34	44	53	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.26	.72	.97	.81	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.87	-	-	-	-	-	-	-	-	-	F.DAYS
	49	53	59	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.97	.99	.87	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.94	.36	-	-	-	-	-	-	-	-	-	F.DAYS
	61	62	64	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.94	.36	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.52	-	-	-	-	-	-	-	-	-	-	F.DAYS
	60	61	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.52	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.88	.23	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.87	.23	-	-	-	-	-	-	-	-	-	-	REL.
24	.94	.45	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.45	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.001
200 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
18.20S - 0.00W 20.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.98	.61	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	60	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.97	.61	.06	-	-	-	-	-	-	-	-	-	REL.
4	.99	.93	.30	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.92	.30	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.54	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	57	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.53	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.96	.32	-	-	-	-	-	-	-	-	-	F.DAYS
	36	45	53	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.34	.77	.94	.32	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.44	-	-	-	-	-	-	-	-	-	F.DAYS
	20	37	47	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.37	.86	.43	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.88	-	-	-	-	-	-	-	-	-	F.DAYS
	13	33	45	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.23	.80	.86	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.84	-	-	-	-	-	-	-	-	-	F.DAYS
	20	37	47	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.37	.87	.83	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.81	-	-	-	-	-	-	-	-	-	F.DAYS
	36	45	53	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.34	.77	.97	.81	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.98	.74	-	-	-	-	-	-	-	-	-	F.DAYS
	53	57	59	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.98	.74	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.97	.63	-	-	-	-	-	-	-	-	-	F.DAYS
	59	61	61	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.96	.63	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.97	.57	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	61	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.96	.56	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.91	.34	-	-	-	-	-	-	-	-	-	F.DAYS
	59	61	61	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.91	.34	-	-	-	-	-	-	-	-	-	REL.

Figure I-25

1 JUN SSN= 20 0.003
500 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
15.50S - 0.00W 20.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.68	.22	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.68	.22	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.31	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.95	.14	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.14	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.79	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	39	54	62	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.98	.78	.06	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.83	.29	-	-	-	-	-	-	-	-	-	F.DAYS
	18	37	57	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.37	.83	.29	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.24	-	-	-	-	-	-	-	-	-	F.DAYS
	10	31	55	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.17	.99	.24	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.87	.36	-	-	-	-	-	-	-	-	-	F.DAYS
	18	37	57	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.37	.86	.35	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.86	.34	-	-	-	-	-	-	-	-	-	F.DAYS
	39	54	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.98	.86	.34	-	-	-	-	-	-	-	-	-	REL.
18	.99	.96	.42	.05	-	-	-	-	-	-	-	-	-	F.DAYS
	57	63	66	70	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.95	.42	.05	-	-	-	-	-	-	-	-	-	REL.
20	.89	.32	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.31	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.79	.22	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.22	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.69	.14	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.68	.14	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.003
500 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
15.50S - 0.00W 20.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.91	.30	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.90	.30	-	-	-	-	-	-	-	-	-	-	REL.
4	.96	.55	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.55	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.82	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.81	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.76	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	23	47	58	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.05	.85	.75	.06	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.33	-	-	-	-	-	-	-	-	-	F.DAYS
	0	25	52	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.05	.96	.33	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.74	-	-	-	-	-	-	-	-	-	F.DAYS
	-7	19	50	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.94	.73	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.85	.08	-	-	-	-	-	-	-	-	F.DAYS
	0	25	52	62	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.05	.96	.84	.08	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.85	.08	-	-	-	-	-	-	-	-	F.DAYS
	23	47	58	65	70	-	-	-	-	-	-	-	-	S/N..DB
	.05	.85	.98	.84	.08	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.94	.69	-	-	-	-	-	-	-	-	-	F.DAYS
	52	59	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.94	.69	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.90	.55	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	66	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.90	.55	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.88	.36	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.87	.35	-	-	-	-	-	-	-	-	-	REL.
24	.99	.98	.66	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.98	.66	.06	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.003
500 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
15.50S - 0.00W 20.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.95	.71	.15	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.71	.15	-	-	-	-	-	-	-	-	-	-	REL.
4	.68	.18	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.68	.18	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.95	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.94	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.98	-	-	-	-	-	-	-	-	-	F.DAYS
	30	50	60	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.16	.93	.99	.98	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.27	-	-	-	-	-	-	-	-	F.DAYS
	2	25	53	62	70	-	-	-	-	-	-	-	-	S/N..DB
	.00	.05	.97	.99	.27	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.06	-	-	-	-	-	-	-	-	F.DAYS
	-9	18	50	60	68	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.94	.99	.06	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.08	-	-	-	-	-	-	-	-	F.DAYS
	1	25	53	62	68	-	-	-	-	-	-	-	-	S/N..DB
	.00	.05	.97	.99	.08	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.15	-	-	-	-	-	-	-	-	F.DAYS
	30	50	60	66	70	-	-	-	-	-	-	-	-	S/N..DB
	.16	.93	.99	.99	.15	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.88	-	-	-	-	-	-	-	-	-	F.DAYS
	57	62	67	71	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.87	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.95	.37	-	-	-	-	-	-	-	-	-	F.DAYS
	56	62	66	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.94	.36	-	-	-	-	-	-	-	-	-	REL.
22	.99	.98	.63	.15	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.98	.63	.15	-	-	-	-	-	-	-	-	-	REL.
24	.99	.85	.20	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.85	.20	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.003
500 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
15.50S - 0.00W 20.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.86	.32	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	65	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.85	.32	-	-	-	-	-	-	-	-	-	REL.
4	.99	.98	.64	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.97	.64	.07	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.91	.19	-	-	-	-	-	-	-	-	-	F.DAYS
	49	56	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.99	.91	.19	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.80	-	-	-	-	-	-	-	-	-	F.DAYS
	8	30	54	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.16	.98	.79	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.87	-	-	-	-	-	-	-	-	-	F.DAYS
	-22	9	47	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.87	.86	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.17	-	-	-	-	-	-	-	-	F.DAYS
	-33	0	44	56	64	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.76	.99	.16	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.97	.27	-	-	-	-	-	-	-	-	F.DAYS
	-22	9	47	58	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.87	.96	.27	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.96	.22	-	-	-	-	-	-	-	-	F.DAYS
	8	30	54	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.16	.98	.95	.22	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.93	.17	-	-	-	-	-	-	-	-	F.DAYS
	49	56	63	67	70	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.93	.17	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.89	.08	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	68	70	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.89	.08	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.87	.07	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	68	70	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.99	.87	.07	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.76	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	66	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.98	.76	-	-	-	-	-	-	-	-	-	REL.

Figure I-26

1 JUN SSN= 20 0.004
800 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
12.80S - 0.00W 20.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.87	.52	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.86	.52	.06	-	-	-	-	-	-	-	-	-	-	REL.
4	.63	.16	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.16	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.84	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.83	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.71	-	-	-	-	-	-	-	-	-	F.DAYS
	23	39	58	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.05	.46	.99	.70	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.06	-	-	-	-	-	-	-	-	F.DAYS
	-7	22	42	60	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.66	.99	.06	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-19	9	37	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.40	.99	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.09	-	-	-	-	-	-	-	-	F.DAYS
	-7	22	51	61	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.95	.99	.09	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.83	.10	-	-	-	-	-	-	-	-	F.DAYS
	23	39	58	66	71	-	-	-	-	-	-	-	-	S/N..DB
	.05	.46	.99	.83	.10	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.90	.41	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	66	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.89	.40	-	-	-	-	-	-	-	-	-	REL.
20	.99	.79	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.79	.13	-	-	-	-	-	-	-	-	-	-	REL.
22	.96	.56	.05	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.56	.05	-	-	-	-	-	-	-	-	-	-	REL.
24	.94	.45	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.45	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.004
800 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
12.80S - 0.00W 20.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.67	.19	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.98	.67	.19	-	-	-	-	-	-	-	-	-	REL.
4	.99	.88	.26	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.88	.26	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.51	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	56	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.55	.99	.51	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.60	-	-	-	-	-	-	-	-	-	F.DAYS
	1	27	54	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.10	.98	.60	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-31	1	47	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.87	.99	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.36	-	-	-	-	-	-	-	-	F.DAYS
	-43	-7	29	55	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.14	.98	.36	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.54	-	-	-	-	-	-	-	-	F.DAYS
	-30	1	33	57	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.25	.99	.54	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.98	.53	-	-	-	-	-	-	-	-	F.DAYS
	1	27	54	62	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.10	.98	.98	.53	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.91	.35	-	-	-	-	-	-	-	-	F.DAYS
	41	56	63	68	72	-	-	-	-	-	-	-	-	S/N..DB
	.55	.99	.98	.91	.35	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.98	.86	.19	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	72	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.97	.85	.19	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.98	.79	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.97	.79	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.91	.48	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.91	.47	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.004
800 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
12.80S - 0.00W 20.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.91	.49	.10	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.91	.49	.10	-	-	-	-	-	-	-	-	-	REL.
4	.96	.52	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.52	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.53	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.53	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.75	-	-	-	-	-	-	-	-	F.DAYS
	9	31	55	63	71	-	-	-	-	-	-	-	-	S/N..DB
	.00	.19	.99	.99	.75	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.98	.15	-	-	-	-	-	-	-	F.DAYS
	-31	1	32	56	67	72	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.22	.99	.98	.15	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.82	-	-	-	-	-	-	-	-	F.DAYS
	-47	-10	28	55	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.11	.98	.82	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.75	-	-	-	-	-	-	-	-	F.DAYS
	-32	0	33	57	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.25	.99	.75	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.89	-	-	-	-	-	-	-	-	F.DAYS
	9	31	55	63	70	-	-	-	-	-	-	-	-	S/N..DB
	.00	.19	.99	.99	.88	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.55	-	-	-	-	-	-	-	-	F.DAYS
	54	60	66	70	73	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.99	.55	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.93	.09	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	72	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.92	.09	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.95	.58	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.94	.58	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.68	.18	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.98	.68	.18	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.004
800 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
12.80S - 0.00W 20.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.97	.75	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.97	.74	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.90	.42	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.89	.42	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.75	-	-	-	-	-	-	-	-	-	F.DAYS
	35	53	61	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	.97	.99	.75	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.22	-	-	-	-	-	-	-	-	F.DAYS
	-19	16	50	59	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.94	.99	.22	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.21	-	-	-	-	-	-	-	-	F.DAYS
	-64	-21	23	54	64	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.04	.98	.21	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.76	-	-	-	-	-	-	-	-	F.DAYS
	-80	-33	18	51	64	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.01	.95	.75	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.75	.07	-	-	-	-	-	-	-	F.DAYS
	-63	-21	23	53	65	69	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.04	.97	.75	.07	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.72	.06	-	-	-	-	-	-	-	F.DAYS
	-19	16	50	59	68	70	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.94	.99	.72	.06	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.65	-	-	-	-	-	-	-	-	F.DAYS
	35	53	61	67	71	-	-	-	-	-	-	-	-	S/N..DB
	.31	.97	.99	.99	.65	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.53	-	-	-	-	-	-	-	-	F.DAYS
	54	59	65	69	71	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.98	.53	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.98	.46	-	-	-	-	-	-	-	-	F.DAYS
	54	59	65	69	71	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.98	.46	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.97	.30	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	71	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.96	.30	-	-	-	-	-	-	-	-	REL.

Figure I-27

1 JUN SSN= 20 0.005
1000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
11.01S - 0.00W 20.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.93	.70	.17	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.70	.17	-	-	-	-	-	-	-	-	-	-	REL.
4	.78	.34	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.75	.34	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.17	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.98	.16	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.97	.08	-	-	-	-	-	-	-	-	F.DAYS
	13	35	55	63	70	-	-	-	-	-	-	-	-	S/N..DB
	.00	.31	.99	.96	.08	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.33	-	-	-	-	-	-	-	-	F.DAYS
	-22	6	37	57	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.40	.99	.33	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.24	-	-	-	-	-	-	-	-	F.DAYS
	-36	-3	33	55	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.25	.98	.24	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.33	-	-	-	-	-	-	-	-	F.DAYS
	-22	6	38	57	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.44	.99	.33	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.95	.37	-	-	-	-	-	-	-	-	F.DAYS
	13	35	55	63	70	-	-	-	-	-	-	-	-	S/N..DB
	.00	.31	.99	.94	.37	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.98	.74	.09	-	-	-	-	-	-	-	-	F.DAYS
	51	58	64	69	72	-	-	-	-	-	-	-	-	S/N..DB
	.94	.99	.97	.74	.09	-	-	-	-	-	-	-	-	REL.
20	.99	.94	.35	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.94	.35	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.81	.17	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.80	.17	-	-	-	-	-	-	-	-	-	-	REL.
24	.98	.72	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.71	.11	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.005
1000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
11.01S - 0.00W 20.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.87	.38	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.86	.37	-	-	-	-	-	-	-	-	-	REL.
4	.99	.96	.46	.08	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.96	.45	.08	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.76	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	38	53	61	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.42	.97	.76	.06	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-10	24	51	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.06	.95	.99	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.16	-	-	-	-	-	-	-	-	F.DAYS
	-49	-11	31	55	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.19	.98	.16	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.66	.09	-	-	-	-	-	-	-	F.DAYS
	-63	-22	25	52	64	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.06	.96	.66	.09	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.81	.20	-	-	-	-	-	-	-	F.DAYS
	-48	-11	30	54	65	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.98	.80	.20	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.81	.19	-	-	-	-	-	-	-	F.DAYS
	-10	24	42	60	68	71	-	-	-	-	-	-	-	S/N..DB
	.00	.06	.66	.99	.80	.19	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.96	.63	.08	-	-	-	-	-	-	-	F.DAYS
	38	53	61	67	71	73	-	-	-	-	-	-	-	S/N..DB
	.42	.97	.99	.96	.62	.08	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.94	.49	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	71	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.93	.48	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.92	.23	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	71	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.92	.23	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.97	.75	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.97	.74	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.005
1000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
11.01S - 0.00W 20.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.96	.73	.29	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.96	.72	.29	-	-	-	-	-	-	-	-	-	REL.
4	.95	.74	.18	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.74	.17	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.96	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.95	.07	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.19	-	-	-	-	-	-	-	F.DAYS
	-2	27	44	60	69	72	-	-	-	-	-	-	-	S/N..DB
	.00	.10	.76	.99	.98	.18	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.74	-	-	-	-	-	-	-	F.DAYS
	-51	-13	28	44	64	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.11	.73	.99	.74	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.20	-	-	-	-	-	-	-	F.DAYS
	-70	-27	24	51	64	69	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.05	.95	.98	.20	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.98	.16	-	-	-	-	-	-	-	F.DAYS
	-52	-13	30	54	65	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.98	.97	.16	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.32	-	-	-	-	-	-	-	F.DAYS
	-2	28	52	61	69	72	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.96	.99	.99	.32	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.88	.20	-	-	-	-	-	-	-	F.DAYS
	52	58	64	69	73	74	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.87	.20	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.44	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	72	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.44	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.86	.20	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	71	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.98	.86	.20	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.91	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.90	.45	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.005
1000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
11.01S - 0.00W 20.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.90	.19	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	71	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.89	.19	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.96	.69	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.96	.68	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.95	.07	-	-	-	-	-	-	-	-	F.DAYS
	33	43	59	65	70	-	-	-	-	-	-	-	-	S/N..DB
	.24	.67	.99	.94	.07	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.57	-	-	-	-	-	-	-	-	F.DAYS
	-34	-1	35	57	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.34	.99	.57	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.57	-	-	-	-	-	-	-	-	F.DAYS
	-87	-38	21	50	63	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.02	.93	.57	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.20	-	-	-	-	-	-	-	F.DAYS
	-107	-52	15	47	62	67	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.86	.99	.20	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.91	.31	-	-	-	-	-	-	-	F.DAYS
	-87	-38	20	50	63	68	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.02	.93	.91	.31	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.90	.29	-	-	-	-	-	-	-	F.DAYS
	-35	-2	35	57	66	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.34	.99	.90	.28	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.86	.23	-	-	-	-	-	-	-	F.DAYS
	33	51	59	65	71	72	-	-	-	-	-	-	-	S/N..DB
	.24	.94	.99	.99	.86	.23	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.80	.14	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	71	72	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.80	.14	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.77	.12	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	71	72	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.77	.12	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.64	.05	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	71	73	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.99	.64	.05	-	-	-	-	-	-	-	REL.

Figure I-28

1 JUN SSN= 20 0.011
2000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
2.01S - 0.00W 20.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.98	.84	.46	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.89	.83	.46	-	-	-	-	-	-	-	-	-	REL.
4	.99	.91	.48	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.83	.48	.11	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.85	-	-	-	-	-	-	-	-	-	F.DAYS
	39	47	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.85	.99	.85	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.68	-	-	-	-	-	-	-	F.DAYS
	-16	8	36	47	61	66	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.37	.86	.99	.67	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.94	.19	.10	-	-	-	-	-	F.DAYS
	-68	-28	10	36	54	63	68	68	-	-	-	-	-	S/N..DB
	.00	.00	.00	.35	.98	.93	.18	.10	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.90	.11	.05	-	-	-	-	-	F.DAYS
	-89	-42	3	32	52	62	68	68	-	-	-	-	-	S/N..DB
	.00	.00	.00	.21	.96	.90	.11	.05	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.91	.08	-	-	-	-	-	-	F.DAYS
	-69	-28	10	36	54	63	68	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.35	.98	.90	.08	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.95	.15	.08	-	-	-	-	-	F.DAYS
	-16	8	36	47	61	66	70	70	-	-	-	-	-	S/N..DB
	.00	.00	.37	.86	.99	.94	.15	.07	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.95	.56	-	-	-	-	-	-	-	F.DAYS
	39	46	56	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.46	.81	.99	.99	.94	.55	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.90	.12	-	-	-	-	-	-	-	-	F.DAYS
	41	49	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.55	.90	.99	.89	.12	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.88	.52	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.87	.52	-	-	-	-	-	-	-	-	-	REL.
24	.99	.98	.84	.42	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.89	.83	.42	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.011
2000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
2.01S - 0.00W 20.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.95	.48	.11	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.94	.47	.11	-	-	-	-	-	-	-	REL.
4	.99	.99	.97	.76	.16	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.96	.75	.16	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.97	.23	-	-	-	-	-	-	-	-	F.DAYS
	25	40	51	60	66	-	-	-	-	-	-	-	-	S/N..DB
	.07	.50	.95	.96	.23	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.32	-	-	-	-	-	-	-	F.DAYS
	-40	-8	31	44	60	66	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.21	.73	.99	.32	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.42	-	-	-	-	-	-	-	F.DAYS
	-95	-47	5	34	56	63	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.27	.99	.42	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	.40	.33	.20	.15	.11	.07	-	F.DAYS
	-116	-61	-3	28	50	61	67	67	68	69	69	70	-	S/N..DB
	.00	.00	.00	.11	.93	.99	.40	.33	.20	.15	.10	.07	-	REL.
14	.99	.99	.99	.99	.99	.97	.60	.49	.33	.26	.20	.15	.07	F.DAYS
	-95	-46	3	32	51	62	68	68	69	70	70	71	71	S/N..DB
	.00	.00	.00	.21	.94	.97	.59	.49	.33	.26	.20	.14	.07	REL.
16	.99	.99	.99	.99	.99	.98	.62	.51	.34	.27	.21	.15	.08	F.DAYS
	-40	-8	31	44	60	65	69	69	70	71	71	72	72	S/N..DB
	.00	.00	.21	.73	.99	.97	.61	.50	.34	.27	.21	.15	.08	REL.
18	.99	.99	.99	.99	.96	.82	.41	.31	.14	.08	-	-	-	F.DAYS
	25	41	51	60	66	69	71	71	72	72	-	-	-	S/N..DB
	.07	.56	.95	.99	.95	.82	.41	.31	.14	.08	-	-	-	REL.
20	.99	.99	.99	.99	.95	.79	.32	.23	.09	-	-	-	-	F.DAYS
	42	49	57	62	67	70	72	71	72	-	-	-	-	S/N..DB
	.61	.90	.99	.99	.94	.78	.32	.23	.09	-	-	-	-	REL.
22	.99	.99	.99	.99	.94	.65	.07	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	72	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.99	.93	.65	.07	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.80	.23	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.98	.79	.23	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.011
2000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
2.01S - 0.00W 20.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.98	.72	.16	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.98	.71	.16	-	-	-	-	-	-	-	REL.
4	.99	.99	.96	.70	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.95	.70	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.69	-	-	-	-	-	-	-	-	F.DAYS
	39	47	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.46	.85	.99	.99	.68	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.94	.87	.59	.43	.30	.19	.05	F.DAYS
	-41	-8	22	42	59	65	69	69	70	71	71	72	72	S/N..DB
	.00	.00	.04	.63	.99	.99	.93	.87	.59	.43	.30	.19	.05	REL.
10	.99	.99	.99	.99	.99	.99	.99	.99	.95	.89	.78	.63	.33	F.DAYS
	-111	-58	-7	21	47	60	66	67	68	69	69	70	70	S/N..DB
	.00	.00	.00	.02	.85	.99	.99	.99	.95	.88	.78	.63	.33	REL.
12	.99	.99	.99	.99	.99	.99	.91	.81	.45	.30	.18	.09	-	F.DAYS
	-139	-77	-10	24	46	59	66	66	68	69	69	70	-	S/N..DB
	.00	.00	.00	.05	.82	.99	.91	.81	.45	.30	.18	.09	-	REL.
14	.99	.99	.99	.99	.99	.99	.77	.62	.31	.19	.11	.06	-	F.DAYS
	-112	-58	0	30	50	61	67	67	68	69	69	70	-	S/N..DB
	.00	.00	.00	.15	.93	.99	.77	.62	.31	.19	.11	.06	-	REL.
16	.99	.99	.99	.99	.99	.99	.93	.85	.54	.40	.28	.18	.05	F.DAYS
	-41	-9	30	43	60	65	69	69	70	71	71	72	71	S/N..DB
	.00	.00	.18	.69	.99	.99	.92	.84	.54	.40	.27	.17	.05	REL.
18	.99	.99	.99	.99	.99	.99	.84	.75	.52	.42	.32	.23	.11	F.DAYS
	39	47	57	62	67	70	72	72	72	73	72	73	73	S/N..DB
	.46	.85	.99	.99	.99	.99	.83	.75	.52	.41	.32	.23	.11	REL.
20	.99	.99	.99	.99	.99	.98	.55	.44	.23	.16	.10	.06	-	F.DAYS
	42	49	57	62	67	70	72	71	72	73	72	73	-	S/N..DB
	.61	.90	.99	.99	.99	.98	.55	.43	.23	.15	.10	.06	-	REL.
22	.99	.99	.99	.99	.99	.91	.25	.16	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	72	71	-	-	-	-	-	S/N..DB
	.61	.90	.99	.99	.99	.91	.25	.16	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.97	.51	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.99	.97	.51	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.011
2000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
2.01S - 0.00W 20.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.97	.67	.08	-	-	-	-	-	-	F.DAYS
	42	50	57	62	67	70	71	-	-	-	-	-	-	S/N..DB
	.61	.93	.99	.99	.96	.67	.08	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.83	.21	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	67	69	-	-	-	-	-	-	-	S/N..DB
	.61	.93	.99	.99	.82	.21	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.98	.38	-	-	-	-	-	-	-	F.DAYS
	14	36	48	58	65	69	-	-	-	-	-	-	-	S/N..DB
	.00	.35	.90	.99	.98	.38	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.93	.14	.06	-	-	-	-	-	F.DAYS
	-73	-31	13	38	57	64	69	68	-	-	-	-	-	S/N..DB
	.00	.00	.00	.43	.99	.93	.13	.06	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.11	.06	-	-	-	-	-	F.DAYS
	-148	-83	-10	26	49	61	67	67	-	-	-	-	-	S/N..DB
	.00	.00	.00	.07	.91	.99	.11	.06	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	.69	.51	.26	.17	.10	.05	-	F.DAYS
	-176	-103	-19	20	45	59	66	66	67	68	68	69	-	S/N..DB
	.00	.00	.00	.01	.77	.99	.68	.51	.26	.17	.10	.05	-	REL.
14	.99	.99	.99	.99	.99	.99	.74	.63	.40	.31	.23	.16	.07	F.DAYS
	-148	-83	-10	25	47	60	66	67	68	69	69	70	70	S/N..DB
	.00	.00	.00	.06	.85	.99	.74	.63	.40	.31	.23	.16	.07	REL.
16	.99	.99	.99	.99	.99	.99	.75	.63	.40	.31	.23	.16	.07	F.DAYS
	-74	-32	14	39	58	64	69	68	69	70	70	71	71	S/N..DB
	.00	.00	.00	.47	.99	.99	.74	.63	.40	.31	.23	.16	.07	REL.
18	.99	.99	.99	.99	.99	.96	.65	.56	.37	.29	.21	.15	.07	F.DAYS
	18	36	48	58	65	69	71	71	71	72	72	72	72	S/N..DB
	.01	.35	.90	.99	.99	.95	.64	.56	.37	.29	.21	.15	.07	REL.
20	.99	.99	.99	.99	.99	.96	.64	.55	.37	.28	.21	.15	.06	F.DAYS
	43	50	57	62	67	70	72	71	71	72	72	73	72	S/N..DB
	.67	.93	.99	.99	.99	.95	.64	.55	.36	.28	.21	.14	.06	REL.
22	.99	.99	.99	.99	.99	.96	.59	.49	.32	.24	.18	.13	.06	F.DAYS
	42	50	57	62	67	70	71	71	71	72	72	73	72	S/N..DB
	.61	.93	.99	.99	.99	.96	.59	.49	.32	.24	.18	.13	.06	REL.
24	.99	.99	.99	.99	.99	.94	.47	.39	.22	.16	.11	.07	-	F.DAYS
	42	50	57	62	67	70	71	71	72	72	72	73	-	S/N..DB
	.61	.93	.99	.99	.99	.93	.47	.38	.22	.16	.11	.07	-	REL.

Figure I-29

1 JUN SSN= 20 0.016
3000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
6.98N - 0.00W 20.00S - 0.00W 180.0 0.0 1618.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.97	.86	.35	-	-	-	-	-	-	-	-	F.DAYS
	30	43	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.19	.67	.93	.86	.35	-	-	-	-	-	-	-	-	REL.
4	.98	.98	.83	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	30	43	51	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.16	.66	.80	.45	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.42	-	-	-	-	-	-	-	-	F.DAYS
	28	40	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.12	.50	.95	.99	.41	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.42	.31	.13	.07	-	-	-	F.DAYS
	-86	-41	16	38	55	60	65	65	65	66	-	-	-	S/N..DB
	.00	.00	.01	.43	.98	.99	.42	.31	.12	.07	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.88	.80	.54	.41	.28	.18	.06	F.DAYS
	-183	-109	-38	15	43	56	61	62	64	65	65	66	66	S/N..DB
	.00	.00	.00	.00	.68	.99	.87	.79	.54	.41	.28	.18	.06	REL.
12	.99	.99	.99	.99	.99	.99	.85	.76	.48	.35	.23	.14	-	F.DAYS
	-221	-136	-54	10	40	55	61	61	63	64	64	65	-	S/N..DB
	.00	.00	.00	.00	.51	.99	.84	.75	.48	.35	.23	.14	-	REL.
14	.99	.99	.99	.99	.99	.99	.83	.73	.43	.29	.18	.10	-	F.DAYS
	-184	-110	-39	17	44	56	62	63	64	65	65	66	-	S/N..DB
	.00	.00	.00	.00	.73	.99	.83	.73	.43	.29	.18	.10	-	REL.
16	.99	.99	.99	.99	.99	.99	.91	.85	.60	.45	.32	.20	.06	F.DAYS
	-87	-41	17	38	55	60	64	65	66	67	67	68	68	S/N..DB
	.00	.00	.01	.43	.98	.99	.91	.84	.60	.45	.31	.20	.06	REL.
18	.99	.99	.99	.99	.99	.97	.87	.58	.37	.28	.19	.13	-	F.DAYS
	27	40	50	56	62	65	67	67	68	69	69	69	-	S/N..DB
	.10	.50	.94	.99	.99	.96	.86	.58	.37	.28	.19	.13	-	REL.
20	.99	.99	.99	.99	.92	.41	-	-	-	-	-	-	-	F.DAYS
	30	42	50	56	62	66	-	-	-	-	-	-	-	S/N..DB
	.16	.62	.94	.99	.91	.41	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.94	.55	.08	-	-	-	-	-	-	-	F.DAYS
	30	43	51	57	63	66	-	-	-	-	-	-	-	S/N..DB
	.19	.67	.95	.93	.55	.08	-	-	-	-	-	-	-	REL.
24	.99	.99	.98	.90	.40	-	-	-	-	-	-	-	-	F.DAYS
	30	43	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.19	.67	.94	.90	.40	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.016
3000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
6.98N - 0.00W 20.00S - 0.00W 180.0 0.0 1618.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.83	.37	.06	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	66	68	-	-	-	-	-	-	S/N..DB
	.21	.67	.95	.98	.82	.37	.06	-	-	-	-	-	-	REL.
4	.99	.99	.99	.95	.47	.10	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	66	-	-	-	-	-	-	-	S/N..DB
	.19	.67	.95	.94	.46	.10	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.82	.06	-	-	-	-	-	-	-	F.DAYS
	5	30	45	55	61	65	-	-	-	-	-	-	-	S/N..DB
	.00	.16	.80	.98	.81	.06	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.71	.87	.16	.07	-	-	-	-	-	F.DAYS
	-113	-60	13	36	52	60	65	65	-	-	-	-	-	S/N..DB
	.00	.00	.00	.36	.69	.87	.16	.07	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.86	.28	.21	.11	.07	-	-	-	F.DAYS
	-214	-130	-51	18	45	57	63	63	64	65	-	-	-	S/N..DB
	.00	.00	.00	.01	.77	.86	.28	.21	.11	.07	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	.77	.68	.47	.40	.33	.27	.17	F.DAYS
	-252	-157	-67	8	40	55	61	62	63	64	65	66	66	S/N..DB
	.00	.00	.00	.00	.51	.99	.77	.68	.46	.40	.33	.27	.17	REL.
14	.99	.99	.99	.99	.99	.99	.88	.83	.66	.56	.47	.40	.27	F.DAYS
	-213	-130	-51	14	43	56	62	62	64	65	65	66	66	S/N..DB
	.00	.00	.00	.00	.68	.99	.88	.82	.66	.55	.46	.39	.27	REL.
16	.99	.99	.99	.99	.99	.99	.91	.87	.73	.64	.54	.46	.32	F.DAYS
	-113	-60	14	36	51	60	65	65	66	67	67	68	68	S/N..DB
	.00	.00	.00	.36	.95	.99	.91	.87	.73	.63	.53	.45	.32	REL.
18	.99	.99	.99	.99	.99	.94	.75	.70	.58	.52	.43	.34	.19	F.DAYS
	21	35	46	55	61	65	68	67	68	69	69	70	69	S/N..DB
	.03	.31	.84	.98	.98	.93	.74	.69	.58	.52	.43	.34	.18	REL.
20	.99	.99	.99	.99	.98	.93	.73	.69	.57	.50	.41	.32	.17	F.DAYS
	31	43	51	57	63	65	68	68	68	69	69	70	70	S/N..DB
	.19	.67	.95	.99	.98	.93	.73	.68	.56	.50	.41	.31	.16	REL.
22	.99	.99	.99	.99	.99	.90	.53	.43	.23	.15	.09	.05	-	F.DAYS
	31	43	51	57	63	65	68	68	68	69	69	70	-	S/N..DB
	.21	.67	.98	.99	.98	.89	.52	.43	.23	.15	.09	.05	-	REL.
24	.99	.99	.99	.99	.94	.66	.08	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	66	68	-	-	-	-	-	-	S/N..DB
	.21	.67	.95	.99	.94	.66	.08	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.016
3000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
6.98N - 0.00W 20.00S - 0.00W 180.0 0.0 1618.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.99	.89	.44	.36	.20	.14	.09	.06	-	F.DAYS
	30	43	51	57	62	65	68	68	68	69	69	70	-	S/N..DB
	.19	.67	.95	.99	.98	.88	.44	.36	.20	.14	.09	.06	-	REL.
4	.99	.99	.99	.99	.73	.17	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	66	-	-	-	-	-	-	-	S/N..DB
	.19	.67	.95	.98	.73	.17	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.78	-	-	-	-	-	-	-	F.DAYS
	25	38	50	56	62	65	-	-	-	-	-	-	-	S/N..DB
	.07	.42	.94	.99	.99	.78	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.99	.99	.99	.98	.95	.90	.71	F.DAYS
	-135	-75	-18	24	47	57	63	63	64	65	65	66	67	S/N..DB
	.00	.00	.00	.06	.85	.99	.99	.99	.99	.97	.95	.90	.70	REL.
10	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.97	F.DAYS
	-265	-167	-73	3	36	49	59	59	61	62	63	64	64	S/N..DB
	.00	.00	.00	.00	.34	.92	.99	.99	.99	.99	.99	.99	.96	REL.
12	.99	.99	.99	.99	.99	.99	.99	.99	.99	.98	.94	.88	.63	F.DAYS
	-318	-203	-94	-0	35	49	59	60	62	63	63	65	65	S/N..DB
	.00	.00	.00	.00	.30	.92	.99	.99	.99	.97	.94	.87	.63	REL.
14	.99	.99	.99	.99	.99	.99	.99	.99	.97	.92	.85	.74	.46	F.DAYS
	-268	-168	-74	8	40	54	61	61	63	64	64	66	66	S/N..DB
	.00	.00	.00	.00	.51	.98	.99	.99	.96	.92	.85	.74	.46	REL.
16	.99	.99	.99	.99	.99	.99	.99	.99	.99	.98	.96	.91	.72	F.DAYS
	-136	-76	8	33	49	59	64	64	65	66	66	67	67	S/N..DB
	.00	.00	.00	.26	.91	.99	.99	.99	.99	.97	.95	.90	.72	REL.
18	.99	.99	.99	.99	.99	.99	.99	.99	.97	.95	.92	.88	.75	F.DAYS
	25	38	50	56	62	65	67	67	68	69	69	69	69	S/N..DB
	.07	.42	.94	.99	.99	.99	.99	.99	.96	.94	.91	.87	.74	REL.
20	.99	.99	.99	.99	.99	.99	.99	.98	.93	.89	.84	.77	.58	F.DAYS
	31	43	51	57	62	65	68	68	68	69	69	70	70	S/N..DB
	.19	.67	.95	.99	.99	.99	.98	.97	.93	.89	.83	.76	.58	REL.
22	.99	.99	.99	.99	.99	.99	.98	.96	.89	.84	.77	.68	.49	F.DAYS
	31	43	51	57	62	65	68	68	68	69	69	70	70	S/N..DB
	.21	.67	.95	.99	.99	.99	.97	.95	.89	.83	.76	.68	.49	REL.
24	.99	.99	.99	.99	.99	.99	.88	.82	.63	.52	.41	.31	.15	F.DAYS
	30	43	51	57	62	65	68	68	68	69	69	70	70	S/N..DB
	.19	.67	.95	.99	.99	.99	.87	.81	.62	.51	.40	.30	.15	REL.

1 DEC SSN= 120 0.016
3000 KM PATH TO 20 DEGREES S AZIMUTHS N.MILES
6.98N - 0.00W 20.00S - 0.00W 180.0 0.0 1618.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.99	.96	.64	.55	.35	.26	.18	.12	-	F.DAYS
	32	43	52	57	63	66	68	68	68	69	69	70	-	S/N..DB
	.24	.67	.96	.99	.99	.96	.64	.55	.34	.25	.18	.12	-	REL.
4	.99	.99	.99	.99	.98	.78	.16	.10	-	-	-	-	-	F.DAYS
	31	43	51	57	63	66	68	68	-	-	-	-	-	S/N..DB
	.19	.67	.95	.99	.98	.77	.16	.10	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.92	.10	-	-	-	-	-	-	F.DAYS
	-10	24	42	53	60	64	67	-	-	-	-	-	-	S/N..DB
	.00	.06	.66	.97	.99	.91	.10	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.84	.74	.47	.31	.19	.10	-	F.DAYS
	-170	-100	2	23	47	58	64	64	65	66	66	67	-	S/N..DB
	.00	.00	.00	.05	.85	.99	.83	.74	.46	.31	.19	.10	-	REL.
10	.99	.99	.99	.99	.99	.99	.72	.55	.29	.19	.11	.06	-	F.DAYS
	-307	-196	-90	5	39	54	61	62	63	64	64	66	-	S/N..DB
	.00	.00	.00	.00	.46	.98	.71	.55	.28	.19	.11	.06	-	REL.
12	.99	.99	.99	.99	.99	.89	.99	.98	.89	.79	.65	.49	.29	F.DAYS
	-359	-232	-111	-2	35	49	59	60	62	63	64	65	65	S/N..DB
	.00	.00	.00	.00	.30	.82	.99	.97	.88	.78	.65	.49	.29	REL.
14	.99	.99	.99	.99	.99	.99	.98	.96	.88	.81	.72	.61	.42	F.DAYS
	-367	-196	-90	4	38	54	61	61	63	64	64	66	66	S/N..DB
	.00	.00	.00	.00	.42	.98	.97	.96	.87	.80	.72	.61	.42	REL.
16	.99	.99	.99	.99	.99	.99	.98	.97	.89	.83	.74	.64	.44	F.DAYS
	-172	-101	4	30	48	58	64	64	65	66	66	67	67	S/N..DB
	.00	.00	.00	.17	.88	.99	.98	.96	.89	.82	.74	.63	.43	REL.
18	.99	.99	.99	.99	.99	.99	.92	.89	.80	.74	.68	.60	.45	F.DAYS
	-11	31	43	54	61	64	67	67	68	69	69	69	69	S/N..DB
	.00	.19	.71	.98	.99	.99	.92	.89	.80	.74	.67	.60	.44	REL.
20	.99	.99	.99	.99	.99	.99	.94	.91	.83	.78	.72	.65	.50	F.DAYS
	33	44	52	58	63	66	68	68	68	69	69	70	70	S/N..DB
	.24	.72	.96	.99	.99	.99	.93	.91	.83	.78	.71	.65	.50	REL.
22	.99	.99	.99	.99	.99	.99	.94	.92	.83	.77	.69	.61	.45	F.DAYS
	32	43	52	58	63	66	68	68	68	69	69	70	70	S/N..DB
	.24	.67	.98	.99	.99	.99	.94	.91	.82	.76	.69	.61	.45	REL.
24	.99	.99	.99	.99	.99	.99	.91	.88	.76	.68	.60	.51	.37	F.DAYS
	31	43	51	57	63	65	68	68	68	69	69	70	70	S/N..DB
	.21	.67	.95	.99	.99	.99	.91	.87	.76	.68	.60	.51	.36	REL.

Figure I-30

1 JUN SSN= 20 0.001
200 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
38.20S - 0.00W 40.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.57	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.57	-	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.13	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.13	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.14	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.14	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.50	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.50	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.96	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.95	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.07	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.96	.07	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.29	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.98	.29	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.87	.25	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	60	61	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.86	.25	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.45	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.44	-	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.56	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.56	-	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.48	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.48	-	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.001
200 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
38.20S - 0.00W 40.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.50	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.49	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.49	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.49	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.80	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.80	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.98	.44	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.91	.44	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.65	-	-	-	-	-	-	-	-	-	-	F.DAYS
	33	44	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.23	.72	.63	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.67	-	-	-	-	-	-	-	-	-	-	F.DAYS
	29	41	50	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.12	.56	.63	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.65	-	-	-	-	-	-	-	-	-	-	F.DAYS
	33	44	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.23	.72	.63	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.54	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.93	.54	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.54	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	57	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.54	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.97	.12	-	-	-	-	-	-	-	-	-	-	F.DAYS
	60	61	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.97	.12	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.87	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.86	.06	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.78	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	60	61	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.78	-	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.001
200 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
38.20S - 0.00W 40.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.81	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	-	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.21	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.21	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.78	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.78	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.63	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	58	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.99	.63	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.65	-	-	-	-	-	-	-	-	-	F.DAYS
	46	52	59	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.96	.99	.64	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.78	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.77	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.80	-	-	-	-	-	-	-	-	-	F.DAYS
	46	52	59	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.96	.99	.79	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.58	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	63	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.99	.99	.58	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.44	-	-	-	-	-	-	-	-	-	-	F.DAYS
	61	62	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.43	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.25	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.25	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.58	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.58	-	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.24	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.24	-	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.001
200 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
38.20S - 0.00W 40.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.88	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.87	.08	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.91	.15	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.90	.15	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.96	.59	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	49	54	57	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.95	.58	.11	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.82	.33	-	-	-	-	-	-	-	-	-	F.DAYS
	35	44	52	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	.72	.79	.33	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.82	.31	-	-	-	-	-	-	-	-	-	F.DAYS
	21	38	48	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.02	.41	.74	.31	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.87	.42	-	-	-	-	-	-	-	-	-	F.DAYS
	16	35	46	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.30	.74	.41	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.91	.40	-	-	-	-	-	-	-	-	-	F.DAYS
	21	38	47	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.02	.42	.80	.39	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.86	.24	-	-	-	-	-	-	-	-	-	F.DAYS
	35	44	52	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	.72	.83	.24	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.91	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	58	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.98	.90	.17	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.71	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	61	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.70	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.57	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.98	.57	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.98	.46	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.97	.45	-	-	-	-	-	-	-	-	-	-	REL.

Figure I-31

1 JUN SSN= 20 0.003
500 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
35.50S - 0.00W 40.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.88	.21	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.21	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.56	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.55	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.82	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.97	.07	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	59	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.97	.07	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.72	-	-	-	-	-	-	-	-	-	-	F.DAYS
	35	52	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.29	.96	.71	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.87	-	-	-	-	-	-	-	-	-	-	F.DAYS
	28	49	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.10	.90	.86	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.98	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	35	52	61	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.29	.96	.98	.12	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.85	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	59	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.85	-	-	-	-	-	-	-	-	-	-	REL.
18	.98	.73	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	62	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.73	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.82	.17	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.82	.17	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.91	.25	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.25	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.86	.17	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.86	.17	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.003
500 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
35.50S - 0.00W 40.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.92	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.91	.11	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.91	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.90	.10	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.96	.31	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	56	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.96	.31	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.84	.16	-	-	-	-	-	-	-	-	-	F.DAYS
	21	46	57	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.03	.81	.83	.16	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.34	-	-	-	-	-	-	-	-	-	F.DAYS
	1	25	53	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.05	.97	.34	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.41	-	-	-	-	-	-	-	-	-	F.DAYS
	-5	20	51	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.95	.41	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.38	-	-	-	-	-	-	-	-	-	F.DAYS
	2	25	53	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.05	.97	.38	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.94	.29	-	-	-	-	-	-	-	-	-	F.DAYS
	21	39	58	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.03	.46	.93	.29	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.96	.29	-	-	-	-	-	-	-	-	-	F.DAYS
	44	56	63	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.99	.95	.29	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.65	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.64	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.97	.46	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.97	.46	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.95	.30	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.95	.30	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.003
500 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
35.50S - 0.00W 40.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.96	.38	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.38	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.67	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.21	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.20	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.37	-	-	-	-	-	-	-	-	-	F.DAYS
	46	57	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.99	.98	.36	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	24	41	59	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.04	.56	.99	.99	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	15	35	56	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.30	.99	.99	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.05	-	-	-	-	-	-	-	-	F.DAYS
	24	47	59	66	70	-	-	-	-	-	-	-	-	S/N..DB
	.04	.85	.99	.99	.05	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.98	-	-	-	-	-	-	-	-	-	F.DAYS
	46	57	64	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.81	.99	.99	.98	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.97	.21	-	-	-	-	-	-	-	-	-	F.DAYS
	57	63	67	70	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.96	.21	-	-	-	-	-	-	-	-	-	REL.
20	.99	.89	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.89	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.95	.11	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.11	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.76	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.75	-	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.003
500 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
35.50S - 0.00W 40.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.56	.50	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.95	.49	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.97	.56	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.96	.56	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.82	.33	-	-	-	-	-	-	-	-	-	F.DAYS
	37	52	60	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.38	.96	.81	.33	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.62	-	-	-	-	-	-	-	-	-	F.DAYS
	5	28	53	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.97	.62	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.65	-	-	-	-	-	-	-	-	-	F.DAYS
	-20	10	47	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.87	.65	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.73	.07	-	-	-	-	-	-	-	-	F.DAYS
	-30	3	45	56	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.80	.73	.07	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.76	-	-	-	-	-	-	-	-	-	F.DAYS
	-20	10	47	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.87	.76	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.66	-	-	-	-	-	-	-	-	-	F.DAYS
	5	28	53	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.97	.65	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.69	-	-	-	-	-	-	-	-	-	F.DAYS
	37	53	61	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.38	.97	.99	.69	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.95	.30	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.94	.30	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.86	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	65	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.85	.14	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.81	.08	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.80	.08	-	-	-	-	-	-	-	-	-	REL.

Figure I-32

1 JUN SSN= 20 0.004
800 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
32.80S - 0.00W 40.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.98	.72	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.71	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.96	.25	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.25	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.54	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.53	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.84	-	-	-	-	-	-	-	-	-	-	F.DAYS
	40	55	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.98	.83	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.62	-	-	-	-	-	-	-	-	-	F.DAYS
	16	34	57	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.26	.99	.61	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.78	-	-	-	-	-	-	-	-	-	F.DAYS
	7	29	54	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.98	.77	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.95	-	-	-	-	-	-	-	-	-	F.DAYS
	16	34	57	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.26	.99	.95	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.77	-	-	-	-	-	-	-	-	-	F.DAYS
	40	55	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.98	.99	.76	-	-	-	-	-	-	-	-	-	REL.
18	.99	.96	.46	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.95	.46	-	-	-	-	-	-	-	-	-	-	REL.
20	.97	.66	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.65	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.76	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.75	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.65	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.65	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.004
800 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
32.80S - 0.00W 40.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.50	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.50	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.46	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.46	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.80	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	33	52	61	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.24	.96	.80	.11	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.70	-	-	-	-	-	-	-	-	-	F.DAYS
	-2	25	53	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.97	.70	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-30	1	47	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.87	.99	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-40	-5	30	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.99	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-30	1	33	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.25	.99	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.88	-	-	-	-	-	-	-	-	-	F.DAYS
	-2	25	53	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.97	.88	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.91	-	-	-	-	-	-	-	-	-	F.DAYS
	33	52	61	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.24	.96	.99	.91	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.98	.41	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.97	.41	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.86	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.86	.23	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.81	.13	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.80	.13	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.004
800 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
32.80S - 0.00W 40.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.85	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.85	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.94	.22	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.22	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.89	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.88	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.97	-	-	-	-	-	-	-	-	-	F.DAYS
	33	52	61	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.24	.96	.99	.97	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.92	-	-	-	-	-	-	-	-	F.DAYS
	0	26	53	62	70	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.97	.99	.92	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.92	-	-	-	-	-	-	-	-	F.DAYS
	-12	19	50	60	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.94	.99	.92	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.87	-	-	-	-	-	-	-	-	F.DAYS
	0	26	53	62	70	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.97	.99	.86	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.77	-	-	-	-	-	-	-	-	F.DAYS
	33	45	61	67	72	-	-	-	-	-	-	-	-	S/N..DB
	.24	.77	.99	.99	.77	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.93	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	66	70	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.93	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.44	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.44	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.78	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.77	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.31	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.31	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.004
800 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
32.80S - 0.00W 40.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.81	.15	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.81	.15	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.84	.20	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.83	.20	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.67	.06	-	-	-	-	-	-	-	-	F.DAYS
	22	38	59	65	70	-	-	-	-	-	-	-	-	S/N..DB
	.04	.42	.99	.66	.06	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.26	-	-	-	-	-	-	-	-	F.DAYS
	-24	13	49	59	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.92	.99	.26	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.28	-	-	-	-	-	-	-	-	F.DAYS
	-62	-20	23	53	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.04	.97	.28	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.37	-	-	-	-	-	-	-	-	F.DAYS
	-77	-30	19	51	64	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.01	.95	.37	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.29	-	-	-	-	-	-	-	-	F.DAYS
	-62	-20	24	54	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.05	.98	.28	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.18	-	-	-	-	-	-	-	-	F.DAYS
	-24	13	49	59	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.92	.99	.18	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.97	.15	-	-	-	-	-	-	-	-	F.DAYS
	22	39	59	65	70	-	-	-	-	-	-	-	-	S/N..DB
	.04	.46	.99	.97	.15	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.84	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.99	.83	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.98	.69	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.97	.69	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.97	.63	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.96	.63	-	-	-	-	-	-	-	-	-	REL.

Figure I-33

1 JUN SSN= 20 0.005
1000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
31.01S - 0.00W 40.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.90	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.89	.14	-	-	-	-	-	-	-	-	-	-	REL.
4	.97	.56	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.56	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.88	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.88	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	35	46	60	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	.81	.99	.44	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	5	31	46	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.17	.84	.99	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-6	25	43	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.05	.71	.99	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.12	-	-	-	-	-	-	-	-	F.DAYS
	5	31	54	61	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.17	.98	.99	.12	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	35	46	60	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	.81	.99	.98	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.76	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	51	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.98	.75	.17	-	-	-	-	-	-	-	-	-	REL.
20	.99	.86	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.85	.14	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.93	.19	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.92	.19	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.88	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.87	.11	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.005
1000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
31.01S - 0.00W 40.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.85	.18	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.84	.18	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.80	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.79	.14	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.43	-	-	-	-	-	-	-	-	-	F.DAYS
	26	42	59	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	.61	.99	.42	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.06	-	-	-	-	-	-	-	-	F.DAYS
	-15	22	40	59	68	-	-	-	-	-	-	-	-	S/N..DB
	.00	.04	.54	.99	.06	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.16	-	-	-	-	-	-	-	-	F.DAYS
	-48	-11	31	55	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.19	.98	.16	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.30	-	-	-	-	-	-	-	-	F.DAYS
	-61	-20	27	52	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.09	.96	.30	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.28	-	-	-	-	-	-	-	-	F.DAYS
	-48	-11	30	54	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.98	.28	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.23	-	-	-	-	-	-	-	-	F.DAYS
	-15	11	40	59	68	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.54	.99	.22	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.23	-	-	-	-	-	-	-	-	F.DAYS
	26	42	59	65	71	-	-	-	-	-	-	-	-	S/N..DB
	.08	.62	.99	.98	.23	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.81	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.80	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.96	.59	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.95	.59	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.94	.48	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.93	.48	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.005
1000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
31.01S - 0.00W 40.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.96	.19	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.95	.18	-	-	-	-	-	-	-	-	-	-	REL.
4	.98	.60	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.59	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.98	.09	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.35	-	-	-	-	-	-	-	-	F.DAYS
	24	40	58	65	71	-	-	-	-	-	-	-	-	S/N..DB
	.06	.50	.99	.99	.35	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.37	-	-	-	-	-	-	-	F.DAYS
	-14	12	40	58	68	72	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.54	.99	.99	.37	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.31	-	-	-	-	-	-	-	F.DAYS
	-29	1	35	56	67	71	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.33	.99	.99	.31	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.30	-	-	-	-	-	-	-	F.DAYS
	-14	12	40	59	68	72	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.54	.99	.98	.30	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.97	.15	-	-	-	-	-	-	-	F.DAYS
	24	40	58	65	71	73	-	-	-	-	-	-	-	S/N..DB
	.06	.50	.99	.99	.97	.15	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.19	-	-	-	-	-	-	-	-	F.DAYS
	51	58	64	69	72	-	-	-	-	-	-	-	-	S/N..DB
	.94	.99	.99	.99	.19	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.88	.05	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.88	.05	-	-	-	-	-	-	-	-	-	REL.
22	.99	.97	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.96	.06	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.74	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.73	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.005
1000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
31.01S - 0.00W 40.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.92	.52	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.91	.52	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.93	.56	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.92	.55	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.83	.18	-	-	-	-	-	-	-	-	F.DAYS
	14	36	56	63	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.35	.99	.83	.18	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.47	.06	-	-	-	-	-	-	-	F.DAYS
	-41	-6	33	56	66	70	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.27	.99	.47	.06	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.52	.06	-	-	-	-	-	-	-	F.DAYS
	-87	-38	20	50	63	69	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.02	.93	.52	.06	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.11	-	-	-	-	-	-	-	F.DAYS
	104	-50	15	48	62	68	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.88	.99	.11	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.61	-	-	-	-	-	-	-	-	F.DAYS
	-87	-38	21	50	63	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.02	.93	.60	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.50	-	-	-	-	-	-	-	-	F.DAYS
	-41	-6	33	56	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.27	.99	.50	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.53	-	-	-	-	-	-	-	-	F.DAYS
	14	36	56	63	69	-	-	-	-	-	-	-	-	S/N..DB
	.00	.35	.99	.99	.53	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.97	.11	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	71	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.96	.11	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.88	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.88	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.85	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.99	.85	-	-	-	-	-	-	-	-	-	REL.

Figure I-34

1 JUN SSN= 20 0.011
2000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
22.01S - 0.00W 40.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.89	.49	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.88	.48	-	-	-	-	-	-	-	-	-	REL.
4	.99	.96	.59	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.87	.59	.12	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.97	.27	-	-	-	-	-	-	-	-	-	F.DAYS
	41	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.55	.90	.96	.26	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.84	-	-	-	-	-	-	-	-	F.DAYS
	10	27	45	54	64	-	-	-	-	-	-	-	-	S/N..DB
	.00	.10	.80	.98	.83	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.53	-	-	-	-	-	-	-	F.DAYS
	-32	-2	25	44	60	66	-	-	-	-	-	-	-	S/N..DB
12	.99	.99	.99	.99	.99	.59	-	-	-	-	-	-	-	F.DAYS
	-49	-14	18	40	58	65	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.01	.52	.99	.59	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.79	-	-	-	-	-	-	-	F.DAYS
	-32	-2	25	44	60	65	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.06	.73	.99	.79	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.59	-	-	-	-	-	-	-	F.DAYS
	10	27	44	54	64	68	-	-	-	-	-	-	-	S/N..DB
	.00	.10	.76	.98	.99	.58	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.95	.37	-	-	-	-	-	-	-	-	F.DAYS
	41	48	56	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.55	.88	.99	.94	.37	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.92	.47	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.91	.46	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.96	.53	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.96	.53	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.92	.40	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.92	.39	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.011
2000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
22.01S - 0.00W 40.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.96	.29	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.95	.29	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.91	.19	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.91	.19	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.49	-	-	-	-	-	-	-	-	F.DAYS
	9	27	46	57	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.10	.84	.99	.49	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.41	-	-	-	-	-	-	-	F.DAYS
	-50	-15	20	42	59	65	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.03	.63	.99	.40	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.60	-	-	-	-	-	-	-	F.DAYS
	-99	-49	3	33	55	63	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.24	.98	.59	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	.18	.11	-	-	-	-	-	F.DAYS
	-117	-62	-4	28	50	61	67	67	-	-	-	-	-	S/N..DB
	.00	.00	.00	.11	.93	.99	.18	.11	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.85	.20	.12	-	-	-	-	-	F.DAYS
	-99	-49	1	31	52	62	68	68	-	-	-	-	-	S/N..DB
	.00	.00	.00	.18	.96	.85	.20	.12	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.81	.15	.09	-	-	-	-	-	F.DAYS
	-50	-15	19	41	59	65	69	69	-	-	-	-	-	S/N..DB
	.00	.00	.02	.57	.99	.81	.15	.09	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.98	.76	.12	.07	-	-	-	-	-	F.DAYS
	9	26	45	57	64	68	71	71	-	-	-	-	-	S/N..DB
	.00	.08	.80	.99	.98	.75	.11	.07	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.87	.25	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.99	.86	.24	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.75	.09	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.99	.75	.09	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.63	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.98	.63	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.011
2000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
22.01S - 0.00W 40.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.95	.66	-	-	-	-	-	-	-	-	-	F.DAYS
	42	50	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.93	.95	.66	-	-	-	-	-	-	-	-	-	REL.
4	.99	.98	.65	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	42	50	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.91	.64	.11	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.71	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.71	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.98	.14	.06	-	-	-	-	-	F.DAYS
	-5	17	40	51	63	67	70	70	-	-	-	-	-	S/N..DB
	.00	.01	.54	.95	.99	.97	.14	.06	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.99	.96	.80	.64	.44	.25	-	F.DAYS
	-62	-23	13	37	53	63	68	68	69	70	70	71	-	S/N..DB
	.00	.00	.00	.39	.97	.99	.98	.96	.79	.63	.44	.25	-	REL.
12	.99	.99	.99	.99	.99	.99	.96	.90	.62	.41	.22	.09	-	F.DAYS
	-84	-39	5	33	52	62	68	68	69	70	70	71	-	S/N..DB
	.00	.00	.00	.24	.96	.99	.95	.90	.61	.41	.21	.09	-	REL.
14	.99	.99	.99	.99	.99	.99	.90	.82	.53	.35	.20	.10	-	F.DAYS
	-62	-23	14	38	58	64	69	69	70	71	70	71	-	S/N..DB
	.00	.00	.00	.43	.99	.99	.90	.82	.53	.35	.20	.10	-	REL.
16	.99	.99	.99	.99	.99	.99	.88	.79	.47	.30	.16	.07	-	F.DAYS
	-5	17	40	51	63	67	70	70	71	72	72	73	-	S/N..DB
	.00	.01	.54	.95	.99	.99	.88	.78	.47	.29	.16	.07	-	REL.
18	.99	.99	.99	.99	.99	.84	-	-	-	-	-	-	-	F.DAYS
	41	49	56	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.55	.90	.99	.99	.99	.83	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.35	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.99	.34	-	-	-	-	-	-	-	-	REL.
22	42	50	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.93	.98	.70	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.88	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	42	50	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.93	.88	.23	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.011
2000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
22.01S - 0.00W 40.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.1KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.98	.62	-	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.61	.93	.99	.97	.62	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.97	.60	-	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.61	.93	.99	.97	.59	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.93	.39	-	-	-	-	-	-	-	F.DAYS
	-5	19	41	55	63	68	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.60	.98	.93	.39	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.84	.22	.16	.06	-	-	-	-	F.DAYS
	-87	-41	8	35	56	63	68	68	69	-	-	-	-	S/N..DB
	.00	.00	.00	.32	.99	.83	.22	.16	.06	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.25	.17	.06	-	-	-	-	F.DAYS
	-153	-87	-13	23	47	59	66	66	68	-	-	-	-	S/N..DB
	.00	.00	.00	.04	.85	.99	.25	.17	.05	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	.44	.34	.15	.09	.05	-	-	F.DAYS
	-178	-105	-21	19	44	58	66	66	67	68	68	-	-	S/N..DB
	.00	.00	.00	.01	.73	.99	.44	.33	.15	.09	.05	-	-	REL.
14	.99	.99	.99	.99	.99	.99	.36	.25	.08	-	-	-	-	F.DAYS
	-153	-87	-12	24	47	60	66	67	68	-	-	-	-	S/N..DB
16	.99	.99	.99	.99	.99	.87	.25	.16	-	-	-	-	-	F.DAYS
	-87	-41	8	36	56	63	68	68	-	-	-	-	-	S/N..DB
	.00	.00	.00	.36	.99	.86	.25	.15	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.92	.23	.13	-	-	-	-	-	F.DAYS
	-5	18	41	52	63	67	70	70	-	-	-	-	-	S/N..DB
	.00	.01	.60	.96	.99	.91	.23	.13	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.98	.62	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.93	.99	.99	.98	.61	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.95	.47	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	67	69	-	-	-	-	-	-	-	S/N..DB
	.61	.93	.99	.99	.95	.47	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.94	.38	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	67	70	-	-	-	-	-	-	-	S/N..DB
	.61	.93	.99	.99	.93	.38	-	-	-	-	-	-	-	REL.

Figure I-35

1 JUN SSN= 20 0.016
3000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
13.02S - 0.00W 40.00S - 0.00W 180.0 0.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.96	.77	.12	-	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.21	.67	.92	.76	.12	-	-	-	-	-	-	-	-	REL.
4	.98	.99	.81	.33	-	-	-	-	-	-	-	-	-	F.DAYS
	31	43	52	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.18	.66	.78	.33	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.85	-	-	-	-	-	-	-	-	-	F.DAYS
	29	42	51	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.14	.62	.95	.84	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.67	-	-	-	-	-	-	-	F.DAYS
	-39	-8	29	44	57	62	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.16	.73	.99	.66	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.83	.92	.29	.19	.05	-	-	-	-	F.DAYS
	-121	-65	-12	26	49	58	63	63	64	-	-	-	-	S/N..DB
	.00	.00	.00	.07	.76	.91	.29	.19	.05	-	-	-	-	REL.
12	.99	.99	.99	.99	.92	.93	.33	.22	.07	-	-	-	-	F.DAYS
	-153	-88	-26	21	46	57	63	63	64	-	-	-	-	S/N..DB
	.00	.00	.00	.02	.75	.92	.33	.22	.07	-	-	-	-	REL.
14	.99	.99	.99	.99	.95	.98	.50	.36	.13	.07	-	-	-	F.DAYS
	-121	-66	-12	27	49	58	64	64	65	65	-	-	-	S/N..DB
	.00	.00	.00	.09	.87	.98	.50	.36	.13	.06	-	-	-	REL.
16	.99	.99	.99	.99	.99	.96	.29	.18	-	-	-	-	-	F.DAYS
	-39	-8	28	44	56	62	66	66	-	-	-	-	-	S/N..DB
	.00	.00	.14	.73	.99	.95	.29	.18	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.78	.23	-	-	-	-	-	-	-	F.DAYS
	29	42	49	56	62	65	-	-	-	-	-	-	-	S/N..DB
	.14	.62	.92	.99	.78	.23	-	-	-	-	-	-	-	REL.
20	.99	.99	.98	.81	.11	-	-	-	-	-	-	-	-	F.DAYS
	30	43	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.16	.67	.94	.80	.11	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.87	.13	-	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.21	.67	.95	.86	.13	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.76	.06	-	-	-	-	-	-	-	-	F.DAYS
	31	43	51	58	63	-	-	-	-	-	-	-	-	S/N..DB
	.21	.67	.95	.75	.06	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.016
3000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
13.02S - 0.00W 40.00S - 0.00W 180.0 0.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.71	.16	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	66	-	-	-	-	-	-	-	S/N..DB
	.21	.67	.95	.99	.71	.16	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.98	.43	-	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.19	.67	.95	.98	.43	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.89	.80	.14	-	-	-	-	-	-	-	F.DAYS
	-23	20	39	49	60	64	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.49	.81	.80	.14	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.62	.81	.17	.10	-	-	-	-	-	F.DAYS
	-136	-76	9	28	50	59	64	64	-	-	-	-	-	S/N..DB
	.00	.00	.00	.13	.58	.81	.17	.09	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.92	.41	.31	.14	.08	-	-	-	F.DAYS
	-228	-140	-57	14	43	56	62	62	64	65	-	-	-	S/N..DB
	.00	.00	.00	.00	.68	.92	.41	.31	.14	.08	-	-	-	REL.
12	.99	.99	.99	.99	.99	.50	.76	.68	.48	.38	.28	.20	.09	F.DAYS
	-262	-165	-72	5	38	52	60	61	63	64	64	65	65	S/N..DB
	.00	.00	.00	.00	.42	.48	.75	.67	.47	.37	.28	.20	.09	REL.
14	.99	.99	.99	.99	.99	.58	.81	.74	.55	.44	.34	.25	.11	F.DAYS
	-267	-140	-57	11	41	53	61	62	63	65	65	66	66	S/N..DB
	.00	.00	.00	.00	.57	.57	.81	.74	.54	.44	.34	.25	.11	REL.
16	.99	.99	.99	.99	.96	.99	.75	.67	.46	.35	.26	.18	.07	F.DAYS
	-136	-76	-18	26	49	58	64	64	65	66	66	67	67	S/N..DB
	.00	.00	.00	.09	.88	.98	.75	.67	.45	.35	.25	.17	.07	REL.
18	.99	.99	.99	.99	.99	.97	.93	.53	.32	.23	.15	.10	-	F.DAYS
	-23	19	39	48	59	63	67	67	67	68	68	69	-	S/N..DB
	.00	.02	.49	.89	.99	.96	.62	.53	.32	.23	.15	.10	-	REL.
20	.99	.99	.99	.99	.99	.81	.17	.11	-	-	-	-	-	F.DAYS
	31	43	51	57	63	66	68	68	-	-	-	-	-	S/N..DB
	.19	.67	.95	.99	.98	.81	.17	.10	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.97	.68	.05	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	66	68	-	-	-	-	-	-	S/N..DB
	.21	.67	.95	.99	.96	.68	.05	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.93	.45	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	66	-	-	-	-	-	-	-	S/N..DB
	.21	.67	.95	.99	.92	.45	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.016
3000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
13.02S - 0.00W 40.00S - 0.00W 180.0 0.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.92	.32	-	-	-	-	-	-	-	-	F.DAYS
	31	43	52	58	63	-	-	-	-	-	-	-	-	S/N..DB
	.21	.67	.96	.92	.31	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.90	.46	-	-	-	-	-	-	-	-	-	F.DAYS
	32	43	52	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.21	.67	.87	.46	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.10	-	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.19	.67	.95	.99	.10	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.94	.87	.59	.42	.27	.15	-	F.DAYS
	-71	-30	20	40	55	60	65	65	66	67	67	68	-	S/N..DB
	.00	.00	.03	.52	.98	.99	.93	.87	.59	.42	.26	.15	-	REL.
10	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.98	.96	.84	F.DAYS
	-181	-107	-37	14	42	55	61	62	63	63	63	65	65	S/N..DB
	.00	.00	.00	.00	.62	.99	.99	.99	.99	.99	.98	.96	.83	REL.
12	.99	.99	.99	.99	.99	.99	.99	.99	.99	.97	.93	.86	.60	F.DAYS
	-224	-138	-56	9	40	55	61	61	62	64	64	65	66	S/N..DB
	.00	.00	.00	.00	.51	.99	.99	.99	.99	.97	.93	.86	.60	REL.
14	.99	.99	.99	.99	.99	.99	.99	.99	.97	.93	.87	.77	.52	F.DAYS
	-182	-108	-38	18	44	56	62	62	64	65	65	66	67	S/N..DB
	.00	.00	.00	.01	.73	.99	.99	.99	.96	.92	.86	.77	.51	REL.
16	.99	.99	.99	.99	.99	.99	.99	.99	.97	.93	.87	.78	.53	F.DAYS
	-71	-30	21	40	55	60	65	65	66	67	67	68	68	S/N..DB
	.00	.00	.03	.52	.98	.99	.99	.99	.96	.93	.87	.78	.52	REL.
18	.99	.99	.99	.99	.99	.99	.69	.56	.25	.14	.06	-	-	F.DAYS
	29	42	50	56	62	65	68	68	68	69	69	-	-	S/N..DB
	.14	.62	.94	.99	.99	.99	.69	.56	.25	.14	.06	-	-	REL.
20	.99	.99	.99	.99	.98	.33	-	-	-	-	-	-	-	F.DAYS
	30	43	51	57	63	.66	-	-	-	-	-	-	-	S/N..DB
	.16	.67	.95	.99	.97	.33	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.48	-	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.21	.67	.95	.99	.48	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.88	.06	-	-	-	-	-	-	-	-	F.DAYS
	32	43	52	58	63	-	-	-	-	-	-	-	-	S/N..DB
	.24	.67	.96	.87	.06	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.016
3000 KM PATH TO 40 DEGREES S AZIMUTHS N.MILES
13.02S - 0.00W 40.00S - 0.00W 180.0 0.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.92	.54	-	-	-	-	-	-	-	F.DAYS
	32	43	52	58	63	66	-	-	-	-	-	-	-	S/N..DB
	.24	.67	.96	.99	.92	.54	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.89	.38	-	-	-	-	-	-	-	F.DAYS
	32	43	52	58	63	66	-	-	-	-	-	-	-	S/N..DB
	.21	.67	.96	.99	.88	.38	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.84	.23	.16	.07	-	-	-	-	F.DAYS
	-49	-15	35	45	58	63	67	66	67	-	-	-	-	S/N..DB
	.00	.00	.34	.78	.99	.84	.23	.16	.07	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.99	.72	.62	.42	.34	.27	.20	.10	F.DAYS
	-201	-122	-46	18	45	57	63	63	64	65	66	67	67	S/N..DB
	.00	.00	.00	.01	.77	.98	.72	.62	.42	.34	.26	.20	.10	REL.
10	.99	.99	.99	.99	.99	.50	.79	.71	.51	.41	.31	.23	.10	F.DAYS
	-326	-209	-98	-0	35	51	60	60	62	63	64	65	65	S/N..DB
	.00	.00	.00	.00	.30	.48	.78	.71	.51	.40	.31	.23	.10	REL.
12	.99	.99	.99	.99	.99	.76	.92	.88	.76	.68	.58	.49	.31	F.DAYS
	-373	-242	-117	-6	32	48	59	59	61	62	63	64	65	S/N..DB
	.00	.00	.00	.00	.20	.69	.91	.88	.75	.67	.58	.49	.31	REL.
14	.99	.99	.99	.99	.99	.72	.89	.85	.72	.64	.55	.46	.26	F.DAYS
	-325	-209	-98	0	36	50	60	60	62	63	64	65	65	S/N..DB
	.00	.00	.00	.00	.34	.68	.88	.84	.71	.64	.55	.46	.26	REL.
16	.99	.99	.99	.99	.99	.99	.84	.79	.63	.54	.44	.33	.15	F.DAYS
	-201	-122	-46	19	45	57	63	63	64	66	66	67	67	S/N..DB
	.00	.00	.00	.02	.77	.98	.84	.78	.63	.54	.43	.32	.15	REL.
18	.99	.99	.99	.99	.99	.99	.87	.81	.61	.50	.37	.25	.09	F.DAYS
	-49	-15	34	45	58	62	66	66	67	68	68	69	69	S/N..DB
	.00	.00	.30	.78	.99	.99	.87	.80	.61	.50	.37	.25	.09	REL.
20	.99	.99	.99	.99	.99	.97	.54	.41	.16	.08	-	-	-	F.DAYS
	32	43	52	57	63	66	68	68	68	69	-	-	-	S/N..DB
	.21	.67	.96	.99	.99	.97	.54	.41	.16	.08	-	-	-	REL.
22	.99	.99	.99	.99	.99	.94	.42	.30	.10	-	-	-	-	F.DAYS
	32	43	52	58	63	66	68	68	68	-	-	-	-	S/N..DB
	.24	.67	.96	.99	.99	.93	.42	.29	.10	-	-	-	-	REL.
24	.99	.99	.99	.99	.99	.91	.29	.18	-	-	-	-	-	F.DAYS
	32	43	52	57	63	66	68	68	-	-	-	-	-	S/N..DB
	.24	.67	.96	.99	.99	.90	.29	.18	-	-	-	-	-	REL.

Figure I-36

1 JUN SSN= 20 0.001
200 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
58.20S - 0.00W 60.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.45	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.45	-	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.43	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.42	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.43	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.43	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.87	.23	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.23	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.98	.61	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.61	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.76	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.76	-	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.87	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.87	-	-	-	-	-	-	-	-	-	-	-	REL.
16	.98	.57	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.57	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.68	.13	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.67	.13	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.34	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.33	-	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.29	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.29	-	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.37	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.37	-	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.001
200 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
58.20S - 0.00W 60.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.78	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.78	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.91	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.90	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.97	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	54	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.94	.14	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.39	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	49	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.68	.85	.37	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.33	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	45	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.39	.73	.31	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.98	.24	-	-	-	-	-	-	-	-	-	-	F.DAYS
	35	43	50	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.33	.64	.22	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.98	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	44	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.41	.69	.09	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.97	.05	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	46	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.54	.72	.05	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.93	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.74	.82	.09	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.85	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.81	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.95	.71	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.69	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.96	.74	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.73	-	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.001
200 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
58.20S - 0.00W 60.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.69	.06	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.68	.06	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.64	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.63	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.86	.17	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.17	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.93	.21	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.92	.21	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.82	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	61	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.99	.81	.14	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.91	.35	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	61	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.98	.91	.35	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.93	.47	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	62	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.99	.93	.47	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.80	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	61	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.99	.80	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.92	.17	-	-	-	-	-	-	-	-	-	-	F.DAYS
	59	60	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.99	.91	.17	-	-	-	-	-	-	-	-	-	-	REL.
20	.82	.14	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.80	.14	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.31	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	-	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.34	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.34	-	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.001
200 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
58.20S - 0.00W 60.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.93	.29	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	58	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.92	.29	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.96	.49	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	56	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.94	.48	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.97	.66	.13	-	-	-	-	-	-	-	-	-	F.DAYS
	47	50	54	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.82	.88	.64	.13	-	-	-	-	-	-	-	-	-	REL.
8	.99	.98	.72	.19	-	-	-	-	-	-	-	-	-	F.DAYS
	36	44	50	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.38	.67	.65	.18	-	-	-	-	-	-	-	-	-	REL.
10	.99	.98	.65	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	27	39	47	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.12	.46	.55	.07	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.62	.05	-	-	-	-	-	-	-	-	-	F.DAYS
	24	39	46	52	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	.46	.50	.05	-	-	-	-	-	-	-	-	-	REL.
14	.99	.98	.55	-	-	-	-	-	-	-	-	-	-	F.DAYS
	27	38	46	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.16	.43	.45	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.98	.50	-	-	-	-	-	-	-	-	-	-	F.DAYS
	33	41	47	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.29	.53	.40	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.57	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	47	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.77	.52	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.97	.43	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	53	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.91	.41	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.94	.28	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	56	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.91	.27	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.94	.33	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	56	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.92	.32	-	-	-	-	-	-	-	-	-	-	REL.

Figure I-37

1 JUN SSN= 20 0.003
500 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
55.50S - 0.00W 60.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.80	.17	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.17	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.78	.15	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.77	.15	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.85	.20	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.20	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.72	.05	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.71	.05	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.95	.19	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	60	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.94	.19	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.98	.42	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	58	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.97	.42	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.61	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	60	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.60	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.96	.19	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.95	.19	-	-	-	-	-	-	-	-	-	-	REL.
18	.91	.51	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.50	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.72	.17	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.71	.17	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.68	.13	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	60	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.67	.13	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.73	.17	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.16	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.003
500 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
55.50S - 0.00W 60.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.98	.21	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	60	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.97	.20	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.40	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.40	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.70	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	53	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.47	.96	.70	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.87	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	23	46	57	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	.78	.87	.11	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.87	.10	-	-	-	-	-	-	-	-	-	F.DAYS
	11	31	54	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.20	.85	.10	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.05	-	-	-	-	-	-	-	-	-	F.DAYS
	6	28	52	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.13	.95	.05	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.73	-	-	-	-	-	-	-	-	-	-	F.DAYS
	11	31	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.22	.70	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.66	-	-	-	-	-	-	-	-	-	-	F.DAYS
	21	44	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.05	.68	.65	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.68	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	51	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.90	.67	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.98	.38	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	56	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.96	.38	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.89	.27	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.88	.27	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.91	.36	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.90	.36	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.003
500 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
55.50S - 0.00W 60.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.90	.29	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.29	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.87	.23	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.85	.23	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.97	.52	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	56	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.51	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.67	.09	-	-	-	-	-	-	-	-	-	F.DAYS
	54	60	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.99	.66	.09	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.98	.69	-	-	-	-	-	-	-	-	-	F.DAYS
	50	58	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.99	.97	.68	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.84	-	-	-	-	-	-	-	-	-	F.DAYS
	44	56	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.70	.98	.99	.83	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.88	-	-	-	-	-	-	-	-	-	F.DAYS
	50	58	65	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.99	.99	.87	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.97	.69	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	66	69	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.99	.97	.68	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.64	.09	-	-	-	-	-	-	-	-	-	F.DAYS
	56	61	65	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.98	.99	.64	.09	-	-	-	-	-	-	-	-	-	REL.
20	.98	.51	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.51	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.66	.07	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.07	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.65	.07	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	64	.07	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.003
500 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
55.50S - 0.00W 60.00S - 0.00W 180.0 0.0 270.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.97	.63	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	59	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.97	.97	.63	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.75	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.97	.74	.11	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.85	.39	-	-	-	-	-	-	-	-	-	F.DAYS
	30	49	58	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.23	.89	.85	.39	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.50	-	-	-	-	-	-	-	-	-	F.DAYS
	9	30	53	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.21	.96	.50	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.41	-	-	-	-	-	-	-	-	-	F.DAYS
	-7	18	49	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.90	.41	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.35	-	-	-	-	-	-	-	-	-	F.DAYS
	-13	14	47	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.85	.34	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.25	-	-	-	-	-	-	-	-	-	F.DAYS
	-7	18	49	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.03	.90	.24	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.20	-	-	-	-	-	-	-	-	-	F.DAYS
	7	28	51	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.15	.92	.20	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.88	.28	-	-	-	-	-	-	-	-	-	F.DAYS
	28	47	56	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.15	.80	.86	.28	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.78	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	60	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.95	.78	.14	-	-	-	-	-	-	-	-	-	REL.
22	.99	.98	.67	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	61	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.98	.66	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.98	.70	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.98	.69	-	-	-	-	-	-	-	-	-	-	REL.

Figure I-38

1 JUN SSN= 20 0.004
800 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
52.80S - 0.00W 60.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.96	.63	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.62	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.95	.59	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.58	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.98	.67	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.67	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.97	.42	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.96	.42	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.83	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	42	56	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.60	.98	.83	.12	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.91	.31	-	-	-	-	-	-	-	-	-	F.DAYS
	37	54	62	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.38	.96	.91	.31	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.97	.54	-	-	-	-	-	-	-	-	-	F.DAYS
	42	56	63	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.98	.96	.53	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.86	.15	-	-	-	-	-	-	-	-	-	F.DAYS
	53	59	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.85	.15	-	-	-	-	-	-	-	-	-	REL.
18	.98	.86	.28	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	59	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.86	.28	-	-	-	-	-	-	-	-	-	-	REL.
20	.93	.58	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.58	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.92	.51	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.51	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.93	.55	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.55	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.004
800 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
52.80S - 0.00W 60.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.80	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.99	.79	.07	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.90	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	63	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.98	.89	.17	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.46	-	-	-	-	-	-	-	-	-	F.DAYS
	25	40	58	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.14	.50	.99	.46	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.75	-	-	-	-	-	-	-	-	-	F.DAYS
	1	25	52	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.12	.94	.74	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-16	16	49	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.90	.99	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-23	5	47	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.85	.99	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-17	16	49	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.90	.99	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	-6	24	51	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.09	.92	.45	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.55	-	-	-	-	-	-	-	-	-	F.DAYS
	23	38	56	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.07	.43	.97	.54	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.87	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.95	.87	.17	-	-	-	-	-	-	-	-	-	REL.
22	.99	.97	.72	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.96	.71	.11	-	-	-	-	-	-	-	-	-	REL.
24	.99	.97	.76	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	63	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.96	.75	.17	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.004
800 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
52.80S - 0.00W 60.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.98	.71	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.71	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.97	.64	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.64	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.90	.15	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	59	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.96	.89	.15	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.96	.53	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.99	.95	.52	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.96	.29	-	-	-	-	-	-	-	-	F.DAYS
	35	53	61	67	71	-	-	-	-	-	-	-	-	S/N..DB
	.31	.95	.99	.96	.28	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.98	.53	-	-	-	-	-	-	-	-	F.DAYS
	28	43	60	66	71	-	-	-	-	-	-	-	-	S/N..DB
	.12	.65	.99	.98	.52	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.62	-	-	-	-	-	-	-	-	F.DAYS
	35	53	61	67	72	-	-	-	-	-	-	-	-	S/N..DB
	.30	.96	.99	.98	.62	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.96	.21	-	-	-	-	-	-	-	-	F.DAYS
	53	59	65	69	72	-	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.99	.95	.21	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.97	.53	-	-	-	-	-	-	-	-	-	F.DAYS
	53	59	64	68	-	-	-	-	-	-	-	-	-	S/N..DB
	.95	.99	.96	.53	-	-	-	-	-	-	-	-	-	REL.
20	.99	.93	.21	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.93	.21	-	-	-	-	-	-	-	-	-	-	REL.
22	.92	.39	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.39	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.90	.35	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.35	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.004
800 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
52.80S - 0.00W 60.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.87	.36	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.99	.87	.36	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.92	.54	-	-	-	-	-	-	-	-	-	F.DAYS
	49	54	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.97	.92	.53	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.73	.06	-	-	-	-	-	-	-	-	F.DAYS
	12	31	55	62	68	-	-	-	-	-	-	-	-	S/N..DB
	.02	.26	.98	.72	.06	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.13	-	-	-	-	-	-	-	-	F.DAYS
	-19	15	48	58	66	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.87	.99	.13	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.06	-	-	-	-	-	-	-	-	F.DAYS
	-44	-8	28	54	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.14	.97	.06	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-53	-15	25	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.09	.97	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-44	-8	44	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.74	.97	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-21	13	47	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.82	.97	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.76	-	-	-	-	-	-	-	-	-	F.DAYS
	10	29	53	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.18	.95	.76	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.96	.58	-	-	-	-	-	-	-	-	-	F.DAYS
	38	52	59	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.44	.93	.96	.58	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.91	.44	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	62	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.98	.90	.43	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.92	.51	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	62	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.98	.92	.50	-	-	-	-	-	-	-	-	-	REL.

Figure I-39

1 JUN SSN= 20 0.00S
1000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
51.01S - 0.00W 60.00S - 0.00W 180.0 0.0 539.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.83	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.83	.13	-	-	-	-	-	-	-	-	-	-	REL.
4	.98	.80	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.80	.10	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.89	.17	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.88	.17	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.75	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.98	.74	.17	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.96	.56	-	-	-	-	-	-	-	-	-	F.DAYS
	37	47	61	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.38	.82	.95	.56	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.72	-	-	-	-	-	-	-	-	-	F.DAYS
	29	43	59	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.14	.65	.99	.72	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.86	-	-	-	-	-	-	-	-	-	F.DAYS
	37	47	61	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.37	.84	.99	.86	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.97	.58	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	63	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.98	.97	.58	-	-	-	-	-	-	-	-	-	REL.
18	.99	.95	.54	.09	-	-	-	-	-	-	-	-	-	F.DAYS
	50	57	63	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.93	.54	.09	-	-	-	-	-	-	-	-	-	REL.
20	.97	.79	.17	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	57	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.78	.17	-	-	-	-	-	-	-	-	-	-	REL.
22	.97	.76	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.75	.13	-	-	-	-	-	-	-	-	-	-	REL.
24	.97	.77	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.77	.14	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.00S
1000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
51.01S - 0.00W 60.00S - 0.00W 180.0 0.0 539.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.96	.34	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.98	.95	.34	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.98	.52	-	-	-	-	-	-	-	-	-	F.DAYS
	42	55	61	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.60	.98	.97	.52	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.80	-	-	-	-	-	-	-	-	-	F.DAYS
	17	36	56	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.05	.39	.99	.79	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-11	23	40	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.09	.54	.99	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-33	-1	34	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.31	.97	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-41	-7	32	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.25	.97	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-33	-1	34	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.33	.97	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-13	21	38	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.05	.46	.97	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.84	-	-	-	-	-	-	-	-	-	F.DAYS
	15	34	53	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.31	.95	.84	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.97	.57	-	-	-	-	-	-	-	-	-	F.DAYS
	40	53	60	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.94	.96	.57	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.86	.43	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.96	.85	.43	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.88	.52	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.96	.88	.51	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.00S
1000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
51.01S - 0.00W 60.00S - 0.00W 180.0 0.0 539.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.88	.16	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.87	.16	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.83	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.83	.10	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.97	.38	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.97	.38	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.83	.07	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	66	70	-	-	-	-	-	-	-	-	S/N..DB
	.90	.98	.99	.83	.07	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.67	-	-	-	-	-	-	-	-	F.DAYS
	27	42	59	65	71	-	-	-	-	-	-	-	-	S/N..DB
	.10	.60	.99	.99	.67	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.82	.15	-	-	-	-	-	-	-	F.DAYS
	18	38	57	64	70	73	-	-	-	-	-	-	-	S/N..DB
	.01	.42	.99	.99	.82	.15	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.86	.13	-	-	-	-	-	-	-	F.DAYS
	27	42	59	65	71	73	-	-	-	-	-	-	-	S/N..DB
	.08	.61	.99	.99	.86	.13	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.69	-	-	-	-	-	-	-	-	F.DAYS
	47	57	63	68	71	-	-	-	-	-	-	-	-	S/N..DB
	.82	.98	.99	.99	.68	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.86	.09	-	-	-	-	-	-	-	-	F.DAYS
	50	57	63	67	71	-	-	-	-	-	-	-	-	S/N..DB
	.90	.98	.99	.85	.09	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.47	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	57	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.98	.47	-	-	-	-	-	-	-	-	-	-	REL.
22	.97	.66	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.65	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.96	.60	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.90	.59	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.00S
1000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
51.01S - 0.00W 60.00S - 0.00W 180.0 0.0 539.4
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.95	.63	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.91	.98	.94	.63	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.97	.74	-	-	-	-	-	-	-	-	-	F.DAYS
	37	53	60	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.41	.96	.96	.74	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.21	-	-	-	-	-	-	-	-	F.DAYS
	2	30	53	61	67	-	-	-	-	-	-	-	-	S/N..DB
	.00	.24	.97	.99	.21	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.35	-	-	-	-	-	-	-	-	F.DAYS
	-36	-3	33	55	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.31	.97	.34	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.28	-	-	-	-	-	-	-	-	F.DAYS
	-66	-24	25	51	63	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.09	.93	.28	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.20	-	-	-	-	-	-	-	-	F.DAYS
	-77	-32	22	50	62	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.05	.91	.20	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.11	-	-	-	-	-	-	-	-	F.DAYS
	-66	-24	25	51	63	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.11	.93	.11	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.09	-	-	-	-	-	-	-	-	F.DAYS
	-37	-5	32	54	63	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.27	.95	.09	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.16	-	-	-	-	-	-	-	-	F.DAYS
	0	27	51	59	65	-	-	-	-	-	-	-	-	S/N..DB
	.00	.14	.92	.99	.16	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.83	-	-	-	-	-	-	-	-	-	F.DAYS
	35	51	58	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.35	.91	.98	.82	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.97	.71	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.97	.96	.70	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.97	.73	-	-	-	-	-	-	-	-	-	F.DAYS
	49	55	61	65	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.97	.96	.73	-	-	-	-	-	-	-	-	-	REL.

Figure I-40

1 JUN SSN= 20 0.011
2000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
42.01S - 0.00W 60.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.92	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.91	.45	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.87	.31	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.86	.31	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.96	.42	-	-	-	-	-	-	-	-	-	F.DAYS
	41	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.55	.90	.96	.42	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.98	.26	-	-	-	-	-	-	-	-	F.DAYS
	35	45	55	61	66	-	-	-	-	-	-	-	-	S/N..DB
	.32	.76	.98	.98	.25	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.87	-	-	-	-	-	-	-	-	F.DAYS
	10	27	45	54	64	-	-	-	-	-	-	-	-	S/N..DB
	.00	.09	.79	.97	.87	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.95	.19	-	-	-	-	-	-	-	F.DAYS
	-0	20	41	52	63	67	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.60	.95	.94	.18	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.98	.46	-	-	-	-	-	-	-	F.DAYS
	10	27	45	57	64	68	-	-	-	-	-	-	-	S/N..DB
	.00	.08	.80	.99	.97	.46	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.86	-	-	-	-	-	-	-	-	F.DAYS
	36	46	56	61	67	-	-	-	-	-	-	-	-	S/N..DB
	.35	.80	.99	.99	.86	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.98	.86	.16	-	-	-	-	-	-	-	-	F.DAYS
	41	48	56	62	67	-	-	-	-	-	-	-	-	S/N..DB
	.55	.87	.98	.85	.16	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.90	.46	-	-	-	-	-	-	-	-	-	F.DAYS
	41	48	56	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.55	.87	.89	.46	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.91	.41	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.91	.41	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.91	.40	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.90	.40	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.011
2000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
42.01S - 0.00W 60.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.42	-	-	-	-	-	-	-	-	F.DAYS
	41	48	56	62	66	-	-	-	-	-	-	-	-	S/N..DB
	.55	.87	.99	.99	.42	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.57	-	-	-	-	-	-	-	-	F.DAYS
	34	45	56	61	66	-	-	-	-	-	-	-	-	S/N..DB
	.31	.76	.99	.99	.56	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.84	.10	-	-	-	-	-	-	-	F.DAYS
	-3	19	41	52	63	67	-	-	-	-	-	-	-	S/N..DB
	.00	.04	.60	.96	.84	.10	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.50	-	-	-	-	-	-	-	F.DAYS
	-48	-14	20	42	58	64	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.04	.62	.99	.49	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.54	-	-	-	-	-	-	-	F.DAYS
	-82	-38	7	35	56	63	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.32	.98	.54	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.46	-	-	-	-	-	-	-	F.DAYS
	-95	-47	3	32	55	62	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.22	.98	.46	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.35	-	-	-	-	-	-	-	F.DAYS
	-82	-38	8	35	56	63	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.33	.98	.35	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.32	-	-	-	-	-	-	-	F.DAYS
	-48	-14	19	41	57	63	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.03	.57	.98	.32	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.97	.40	-	-	-	-	-	-	-	F.DAYS
	-4	17	40	50	62	66	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.54	.91	.96	.40	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.76	-	-	-	-	-	-	-	-	F.DAYS
	37	44	55	60	66	-	-	-	-	-	-	-	-	S/N..DB
	.39	.71	.98	.99	.75	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.96	.56	-	-	-	-	-	-	-	-	F.DAYS
	41	48	56	61	66	-	-	-	-	-	-	-	-	S/N..DB
	.55	.86	.99	.96	.55	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.97	.60	-	-	-	-	-	-	-	-	F.DAYS
	41	48	56	61	66	-	-	-	-	-	-	-	-	S/N..DB
	.55	.86	.99	.96	.59	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.011
2000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
42.01S - 0.00W 60.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0.DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.94	.47	-	-	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.92	.94	.47	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.88	.27	-	-	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.92	.88	.27	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.74	-	-	-	-	-	-	-	-	-	F.DAYS
	42	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.74	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.96	.38	-	-	-	-	-	-	-	F.DAYS
	29	42	54	60	65	68	-	-	-	-	-	-	-	S/N..DB
	.16	.61	.98	.99	.96	.38	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.54	.36	.08	-	-	-	-	F.DAYS
	-4	18	40	51	63	67	70	70	71	-	-	-	-	S/N..DB
	.00	.01	.54	.94	.99	.99	.53	.36	.08	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	.77	.65	.30	.15	.07	-	-	F.DAYS
	-19	6	36	47	61	66	70	70	71	71	71	-	-	S/N..DB
	.00	.00	.37	.85	.99	.99	.77	.64	.30	.15	.07	-	-	REL.
14	.99	.99	.99	.99	.99	.99	.79	.70	.41	.21	.08	-	-	F.DAYS
	-4	18	40	51	63	67	70	70	71	72	72	-	-	S/N..DB
	.00	.00	.54	.94	.99	.99	.79	.70	.41	.21	.08	-	-	REL.
16	.99	.99	.99	.99	.99	.98	.53	.33	-	-	-	-	-	F.DAYS
	30	43	54	60	66	69	71	71	-	-	-	-	-	S/N..DB
	.17	.66	.98	.99	.99	.97	.53	.33	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.98	.41	-	-	-	-	-	-	-	F.DAYS
	41	48	56	61	67	69	-	-	-	-	-	-	-	S/N..DB
	.55	.87	.99	.99	.98	.41	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.93	-	-	-	-	-	-	-	-	-	F.DAYS
	41	49	56	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.55	.89	.99	.92	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.85	.15	-	-	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.92	.84	.14	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.73	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	42	50	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.61	.92	.73	.06	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.011
2000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
42.01S - 0.00W 60.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.98	.66	-	-	-	-	-	-	-	-	F.DAYS
	42	49	56	62	66	-	-	-	-	-	-	-	-	S/N..DB
	.61	.90	.99	.97	.66	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.76	.08	-	-	-	-	-	-	-	F.DAYS
	28	43	54	60	66	68	-	-	-	-	-	-	-	S/N..DB
	.16	.67	.98	.98	.76	.08	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.49	.07	-	-	-	-	-	-	F.DAYS
	-23	9	36	48	61	66	69	-	-	-	-	-	-	S/N..DB
	.00	.00	.39	.88	.99	.48	.07	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.67	.19	.14	.06	-	-	-	-	F.DAYS
	-83	-38	9	36	56	63	67	67	68	-	-	-	-	S/N..DB
	.00	.00	.00	.37	.98	.67	.19	.14	.06	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.17	.12	-	-	-	-	-	F.DAYS
	-130	-71	-7	26	49	60	66	66	-	-	-	-	-	S/N..DB
	.00	.00	.00	.08	.90	.99	.17	.12	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.99	.13	.08	-	-	-	-	-	F.DAYS
	-148	-84	-11	24	48	60	66	66	-	-	-	-	-	S/N..DB
	.00	.00	.00	.06	.87	.99	.12	.08	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	F.DAYS
	-130	-71	-5	27	53	61	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.11	.96	.99	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.54	-	-	-	-	-	-	-	F.DAYS
	-84	-39	9	35	55	62	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.33	.97	.54	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.64	-	-	-	-	-	-	-	F.DAYS
	-24	8	35	47	60	65	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.35	.83	.99	.63	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.94	.29	-	-	-	-	-	-	-	F.DAYS
	27	41	53	59	65	68	-	-	-	-	-	-	-	S/N..DB
	.13	.55	.96	.99	.93	.29	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.81	.09	-	-	-	-	-	-	-	F.DAYS
	41	49	56	61	66	68	-	-	-	-	-	-	-	S/N..DB
	.55	.89	.99	.99	.80	.09	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.82	.10	-	-	-	-	-	-	-	F.DAYS
	41	48	56	61	66	68	-	-	-	-	-	-	-	S/N..DB
	.55	.86	.99	.99	.81	.10	-	-	-	-	-	-	-	REL.

Figure I-41

1 JUN SSN= 20 0.016
3000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
33.02S - 0.00W 60.00S - 0.00W 180.0 0.0 1610.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.83	.06	-	-	-	-	-	-	-	-	F.DAYS
	31	42	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.21	.61	.94	.82	.06	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.96	.66	-	-	-	-	-	-	-	-	-	F.DAYS
	30	42	51	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.17	.61	.91	.65	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.83	-	-	-	-	-	-	-	-	-	F.DAYS
	29	42	50	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.15	.61	.93	.83	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.83	.08	-	-	-	-	-	-	-	F.DAYS
	19	34	48	53	60	64	-	-	-	-	-	-	-	S/N..DB
	.04	.31	.89	.96	.82	.08	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.71	-	-	-	-	-	-	-	F.DAYS
	-46	-13	26	43	56	62	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.11	.68	.98	.70	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.86	-	-	-	-	-	-	-	F.DAYS
	-68	-28	20	39	55	61	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.03	.47	.98	.85	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.93	.17	.08	-	-	-	-	-	F.DAYS
	-46	-13	32	43	56	61	66	66	-	-	-	-	-	S/N..DB
	.00	.00	.22	.68	.99	.92	.17	.08	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.70	-	-	-	-	-	-	-	F.DAYS
	19	34	48	53	61	64	-	-	-	-	-	-	-	S/N..DB
	.02	.28	.88	.96	.99	.70	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.97	.53	.05	-	-	-	-	-	-	-	F.DAYS
	29	42	50	56	62	65	-	-	-	-	-	-	-	S/N..DB
	.14	.61	.93	.95	.53	.05	-	-	-	-	-	-	-	REL.
20	.99	.99	.97	.79	.09	-	-	-	-	-	-	-	-	F.DAYS
	29	42	50	56	62	-	-	-	-	-	-	-	-	S/N..DB
	.14	.61	.91	.78	.09	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.82	.08	-	-	-	-	-	-	-	-	F.DAYS
	30	42	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.19	.61	.94	.82	.08	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.98	.79	.07	-	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.22	.66	.94	.79	.07	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.016
3000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
33.02S - 0.00W 60.00S - 0.00W 180.0 0.0 1610.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.84	.12	-	-	-	-	-	-	-	F.DAYS
	29	41	50	56	61	64	-	-	-	-	-	-	-	S/N..DB
	.17	.55	.93	.98	.84	.12	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.91	.20	-	-	-	-	-	-	-	F.DAYS
	30	39	50	55	61	64	-	-	-	-	-	-	-	S/N..DB
	.21	.47	.92	.98	.90	.20	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.98	.59	-	-	-	-	-	-	-	F.DAYS
	-50	-16	28	43	55	61	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.18	.67	.96	.58	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.74	.90	.23	.13	-	-	-	-	-	F.DAYS
	-138	-77	-20	26	48	57	63	63	-	-	-	-	-	S/N..DB
	.00	.00	.00	.10	.64	.90	.23	.13	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.95	.36	.24	.07	-	-	-	-	F.DAYS
	-207	-126	-49	15	43	56	62	62	63	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.67	.94	.36	.24	.07	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.95	.36	.24	.07	-	-	-	-	F.DAYS
	-233	-144	-60	11	41	55	61	61	63	-	-	-	-	S/N..DB
	.00	.00	.00	.00	.56	.94	.36	.24	.07	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.95	.26	.15	-	-	-	-	-	F.DAYS
	-207	-126	-49	14	42	55	61	61	-	-	-	-	-	S/N..DB
	.00	.00	.00	.01	.61	.94	.26	.15	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.77	.93	.18	.09	-	-	-	-	-	F.DAYS
	-137	-77	-20	26	48	58	63	63	-	-	-	-	-	S/N..DB
	.00	.00	.00	.10	.67	.93	.18	.09	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.92	.21	.11	-	-	-	-	-	F.DAYS
	-49	-15	28	44	57	61	65	65	-	-	-	-	-	S/N..DB
	.00	.00	.15	.73	.99	.92	.20	.11	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.98	.52	-	-	-	-	-	-	-	F.DAYS
	29	38	48	54	60	63	-	-	-	-	-	-	-	S/N..DB
	.16	.43	.86	.96	.97	.51	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.85	.31	-	-	-	-	-	-	-	F.DAYS
	30	42	50	56	61	64	-	-	-	-	-	-	-	S/N..DB
	.21	.61	.92	.98	.85	.31	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.85	.31	-	-	-	-	-	-	-	F.DAYS
	29	41	50	56	61	64	-	-	-	-	-	-	-	S/N..DB
	.18	.55	.92	.98	.85	.31	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.016
3000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
33.02S - 0.00W 60.00S - 0.00W 180.0 0.0 1610.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.88	.07	-	-	-	-	-	-	-	-	F.DAYS
	32	43	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.24	.66	.95	.88	.07	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.98	.68	-	-	-	-	-	-	-	-	-	F.DAYS
	32	43	51	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.22	.66	.93	.68	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.96	.10	-	-	-	-	-	-	-	-	F.DAYS
	31	42	51	57	63	-	-	-	-	-	-	-	-	S/N..DB
	.19	.61	.95	.96	.10	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.92	.23	.13	-	-	-	-	-	F.DAYS
	12	29	41	52	59	63	66	66	-	-	-	-	-	S/N..DB
	.01	.19	.60	.95	.99	.92	.22	.13	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.99	.98	.96	.86	.77	.65	.51	.22	F.DAYS
	-79	-36	17	38	54	60	64	64	65	67	67	68	68	S/N..DB
	.00	.00	.02	.43	.97	.99	.98	.96	.86	.77	.65	.51	.21	REL.
12	.99	.99	.99	.99	.99	.99	.99	.99	.94	.88	.81	.70	.44	F.DAYS
	-109	-57	10	33	53	58	64	63	65	66	66	67	67	S/N..DB
	.00	.00	.00	.26	.96	.99	.99	.98	.93	.88	.80	.70	.44	REL.
14	.99	.99	.99	.99	.99	.99	.98	.97	.92	.87	.80	.72	.52	F.DAYS
	-80	-36	18	38	54	60	64	64	65	66	66	68	68	S/N..DB
	.00	.00	.01	.43	.98	.99	.98	.97	.91	.86	.80	.72	.52	REL.
16	.99	.99	.99	.99	.99	.99	.95	.91	.78	.69	.58	.44	.12	F.DAYS
	-5	24	41	52	59	63	66	66	67	68	68	69	68	S/N..DB
	.00	.06	.59	.95	.99	.99	.94	.91	.78	.68	.58	.44	.12	REL.
18	.99	.99	.99	.99	.99	.93	.23	.15	-	-	-	-	-	F.DAYS
	29	42	50	56	62	64	67	67	-	-	-	-	-	S/N..DB
	.14	.61	.93	.98	.99	.92	.22	.15	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.44	-	-	-	-	-	-	-	-	F.DAYS
	29	42	50	56	62	-	-	-	-	-	-	-	-	S/N..DB
	.14	.61	.93	.98	.44	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.70	-	-	-	-	-	-	-	-	-	F.DAYS
	31	43	51	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.22	.66	.94	.69	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.97	.48	-	-	-	-	-	-	-	-	-	F.DAYS
	32	43	51	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.24	.66	.92	.48	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.016
3000 KM PATH TO 60 DEGREES S AZIMUTHS N.MILES
33.02S - 0.00W 60.00S - 0.00W 180.0 0.0 1610.8
VERTICAL SH OL ODEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.89	.42	-	-	-	-	-	-	-	F.DAYS
	31	42	50	56	62	65	-	-	-	-	-	-	-	S/N..DB
	.21	.61	.93	.98	.89	.41	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.93	.57	-	-	-	-	-	-	-	F.DAYS
	29	38	49	55	61	64	-	-	-	-	-	-	-	S/N..DB
	.19	.43	.90	.98	.93	.57	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.97	.80	.35	.28	.16	.11	.08	.05	-	F.DAYS
	-84	-40	21	39	55	60	64	64	65	66	66	67	-	S/N..DB
	.00	.00	.07	.47	.95	.80	.34	.28	.16	.11	.08	.05	-	REL.
8	.99	.99	.99	.99	.99	.91	.58	.51	.36	.29	.23	.18	.10	F.DAYS
	-203	-124	-48	17	44	55	62	62	63	64	64	65	65	S/N..DB
	.00	.00	.00	.02	.71	.89	.58	.50	.36	.29	.23	.18	.10	REL.
10	.99	.99	.99	.99	.99	.39	.64	.56	.40	.32	.25	.19	.10	F.DAYS
	-297	-189	-86	1	36	51	60	60	62	63	63	64	65	S/N..DB
	.00	.00	.00	.00	.35	.37	.63	.56	.39	.32	.25	.19	.10	REL.
12	.99	.99	.99	.99	.99	.37	.62	.54	.38	.30	.23	.17	.09	F.DAYS
	-333	-214	-101	-1	35	50	59	60	62	63	63	64	65	S/N..DB
	.00	.00	.00	.00	.32	.35	.62	.54	.37	.30	.23	.17	.09	REL.
14	.99	.99	.99	.99	.99	.96	.57	.47	.25	.16	.10	.06	-	F.DAYS
	-298	-190	-87	4	37	52	60	60	61	63	63	64	-	S/N..DB
	.00	.00	.00	.00	.40	.92	.57	.46	.25	.16	.10	.06	-	REL.
16	.99	.99	.99	.99	.99	.94	.47	.37	.17	.10	.06	-	-	F.DAYS
	-202	-123	-47	18	45	56	62	62	64	65	65	-	-	S/N..DB
	.00	.00	.00	.02	.76	.93	.47	.36	.17	.10	.06	-	-	REL.
18	.99	.99	.99	.99	.99	.98	.51	.39	.18	.11	.06	-	-	F.DAYS
	-83	-39	20	39	55	60	65	65	66	67	67	-	-	S/N..DB
	.00	.00	.04	.47	.98	.97	.51	.39	.18	.11	.06	-	-	REL.
20	.99	.99	.99	.99	.99	.87	.15	.09	-	-	-	-	-	F.DAYS
	27	36	48	54	60	63	65	65	-	-	-	-	-	S/N..DB
	.12	.36	.86	.96	.99	.86	.15	.09	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.97	.69	-	-	-	-	-	-	-	F.DAYS
	31	42	50	56	61	64	-	-	-	-	-	-	-	S/N..DB
	.23	.61	.92	.98	.97	.69	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.97	.68	-	-	-	-	-	-	-	F.DAYS
	30	42	50	56	61	64	-	-	-	-	-	-	-	S/N..DB
	.21	.61	.92	.98	.97	.68	-	-	-	-	-	-	-	REL.

Figure I-42

1 JUN SSN= 20 0.001
200 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
78.20S - 0.00W 80.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.12	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.11	-	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.21	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	43	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.12	-	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.30	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	43	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.17	-	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.32	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.21	-	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.31	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.30	-	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.31	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	-	-	-	-	-	-	-	-	-	-	-	-	REL.
14	.33	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.33	-	-	-	-	-	-	-	-	-	-	-	-	REL.
16	.17	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.16	-	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.09	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	-	-	-	-	-	-	-	-	-	-	-	-	REL.
20	-	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	-	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	-	-	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.06	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.06	-	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.09	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	-	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.001
200 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
78.20S - 0.00W 80.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.83	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	53	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.78	.09	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.84	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	53	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.86	.80	.11	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.90	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	47	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.80	.82	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.92	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	45	48	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.67	.71	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.96	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	45	48	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.71	.79	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.91	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	48	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.67	.75	-	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.79	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	49	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.77	.69	-	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.79	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	48	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.74	.64	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.98	.73	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	50	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.73	.64	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.98	.78	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	49	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.64	.05	-	-	-	-	-	-	-	-	-	-	REL.
22	.94	.73	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	51	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.75	.64	.10	-	-	-	-	-	-	-	-	-	-	REL.
24	.94	.72	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	51	53	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.78	.63	.09	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.001
200 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
78.20S - 0.00W 80.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.71	.15	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.64	.14	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.73	.17	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	43	43	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.42	.10	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.75	.26	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	43	44	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.44	.16	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.85	.37	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	47	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.57	.26	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.88	.54	.09	-	-	-	-	-	-	-	-	-	-	F.DAYS
	57	58	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.54	.09	-	-	-	-	-	-	-	-	-	-	REL.
12	.90	.60	.12	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	58	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.59	.12	-	-	-	-	-	-	-	-	-	-	REL.
14	.89	.63	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	58	59	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.62	.14	-	-	-	-	-	-	-	-	-	-	REL.
16	.83	.47	.05	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	55	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.78	.44	.05	-	-	-	-	-	-	-	-	-	-	REL.
18	.79	.31	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.74	.29	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.56	.15	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.13	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.54	.10	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.51	.10	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.62	.16	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.58	.16	-	-	-	-	-	-	-	-	-	-	-	REL.

DEC SSN= 120 0.001
200 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
78.20S - 0.00W 80.00S - 0.00W 180.0 0.0 108.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.90	.33	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	50	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.75	.79	.31	-	-	-	-	-	-	-	-	-	-	REL.
4	.99	.90	.33	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	49	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.78	.31	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.96	.19	-	-	-	-	-	-	-	-	-	-	F.DAYS
	45	47	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.77	.17	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.94	.12	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	43	48	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.48	.57	.09	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.94	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	38	44	49	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.64	.07	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.95	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	43	48	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.44	.61	.09	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.90	.18	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	44	49	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.47	.63	.16	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.91	.21	-	-	-	-	-	-	-	-	-	-	F.DAYS
	40	44	49	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.61	.18	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.89	.25	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	46	50	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.66	.22	-	-	-	-	-	-	-	-	-	-	REL.
20	.99	.90	.29	-	-	-	-	-	-	-	-	-	-	F.DAYS
	45	46	49	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.66	.25	-	-	-	-	-	-	-	-	-	-	REL.
22	.99	.89	.35	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	48	50	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.65	.72	.31	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.88	.32	-	-	-	-	-	-	-	-	-	-	F.DAYS
	45	48	50	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.71	.28	-	-	-	-	-	-	-	-	-	-	REL.

Figure I-43

1 JUN SSN= 20 0.003
500 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
75.50S - 0.00W 80.00S - 0.00W 180.0 0.0 270.0
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.36	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.31	-	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.49	.06	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	40	44	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.24	.04	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.53	.15	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	44	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.28	.09	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.61	.19	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	48	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.38	.14	-	-	-	-	-	-	-	-	-	-	-	REL.
10	.72	.18	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.68	.18	-	-	-	-	-	-	-	-	-	-	-	REL.
12	.72	.19	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	54	58	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.19	-	-	-	-	-	-	-	-	-	-	-	REL.
14	.71	.21	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.21	-	-	-	-	-	-	-	-	-	-	-	REL.
16	.52	.07	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	56	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.07	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.32	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.29	-	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.15	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.13	-	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.20	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.17	-	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.26	-	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	-	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.24	-	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.003
500 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
75.50S - 0.00W 80.00S - 0.00W 180.0 0.0 270.0
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	99	.97	.43	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	53	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	75	.91	.43	-	-	-	-	-	-	-	-	-	-	REL.
4	99	.99	.48	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	52	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	54	.92	.47	-	-	-	-	-	-	-	-	-	-	REL.
6	99	.99	.47	-	-	-	-	-	-	-	-	-	-	F.DAYS
	36	50	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	43	.88	.46	-	-	-	-	-	-	-	-	-	-	REL.
8	99	.99	.55	-	-	-	-	-	-	-	-	-	-	F.DAYS
	28	45	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	33	.68	.50	-	-	-	-	-	-	-	-	-	-	REL.
10	99	.99	.49	-	-	-	-	-	-	-	-	-	-	F.DAYS
	26	45	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	24	.72	.46	-	-	-	-	-	-	-	-	-	-	REL.
12	99	.99	.31	-	-	-	-	-	-	-	-	-	-	F.DAYS
	24	44	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	21	.68	.30	-	-	-	-	-	-	-	-	-	-	REL.
14	99	.99	.25	-	-	-	-	-	-	-	-	-	-	F.DAYS
	27	46	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.23	.77	.25	-	-	-	-	-	-	-	-	-	-	REL.
16	99	.99	.26	-	-	-	-	-	-	-	-	-	-	F.DAYS
	29	46	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.23	.74	.24	-	-	-	-	-	-	-	-	-	-	REL.
18	99	.99	.33	-	-	-	-	-	-	-	-	-	-	F.DAYS
	35	48	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.37	.81	.32	-	-	-	-	-	-	-	-	-	-	REL.
20	99	.99	.40	-	-	-	-	-	-	-	-	-	-	F.DAYS
	38	48	55	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.79	.38	-	-	-	-	-	-	-	-	-	-	REL.
22	99	.88	.42	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	50	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.75	.40	-	-	-	-	-	-	-	-	-	-	REL.
24	99	.88	.43	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	51	56	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.78	.41	-	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.003
500 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
75.50S - 0.00W 80.00S - 0.00W 180.0 0.0 270.0
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.83	.34	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	52	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.71	.31	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.85	.38	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	43	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.44	.22	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.90	.46	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	41	43	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.47	.26	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.96	.67	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	44	47	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.59	.47	.11	-	-	-	-	-	-	-	-	-	-	REL.
10	.96	.81	.33	.05	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.93	.80	.32	.05	-	-	-	-	-	-	-	-	-	REL.
12	.97	.85	.39	.08	-	-	-	-	-	-	-	-	-	F.DAYS
	55	59	62	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.84	.39	.08	-	-	-	-	-	-	-	-	-	REL.
14	.96	.85	.44	.10	-	-	-	-	-	-	-	-	-	F.DAYS
	55	60	63	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.84	.43	.10	-	-	-	-	-	-	-	-	-	REL.
16	.93	.75	.26	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	57	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.72	.25	-	-	-	-	-	-	-	-	-	-	REL.
18	.94	.59	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	56	60	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.56	.11	-	-	-	-	-	-	-	-	-	-	REL.
20	.81	.33	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.69	.30	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.69	.24	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.62	.23	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.73	.31	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.29	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.003
500 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
75.50S - 0.00W 80.00S - 0.00W 180.0 0.0 270.0
VERTICAL SH OL 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.63	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	38	50	56	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.88	.61	.11	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.63	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	34	48	55	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.39	.83	.62	.12	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.66	-	-	-	-	-	-	-	-	-	-	F.DAYS
	27	45	54	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.28	.73	.63	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.58	-	-	-	-	-	-	-	-	-	-	F.DAYS
	17	.40	50	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.20	.50	.49	-	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.52	-	-	-	-	-	-	-	-	-	-	F.DAYS
	13	32	50	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	.35	.47	-	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	-	-	-	-	-	-	-	-	-	-	F.DAYS
	.11	.30	49	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	.31	.87	-	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.48	-	-	-	-	-	-	-	-	-	-	F.DAYS
	14	33	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.07	.35	.44	-	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.52	-	-	-	-	-	-	-	-	-	-	F.DAYS
	18	41	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.07	.54	.47	-	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.57	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	26	44	52	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.18	.67	.53	.06	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.62	.08	-	-	-	-	-	-	-	-	-	F.DAYS
	31	45	52	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.34	.70	.56	.08	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.61	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	36	47	53	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.42	.77	.57	.13	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.59	.12	-	-	-	-	-	-	-	-	-	F.DAYS
	38	49	54	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.45	.82	.56	.12	-	-	-	-	-	-	-	-	-	REL.

Figure I-44

1 JUN SSN= 20 0.004
800 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
72.80S - 0.00W 80.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.68	.20	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.54	.18	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.77	.32	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	44	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.36	.20	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.82	.40	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	44	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.39	.24	-	-	-	-	-	-	-	-	-	-	-	REL.
8	.88	.49	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	42	47	52	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.35	.07	-	-	-	-	-	-	-	-	-	-	REL.
10	.94	.63	.07	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.63	.07	-	-	-	-	-	-	-	-	-	-	REL.
12	.94	.65	.08	-	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.64	.08	-	-	-	-	-	-	-	-	-	-	REL.
14	.92	.65	.10	-	-	-	-	-	-	-	-	-	-	F.DAYS
	53	59	64	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.88	.65	.10	-	-	-	-	-	-	-	-	-	-	REL.
16	.84	.41	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.71	.39	-	-	-	-	-	-	-	-	-	-	-	REL.
18	.66	.21	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.56	.20	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.44	.07	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	47	52	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.34	.06	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.45	.09	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.38	.08	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.53	.14	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.45	.14	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.004
800 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
72.80S - 0.00W 80.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.85	.28	-	-	-	-	-	-	-	-	-	F.DAYS
	35	50	58	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.41	.88	.84	.27	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.88	.32	-	-	-	-	-	-	-	-	-	F.DAYS
	30	49	57	62	-	-	-	-	-	-	-	-	-	S/N..DB
	.33	.86	.86	.32	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.27	-	-	-	-	-	-	-	-	-	F.DAYS
	21	36	55	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.20	.43	.97	.26	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.36	-	-	-	-	-	-	-	-	-	F.DAYS
	10	28	51	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.13	.33	.86	.34	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.27	-	-	-	-	-	-	-	-	-	F.DAYS
	5	25	51	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.04	.23	.91	.26	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	3	23	50	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.03	.20	.89	.11	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.09	-	-	-	-	-	-	-	-	-	F.DAYS
	6	26	52	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.02	.21	.94	.09	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.11	-	-	-	-	-	-	-	-	-	F.DAYS
	11	29	52	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.03	.24	.92	.10	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.17	-	-	-	-	-	-	-	-	-	F.DAYS
	20	35	54	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	.37	.94	.17	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.80	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	26	45	53	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.27	.70	.74	.22	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.73	.26	-	-	-	-	-	-	-	-	-	F.DAYS
	33	48	55	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.36	.80	.70	.25	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.75	.29	-	-	-	-	-	-	-	-	-	F.DAYS
	35	49	56	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.82	.72	.28	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.004
800 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
72.80S - 0.00W 80.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.93	.63	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.74	.58	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.94	.67	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	44	48	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.44	.41	.04	-	-	-	-	-	-	-	-	-	-	REL.
6	.97	.77	.21	-	-	-	-	-	-	-	-	-	-	F.DAYS
	39	44	48	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.46	.47	.15	-	-	-	-	-	-	-	-	-	-	REL.
8	.99	.92	.42	.09	-	-	-	-	-	-	-	-	-	F.DAYS
	42	47	51	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.56	.65	.35	.08	-	-	-	-	-	-	-	-	-	REL.
10	.99	.94	.68	.29	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.93	.67	.29	-	-	-	-	-	-	-	-	-	REL.
12	.99	.96	.75	.38	-	-	-	-	-	-	-	-	-	F.DAYS
	52	58	63	66	-	-	-	-	-	-	-	-	-	S/N..DB
	.92	.94	.75	.37	-	-	-	-	-	-	-	-	-	REL.
14	.99	.95	.77	.43	-	-	-	-	-	-	-	-	-	F.DAYS
	53	59	64	67	-	-	-	-	-	-	-	-	-	S/N..DB
	.94	.95	.77	.42	-	-	-	-	-	-	-	-	-	REL.
16	.98	.91	.61	.23	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	61	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.83	.87	.61	.23	-	-	-	-	-	-	-	-	-	REL.
18	.99	.89	.38	.08	-	-	-	-	-	-	-	-	-	F.DAYS
	50	55	60	64	-	-	-	-	-	-	-	-	-	S/N..DB
	.84	.84	.38	.08	-	-	-	-	-	-	-	-	-	REL.
20	.95	.63	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	47	53	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.73	.58	.13	-	-	-	-	-	-	-	-	-	-	REL.
22	.82	.48	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.70	.45	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.84	.53	.06	-	-	-	-	-	-	-	-	-	-	F.DAYS
	49	54	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.50	.06	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.004
800 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
72.80S - 0.00W 80.00S - 0.00W 180.0 0.0 432.0
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.43	-	-	-	-	-	-	-	-	-	F.DAYS
	27	47	55	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.28	.79	.96	.43	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	20	35	54	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.19	.41	.96	.45	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.42	-	-	-	-	-	-	-	-	-	F.DAYS
	8	27	52	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	.28	.93	.41	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-5	17	47	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.04	.20	.76	.92	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-12	12	47	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.08	.81	.96	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-16	9	47	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.06	.81	.96	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-12	12	48	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.06	.86	.97	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-4	17	48	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.06	.83	.96	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.36	-	-	-	-	-	-	-	-	-	F.DAYS
	7	26	51	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.18	.90	.35	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.41	-	-	-	-	-	-	-	-	-	F.DAYS
	16	32	51	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.14	.36	.88	.40	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.42	-	-	-	-	-	-	-	-	-	F.DAYS
	25	45	53	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.22	.70	.92	.41	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.85	.41	-	-	-	-	-	-	-	-	-	F.DAYS
	28	46	54	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.27	.73	.80	.40	-	-	-	-	-	-	-	-	-	REL.

Figure I-45

1 JUN SSN= 20 0.00S
1000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
71.01S - 0.00W 80.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.81	.40	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	52	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.60	.36	-	-	-	-	-	-	-	-	-	-	-	REL.
4	.87	.54	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	43	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.36	.31	-	-	-	-	-	-	-	-	-	-	-	REL.
6	.91	.59	.13	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	43	48	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.38	.34	.09	-	-	-	-	-	-	-	-	-	-	REL.
8	.94	.72	.22	-	-	-	-	-	-	-	-	-	-	F.DAYS
	40	46	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.47	.49	.18	-	-	-	-	-	-	-	-	-	-	REL.
10	.98	.85	.28	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.82	.27	-	-	-	-	-	-	-	-	-	-	REL.
12	.98	.86	.30	-	-	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.87	.84	.30	-	-	-	-	-	-	-	-	-	-	REL.
14	.97	.83	.32	-	-	-	-	-	-	-	-	-	-	F.DAYS
	51	57	62	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.89	.82	.32	-	-	-	-	-	-	-	-	-	-	REL.
16	.93	.67	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	59	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.74	.62	.11	-	-	-	-	-	-	-	-	-	-	REL.
18	.82	.41	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.66	.39	-	-	-	-	-	-	-	-	-	-	-	REL.
20	.65	.20	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.48	.18	-	-	-	-	-	-	-	-	-	-	-	REL.
22	.61	.21	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.50	.19	-	-	-	-	-	-	-	-	-	-	-	REL.
24	.69	.29	-	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	-	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.56	.27	-	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.00S
1000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
71.01S - 0.00W 80.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.56	-	-	-	-	-	-	-	-	-	F.DAYS
	30	42	56	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.33	.59	.97	.55	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.62	-	-	-	-	-	-	-	-	-	F.DAYS
	24	37	55	61	-	-	-	-	-	-	-	-	-	S/N..DB
	.24	.44	.97	.62	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.71	-	-	-	-	-	-	-	-	-	F.DAYS
	13	30	52	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.11	.33	.93	.71	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	0	20	48	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.07	.23	.79	.93	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-6	17	48	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.13	.84	.96	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-9	15	47	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.11	.81	.96	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-5	18	49	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.11	.89	.98	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	1	21	49	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.11	.85	.97	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	12	29	51	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.03	.24	.90	.44	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.52	-	-	-	-	-	-	-	-	-	F.DAYS
	20	34	51	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.19	.39	.88	.50	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.50	-	-	-	-	-	-	-	-	-	F.DAYS
	28	46	54	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.27	.73	.93	.49	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.86	.54	-	-	-	-	-	-	-	-	-	F.DAYS
	31	47	54	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.32	.77	.81	.53	-	-	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.00S
1000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
71.01S - 0.00W 80.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.96	.77	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	52	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.71	.69	.14	-	-	-	-	-	-	-	-	-	-	REL.
4	.96	.80	.18	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	43	47	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.4[illegible]	.46	.13	-	-	-	-	-	-	-	-	-	-	REL.
6	.99	.89	.36	.06	-	-	-	-	-	-	-	-	-	F.DAYS
	37	43	48	52	-	-	-	-	-	-	-	-	-	S/N..DB
	.41	.52	.26	.05	-	-	-	-	-	-	-	-	-	REL.
8	.99	.97	.67	.24	-	-	-	-	-	-	-	-	-	F.DAYS
	40	46	51	55	-	-	-	-	-	-	-	-	-	S/N..DB
	.49	.66	.54	.21	-	-	-	-	-	-	-	-	-	REL.
10	.99	.97	.84	.50	.07	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	66	69	-	-	-	-	-	-	-	-	S/N..DB
	.89	.95	.83	.50	.07	-	-	-	-	-	-	-	-	REL.
12	.99	.98	.88	.61	.12	-	-	-	-	-	-	-	-	F.DAYS
	50	56	62	66	69	-	-	-	-	-	-	-	-	S/N..DB
	.89	.96	.88	.61	.12	-	-	-	-	-	-	-	-	REL.
14	.99	.98	.88	.65	.15	-	-	-	-	-	-	-	-	F.DAYS
	51	57	63	67	70	-	-	-	-	-	-	-	-	S/N..DB
	.92	.96	.88	.65	.15	-	-	-	-	-	-	-	-	REL.
16	.99	.95	.79	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	60	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.89	.78	.45	-	-	-	-	-	-	-	-	-	REL.
18	.99	.96	.61	.22	-	-	-	-	-	-	-	-	-	F.DAYS
	48	54	59	63	-	-	-	-	-	-	-	-	-	S/N..DB
	.79	.89	.60	.22	-	-	-	-	-	-	-	-	-	REL.
20	.98	.81	.28	-	-	-	-	-	-	-	-	-	-	F.DAYS
	46	51	57	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.71	.27	-	-	-	-	-	-	-	-	-	-	REL.
22	.88	.62	.11	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.72	.58	.11	-	-	-	-	-	-	-	-	-	-	REL.
24	.89	.65	.14	-	-	-	-	-	-	-	-	-	-	F.DAYS
	48	53	58	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.73	.61	.13	-	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.00S
1000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
71.01S - 0.00W 80.00S - 0.00W 180.0 0.0 539.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.66	-	-	-	-	-	-	-	-	-	F.DAYS
	22	36	54	60	-	-	-	-	-	-	-	-	-	S/N..DB
	.21	.43	.95	.65	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.67	-	-	-	-	-	-	-	-	-	F.DAYS
	12	29	53	59	-	-	-	-	-	-	-	-	-	S/N..DB
	.11	.31	.95	.67	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-1	19	49	57	-	-	-	-	-	-	-	-	-	S/N..DB
	.03	.18	.88	.98	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-19	10	45	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.01	.13	.70	.89	-	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-29	0	28	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.29	.94	-	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-33	-2	26	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.26	.93	-	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-28	0	45	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.76	.96	-	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-18	11	45	54	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.03	.73	.94	-	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	-	-	-	-	-	-	-	-	-	F.DAYS
	-2	18	48	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.83	.96	-	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.65	-	-	-	-	-	-	-	-	-	F.DAYS
	9	26	49	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.08	.27	.84	.62	-	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.63	-	-	-	-	-	-	-	-	-	F.DAYS
	19	33	52	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.14	.36	.90	.61	-	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.63	-	-	-	-	-	-	-	-	-	F.DAYS
	23	44	52	58	-	-	-	-	-	-	-	-	-	S/N..DB
	.28	.66	.90	.61	-	-	-	-	-	-	-	-	-	REL.

Figure I-46

1 JUN SSN= 20 0.011
2000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
62.01S - 0.00W 80.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.95	.62	.14	-	-	-	-	-	-	-	-	-	F.DAYS
	36	43	51	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.39	.59	.55	.13	-	-	-	-	-	-	-	-	-	REL.
4	.99	.97	.73	.25	-	-	-	-	-	-	-	-	-	F.DAYS
	27	34	42	47	-	-	-	-	-	-	-	-	-	S/N..DB
	.18	.33	.42	.17	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.80	.34	-	-	-	-	-	-	-	-	-	F.DAYS
	27	34	41	47	-	-	-	-	-	-	-	-	-	S/N..DB
	.18	.34	.44	.24	-	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.93	.58	.07	-	-	-	-	-	-	-	-	F.DAYS
	29	36	43	49	53	-	-	-	-	-	-	-	-	S/N..DB
	.32	.43	.56	.44	.06	-	-	-	-	-	-	-	-	REL.
10	.99	.99	.98	.82	.09	-	-	-	-	-	-	-	-	F.DAYS
	35	47	54	59	64	-	-	-	-	-	-	-	-	S/N..DB
	.40	.79	.94	.81	.09	-	-	-	-	-	-	-	-	REL.
12	.99	.99	.98	.85	.13	-	-	-	-	-	-	-	-	F.DAYS
	35	44	54	59	64	-	-	-	-	-	-	-	-	S/N..DB
	.40	.67	.94	.84	.13	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.98	.87	.19	-	-	-	-	-	-	-	-	F.DAYS
	37	48	55	60	65	-	-	-	-	-	-	-	-	S/N..DB
	.39	.84	.96	.86	.18	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.94	.62	-	-	-	-	-	-	-	-	-	F.DAYS
	36	43	50	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.39	.62	.81	.59	-	-	-	-	-	-	-	-	-	REL.
18	.99	.96	.71	.27	-	-	-	-	-	-	-	-	-	F.DAYS
	36	43	51	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.39	.60	.62	.26	-	-	-	-	-	-	-	-	-	REL.
20	.99	.89	.43	.07	-	-	-	-	-	-	-	-	-	F.DAYS
	33	40	48	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.35	.45	.35	.06	-	-	-	-	-	-	-	-	-	REL.
22	.99	.84	.35	-	-	-	-	-	-	-	-	-	-	F.DAYS
	37	44	51	-	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.57	.32	-	-	-	-	-	-	-	-	-	-	REL.
24	.99	.89	.47	.10	-	-	-	-	-	-	-	-	-	F.DAYS
	37	44	51	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.60	.42	.10	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.011
2000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
62.01S - 0.00W 80.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.66	-	-	-	-	-	-	-	-	F.DAYS
	23	32	43	53	60	-	-	-	-	-	-	-	-	S/N..DB
	.21	.37	.65	.92	.65	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.77	.09	-	-	-	-	-	-	-	F.DAYS
	8	24	39	53	60	63	-	-	-	-	-	-	-	S/N..DB
	.08	.25	.49	.95	.77	.09	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.89	.13	-	-	-	-	-	-	-	F.DAYS
	-11	10	31	43	58	62	-	-	-	-	-	-	-	S/N..DB
	.01	.10	.36	.66	.88	.13	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.24	-	-	-	-	-	-	-	F.DAYS
	-35	-8	19	33	52	57	-	-	-	-	-	-	-	S/N..DB
	.00	.03	.22	.40	.84	.23	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.10	-	-	-	-	-	-	-	F.DAYS
	-48	-16	14	32	53	59	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.10	.35	.91	.09	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-54	-20	11	30	53	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.08	.31	.91	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-47	-15	15	33	55	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.12	.37	.96	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-35	-8	19	33	52	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.10	.33	.87	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.62	-	-	-	-	-	-	-	-	F.DAYS
	-15	6	27	39	54	-	-	-	-	-	-	-	-	S/N..DB
	.00	.01	.22	.48	.56	-	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.60	-	-	-	-	-	-	-	-	F.DAYS
	3	19	35	48	55	-	-	-	-	-	-	-	-	S/N..DB
	.04	.16	.42	.76	.55	-	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.54	-	-	-	-	-	-	-	-	F.DAYS
	17	29	41	51	57	-	-	-	-	-	-	-	-	S/N..DB
	.15	.31	.56	.86	.51	-	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.95	.62	.08	-	-	-	-	-	-	-	F.DAYS
	22	33	46	52	58	60	-	-	-	-	-	-	-	S/N..DB
	.20	.37	.74	.83	.59	.08	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.011
2000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
62.01S - 0.00W 80.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.81	.31	-	-	-	-	-	-	-	-	-	F.DAYS
	37	44	51	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.42	.65	.72	.30	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.85	.38	-	-	-	-	-	-	-	-	-	F.DAYS
	28	35	42	47	-	-	-	-	-	-	-	-	-	S/N..DB
	.20	.36	.49	.26	-	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.95	.63	.06	-	-	-	-	-	-	-	-	F.DAYS
	27	34	42	47	51	-	-	-	-	-	-	-	-	S/N..DB
	.18	.34	.55	.44	.05	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.95	.44	.07	-	-	-	-	-	-	-	F.DAYS
	29	36	43	49	53	56	-	-	-	-	-	-	-	S/N..DB
	.32	.43	.61	.72	.37	.06	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.98	.81	.36	-	-	-	-	-	-	-	F.DAYS
	35	47	54	59	64	66	-	-	-	-	-	-	-	S/N..DB
	.40	.79	.95	.97	.80	.36	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.89	.53	.09	.06	-	-	-	-	-	F.DAYS
	35	44	54	59	64	66	68	68	-	-	-	-	-	S/N..DB
	.40	.67	.95	.98	.88	.53	.09	.06	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.92	.62	-	-	-	-	-	-	-	F.DAYS
	37	48	55	60	65	68	-	-	-	-	-	-	-	S/N..DB
	.39	.84	.97	.99	.91	.61	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.98	.78	.19	-	-	-	-	-	-	-	F.DAYS
	36	43	50	56	61	63	-	-	-	-	-	-	-	S/N..DB
	.39	.62	.86	.93	.77	.19	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.95	.40	.05	-	-	-	-	-	-	-	F.DAYS
	36	43	50	56	61	63	-	-	-	-	-	-	-	S/N..DB
	.39	.62	.86	.90	.39	.05	-	-	-	-	-	-	-	REL.
20	.99	.99	.94	.52	-	-	-	-	-	-	-	-	-	F.DAYS
	33	40	48	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.35	.50	.75	.47	-	-	-	-	-	-	-	-	-	REL.
22	.99	.94	.64	.18	-	-	-	-	-	-	-	-	-	F.DAYS
	37	44	51	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.63	.58	.17	-	-	-	-	-	-	-	-	-	REL.
24	.99	.95	.66	.19	-	-	-	-	-	-	-	-	-	F.DAYS
	37	44	51	56	-	-	-	-	-	-	-	-	-	S/N..DB
	.40	.64	.59	.19	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.011
2000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
62.01S - 0.00W 80.00S - 0.00W 180.0 0.0 1079.4
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.73	.15	-	-	-	-	-	-	-	F.DAYS
	10	25	39	52	59	62	-	-	-	-	-	-	-	S/N..DB
	.11	.27	.49	.90	.71	.15	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.77	.20	-	-	-	-	-	-	-	F.DAYS
	-5	14	33	51	59	63	-	-	-	-	-	-	-	S/N..DB
	.02	.13	.39	.92	.77	.20	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.28	-	-	-	-	-	-	-	F.DAYS
	-32	-4	24	37	56	62	-	-	-	-	-	-	-	S/N..DB
	.00	.02	.26	.45	.97	.28	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.27	-	-	-	-	-	-	-	F.DAYS
	-64	-28	5	26	50	56	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.10	.30	.80	.25	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.12	-	-	-	-	-	-	-	F.DAYS
	-83	-41	0	25	51	58	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.02	.23	.87	.12	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-91	-46	-3	24	51	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.01	.21	.87	-	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	-	-	-	-	-	-	-	-	F.DAYS
	-82	-39	0	27	53	-	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.03	.27	.94	-	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.05	-	-	-	-	-	-	-	F.DAYS
	-64	-28	12	27	50	56	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.04	.21	.83	.05	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.99	.14	-	-	-	-	-	-	-	F.DAYS
	-36	-8	20	33	52	57	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.11	.33	.87	.14	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.74	.15	-	-	-	-	-	-	-	F.DAYS
	-10	9	28	46	54	58	-	-	-	-	-	-	-	S/N..DB
	.00	.07	.30	.70	.66	.15	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.68	.11	-	-	-	-	-	-	-	F.DAYS
	8	23	37	50	56	60	-	-	-	-	-	-	-	S/N..DB
	.07	.22	.46	.83	.64	.10	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.72	.14	-	-	-	-	-	-	-	F.DAYS
	14	27	40	51	57	60	-	-	-	-	-	-	-	S/N..DB
	.12	.28	.53	.86	.68	.14	-	-	-	-	-	-	-	REL.

Figure 1-47

1 JUN SSN= 20 0.016
3000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
53.02S - 0.00W 80.00S - 0.00W 180.0 0.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.90	.57	-	-	-	-	-	-	-	-	-	F.DAYS
	27	38	46	52	-	-	-	-	-	-	-	-	-	S/N..DB
	.14	.43	.71	.53	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.92	.66	.06	-	-	-	-	-	-	-	-	F.DAYS
	28	39	47	53	58	-	-	-	-	-	-	-	-	S/N..DB
	.17	.47	.76	.62	.06	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.96	.71	.13	-	-	-	-	-	-	-	-	F.DAYS
	27	39	47	53	58	-	-	-	-	-	-	-	-	S/N..DB
	.15	.47	.79	.67	.13	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.91	.37	.06	-	-	-	-	-	-	-	F.DAYS
	24	36	44	50	56	59	-	-	-	-	-	-	-	S/N..DB
	.15	.40	.68	.78	.35	.05	-	-	-	-	-	-	-	REL.
10	.99	.99	.99	.98	.67	.10	-	-	-	-	-	-	-	F.DAYS
	29	41	49	55	61	64	-	-	-	-	-	-	-	S/N..DB
	.26	.56	.91	.97	.67	.10	-	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.75	.17	-	-	-	-	-	-	-	F.DAYS
	25	35	47	53	60	63	-	-	-	-	-	-	-	S/N..DB
	.19	.38	.86	.96	.75	.17	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.79	.25	-	-	-	-	-	-	-	F.DAYS
	31	43	50	56	62	65	-	-	-	-	-	-	-	S/N..DB
	.19	.65	.92	.97	.79	.25	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.95	.49	-	-	-	-	-	-	-	-	F.DAYS
	28	40	48	54	60	-	-	-	-	-	-	-	-	S/N..DB
	.11	.50	.85	.91	.48	-	-	-	-	-	-	-	-	REL.
18	.99	.99	.94	.73	.15	-	-	-	-	-	-	-	-	F.DAYS
	29	40	48	54	60	-	-	-	-	-	-	-	-	S/N..DB
	.13	.50	.80	.70	.15	-	-	-	-	-	-	-	-	REL.
20	.98	.98	.83	.45	-	-	-	-	-	-	-	-	-	F.DAYS
	28	39	47	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.13	.45	.69	.43	-	-	-	-	-	-	-	-	-	REL.
22	.96	.96	.76	.37	-	-	-	-	-	-	-	-	-	F.DAYS
	23	34	42	48	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	.31	.46	.29	-	-	-	-	-	-	-	-	-	REL.
24	.97	.97	.82	.46	-	-	-	-	-	-	-	-	-	F.DAYS
	23	34	42	48	-	-	-	-	-	-	-	-	-	S/N..DB
	.09	.31	.50	.37	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 20 0.016
3000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
53.02S - 0.00W 80.00S - 0.00W 180.0 0.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.92	.34	-	-	-	-	-	-	-	-	F.DAYS
	23	32	45	51	57	61	-	-	-	-	-	-	-	S/N..DB
	.08	.25	.76	.91	.90	.34	-	-	-	-	-	-	-	REL.
4	.99	.99	.99	.99	.96	.55	-	-	-	-	-	-	-	F.DAYS
	-21	16	34	46	54	58	-	-	-	-	-	-	-	S/N..DB
	.00	.09	.38	.75	.90	.54	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.99	.77	-	-	-	-	-	-	-	F.DAYS
	-64	-28	20	37	51	56	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.14	.44	.88	.75	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.68	.88	.12	.06	-	-	-	-	-	F.DAYS
	-111	-61	9	30	46	54	59	59	-	-	-	-	-	S/N..DB
	.00	.00	.03	.27	.50	.82	.12	.06	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.74	.84	.06	-	-	-	-	-	-	F.DAYS
	-143	-83	-25	24	47	56	62	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.14	.61	.83	.06	-	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.63	-	-	-	-	-	-	-	F.DAYS
	-157	-92	2	23	47	56	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.13	.82	.62	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.17	.44	-	-	-	-	-	-	-	F.DAYS
	-145	-84	4	28	46	55	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.01	.22	.13	.42	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.11	.43	-	-	-	-	-	-	-	F.DAYS
	-106	-56	13	35	50	58	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.01	.35	.10	.43	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.92	.50	-	-	-	-	-	-	-	F.DAYS
	-59	-23	25	41	55	61	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.12	.56	.90	.50	-	-	-	-	-	-	-	REL.
20	.99	.99	.99	.99	.88	.34	-	-	-	-	-	-	-	F.DAYS
	-19	18	36	48	56	60	-	-	-	-	-	-	-	S/N..DB
	.00	.09	.42	.83	.86	.34	-	-	-	-	-	-	-	REL.
22	.99	.99	.99	.97	.77	.28	-	-	-	-	-	-	-	F.DAYS
	23	33	45	51	58	61	-	-	-	-	-	-	-	S/N..DB
	.15	.33	.75	.89	.76	.27	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.98	.83	.41	-	-	-	-	-	-	-	F.DAYS
	27	38	47	52	58	61	-	-	-	-	-	-	-	S/N..DB
	.21	.45	.82	.91	.82	.41	-	-	-	-	-	-	-	REL.

1 JUN SSN= 120 0.016
3000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
53.02S - 0.00W 80.00S - 0.00W 180.0 0.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.95	.71	-	-	-	-	-	-	-	-	-	F.DAYS
	28	39	47	53	-	-	-	-	-	-	-	-	-	S/N..DB
	.16	.47	.78	.67	-	-	-	-	-	-	-	-	-	REL.
4	.99	.99	.96	.74	.07	-	-	-	-	-	-	-	-	F.DAYS
	29	39	47	53	58	-	-	-	-	-	-	-	-	S/N..DB
	.19	.47	.79	.70	.06	-	-	-	-	-	-	-	-	REL.
6	.99	.99	.99	.91	.31	-	-	-	-	-	-	-	-	F.DAYS
	28	39	47	53	58	-	-	-	-	-	-	-	-	S/N..DB
	.17	.47	.82	.86	.31	-	-	-	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.88	.42	.07	-	-	-	-	-	-	F.DAYS
	25	37	45	50	56	59	61	-	-	-	-	-	-	S/N..DB
	.17	.42	.72	.85	.84	.41	.06	-	-	-	-	-	-	REL.
10	.99	.99	.99	.99	.97	.83	.41	.34	.21	.15	.11	.08	-	F.DAYS
	25	39	48	54	60	63	66	66	66	67	67	68	-	S/N..DB
	.19	.47	.89	.97	.96	.82	.41	.34	.20	.15	.11	.08	-	REL.
12	.99	.99	.99	.99	.98	.90	.59	.52	.37	.30	.24	.19	.11	F.DAYS
	19	29	45	52	59	62	65	65	66	67	67	67	67	S/N..DB
	.11	.26	.79	.96	.98	.90	.58	.51	.37	.30	.24	.19	.11	REL.
14	.99	.99	.99	.99	.99	.93	.67	.60	.42	.30	.20	.12	-	F.DAYS
	26	40	49	55	61	64	67	67	68	68	68	69	-	S/N..DB
	.08	.50	.90	.97	.98	.92	.66	.60	.42	.30	.20	.12	-	REL.
16	.99	.99	.99	.99	.97	.82	.30	.19	-	-	-	-	-	F.DAYS
	28	40	48	54	59	62	65	65	-	-	-	-	-	S/N..DB
	.11	.50	.85	.95	.96	.81	.30	.19	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.88	.39	.05	-	-	-	-	-	-	F.DAYS
	28	40	48	54	60	63	65	-	-	-	-	-	-	S/N..DB
	.11	.50	.85	.95	.87	.39	.05	-	-	-	-	-	-	REL.
20	.99	.99	.99	.89	.26	-	-	-	-	-	-	-	-	F.DAYS
	28	39	47	53	59	-	-	-	-	-	-	-	-	S/N..DB
	.13	.46	.82	.85	.26	-	-	-	-	-	-	-	-	REL.
22	.97	.98	.84	.48	-	-	-	-	-	-	-	-	-	F.DAYS
	24	34	43	49	-	-	-	-	-	-	-	-	-	S/N..DB
	.10	.32	.54	.40	-	-	-	-	-	-	-	-	-	REL.
24	.97	.98	.85	.49	-	-	-	-	-	-	-	-	-	F.DAYS
	24	35	43	49	-	-	-	-	-	-	-	-	-	S/N..DB
	.10	.34	.55	.40	-	-	-	-	-	-	-	-	-	REL.

1 DEC SSN= 120 0.016
3000 KM PATH TO 80 DEGREES S AZIMUTHS N.MILES
53.02S - 0.00W 80.00S - 0.00W 180.0 0.0 1618.8
VERTICAL 5H 0L 0DEG ANT= 10DB
OFF AZIMUTH 0 DEG. MIN. ANGLE= 0 DEG. OFF AZIMUTH 0 DEG.
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 40DB
OPERATING FREQUENCIES

GMT	3	4	6	8	12	16	22	23	25	26	27	28	30	
2	.99	.99	.99	.99	.93	.58	.05	-	-	-	-	-	-	F.DAYS
	18	28	43	50	57	61	63	-	-	-	-	-	-	S/N..DB
	.03	.16	.67	.89	.91	.57	.05	-	-	-	-	-	-	REL.
4	.99	.99	.99	.98	.95	.68	.11	.06	-	-	-	-	-	F.DAYS
	-44	9	30	41	52	57	61	60	-	-	-	-	-	S/N..DB
	.00	.04	.30	.55	.86	.66	.11	.06	-	-	-	-	-	REL.
6	.99	.99	.99	.99	.63	.81	.22	.15	-	-	-	-	-	F.DAYS
	-103	-55	13	33	47	55	59	59	-	-	-	-	-	S/N..DB
	.00	.00	.07	.35	.49	.78	.22	.14	-	-	-	-	-	REL.
8	.99	.99	.99	.99	.99	.85	.29	.20	.07	-	-	-	-	F.DAYS
	-167	-100	-37	19	42	52	58	58	59	-	-	-	-	S/N..DB
	.00	.00	.00	.10	.58	.76	.28	.19	.07	-	-	-	-	REL.
10	.99	.99	.99	.99	.99	.83	.17	.10	-	-	-	-	-	F.DAYS
	-212	-131	-54	14	43	54	60	61	-	-	-	-	-	S/N..DB
	.00	.00	.00	.04	.66	.80	.17	.10	-	-	-	-	-	REL.
12	.99	.99	.99	.99	.99	.68	-	-	-	-	-	-	-	F.DAYS
	-231	-144	-62	14	43	54	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.04	.66	.66	-	-	-	-	-	-	-	REL.
14	.99	.99	.99	.99	.99	.58	-	-	-	-	-	-	-	F.DAYS
	-213	-132	-55	16	43	54	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.06	.65	.56	-	-	-	-	-	-	-	REL.
16	.99	.99	.99	.99	.99	.61	-	-	-	-	-	-	-	F.DAYS
	-162	-96	4	29	48	57	-	-	-	-	-	-	-	S/N..DB
	.00	.00	.00	.19	.85	.60	-	-	-	-	-	-	-	REL.
18	.99	.99	.99	.99	.44	.68	.11	.07	-	-	-	-	-	F.DAYS
	-98	-50	17	37	52	59	64	64	-	-	-	-	-	S/N..DB
	.00	.00	.03	.41	.42	.67	.11	.07	-	-	-	-	-	REL.
20	.99	.99	.99	.98	.95	.62	.08	-	-	-	-	-	-	F.DAYS
	-42	11	32	43	54	59	62	-	-	-	-	-	-	S/N..DB
	.00	.04	.33	.64	.91	.62	.08	-	-	-	-	-	-	REL.
22	.99	.99	.99	.99	.91	.53	-	-	-	-	-	-	-	F.DAYS
	18	28	42	50	57	61	-	-	-	-	-	-	-	S/N..DB
	.09	.23	.63	.89	.89	.53	-	-	-	-	-	-	-	REL.
24	.99	.99	.99	.99	.93	.59	.06	-	-	-	-	-	-	F.DAYS
	22	35	45	51	58	61	63	-	-	-	-	-	-	S/N..DB
	.13	.38	.75	.91	.91	.59	.06	-	-	-	-	-	-	REL.

Figure I-48

APPENDIX II

COMPUTATIONS TO ESTIMATE THE FEASIBILITY OF FREQUENCY SHARING THROUGH GEOGRAPHICAL SEPARATION

Transmitter Latitude	Day or Night	Frequency - MHz					
		4.2	6.2	8.3	12.4	16.6	22.1
0° N	Day	II-1	II-2	II-3	II-4	II-5	II-6
	Night	II-7	II-8	II-9	II-10	II-11	II-12
20° N	Day	II-13	II-14	II-15	II-16	II-17	II-18
	Night	II-19	II-20	II-21	II-22	II-23	II-24
40° N	Day	II-25	II-26	II-27	II-28	II-29	II-30
	Night	II-31	II-32	II-33	II-34	II-35	II-36
60° N	Day	II-37	II-38	II-39	II-40	II-41	II-42
	Night	II-43	II-44	II-45	II-46	II-47	II-48
80° N	Day	II-49	II-50	II-51	II-52	II-53	II-54
	Night	II-55	II-56	II-57	II-58	II-59	II-60

MAR GMT 12 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 4.20MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

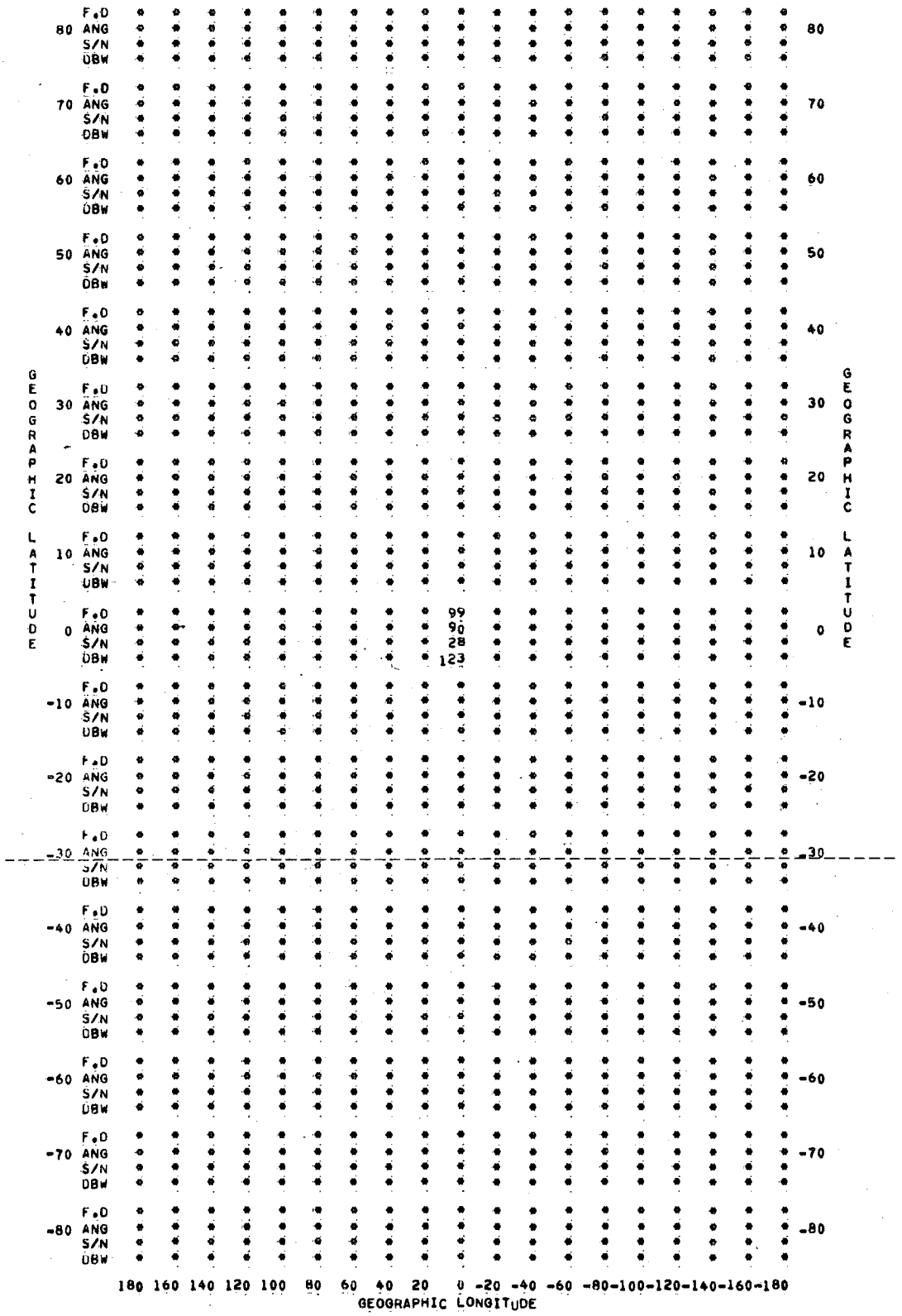

Figure 11-1

MAR GMT 12 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 6.20MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	30
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	20
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
10	F.D	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*	10
	ANG	*	*	*	*	*	*	*	*	*	45	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	10	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	145	*	*	*	*	*	*	*	*	*	
0	F.D	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*	0
	ANG	*	*	*	*	*	*	*	*	*	90	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	39	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	119	*	*	*	*	*	*	*	*	*	
-10	F.D	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*	-10
	ANG	*	*	*	*	*	*	*	*	*	42	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	8	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	147	*	*	*	*	*	*	*	*	*	
-20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-20
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-30
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-2

MAR GMT 12 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 8.30MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	30
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
20	F.D	*	*	*	*	*	*	*	*	99	99	*	*	*	*	*	*	*	*	*	20
	ANG	*	*	*	*	*	*	*	*	27	26	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	-6	7	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	166	152	*	*	*	*	*	*	*	*	*	
10	F.D	*	*	*	*	*	*	*	*	99	99	99	*	*	*	*	*	*	*	*	10
	ANG	*	*	*	*	*	*	*	*	0	27	33	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	2	39	2	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	157	120	157	*	*	*	*	*	*	*	*	
0	F.D	*	*	*	*	*	*	*	*	99	47	99	*	*	*	*	*	*	*	*	0
	ANG	*	*	*	*	*	*	*	*	26	90	34	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	12	44	-1	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	147	115	161	*	*	*	*	*	*	*	*	
-10	F.D	*	*	*	*	*	*	*	*	99	99	99	*	*	*	*	*	*	*	*	-10
	ANG	*	*	*	*	*	*	*	*	30	42	30	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	1	27	1	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	158	132	158	*	*	*	*	*	*	*	*	
-20	F.D	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*	-20
	ANG	*	*	*	*	*	*	*	*	*	31	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	159	*	*	*	*	*	*	*	*	*	
-30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-30
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure 11-3

MAR GMT 12 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 12.40MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	
80	F.D	84	84	84	83	84	92	95	96	97	98	*	*	*	98	94	92	88	84	84	80
	ANG	0	0	1	1	2	1	2	2	2	2	*	*	*	1	1	1	1	0	0	
	S/N	-9	-6	-0	-3	-4	-5	-5	-6	-9	-9	*	*	*	-10	-9	-9	-6	-9	-9	
	DBW	174	171	165	168	169	170	170	171	174	174	*	*	*	175	174	174	171	174	174	
70	F.D	40	35	*	72	82	92	96	98	*	*	*	99	99	99	99	*	*	55	40	70
	ANG	1	2	*	1	2	1	3	0	*	*	*	0	4	2	1	*	*	1	1	
	S/N	-6	-6	*	-3	-3	-3	-9	6	*	*	*	5	-7	-6	-6	*	*	-7	-6	
	DBW	171	171	*	168	168	168	174	158	*	*	*	159	172	171	171	*	*	172	171	
60	F.D	28	*	5	51	77	94	99	99	99	99	99	99	99	99	99	*	87	62	28	60
	ANG	0	*	1	1	2	2	5	8	9	10	9	8	5	3	1	*	4	0	0	
	S/N	-10	*	-10	-9	-9	-10	-9	-8	-6	-4	-4	-5	-5	-5	-6	*	-10	1	-10	
	DBW	175	*	175	174	174	175	174	173	171	169	169	170	170	170	171	*	175	163	175	
50	F.D	36	11	-	-	85	99	99	99	99	99	99	99	99	99	*	98	92	72	36	50
	ANG	2	2	-	-	1	2	6	9	11	12	11	9	6	3	*	4	3	2	2	
	S/N	-5	-5	-	-	-5	-7	-5	0	-3	-2	-2	-3	-5	-4	*	-10	-9	-8	-5	
	DBW	170	170	-	-	170	172	170	164	168	167	167	168	170	169	*	175	174	173	170	
40	F.D	50	29	18	18	93	99	99	99	99	99	99	99	99	99	99	*	93	77	50	40
	ANG	0	1	2	1	1	3	7	11	14	16	14	11	7	3	0	*	2	1	0	
	S/N	-6	-6	-5	-3	-6	-6	-2	4	0	2	0	-2	-5	-6	1	*	-9	-7	-6	
	DBW	171	171	170	168	171	171	167	160	164	162	164	167	170	171	163	*	174	172	171	
30	F.D	65	60	62	54	99	99	99	99	99	99	99	99	99	99	*	*	98	*	65	30
	ANG	0	1	1	0	0	3	8	13	13	15	13	13	8	3	*	*	1	*	0	
	S/N	-9	-8	-6	-4	-9	-6	-0	6	17	21	17	-1	-5	-9	*	*	-10	*	-9	
	DBW	174	173	171	169	174	171	165	158	147	143	147	166	170	172	*	*	175	*	174	
20	F.D	*	*	74	37	*	99	99	99	99	99	99	99	99	*	*	*	*	*	*	20
	ANG	*	*	0	0	*	4	9	15	17	1	17	16	9	*	*	*	*	*	*	
	S/N	*	*	-10	-6	*	-7	-0	9	28	30	22	0	-5	*	*	*	*	*	*	
	DBW	*	*	175	171	*	172	165	155	136	134	142	164	170	*	*	*	*	*	*	
10	F.D	*	*	*	-	97	99	99	99	99	99	99	99	99	*	*	*	*	*	*	10
	ANG	*	*	*	-	0	4	10	18	0	11	0	17	10	*	*	*	*	*	*	
	S/N	*	*	*	-	-10	-7	-0	12	35	52	27	1	-5	*	*	*	*	*	*	
	DBW	*	*	*	-	175	172	165	152	129	112	137	163	170	*	*	*	*	*	*	
0	F.D	*	*	*	*	*	99	99	99	99	-	99	99	99	99	*	*	*	*	*	0
	ANG	*	*	*	*	*	4	10	13	1	-	1	16	10	5	*	*	*	*	*	
	S/N	*	*	*	*	*	-8	-1	13	36	-	25	0	-6	-10	*	*	*	*	*	
	DBW	*	*	*	*	*	173	166	151	128	-	136	164	171	172	*	*	*	*	*	
-10	F.D	*	*	*	*	*	*	99	99	99	99	99	99	99	99	*	*	*	*	*	-10
	ANG	*	*	*	*	*	*	10	16	20	23	19	15	13	4	*	*	*	*	*	
	S/N	*	*	*	*	*	*	-1	9	31	51	25	-1	-7	-8	*	*	*	*	*	
	DBW	*	*	*	*	*	*	166	155	133	113	139	165	172	173	*	*	*	*	*	
-20	F.D	*	*	*	*	*	99	99	99	99	99	99	99	99	99	*	*	*	*	*	-20
	ANG	*	*	*	*	*	4	13	14	15	21	15	14	13	4	*	*	*	*	*	
	S/N	*	*	*	*	*	-10	-9	5	24	33	20	-1	-7	-8	*	*	*	*	*	
	DBW	*	*	*	*	*	175	174	159	140	131	144	166	172	173	*	*	*	*	*	
-30	F.D	*	*	*	82	*	*	*	99	99	99	99	99	99	99	*	*	*	*	*	-30
	ANG	*	*	*	3	*	*	*	12	17	14	18	13	9	3	*	*	*	*	*	
	S/N	*	*	*	-9	*	*	*	3	12	23	14	-3	-1	-8	*	*	*	*	*	
	DBW	*	*	*	174	*	*	*	161	152	141	150	168	166	173	*	*	*	*	*	
-40	F.D	69	53	45	66	*	*	*	99	99	99	99	99	99	99	*	*	*	*	69	-40
	ANG	1	1	2	0	*	*	*	11	14	16	14	11	8	3	*	*	*	*	1	
	S/N	-10	-9	-8	-7	*	*	*	1	6	10	7	3	-3	-9	*	*	*	*	-10	
	DBW	175	174	173	172	*	*	*	163	158	154	157	161	168	174	*	*	*	*	175	
-50	F.D	*	21	*	37	*	*	*	99	99	99	99	99	99	99	*	*	*	69	*	-50
	ANG	*	2	*	1	*	*	*	12	11	12	12	10	7	3	*	*	*	2	*	
	S/N	*	-8	*	-5	*	*	*	-8	1	4	3	-0	-5	-10	*	*	*	-10	*	
	DBW	*	173	*	170	*	*	*	173	163	160	161	165	170	175	*	*	*	175	*	
-60	F.D	*	17	10	81	*	*	99	99	99	99	99	99	99	*	*	*	80	*	*	-60
	ANG	*	0	0	0	*	*	5	7	9	10	9	8	6	*	*	*	3	*	*	
	S/N	*	-8	-10	-8	*	*	-7	-5	-2	-1	-1	-3	-8	*	*	*	-10	*	*	
	DBW	*	173	175	173	*	*	172	170	167	166	166	168	173	*	*	*	175	*	*	
-70	F.D	59	*	*	*	*	*	99	99	99	99	99	*	*	*	*	95	*	73	59	-70
	ANG	0	*	*	*	*	*	3	5	6	7	7	*	*	*	*	0	*	0	0	
	S/N	-9	*	*	*	*	*	-9	-7	-6	-7	-7	*	*	*	*	-10	*	-7	-9	
	DBW	174	*	*	*	*	*	174	172	171	172	172	*	*	*	*	175	*	172	174	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-4

MAR GMT 12 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 16.60MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.O	34	34	35	35	40	47	56	65	71	76	79	81	81	78	69	59	47	34	34	80
	ANG	2	2	0	0	0	1	2	2	2	3	3	2	2	1	1	0	0	2	2	
	S/N	13	16	16	15	15	15	14	14	11	11	9	9	9	9	10	10	11	13	13	
	DBW	154	151	151	152	152	152	153	153	156	156	158	158	158	158	157	157	156	154	154	
70	F.O	-	-	15	14	22	45	64	75	88	91	93	92	93	92	88	74	51	-	-	70
	ANG	-	-	1	2	0	1	2	4	0	0	0	4	3	2	2	1	1	-	-	
	S/N	-	-	15	16	15	16	11	11	16	8	15	12	12	13	13	13	8	-	-	
	DBW	-	-	152	151	152	151	156	156	151	159	152	155	155	154	154	154	159	-	-	
60	F.O	-	-	-	-	14	54	82	96	98	98	99	99	99	96	93	88	39	8	-	60
	ANG	-	-	-	-	0	2	3	0	2	2	2	0	4	2	1	0	1	0	-	
	S/N	-	-	-	-	10	11	12	13	20	23	22	17	14	14	14	15	16	9	-	
	DBW	-	-	-	-	157	156	155	154	147	144	145	150	153	153	153	152	151	158	-	
50	F.O	-	-	-	-	15	76	93	98	99	99	99	99	99	97	95	83	55	7	-	50
	ANG	-	-	-	-	0	2	4	2	4	5	4	2	4	2	0	0	0	2	-	
	S/N	-	-	-	-	14	15	17	22	24	25	25	24	15	16	14	14	19	11	-	
	DBW	-	-	-	-	153	152	150	145	143	142	142	143	152	151	153	153	148	156	-	
40	F.O	-	-	-	-	34	90	99	99	99	99	99	99	99	98	97	85	57	12	-	40
	ANG	-	-	-	-	0	2	0	4	7	9	7	4	0	1	0	3	2	1	-	
	S/N	-	-	-	-	16	17	18	25	27	29	27	25	15	15	9	10	11	12	-	
	DBW	-	-	-	-	151	150	149	142	140	138	140	142	152	152	158	157	156	155	-	
30	F.O	14	-	-	-	58	97	99	99	99	73	93	99	99	99	99	98	81	32	14	30
	ANG	1	-	-	-	2	2	1	6	4	17	12	6	1	3	0	3	1	2	1	
	S/N	11	-	-	-	16	17	19	27	31	35	31	26	20	14	19	10	11	12	11	
	DBW	156	-	-	-	151	150	148	140	136	132	136	141	147	153	148	157	156	155	156	
20	F.O	38	11	-	-	59	99	99	99	30	99	31	99	99	99	99	99	99	89	38	20
	ANG	2	0	-	-	2	2	1	8	21	2	21	8	2	3	0	2	0	3	2	
	S/N	9	9	-	-	15	16	21	30	42	49	36	27	22	12	14	9	6	5	9	
	DBW	158	158	-	-	152	151	146	137	129	118	131	140	145	154	152	158	161	162	158	
10	F.O	83	68	9	-	24	99	99	99	99	-	99	99	99	99	99	99	99	99	83	10
	ANG	0	2	0	-	2	4	2	2	0	-	9	9	3	4	0	3	0	2	0	
	S/N	3	7	7	-	14	15	22	32	47	-	47	28	23	12	4	8	5	4	3	
	DBW	164	160	160	-	153	152	145	135	120	-	120	139	144	154	159	159	162	163	164	
0	F.O	99	91	41	-	54	99	99	99	99	-	99	99	99	99	99	99	99	99	99	0
	ANG	1	1	2	-	2	3	2	2	10	-	9	9	3	4	0	2	3	1	1	
	S/N	1	3	7	-	13	12	22	33	48	-	41	27	22	13	6	7	5	2	1	
	DBW	166	164	160	-	154	155	145	134	119	-	119	139	145	154	159	160	162	165	166	
-10	F.O	83	98	87	-	78	99	99	99	99	38	99	99	99	99	99	99	99	96	83	-10
	ANG	0	1	0	-	1	3	2	9	8	28	8	8	2	3	4	1	3	2	0	
	S/N	2	1	7	-	12	12	21	30	46	58	45	26	21	12	7	7	4	2	2	
	DBW	165	166	160	-	155	155	146	137	121	109	121	140	146	155	160	160	163	165	165	
-20	F.O	65	72	70	11	89	99	99	99	99	99	97	99	99	99	99	97	83	67	65	-20
	ANG	2	2	1	2	0	3	1	7	15	8	15	7	1	3	4	2	1	3	2	
	S/N	8	7	9	11	12	11	19	27	38	47	34	26	20	12	9	8	8	8	8	
	DBW	159	160	158	156	155	159	148	140	129	120	133	141	147	155	158	159	159	159	159	
-30	F.O	42	22	22	10	83	99	99	99	99	99	99	99	99	99	96	75	54	44	42	-30
	ANG	1	1	1	0	0	2	0	5	10	13	10	6	1	2	0	3	1	1	1	
	S/N	9	9	10	10	11	11	15	25	32	37	33	25	18	13	10	12	10	10	9	
	DBW	158	158	157	157	156	156	152	142	135	130	134	142	149	154	157	155	157	157	158	
-40	F.O	17	-	-	-	86	99	99	99	99	99	99	99	99	95	90	59	20	18	17	-40
	ANG	0	-	-	-	0	1	5	3	7	8	7	4	0	2	1	0	2	1	0	
	S/N	10	-	-	-	12	11	14	24	28	30	28	25	16	13	11	12	10	10	10	
	DBW	157	-	-	-	155	156	153	143	139	137	139	142	151	154	156	155	157	157	157	
-50	F.O	-	-	-	-	83	99	99	99	99	99	99	99	98	93	85	53	11	5	-	-50
	ANG	-	-	-	-	0	1	4	1	4	5	5	2	4	2	1	1	3	2	-	
	S/N	-	-	-	-	13	11	14	20	24	26	25	21	17	13	11	5	4	3	-	
	DBW	-	-	-	-	154	156	153	147	143	141	142	146	150	154	156	162	163	164	-	
-60	F.O	-	-	-	16	70	92	99	99	99	99	99	99	97	91	83	73	15	9	-	-60
	ANG	-	-	-	1	1	1	2	4	1	2	2	0	3	2	1	0	0	0	-	
	S/N	-	-	-	13	13	13	13	17	19	20	19	17	14	8	7	9	9	6	-	
	DBW	-	-	-	154	154	154	154	150	148	147	148	150	153	159	160	158	158	161	-	
-70	F.O	-	-	15	33	65	84	91	93	94	97	93	92	91	89	83	72	61	15	-	-70
	ANG	-	-	1	2	0	1	2	3	3	4	4	4	2	1	1	1	0	1	-	
	S/N	-	-	6	11	11	13	14	15	16	14	15	9	9	11	13	12	12	12	-	
	DBW	-	-	161	156	156	154	153	152	151	153	152	158	158	156	154	155	155	155	-	
-80	F.O	53	50	50	58	70	78	84	87	89	90	90	89	88	86	82	72	66	59	53	-80
	ANG	2	2	2	0	0	1	1	2	2	2	2	2	1	1	0	1	1	1	2	
	S/N	12	10	7	7	6	6	7	7	7	8	9	9	11	10	13	12	12	12	12	
	DBW	155	157	160	160	161	161	160	160	160	159	158	158	156	157	154	155	155	155	155	

GEOGRAPHIC LONGITUDE

Figure II-5

MAR GMT 12 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 22.10MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
	F.D	-	-	-	-	-	-	-	-	-	6	8	11	11	9	9	-	-	-	-	
80	ANG	-	-	-	-	-	-	-	-	-	6	6	6	5	4	4	-	-	-	-	80
	S/N	-	-	-	-	-	-	-	-	-	24	21	21	21	22	22	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	147	150	150	150	149	149	-	-	-	-	
	F.D	-	-	-	-	-	-	-	18	33	44	53	56	38	40	31	17	-	-	-	
70	ANG	-	-	-	-	-	-	-	0	1	1	1	0	7	5	3	2	-	-	-	70
	S/N	-	-	-	-	-	-	-	23	24	24	25	25	25	26	26	26	-	-	-	
	DBW	-	-	-	-	-	-	-	148	147	147	146	146	146	145	145	145	-	-	-	
	F.D	-	-	-	-	-	-	-	42	56	65	72	77	55	61	58	38	-	-	-	
60	ANG	-	-	-	-	-	-	-	2	3	3	3	1	7	5	3	1	-	-	-	60
	S/N	-	-	-	-	-	-	-	26	32	34	34	33	28	27	28	28	-	-	-	
	DBW	-	-	-	-	-	-	-	145	139	137	137	138	143	144	143	143	-	-	-	
	F.D	-	-	-	-	-	-	46	65	95	95	97	84	85	67	66	17	-	-	-	
50	ANG	-	-	-	-	-	-	0	3	4	5	4	3	0	4	2	1	-	-	-	50
	S/N	-	-	-	-	-	-	30	34	35	37	36	36	29	29	29	29	-	-	-	
	DBW	-	-	-	-	-	-	141	137	136	134	135	135	142	142	142	142	-	-	-	
	F.D	-	-	-	-	-	13	78	84	98	91	94	90	97	77	74	31	-	-	-	
40	ANG	-	-	-	-	-	5	1	5	7	9	7	5	0	4	1	0	-	-	-	40
	S/N	-	-	-	-	-	30	33	37	38	40	39	37	29	29	28	24	-	-	-	
	DBW	-	-	-	-	-	141	138	134	133	131	132	134	142	142	143	147	-	-	-	
	F.D	-	-	-	-	-	34	92	98	98	92	93	76	91	88	92	71	9	-	-	
30	ANG	-	-	-	-	-	5	1	5	0	3	0	7	1	4	0	4	3	-	-	30
	S/N	-	-	-	-	-	31	35	39	41	49	41	38	33	28	23	24	24	-	-	
	DBW	-	-	-	-	-	140	136	132	130	122	130	133	138	143	148	147	147	-	-	
	F.D	-	-	-	-	-	50	98	62	77	12	78	46	96	94	94	94	89	47	-	
20	ANG	-	-	-	-	-	6	2	10	5	13	5	11	2	4	0	3	1	0	-	20
	S/N	-	-	-	-	-	31	35	42	50	56	50	39	34	28	23	24	23	20	-	
	DBW	-	-	-	-	-	140	136	129	121	115	121	132	137	143	148	147	148	151	-	
	F.D	37	-	-	-	-	53	99	20	15	-	49	39	95	93	95	86	88	87	37	
10	ANG	2	-	-	-	-	6	2	12	11	-	11	12	3	5	1	4	1	2	2	10
	S/N	21	-	-	-	-	30	35	43	54	-	54	40	35	28	27	27	24	20	21	
	DBW	150	-	-	-	-	141	136	128	117	-	117	131	136	143	144	144	147	151	150	
	F.D	87	-	-	-	-	73	99	15	28	-	84	91	98	98	99	99	98	97	87	
0	ANG	2	-	-	-	-	5	2	13	13	-	10	10	2	4	0	3	0	2	2	0
	S/N	17	-	-	-	-	30	35	44	55	-	50	39	34	30	26	24	21	18	17	
	DBW	154	-	-	-	-	141	136	127	116	-	116	132	137	141	145	147	150	153	154	
	F.D	36	60	-	-	-	75	99	65	94	-	99	98	99	99	99	98	94	60	36	
-10	ANG	2	3	-	-	-	5	2	10	8	-	7	8	1	3	0	2	0	3	2	-10
	S/N	20	20	-	-	-	27	35	42	53	-	53	38	34	28	24	23	21	21	20	
	DBW	151	151	-	-	-	144	136	129	118	-	118	133	137	143	147	148	150	150	151	
	F.D	13	-	-	-	10	85	99	97	99	98	99	96	97	93	85	52	16	-	13	
-20	ANG	3	-	-	-	1	4	1	7	3	8	3	7	1	4	0	4	2	-	3	-20
	S/N	21	-	-	-	24	30	34	40	49	54	49	38	34	30	27	26	23	-	21	
	DBW	150	-	-	-	147	141	137	131	122	117	122	133	137	141	144	145	148	-	150	
	F.D	-	-	-	-	-	71	98	99	83	99	51	90	84	69	56	7	-	-	-	
-30	ANG	-	-	-	-	-	4	0	4	11	2	13	6	1	4	2	0	-	-	-	-30
	S/N	-	-	-	-	-	29	33	37	44	48	45	37	34	30	28	20	-	-	-	
	DBW	-	-	-	-	-	142	138	134	127	123	126	134	137	141	143	151	-	-	-	
	F.D	-	-	-	-	13	66	85	98	96	82	81	77	84	53	36	-	-	-	-	
-40	ANG	-	-	-	-	1	4	6	3	7	9	8	5	1	5	2	-	-	-	-	-40
	S/N	-	-	-	-	24	29	32	36	40	42	40	37	32	28	26	-	-	-	-	
	DBW	-	-	-	-	147	142	139	135	131	129	131	134	139	143	145	-	-	-	-	
	F.D	-	-	-	-	12	61	75	92	95	95	86	73	71	42	22	-	-	-	-	
-50	ANG	-	-	-	-	2	4	6	1	4	5	4	3	0	5	3	-	-	-	-	-50
	S/N	-	-	-	-	25	29	31	34	36	38	37	34	31	27	24	-	-	-	-	
	DBW	-	-	-	-	146	142	140	137	135	133	134	137	140	144	147	-	-	-	-	
	F.D	-	-	-	-	6	39	59	84	84	79	75	71	37	36	16	-	-	-	-	
-60	ANG	-	-	-	-	2	4	6	0	1	2	2	1	7	5	3	-	-	-	-	-60
	S/N	-	-	-	-	25	28	30	32	34	34	33	32	28	21	20	-	-	-	-	
	DBW	-	-	-	-	146	143	141	139	137	137	138	139	143	150	151	-	-	-	-	
	F.D	-	-	-	-	-	18	35	42	65	69	63	58	34	29	21	15	6	-	-	
-70	ANG	-	-	-	-	-	4	5	6	0	0	0	0	6	4	3	2	1	-	-	-70
	S/N	-	-	-	-	-	27	28	29	30	29	29	23	23	24	26	25	20	-	-	
	DBW	-	-	-	-	-	144	143	142	141	142	142	148	148	147	145	146	151	-	-	
	F.D	-	-	-	-	-	10	17	23	27	28	29	27	25	21	16	14	9	5	-	
-80	ANG	-	-	-	-	-	4	4	5	5	5	6	5	5	4	3	3	2	2	-	-80
	S/N	-	-	-	-	-	20	21	21	22	22	23	23	24	24	26	25	24	23	-	
	DBW	-	-	-	-	-	151	150	150	149	149	148	148	147	147	145	146	147	148	-	

GEOGRAPHIC LONGITUDE

Figure II-6

MAR GMT 24 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 4.20MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	80
	ANG	0	0	0	1	1	2	3	3	4	4	4	4	3	2	2	1	0	0	0	
	S/N	-8	-5	-5	-3	-1	-1	0	0	-1	-1	-4	-5	-5	-6	-6	-7	-9	-7	-8	
	DBW	160	157	157	155	153	153	151	151	153	153	156	157	157	158	158	159	161	159	160	
70	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	70
	ANG	*	*	*	0	1	2	4	5	6	0	6	5	4	3	1	0	*	*	*	
	S/N	*	*	*	0	-2	-0	-3	-0	-3	7	-3	0	-0	-1	-2	-6	*	*	*	
	DBW	*	*	*	151	154	152	155	152	155	144	155	151	152	153	154	158	*	*	*	
60	F.D	*	*	*	*	*	99	99	99	99	99	99	99	99	99	99	*	*	*	*	60
	ANG	*	*	*	*	*	3	5	0	2	2	2	0	5	3	1	*	*	*	*	
	S/N	*	*	*	*	*	-7	-3	1	11	13	12	8	2	0	-1	*	*	*	*	
	DBW	*	*	*	*	*	159	155	150	140	138	139	143	149	151	153	*	*	*	*	
50	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	50
	ANG	*	*	*	*	0	3	6	2	4	4	3	2	6	3	0	*	*	*	*	
	S/N	*	*	*	*	-9	-2	1	12	15	13	13	14	4	1	-1	*	*	*	*	
	DBW	*	*	*	*	161	154	150	139	136	135	135	137	147	150	153	*	*	*	*	
40	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	40
	ANG	*	*	*	*	0	3	0	4	6	7	6	3	0	3	0	*	*	*	*	
	S/N	*	*	*	*	-5	0	7	16	17	15	15	15	16	1	-3	*	*	*	*	
	DBW	*	*	*	*	157	151	144	135	132	131	132	135	135	150	155	*	*	*	*	
30	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	*	*	*	*	*	30
	ANG	*	*	*	*	0	3	1	5	9	1	9	4	0	3	*	*	*	*	*	
	S/N	*	*	*	*	-6	2	10	17	18	26	19	14	9	1	*	*	*	*	*	
	DBW	*	*	*	*	158	149	141	133	129	121	129	134	142	150	*	*	*	*	*	
20	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	*	*	*	*	*	20
	ANG	*	*	*	*	4	3	1	6	2	7	2	5	0	3	*	*	*	*	*	
	S/N	*	*	*	*	-9	0	10	17	27	33	28	14	10	0	*	*	*	*	*	
	DBW	*	*	*	*	161	150	140	131	119	113	119	133	140	151	*	*	*	*	*	
10	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	*	*	*	*	*	10
	ANG	*	*	*	*	4	3	1	7	6	20	5	7	1	3	*	*	*	*	*	
	S/N	*	*	*	*	-10	-1	7	17	29	34	24	11	11	0	*	*	*	*	*	
	DBW	*	*	*	*	162	150	139	129	115	104	115	132	139	151	*	*	*	*	*	
0	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	0
	ANG	*	*	*	*	0	3	2	8	7	90	7	7	1	3	4	*	*	*	*	
	S/N	*	*	*	*	-10	-0	2	15	29	33	19	10	11	1	-10	*	*	*	*	
	DBW	*	*	*	*	162	151	139	129	114	98	113	131	138	150	162	*	*	*	*	
-10	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-10
	ANG	*	*	*	*	1	4	2	7	6	20	6	8	1	3	0	*	*	*	*	
	S/N	*	*	*	*	-9	-0	4	16	31	39	23	11	11	1	-6	*	*	*	*	
	DBW	*	*	*	*	161	152	139	130	115	104	115	131	139	150	158	*	*	*	*	
-20	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-20
	ANG	*	*	*	*	0	4	1	6	2	8	3	7	1	3	0	*	*	*	*	
	S/N	*	*	*	*	-8	0	8	16	30	36	25	10	11	2	-8	*	*	*	*	
	DBW	*	*	*	*	160	151	141	132	119	113	118	132	139	149	160	*	*	*	*	
-30	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-30
	ANG	*	*	*	*	0	3	0	4	10	2	11	6	1	3	0	*	*	*	*	
	S/N	*	*	*	*	-8	-0	8	17	25	31	23	14	10	2	-6	*	*	*	*	
	DBW	*	*	*	*	160	152	143	134	126	120	125	134	141	149	158	*	*	*	*	
-40	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-40
	ANG	*	*	*	*	0	2	5	3	6	8	7	4	0	3	1	*	*	*	*	
	S/N	*	*	*	*	-9	-1	4	14	20	23	21	16	7	1	-7	*	*	*	*	
	DBW	*	*	*	*	161	153	147	137	131	128	130	135	144	150	159	*	*	*	*	
-50	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-50
	ANG	*	*	*	*	0	2	5	1	4	5	4	2	6	3	1	*	*	*	*	
	S/N	*	*	*	*	-9	-1	3	12	16	18	17	12	4	0	-7	*	*	*	*	
	DBW	*	*	*	*	161	153	148	139	135	133	134	139	147	151	159	*	*	*	*	
-60	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	-60
	ANG	*	*	*	*	1	2	4	0	1	2	2	0	5	3	1	0	*	*	*	
	S/N	*	*	*	*	-8	-1	2	6	11	12	11	6	1	-6	-9	-9	*	*	*	
	DBW	*	*	*	*	160	153	149	145	140	139	140	145	150	158	161	161	*	*	*	
-70	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	-70
	ANG	*	*	*	0	1	2	4	5	6	0	6	5	4	3	2	0	4	*	*	
	S/N	*	*	*	-10	-8	-2	-0	2	4	7	3	-2	-3	-2	-3	-7	-10	*	*	
	DBW	*	*	*	162	160	154	152	149	147	144	148	154	155	154	155	159	162	*	*	
-80	F.D	99	99	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	99	-80
	ANG	0	0	*	*	*	2	3	4	4	4	4	4	3	3	2	1	1	0	0	
	S/N	-9	-10	*	*	*	-9	-6	-5	-4	-4	-4	-4	-1	-2	-2	-3	-6	-8	-9	
	DBW	161	162	*	*	*	161	158	157	156	156	156	156	153	154	154	155	158	160	161	

GEOGRAPHIC LONGITUDE

Figure II-7

MAR GMT 24 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 6.20MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	99	99	99	99	99	99	99	99	99	99	99	98	98	99	98	99	99	99	99	80
	ANG	4	0	0	0	1	2	3	3	4	4	4	3	3	2	1	1	0	0	4	
	S/N	3	19	11	9	14	14	16	16	14	14	10	10	10	10	9	7	2	14	3	
	DBW	152	136	144	146	141	141	139	139	141	141	145	145	145	145	146	148	153	141	152	
70	F.D	99	99	99	99	99	99	99	99	99	98	98	98	98	98	98	99	99	99	99	70
	ANG	2	2	3	4	1	2	4	5	6	6	6	5	4	3	1	0	1	2	2	
	S/N	0	1	7	7	12	14	12	15	11	11	11	15	14	14	13	8	1	0	0	
	DBW	155	154	148	148	143	141	143	140	144	144	144	140	141	141	142	147	154	156	155	
60	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	60
	ANG	1	1	2	3	0	2	5	0	1	2	1	0	5	3	1	3	1	1	1	
	S/N	-8	-8	-2	3	6	7	11	15	23	25	24	18	17	16	14	7	6	-3	-8	
	DBW	164	164	158	152	149	148	144	140	132	130	131	137	138	139	141	148	149	159	164	
50	F.D	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	50
	ANG	*	*	1	2	0	2	5	2	3	4	3	1	5	3	0	2	0	*	*	
	S/N	*	*	-10	4	8	12	16	24	27	26	26	26	19	17	9	8	-9	*	*	
	DBW	*	*	166	151	147	143	139	131	128	127	127	129	136	138	146	147	165	*	*	
40	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	40
	ANG	*	*	*	2	0	3	0	3	6	7	5	3	6	3	0	1	*	*	*	
	S/N	*	*	*	0	9	16	23	28	28	27	27	27	19	17	21	4	*	*	*	
	DBW	*	*	*	155	148	139	132	127	125	124	125	127	136	138	134	151	*	*	*	
30	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	30
	ANG	*	*	*	1	4	2	0	4	9	0	9	3	0	2	4	0	*	*	*	
	S/N	*	*	*	-7	10	16	23	28	30	33	31	27	28	17	9	-5	*	*	*	
	DBW	*	*	*	153	145	138	132	125	122	119	122	126	127	138	146	161	*	*	*	
20	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	98	99	*	*	*	*	20
	ANG	*	*	*	*	3	2	0	6	2	7	1	5	0	2	3	*	*	*	*	
	S/N	*	*	*	*	9	15	22	29	36	41	37	27	19	16	8	*	*	*	*	
	DBW	*	*	*	*	146	138	131	123	115	110	115	125	135	138	147	*	*	*	*	
10	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	10
	ANG	*	*	*	*	3	2	1	7	6	21	5	6	0	2	1	*	*	*	*	
	S/N	*	*	*	*	9	14	19	29	38	43	35	24	19	15	4	*	*	*	*	
	DBW	*	*	*	*	146	138	131	122	111	102	111	124	135	138	147	*	*	*	*	
0	F.D	*	*	*	*	99	99	99	99	99	95	99	99	99	99	99	*	*	*	*	0
	ANG	*	*	*	*	4	3	1	8	7	90	7	7	1	2	3	*	*	*	*	
	S/N	*	*	*	*	9	15	16	28	38	37	30	23	22	16	8	*	*	*	*	
	DBW	*	*	*	*	146	138	131	121	110	102	110	124	131	138	146	*	*	*	*	
-10	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-10
	ANG	*	*	*	*	0	3	1	7	5	21	6	7	1	3	4	*	*	*	*	
	S/N	*	*	*	*	10	16	18	29	41	48	35	25	24	18	10	*	*	*	*	
	DBW	*	*	*	*	145	139	131	122	111	102	111	124	131	137	145	*	*	*	*	
-20	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	98	99	*	*	*	*	-20
	ANG	*	*	*	*	0	3	0	5	2	8	2	7	1	3	4	*	*	*	*	
	S/N	*	*	*	*	9	17	21	29	39	44	36	24	24	18	11	*	*	*	*	
	DBW	*	*	*	*	146	138	132	124	115	110	114	125	131	137	144	*	*	*	*	
-30	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	98	99	99	*	*	*	-30
	ANG	*	*	*	*	3	2	6	4	10	1	11	5	1	3	0	1	*	*	*	
	S/N	*	*	*	*	8	15	22	29	36	39	35	28	24	18	12	-9	*	*	*	
	DBW	*	*	*	*	147	140	133	126	119	116	119	126	131	137	143	165	*	*	*	
-40	F.D	*	*	*	99	99	99	99	99	99	99	99	98	98	97	99	99	*	*	*	-40
	ANG	*	*	*	1	4	2	5	2	6	8	7	4	0	3	0	2	*	*	*	
	S/N	*	*	*	-4	9	15	20	27	32	34	33	29	22	17	11	-2	*	*	*	
	DBW	*	*	*	150	146	140	135	128	123	121	122	126	133	138	144	158	*	*	*	
-50	F.D	*	*	*	99	99	99	99	99	99	99	99	99	96	97	99	99	*	*	*	-50
	ANG	*	*	*	2	0	2	4	1	3	5	4	2	6	3	1	3	*	*	*	
	S/N	*	*	*	5	16	15	20	24	28	30	29	25	20	16	10	0	*	*	*	
	DBW	*	*	*	150	145	140	135	131	127	125	126	130	135	139	145	156	*	*	*	
-60	F.D	*	*	99	99	99	99	99	99	99	99	99	99	98	97	99	99	99	*	*	-60
	ANG	*	*	2	3	0	2	4	6	1	2	1	0	5	3	1	4	2	*	*	
	S/N	*	*	-1	7	10	14	18	21	24	24	23	21	17	9	6	7	-2	*	*	
	DBW	*	*	157	148	145	141	137	134	131	131	132	134	138	146	149	148	158	*	*	
-70	F.D	99	99	99	99	99	99	99	99	99	99	99	98	98	98	99	99	99	99	99	-70
	ANG	2	2	3	0	1	2	3	5	6	6	6	5	4	3	1	0	4	2	2	
	S/N	0	0	2	7	7	13	15	18	19	18	18	13	12	13	13	11	8	5	0	
	DBW	155	155	153	148	148	142	140	137	136	137	137	142	143	142	142	144	147	150	155	
-80	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	-80
	ANG	0	0	0	1	1	2	3	3	4	4	4	3	3	2	2	1	0	0	0	
	S/N	9	8	5	3	4	5	9	10	10	11	11	11	14	13	13	12	11	9	9	
	DBW	146	147	150	152	151	150	146	145	145	144	144	144	141	142	142	143	144	146	146	

GEOGRAPHIC LONGITUDE

Figure II-8

MAR GMT 24 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 8.30MC/S
VERTICAL SH 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	98	98	98	98	97	97	96	94	92	90	88	88	88	89	89	92	95	97	98	80
	ANG	0	0	0	1	1	2	3	4	4	4	4	4	3	3	2	1	0	0	0	
	S/N	23	26	18	21	24	25	26	26	24	24	20	20	20	20	19	18	14	16	23	
	DBW	136	133	141	138	135	134	133	133	135	135	139	139	139	139	140	141	145	143	136	
70	F.D	97	98	98	98	99	98	97	94	90	94	85	85	84	84	88	90	92	98	97	70
	ANG	0	1	3	4	1	2	4	5	7	0	7	6	5	3	2	0	4	1	0	
	S/N	12	13	18	18	22	25	22	24	21	24	20	24	24	24	23	17	12	11	12	
	DBW	147	146	141	141	137	134	137	135	138	135	139	135	135	135	136	142	147	148	147	
60	F.D	99	99	99	99	99	99	99	99	98	98	98	97	92	89	94	95	99	99	99	60
	ANG	1	1	2	3	0	2	5	0	2	2	2	0	5	3	1	4	2	1	1	
	S/N	7	6	11	14	17	18	21	25	31	33	32	27	26	26	24	19	18	11	7	
	DBW	152	153	148	145	142	141	138	134	128	126	127	132	133	133	135	140	141	148	152	
50	F.D	99	99	99	99	99	99	99	99	99	99	99	99	97	96	98	99	99	99	99	50
	ANG	3	0	1	2	0	2	6	2	4	4	3	2	6	3	0	2	0	3	3	
	S/N	-7	-3	7	16	20	22	26	33	35	35	36	35	28	27	22	20	6	-3	-7	
	DBW	167	163	152	143	139	137	133	126	124	123	123	124	131	132	137	139	153	163	167	
40	F.D	*	*	99	99	99	99	99	99	99	99	99	99	98	98	99	99	99	*	*	40
	ANG	*	*	0	1	4	3	0	3	6	7	5	3	6	3	0	1	2	*	*	
	S/N	*	*	-1	14	21	25	30	36	37	37	37	36	29	27	27	22	-2	*	*	
	DBW	*	*	161	145	138	133	129	123	121	120	121	123	130	132	132	137	162	*	*	
30	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	95	97	99	99	*	*	30
	ANG	*	*	*	1	4	2	0	4	9	0	9	3	0	3	4	0	2	*	*	
	S/N	*	*	*	10	22	24	32	37	38	39	40	36	31	27	20	9	-10	*	*	
	DBW	*	*	*	142	137	132	126	121	119	118	119	122	128	132	139	150	170	*	*	
20	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	93	96	99	*	*	*	20
	ANG	*	*	*	0	3	2	0	6	2	7	1	5	0	3	4	0	*	*	*	
	S/N	*	*	*	4	21	23	30	37	43	49	45	36	28	25	20	2	*	*	*	
	DBW	*	*	*	158	138	132	126	119	113	108	113	121	130	132	139	157	*	*	*	
10	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	95	96	99	*	*	*	10
	ANG	*	*	*	0	3	2	1	7	6	21	5	6	0	2	3	0	*	*	*	
	S/N	*	*	*	0	21	22	28	37	46	50	43	34	28	25	16	0	*	*	*	
	DBW	*	*	*	159	138	132	126	118	109	101	109	120	130	132	139	159	*	*	*	
0	F.D	*	*	*	99	99	99	99	99	99	56	99	99	99	97	97	99	*	*	*	0
	ANG	*	*	*	1	4	3	1	8	7	90	7	7	1	3	3	0	*	*	*	
	S/N	*	*	*	-0	22	23	29	36	46	40	38	33	31	26	19	-2	*	*	*	
	DBW	*	*	*	160	137	132	125	118	108	105	108	120	127	132	138	162	*	*	*	
-10	F.D	*	*	*	99	99	99	99	99	99	99	99	99	98	96	97	99	*	*	*	-10
	ANG	*	*	*	1	0	3	1	7	5	21	6	8	1	3	4	0	*	*	*	
	S/N	*	*	*	1	22	27	28	37	48	55	44	36	34	28	22	-0	*	*	*	
	DBW	*	*	*	158	137	132	125	119	109	101	109	120	125	131	137	160	*	*	*	
-20	F.D	*	*	*	99	99	99	99	99	99	99	99	99	95	92	98	99	*	*	*	-20
	ANG	*	*	*	1	4	3	0	5	2	8	3	7	1	3	0	0	*	*	*	
	S/N	*	*	*	2	22	27	31	37	40	51	45	35	34	28	23	3	*	*	*	
	DBW	*	*	*	157	137	132	126	120	113	108	112	121	125	131	136	156	*	*	*	
-30	F.D	*	*	*	99	99	99	99	99	99	99	92	94	91	86	93	99	*	*	*	-30
	ANG	*	*	*	1	3	2	6	4	10	1	12	6	1	4	0	1	*	*	*	
	S/N	*	*	*	6	21	26	32	38	43	45	43	37	34	30	24	8	*	*	*	
	DBW	*	*	*	153	138	133	127	121	116	114	118	122	125	129	135	151	*	*	*	
-40	F.D	*	*	99	99	99	99	99	99	99	97	93	83	85	79	90	99	99	*	*	-40
	ANG	*	*	0	1	4	2	5	2	6	9	8	4	1	4	1	2	0	*	*	
	S/N	*	*	-6	12	21	26	31	35	40	41	40	37	33	28	24	12	-5	*	*	
	DBW	*	*	166	147	138	133	128	124	119	118	119	122	126	131	135	147	165	*	*	
-50	F.D	*	99	99	99	99	99	99	99	99	98	96	87	85	77	90	99	99	99	*	-50
	ANG	*	0	1	2	0	2	5	1	4	5	5	3	0	4	1	3	1	0	*	
	S/N	*	-6	4	18	22	26	30	34	37	38	37	34	31	27	23	12	-1	-7	*	
	DBW	*	166	155	141	137	133	129	125	122	121	122	125	128	132	136	147	161	167	*	
-60	F.D	99	99	99	99	99	99	99	99	99	99	96	92	78	79	90	95	99	99	99	-60
	ANG	1	1	2	3	0	2	4	0	1	2	2	1	6	4	2	4	2	1	1	
	S/N	-3	4	13	19	22	25	28	32	33	33	33	32	28	21	19	19	12	0	-3	
	DBW	163	155	146	140	137	134	131	127	126	126	126	127	131	138	140	140	147	159	163	
-70	F.D	99	99	99	99	99	99	99	99	98	96	90	86	83	84	90	94	97	99	99	-70
	ANG	2	2	3	0	1	2	3	5	6	7	7	6	5	3	2	0	2	3	2	
	S/N	13	13	13	19	19	24	25	28	29	28	29	23	23	25	25	23	20	17	13	
	DBW	146	146	146	140	140	135	134	131	130	131	130	136	136	134	134	136	139	142	146	
-80	F.D	98	98	98	99	99	99	99	98	97	96	94	92	90	91	93	94	96	97	98	-80
	ANG	0	0	0	1	1	2	3	3	4	4	4	4	3	3	2	1	1	0	0	
	S/N	21	20	17	15	15	16	19	20	21	21	22	22	25	24	25	24	23	21	21	
	DBW	138	139	142	144	144	143	140	139	138	138	137	137	134	135	134	135	136	138	138	

GEOGRAPHIC LONGITUDE

Figure II-9

MAR GMT 24 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 12.40MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																					GEOGRAPHIC LATITUDE
	F.D	77	79	77	73	68	62	52	40	30	23	19	18	18	21	32	42	55	68	77	
80	ANG	1	1	1	2	2	4	5	6	6	6	6	6	5	4	4	3	2	1	1	80
	S/N	26	29	32	33	33	33	34	34	32	32	28	28	28	28	28	28	28	30	26	
	DBW	138	135	132	131	131	131	130	130	132	132	136	136	136	136	136	136	136	134	138	
	F.D	74	79	78	83	82	73	58	58	48	40	35	30	12	12	18	35	50	74	74	
70	ANG	3	4	4	0	2	3	6	0	1	1	1	0	7	5	3	2	1	4	3	70
	S/N	22	23	28	28	33	35	30	34	32	32	31	32	32	32	32	31	25	21	22	
	DBW	142	141	136	136	131	129	134	130	132	132	133	132	132	132	132	133	139	143	142	
	F.D	94	93	93	88	92	86	71	71	60	57	60	57	44	21	23	54	95	93	94	
60	ANG	1	1	2	4	1	3	6	1	3	4	3	2	0	5	3	1	2	1	1	60
	S/N	22	20	23	26	28	28	30	34	39	40	40	40	34	34	34	31	29	25	22	
	DBW	142	144	141	138	136	136	134	130	125	124	124	124	130	130	130	133	135	139	142	
	F.D	97	98	99	99	98	95	83	83	93	94	96	83	74	46	59	97	99	99	97	
50	ANG	2	0	0	3	0	3	7	3	4	5	4	2	0	5	2	2	0	3	2	50
	S/N	15	17	23	28	31	32	35	41	42	43	44	42	36	35	35	31	23	18	15	
	DBW	149	147	141	136	133	132	129	123	122	121	120	122	128	129	129	133	141	146	149	
	F.D	99	99	99	99	98	95	95	90	97	97	98	92	85	64	79	99	99	99	99	
40	ANG	0	2	0	2	0	3	0	4	7	8	6	3	0	4	1	1	3	1	0	40
	S/N	6	10	18	27	31	35	39	44	45	46	45	43	36	36	32	29	18	12	6	
	DBW	158	154	146	137	132	128	125	120	119	118	119	121	128	128	132	135	146	152	158	
	F.D	98	99	99	99	97	96	98	99	99	99	98	99	87	56	75	99	99	99	98	
30	ANG	0	1	3	1	4	3	0	5	10	1	9	4	0	5	0	1	2	1	0	30
	S/N	-3	2	13	26	31	34	41	45	46	47	46	44	37	36	30	25	14	4	-3	
	DBW	168	162	151	138	131	127	123	119	118	117	118	120	127	128	134	139	150	160	168	
	F.D	*	99	99	98	98	99	99	99	99	99	99	99	93	61	70	99	99	99	*	
20	ANG	*	0	1	1	3	3	1	6	2	7	2	5	0	4	0	0	1	0	*	20
	S/N	*	-5	7	23	32	34	41	47	52	56	51	45	37	36	30	21	6	-5	*	
	DBW	*	170	157	141	131	127	122	117	112	108	113	119	127	128	134	143	158	170	*	
	F.D	*	*	99	99	99	99	99	99	99	77	99	99	90	68	80	98	98	99	*	
10	ANG	*	*	2	0	3	3	1	8	6	24	5	7	1	4	0	0	1	0	*	10
	S/N	*	*	3	20	31	33	39	48	55	59	54	45	40	36	37	20	4	-10	*	
	DBW	*	*	161	144	131	127	122	116	109	102	109	119	124	128	126	144	160	175	*	
	F.D	*	*	99	99	99	99	99	99	99	-	99	99	93	80	82	98	98	*	*	
0	ANG	*	*	2	1	4	3	1	8	8	-	8	8	1	3	4	0	1	*	*	0
	S/N	*	*	3	20	32	34	36	47	56	-	49	45	41	38	34	19	2	*	*	
	DBW	*	*	161	144	131	127	122	116	108	-	108	119	123	126	130	145	162	*	*	
	F.D	*	*	99	99	99	99	99	99	99	85	99	92	86	73	83	98	98	*	*	
-10	ANG	*	*	2	2	0	4	1	7	5	24	6	9	2	4	0	0	0	*	*	-10
	S/N	*	*	4	22	34	36	38	47	55	62	55	45	43	39	34	20	3	*	*	
	DBW	*	*	160	142	130	128	122	117	109	102	109	119	121	125	130	144	161	*	*	
	F.D	93	99	99	99	99	99	99	99	99	99	94	69	66	53	73	98	99	99	93	
-20	ANG	0	0	2	1	0	3	1	6	2	8	3	9	2	6	1	1	2	1	0	-20
	S/N	-10	-7	5	22	33	37	42	46	52	59	52	44	43	39	35	22	7	-4	-10	
	DBW	175	172	159	142	131	127	122	118	112	108	112	120	121	125	129	142	157	169	175	
	F.D	96	99	99	99	99	99	99	99	93	96	81	45	37	25	46	97	99	98	96	
-30	ANG	0	1	2	1	4	2	6	4	11	2	0	9	3	6	2	0	3	1	0	-30
	S/N	-1	0	10	24	33	37	41	45	49	51	50	44	42	39	36	25	12	1	-1	
	DBW	166	164	154	140	131	127	123	119	115	113	114	120	122	125	128	139	152	163	166	
	F.D	96	99	99	99	99	99	99	99	91	61	40	19	22	6	23	92	99	98	96	
-40	ANG	1	2	0	1	4	2	5	3	7	11	11	6	2	6	2	3	0	2	1	-40
	S/N	5	8	16	27	33	36	40	44	47	48	47	45	41	37	34	28	17	9	5	
	DBW	159	156	148	137	131	128	124	120	117	116	117	119	123	127	130	136	147	155	159	
	F.D	97	98	99	99	99	99	98	98	91	68	42	14	11	-	9	82	96	97	97	
-50	ANG	0	0	1	2	0	2	5	1	4	7	7	4	1	-	3	4	0	0	0	-50
	S/N	12	16	22	31	34	37	39	42	45	46	45	42	35	-	31	26	17	14	12	
	DBW	152	148	142	133	130	127	125	122	119	118	119	122	129	-	133	138	147	150	152	
	F.D	96	97	99	98	98	97	95	95	88	69	43	23	14	7	10	52	94	94	96	
-60	ANG	0	0	2	4	1	2	5	0	2	3	4	2	0	5	3	1	3	0	0	-60
	S/N	15	22	27	31	33	36	38	40	42	42	41	40	25	30	28	31	26	18	15	
	DBW	149	142	137	133	131	128	126	124	122	122	123	124	139	134	136	133	138	146	149	
	F.D	95	96	93	96	96	94	90	81	82	70	50	32	10	12	23	51	77	94	95	
-70	ANG	3	3	4	0	1	3	4	6	0	1	1	0	7	5	4	2	0	3	3	-70
	S/N	26	25	25	30	30	34	36	38	39	38	38	32	32	34	35	34	32	30	26	
	DBW	138	139	139	134	134	130	128	126	125	129	126	132	132	130	129	130	132	134	138	
	F.D	73	76	80	83	86	84	79	72	62	50	38	29	25	27	35	49	62	70	73	
-80	ANG	1	1	1	2	2	3	4	5	6	7	7	6	5	5	4	3	2	1	1	-80
	S/N	33	32	29	27	27	27	30	31	31	31	32	31	35	34	35	35	34	33	33	
	DBW	131	132	135	137	137	137	134	133	133	133	132	133	129	130	129	129	130	131	131	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-10

MAR GMT 24 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 16.60MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	28	30	27	23	17	6	-	-	-	-	-	-	-	-	-	-	8	17	28	80
	ANG	2	2	2	3	3	4	-	-	-	-	-	-	-	-	-	-	2	2	2	
	S/N	33	37	37	37	37	37	-	-	-	-	-	-	-	-	-	-	32	35	33	
	DBW	134	130	130	130	130	130	-	-	-	-	-	-	-	-	-	-	135	132	134	
70	F.D	38	39	39	38	28	15	-	-	-	-	-	-	-	-	-	-	6	31	38	70
	ANG	0	0	1	2	3	5	-	-	-	-	-	-	-	-	-	-	1	0	0	
	S/N	26	27	34	37	37	39	-	-	-	-	-	-	-	-	-	-	28	25	26	
	DBW	141	140	133	130	130	128	-	-	-	-	-	-	-	-	-	-	139	142	141	
60	F.D	72	69	66	59	55	36	26	12	5	-	5	-	-	-	-	-	63	72	72	60
	ANG	2	2	4	0	2	5	0	2	4	-	4	-	-	-	-	-	4	2	2	
	S/N	29	26	30	32	33	33	34	36	42	-	43	-	-	-	-	-	34	32	29	
	DBW	138	141	137	135	134	134	133	131	125	-	124	-	-	-	-	-	133	135	138	
50	F.D	90	88	90	87	80	63	50	26	52	58	67	26	14	-	-	70	93	95	90	50
	ANG	0	0	2	3	1	4	1	4	6	6	5	4	1	-	-	4	1	0	0	
	S/N	26	27	32	34	36	37	39	44	45	46	47	46	42	-	-	35	32	26	26	
	DBW	141	140	135	133	131	130	128	123	122	121	120	121	125	-	-	132	135	141	141	
40	F.D	94	95	97	96	88	76	69	48	76	80	86	54	40	7	21	91	97	96	94	40
	ANG	2	3	0	2	0	4	1	6	8	9	7	5	2	5	2	2	0	2	2	
	S/N	21	23	29	34	37	41	44	47	48	49	48	47	44	40	39	35	31	24	21	
	DBW	146	144	138	133	130	126	123	120	119	118	119	120	123	127	128	132	136	143	146	
30	F.D	93	97	96	94	92	83	83	94	89	97	83	94	47	10	26	94	97	96	93	30
	ANG	0	1	3	1	0	3	1	5	11	1	10	4	2	5	1	1	2	1	0	
	S/N	14	18	26	34	39	42	46	49	49	51	49	48	45	40	38	33	25	19	14	
	DBW	153	149	141	133	128	125	121	118	118	116	118	119	122	127	129	134	142	148	153	
20	F.D	93	97	92	93	91	97	97	95	97	93	98	96	73	21	21	94	97	96	93	20
	ANG	2	0	2	1	4	3	1	7	3	8	2	6	1	5	1	1	2	0	2	
	S/N	8	13	22	32	39	42	46	50	55	59	54	48	44	40	38	31	21	13	8	
	DBW	159	154	145	135	128	125	121	117	112	108	113	119	123	127	129	136	146	154	159	
10	F.D	94	93	98	99	98	99	99	90	93	11	97	88	64	27	42	93	92	96	94	10
	ANG	1	0	2	1	4	3	1	9	7	28	6	8	2	5	1	1	2	1	1	
	S/N	2	10	20	30	39	42	46	51	58	63	58	49	45	40	37	30	20	10	2	
	DBW	165	157	147	137	128	125	121	116	109	104	109	118	122	127	130	137	147	157	165	
0	F.D	98	99	99	99	99	99	99	89	97	-	96	87	73	42	54	93	93	91	98	0
	ANG	1	1	3	2	0	3	2	9	8	-	8	9	2	5	1	1	2	0	1	
	S/N	-2	8	20	30	39	42	44	51	59	-	58	48	45	43	39	29	18	8	-2	
	DBW	170	159	147	137	128	125	121	116	108	-	108	119	122	124	128	138	149	159	170	
-10	F.D	76	98	99	99	99	99	98	99	99	22	90	42	53	33	48	92	91	92	76	-10
	ANG	0	0	3	2	1	4	2	8	6	28	7	12	3	6	2	1	2	0	0	
	S/N	5	7	20	31	39	40	46	51	58	63	58	48	47	43	40	30	19	10	5	
	DBW	162	160	147	136	128	127	121	116	109	105	109	119	120	124	127	137	148	157	162	
-20	F.D	78	99	98	97	97	99	99	99	99	83	50	5	26	15	24	90	94	90	78	-20
	ANG	1	0	2	1	0	4	1	6	2	9	6	10	3	6	2	1	2	1	1	
	S/N	11	11	20	31	39	42	46	50	55	59	55	47	46	43	40	32	22	15	11	
	DBW	156	156	147	136	128	125	121	117	112	108	112	120	121	124	127	135	145	152	156	
-30	F.D	83	97	99	98	97	97	99	97	60	62	32	6	-	-	6	75	95	84	83	-30
	ANG	2	1	3	1	4	3	0	5	13	3	1	9	-	-	2	3	0	2	2	
	S/N	16	17	24	32	38	42	45	49	53	54	50	47	-	-	37	34	25	19	16	
	DBW	151	150	143	135	129	125	122	118	114	113	117	120	-	-	130	133	142	148	151	
-40	F.D	84	94	98	97	95	96	95	89	51	15	-	-	-	-	-	43	83	88	84	-40
	ANG	3	3	0	2	0	2	6	3	10	12	-	-	-	-	-	5	1	0	3	
	S/N	21	22	28	35	39	41	44	48	50	51	-	-	-	-	-	35	28	23	21	
	DBW	146	145	139	132	128	126	123	119	117	116	-	-	-	-	-	132	139	144	146	
-50	F.D	84	90	96	95	91	91	82	78	45	19	-	-	-	-	-	28	68	81	84	-50
	ANG	0	0	1	3	0	3	6	2	7	8	-	-	-	-	-	0	3	1	0	
	S/N	24	27	31	37	40	42	44	47	48	49	-	-	-	-	-	30	26	26	24	
	DBW	143	140	136	130	127	125	123	120	119	118	-	-	-	-	-	137	141	141	143	
-60	F.D	79	86	91	86	85	76	64	64	37	10	-	-	-	-	-	-	58	73	79	-60
	ANG	2	2	2	4	1	3	6	1	4	4	-	-	-	-	-	-	4	3	2	
	S/N	24	30	34	37	38	41	43	45	46	45	-	-	-	-	-	-	33	27	24	
	DBW	143	137	133	130	129	126	124	122	121	122	-	-	-	-	-	-	134	140	143	
-70	F.D	72	75	72	76	73	63	48	47	28	10	-	-	-	-	-	7	28	66	72	-70
	ANG	4	4	0	1	2	4	6	0	1	1	-	-	-	-	-	2	1	4	4	
	S/N	32	31	31	36	35	39	40	42	43	38	-	-	-	-	-	36	37	36	32	
	DBW	135	136	136	131	132	128	127	125	124	129	-	-	-	-	-	131	130	131	135	
-80	F.D	22	26	33	38	36	31	23	14	6	-	-	-	-	-	-	6	12	19	22	-80
	ANG	2	2	3	3	4	5	5	6	6	-	-	-	-	-	-	3	3	2	2	
	S/N	37	36	33	31	31	32	34	35	35	-	-	-	-	-	-	38	37	37	37	
	DBW	130	131	134	136	136	135	133	132	132	-	-	-	-	-	-	129	130	130	130	

GEOGRAPHIC LONGITUDE

Figure II-11

MAR GMT 24 SUNSPOT 70

TRANSMITTER 0.01N - 0.01W FREQUENCY 22.10MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
70	F.D	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	70
	ANG	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	S/N	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28	
	DBW	143	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	143	
60	F.D	30	26	16	11	-	-	-	-	-	-	-	-	-	-	-	-	-	29	30	60
	ANG	3	4	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	
	S/N	33	29	33	35	-	-	-	-	-	-	-	-	-	-	-	-	-	36	33	
	DBW	138	142	138	136	-	-	-	-	-	-	-	-	-	-	-	-	-	135	138	
50	F.D	64	57	49	47	17	7	-	-	-	5	9	-	-	-	-	9	54	68	64	50
	ANG	1	2	3	0	2	5	-	-	-	7	6	-	-	-	-	0	3	1	1	
	S/N	34	35	37	38	37	40	-	-	-	49	49	-	-	-	-	39	37	34	34	
	DBW	137	136	134	133	134	131	-	-	-	122	122	-	-	-	-	132	134	137	137	
40	F.D	76	79	77	71	53	24	21	8	28	33	43	11	-	-	-	40	75	73	76	40
	ANG	3	0	1	3	2	5	2	6	10	11	9	6	-	-	-	4	1	3	3	
	S/N	31	32	36	39	41	44	46	50	50	50	50	49	-	-	-	38	33	31	31	
	DBW	140	139	135	132	130	127	125	121	121	121	121	122	-	-	-	133	138	140	140	
30	F.D	79	81	76	71	68	46	38	63	47	77	37	63	7	-	-	64	79	73	79	30
	ANG	1	2	0	2	1	5	3	7	14	2	13	6	2	-	-	2	0	2	1	
	S/N	27	29	34	40	43	46	49	52	51	55	51	50	47	-	-	38	32	29	27	
	DBW	144	142	137	131	128	125	122	119	120	116	120	121	124	-	-	133	139	142	144	
20	F.D	82	81	71	73	75	67	68	57	70	48	76	60	34	-	-	68	77	69	82	20
	ANG	0	1	0	2	0	5	2	9	4	11	3	8	2	-	-	2	3	2	0	
	S/N	22	27	32	39	43	46	49	53	57	61	57	51	48	-	-	37	32	27	22	
	DBW	149	144	139	132	128	125	122	118	114	110	114	120	123	-	-	134	139	144	149	
10	F.D	81	67	76	87	81	78	85	36	48	-	67	30	24	-	9	75	72	69	81	10
	ANG	2	1	3	2	0	4	2	11	9	-	8	10	3	-	1	2	3	2	2	
	S/N	19	26	32	38	43	46	49	54	60	-	60	50	48	-	40	38	32	26	19	
	DBW	152	145	139	133	128	125	122	117	111	-	111	121	123	-	131	133	139	145	152	
0	F.D	84	83	89	88	87	87	90	31	71	-	60	26	34	9	17	75	72	69	84	0
	ANG	2	2	0	3	1	4	2	12	10	-	10	11	3	5	1	1	3	2	2	
	S/N	16	24	30	38	43	46	49	54	61	-	61	50	48	45	42	37	31	25	16	
	DBW	155	147	141	133	128	125	122	117	110	-	110	121	123	126	129	134	140	146	155	
-10	F.D	43	90	95	91	87	85	75	85	90	-	35	-	15	-	12	71	68	55	43	-10
	ANG	1	0	0	3	1	5	3	9	7	-	10	-	4	-	2	2	3	2	1	
	S/N	22	22	30	38	43	43	49	54	60	-	60	-	49	-	43	38	31	25	22	
	DBW	149	149	141	133	128	128	122	117	111	-	111	-	122	-	128	133	140	146	149	
-20	F.D	45	89	89	87	89	91	96	91	85	20	-	-	-	-	-	55	68	34	45	-20
	ANG	2	1	3	2	0	4	1	7	3	12	-	-	-	-	-	3	0	3	2	
	S/N	25	25	31	37	43	46	49	53	57	61	-	-	-	-	-	38	32	28	25	
	DBW	146	146	140	134	128	125	122	118	114	110	-	-	-	-	-	133	139	143	146	
-30	F.D	50	79	93	90	90	87	94	78	54	-	-	-	-	-	-	17	59	39	50	-30
	ANG	0	2	0	2	0	3	0	6	0	-	-	-	-	-	-	4	1	0	0	
	S/N	28	29	32	38	42	45	48	51	55	-	-	-	-	-	-	39	34	30	28	
	DBW	143	142	139	133	129	126	123	120	116	-	-	-	-	-	-	132	137	141	143	
-40	F.D	55	74	84	79	76	81	84	47	10	-	-	-	-	-	-	-	18	41	55	-40
	ANG	0	0	1	3	0	3	0	5	10	-	-	-	-	-	-	-	3	1	0	
	S/N	31	32	36	40	43	45	48	50	53	-	-	-	-	-	-	-	34	32	31	
	DBW	140	139	135	131	128	126	123	121	118	-	-	-	-	-	-	-	137	139	140	
-50	F.D	47	63	74	67	52	47	48	19	-	-	-	-	-	-	-	-	-	22	47	-50
	ANG	2	2	2	4	2	5	0	4	-	-	-	-	-	-	-	-	-	3	2	
	S/N	32	35	38	42	43	45	47	49	-	-	-	-	-	-	-	-	-	32	32	
	DBW	139	136	133	129	128	126	124	122	-	-	-	-	-	-	-	-	-	139	139	
-60	F.D	39	50	59	52	35	20	18	8	-	-	-	-	-	-	-	-	-	30	39	-60
	ANG	4	4	4	1	3	5	0	2	-	-	-	-	-	-	-	-	-	4	4	
	S/N	29	36	39	40	42	44	46	45	-	-	-	-	-	-	-	-	-	31	29	
	DBW	142	135	132	131	129	127	125	126	-	-	-	-	-	-	-	-	-	140	142	
-70	F.D	30	35	22	27	16	8	-	-	-	-	-	-	-	-	-	-	-	24	30	-70
	ANG	0	0	1	2	3	5	-	-	-	-	-	-	-	-	-	-	-	0	0	
	S/N	36	34	34	39	37	42	-	-	-	-	-	-	-	-	-	-	-	39	36	
	DBW	135	137	137	132	134	129	-	-	-	-	-	-	-	-	-	-	-	132	135	
-80	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-80
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-12

MAR GMT 12 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 4.20MC/S

VERTICAL SH OL 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

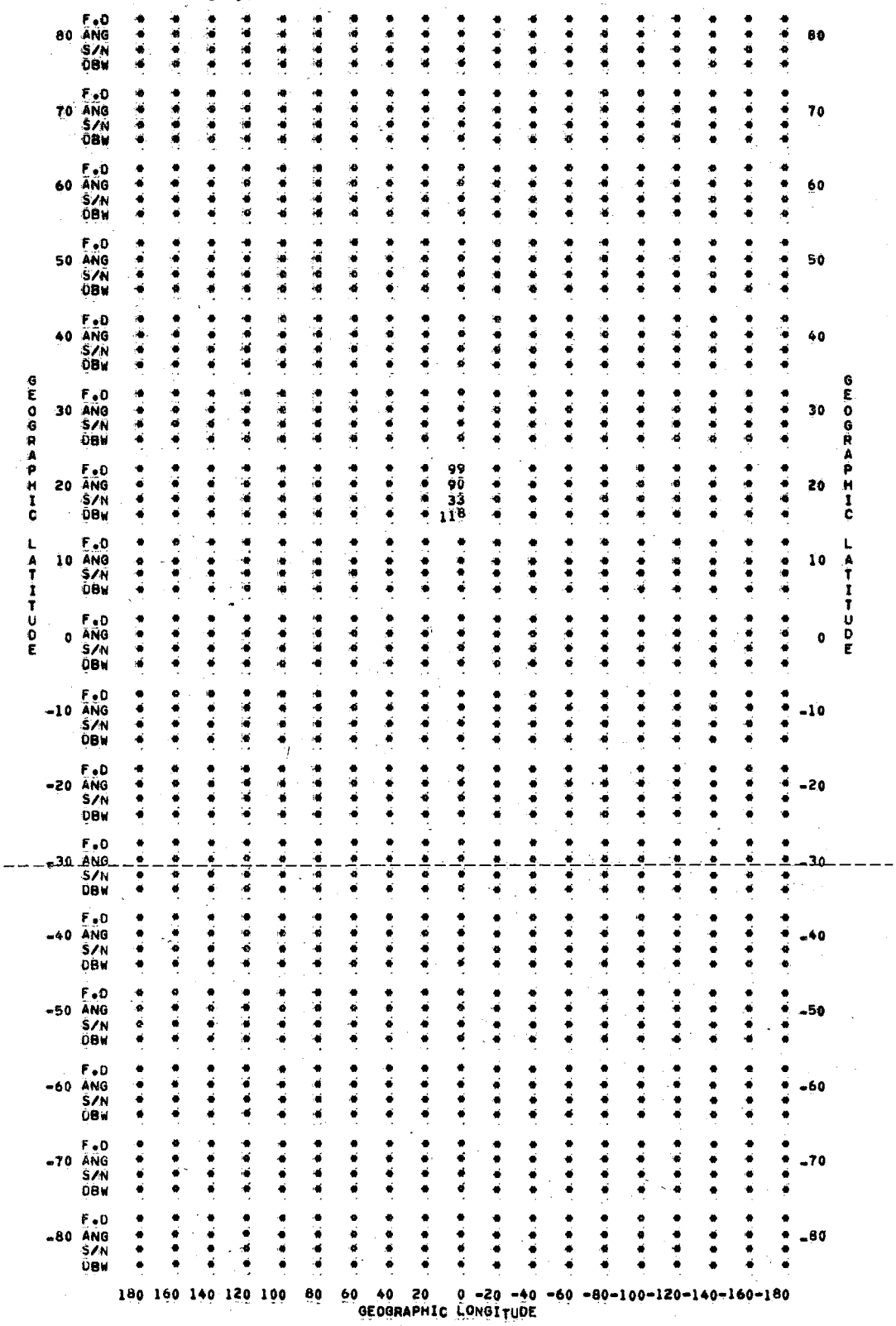

Figure II-13

MAR GMT 12 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 6.20MC/S

VERTICAL SH OL 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
30	F.D	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*	30
	ANG	*	*	*	*	*	*	*	*	*	40	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	8	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	147	*	*	*	*	*	*	*	*	*	
20	F.D	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*	20
	ANG	*	*	*	*	*	*	*	*	*	90	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	42	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	113	*	*	*	*	*	*	*	*	*	
10	F.D	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*	10
	ANG	*	*	*	*	*	*	*	*	*	42	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	4	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	151	*	*	*	*	*	*	*	*	*	
0	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-10
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-20
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-30
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-14

MAR GMT 12 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 8.30MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*	*	*	*	*	80
	ANG	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	-7	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	167	*	*	*	*	*	*	*	*	*	*	*	*	*	
70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
40	F.D	*	*	*	*	*	*	*	*	*	99	99	*	*	*	*	*	*	*	*	40
	ANG	*	*	*	*	*	*	*	*	*	23	24	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	12	-10	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	147	170	*	*	*	*	*	*	*	*	
30	F.D	*	*	*	*	*	*	*	*	99	99	99	*	*	*	*	*	*	*	*	30
	ANG	*	*	*	*	*	*	*	*	29	39	29	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	5	27	5	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	154	132	154	*	*	*	*	*	*	*	*	
20	F.D	*	*	*	*	*	*	*	*	99	99	99	*	*	*	*	*	*	*	*	20
	ANG	*	*	*	*	*	*	*	*	25	90	25	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	11	47	11	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	148	112	148	*	*	*	*	*	*	*	*	
10	F.D	*	*	*	*	*	*	*	*	99	99	99	*	*	*	*	*	*	*	*	10
	ANG	*	*	*	*	*	*	*	*	31	25	31	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	-5	40	-5	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	165	119	165	*	*	*	*	*	*	*	*	
0	F.D	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*	0
	ANG	*	*	*	*	*	*	*	*	*	26	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	7	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	152	*	*	*	*	*	*	*	*	*	
-10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-10
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-20
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-30
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-15

MAR GMT 12 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 12.40MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.O	85	86	85	84	85	88	93	94	95	96	97	97	97	95	92	89	86	83	85	80
	ANG	2	2	3	3	4	5	0	1	1	1	1	0	0	5	4	3	3	2	2	
	S/N	6	9	8	8	7	7	10	12	12	12	9	6	11	1	2	3	2	6	6	
	DBW	158	155	156	156	157	157	154	152	152	152	155	158	153	163	162	161	162	158	158	
70	F.O	76	77	75	75	80	86	94	97	98	98	98	99	99	98	98	94	87	75	76	70
	ANG	1	1	1	2	3	5	1	0	8	8	8	0	1	4	3	2	2	1	1	
	S/N	4	6	9	9	7	6	14	13	-0	0	5	15	12	5	6	6	2	3	4	
	DBW	160	158	155	155	157	158	150	151	165	164	159	149	152	159	158	158	162	161	160	
60	F.O	54	44	44	54	74	88	98	99	99	99	99	99	99	99	99	99	96	77	54	60
	ANG	1	2	0	1	3	5	2	8	1	9	8	11	2	3	3	1	1	1	1	
	S/N	9	7	4	4	7	0	9	5	8	19	19	7	16	5	7	9	7	10	9	
	DBW	155	157	160	160	157	164	155	159	156	145	145	167	148	159	157	155	157	154	155	
50	F.O	54	20	12	29	81	96	98	99	99	99	99	99	99	99	99	99	98	85	54	50
	ANG	0	0	1	0	2	4	7	10	11	12	11	10	9	5	2	0	4	4	0	
	S/N	4	6	8	8	0	7	7	14	22	24	23	8	6	5	8	1	2	4	4	
	DBW	160	158	156	156	164	157	157	150	142	140	141	156	158	159	156	163	162	160	160	
40	F.O	65	52	43	37	92	99	99	99	99	99	99	99	99	99	99	99	96	85	65	40
	ANG	2	2	0	2	1	5	9	14	14	20	15	15	9	4	1	3	3	2	2	
	S/N	5	3	5	8	6	4	8	16	26	34	26	11	4	3	10	0	2	4	5	
	DBW	159	161	159	156	158	160	156	148	138	130	138	153	160	161	154	164	162	160	159	
30	F.O	78	74	77	70	97	99	99	99	99	99	99	99	99	99	99	99	98	93	78	30
	ANG	1	1	2	0	1	4	9	15	19	20	19	16	9	4	0	2	2	1	1	
	S/N	5	4	2	0	1	2	7	17	31	53	31	10	2	0	-6	-0	1	3	5	
	DBW	159	160	162	164	163	162	157	147	133	111	133	154	162	163	169	165	163	161	159	
20	F.O	82	90	89	71	99	99	99	99	99	8	99	99	99	99	*	99	99	99	82	20
	ANG	3	0	1	3	0	4	9	16	22	90	22	16	9	4	*	2	0	2	3	
	S/N	-1	-1	-1	1	-2	-0	5	15	34	51	34	7	0	-5	*	-6	-8	-3	-1	
	DBW	166	166	166	163	167	165	159	149	130	113	130	157	164	166	*	168	173	168	166	
10	F.O	95	98	94	37	99	99	99	99	99	99	99	99	99	99	99	99	99	99	95	10
	ANG	0	2	0	2	0	4	13	15	20	23	21	16	10	4	0	2	3	1	0	
	S/N	-5	-5	-6	-1	-4	-2	-2	12	28	52	28	4	-1	-7	-2	-9	-9	-4	-5	
	DBW	170	170	171	166	169	167	167	152	136	112	136	160	166	168	160	170	174	169	170	
0	F.O	*	*	*	71	97	99	99	99	99	99	99	99	*	99	99	99	*	99	*	0
	ANG	*	*	*	1	4	4	12	15	17	1	17	16	*	5	0	2	*	0	*	
	S/N	*	*	*	-7	-9	-5	-6	9	22	28	19	1	*	-8	-5	-9	*	-7	*	
	DBW	*	*	*	172	174	170	171	155	142	134	142	163	*	170	164	171	*	172	*	
-10	F.O	*	*	*	*	*	99	*	99	99	99	99	99	*	99	*	*	*	99	*	-10
	ANG	*	*	*	*	*	3	*	14	2	16	2	14	*	4	*	*	*	0	*	
	S/N	*	*	*	*	*	-8	*	5	16	20	5	-3	*	-7	*	*	*	-8	*	
	DBW	*	*	*	*	*	173	*	159	148	144	159	167	*	172	*	*	*	173	*	
-20	F.O	*	*	*	*	*	99	*	99	99	99	99	*	*	99	*	*	*	*	*	-20
	ANG	*	*	*	*	*	3	*	15	16	1	16	*	*	3	*	*	*	*	*	
	S/N	*	*	*	*	*	-10	*	-6	7	11	-2	*	*	-9	*	*	*	*	*	
	DBW	*	*	*	*	*	175	*	171	157	153	167	*	*	174	*	*	*	*	*	
-30	F.O	*	*	*	*	*	*	*	*	99	99	*	*	*	*	*	*	*	*	*	-30
	ANG	*	*	*	*	*	*	*	*	17	14	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	-5	2	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	170	162	*	*	*	*	*	*	*	*	*	
-40	F.O	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	*	*	15	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	-8	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	173	*	*	*	*	*	*	*	*	*	
-50	F.O	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	F.O	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.O	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.O	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-16

ARCHIVES U.I.T. GENEVE

MAR GMT 12 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 16.60MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.O	42	44	41	39	48	54	61	67	72	76	79	80	79	76	62	53	42	37	42	80
	ANG	2	2	3	3	0	0	1	1	2	2	1	1	0	0	4	3	3	2	2	
	S/N	20	23	23	23	28	23	27	28	25	25	23	21	17	25	17	18	16	20	20	
	DBW	147	144	144	144	139	144	140	139	142	142	144	146	150	142	150	149	151	147	147	
70	F.O	23	24	21	20	24	51	66	79	94	94	95	92	92	86	83	70	48	22	23	70
	ANG	1	1	1	2	3	1	2	0	0	0	0	0	1	5	4	2	2	1	1	
	S/N	18	20	23	23	22	25	28	26	23	23	28	28	25	20	21	20	16	17	18	
	DBW	149	147	144	144	145	142	139	141	144	144	139	139	142	147	146	147	151	150	149	
60	F.O	6	-	-	-	14	56	81	97	97	96	98	99	98	93	94	91	68	26	6	60
	ANG	2	-	-	-	3	0	2	1	2	3	3	1	2	5	3	1	0	0	2	
	S/N	22	-	-	-	22	17	23	23	29	32	31	30	29	21	23	23	23	22	22	
	DBW	145	-	-	-	145	150	144	144	138	135	136	137	138	146	144	144	144	145	145	
50	F.O	8	-	-	-	10	73	93	98	99	99	99	99	99	97	97	93	80	34	8	50
	ANG	0	-	-	-	2	0	0	2	0	2	0	2	2	4	2	1	0	0	0	
	S/N	19	-	-	-	15	24	26	31	34	42	35	31	30	22	24	22	18	20	19	
	DBW	148	-	-	-	152	143	141	136	133	125	132	136	137	145	143	145	149	147	148	
40	F.O	14	-	-	-	26	87	99	99	99	99	99	99	99	98	98	93	66	30	14	40
	ANG	2	-	-	-	1	4	2	7	4	7	4	7	2	3	1	4	3	2	2	
	S/N	20	-	-	-	22	23	27	33	45	49	45	32	29	21	22	18	18	19	20	
	DBW	147	-	-	-	145	144	140	134	122	118	122	135	138	146	145	149	149	148	147	
30	F.O	29	15	7	-	58	96	99	99	99	90	99	99	99	99	99	96	82	51	29	30
	ANG	0	1	2	-	1	3	2	8	7	22	7	8	2	4	0	3	2	1	0	
	S/N	20	20	18	-	22	22	27	34	49	59	49	32	28	20	20	17	18	20	20	
	DBW	147	147	149	-	145	145	140	133	118	108	118	135	139	147	147	150	149	147	147	
20	F.O	56	31	23	-	73	99	99	99	99	-	99	99	99	99	99	99	98	91	56	20
	ANG	0	1	1	-	0	3	2	8	9	-	9	9	2	3	0	2	0	4	0	
	S/N	18	18	18	-	20	19	25	33	50	-	50	31	26	17	22	15	16	14	18	
	DBW	149	149	149	-	147	148	142	134	117	-	117	136	141	149	144	152	151	153	149	
10	F.O	85	70	35	-	61	99	99	99	99	51	99	99	99	99	99	99	99	99	85	10
	ANG	1	2	0	-	1	3	2	8	8	29	8	9	2	3	0	2	0	2	1	
	S/N	13	15	15	-	17	16	23	32	47	58	47	30	25	15	11	14	20	14	13	
	DBW	154	152	152	-	150	151	144	135	120	109	120	137	142	151	152	153	147	153	154	
0	F.O	95	99	83	-	51	99	99	99	37	99	44	99	99	99	99	99	98	97	95	0
	ANG	3	0	0	-	1	2	1	8	21	2	21	8	2	3	0	2	0	2	3	
	S/N	9	10	11	-	15	13	21	29	36	44	29	27	23	15	8	13	13	14	9	
	DBW	158	157	156	-	152	154	146	138	131	118	131	139	144	152	157	154	154	153	158	
-10	F.O	94	93	67	-	83	99	99	99	99	44	99	99	99	99	99	99	99	99	94	-10
	ANG	2	0	0	-	0	2	1	7	3	19	3	7	1	2	3	1	2	0	2	
	S/N	8	6	9	-	12	13	19	27	34	34	30	24	20	13	9	9	7	5	8	
	DBW	159	161	158	-	155	154	148	140	133	133	136	142	147	154	158	158	160	162	159	
-20	F.O	99	99	93	30	94	99	99	99	99	99	99	99	99	99	99	99	99	97	99	-20
	ANG	0	0	3	1	3	1	5	10	9	2	8	10	6	1	3	1	3	1	0	
	S/N	5	2	6	9	10	11	10	19	29	31	26	13	11	9	7	10	5	7	5	
	DBW	162	165	161	158	157	156	157	148	138	136	141	154	156	158	160	157	162	160	162	
-30	F.O	27	42	46	10	47	99	99	99	99	99	99	99	99	99	97	93	74	50	27	-30
	ANG	2	0	1	1	0	1	4	7	3	7	11	8	5	1	3	1	1	0	2	
	S/N	4	6	7	9	10	8	9	14	22	25	12	11	10	8	10	10	8	7	4	
	DBW	163	161	160	158	157	159	158	153	145	142	155	156	157	159	157	157	159	160	163	
-40	F.O	6	-	-	-	57	99	99	99	99	99	99	99	99	99	87	67	31	6	6	-40
	ANG	0	-	-	-	0	0	3	6	8	10	9	7	4	1	3	2	0	1	0	
	S/N	0	-	-	-	10	3	8	12	15	18	11	10	11	7	10	9	7	1	0	
	DBW	168	-	-	-	157	164	159	155	152	149	156	157	156	160	157	158	160	166	168	
-50	F.O	-	-	-	-	45	99	99	99	99	99	99	99	99	95	80	55	15	-	-	-50
	ANG	-	-	-	-	0	0	2	4	6	7	7	5	3	1	3	2	1	-	-	
	S/N	-	-	-	-	9	3	6	9	12	13	12	8	8	5	7	1	-1	-	-	
	DBW	-	-	-	-	158	164	161	158	155	154	155	159	159	162	160	166	169	-	-	
-60	F.O	-	-	-	-	26	99	99	99	99	99	99	99	99	99	72	53	13	6	-	-60
	ANG	-	-	-	-	0	0	1	3	4	5	5	4	2	1	3	2	1	1	-	
	S/N	-	-	-	-	8	3	3	6	8	8	9	8	5	0	-1	5	3	0	-	
	DBW	-	-	-	-	159	164	164	161	159	159	158	159	162	168	169	162	164	168	-	
-70	F.O	-	-	-	-	17	92	97	98	99	99	98	98	96	94	72	52	29	11	-	-70
	ANG	-	-	-	-	0	0	1	1	1	3	1	0	1	0	3	2	1	1	-	
	S/N	-	-	-	-	6	4	3	3	4	5	4	0	1	-6	2	4	4	5	-	
	DBW	-	-	-	-	161	163	164	164	163	162	163	168	166	174	165	163	163	162	-	
-80	F.O	22	12	12	17	29	86	91	94	95	95	95	95	93	92	70	56	39	28	22	-80
	ANG	2	2	0	0	0	0	0	0	1	1	1	1	0	0	0	0	2	2	2	
	S/N	6	0	7	1	0	-1	-1	-2	-2	-2	-1	0	-4	1	4	9	3	3	6	
	DBW	161	167	160	166	168	169	169	170	170	170	169	168	172	166	163	158	164	164	161	

GEOGRAPHIC LONGITUDE

Figure II-17

MAR GMT 12 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 22.10MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	-	-	-	-	-	-	6	10	15	20	24	26	25	20	14	-	-	-	-	80
	ANG	-	-	-	-	-	-	1	2	3	3	3	2	1	1	0	-	-	-	-	
	S/N	-	-	-	-	-	-	35	37	34	35	32	32	31	27	27	-	-	-	-	
	DBW	-	-	-	-	-	-	136	134	137	136	139	139	140	144	144	-	-	-	-	
70	F.D	-	-	-	-	-	-	9	19	62	65	69	56	59	55	24	12	-	-	-	70
	ANG	-	-	-	-	-	-	2	4	4	5	4	4	2	1	6	5	-	-	-	
	S/N	-	-	-	-	-	-	37	35	32	32	37	37	36	31	30	29	-	-	-	
	DBW	-	-	-	-	-	-	134	136	139	139	134	134	135	140	141	142	-	-	-	
60	F.D	-	-	-	-	-	-	17	68	63	62	70	80	78	74	57	35	-	-	-	60
	ANG	-	-	-	-	-	-	3	5	7	9	8	5	2	0	5	4	-	-	-	
	S/N	-	-	-	-	-	-	32	33	38	41	40	40	38	33	32	33	-	-	-	
	DBW	-	-	-	-	-	-	139	138	133	130	131	131	133	138	139	138	-	-	-	
50	F.D	-	-	-	-	-	8	45	72	51	92	57	81	84	69	72	58	16	-	-	50
	ANG	-	-	-	-	-	0	4	6	12	1	12	7	3	6	3	2	1	-	-	
	S/N	-	-	-	-	-	22	36	41	42	46	43	41	39	33	34	34	32	-	-	
	DBW	-	-	-	-	-	149	135	130	129	125	128	130	132	138	137	137	139	-	-	
40	F.D	-	-	-	-	-	29	75	80	99	97	99	91	95	77	78	66	6	-	-	40
	ANG	-	-	-	-	-	0	3	8	3	7	3	8	3	5	2	1	0	-	-	
	S/N	-	-	-	-	-	34	38	43	50	55	51	42	39	33	33	30	22	-	-	
	DBW	-	-	-	-	-	137	133	128	121	116	120	129	132	138	138	141	149	-	-	
30	F.D	-	-	-	-	-	39	90	85	98	22	99	98	97	92	90	70	12	-	-	30
	ANG	-	-	-	-	-	6	2	9	7	26	7	8	2	4	1	4	4	-	-	
	S/N	-	-	-	-	-	34	39	44	55	62	55	42	38	32	31	28	28	-	-	
	DBW	-	-	-	-	-	137	132	127	116	109	116	129	133	139	140	143	143	-	-	
20	F.D	13	-	-	-	-	64	99	97	99	-	99	99	99	99	99	96	84	50	13	20
	ANG	1	-	-	-	-	5	2	9	9	-	9	9	1	3	0	2	1	1	1	
	S/N	28	-	-	-	-	33	37	44	56	-	56	41	36	31	26	28	28	29	28	
	DBW	143	-	-	-	-	138	134	127	115	-	115	130	135	140	145	143	143	142	143	
10	F.D	57	9	-	-	-	74	99	99	99	-	94	87	99	99	99	94	94	90	57	10
	ANG	2	0	-	-	-	4	1	8	7	-	8	10	2	4	0	3	0	2	2	
	S/N	27	25	-	-	-	32	35	42	54	-	54	40	36	30	25	27	23	25	27	
	DBW	144	146	-	-	-	139	136	129	117	-	117	131	135	141	146	144	148	146	144	
0	F.D	85	74	9	-	-	84	99	96	83	12	87	64	98	97	97	96	80	77	85	0
	ANG	0	1	1	-	-	3	0	8	5	13	5	10	2	4	0	3	1	2	0	
	S/N	21	25	18	-	-	30	33	41	50	54	45	39	34	29	25	26	24	25	21	
	DBW	150	146	153	-	-	141	138	130	121	115	121	132	137	142	146	145	147	146	150	
-10	F.D	77	33	-	-	-	92	99	70	96	83	90	64	99	99	99	99	99	93	77	-10
	ANG	2	2	-	-	-	3	0	8	0	4	1	8	0	2	4	1	3	0	2	
	S/N	21	22	-	-	-	28	27	39	45	49	41	37	27	28	23	24	21	20	21	
	DBW	150	149	-	-	-	143	144	132	126	122	130	134	144	143	148	147	150	151	150	
-20	F.D	94	61	13	-	16	92	97	99	28	11	40	99	92	98	95	87	71	47	94	-20
	ANG	1	2	0	-	0	2	6	3	10	12	10	3	6	2	4	2	0	3	1	
	S/N	18	20	21	-	25	27	26	35	41	43	38	35	27	27	26	24	19	21	18	
	DBW	153	151	150	-	146	144	145	136	130	128	133	136	144	144	145	147	152	150	153	
-30	F.D	-	-	-	-	-	90	98	99	87	86	96	97	82	87	56	25	7	-	-	-30
	ANG	-	-	-	-	-	2	5	1	5	6	5	2	6	2	0	3	1	-	-	
	S/N	-	-	-	-	-	26	26	32	36	37	34	33	26	27	26	25	23	-	-	
	DBW	-	-	-	-	-	145	145	139	135	134	137	138	145	144	145	146	148	-	-	
-40	F.D	-	-	-	-	-	78	97	94	98	96	95	92	71	65	25	-	-	-	-	-40
	ANG	-	-	-	-	-	1	3	6	2	3	2	0	5	3	0	-	-	-	-	
	S/N	-	-	-	-	-	25	27	30	32	34	33	26	29	26	24	-	-	-	-	
	DBW	-	-	-	-	-	146	144	141	139	137	138	145	142	145	147	-	-	-	-	
-50	F.D	-	-	-	-	-	73	92	89	95	96	89	53	57	50	14	-	-	-	-	-50
	ANG	-	-	-	-	-	1	3	5	0	0	0	7	5	3	0	-	-	-	-	
	S/N	-	-	-	-	-	24	26	28	30	31	30	25	26	23	22	-	-	-	-	
	DBW	-	-	-	-	-	147	145	143	141	140	141	146	145	148	149	-	-	-	-	
-60	F.D	-	-	-	-	-	52	79	83	78	68	59	54	50	41	6	-	-	-	-	-60
	ANG	-	-	-	-	-	1	2	4	5	6	6	5	4	2	0	-	-	-	-	
	S/N	-	-	-	-	-	23	24	26	27	27	27	25	23	16	12	-	-	-	-	
	DBW	-	-	-	-	-	148	147	145	144	144	144	146	148	155	159	-	-	-	-	
-70	F.D	-	-	-	-	-	27	48	58	59	59	54	49	43	34	6	-	-	-	-	-70
	ANG	-	-	-	-	-	1	2	3	4	4	4	4	3	2	0	-	-	-	-	
	S/N	-	-	-	-	-	22	22	23	23	24	23	17	16	17	16	-	-	-	-	
	DBW	-	-	-	-	-	149	149	148	148	147	148	154	155	154	155	-	-	-	-	
-80	F.D	-	-	-	-	-	15	25	33	37	38	39	36	31	25	-	-	-	-	-	-80
	ANG	-	-	-	-	-	1	1	2	2	2	2	2	2	1	-	-	-	-	-	
	S/N	-	-	-	-	-	14	15	15	15	15	16	17	17	18	-	-	-	-	-	
	DBW	-	-	-	-	-	157	156	156	156	156	155	154	154	153	-	-	-	-	-	

GEOGRAPHIC LONGITUDE

Figure II-18

MAR GMT 24 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 4.20MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.O	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	80
	ANG	4	4	4	5	6	0	1	2	2	2	2	2	1	0	6	5	5	4	4	
	S/N	-2	2	2	2	2	8	11	13	12	12	8	8	7	3	-1	-2	-3	-0	-2	
	DBW	154	149	149	149	149	143	140	138	139	139	143	143	144	148	153	154	155	152	154	
70	F.O	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	70
	ANG	2	2	3	4	5	0	2	4	6	6	6	4	2	0	5	4	3	2	2	
	S/N	-0	2	0	1	2	8	13	13	10	11	15	13	12	8	1	0	-4	-6	-0	
	DBW	152	149	151	150	149	143	138	138	141	140	136	138	139	143	150	151	156	158	152	
60	F.O	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	*	60
	ANG	*	*	1	3	4	0	3	6	9	10	9	6	3	0	5	3	1	0	*	
	S/N	*	*	-5	-4	2	1	7	13	18	20	19	18	15	10	2	1	-0	-8	*	
	DBW	*	*	157	156	149	150	144	138	133	131	132	133	136	141	149	150	152	160	*	
50	F.O	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	50
	ANG	*	*	*	1	3	0	3	8	0	2	0	7	3	0	4	1	0	*	*	
	S/N	*	*	*	-1	-4	4	12	21	26	28	23	20	17	10	3	1	-2	*	*	
	DBW	*	*	*	153	156	147	139	130	125	120	125	131	134	141	148	150	154	*	*	
40	F.O	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	40
	ANG	*	*	*	0	3	6	4	9	4	8	4	8	3	6	3	0	*	*	*	
	S/N	*	*	*	-5	-0	9	16	24	32	33	30	20	17	5	2	-2	*	*	*	
	DBW	*	*	*	157	152	146	135	127	117	113	117	130	134	146	149	154	*	*	*	
30	F.O	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	30
	ANG	*	*	*	*	2	5	3	10	7	21	7	8	3	5	1	*	*	*	*	
	S/N	*	*	*	*	-0	6	17	24	34	43	34	19	16	3	1	*	*	*	*	
	DBW	*	*	*	*	152	145	134	126	113	104	114	129	135	148	150	*	*	*	*	
20	F.O	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	20
	ANG	*	*	*	*	1	4	3	9	8	90	8	8	2	4	1	*	*	*	*	
	S/N	*	*	*	*	-3	4	15	22	34	48	35	17	14	2	-1	*	*	*	*	
	DBW	*	*	*	*	155	146	135	126	112	98	112	130	136	149	153	*	*	*	*	
10	F.O	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	10
	ANG	*	*	*	*	0	3	2	8	6	20	6	7	1	3	0	*	*	*	*	
	S/N	*	*	*	*	-4	0	9	18	29	34	24	12	13	0	-1	*	*	*	*	
	DBW	*	*	*	*	156	148	137	128	115	104	115	131	137	150	150	*	*	*	*	
0	F.O	*	*	*	*	99	99	99	99	99	99	99	99	99	99	*	*	*	*	*	0
	ANG	*	*	*	*	0	3	1	6	2	7	2	5	0	2	*	*	*	*	*	
	S/N	*	*	*	*	-6	0	1	13	24	17	13	8	7	0	*	*	*	*	*	
	DBW	*	*	*	*	158	150	140	131	119	114	119	133	142	151	*	*	*	*	*	
-10	F.O	*	*	*	*	99	99	99	99	99	99	99	99	99	99	*	*	*	*	*	-10
	ANG	*	*	*	*	0	3	0	5	9	1	9	4	0	2	*	*	*	*	*	
	S/N	*	*	*	*	-9	-0	0	12	19	22	9	7	16	0	*	*	*	*	*	
	DBW	*	*	*	*	161	152	143	134	127	121	129	135	134	151	*	*	*	*	*	
-20	F.O	*	*	*	*	99	99	99	99	99	99	99	99	99	99	*	*	*	*	*	-20
	ANG	*	*	*	*	0	2	5	2	6	7	6	3	5	2	*	*	*	*	*	
	S/N	*	*	*	*	-9	-1	-0	11	17	20	10	6	1	-1	*	*	*	*	*	
	DBW	*	*	*	*	161	153	150	137	132	129	133	136	149	153	*	*	*	*	*	
-30	F.O	*	*	*	*	*	99	99	99	99	99	99	99	99	99	*	*	*	*	*	-30
	ANG	*	*	*	*	*	1	4	0	3	4	3	1	4	1	*	*	*	*	*	
	S/N	*	*	*	*	*	-2	-0	7	15	17	12	9	1	-3	*	*	*	*	*	
	DBW	*	*	*	*	*	154	152	144	136	134	136	139	150	155	*	*	*	*	*	
-40	F.O	*	*	*	*	*	99	99	99	99	99	99	99	99	99	*	*	*	*	*	-40
	ANG	*	*	*	*	*	0	2	5	1	2	1	6	3	1	*	*	*	*	*	
	S/N	*	*	*	*	*	-6	-1	3	9	12	12	2	1	-7	*	*	*	*	*	
	DBW	*	*	*	*	*	158	153	148	142	139	139	149	150	159	*	*	*	*	*	
-50	F.O	*	*	*	*	*	99	99	99	99	99	99	99	99	99	*	*	*	*	*	-50
	ANG	*	*	*	*	*	0	2	3	5	6	5	4	2	0	*	*	*	*	*	
	S/N	*	*	*	*	*	-9	-3	0	4	5	4	0	-2	-10	*	*	*	*	*	
	DBW	*	*	*	*	*	161	155	151	147	146	147	151	154	162	*	*	*	*	*	
-60	F.O	*	*	*	*	*	*	99	99	99	99	99	99	99	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	1	2	3	4	4	3	1	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	-7	-2	0	0	0	-2	-6	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	159	154	151	151	151	154	158	*	*	*	*	*	*	
-70	F.O	*	*	*	*	*	*	*	99	99	99	99	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	1	2	2	2	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	-7	-4	-3	-5	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	159	156	155	157	*	*	*	*	*	*	*	*	
-80	F.O	*	99	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	99	*	-80
	ANG	*	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	1	*	
	S/N	*	-10	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-10	*	
	DBW	*	162	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	162	*	

GEOGRAPHIC LONGITUDE

Figure II-19

MAR GMT 24 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 6.20MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																					GEOGRAPHIC LATITUDE
	F.D	99	99	99	99	99	99	99	99	99	99	98	98	98	99	96	97	98	99	99	
80	ANG	4	4	4	5	5	0	1	1	2	2	2	2	1	0	6	5	4	4	4	80
	S/N	13	17	17	17	17	28	21	25	24	24	20	20	18	12	12	12	11	14	13	
	DBW	142	138	138	138	138	127	134	130	131	131	135	135	137	143	143	143	144	141	142	
	F.D	99	99	99	99	99	99	99	99	98	98	98	97	97	98	97	97	99	99	99	
70	ANG	2	2	2	3	5	0	2	3	5	6	5	4	2	0	5	4	0	0	2	70
	S/N	9	14	16	16	17	25	25	25	22	22	26	25	24	16	16	15	10	13	9	
	DBW	146	141	139	139	138	130	130	130	133	133	129	130	131	139	139	140	145	142	146	
	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	98	99	99	99	99	99	
60	ANG	0	0	1	2	4	0	2	6	9	10	9	6	3	0	5	2	1	0	0	60
	S/N	8	0	9	10	17	19	18	24	28	30	30	29	27	19	17	16	14	4	8	
	DBW	147	156	146	145	138	136	137	131	127	125	125	126	128	136	138	139	141	151	147	
	F.D	*	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	*	
50	ANG	*	3	4	1	3	6	3	8	0	2	0	7	3	0	3	1	4	3	*	50
	S/N	*	-8	0	12	10	18	23	32	33	37	33	31	28	27	18	16	3	-6	*	
	DBW	*	164	155	143	145	137	132	123	122	119	120	124	127	128	137	139	152	162	*	
	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	
40	ANG	*	*	*	0	2	5	3	9	4	8	3	8	3	6	2	4	*	*	*	40
	S/N	*	*	*	7	15	20	27	35	40	42	39	31	28	19	18	10	*	*	*	
	DBW	*	*	*	148	140	135	128	120	113	109	113	123	127	136	137	145	*	*	*	
	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	
30	ANG	*	*	*	3	1	5	3	10	7	21	7	8	2	5	1	3	*	*	*	30
	S/N	*	*	*	4	14	19	29	34	42	50	43	31	28	19	16	5	*	*	*	
	DBW	*	*	*	151	141	135	126	119	110	102	110	122	127	136	139	150	*	*	*	
	F.D	*	*	*	99	99	99	99	99	99	94	99	99	99	99	99	99	*	*	*	
20	ANG	*	*	*	2	0	4	2	9	8	90	8	8	2	4	0	1	*	*	*	20
	S/N	*	*	*	-9	13	18	25	32	42	50	43	29	26	17	9	-7	*	*	*	
	DBW	*	*	*	155	142	135	128	120	109	101	109	123	128	137	146	163	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	
10	ANG	*	*	*	*	4	3	1	7	6	20	5	6	1	3	4	*	*	*	*	10
	S/N	*	*	*	*	11	15	20	30	38	43	35	24	24	16	5	*	*	*	*	
	DBW	*	*	*	*	144	137	130	121	111	102	111	124	130	137	146	*	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	
0	ANG	*	*	*	*	3	2	0	6	2	7	1	5	0	2	3	*	*	*	*	0
	S/N	*	*	*	*	9	15	16	26	33	29	25	22	26	16	7	*	*	*	*	
	DBW	*	*	*	*	146	138	131	123	115	110	115	125	127	138	147	*	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	
-10	ANG	*	*	*	*	4	2	0	4	9	1	9	3	5	2	3	0	*	*	*	-10
	S/N	*	*	*	*	9	16	22	26	32	32	24	23	19	16	8	-10	*	*	*	
	DBW	*	*	*	*	146	139	127	125	120	118	122	126	136	139	147	166	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	
-20	ANG	*	*	*	*	4	2	5	2	5	7	6	2	5	1	2	*	*	*	*	-20
	S/N	*	*	*	*	8	15	15	24	30	32	25	21	18	14	7	*	*	*	*	
	DBW	*	*	*	*	147	140	138	129	124	122	125	128	137	141	148	*	*	*	*	
	F.D	*	*	*	99	99	99	99	99	99	99	99	99	98	98	99	*	*	*	*	
-30	ANG	*	*	*	0	2	1	3	0	3	4	1	0	4	1	0	*	*	*	*	-30
	S/N	*	*	*	-2	5	13	17	22	27	29	27	21	17	13	7	*	*	*	*	
	DBW	*	*	*	158	150	142	138	133	128	126	127	133	138	142	148	*	*	*	*	
	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	96	99	99	*	*	*	
-40	ANG	*	*	*	0	2	0	2	4	0	1	1	6	3	0	2	0	*	*	*	-40
	S/N	*	*	*	-8	4	17	15	20	23	25	24	18	17	11	6	-7	*	*	*	
	DBW	*	*	*	164	151	138	140	135	132	130	131	137	138	144	149	163	*	*	*	
	F.D	*	*	*	99	99	99	99	99	99	99	99	98	98	97	99	99	*	*	*	
-50	ANG	*	*	*	0	2	4	1	3	5	6	5	4	2	0	0	0	*	*	*	-50
	S/N	*	*	*	0	5	9	12	17	20	21	20	16	14	9	4	-5	*	*	*	
	DBW	*	*	*	155	150	146	143	138	135	134	135	139	141	146	151	161	*	*	*	
	F.D	*	*	99	99	99	99	99	99	99	99	99	99	98	97	99	99	99	*	*	
-60	ANG	*	*	3	0	2	3	0	2	3	3	3	2	1	4	2	1	3	*	*	-60
	S/N	*	*	-7	0	3	8	10	14	16	16	16	14	10	2	0	0	-8	*	*	
	DBW	*	*	163	155	152	147	145	141	139	139	139	141	145	153	155	155	164	*	*	
	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	98	99	99	99	99	99	
-70	ANG	3	3	0	1	2	3	0	1	1	2	1	1	0	4	2	1	0	0	3	-70
	S/N	-5	-5	-5	0	2	6	7	10	11	12	10	5	0	0	6	5	-1	-1	-5	
	DBW	161	161	161	155	153	149	148	145	144	143	145	150	155	155	149	150	157	157	161	
	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	
-80	ANG	1	1	1	2	2	3	4	4	0	0	0	0	4	3	2	2	1	1	1	-80
	S/N	1	3	5	-1	-1	-1	1	2	3	3	3	12	0	3	6	6	9	4	1	
	DBW	154	152	150	157	157	157	154	153	152	152	152	143	155	152	149	149	146	151	154	

180 160 140 120 100 80 60 40 20 0 -20 -40 -60 -80 -100 -120 -140 -160 -180

GEOGRAPHIC LONGITUDE

Figure II-20

MAR GMT 24 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 8.30MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	96	97	96	95	94	97	96	95	93	91	90	89	89	91	83	88	92	95	96	80
	ANG	4	4	4	5	6	0	1	2	2	3	2	2	1	0	7	6	5	4	4	
	S/N	22	26	26	26	26	29	30	33	32	32	28	27	26	21	21	21	20	24	22	
	DBW	137	133	133	133	133	130	129	126	127	127	131	132	133	138	138	138	139	135	137	
70	F.D	95	97	97	97	97	98	96	93	90	89	89	83	83	85	80	87	92	95	95	70
	ANG	0	0	2	3	5	0	2	4	6	6	6	4	3	1	6	4	3	0	0	
	S/N	22	24	26	26	26	26	33	33	29	29	34	33	32	29	25	24	20	18	22	
	DBW	137	135	133	133	133	133	126	126	130	130	125	126	127	130	134	135	139	141	137	
60	F.D	97	97	98	98	99	99	98	95	92	91	93	95	89	87	90	96	99	97	97	60
	ANG	0	0	1	2	4	0	3	6	9	10	9	6	3	1	5	3	1	0	0	
	S/N	14	11	18	20	26	23	26	31	35	37	37	36	35	30	27	26	24	15	14	
	DBW	145	148	141	139	133	136	133	128	124	122	122	123	124	129	132	133	135	144	145	
50	F.D	98	98	99	99	99	99	99	97	99	99	99	98	96	97	96	99	99	99	98	50
	ANG	1	2	0	1	3	6	3	8	0	2	0	8	4	0	4	1	4	2	1	
	S/N	3	8	24	22	20	27	31	39	39	44	40	38	36	29	28	26	17	10	3	
	DBW	156	151	135	137	139	132	128	120	120	114	119	121	123	130	131	133	142	149	156	
40	F.D	98	99	99	99	99	99	99	99	99	99	99	99	99	97	99	99	99	99	98	40
	ANG	1	1	2	0	2	6	3	10	4	8	3	8	3	6	2	0	2	1	1	
	S/N	-7	-3	6	18	24	28	35	42	46	49	47	39	36	29	28	31	6	-3	-7	
	DBW	167	163	153	141	135	130	124	117	112	108	111	120	123	130	131	128	153	163	167	
30	F.D	*	*	99	99	99	99	99	99	99	99	99	99	99	97	99	99	99	99	*	30
	ANG	*	*	1	3	1	5	3	10	7	22	7	8	3	5	1	3	0	0	*	
	S/N	*	*	2	17	25	27	35	42	49	56	51	39	36	28	26	18	-3	-7	*	
	DBW	*	*	157	142	134	129	123	116	108	101	108	119	123	131	133	141	163	167	*	
20	F.D	*	*	*	99	99	99	99	99	99	64	99	99	99	95	99	99	99	*	*	20
	ANG	*	*	*	2	0	4	2	9	8	90	8	8	2	4	0	1	0	*	*	
	S/N	*	*	*	8	24	26	32	39	49	52	51	38	34	26	21	10	-2	*	*	
	DBW	*	*	*	151	135	129	124	117	107	105	107	119	124	131	138	149	162	*	*	
10	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	98	98	99	*	*	*	10
	ANG	*	*	*	1	4	3	1	7	6	20	5	6	1	3	4	1	*	*	*	
	S/N	*	*	*	2	23	23	29	37	46	50	43	34	31	26	16	6	*	*	*	
	DBW	*	*	*	157	136	131	125	118	109	101	109	120	127	131	139	153	*	*	*	
0	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	96	99	99	*	*	*	0
	ANG	*	*	*	1	3	2	0	6	2	7	1	5	0	2	3	0	*	*	*	
	S/N	*	*	*	-0	22	23	25	35	41	37	33	32	33	26	18	-2	*	*	*	
	DBW	*	*	*	160	137	132	126	119	113	108	113	121	125	132	139	162	*	*	*	
-10	F.D	*	*	*	99	99	99	99	99	99	99	99	99	98	97	98	99	*	*	*	-10
	ANG	*	*	*	1	4	2	0	4	9	1	9	3	6	2	3	0	*	*	*	
	S/N	*	*	*	1	21	27	31	35	41	39	34	34	29	27	20	9	*	*	*	
	DBW	*	*	*	158	138	132	122	121	116	117	119	122	130	132	139	150	*	*	*	
-20	F.D	*	*	*	99	99	99	99	99	99	99	99	99	96	96	97	99	*	*	*	-20
	ANG	*	*	*	0	4	2	5	2	5	7	6	2	5	1	3	3	*	*	*	
	S/N	*	*	*	1	21	26	26	33	39	41	36	32	28	25	20	0	*	*	*	
	DBW	*	*	*	158	138	133	131	124	120	118	121	124	131	134	139	159	*	*	*	
-30	F.D	*	*	*	99	99	99	99	99	99	99	99	99	90	91	96	99	*	*	*	-30
	ANG	*	*	*	0	2	1	3	0	2	4	3	1	4	1	0	1	*	*	*	
	S/N	*	*	*	15	18	24	27	32	36	37	36	32	28	25	20	4	*	*	*	
	DBW	*	*	*	144	141	135	132	127	123	122	123	127	131	134	139	155	*	*	*	
-40	F.D	*	*	*	99	99	99	99	99	99	99	98	88	91	83	95	99	*	*	*	-40
	ANG	*	*	*	0	2	0	2	4	0	1	1	6	3	1	2	0	*	*	*	
	S/N	*	*	*	8	18	28	26	30	33	34	33	28	29	24	19	9	*	*	*	
	DBW	*	*	*	151	141	131	133	129	126	125	126	131	130	135	140	150	*	*	*	
-50	F.D	*	*	99	99	99	99	99	99	99	99	91	84	83	82	92	99	99	*	*	-50
	ANG	*	*	2	0	2	4	1	3	5	6	6	5	3	0	3	0	2	*	*	
	S/N	*	*	-1	14	18	21	25	28	30	31	31	26	27	23	17	8	-7	*	*	
	DBW	*	*	161	145	141	138	134	131	129	128	128	133	132	136	142	151	167	*	*	
-60	F.D	99	99	99	99	99	99	99	99	99	98	94	89	86	85	94	99	99	99	99	-60
	ANG	1	2	3	0	2	3	0	2	3	4	4	3	2	0	3	1	3	2	1	
	S/N	-9	-1	8	14	17	20	23	25	27	27	27	26	23	16	13	13	7	-5	-9	
	DBW	169	161	151	145	142	139	136	134	132	132	132	133	136	143	146	146	152	165	169	
-70	F.D	99	99	99	99	99	99	99	99	99	98	97	94	91	90	96	99	99	99	99	-70
	ANG	3	3	0	1	2	3	0	1	1	2	2	1	1	0	3	1	0	0	3	
	S/N	8	7	8	13	15	18	20	22	23	24	22	17	15	22	18	17	12	12	8	
	DBW	151	152	151	146	144	141	139	137	136	135	137	142	144	137	141	142	147	147	151	
-80	F.D	99	99	99	99	99	99	99	99	99	98	97	96	95	91	98	99	99	99	99	-80
	ANG	1	1	1	2	2	3	4	0	0	0	0	0	0	4	3	2	1	1	1	
	S/N	14	15	12	11	10	11	14	14	15	15	15	12	22	16	18	18	17	16	14	
	DBW	145	144	147	148	149	148	145	145	144	144	144	147	137	143	141	141	142	143	145	

GEOGRAPHIC LONGITUDE

Figure II-21

MAR GMT 24 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 12.40MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	72	73	69	64	72	69	61	52	43	37	33	31	32	36	44	51	49	62	72	80
	ANG	5	5	6	6	0	1	2	4	4	5	4	4	3	2	1	0	7	6	5	
	S/N	30	35	34	34	34	37	39	40	39	39	35	35	34	34	32	28	28	32	30	
	DBW	134	129	130	130	130	127	125	124	125	125	129	129	130	130	132	136	136	132	134	
70	F.D	66	73	76	75	71	76	64	47	34	31	32	19	20	22	29	35	49	59	66	70
	ANG	3	3	3	5	6	1	3	6	8	9	8	6	4	2	0	6	5	4	3	
	S/N	28	32	34	34	34	36	40	39	35	36	40	40	39	38	32	32	28	27	28	
	DBW	136	132	130	130	130	128	124	125	129	128	124	124	125	126	132	132	136	137	136	
60	F.D	81	83	86	86	85	86	75	47	32	28	37	48	22	27	9	55	79	80	81	60
	ANG	1	1	2	3	5	0	4	9	12	13	12	9	5	2	7	4	2	1	1	
	S/N	26	25	28	29	36	27	34	38	41	43	42	42	41	40	34	34	33	29	26	
	DBW	138	139	136	135	128	137	130	126	123	121	122	122	123	124	130	130	131	135	138	
50	F.D	93	83	91	95	95	94	85	57	83	84	88	68	50	42	46	86	95	87	93	50
	ANG	1	4	0	1	4	0	4	10	1	3	0	9	6	2	6	2	0	3	1	
	S/N	21	22	25	31	29	36	39	46	46	50	45	44	43	41	36	36	33	25	21	
	DBW	143	142	139	133	135	128	125	118	118	114	119	120	121	123	128	128	131	139	143	
40	F.D	92	96	98	96	98	95	94	72	96	93	98	84	76	68	77	96	99	97	92	40
	ANG	0	1	2	0	3	6	4	11	4	9	4	10	4	0	4	0	1	0	0	
	S/N	16	18	23	27	32	37	42	48	53	56	53	45	43	36	36	31	24	18	16	
	DBW	148	146	141	137	131	126	122	116	111	108	111	119	121	128	128	133	140	146	148	
30	F.D	91	95	99	96	99	96	97	89	98	72	99	95	84	54	86	98	99	97	91	30
	ANG	0	0	0	4	1	5	3	11	8	24	7	9	3	7	2	3	1	0	0	
	S/N	5	10	20	29	33	36	44	49	56	62	56	46	43	36	36	30	21	7	5	
	DBW	159	154	144	135	129	125	120	115	108	102	108	118	121	128	128	134	143	157	159	
20	F.D	95	96	99	99	99	98	99	98	99	0	99	99	91	45	76	99	99	98	95	20
	ANG	2	2	0	2	0	4	2	9	9	90	8	8	2	6	1	2	0	2	2	
	S/N	-2	3	12	25	34	36	42	49	57	56	57	46	43	36	35	26	13	2	-2	
	DBW	167	161	152	139	129	125	121	115	107	108	107	118	121	128	129	138	151	162	167	
10	F.D	*	96	99	99	98	98	99	99	99	93	99	99	96	75	86	99	99	99	*	10
	ANG	*	1	3	1	0	3	1	8	6	21	5	7	1	4	0	1	3	2	*	
	S/N	*	-5	7	22	32	34	40	48	55	59	54	46	41	37	30	23	8	-2	*	
	DBW	*	170	157	142	130	126	121	116	109	102	109	118	123	127	133	141	156	167	*	
0	F.D	*	*	99	99	99	99	99	99	99	99	99	99	92	75	86	99	99	99	*	0
	ANG	*	*	2	0	4	2	0	6	2	7	2	5	0	3	4	0	2	2	*	
	S/N	*	*	4	21	32	34	39	46	52	47	44	45	37	37	31	18	5	-5	*	
	DBW	*	*	160	143	131	127	122	117	112	108	113	119	127	127	133	146	159	170	*	
-10	F.D	*	*	99	99	99	99	99	99	99	99	99	99	87	83	85	99	99	*	*	-10
	ANG	*	*	3	2	4	2	0	4	10	1	9	4	6	2	3	0	0	*	*	
	S/N	*	*	5	21	33	36	35	45	49	48	46	44	37	36	31	21	6	*	*	
	DBW	*	*	159	143	131	128	125	119	115	116	118	120	127	128	133	143	158	*	*	
-20	F.D	*	*	99	99	99	99	99	99	99	99	99	89	72	73	78	98	99	99	*	-20
	ANG	*	*	1	0	4	2	5	2	6	8	6	3	6	2	3	0	0	2	*	
	S/N	*	*	4	21	33	36	37	43	46	48	45	43	36	37	33	28	10	-8	*	
	DBW	*	*	160	143	131	128	127	121	118	116	119	121	128	127	131	136	154	173	*	
-30	F.D	98	99	99	99	99	99	99	99	99	99	94	61	47	51	72	95	98	99	98	-30
	ANG	1	2	1	0	2	1	3	0	3	4	4	2	7	3	3	0	0	7	1	
	S/N	-9	-5	7	28	31	33	37	41	44	45	43	42	36	36	33	23	11	-5	-9	
	DBW	174	170	157	136	133	131	127	123	120	119	121	122	128	128	131	141	153	170	174	
-40	F.D	98	99	99	99	99	99	99	99	99	88	55	27	12	32	54	91	98	99	98	-40
	ANG	0	0	1	0	2	0	2	5	1	2	3	1	5	2	4	0	0	0	0	
	S/N	-0	3	12	24	31	33	36	39	42	43	42	38	38	35	32	25	12	2	-0	
	DBW	165	161	152	140	133	131	128	125	122	121	122	126	128	129	132	139	152	162	165	
-50	F.D	98	99	99	99	97	99	99	97	88	83	49	20	19	20	43	85	95	98	98	-50
	ANG	0	1	2	0	2	4	1	3	6	0	0	6	4	2	5	1	1	0	0	
	S/N	6	11	18	28	31	33	36	38	40	41	40	35	36	33	30	22	13	9	6	
	DBW	158	153	146	136	133	131	128	126	124	123	124	129	128	131	134	142	151	155	158	
-60	F.D	97	98	99	99	99	97	97	94	86	66	42	29	23	22	38	79	96	96	97	-60
	ANG	1	1	3	1	2	4	1	2	4	5	6	5	3	1	5	2	0	1	1	
	S/N	10	17	23	27	29	32	34	36	38	38	37	36	33	27	22	27	22	13	10	
	DBW	154	147	141	137	135	132	130	128	126	126	127	128	131	137	142	137	142	151	154	
-70	F.D	97	98	98	98	98	95	95	92	84	69	51	33	23	18	48	78	92	96	97	-70
	ANG	0	0	0	1	2	4	0	1	2	3	4	3	2	1	5	2	1	0	0	
	S/N	22	21	21	26	27	30	32	34	35	35	33	28	27	25	28	28	26	26	22	
	DBW	142	143	143	138	137	134	132	130	129	129	131	136	137	139	136	136	138	138	142	
-80	F.D	91	89	90	91	92	86	88	84	77	68	56	45	37	33	62	77	87	91	91	-80
	ANG	2	2	2	2	3	4	0	0	1	1	2	2	1	1	4	3	2	2	2	
	S/N	28	27	23	24	20	24	26	27	27	27	27	27	26	27	28	29	28	28	28	
	DBW	136	137	141	140	144	140	138	137	137	137	137	137	138	137	136	135	136	136	136	

GEOGRAPHIC LONGITUDE

Figure II-22

MAR GMT 24 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 16.60MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	29	29	25	33	29	18	12	7	-	-	-	-	-	-	7	11	10	19	29	80
	ANG	6	7	7	0	1	2	3	4	-	-	-	-	-	-	1	0	7	7	6	
	S/N	34	38	37	37	39	42	43	44	-	-	-	-	-	-	35	24	32	35	34	
	DBW	133	129	130	130	128	125	124	123	-	-	-	-	-	-	132	143	135	132	133	
70	F.D	27	30	33	32	35	26	14	-	-	-	-	-	-	-	-	-	10	16	27	70
	ANG	4	4	5	6	0	2	4	-	-	-	-	-	-	-	-	-	5	4	4	
	S/N	31	36	38	37	37	42	43	-	-	-	-	-	-	-	-	-	32	31	31	
	DBW	136	131	129	130	130	125	124	-	-	-	-	-	-	-	-	-	135	136	136	
60	F.D	44	47	49	49	41	43	17	-	-	-	-	-	-	-	-	-	16	43	44	60
	ANG	2	2	3	5	7	2	5	-	-	-	-	-	-	-	-	-	3	2	2	
	S/N	34	31	32	32	40	35	38	-	-	-	-	-	-	-	-	-	37	35	34	
	DBW	133	136	135	135	127	132	129	-	-	-	-	-	-	-	-	-	130	132	133	
50	F.D	75	49	56	67	68	65	34	-	29	32	42	10	-	-	-	24	66	55	75	50
	ANG	3	1	1	3	5	1	6	-	2	4	2	11	-	-	-	3	1	0	3	
	S/N	29	30	34	36	32	40	42	-	51	53	52	47	-	-	-	40	35	30	29	
	DBW	138	137	133	131	135	127	125	-	116	114	115	120	-	-	-	127	132	137	138	
40	F.D	74	78	85	73	82	82	57	12	69	55	80	28	16	-	8	70	91	83	74	40
	ANG	2	2	3	1	3	0	5	13	6	11	5	12	6	-	5	1	2	2	2	
	S/N	27	28	31	35	37	42	46	51	55	59	56	48	46	-	40	38	32	29	27	
	DBW	140	139	136	132	130	125	121	116	112	108	111	119	121	-	127	129	135	138	140	
30	F.D	71	77	88	80	89	79	76	39	84	12	92	62	31	12	24	82	94	82	71	30
	ANG	1	1	2	0	2	6	4	14	9	28	8	11	5	0	4	4	1	1	1	
	S/N	22	25	29	33	40	43	48	52	59	63	58	49	46	32	40	35	29	22	22	
	DBW	145	142	138	134	127	124	119	115	108	104	109	118	121	135	127	132	138	145	145	
20	F.D	74	78	90	96	91	88	89	84	95	-	97	92	58	-	18	98	95	85	74	20
	ANG	0	0	1	2	1	5	3	11	9	-	8	9	4	-	2	2	0	0	0	
	S/N	18	21	26	34	40	43	47	52	59	-	59	49	46	-	40	33	22	23	18	
	DBW	149	146	141	133	127	124	120	115	108	-	108	118	121	-	127	134	145	144	149	
10	F.D	67	76	93	95	93	93	98	97	99	61	98	92	79	26	43	98	97	87	67	10
	ANG	2	3	0	2	0	4	2	8	6	25	6	7	2	9	2	1	0	3	2	
	S/N	13	17	23	32	39	43	46	51	58	64	58	49	45	40	39	32	21	14	13	
	DBW	154	150	144	135	128	124	121	116	109	103	109	118	122	127	128	135	146	153	154	
0	F.D	58	82	93	94	94	99	99	99	98	93	98	92	71	36	54	97	96	88	58	0
	ANG	2	2	0	2	4	3	1	6	2	8	2	6	1	4	0	1	3	3	2	
	S/N	9	13	20	31	39	42	44	50	54	55	53	48	43	40	35	29	19	12	9	
	DBW	158	154	147	136	128	125	121	117	113	108	113	119	124	127	132	138	148	155	158	
-10	F.D	45	86	98	99	99	99	99	96	92	98	83	95	71	47	59	94	96	99	45	-10
	ANG	1	2	3	2	0	3	0	5	11	1	11	4	0	4	0	0	1	1	1	
	S/N	6	11	21	31	38	40	41	49	52	52	49	47	40	40	35	27	20	9	6	
	DBW	161	156	146	136	129	127	126	118	115	115	118	120	127	127	132	140	147	158	161	
-20	F.D	66	99	99	99	99	98	98	99	93	88	81	31	44	32	46	91	96	96	66	-20
	ANG	0	0	2	1	4	3	6	2	7	9	7	5	0	4	0	0	1	1	0	
	S/N	2	8	19	30	38	40	41	47	50	51	48	46	40	41	39	28	20	10	2	
	DBW	165	159	148	137	129	127	126	120	117	116	119	121	127	126	128	139	147	157	165	
-30	F.D	92	98	99	99	99	99	99	99	98	85	52	-	12	14	38	79	90	97	92	-30
	ANG	2	0	1	0	2	1	4	0	3	5	6	-	7	3	0	0	1	0	2	
	S/N	10	12	21	29	37	38	41	45	48	49	46	-	40	41	38	32	23	13	10	
	DBW	157	155	146	138	130	129	126	122	119	118	121	-	127	126	129	135	144	154	157	
-40	F.D	88	98	96	95	94	99	99	95	81	28	-	-	-	-	13	58	84	92	88	-40
	ANG	0	1	2	0	2	0	2	5	1	4	-	-	-	-	0	2	2	1	0	
	S/N	16	18	25	32	37	36	41	44	46	46	-	-	-	-	36	33	25	18	16	
	DBW	151	149	142	139	130	131	126	123	121	121	-	-	-	-	131	134	142	149	151	
-50	F.D	87	95	94	94	88	95	93	78	62	18	8	-	-	-	-	32	72	83	87	-50
	ANG	1	2	3	0	2	0	2	4	0	1	0	-	-	-	-	3	0	2	1	
	S/N	20	23	28	34	37	39	41	43	44	41	37	-	-	-	-	28	23	22	20	
	DBW	147	144	139	133	130	128	126	124	123	129	130	-	-	-	-	139	144	145	147	
-60	F.D	82	88	95	96	91	84	79	64	40	18	9	-	-	-	-	21	64	79	82	-60
	ANG	3	3	0	1	3	0	2	4	6	6	6	-	-	-	-	3	1	0	3	
	S/N	21	27	31	33	35	30	40	41	42	42	41	-	-	-	-	32	30	23	21	
	DBW	146	140	136	134	132	129	127	126	125	125	126	-	-	-	-	135	137	144	146	
-70	F.D	79	82	86	87	85	73	64	50	29	20	-	-	-	-	-	21	56	75	79	-70
	ANG	0	1	1	2	3	0	1	3	4	4	-	-	-	-	-	4	2	1	0	
	S/N	29	28	28	32	34	36	37	39	39	39	-	-	-	-	-	32	32	33	29	
	DBW	138	139	139	135	133	131	130	128	128	128	-	-	-	-	-	135	135	134	138	
-80	F.D	51	46	49	51	49	44	37	28	18	9	-	-	-	-	10	19	39	53	51	-80
	ANG	3	4	4	4	5	1	1	2	2	2	-	-	-	-	0	5	4	3	3	
	S/N	34	31	27	30	24	29	31	31	32	29	-	-	-	-	32	33	32	32	34	
	DBW	133	136	140	137	143	138	136	136	135	138	-	-	-	-	135	134	135	135	133	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-23

MAR GMT 24 SUNSPOT 70

TRANSMITTER 20.01N - 0.01W FREQUENCY 22.10MC/S

VERTICAL SH OL 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																					
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
80	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
70	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	11	13	11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	10	11	
60	ANG	2	2	3	5	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	60
	S/N	38	34	35	35	-	-	-	-	-	-	-	-	-	-	-	-	-	38	38	
	DBW	133	137	136	136	-	-	-	-	-	-	-	-	-	-	-	-	-	133	133	
	F.D	46	12	10	8	9	9	-	-	-	-	-	-	-	-	-	-	-	-	46	
50	ANG	0	1	2	3	6	2	-	-	-	-	-	-	-	-	-	-	-	-	0	50
	S/N	34	34	38	39	35	39	-	-	-	-	-	-	-	-	-	-	-	-	34	
	DBW	137	137	133	132	136	132	-	-	-	-	-	-	-	-	-	-	-	-	137	
	F.D	39	38	50	13	23	23	-	-	11	-	22	-	-	-	-	-	54	39	39	
40	ANG	3	4	0	2	5	1	-	-	7	-	6	-	-	-	-	-	4	3	3	40
	S/N	34	34	35	39	40	40	-	-	58	-	58	-	-	-	-	-	36	35	34	
	DBW	137	137	136	132	131	131	-	-	113	-	113	-	-	-	-	-	135	136	137	
	F.D	37	36	44	18	44	51	17	27	29	-	50	7	-	-	-	31	60	39	37	
30	ANG	2	3	4	1	4	0	6	0	11	-	10	12	-	-	-	0	3	2	2	30
	S/N	32	34	35	39	44	46	50	41	61	-	61	51	-	-	-	37	35	33	32	
	DBW	139	137	136	132	127	129	121	130	110	-	110	120	-	-	-	134	136	138	139	
	F.D	25	31	51	70	62	52	48	38	68	-	77	56	12	-	-	76	66	32	25	
20	ANG	1	1	3	4	2	7	5	13	11	-	9	11	4	-	-	3	1	1	1	20
	S/N	29	31	35	40	44	47	50	54	62	-	62	51	49	-	-	38	34	30	29	
	DBW	142	140	136	131	127	124	121	117	109	-	109	120	122	-	-	133	137	141	142	
	F.D	18	31	59	75	73	71	83	81	90	15	82	56	32	-	5	83	70	31	18	
10	ANG	0	0	1	3	1	5	2	9	7	27	7	9	3	-	2	2	1	0	0	10
	S/N	25	28	33	39	43	46	50	54	60	65	60	51	49	-	42	37	31	24	25	
	DBW	146	143	138	132	128	125	121	117	111	106	111	120	122	-	129	134	140	147	146	
	F.D	9	23	66	76	83	95	97	90	78	48	76	44	31	6	10	83	78	27	9	
0	ANG	3	0	1	2	0	3	1	7	3	11	3	8	2	4	1	1	0	0	3	0
	S/N	22	26	32	38	43	45	49	53	57	61	57	50	48	43	39	36	28	23	22	
	DBW	149	145	139	133	128	126	122	118	114	110	114	121	123	128	132	135	143	148	149	
	F.D	-	47	83	88	96	97	94	60	44	78	18	57	32	12	20	78	83	74	-	
-10	ANG	-	0	0	3	0	3	1	7	14	2	13	6	1	4	0	1	2	2	-	-10
	S/N	-	26	32	38	42	44	43	52	55	56	51	50	46	43	38	34	29	24	-	
	DBW	-	145	139	133	129	127	128	119	116	115	120	121	125	128	133	137	142	147	-	
	F.D	-	96	96	96	93	77	88	96	48	31	16	-	10	-	11	67	84	88	-	
-20	ANG	-	0	2	1	0	4	0	3	9	11	9	-	0	-	0	1	1	0	-	-20
	S/N	-	22	30	37	42	43	45	50	53	54	50	-	40	-	41	35	30	28	-	
	DBW	-	149	141	134	129	128	126	121	118	117	121	-	131	-	130	136	141	143	-	
	F.D	69	91	98	98	97	96	92	94	77	23	-	-	-	-	7	42	66	77	69	
-30	ANG	0	0	2	0	3	2	4	1	4	7	-	-	-	-	0	2	2	0	0	-30
	S/N	24	24	30	33	41	42	44	48	50	52	-	-	-	-	33	38	31	26	24	
	DBW	147	147	141	138	130	129	127	123	121	119	-	-	-	-	138	133	140	145	147	
	F.D	56	80	81	80	76	93	88	56	16	-	-	-	-	-	-	12	37	45	56	
-40	ANG	2	1	3	1	3	1	3	7	3	-	-	-	-	-	-	2	0	3	2	-40
	S/N	28	29	33	38	41	39	45	47	48	-	-	-	-	-	-	37	33	29	28	
	DBW	143	142	138	133	130	132	126	124	123	-	-	-	-	-	-	134	138	142	143	
	F.D	46	68	77	72	57	71	59	30	15	-	-	-	-	-	-	-	14	25	46	
-50	ANG	3	3	0	1	4	1	3	6	0	-	-	-	-	-	-	-	1	0	3	-50
	S/N	29	32	35	40	41	43	45	46	47	-	-	-	-	-	-	-	27	29	29	
	DBW	142	139	136	131	130	128	126	125	124	-	-	-	-	-	-	-	144	142	142	
	F.D	42	58	69	67	48	39	31	17	-	-	-	-	-	-	-	-	-	32	42	
-60	ANG	0	0	1	2	5	1	3	5	-	-	-	-	-	-	-	-	-	1	0	-60
	S/N	27	33	36	38	39	42	43	44	-	-	-	-	-	-	-	-	-	28	27	
	DBW	144	138	135	133	132	129	128	127	-	-	-	-	-	-	-	-	-	143	144	
	F.D	24	30	40	41	39	14	8	-	-	-	-	-	-	-	-	-	-	18	24	
-70	ANG	2	2	3	4	0	1	2	-	-	-	-	-	-	-	-	-	-	2	2	-70
	S/N	33	32	32	36	37	39	37	-	-	-	-	-	-	-	-	-	-	36	33	
	DBW	138	139	139	135	134	132	134	-	-	-	-	-	-	-	-	-	-	135	138	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-80	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-80
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-24

MAR GMT 12 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 4.20MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE	F.D / ANG / S/N / DBW	180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180
80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
50	F.D	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	53	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	-8	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	160	*	*	*	*	*	*	*	*	*
40	F.D	*	*	*	*	*	*	*	*	*	99	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	90	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	39	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	112	*	*	*	*	*	*	*	*	*
30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
0	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
-10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
-20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
-30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
-40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
-50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

GEOGRAPHIC LONGITUDE

Figure II-25

MAR GMT 12 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 6.20MC/S

VERTICAL SH 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	*	99	99	99	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	80
	ANG	*	1	1	2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	-10	-9	-9	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	166	165	165	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
60	F.D	*	*	*	*	*	*	*	*	*	99	99	*	*	*	*	*	*	*	*	60
	ANG	*	*	*	*	*	*	*	*	*	1	28	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	2	-10	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	153	166	*	*	*	*	*	*	*	*	
50	F.D	*	*	*	*	*	*	*	*	99	99	99	*	*	*	*	*	*	*	*	50
	ANG	*	*	*	*	*	*	*	*	2	9	2	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	5	19	5	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	150	136	150	*	*	*	*	*	*	*	*	
40	F.D	*	*	*	*	*	*	*	*	99	89	99	*	*	*	*	*	*	*	*	40
	ANG	*	*	*	*	*	*	*	*	37	90	39	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	4	45	4	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	151	110	151	*	*	*	*	*	*	*	*	
30	F.D	*	*	*	*	*	*	*	*	99	99	99	*	*	*	*	*	*	*	*	30
	ANG	*	*	*	*	*	*	*	*	33	38	34	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	-6	13	-7	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	162	142	163	*	*	*	*	*	*	*	*	
20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	20
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	10
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
0	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-10
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-20
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-30
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-26

MAR GMT 12 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 8.30MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	80
	ANG	1	1	1	2	3	5	0	1	1	1	1	1	7	6	4	2	1	1	1	
	S/N	5	9	10	10	10	10	0	1	0	0	-2	-3	6	5	5	5	4	7	5	
	DBW	154	150	149	149	149	149	159	158	159	159	162	163	153	154	154	154	155	152	154	
70	F.D	97	97	97	98	97	99	99	99	99	99	99	99	99	99	99	99	99	97	97	70
	ANG	5	5	6	0	2	4	1	2	4	4	4	2	12	11	2	0	5	5	5	
	S/N	-3	-3	-1	4	8	-1	-3	-1	-2	-2	-2	0	-1	-2	7	0	-6	-4	-3	
	DBW	163	163	161	155	151	161	163	161	162	162	162	159	161	162	152	159	166	164	163	
60	F.D	95	91	93	95	99	99	99	99	99	99	99	99	99	99	99	99	99	98	95	60
	ANG	3	3	4	5	1	3	12	4	7	1	19	4	15	11	0	5	4	3	3	
	S/N	1	-3	-3	-5	3	-0	0	4	16	20	19	1	-0	-2	4	0	1	3	1	
	DBW	158	163	163	165	156	160	159	155	143	139	140	158	160	162	155	159	158	156	158	
50	F.D	94	87	87	93	99	99	99	99	99	99	99	99	99	99	99	99	99	98	94	50
	ANG	2	2	2	4	5	9	15	4	2	10	2	4	15	9	5	3	2	2	2	
	S/N	5	4	0	-1	-10	-8	1	8	28	44	25	1	-3	-5	-2	1	3	4	5	
	DBW	154	155	159	161	170	168	158	151	131	115	134	158	163	165	162	158	156	155	154	
40	F.D	88	91	90	96	99	99	99	99	99	36	99	99	99	99	99	99	99	99	88	40
	ANG	0	1	2	2	4	9	18	21	4	90	4	21	18	9	3	2	1	0	0	
	S/N	7	2	3	-1	-7	-4	-8	6	29	48	25	-2	-5	-9	-5	-0	1	1	7	
	DBW	152	157	156	161	166	164	168	153	130	111	134	162	165	169	165	160	157	158	152	
30	F.D	94	87	99	99	*	*	*	99	99	99	99	*	*	*	99	*	99	96	94	30
	ANG	2	4	0	1	*	*	*	24	23	9	23	*	*	*	2	*	4	3	2	
	S/N	-4	1	-1	-2	*	*	*	-6	16	32	17	*	*	*	-10	*	-7	-1	-4	
	DBW	164	158	161	162	*	*	*	166	143	127	142	*	*	*	168	*	165	161	164	
20	F.D	*	98	99	*	*	*	*	*	99	99	99	*	*	*	*	*	*	*	*	20
	ANG	*	1	2	*	*	*	*	*	24	22	24	*	*	*	*	*	*	*	*	
	S/N	*	-10	-10	*	*	*	*	*	-9	12	-9	*	*	*	*	*	*	*	*	
	DBW	*	170	170	*	*	*	*	*	169	147	169	*	*	*	*	*	*	*	*	
10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	10
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
0	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-10
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-20
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-30
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-27

MAR GMT 12 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 12.40MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																					GEOGRAPHIC LATITUDE
	F.D	87	87	86	85	93	92	93	94	94	95	96	96	96	96	97	87	83	82	87	
80	ANG	1	1	2	3	1	1	2	3	3	4	4	3	2	1	1	3	2	2	1	80
	S/N	25	28	28	28	28	28	28	29	26	26	24	24	23	23	23	23	22	26	25	
	DBW	139	136	136	136	136	136	136	135	138	138	140	140	141	141	141	141	142	138	139	
	F.D	67	69	71	73	78	92	94	94	93	92	95	97	98	98	95	94	86	74	67	
70	ANG	0	0	1	1	0	1	3	5	7	8	7	5	3	1	2	1	0	0	0	70
	S/N	17	16	21	27	28	27	25	26	25	25	25	28	27	26	26	23	14	16	17	
	DBW	147	148	143	137	136	137	139	138	139	139	139	136	137	138	138	141	150	148	147	
	F.D	48	34	28	46	70	94	97	95	99	99	99	98	99	99	99	98	94	73	48	
60	ANG	3	3	4	1	2	0	3	7	0	2	0	7	4	3	0	5	4	3	3	60
	S/N	21	16	16	20	24	23	23	27	36	43	38	30	28	27	23	21	21	23	21	
	DBW	143	148	148	144	140	141	141	137	128	121	126	134	136	137	141	143	143	141	143	
	F.D	50	26	14	17	67	97	99	99	99	81	99	99	99	99	99	99	97	80	50	
50	ANG	1	2	2	4	1	0	1	6	3	21	3	6	7	2	5	4	2	2	1	50
	S/N	24	23	20	19	16	18	26	31	46	54	48	31	27	26	21	23	23	24	24	
	DBW	140	141	144	145	148	146	138	133	118	110	116	133	137	138	143	141	141	140	140	
	F.D	55	38	24	27	73	99	99	99	99	-	99	99	99	99	99	99	97	82	55	
40	ANG	2	0	1	2	4	1	6	5	12	-	13	12	7	1	3	2	1	1	2	40
	S/N	25	25	23	20	18	20	25	31	48	-	49	29	25	21	19	22	23	24	25	
	DBW	139	139	141	144	146	144	139	133	116	-	115	135	139	143	145	142	141	140	139	
	F.D	73	56	55	59	91	99	99	99	99	94	99	99	99	99	99	99	98	77	73	
30	ANG	3	0	1	1	2	0	10	11	2	20	2	11	11	5	2	0	5	4	3	30
	S/N	21	24	23	21	18	19	17	29	38	54	38	26	11	10	16	13	17	19	21	
	DBW	143	140	141	143	146	145	147	135	126	110	126	138	153	152	146	151	147	145	143	
	F.D	87	83	88	79	97	99	99	99	99	99	99	99	99	99	99	99	99	97	87	
20	ANG	1	2	3	1	1	4	9	14	14	20	15	15	9	4	1	3	2	1	1	20
	S/N	15	17	18	17	14	11	13	18	26	34	27	12	7	5	8	10	15	16	15	
	DBW	149	147	146	147	150	153	151	146	138	130	137	152	157	158	151	151	149	148	149	
	F.D	98	94	95	70	97	99	99	99	99	99	99	99	99	99	99	99	99	99	98	
10	ANG	2	0	1	3	0	3	11	13	17	13	17	13	9	4	0	2	1	0	2	10
	S/N	11	12	13	15	8	6	2	11	9	22	9	4	3	2	-2	7	14	10	11	
	DBW	153	152	151	149	156	158	162	153	155	142	159	160	161	158	160	153	150	154	153	
	F.D	98	99	99	75	90	99	99	99	99	99	99	99	*	99	99	99	99	99	98	
0	ANG	0	1	0	2	4	3	10	15	14	16	14	12	*	4	0	2	0	2	0	0
	S/N	5	8	9	9	5	2	-3	0	0	0	-1	0	*	0	2	5	10	8	5	
	DBW	159	156	155	155	159	162	168	164	164	162	163	164	*	161	156	156	154	156	159	
	F.D	99	99	99	76	98	99	*	99	99	99	99	*	*	99	99	99	99	99	99	
-10	ANG	0	0	3	1	3	5	*	13	13	14	13	*	*	3	3	1	3	1	0	-10
	S/N	3	6	6	4	-2	-9	*	-5	3	-3	-4	*	*	0	-4	5	6	9	3	
	DBW	161	158	158	160	167	174	*	170	161	168	169	*	*	164	166	159	158	155	161	
	F.D	98	99	99	98	99	*	*	*	*	*	*	*	*	99	99	99	99	99	98	
-20	ANG	1	0	1	0	2	*	*	*	*	*	*	*	*	1	1	0	2	0	1	-20
	S/N	1	1	1	-3	-7	*	*	*	*	*	*	*	*	-7	-8	7	3	10	1	
	DBW	163	163	163	168	172	*	*	*	*	*	*	*	*	172	173	157	161	154	163	
	F.D	99	99	99	98	*	*	*	*	*	*	*	*	*	*	*	99	99	98	99	
-30	ANG	1	4	1	0	*	*	*	*	*	*	*	*	*	*	*	3	1	0	1	-30
	S/N	0	3	-4	-8	*	*	*	*	*	*	*	*	*	*	*	-9	-1	6	0	
	DBW	164	161	169	173	*	*	*	*	*	*	*	*	*	*	*	174	166	158	164	
	F.D	99	99	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	99	99	
-40	ANG	2	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	2	-40
	S/N	1	-10	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-9	1	
	DBW	163	175	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	174	163	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-28

MAR GMT 12 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 16.60MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	
80	F.D	44	44	41	38	54	55	57	58	59	62	66	70	73	74	73	43	34	33	44	80
	ANG	3	3	4	4	5	6	7	8	9	9	9	8	6	5	4	5	4	3	3	
	S/N	34	37	37	37	37	37	37	37	35	35	33	32	32	32	32	32	30	34	34	
	DBW	133	130	130	130	130	130	130	130	132	132	134	135	135	135	135	135	137	133	133	
70	F.D	16	16	17	19	20	56	59	55	88	90	92	74	82	86	76	64	41	21	16	70
	ANG	1	1	2	3	4	6	8	11	0	1	0	10	7	5	3	2	2	1	1	
	S/N	27	28	32	36	36	36	34	35	34	37	33	37	36	35	35	33	28	27	27	
	DBW	140	139	135	131	131	131	133	132	133	130	134	130	131	132	132	134	139	140	140	
60	F.D	-	-	-	-	7	63	68	92	93	90	95	96	90	97	95	72	43	17	-	60
	ANG	-	-	-	-	3	4	8	0	5	7	5	0	7	4	1	7	7	6	-	
	S/N	-	-	-	-	33	34	33	36	47	49	49	39	38	36	34	31	30	31	-	
	DBW	-	-	-	-	134	133	134	131	120	118	118	128	129	131	133	136	137	136	-	
50	F.D	-	-	-	-	6	50	81	95	87	27	89	97	95	97	94	89	65	27	-	50
	ANG	-	-	-	-	1	4	6	1	10	25	10	2	7	2	6	4	4	4	-	
	S/N	-	-	-	-	27	29	36	41	52	58	54	45	37	36	32	32	32	32	-	
	DBW	-	-	-	-	140	138	131	126	115	109	113	122	130	131	135	135	135	135	-	
40	F.D	12	-	-	-	9	79	95	99	89	-	91	99	97	98	95	93	74	34	12	40
	ANG	2	-	-	-	0	2	5	1	12	-	12	1	5	1	4	2	2	2	2	
	S/N	33	-	-	-	34	33	35	42	54	-	55	44	36	31	31	32	33	33	33	
	DBW	134	-	-	-	133	134	132	125	113	-	112	123	131	136	136	135	134	134	134	
30	F.D	40	12	-	-	20	95	98	95	98	56	98	96	99	98	98	95	79	44	40	30
	ANG	0	1	-	-	5	0	3	9	8	23	8	10	4	5	2	1	0	1	0	
	S/N	31	32	-	-	29	31	33	39	51	60	51	37	33	27	30	29	27	30	31	
	DBW	136	135	-	-	138	136	134	128	116	107	116	130	134	140	137	138	140	137	136	
20	F.D	61	33	31	9	51	96	99	99	99	99	99	99	99	98	99	98	98	86	61	20
	ANG	2	4	0	2	4	4	2	7	4	7	4	8	2	4	1	4	2	2	2	
	S/N	28	29	29	30	29	27	29	35	45	49	46	33	30	24	26	25	27	27	28	
	DBW	139	138	138	137	138	140	138	132	122	118	121	134	137	142	140	142	140	140	139	
10	F.D	90	70	40	-	53	98	99	99	99	98	99	99	99	99	99	98	98	95	90	10
	ANG	3	1	3	-	2	3	0	5	10	13	10	6	1	3	0	3	1	0	3	
	S/N	23	26	27	-	26	22	23	30	32	35	32	29	27	21	16	24	26	24	23	
	DBW	144	141	140	-	141	145	144	137	135	132	135	138	140	145	147	143	141	143	144	
0	F.D	92	95	87	-	29	99	99	99	99	99	99	99	99	99	99	98	96	95	92	0
	ANG	1	2	0	-	1	1	5	4	7	9	7	5	0	3	0	3	1	3	1	
	S/N	20	21	24	-	22	17	19	27	27	24	21	25	21	20	16	22	24	22	20	
	DBW	147	146	143	-	145	150	148	140	140	138	139	141	146	147	149	145	143	145	147	
-10	F.D	93	94	78	-	47	99	99	99	99	99	99	99	99	99	99	99	98	97	93	-10
	ANG	0	1	0	-	4	0	4	8	6	6	5	8	5	1	3	1	0	2	0	
	S/N	18	19	22	-	19	12	14	18	25	24	23	12	15	17	16	20	27	22	18	
	DBW	149	148	145	-	148	155	153	149	142	143	143	154	152	150	151	147	140	145	149	
-20	F.D	93	98	94	51	62	99	99	99	99	99	99	99	99	99	99	99	99	98	93	-20
	ANG	0	0	2	2	3	4	3	6	7	8	7	6	3	0	1	0	2	1	0	
	S/N	17	17	17	17	16	8	12	13	14	10	10	11	12	10	12	13	18	18	17	
	DBW	150	150	150	150	151	159	155	154	153	157	157	156	155	157	155	154	149	149	150	
-30	F.D	94	92	90	37	59	99	99	99	99	99	99	99	99	99	99	99	96	86	94	-30
	ANG	2	0	2	1	2	3	1	4	5	6	6	5	1	3	1	0	2	0	2	
	S/N	16	16	15	14	12	4	9	9	10	10	8	9	13	5	9	17	15	17	16	
	DBW	151	151	152	153	155	163	158	158	157	157	159	158	154	162	158	150	152	150	151	
-40	F.D	84	43	19	17	73	99	99	99	99	99	99	99	99	99	98	91	69	64	84	-40
	ANG	2	2	3	1	1	2	4	2	7	8	8	3	0	2	1	0	3	2	2	
	S/N	16	11	11	10	8	1	0	5	1	2	-3	7	0	3	5	7	10	12	16	
	DBW	151	156	156	157	159	166	168	162	166	165	171	160	168	164	162	160	157	155	151	
-50	F.D	-	-	-	-	78	99	99	99	99	99	99	99	99	99	95	82	52	24	-	-50
	ANG	-	-	-	-	0	1	2	0	6	6	2	1	4	2	1	0	0	1	-	
	S/N	-	-	-	-	5	-1	-3	-2	-1	0	5	5	-2	0	1	2	2	0	-	
	DBW	-	-	-	-	162	169	171	170	169	168	162	162	170	168	166	165	165	167	-	
-60	F.D	-	-	-	-	65	99	99	99	99	99	99	99	99	98	94	78	54	15	-	-60
	ANG	-	-	-	-	0	1	2	3	0	1	0	4	3	1	0	0	0	2	-	
	S/N	-	-	-	-	2	-2	-4	-5	-3	-3	-3	-4	-2	-5	-5	-4	-1	-7	-	
	DBW	-	-	-	-	165	170	172	173	171	171	171	172	170	173	173	172	169	175	-	
-70	F.D	12	-	-	7	52	93	99	99	99	99	99	99	99	99	97	89	64	38	12	-70
	ANG	2	-	-	1	0	0	1	2	2	2	3	2	2	1	0	0	0	0	2	
	S/N	-5	-	-	-5	0	-2	-6	-6	-5	-7	-6	-9	-6	-3	-1	2	5	5	-5	
	DBW	173	-	-	173	168	170	174	174	173	175	174	177	174	171	169	165	162	162	173	
-80	F.D	52	39	36	45	67	86	*	*	99	99	99	99	98	97	95	83	74	63	52	-80
	ANG	0	0	1	1	0	0	*	*	1	1	1	1	0	0	0	0	0	0	0	
	S/N	-2	-3	-4	-4	-4	-9	*	*	-8	-7	-7	-5	-5	-3	1	-6	-6	-5	-2	
	DBW	170	171	172	172	172	177	*	*	176	175	175	173	173	171	166	174	174	173	170	

GEOGRAPHIC LONGITUDE

Figure II-29

MAR GMT 12 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 22.10MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.O	-	-	-	-	7	5	6	7	7	9	12	16	19	20	21	-	-	-	-	80
	ANG	-	-	-	-	5	6	8	9	10	10	10	9	8	7	5	-	-	-	-	
	S/N	-	-	-	-	42	43	43	43	41	41	38	38	38	37	37	-	-	-	-	
	DBW	-	-	-	-	129	128	128	128	130	130	133	133	133	134	134	-	-	-	-	
70	F.O	-	-	-	-	-	5	7	5	52	57	63	21	37	45	24	13	-	-	-	70
	ANG	-	-	-	-	-	6	9	12	2	2	1	12	9	6	4	3	-	-	-	
	S/N	-	-	-	-	-	42	40	41	43	43	41	43	42	41	41	39	-	-	-	
	DBW	-	-	-	-	-	129	131	130	128	128	130	128	129	130	130	132	-	-	-	
60	F.O	-	-	-	-	-	10	11	58	65	54	70	78	54	69	59	35	-	-	-	60
	ANG	-	-	-	-	-	5	9	1	6	9	6	1	9	5	2	1	-	-	-	
	S/N	-	-	-	-	-	40	40	40	52	54	54	46	44	43	42	38	-	-	-	
	DBW	-	-	-	-	-	131	131	131	119	117	117	125	127	128	129	133	-	-	-	
50	F.O	-	-	-	-	-	-	29	71	43	-	49	84	67	79	76	35	12	-	-	50
	ANG	-	-	-	-	-	-	8	1	12	-	13	2	8	3	0	6	5	-	-	
	S/N	-	-	-	-	-	-	43	48	57	-	58	50	44	43	38	38	38	-	-	
	DBW	-	-	-	-	-	-	128	123	114	-	113	121	127	128	133	133	133	-	-	
40	F.O	-	-	-	-	-	9	58	86	36	-	41	92	79	85	68	53	18	-	-	40
	ANG	-	-	-	-	-	3	6	1	14	-	15	1	6	1	5	4	3	-	-	
	S/N	-	-	-	-	-	40	43	49	59	-	60	48	44	41	38	38	39	-	-	
	DBW	-	-	-	-	-	131	128	122	112	-	111	123	127	130	133	133	132	-	-	
30	F.O	10	-	-	-	-	41	81	58	79	-	83	65	88	92	83	66	15	13	10	30
	ANG	0	-	-	-	-	1	4	11	8	-	9	12	4	0	3	2	1	1	0	
	S/N	37	-	-	-	-	40	42	48	57	-	57	45	42	41	37	38	38	35	37	
	DBW	134	-	-	-	-	131	129	123	114	-	114	126	129	130	134	133	133	136	134	
20	F.O	26	-	-	-	-	48	94	88	99	97	99	92	93	86	89	88	79	51	26	20
	ANG	3	-	-	-	-	6	2	7	3	7	3	8	2	5	2	0	4	4	3	
	S/N	35	-	-	-	-	38	39	44	51	55	51	42	40	35	36	33	34	36	35	
	DBW	136	-	-	-	-	133	132	127	120	115	120	129	131	136	135	138	137	135	136	
10	F.O	69	16	-	-	-	69	97	96	83	99	87	98	94	89	89	84	83	78	69	10
	ANG	0	2	-	-	-	4	0	5	11	1	11	5	1	4	1	3	2	1	0	
	S/N	33	33	-	-	-	35	36	40	42	47	42	39	36	33	33	32	34	33	33	
	DBW	138	138	-	-	-	136	135	131	129	124	129	132	135	138	138	139	137	138	138	
0	F.O	71	70	18	-	-	76	95	99	99	91	92	98	96	89	90	80	74	79	71	0
	ANG	2	3	2	-	-	2	5	3	7	9	8	4	0	3	1	4	2	0	2	
	S/N	31	32	32	-	-	32	33	37	38	38	34	37	30	32	31	31	33	32	31	
	DBW	140	139	139	-	-	139	138	134	133	131	132	134	141	139	140	140	138	139	140	
-10	F.O	71	58	7	-	-	92	97	99	89	74	91	99	95	97	92	90	86	78	71	-10
	ANG	1	3	1	-	-	1	4	1	5	7	5	1	5	2	4	2	0	3	1	
	S/N	30	31	23	-	-	29	28	34	37	36	36	32	28	30	28	30	27	29	30	
	DBW	141	140	148	-	-	142	143	137	134	135	135	139	143	141	143	141	144	142	141	
-20	F.O	71	80	44	-	-	96	99	99	99	99	99	99	99	99	96	96	89	84	71	-20
	ANG	1	1	0	-	-	0	2	5	0	1	0	5	2	0	2	0	3	1	1	
	S/N	28	28	29	-	-	26	27	29	31	32	28	26	27	25	27	24	28	29	28	
	DBW	143	143	142	-	-	145	144	142	140	139	143	145	144	146	144	147	143	142	143	
-30	F.O	72	53	7	-	-	96	99	99	99	99	99	99	99	98	80	67	46	46	72	-30
	ANG	0	2	0	-	-	3	1	3	4	5	5	3	1	3	2	1	0	2	0	
	S/N	27	28	20	-	-	23	23	24	25	28	24	25	24	23	27	26	25	29	27	
	DBW	144	143	151	-	-	148	148	147	146	143	147	146	147	148	144	145	146	142	144	
-40	F.O	25	-	-	-	-	65	99	99	99	99	99	99	95	73	49	24	8	-	25	-40
	ANG	0	-	-	-	-	3	4	1	2	3	3	2	0	4	3	1	0	-	0	
	S/N	26	-	-	-	-	22	20	19	21	24	23	24	18	23	23	23	21	-	26	
	DBW	145	-	-	-	-	149	151	152	150	147	148	147	153	148	148	148	150	-	145	
-50	F.O	-	-	-	-	-	64	99	99	99	99	99	97	79	61	38	13	-	-	-	-50
	ANG	-	-	-	-	-	2	3	0	1	2	2	1	4	3	2	1	-	-	-	
	S/N	-	-	-	-	-	20	17	17	18	21	22	20	16	19	19	17	-	-	-	
	DBW	-	-	-	-	-	151	154	154	153	150	149	151	155	152	152	154	-	-	-	
-60	F.O	-	-	-	-	-	38	87	99	98	99	98	86	72	52	33	9	-	-	-	-60
	ANG	-	-	-	-	-	2	3	3	4	0	0	5	4	3	2	1	-	-	-	
	S/N	-	-	-	-	-	18	18	17	18	17	18	18	15	11	14	5	-	-	-	
	DBW	-	-	-	-	-	153	153	154	153	154	153	153	156	160	157	166	-	-	-	
-70	F.O	-	-	-	-	-	12	44	67	74	78	72	65	55	41	23	8	-	-	-	-70
	ANG	-	-	-	-	-	2	3	3	3	4	4	4	3	2	2	1	-	-	-	
	S/N	-	-	-	-	-	14	16	16	16	15	15	9	11	14	18	16	-	-	-	
	DBW	-	-	-	-	-	157	155	155	155	150	156	162	160	157	153	155	-	-	-	
-80	F.O	-	-	-	-	-	-	15	27	37	42	43	40	34	26	16	11	-	-	-	-80
	ANG	-	-	-	-	-	-	2	2	3	3	3	3	2	2	1	1	-	-	-	
	S/N	-	-	-	-	-	-	9	9	9	10	10	13	13	16	17	16	-	-	-	
	DBW	-	-	-	-	-	-	162	162	162	161	161	158	158	155	154	155	-	-	-	

GEOGRAPHIC LONGITUDE

Figure II-30

MAR GMT 24 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 4.20MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	
80	ANG	3	3	3	4	5	6	8	9	10	10	10	9	8	7	5	4	3	3	3	80
	S/N	11	15	15	18	16	17	19	20	19	20	16	15	14	13	11	10	9	11	11	
	DBW	140	136	136	133	135	134	132	131	132	131	135	136	137	138	140	141	142	140	140	
	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	
70	ANG	0	0	1	2	4	6	9	0	2	3	2	0	9	7	4	2	1	0	0	70
	S/N	3	4	10	14	19	17	16	22	25	25	24	23	19	16	14	13	6	2	3	
	DBW	148	147	141	137	132	134	135	129	126	126	127	128	132	135	137	138	145	149	148	
	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	99	
60	ANG	2	2	5	0	2	5	9	2	7	10	7	2	10	6	3	0	5	2	2	60
	S/N	-8	-9	-1	4	13	15	16	24	34	36	35	30	21	18	15	10	3	-3	-8	
	DBW	160	161	153	147	138	136	135	127	117	115	116	121	130	133	136	141	148	155	160	
	F.D	*	*	99	99	99	99	99	99	99	98	99	99	99	99	99	99	99	*	*	
50	ANG	*	*	4	5	1	4	9	3	13	26	13	3	9	5	1	5	3	*	*	50
	S/N	*	*	-8	1	6	9	19	30	39	42	38	33	22	18	15	5	-6	*	*	
	DBW	*	*	160	150	145	142	132	121	112	109	110	118	129	133	136	146	158	*	*	
	F.D	*	*	*	99	99	99	99	99	99	73	99	99	99	99	99	99	*	*	*	
40	ANG	*	*	*	4	6	3	8	3	15	90	15	3	8	3	6	3	*	*	*	40
	S/N	*	*	*	-0	3	14	20	31	40	44	39	32	21	16	6	2	*	*	*	
	DBW	*	*	*	152	148	137	131	120	109	102	108	118	130	135	145	149	*	*	*	
	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	
30	ANG	*	*	*	2	4	1	6	1	10	24	10	0	6	1	4	2	*	*	*	30
	S/N	*	*	*	-1	3	13	20	28	36	43	36	23	19	15	4	-5	*	*	*	
	DBW	*	*	*	153	148	138	131	122	111	104	112	125	132	136	147	157	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	
20	ANG	*	*	*	*	3	0	4	9	4	8	4	8	3	0	3	*	*	*	*	20
	S/N	*	*	*	*	3	12	17	22	29	33	30	18	16	18	2	*	*	*	*	
	DBW	*	*	*	*	148	138	133	126	117	113	117	129	134	133	149	*	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	
10	ANG	*	*	*	*	1	5	2	6	11	1	10	5	1	4	1	*	*	*	*	10
	S/N	*	*	*	*	-0	2	10	16	16	18	11	10	13	2	-2	*	*	*	*	
	DBW	*	*	*	*	152	146	136	130	128	120	128	133	137	148	151	*	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	
0	ANG	*	*	*	*	0	3	0	4	6	7	6	3	6	3	0	*	*	*	*	0
	S/N	*	*	*	*	-6	1	-1	10	11	0	0	6	2	1	-3	*	*	*	*	
	DBW	*	*	*	*	158	149	143	134	132	131	132	135	147	150	155	*	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	*	*	*	*	*	
-10	ANG	*	*	*	*	0	2	5	2	3	4	3	1	4	2	*	*	*	*	*	-10
	S/N	*	*	*	*	-8	0	-5	8	11	8	2	4	1	0	*	*	*	*	*	
	DBW	*	*	*	*	160	151	149	138	135	135	136	138	149	151	*	*	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	
-20	ANG	*	*	*	*	0	2	4	6	1	2	1	6	3	1	3	*	*	*	*	-20
	S/N	*	*	*	*	-7	-2	-1	2	9	12	5	-5	0	-5	-10	*	*	*	*	
	DBW	*	*	*	*	159	154	151	146	140	137	138	148	150	157	162	*	*	*	*	
	F.D	*	*	*	*	*	99	99	99	99	99	99	99	99	99	*	*	*	*	*	
-30	ANG	*	*	*	*	*	0	2	4	5	6	5	4	2	0	*	*	*	*	*	-30
	S/N	*	*	*	*	*	-8	-1	1	4	6	-0	-1	-0	-7	*	*	*	*	*	
	DBW	*	*	*	*	*	160	153	150	147	145	149	150	152	159	*	*	*	*	*	
	F.D	*	*	*	*	*	*	99	99	99	99	99	99	99	99	*	*	*	*	*	
-40	ANG	*	*	*	*	*	*	0	2	3	4	3	2	1	4	*	*	*	*	*	-40
	S/N	*	*	*	*	*	*	-9	-2	0	2	0	-0	-2	-9	*	*	*	*	*	
	DBW	*	*	*	*	*	*	161	154	151	149	151	152	154	161	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	99	99	99	99	99	*	*	*	*	*	*	*	
-50	ANG	*	*	*	*	*	*	*	0	1	2	2	1	*	*	*	*	*	*	*	-50
	S/N	*	*	*	*	*	*	*	-9	-3	-1	-1	-3	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	161	155	153	153	155	*	*	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	99	99	99	*	*	*	*	*	*	*	*	
-60	ANG	*	*	*	*	*	*	*	*	0	0	0	*	*	*	*	*	*	*	*	-60
	S/N	*	*	*	*	*	*	*	*	-10	-9	-8	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	162	161	160	*	*	*	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	99	*	*	*	
-70	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	*	*	-70
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-10	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	162	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	99	*	*	
-80	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	*	-80
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-10	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	162	*	*	

GEOGRAPHIC LONGITUDE

Figure II-31

MAR GMT 24 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 6.20MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	98	98	98	98	96	97	96	95	93	92	91	92	93	94	94	97	98	98	98	80
	ANG	2	2	3	4	5	6	8	9	10	11	10	10	8	7	5	4	3	2	2	
	S/N	22	26	26	27	27	28	30	30	29	29	25	25	24	23	22	22	21	22	22	
	DBW	133	129	129	128	128	127	125	125	126	126	130	130	131	132	133	133	134	133	133	
70	F.D	97	98	98	98	99	97	96	98	97	97	97	97	90	92	96	97	98	98	97	70
	ANG	0	0	0	2	3	6	9	0	2	3	2	0	10	7	4	2	1	0	0	
	S/N	23	19	20	25	27	28	26	39	33	33	32	33	29	27	26	24	16	15	23	
	DBW	132	136	135	130	128	127	129	116	122	122	123	122	126	128	129	131	139	140	132	
60	F.D	96	96	98	99	99	98	98	99	98	97	98	99	94	96	99	99	99	95	96	60
	ANG	1	2	3	0	2	5	9	2	7	11	7	2	10	6	2	0	3	2	1	
	S/N	9	7	12	16	24	26	26	32	41	43	42	38	31	29	27	19	17	13	9	
	DBW	146	148	143	139	131	129	129	123	114	112	113	117	124	126	128	136	138	142	146	
50	F.D	96	97	99	99	99	99	99	99	97	78	97	99	99	99	99	99	99	95	96	50
	ANG	0	0	1	5	0	4	9	3	13	28	13	3	9	4	1	5	1	0	0	
	S/N	4	3	9	15	15	20	29	38	46	48	46	41	32	29	25	19	12	4	4	
	DBW	151	152	146	140	140	135	126	117	109	105	107	114	123	126	130	136	143	151	151	
40	F.D	*	*	99	99	99	99	99	99	98	-	99	99	99	99	99	99	99	*	*	40
	ANG	*	*	2	3	6	2	8	2	16	-	15	2	8	3	6	3	1	*	*	
	S/N	*	*	3	15	17	25	31	39	46	-	46	39	31	28	20	18	4	*	*	
	DBW	*	*	152	140	138	130	124	116	107	-	106	115	124	127	135	137	151	*	*	
30	F.D	*	*	99	99	99	99	99	99	99	96	99	99	99	99	99	99	99	*	*	30
	ANG	*	*	0	2	4	1	6	0	10	25	10	0	5	1	4	1	0	*	*	
	S/N	*	*	-10	12	18	23	31	36	44	50	45	35	30	26	19	12	1	*	*	
	DBW	*	*	166	143	137	131	124	117	108	102	108	118	125	129	136	143	154	*	*	
20	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	20
	ANG	*	*	*	0	2	6	4	9	4	8	3	8	3	6	2	0	*	*	*	
	S/N	*	*	*	1	18	21	27	32	38	42	39	29	27	18	18	1	*	*	*	
	DBW	*	*	*	154	137	132	126	120	113	109	113	123	127	136	137	154	*	*	*	
10	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	10
	ANG	*	*	*	3	1	4	2	6	11	1	10	5	1	4	1	3	*	*	*	
	S/N	*	*	*	-3	14	17	21	28	27	28	24	23	25	16	12	-5	*	*	*	
	DBW	*	*	*	159	141	135	129	123	122	117	122	125	129	137	139	161	*	*	*	
0	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	0
	ANG	*	*	*	*	0	3	0	3	6	7	5	3	5	2	0	*	*	*	*	
	S/N	*	*	*	*	12	16	15	23	23	15	15	20	17	16	17	*	*	*	*	
	DBW	*	*	*	*	143	137	132	126	125	124	125	127	136	138	137	*	*	*	*	
-10	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-10
	ANG	*	*	*	*	4	2	5	1	3	3	2	1	4	1	3	*	*	*	*	
	S/N	*	*	*	*	10	15	12	21	25	24	19	18	18	16	8	*	*	*	*	
	DBW	*	*	*	*	145	140	137	130	127	126	127	131	137	139	147	*	*	*	*	
-20	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-20
	ANG	*	*	*	*	2	1	4	5	0	1	1	5	3	0	2	*	*	*	*	
	S/N	*	*	*	*	9	13	15	19	23	25	19	12	17	12	8	*	*	*	*	
	DBW	*	*	*	*	146	142	138	134	131	129	131	137	138	143	147	*	*	*	*	
-30	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	98	99	99	*	*	*	-30
	ANG	*	*	*	*	2	0	2	3	5	5	5	4	2	4	2	0	*	*	*	
	S/N	*	*	*	*	6	11	15	18	20	21	17	16	16	10	6	-1	*	*	*	
	DBW	*	*	*	*	149	144	140	137	135	134	137	138	139	145	149	157	*	*	*	
-40	F.D	*	*	*	99	99	99	99	99	99	99	99	99	97	95	98	99	*	*	*	-40
	ANG	*	*	*	3	1	3	0	1	3	3	3	2	0	4	0	3	*	*	*	
	S/N	*	*	*	-10	3	8	10	13	17	18	17	16	10	9	4	-9	*	*	*	
	DBW	*	*	*	166	152	147	145	142	138	137	138	139	145	146	151	165	*	*	*	
-50	F.D	*	*	*	99	99	99	99	99	99	99	99	99	94	94	97	99	*	*	*	-50
	ANG	*	*	*	3	1	2	3	0	1	1	1	1	4	3	1	3	*	*	*	
	S/N	*	*	*	-2	2	5	8	10	12	14	15	12	6	6	1	-4	*	*	*	
	DBW	*	*	*	158	153	150	147	145	143	141	140	143	149	149	154	160	*	*	*	
-60	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	95	97	99	*	*	*	-60
	ANG	*	*	*	3	0	1	3	3	4	0	0	4	3	2	0	3	*	*	*	
	S/N	*	*	*	-2	1	3	6	8	9	10	9	7	4	0	-2	-7	*	*	*	
	DBW	*	*	*	158	154	152	149	147	146	145	146	148	151	156	158	163	*	*	*	
-70	F.D	99	*	99	99	99	99	99	99	99	99	99	99	98	99	99	99	99	99	99	-70
	ANG	1	*	2	3	0	1	2	3	3	3	3	3	2	1	0	3	2	1	1	
	S/N	-10	*	-10	-3	-1	1	2	5	6	5	5	0	0	3	0	-2	-2	-2	-10	
	DBW	166	*	166	159	157	154	153	150	149	150	150	156	155	152	155	158	158	158	166	
-80	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	-80
	ANG	2	2	3	0	0	1	1	1	2	2	2	2	1	1	0	0	3	3	2	
	S/N	-3	-3	-7	4	-9	-6	-5	-2	0	0	0	3	3	4	0	8	-2	-2	-3	
	DBW	159	159	163	151	165	162	161	158	156	155	155	152	152	151	156	147	158	158	159	

GEOGRAPHIC LONGITUDE

Figure II-32

MAR GMT 24 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 8.30MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	92	91	91	91	84	84	81	76	70	65	64	66	70	74	78	89	91	92	92	80
	ANG	3	3	3	4	6	7	9	10	12	12	12	11	9	8	6	4	3	3	3	
	S/N	30	34	34	34	35	35	37	37	35	35	32	31	31	30	30	29	28	30	30	
	DBW	129	125	125	125	124	124	122	122	124	124	127	128	128	129	129	130	131	129	129	
70	F.D	89	92	92	92	93	87	82	91	88	85	85	84	60	68	83	89	92	92	89	70
	ANG	0	0	1	2	4	7	10	0	2	4	3	0	11	8	4	2	1	0	0	
	S/N	24	22	29	33	34	35	33	36	39	39	38	36	35	34	33	32	25	20	24	
	DBW	135	137	130	126	125	124	126	123	120	120	121	123	124	125	126	127	134	139	135	
60	F.D	88	88	92	94	96	90	87	94	89	82	89	90	67	75	92	95	93	86	88	60
	ANG	2	2	3	0	2	6	10	2	8	12	8	3	12	7	3	0	3	2	2	
	S/N	21	18	22	22	32	33	33	38	46	48	48	44	37	36	34	27	27	24	21	
	DBW	138	141	137	137	127	126	126	121	113	111	111	115	122	123	125	132	132	135	138	
50	F.D	88	90	93	95	97	97	91	96	81	29	84	95	86	90	97	96	94	86	88	50
	ANG	0	0	1	3	1	4	10	3	15	32	14	3	10	5	1	3	1	0	0	
	S/N	16	17	21	25	24	27	36	43	51	53	53	46	38	37	33	29	23	18	16	
	DBW	143	142	138	134	135	132	123	116	108	105	106	113	121	122	126	130	136	141	143	
40	F.D	94	89	94	96	96	98	96	98	85	-	89	99	97	97	97	97	93	85	94	40
	ANG	0	1	0	1	6	3	8	3	17	-	16	2	8	3	6	1	1	1	0	
	S/N	4	7	18	24	26	32	38	45	52	-	53	46	38	36	29	27	18	8	4	
	DBW	155	152	141	135	133	126	121	114	106	-	105	113	121	123	130	132	141	151	155	
30	F.D	*	93	96	98	98	99	98	99	97	71	98	99	99	99	99	99	96	92	*	30
	ANG	*	2	0	0	4	1	6	0	11	27	10	0	6	1	4	0	0	2	*	
	S/N	*	-4	9	23	27	30	37	44	50	55	52	39	37	34	28	27	10	-7	*	
	DBW	*	164	150	136	132	126	121	114	107	102	107	119	122	125	131	132	149	167	*	
20	F.D	*	*	97	98	99	98	98	99	99	99	99	99	99	93	99	99	98	*	*	20
	ANG	*	*	2	0	3	6	4	10	4	8	3	8	3	7	3	0	1	*	*	
	S/N	*	*	-4	14	28	28	34	39	45	49	47	37	35	26	27	14	-6	*	*	
	DBW	*	*	164	145	131	127	122	117	111	108	111	120	123	131	132	145	166	*	*	
10	F.D	*	*	*	99	99	98	99	99	99	99	99	99	99	96	99	99	*	*	*	10
	ANG	*	*	*	2	1	4	2	6	11	1	10	5	1	4	1	2	*	*	*	
	S/N	*	*	*	13	26	25	30	35	36	36	33	33	33	26	22	11	*	*	*	
	DBW	*	*	*	146	133	129	124	120	119	115	119	121	125	131	133	148	*	*	*	
0	F.D	*	*	*	99	98	98	98	99	99	99	99	99	99	98	99	99	*	*	*	0
	ANG	*	*	*	1	0	3	0	4	6	7	5	3	6	3	0	3	*	*	*	
	S/N	*	*	*	5	24	24	24	32	33	25	25	30	28	26	22	5	*	*	*	
	DBW	*	*	*	154	135	131	127	122	121	120	121	123	130	132	135	154	*	*	*	
-10	F.D	*	*	*	97	98	98	97	99	99	99	99	99	99	99	99	99	*	*	*	-10
	ANG	*	*	*	1	0	2	5	1	3	3	2	1	4	1	3	1	*	*	*	
	S/N	*	*	*	5	22	26	22	31	34	34	30	29	28	26	21	4	*	*	*	
	DBW	*	*	*	154	137	133	131	125	123	122	123	127	131	133	138	155	*	*	*	
-20	F.D	*	*	*	96	96	99	99	99	99	99	99	99	98	97	99	99	*	*	*	-20
	ANG	*	*	*	0	3	1	4	6	0	1	1	6	3	0	3	0	*	*	*	
	S/N	*	*	*	4	22	25	25	29	33	34	30	25	27	24	20	2	*	*	*	
	DBW	*	*	*	155	137	134	132	128	126	125	127	131	132	135	139	157	*	*	*	
-30	F.D	*	*	*	99	99	99	99	99	99	99	99	99	95	92	97	98	*	*	*	-30
	ANG	*	*	*	0	2	0	2	3	5	5	5	4	2	4	1	0	*	*	*	
	S/N	*	*	*	4	19	23	26	28	30	31	28	27	26	23	19	13	*	*	*	
	DBW	*	*	*	155	140	136	133	131	129	128	131	132	133	136	140	146	*	*	*	
-40	F.D	*	*	*	99	99	99	99	99	99	99	98	96	88	79	93	98	*	*	*	-40
	ANG	*	*	*	3	1	3	0	1	3	3	3	2	1	4	1	2	*	*	*	
	S/N	*	*	*	7	17	20	23	25	27	28	27	27	23	23	17	6	*	*	*	
	DBW	*	*	*	152	142	139	136	134	132	131	132	132	136	136	142	153	*	*	*	
-50	F.D	*	*	99	99	99	99	99	99	99	99	98	93	82	76	89	97	99	*	*	-50
	ANG	*	*	1	3	1	2	3	0	1	2	2	1	0	3	1	2	0	*	*	
	S/N	*	*	-0	12	16	19	20	23	24	25	26	24	27	20	15	10	-6	*	*	
	DBW	*	*	160	147	143	140	139	136	135	134	133	135	132	139	144	149	166	*	*	
-60	F.D	*	99	99	99	99	99	99	99	99	99	98	91	85	79	88	97	99	99	*	-60
	ANG	*	0	1	2	0	1	3	3	4	0	0	4	4	3	1	1	1	0	*	
	S/N	*	-4	5	11	15	17	19	20	21	22	22	21	16	11	11	7	4	-8	*	
	DBW	*	164	154	148	144	142	140	139	138	137	137	138	143	148	148	152	155	168	*	
-70	F.D	99	99	99	99	99	99	99	99	99	99	93	89	86	89	95	98	99	99	99	-70
	ANG	1	1	2	3	0	1	2	3	3	4	4	3	3	2	1	3	2	1	1	
	S/N	5	3	4	10	12	14	16	18	19	18	18	11	12	16	15	10	11	10	5	
	DBW	154	156	155	149	147	145	143	141	140	141	141	148	147	143	144	149	148	149	154	
-80	F.D	99	99	99	99	99	99	99	99	98	97	95	94	93	95	97	99	99	99	99	-80
	ANG	2	3	3	0	0	1	1	2	2	2	2	2	2	1	0	0	3	3	2	
	S/N	10	10	6	15	3	6	7	10	11	12	12	16	15	17	14	11	10	11	10	
	DBW	149	149	153	144	156	153	152	149	148	147	147	143	144	142	145	148	149	148	149	

GEOGRAPHIC LONGITUDE

Figure II-33

MAR GMT 24 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 12.40MC/S

VERTICAL SH 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																				
	F.D	53	52	52	51	35	29	25	18	13	37	9	10	13	17	26	45	52	53	53
80	ANG	4	5	5	6	8	9	11	12	14	0	14	13	11	10	8	6	5	5	4
	S/N	37	41	41	41	41	41	42	43	41	43	37	37	37	36	36	36	35	37	37
	DBW	127	123	123	123	123	123	122	121	123	121	127	127	127	128	128	128	129	127	127
	F.D	54	54	55	55	54	35	26	47	38	32	31	30	7	11	28	45	56	55	54
70	ANG	1	2	2	4	6	9	12	1	4	5	4	2	13	9	6	4	2	2	1
	S/N	32	33	38	40	41	41	39	45	44	44	44	45	41	40	39	39	34	32	32
	DBW	132	131	126	124	123	123	125	119	120	120	120	119	123	124	125	125	130	132	132
	F.D	44	44	56	59	61	44	26	51	31	18	31	35	5	-	26	60	57	42	44
60	ANG	7	7	0	1	4	8	13	4	10	14	10	4	13	-	5	2	0	7	7
	S/N	30	26	28	33	39	40	39	44	51	53	53	50	43	-	41	39	34	32	30
	DBW	134	138	136	131	125	124	125	120	113	111	111	114	121	-	123	125	130	132	134
	F.D	49	50	48	48	67	65	36	61	16	-	20	56	-	10	58	45	47	50	49
50	ANG	2	2	6	8	2	5	12	5	17	-	17	5	-	7	2	8	6	2	2
	S/N	29	30	30	32	33	35	43	49	55	-	57	52	-	43	42	36	33	30	29
	DBW	135	134	134	132	131	129	121	115	109	-	107	112	-	121	122	128	131	134	135
	F.D	45	50	57	58	74	73	52	75	13	-	22	81	43	47	75	57	55	48	45
40	ANG	2	0	1	5	0	4	11	4	20	-	19	3	11	5	0	5	1	0	2
	S/N	25	27	30	32	32	40	45	51	57	-	58	52	44	43	36	36	31	27	25
	DBW	139	137	134	132	131	123	119	113	107	-	106	112	120	121	128	128	133	137	139
	F.D	63	48	58	67	68	81	70	85	64	-	76	91	77	65	69	67	55	44	63
30	ANG	0	1	2	3	6	2	8	1	13	-	11	0	7	2	6	3	1	1	0
	S/N	16	21	28	33	33	39	45	50	57	-	57	46	44	42	36	34	28	20	16
	DBW	148	143	136	131	129	122	119	114	107	-	107	118	120	122	128	130	136	144	148
	F.D	58	62	69	73	77	85	77	70	96	93	98	86	81	53	82	74	72	64	58
20	ANG	2	3	0	1	4	0	5	12	4	9	4	9	4	1	4	1	3	2	2
	S/N	7	12	21	32	37	38	44	49	53	56	53	45	43	40	36	31	17	11	7
	DBW	157	152	143	132	126	123	119	115	111	108	111	119	121	124	128	133	147	153	157
	F.D	53	61	69	79	83	77	84	91	84	99	91	97	94	52	84	81	76	59	53
10	ANG	1	1	2	0	2	6	2	7	12	1	11	5	2	7	2	0	2	2	1
	S/N	-0	4	16	30	35	36	40	46	46	47	45	45	42	36	35	28	14	5	-0
	DBW	165	160	148	134	127	124	121	118	118	114	118	119	122	128	128	136	150	159	165
	F.D	44	57	69	76	83	83	86	89	97	97	98	95	85	68	91	85	74	48	44
0	ANG	0	0	1	3	1	4	0	4	7	8	6	3	6	4	0	3	2	1	0
	S/N	-7	-1	13	26	34	35	35	43	45	37	38	43	37	36	30	23	11	1	-7
	DBW	172	166	151	138	129	126	123	120	119	118	119	121	127	128	134	141	153	163	172
	F.D	*	47	65	69	82	84	81	93	99	99	99	96	93	85	88	88	84	50	*
-10	ANG	*	2	1	3	0	3	6	2	3	4	2	1	5	2	4	1	1	2	*
	S/N	*	-4	12	26	34	37	32	42	44	44	43	40	37	36	31	23	10	-2	*
	DBW	*	169	152	138	130	127	128	122	120	120	121	124	127	128	133	141	154	167	*
	F.D	*	57	69	73	77	95	96	95	99	99	98	91	83	78	87	89	84	*	*
-20	ANG	*	0	1	2	0	2	4	6	1	2	1	6	4	1	3	0	3	*	*
	S/N	*	-7	12	26	34	36	36	40	42	42	41	36	36	36	33	23	6	*	*
	DBW	*	172	152	138	130	128	128	124	122	122	123	128	128	128	131	141	158	*	*
	F.D	*	77	88	92	92	98	98	99	99	95	73	67	66	64	78	87	84	88	*
-30	ANG	*	1	3	1	3	1	2	4	5	6	7	5	3	1	3	0	2	1	*
	S/N	*	-6	12	24	32	34	36	38	39	40	36	36	36	35	32	28	11	-5	*
	DBW	*	171	152	140	132	130	128	126	125	124	128	128	128	129	132	136	153	170	*
	F.D	*	93	94	96	96	95	99	99	99	88	55	33	43	33	59	90	88	87	*
-40	ANG	*	1	2	0	2	4	0	2	3	4	5	4	2	1	3	0	1	0	*
	S/N	*	2	14	25	31	33	34	36	37	39	35	35	35	33	31	23	12	1	*
	DBW	*	162	150	139	133	131	130	128	127	125	129	129	129	131	133	141	152	163	*
	F.D	99	93	98	96	98	97	99	99	97	83	47	18	30	28	46	79	91	97	99
-50	ANG	1	0	1	3	1	3	3	0	1	3	4	2	1	0	3	0	1	0	1
	S/N	2	9	18	27	30	32	32	34	36	37	35	34	32	31	28	24	15	6	2
	DBW	162	155	146	137	134	132	132	130	128	127	129	130	132	133	136	140	149	158	162
	F.D	98	99	94	92	99	98	98	97	95	81	51	23	10	26	43	74	89	97	98
-60	ANG	0	0	2	3	1	2	3	4	0	1	2	1	0	4	3	0	2	0	0
	S/N	8	15	21	25	28	30	31	33	33	35	34	32	20	21	22	21	20	11	8
	DBW	156	149	143	139	136	134	133	131	131	129	130	132	144	143	142	143	144	153	156
	F.D	97	98	99	97	97	97	94	89	79	72	49	35	24	29	46	73	90	96	97
-70	ANG	1	1	2	3	0	1	2	3	4	0	0	0	4	3	2	0	3	2	1
	S/N	19	18	18	24	26	27	28	30	32	30	30	22	22	26	28	22	23	23	19
	DBW	145	146	146	140	138	137	136	134	132	134	134	142	142	138	136	142	141	141	145
	F.D	88	90	92	94	92	90	87	80	71	59	48	42	41	46	58	75	86	91	88
-80	ANG	3	0	0	0	1	1	2	2	3	4	4	4	3	3	2	1	0	0	3
	S/N	25	29	21	18	17	20	21	24	22	22	22	26	26	28	28	27	22	29	25
	DBW	139	135	143	146	147	144	143	140	142	142	142	138	138	136	136	137	142	135	139
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180

GEOGRAPHIC LONGITUDE

Figure II-34

MAR GMT 24 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 16.60MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	
	F.D	16	16	16	15	6	-	-	-	-	-	-	-	-	-	-	11	16	16	16	
80	ANG	5	5	5	6	8	-	-	-	-	-	-	-	-	-	-	6	6	5	5	80
	S/N	40	44	44	44	44	-	-	-	-	-	-	-	-	-	-	39	38	40	40	
	DBW	127	123	123	123	123	-	-	-	-	-	-	-	-	-	-	128	129	127	127	
	F.D	19	17	18	18	13	-	-	9	-	-	-	-	-	-	-	11	18	18	19	
70	ANG	2	2	3	4	6	-	-	1	-	-	-	-	-	-	-	4	3	2	2	70
	S/N	36	37	41	44	44	-	-	47	-	-	-	-	-	-	-	42	37	35	36	
	DBW	131	130	126	123	123	-	-	120	-	-	-	-	-	-	-	125	130	132	131	
	F.D	12	12	16	18	12	7	-	7	-	-	-	-	-	-	-	6	-	-	12	
60	ANG	7	7	0	2	4	8	-	4	-	-	-	-	-	-	-	2	-	-	7	60
	S/N	35	31	32	37	42	43	-	46	-	-	-	-	-	-	-	43	-	-	35	
	DBW	132	136	135	130	125	124	-	121	-	-	-	-	-	-	-	124	-	-	132	
	F.D	14	15	11	14	17	6	-	12	-	-	-	9	-	-	-	-	-	6	14	
50	ANG	4	5	6	0	3	6	-	6	-	-	-	6	-	-	-	-	-	5	4	50
	S/N	35	35	35	35	37	38	-	52	-	-	-	54	-	-	-	-	-	36	35	
	DBW	132	132	132	132	130	129	-	115	-	-	-	113	-	-	-	-	-	131	132	
	F.D	5	17	14	11	14	13	-	17	-	-	-	27	-	-	7	-	-	6	5	
40	ANG	2	3	4	6	1	5	-	5	-	-	-	5	-	-	1	-	-	2	2	40
	S/N	33	35	36	36	38	44	-	53	-	-	-	55	-	-	42	-	-	35	33	
	DBW	134	132	131	131	129	123	-	114	-	-	-	112	-	-	125	-	-	132	134	
	F.D	13	7	11	8	8	18	12	35	8	-	18	52	9	-	-	-	-	-	13	
30	ANG	0	1	2	4	7	3	9	3	14	-	13	2	9	-	-	-	-	-	0	30
	S/N	27	26	33	38	39	44	49	53	59	-	59	52	47	-	-	-	-	-	27	
	DBW	140	141	134	129	128	123	118	114	108	-	108	115	120	-	-	-	-	-	140	
	F.D	9	9	19	13	13	28	25	11	67	55	80	31	24	-	15	6	11	8	9	
20	ANG	2	3	0	2	5	1	6	13	6	11	5	12	6	-	5	2	0	3	2	20
	S/N	22	24	31	38	42	45	46	52	56	59	56	48	46	-	40	37	23	24	22	
	DBW	145	143	136	129	125	122	119	115	111	108	111	119	121	-	127	130	144	143	145	
	F.D	6	9	6	15	23	40	39	46	81	85	48	72	59	-	19	13	-	5	6	
10	ANG	1	1	5	1	3	0	4	9	0	2	14	7	3	-	4	1	-	2	1	10
	S/N	10	19	27	36	41	44	47	50	48	53	48	48	46	-	40	34	-	15	10	
	DBW	157	148	140	131	126	123	120	117	119	114	119	119	121	-	127	133	-	152	157	
	F.D	-	-	-	14	37	36	51	47	78	80	87	66	61	10	50	25	-	-	-	
0	ANG	-	-	-	0	2	6	2	6	8	9	6	4	1	5	2	0	-	-	-	0
	S/N	-	-	-	34	40	43	43	48	48	45	47	47	40	40	39	30	-	-	-	
	DBW	-	-	-	133	127	124	122	119	119	118	119	120	127	127	128	137	-	-	-	
	F.D	-	-	-	16	44	47	57	61	95	94	95	75	63	43	60	36	13	-	-	
-10	ANG	-	-	-	0	2	5	0	3	3	4	3	2	6	4	0	4	0	-	-	-10
	S/N	-	-	-	33	39	42	39	46	48	47	47	45	40	40	34	30	23	-	-	
	DBW	-	-	-	134	128	125	128	121	119	120	120	122	127	127	133	137	144	-	-	
	F.D	-	-	14	29	37	51	54	79	83	83	74	65	48	40	56	48	35	-	-	
-20	ANG	-	-	2	4	2	4	6	0	2	3	2	0	6	3	0	3	1	-	-	-20
	S/N	-	-	24	33	39	41	39	45	46	46	45	39	40	40	38	31	23	-	-	
	DBW	-	-	143	134	128	126	128	122	121	121	122	128	127	127	129	136	144	-	-	
	F.D	-	6	33	39	47	71	78	83	81	76	26	-	26	24	39	56	50	16	-	
-30	ANG	-	1	0	3	0	2	3	4	6	0	1	-	4	1	4	2	0	1	-	-30
	S/N	-	6	25	33	38	40	40	43	44	45	39	-	40	39	38	32	21	12	-	
	DBW	-	161	142	134	129	127	127	124	123	122	128	-	127	128	129	135	146	155	-	
	F.D	-	43	50	55	56	66	92	93	85	29	-	-	9	-	20	63	58	56	-	
-40	ANG	-	2	0	2	3	0	1	2	4	6	-	-	2	-	4	1	3	2	-	-40
	S/N	-	20	26	33	37	39	40	41	42	43	-	-	39	-	36	32	25	19	-	
	DBW	-	147	141	134	130	128	127	126	125	124	-	-	128	-	131	135	142	148	-	
	F.D	87	73	68	70	68	67	95	93	68	18	-	-	-	-	11	41	65	80	87	
-50	ANG	3	1	3	1	2	4	4	1	3	4	-	-	-	-	3	1	3	1	3	-50
	S/N	17	22	26	34	36	38	38	40	41	40	-	-	-	-	33	31	26	19	17	
	DBW	150	145	141	133	131	129	129	127	126	127	-	-	-	-	134	136	141	148	150	
	F.D	86	90	74	72	79	75	72	80	54	15	-	-	-	-	9	25	56	78	86	
-60	ANG	1	1	3	0	1	3	4	0	1	2	-	-	-	-	3	1	0	2	1	-60
	S/N	18	24	30	32	35	36	37	39	39	36	-	-	-	-	27	27	28	20	18	
	DBW	149	143	137	135	132	131	130	128	128	131	-	-	-	-	140	140	139	147	149	
	F.D	77	81	86	83	80	77	64	55	38	7	8	-	-	-	7	24	49	70	77	
-70	ANG	2	2	3	0	1	2	4	0	0	0	0	-	-	-	2	1	0	3	2	-70
	S/N	27	25	25	30	32	34	35	36	36	26	24	-	-	-	33	31	27	28	27	
	DBW	140	142	142	137	135	133	132	131	131	141	143	-	-	-	134	136	140	139	140	
	F.D	45	43	51	57	57	51	42	32	22	13	8	5	-	7	12	15	33	47	45	
-80	ANG	1	1	1	1	2	3	3	4	4	4	4	4	-	3	2	2	1	1	1	-80
	S/N	31	29	26	27	24	26	27	29	26	27	27	31	-	33	33	33	31	31	31	
	DBW	136	138	141	140	143	141	140	138	141	140	140	136	-	134	134	134	136	136	136	

GEOGRAPHIC LONGITUDE

Figure II-35

MAR GMT 24 SUNSPOT 70

TRANSMITTER 40.01N - 0.01W FREQUENCY 22.10MC/S

VERTICAL 5M 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
70	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
60	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
50	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
40	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
30	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
20	F.D	-	-	-	-	-	-	-	-	9	-	23	-	-	-	-	-	-	-	-	20
	ANG	-	-	-	-	-	-	-	-	7	-	6	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	58	-	58	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	113	-	113	-	-	-	-	-	-	-	-	
10	F.D	-	-	-	-	-	-	-	-	24	30	39	13	6	-	-	-	-	-	-	10
	ANG	-	-	-	-	-	-	-	-	1	3	1	8	3	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	53	57	49	50	48	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	118	114	122	121	123	-	-	-	-	-	-	
0	F.D	-	-	-	-	-	-	13	8	30	33	44	18	14	-	-	-	-	-	-	0
	ANG	-	-	-	-	-	-	2	6	10	11	9	5	1	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	46	51	50	50	50	49	46	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	125	120	121	121	121	122	125	-	-	-	-	-	-	
-10	F.D	-	-	-	-	9	11	17	15	69	63	70	26	26	-	13	-	-	-	-	-10
	ANG	-	-	-	-	2	5	0	4	5	6	4	3	0	-	1	-	-	-	-	
	S/N	-	-	-	-	39	44	42	49	51	50	50	48	47	-	39	-	-	-	-	
	DBW	-	-	-	-	132	127	129	122	120	121	121	123	124	-	132	-	-	-	-	
-20	F.D	-	-	-	-	5	-	-	13	19	19	9	-	12	8	11	7	-	-	-	-20
	ANG	-	-	-	-	2	-	-	1	3	4	3	-	6	3	0	3	-	-	-	
	S/N	-	-	-	-	38	-	-	43	48	48	48	-	43	41	41	36	-	-	-	
	DBW	-	-	-	-	133	-	-	128	123	123	123	-	128	130	130	135	-	-	-	
-30	F.D	-	-	-	-	-	11	12	19	40	12	-	-	-	-	7	18	14	-	-	-30
	ANG	-	-	-	-	-	3	4	6	0	1	-	-	-	-	4	2	0	-	-	
	S/N	-	-	-	-	-	41	42	46	47	43	-	-	-	-	40	36	29	-	-	
	DBW	-	-	-	-	-	130	129	125	124	128	-	-	-	-	131	135	142	-	-	
-40	F.D	-	-	-	-	-	8	43	49	22	-	-	-	-	-	-	23	21	18	-	-40
	ANG	-	-	-	-	-	0	2	4	5	-	-	-	-	-	-	1	0	2	-	
	S/N	-	-	-	-	-	32	43	45	45	-	-	-	-	-	-	36	31	28	-	
	DBW	-	-	-	-	-	139	128	126	126	-	-	-	-	-	-	135	140	143	-	
-50	F.D	49	32	12	11	10	9	69	49	5	-	-	-	-	-	-	8	25	35	49	-50
	ANG	1	2	0	1	3	5	0	2	3	-	-	-	-	-	-	1	4	2	1	
	S/N	26	30	34	37	37	40	42	43	43	-	-	-	-	-	-	34	31	28	26	
	DBW	145	141	137	134	134	131	129	128	128	-	-	-	-	-	-	137	140	143	145	
-60	F.D	37	44	37	31	18	10	14	15	-	-	-	-	-	-	-	-	11	21	37	-60
	ANG	2	3	0	1	3	4	0	1	-	-	-	-	-	-	-	-	0	3	2	
	S/N	25	31	34	36	38	38	40	42	-	-	-	-	-	-	-	-	31	25	25	
	DBW	146	140	137	135	133	133	131	129	-	-	-	-	-	-	-	-	140	146	146	
-70	F.D	18	29	41	38	33	29	17	11	-	-	-	-	-	-	-	-	-	15	18	-70
	ANG	3	0	0	1	2	3	4	0	-	-	-	-	-	-	-	-	-	0	3	
	S/N	31	29	30	34	36	37	38	39	-	-	-	-	-	-	-	-	-	31	31	
	DBW	140	142	141	137	135	134	133	132	-	-	-	-	-	-	-	-	-	140	140	
-80	F.D	-	-	-	-	12	10	6	-	-	-	-	-	-	-	-	-	-	-	-	-80
	ANG	-	-	-	-	2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	28	27	28	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	143	144	143	-	-	-	-	-	-	-	-	-	-	-	-	

GEOGRAPHIC LONGITUDE

Figure II-36

MAR GMT 12 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 4.20MC/S

VERTICAL SH 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	80
	ANG	7	8	9	11	19	22	25	28	31	32	31	28	25	22	19	11	9	8	7	
	S/N	2	5	5	5	-5	-5	-4	-3	5	5	2	-8	-9	-10	-10	0	-1	2	2	
	DBW	149	146	146	146	157	157	156	155	146	146	149	160	161	162	162	151	153	149	149	
70	F.D	99	99	99	99	99	99	99	99	99	99	99	99	*	99	99	99	99	99	99	70
	ANG	4	4	5	6	16	21	27	34	6	9	6	34	*	21	16	6	-5	4	4	
	S/N	1	3	5	3	-8	-8	-7	2	6	17	7	-0	*	-9	-9	-3	-2	0	1	
	DBW	150	148	146	148	160	160	159	149	145	134	144	152	*	161	161	155	154	151	150	
60	F.D	98	99	99	99	*	*	*	99	99	94	99	99	*	*	*	99	99	99	98	60
	ANG	2	2	3	4	*	*	*	1	9	90	43	1	*	*	*	4	3	2	2	
	S/N	2	-2	-4	-0	*	*	*	-7	7	41	13	-1	*	*	*	2	1	4	2	
	DBW	149	154	156	152	*	*	*	159	144	110	138	153	*	*	*	149	150	147	149	
50	F.D	99	98	99	99	*	*	*	*	99	99	99	*	*	*	*	99	99	99	99	50
	ANG	0	0	1	2	*	*	*	*	4	9	43	*	*	*	*	1	-0	0	0	
	S/N	10	0	-0	-3	*	*	*	*	-10	4	-7	*	*	*	*	-0	0	8	10	
	DBW	141	150	152	155	*	*	*	*	162	147	159	*	*	*	*	162	151	143	141	
40	F.D	99	98	99	99	99	*	*	*	*	*	*	*	*	*	99	*	99	99	99	40
	ANG	4	2	5	0	2	*	*	*	*	*	*	*	*	*	2	*	5	4	4	
	S/N	-3	-5	-6	3	-10	*	*	*	*	*	*	*	*	*	-8	*	-6	-6	-3	
	DBW	154	155	158	148	162	*	*	*	*	*	*	*	*	*	160	*	158	156	154	
30	F.D	99	99	99	*	*	*	*	*	*	*	*	*	*	*	*	*	99	99	99	30
	ANG	2	2	3	*	*	*	*	*	*	*	*	*	*	*	*	*	3	2	2	
	S/N	-7	-6	-6	*	*	*	*	*	*	*	*	*	*	*	*	*	-9	-8	-7	
	DBW	158	158	158	*	*	*	*	*	*	*	*	*	*	*	*	*	159	158	158	
20	F.D	*	*	99	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	20
	ANG	*	*	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	-8	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	160	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	10
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
0	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-10
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-20
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-30
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-37

MAR GMT 12 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 6.20MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	80
	ANG	7	7	8	9	11	13	16	12	14	15	14	18	16	13	11	9	8	7	7	
	S/N	18	21	20	20	20	20	21	22	23	23	21	17	15	15	14	15	14	18	18	
	DBW	137	134	135	135	135	135	134	133	132	132	134	138	140	140	141	140	141	137	137	
70	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	70
	ANG	4	4	5	6	8	12	17	16	6	9	6	16	17	12	8	6	5	4	4	
	S/N	16	18	20	19	17	17	19	21	24	36	26	18	13	16	16	12	13	15	16	
	DBW	139	137	135	136	138	138	136	134	131	119	129	137	142	139	139	143	142	140	139	
60	F.D	94	98	98	99	99	99	99	99	99	55	99	99	99	99	99	99	99	99	94	60
	ANG	2	2	3	3	6	14	5	1	9	90	24	24	23	17	6	3	2	2	2	
	S/N	18	12	11	16	12	2	0	19	26	43	41	19	4	4	14	18	17	19	18	
	DBW	137	143	144	139	143	153	155	136	129	112	114	136	151	151	141	137	138	136	137	
50	F.D	96	93	97	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	96	50
	ANG	4	0	0	2	3	15	25	6	4	9	4	6	21	15	3	1	0	4	4	
	S/N	13	22	12	14	6	-7	-5	8	21	26	18	0	-2	0	14	16	13	13	13	
	DBW	142	132	143	141	149	163	161	147	134	129	137	156	158	155	141	139	142	142	142	
40	F.D	97	94	97	99	99	*	*	*	99	99	99	*	*	*	99	99	99	99	97	40
	ANG	2	2	3	5	1	*	*	*	27	1	28	*	*	*	0	5	4	2	2	
	S/N	14	13	11	7	7	*	*	*	2	5	-8	*	*	*	4	8	11	12	14	
	DBW	140	141	144	148	147	*	*	*	153	150	164	*	*	*	151	147	143	142	140	
30	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	30
	ANG	2	0	1	4	5	*	*	*	*	*	*	*	*	*	4	3	2	2	2	
	S/N	11	11	12	6	-5	*	*	*	*	*	*	*	*	*	-2	5	10	11	11	
	DBW	144	144	143	149	158	*	*	*	*	*	*	*	*	*	158	149	143	143	144	
20	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	*	99	99	99	99	20
	ANG	0	0	1	2	3	*	*	*	*	*	*	*	*	*	*	1	0	0	0	
	S/N	7	7	9	5	-8	*	*	*	*	*	*	*	*	*	*	1	1	5	7	
	DBW	148	148	146	150	161	*	*	*	*	*	*	*	*	*	*	150	151	149	148	
10	F.D	99	99	99	99	*	*	*	*	*	*	*	*	*	*	*	99	99	99	99	10
	ANG	2	2	3	0	*	*	*	*	*	*	*	*	*	*	*	0	3	2	2	
	S/N	-5	-4	1	-1	*	*	*	*	*	*	*	*	*	*	*	3	-1	-5	-5	
	DBW	161	160	154	157	*	*	*	*	*	*	*	*	*	*	*	146	154	159	161	
0	F.D	99	*	99	99	*	*	*	*	*	*	*	*	*	*	*	*	99	99	99	0
	ANG	0	*	1	3	*	*	*	*	*	*	*	*	*	*	*	*	2	1	0	
	S/N	-9	*	-8	-8	*	*	*	*	*	*	*	*	*	*	*	*	-7	-10	-9	
	DBW	165	*	164	163	*	*	*	*	*	*	*	*	*	*	*	*	160	164	165	
-10	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	99	*	*	-10
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	1	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-6	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	161	*	*	
-20	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-20
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-30	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-30
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-38

MAR GMT 12 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 8.30MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																					
	F.D	99	99	99	98	99	99	99	99	99	99	99	99	99	99	99	99	98	98	99	
80	ANG	4	4	4	5	0	2	4	7	8	9	8	7	4	2	6	5	4	4	4	80
	S/N	28	31	30	30	40	36	38	40	41	39	38	35	33	31	25	25	24	28	28	
	DBW	131	128	129	129	119	123	121	119	118	120	121	124	126	128	134	134	135	131	131	
	F.D	98	98	98	98	99	99	98	99	99	99	99	99	99	99	99	99	99	98	98	
70	ANG	1	1	2	3	4	1	10	2	6	11	6	2	10	1	8	3	2	1	1	70
	S/N	25	28	30	30	28	34	29	33	41	43	42	30	23	33	27	22	23	24	25	
	DBW	134	131	129	129	131	129	130	126	118	116	117	129	136	126	132	137	136	135	134	
	F.D	84	88	85	99	99	99	99	99	99	-	99	99	99	99	99	99	99	97	84	
60	ANG	2	2	3	1	2	5	5	1	10	-	10	1	14	9	5	3	2	2	2	60
	S/N	28	22	22	26	24	22	23	30	42	-	49	33	27	24	26	29	32	29	28	
	DBW	131	137	137	133	135	137	136	129	117	-	110	126	132	135	133	130	127	130	131	
	F.D	89	80	83	87	99	99	99	99	99	99	99	99	99	99	99	99	98	94	89	
50	ANG	0	0	1	2	0	8	3	7	4	10	4	7	18	8	3	1	0	6	0	50
	S/N	34	23	25	25	18	15	14	27	33	46	33	25	14	23	29	27	23	24	34	
	DBW	125	136	134	134	141	144	145	132	126	113	126	134	145	136	130	132	136	135	125	
	F.D	90	84	87	92	99	99	99	99	99	99	99	99	99	99	99	99	99	95	90	
40	ANG	4	4	4	0	1	11	15	4	7	1	19	4	16	11	0	5	3	3	4	40
	S/N	26	26	23	28	21	6	13	14	25	24	21	6	6	10	17	21	23	24	26	
	DBW	133	133	136	131	137	153	146	145	134	135	138	153	153	149	142	138	135	135	133	
	F.D	95	95	94	98	99	99	99	99	99	99	99	99	*	99	99	99	99	98	95	
30	ANG	2	2	2	4	4	9	17	1	3	4	3	1	*	9	4	3	1	1	2	30
	S/N	23	24	24	20	11	8	0	-1	6	-3	-3	-7	*	5	12	18	22	24	23	
	DBW	136	135	135	139	145	149	159	161	153	163	163	167	*	154	145	139	135	135	136	
	F.D	97	97	99	99	99	99	*	*	*	*	*	*	*	*	99	99	99	99	97	
20	ANG	0	0	1	2	3	11	*	*	*	*	*	*	*	*	2	1	0	0	0	20
	S/N	21	21	21	19	9	-2	*	*	*	*	*	*	*	*	6	14	13	20	21	
	DBW	138	138	138	140	147	160	*	*	*	*	*	*	*	*	147	140	143	139	138	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	
10	ANG	2	2	3	0	1	*	*	*	*	*	*	*	*	*	1	0	3	2	2	10
	S/N	11	11	16	23	5	*	*	*	*	*	*	*	*	*	0	17	14	11	11	
	DBW	148	148	143	136	151	*	*	*	*	*	*	*	*	*	151	136	143	147	148	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	
0	ANG	0	0	1	4	0	*	*	*	*	*	*	*	*	*	0	3	2	1	0	0
	S/N	8	8	8	10	-2	*	*	*	*	*	*	*	*	*	-5	5	10	8	8	
	DBW	151	151	151	149	160	*	*	*	*	*	*	*	*	*	159	149	147	150	151	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	*	99	99	99	99	
-10	ANG	3	3	0	1	3	*	*	*	*	*	*	*	*	*	*	2	1	0	3	-10
	S/N	5	5	5	4	-9	*	*	*	*	*	*	*	*	*	*	4	9	7	5	
	DBW	154	154	154	159	169	*	*	*	*	*	*	*	*	*	*	153	149	152	154	
	F.D	99	99	99	99	*	*	*	*	*	*	*	*	*	*	*	99	99	99	99	
-20	ANG	2	2	2	0	*	*	*	*	*	*	*	*	*	*	*	0	3	2	2	-20
	S/N	3	2	2	-3	*	*	*	*	*	*	*	*	*	*	*	-1	4	4	3	
	DBW	156	157	157	163	*	*	*	*	*	*	*	*	*	*	*	160	155	155	156	
	F.D	99	99	99	99	*	*	*	*	*	*	*	*	*	*	*	99	99	99	99	
-30	ANG	1	1	2	3	*	*	*	*	*	*	*	*	*	*	*	3	2	1	1	-30
	S/N	2	1	-0	-10	*	*	*	*	*	*	*	*	*	*	*	-7	3	2	2	
	DBW	157	158	160	170	*	*	*	*	*	*	*	*	*	*	*	167	156	157	157	
	F.D	99	99	99	*	*	*	*	*	*	*	*	*	*	*	*	*	99	99	99	
-40	ANG	0	0	1	*	*	*	*	*	*	*	*	*	*	*	*	*	1	0	0	-40
	S/N	1	-0	-2	*	*	*	*	*	*	*	*	*	*	*	*	*	2	0	1	
	DBW	158	160	162	*	*	*	*	*	*	*	*	*	*	*	*	*	157	159	158	
	F.D	99	99	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	98	99	
-50	ANG	2	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	2	-50
	S/N	-0	-2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-3	-0	
	DBW	160	162	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	163	160	
	F.D	99	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	99	
-60	ANG	2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	2	-60
	S/N	-1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-1	
	DBW	161	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	161	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-100	

GEOGRAPHIC LONGITUDE

Figure II-39

MAR GMT 12 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 12.40MC/S
VERTICAL SH OL 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
	F.D	68	69	66	60	89	90	93	92	90	90	92	94	96	94	93	84	63	65	68	
80	ANG	9	9	10	12	0	2	3	5	7	8	7	5	3	1	0	11	10	10	9	80
	S/N	37	40	40	40	40	44	46	48	49	47	46	43	41	39	37	35	33	37	37	
	DBW	127	124	124	124	124	120	118	116	115	117	118	121	123	125	127	129	131	127	127	
	F.D	71	73	70	64	59	89	94	89	63	36	72	94	98	99	91	84	75	67	71	
70	ANG	6	6	6	8	11	0	4	9	17	26	17	9	4	0	9	7	6	6	6	70
	S/N	34	36	39	39	39	39	46	47	48	50	50	43	40	38	38	32	32	33	34	
	DBW	130	128	125	125	125	125	118	117	116	114	114	121	124	126	126	132	132	131	130	
	F.D	45	32	27	59	63	66	93	92	42	-	57	96	99	98	98	97	90	73	45	
60	ANG	4	0	1	6	7	10	2	8	26	-	25	8	2	9	6	4	1	0	4	60
	S/N	37	31	31	35	35	34	40	43	49	-	56	49	44	36	37	38	38	38	37	
	DBW	127	133	133	129	129	130	124	121	115	-	108	115	120	128	127	126	126	126	127	
	F.D	52	32	18	18	66	87	99	70	99	63	99	85	99	99	99	99	87	72	52	
50	ANG	1	2	2	0	5	7	0	17	5	23	5	18	0	6	3	1	0	0	1	50
	S/N	37	37	36	35	30	28	31	40	48	55	51	38	36	36	38	38	33	34	37	
	DBW	127	127	128	129	134	136	133	124	116	109	113	126	128	128	126	126	131	130	127	
	F.D	51	35	30	26	57	97	99	99	99	99	99	99	99	99	99	99	86	67	51	
40	ANG	6	7	0	1	3	1	7	5	0	2	0	5	7	3	0	5	5	5	6	40
	S/N	38	37	32	36	35	30	33	35	40	46	41	34	33	34	31	33	34	34	38	
	DBW	126	127	132	128	129	134	131	129	124	118	123	130	131	130	133	131	130	130	126	
	F.D	67	59	52	38	81	99	99	99	99	99	99	99	99	99	99	99	90	79	67	
30	ANG	3	4	5	6	0	1	4	1	4	5	4	1	4	1	4	3	3	3	3	30
	S/N	36	36	36	32	37	28	25	29	32	29	29	28	20	27	28	33	34	34	36	
	DBW	128	128	128	132	127	136	139	135	132	135	135	136	144	135	134	131	130	130	128	
	F.D	80	74	76	76	91	99	99	99	99	99	99	99	99	99	99	98	97	91	80	
20	ANG	0	1	2	2	3	5	8	8	1	9	1	11	7	5	2	0	1	0	0	20
	S/N	33	34	33	32	29	23	20	17	18	21	13	12	15	17	23	28	31	33	33	
	DBW	131	130	131	132	135	141	144	147	146	143	151	152	149	143	136	133	133	131	131	
	F.D	95	97	84	76	92	99	99	99	99	99	99	99	99	99	99	99	96	97	95	
10	ANG	1	2	0	1	1	3	10	9	10	11	10	9	8	4	1	0	4	1	1	10
	S/N	27	27	33	31	27	18	10	10	9	2	3	6	11	13	19	23	28	28	27	
	DBW	137	137	131	133	137	146	154	154	155	162	161	158	153	147	138	137	136	136	137	
	F.D	94	97	98	54	82	99	99	99	99	99	99	99	99	99	99	99	98	97	94	
0	ANG	1	0	2	0	1	2	9	11	9	10	9	8	9	3	0	2	2	0	1	0
	S/N	25	25	26	25	23	13	3	-1	3	-4	-4	1	-3	11	14	23	27	26	25	
	DBW	139	139	138	139	141	151	161	166	161	167	166	163	168	150	144	138	137	138	139	
	F.D	96	98	98	84	81	99	99	99	99	*	*	*	99	99	99	99	98	98	96	
-10	ANG	0	0	0	2	3	1	8	9	11	*	*	*	9	2	4	1	0	0	0	-10
	S/N	23	23	23	25	18	6	-2	-7	-9	*	*	*	-7	14	13	24	26	24	23	
	DBW	141	141	141	139	146	158	167	172	174	*	*	*	172	150	148	140	138	140	141	
	F.D	95	97	98	96	96	99	*	*	*	*	*	*	*	99	99	99	99	97	95	
-20	ANG	2	2	3	1	2	0	*	*	*	*	*	*	*	0	1	1	0	2	2	-20
	S/N	22	22	21	20	12	2	*	*	*	*	*	*	*	1	11	19	27	22	22	
	DBW	142	142	143	144	152	162	*	*	*	*	*	*	*	163	153	145	137	142	142	
	F.D	96	97	98	97	98	99	*	*	*	*	*	*	*	99	99	99	98	98	96	
-30	ANG	1	1	3	0	0	2	*	*	*	*	*	*	*	2	0	3	3	1	1	-30
	S/N	21	20	20	16	6	-6	*	*	*	*	*	*	*	-3	6	15	21	21	21	
	DBW	143	144	144	148	158	171	*	*	*	*	*	*	*	168	158	149	143	143	143	
	F.D	95	96	93	95	99	*	*	*	*	*	*	*	*	*	99	99	93	95	95	
-40	ANG	0	1	2	3	3	*	*	*	*	*	*	*	*	*	0	2	2	1	0	-40
	S/N	20	19	19	11	0	*	*	*	*	*	*	*	*	*	0	10	19	19	20	
	DBW	144	145	145	153	164	*	*	*	*	*	*	*	*	*	164	154	145	145	144	
	F.D	96	86	90	90	99	*	*	*	*	*	*	*	*	*	99	99	97	88	96	
-50	ANG	0	1	2	2	2	*	*	*	*	*	*	*	*	*	2	2	2	1	0	-50
	S/N	18	18	14	5	-7	*	*	*	*	*	*	*	*	*	-7	-0	11	16	18	
	DBW	146	146	150	159	172	*	*	*	*	*	*	*	*	*	172	165	153	148	146	
	F.D	83	16	25	80	*	*	*	*	*	*	*	*	*	*	*	*	*	95	83	
-60	ANG	3	0	1	1	*	*	*	*	*	*	*	*	*	*	*	*	*	0	3	-60
	S/N	17	2	-1	-6	*	*	*	*	*	*	*	*	*	*	*	*	*	-4	17	
	DBW	147	162	166	171	*	*	*	*	*	*	*	*	*	*	*	*	*	169	147	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-40

MAR GMT 12 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 16.60MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																				
	F.D	17	18	15	49	50	50	61	58	53	52	58	67	73	66	62	54	13	14	17	
80	ANG	11	11	12	0	1	3	5	7	9	10	9	7	4	2	1	0	12	11	11	80
	S/N	41	44	44	44	47	49	51	52	53	51	51	47	45	44	40	38	37	41	41	
	DBW	126	123	123	123	120	118	116	115	114	119	116	120	122	123	127	129	130	126	126	
	F.D	20	22	18	13	6	49	65	48	11	-	19	67	84	88	44	38	25	18	20	
70	ANG	7	7	8	9	12	2	5	11	20	-	20	10	4	0	12	9	8	7	7	70
	S/N	38	40	43	43	43	47	50	51	52	-	53	48	44	42	42	36	36	37	38	
	DBW	129	127	124	124	124	120	117	116	115	-	114	119	123	125	125	131	131	130	129	
	F.D	6	-	-	6	8	9	66	62	-	-	5	79	95	76	82	71	44	19	6	
60	ANG	4	-	-	6	8	12	3	9	-	-	27	9	2	10	7	5	5	4	4	60
	S/N	41	-	-	40	39	39	45	48	-	-	59	54	49	42	42	43	42	43	41	
	DBW	126	-	-	127	128	128	122	119	-	-	108	113	118	125	125	124	125	124	126	
	F.D	18	-	-	-	9	26	33	84	55	9	66	92	80	92	93	89	58	36	18	
50	ANG	1	-	-	-	5	8	13	5	14	25	14	5	11	6	3	2	2	2	1	50
	S/N	41	-	-	-	35	34	39	48	53	58	55	51	43	42	43	43	42	42	41	
	DBW	126	-	-	-	132	133	128	119	114	109	112	116	124	125	124	124	125	125	126	
	F.D	17	-	-	-	-	59	82	93	93	90	95	96	92	97	96	83	50	31	17	
40	ANG	7	-	-	-	-	5	7	0	5	7	5	1	7	3	1	6	7	7	7	40
	S/N	42	-	-	-	-	38	41	44	49	52	50	42	41	41	39	38	38	38	42	
	DBW	125	-	-	-	-	129	126	123	118	115	117	125	126	126	128	129	129	129	125	
	F.D	27	6	-	-	16	83	95	86	78	96	97	91	97	96	93	90	62	38	27	
30	ANG	4	4	-	-	1	2	4	7	11	1	0	8	4	1	5	4	4	4	4	30
	S/N	41	40	-	-	36	39	37	39	42	43	39	38	38	36	37	38	39	39	41	
	DBW	126	127	-	-	131	128	130	128	125	124	128	129	129	131	130	129	128	128	126	
	F.D	43	21	13	8	20	86	98	97	97	96	97	98	97	94	94	89	81	63	43	
20	ANG	2	2	3	4	6	6	1	4	2	3	3	4	2	5	3	2	1	1	2	20
	S/N	39	39	38	37	35	35	33	33	35	34	33	33	34	30	35	38	38	39	39	
	DBW	128	128	129	130	132	132	134	134	132	133	134	134	133	130	131	129	129	128	128	
	F.D	75	76	29	7	29	95	96	97	99	99	99	97	97	95	96	93	84	79	75	
10	ANG	3	3	1	2	3	3	5	1	0	0	0	2	0	4	2	0	0	3	3	10
	S/N	36	36	36	37	35	31	28	27	28	28	28	29	25	28	30	33	40	36	36	
	DBW	131	131	131	130	132	136	139	140	139	139	139	138	142	138	133	134	127	131	131	
	F.D	75	79	82	-	9	97	98	97	99	98	99	99	95	95	95	90	83	79	75	
0	ANG	1	2	2	-	2	1	3	6	1	2	2	0	5	3	1	4	3	2	1	0
	S/N	34	34	35	-	30	25	22	22	23	20	18	20	22	27	29	32	33	35	34	
	DBW	133	133	132	-	137	142	145	145	144	142	142	146	145	140	136	135	134	132	133	
	F.D	76	80	81	9	10	98	99	99	98	99	99	99	97	97	97	90	87	82	76	
-10	ANG	0	0	1	4	0	0	2	2	4	0	4	3	3	1	0	3	2	1	0	-10
	S/N	32	32	33	32	18	20	17	16	18	14	12	14	19	24	30	31	33	33	32	
	DBW	135	135	134	135	149	147	150	151	149	153	154	152	148	143	137	136	134	134	135	
	F.D	71	74	85	49	41	99	99	99	99	99	99	99	99	99	97	91	92	80	71	
-20	ANG	3	3	0	2	3	3	1	2	3	4	4	2	1	4	2	1	0	3	3	-20
	S/N	32	32	31	31	27	16	12	11	9	9	10	12	16	18	25	30	28	32	32	
	DBW	135	135	136	136	140	151	155	156	158	158	157	155	151	149	142	137	139	135	135	
	F.D	72	73	78	58	53	99	99	99	99	99	99	99	99	99	99	97	88	84	72	
-30	ANG	2	2	3	1	2	2	4	0	1	2	2	1	4	2	1	0	3	2	2	-30
	S/N	31	31	30	28	23	12	7	3	2	6	7	8	8	14	21	25	28	30	31	
	DBW	136	136	137	139	144	155	160	164	165	161	160	159	159	153	146	142	139	137	136	
	F.D	69	69	62	35	63	99	99	99	99	99	99	99	99	99	99	88	70	76	69	
-40	ANG	2	2	3	1	1	0	2	3	4	0	0	4	2	1	0	3	3	2	2	-40
	S/N	30	30	30	25	19	8	2	-1	-3	-2	-3	0	6	9	17	21	27	29	30	
	DBW	137	137	137	142	148	159	165	169	171	170	171	168	161	158	150	146	140	138	137	
	F.D	68	44	-	5	74	99	99	99	99	99	99	99	99	99	94	80	58	57	68	
-50	ANG	1	2	-	0	0	3	0	1	2	3	3	2	1	0	3	3	3	2	1	-50
	S/N	28	28	-	13	14	3	-1	-3	-3	-3	-2	0	0	3	11	15	23	26	28	
	DBW	139	139	-	154	153	164	169	171	171	171	170	167	168	164	156	152	144	141	139	
	F.D	35	-	-	-	62	98	99	99	99	99	99	99	99	98	94	80	53	33	35	
-60	ANG	1	-	-	-	3	2	3	0	1	1	2	1	0	3	2	2	2	2	1	-60
	S/N	26	-	-	-	8	-1	-5	-7	-8	-8	-6	-6	-5	-6	0	4	7	11	26	
	DBW	141	-	-	-	159	169	173	175	176	176	174	174	173	174	167	163	160	156	141	
	F.D	20	-	-	-	57	97	99	99	*	*	99	99	*	97	94	86	72	52	20	
-70	ANG	1	-	-	-	3	2	2	3	*	*	0	0	*	2	2	1	1	1	1	-70
	S/N	-8	-	-	-	0	-4	-8	-10	*	*	-10	-10	*	-5	-1	4	4	1	-8	
	DBW	176	-	-	-	167	172	176	178	*	*	178	178	*	173	169	163	163	166	176	
	F.D	61	44	39	51	*	*	*	*	*	*	*	*	99	99	98	94	88	78	61	
-80	ANG	2	2	2	2	*	*	*	*	*	*	*	*	2	2	2	1	1	1	2	-80
	S/N	-5	-8	-10	-9	*	*	*	*	*	*	*	*	-9	-5	-3	-2	-2	-2	-5	
	DBW	173	176	178	177	*	*	*	*	*	*	*	*	177	173	171	170	170	170	173	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-41

MAR GMT 12 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 22.10MC/S
VERTICAL 5M 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	
80	F.D	-	-	-	6	5	5	11	8	6	6	9	15	21	14	11	8	-	-	-	80
	ANG	-	-	-	0	1	3	5	8	10	10	10	8	5	3	1	0	-	-	-	
	S/N	-	-	-	37	50	52	54	55	56	54	54	50	49	47	44	32	-	-	-	
	DBW	-	-	-	134	121	119	117	116	115	117	117	121	122	124	127	139	-	-	-	
70	F.D	-	-	-	-	-	-	13	-	-	-	-	15	38	38	-	-	-	-	-	70
	ANG	-	-	-	-	-	-	5	-	-	-	-	11	6	2	-	-	-	-	-	
	S/N	-	-	-	-	-	-	54	-	-	-	-	51	48	49	-	-	-	-	-	
	DBW	-	-	-	-	-	-	117	-	-	-	-	120	123	122	-	-	-	-	-	
60	F.D	-	-	-	-	-	-	12	9	-	-	-	30	61	20	27	15	5	-	-	60
	ANG	-	-	-	-	-	-	3	10	-	-	-	11	3	12	8	6	5	-	-	
	S/N	-	-	-	-	-	-	49	51	-	-	-	57	54	46	46	46	45	-	-	
	DBW	-	-	-	-	-	-	122	120	-	-	-	114	117	125	125	125	126	-	-	
50	F.D	-	-	-	-	-	-	26	40	5	-	12	65	76	45	51	39	24	8	-	50
	ANG	-	-	-	-	-	-	0	6	15	-	16	6	0	9	5	3	2	2	-	
	S/N	-	-	-	-	-	-	30	52	56	-	59	55	48	47	47	47	46	45	-	
	DBW	-	-	-	-	-	-	141	119	115	-	112	116	123	124	124	124	125	126	-	
40	F.D	-	-	-	-	-	-	12	64	63	54	71	77	54	70	63	50	22	6	-	40
	ANG	-	-	-	-	-	-	9	1	6	9	6	1	9	4	2	1	0	7	-	
	S/N	-	-	-	-	-	-	47	50	54	57	55	48	46	46	46	43	42	42	-	
	DBW	-	-	-	-	-	-	124	121	117	114	116	123	125	125	125	128	129	129	-	
30	F.D	-	-	-	-	-	14	49	42	77	78	81	57	75	72	50	40	21	6	-	30
	ANG	-	-	-	-	-	3	5	9	0	1	0	9	5	2	7	6	5	4	-	
	S/N	-	-	-	-	-	43	44	47	50	49	46	45	44	44	41	42	42	42	-	
	DBW	-	-	-	-	-	128	127	124	121	122	125	126	127	127	130	129	129	129	-	
20	F.D	10	-	-	-	-	47	66	72	65	62	69	80	75	60	63	53	36	22	10	20
	ANG	2	-	-	-	-	0	2	4	7	9	8	5	2	7	4	4	3	2	2	
	S/N	42	-	-	-	-	42	42	43	44	43	42	42	42	38	41	42	42	43	42	
	DBW	129	-	-	-	-	129	129	128	127	128	129	129	129	133	130	129	129	128	129	
10	F.D	33	22	-	-	-	43	73	71	84	83	85	74	78	67	69	61	41	40	33	10
	ANG	4	0	-	-	-	5	0	2	3	4	4	3	0	5	3	2	1	0	4	
	S/N	40	40	-	-	-	39	38	39	39	39	39	39	34	37	40	41	40	40	40	
	DBW	131	131	-	-	-	132	133	132	132	132	132	132	137	134	131	130	131	131	131	
0	F.D	33	18	17	-	-	57	64	79	71	65	71	79	61	66	66	61	40	32	33	0
	ANG	3	3	4	-	-	3	5	0	2	3	3	1	6	4	2	0	0	4	3	
	S/N	39	39	38	-	-	36	34	35	36	34	31	34	32	36	39	35	36	39	39	
	DBW	132	132	133	-	-	135	137	136	135	135	135	137	139	135	132	136	135	132	132	
-10	F.D	27	14	14	-	-	66	73	60	72	74	81	67	70	73	71	48	39	28	27	-10
	ANG	2	2	2	-	-	1	3	6	0	0	0	6	4	2	1	5	4	2	2	
	S/N	38	37	35	-	-	33	31	31	32	27	28	29	31	34	35	35	36	38	38	
	DBW	133	134	136	-	-	138	140	140	139	144	143	142	140	137	136	136	135	133	133	
-20	F.D	26	11	23	-	-	62	79	78	77	78	84	91	86	87	70	62	53	33	26	-20
	ANG	0	0	1	-	-	4	1	3	4	5	4	3	1	0	3	2	2	1	0	
	S/N	36	35	36	-	-	30	28	28	27	25	26	27	29	31	35	36	37	37	36	
	DBW	135	136	135	-	-	141	143	143	144	145	145	144	142	140	136	135	134	134	135	
-30	F.D	14	9	28	-	-	70	74	93	94	93	94	97	85	81	81	73	58	33	14	-30
	ANG	3	0	0	-	-	3	4	0	1	2	2	1	4	3	2	1	0	0	3	
	S/N	35	33	36	-	-	28	25	23	22	23	24	23	25	29	33	33	32	35	35	
	DBW	136	138	135	-	-	143	146	148	149	148	147	148	146	142	138	138	139	136	136	
-40	F.D	12	11	18	-	-	66	85	97	96	99	99	98	87	83	60	33	32	25	12	-40
	ANG	2	3	0	-	-	2	2	3	4	0	0	4	3	2	1	1	0	3	2	
	S/N	34	34	35	-	-	25	22	19	19	19	16	18	24	25	29	30	31	35	34	
	DBW	137	137	136	-	-	146	149	152	152	152	155	153	147	146	142	141	140	136	137	
-50	F.D	10	5	-	-	-	69	90	95	93	90	92	95	84	72	43	15	5	17	10	-50
	ANG	2	2	-	-	-	1	1	2	3	3	3	3	2	1	1	0	3	2	2	
	S/N	32	29	-	-	-	22	19	18	17	18	18	18	19	21	24	23	27	32	32	
	DBW	139	142	-	-	-	149	152	153	154	153	153	153	152	150	147	148	144	139	139	
-60	F.D	-	-	-	-	-	53	95	97	96	96	97	93	78	63	38	11	-	-	-	-60
	ANG	-	-	-	-	-	0	0	0	1	1	2	2	1	1	0	3	-	-	-	
	S/N	-	-	-	-	-	19	16	14	14	14	15	16	15	12	16	16	-	-	-	
	DBW	-	-	-	-	-	152	155	157	157	157	156	155	156	159	155	155	-	-	-	
-70	F.D	-	-	-	-	-	14	66	87	92	92	91	85	75	53	31	17	7	-	-	-70
	ANG	-	-	-	-	-	3	0	0	0	0	1	1	0	0	3	3	2	-	-	
	S/N	-	-	-	-	-	14	14	13	12	11	12	6	6	10	13	18	18	-	-	
	DBW	-	-	-	-	-	157	157	158	159	160	159	165	165	161	158	153	153	-	-	
-80	F.D	-	-	-	-	-	5	18	42	55	61	64	59	50	30	20	14	7	-	-	-80
	ANG	-	-	-	-	-	3	3	0	0	0	0	0	0	3	3	3	2	-	-	
	S/N	-	-	-	-	-	5	6	5	5	5	4	5	12	12	13	13	14	-	-	
	DBW	-	-	-	-	-	166	165	166	166	166	167	166	159	159	158	158	157	-	-	

GEOGRAPHIC LONGITUDE

Figure II-42

MAR GMT 24 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 4.20MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	
80	F.D	99	99	98	98	99	99	99	99	99	99	99	99	99	99	99	99	98	99	99	80
	ANG	4	4	4	11	1	3	5	7	9	10	9	7	5	3	1	0	5	4	4	
	S/N	17	22	22	23	28	31	33	36	37	36	35	30	28	26	24	28	16	19	17	
	DBW	134	129	129	128	123	120	118	115	114	115	116	121	123	125	127	123	135	132	134	
70	F.D	99	99	99	99	99	99	99	99	95	88	94	98	99	99	99	98	98	98	99	70
	ANG	1	5	6	7	10	1	5	11	20	27	20	11	6	2	11	3	2	1	1	
	S/N	11	16	18	20	21	29	33	37	31	32	38	32	28	30	22	14	13	11	11	
	DBW	140	135	133	131	130	122	118	114	120	119	113	119	123	121	129	137	138	140	140	
60	F.D	99	99	99	99	99	99	99	99	91	27	89	99	99	98	99	99	98	98	99	60
	ANG	2	2	3	4	7	10	3	10	27	90	28	11	4	12	8	5	3	2	2	
	S/N	2	1	9	16	18	19	28	33	32	43	45	38	33	24	21	18	15	7	2	
	DBW	149	150	142	135	133	132	123	118	119	108	106	113	118	127	130	133	136	144	149	
50	F.D	*	99	99	99	99	99	99	99	98	92	98	99	99	99	99	99	99	99	*	50
	ANG	*	0	1	2	4	8	0	6	16	27	16	7	1	9	5	2	0	0	*	
	S/N	*	-9	0	13	11	12	19	33	37	40	39	36	30	22	19	17	1	-1	*	
	DBW	*	161	151	138	140	139	132	118	114	108	109	115	121	129	132	134	150	153	*	
40	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	40
	ANG	*	*	*	0	2	5	9	2	7	10	7	2	10	6	2	0	*	*	*	
	S/N	*	*	*	7	14	14	22	30	34	34	32	31	23	19	17	15	*	*	*	
	DBW	*	*	*	144	137	137	129	121	115	112	115	119	128	132	134	136	*	*	*	
30	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	30
	ANG	*	*	*	4	0	2	6	10	2	3	2	10	6	3	0	4	*	*	*	
	S/N	*	*	*	-7	17	16	19	24	27	29	28	20	19	17	11	-7	*	*	*	
	DBW	*	*	*	159	134	135	132	126	120	118	120	128	132	134	140	159	*	*	*	
20	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	20
	ANG	*	*	*	*	4	0	3	6	9	10	8	6	3	0	4	*	*	*	*	
	S/N	*	*	*	*	4	9	16	18	19	17	17	15	15	11	4	*	*	*	*	
	DBW	*	*	*	*	147	141	134	130	127	129	130	132	135	140	147	*	*	*	*	
10	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	10
	ANG	*	*	*	*	2	5	1	3	5	5	4	3	1	5	3	*	*	*	*	
	S/N	*	*	*	*	2	3	6	11	12	5	5	8	11	3	-0	*	*	*	*	
	DBW	*	*	*	*	149	145	140	135	132	133	134	135	139	147	149	*	*	*	*	
0	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	0
	ANG	*	*	*	*	1	3	5	1	2	2	2	0	5	3	1	*	*	*	*	
	S/N	*	*	*	*	-3	1	-3	3	6	-4	-4	-0	1	2	0	*	*	*	*	
	DBW	*	*	*	*	155	149	145	141	137	139	137	142	148	149	151	*	*	*	*	
-10	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-10
	ANG	*	*	*	*	0	2	4	5	0	0	6	5	3	1	0	*	*	*	*	
	S/N	*	*	*	*	-6	-1	-5	0	7	5	-9	-6	0	0	4	*	*	*	*	
	DBW	*	*	*	*	158	153	149	146	139	138	148	149	150	151	147	*	*	*	*	
-20	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-20
	ANG	*	*	*	*	0	1	2	3	4	4	4	3	2	0	3	*	*	*	*	
	S/N	*	*	*	*	-6	-6	-2	-1	0	-0	-6	-7	0	-6	-9	*	*	*	*	
	DBW	*	*	*	*	158	158	152	150	149	150	150	150	151	158	161	*	*	*	*	
-30	F.D	*	*	*	*	*	99	99	99	99	99	99	99	99	99	*	*	*	*	*	-30
	ANG	*	*	*	*	*	4	1	1	2	3	2	2	0	4	*	*	*	*	*	
	S/N	*	*	*	*	*	-9	-6	-3	-1	-0	-2	-3	-6	-8	*	*	*	*	*	
	DBW	*	*	*	*	*	161	158	155	153	152	151	152	158	160	*	*	*	*	*	
-40	F.D	*	*	*	*	*	*	*	99	99	99	99	99	99	99	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	0	0	1	1	0	4	3	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	-7	-7	-5	-2	-4	-8	-10	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	159	159	157	154	156	160	162	*	*	*	*	*	
-50	F.D	*	*	*	*	*	*	*	*	99	99	99	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	4	4	4	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	-10	-9	-9	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	162	161	161	*	*	*	*	*	*	*	*	
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-43

MAR GMT 24 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 6.20MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																					GEOGRAPHIC LATITUDE
	F.D	91	91	90	89	97	97	97	95	93	91	92	93	95	96	96	86	88	90	91	
80	ANG	9	9	10	11	1	2	5	7	9	10	9	7	5	3	1	12	11	10	9	80
	S/N	27	31	31	32	34	39	41	43	45	43	43	37	36	34	31	27	26	29	27	
	DBW	128	124	124	123	121	116	114	112	110	112	112	118	119	121	124	128	129	126	128	
	F.D	96	98	97	95	95	98	97	92	71	45	64	86	93	97	90	88	93	94	96	
70	ANG	1	1	1	7	10	1	5	11	21	32	22	12	6	1	11	8	2	1	1	70
	S/N	22	27	29	30	31	36	41	44	37	37	44	39	35	37	31	24	23	22	22	
	DBW	133	128	126	125	124	119	114	111	118	118	111	116	120	118	124	131	132	133	133	
	F.D	99	97	96	99	98	95	98	94	50	-	41	89	97	85	93	97	92	93	99	
60	ANG	2	2	3	0	7	11	3	11	32	-	32	11	4	12	8	1	3	2	2	60
	S/N	18	16	20	26	28	28	36	39	37	-	50	45	41	33	31	28	26	21	18	
	DBW	137	139	135	129	127	127	119	116	118	-	105	110	114	122	124	127	129	134	137	
	F.D	99	99	97	98	99	98	99	97	86	52	83	95	99	94	95	97	98	98	99	
50	ANG	3	3	0	2	4	8	0	6	17	32	18	7	1	9	5	2	0	3	3	50
	S/N	-1	1	13	24	22	22	28	41	44	46	46	43	37	32	30	28	12	3	-1	
	DBW	157	154	142	131	133	133	127	114	111	107	107	112	118	123	125	127	143	152	157	
	F.D	*	99	99	98	99	99	99	99	98	97	98	99	97	97	98	96	99	*	*	
40	ANG	*	4	5	4	2	5	9	2	7	11	7	2	10	6	2	3	2	*	*	40
	S/N	*	-10	0	16	25	25	32	38	41	42	41	39	32	30	28	18	1	*	*	
	DBW	*	166	155	139	130	130	123	117	112	109	111	115	123	125	127	137	154	*	*	
	F.D	*	*	99	99	99	99	99	97	99	99	99	97	99	99	99	99	99	*	*	
30	ANG	*	*	3	4	4	2	6	10	1	3	1	10	6	3	0	1	2	*	*	30
	S/N	*	*	-9	11	19	26	30	33	36	38	37	31	30	28	30	12	-9	*	*	
	DBW	*	*	165	144	136	128	125	120	116	114	116	122	125	127	125	143	165	*	*	
	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	
20	ANG	*	*	*	2	4	0	3	6	9	10	8	6	3	0	2	2	*	*	*	20
	S/N	*	*	*	7	19	22	26	29	30	28	29	27	27	19	19	5	*	*	*	
	DBW	*	*	*	148	136	131	127	123	121	123	123	125	127	135	136	150	*	*	*	
	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	
10	ANG	*	*	*	0	2	4	0	3	5	5	4	2	0	5	2	1	*	*	*	10
	S/N	*	*	*	-6	18	18	19	24	24	19	20	21	19	17	14	-2	*	*	*	
	DBW	*	*	*	152	137	134	131	127	125	126	126	127	135	136	137	158	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	
0	ANG	*	*	*	*	0	3	5	0	2	2	1	0	5	3	1	*	*	*	*	0
	S/N	*	*	*	*	13	15	13	18	19	11	11	18	16	16	14	*	*	*	*	
	DBW	*	*	*	*	142	138	134	131	129	128	129	129	137	138	140	*	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	
-10	ANG	*	*	*	*	4	1	3	5	6	6	6	5	3	1	2	*	*	*	*	-10
	S/N	*	*	*	*	11	14	12	17	19	14	10	12	17	16	9	*	*	*	*	
	DBW	*	*	*	*	144	141	137	134	133	136	136	137	138	139	146	*	*	*	*	
	F.D	*	*	*	*	98	99	98	99	99	99	99	99	99	99	99	*	*	*	*	
-20	ANG	*	*	*	*	3	0	2	3	4	4	4	3	1	0	3	*	*	*	*	-20
	S/N	*	*	*	*	10	12	13	15	17	16	12	11	16	12	9	*	*	*	*	
	DBW	*	*	*	*	145	143	140	138	137	138	138	138	139	143	146	*	*	*	*	
	F.D	*	*	*	*	98	97	99	99	99	99	99	99	99	99	99	*	*	*	*	
-30	ANG	*	*	*	*	1	4	0	1	2	2	2	1	0	4	0	*	*	*	*	-30
	S/N	*	*	*	*	6	9	12	13	14	16	15	14	12	10	6	*	*	*	*	
	DBW	*	*	*	*	149	146	143	142	141	139	139	140	143	145	149	*	*	*	*	
	F.D	*	*	*	*	99	99	99	99	99	99	99	99	94	95	97	*	*	*	*	
-40	ANG	*	*	*	*	1	2	3	4	0	0	0	0	4	2	1	*	*	*	*	-40
	S/N	*	*	*	*	2	5	8	9	11	12	11	17	10	7	4	*	*	*	*	
	DBW	*	*	*	*	153	150	147	146	144	143	144	138	145	148	151	*	*	*	*	
	F.D	*	*	*	99	99	99	99	99	99	99	99	99	93	94	98	97	*	*	*	
-50	ANG	*	*	*	2	0	1	2	3	4	4	4	4	3	2	0	1	*	*	*	-50
	S/N	*	*	*	-7	1	3	5	7	9	10	9	6	6	4	2	-7	*	*	*	
	DBW	*	*	*	163	154	152	150	148	146	145	146	149	149	151	153	163	*	*	*	
	F.D	*	*	*	99	99	99	99	99	99	99	99	99	93	94	97	98	*	*	*	
-60	ANG	*	*	*	2	3	0	1	2	2	3	3	2	2	1	2	1	*	*	*	-60
	S/N	*	*	*	-3	-1	0	2	4	5	5	5	4	1	-4	-3	-8	*	*	*	
	DBW	*	*	*	159	157	155	153	151	150	150	150	151	154	160	159	164	*	*	*	
	F.D	*	*	99	99	99	99	99	99	99	99	99	99	99	95	96	98	98	99	*	
-70	ANG	*	*	1	2	2	3	0	1	1	1	1	1	0	0	3	1	0	0	*	-70
	S/N	*	*	-4	-6	-4	-2	0	1	1	0	0	-1	-3	3	-3	-2	-2	-7	*	
	DBW	*	*	160	162	160	158	156	154	154	155	155	157	159	152	159	158	158	163	*	
	F.D	99	99	99	99	*	99	99	99	99	99	99	99	99	99	99	99	99	99	99	
-80	ANG	1	1	1	2	*	3	3	0	0	0	0	0	3	3	2	2	2	1	1	-80
	S/N	-6	-7	-10	-9	*	-10	-9	-6	-6	-6	-7	0	-4	-2	-2	-1	-3	-3	-6	
	DBW	162	163	166	165	*	166	165	162	162	162	163	156	160	158	158	157	159	159	162	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-44

MAR GMT 24 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 8.30MC/S

VERTICAL 5H 0L 00EG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	73	73	71	66	89	87	87	81	73	68	69	74	80	83	85	84	65	70	73	80
	ANG	10	11	11	13	1	3	5	8	10	12	11	8	6	3	1	0	12	11	10	
	S/N	34	38	38	38	41	44	46	49	50	48	48	43	41	40	37	38	32	35	34	
	DBW	125	121	121	121	118	115	113	110	109	111	111	116	118	119	122	121	127	124	125	
70	F.D	88	90	87	83	77	90	87	70	32	11	25	54	73	83	59	68	76	84	88	70
	ANG	1	1	6	8	11	1	5	12	24	32	25	14	7	2	13	9	7	2	1	
	S/N	29	34	36	37	37	42	46	49	42	42	49	44	41	43	37	31	30	29	29	
	DBW	130	125	123	122	122	117	113	110	117	117	110	115	118	116	122	128	129	130	130	
60	F.D	92	87	89	92	88	77	90	75	10	-	6	56	79	81	68	80	81	81	92	60
	ANG	2	3	0	5	7	12	4	12	32	-	32	14	5	0	9	6	0	2	2	
	S/N	28	25	28	34	35	34	42	45	42	-	54	50	47	45	37	35	34	31	28	
	DBW	131	134	131	125	124	125	117	114	117	-	105	109	112	114	122	124	125	128	131	
50	F.D	92	95	90	91	93	90	95	87	50	12	44	78	88	65	74	85	90	92	92	50
	ANG	4	0	1	2	4	8	0	7	21	32	21	8	1	10	6	2	1	0	4	
	S/N	15	21	25	32	29	29	35	46	48	52	52	49	43	38	37	36	27	28	15	
	DBW	144	138	134	127	130	130	124	113	111	109	107	110	116	121	122	123	132	131	144	
40	F.D	94	95	97	93	94	95	88	94	90	82	89	91	72	78	88	87	92	91	94	40
	ANG	1	2	3	0	2	5	10	2	8	11	8	2	11	7	3	0	2	1	1	
	S/N	7	10	16	30	32	31	39	44	48	49	48	46	39	37	36	28	17	8	7	
	DBW	152	149	143	129	127	127	120	115	110	108	110	113	120	122	123	131	142	151	152	
30	F.D	95	98	98	95	96	96	95	84	95	94	95	81	89	90	90	88	93	95	95	30
	ANG	2	0	1	2	0	2	6	11	2	3	1	11	7	3	0	2	0	2	2	
	S/N	-7	-2	10	23	37	32	36	41	43	45	44	38	37	36	29	24	9	-1	-7	
	DBW	167	162	149	136	122	124	122	117	114	112	115	120	122	123	130	135	150	161	167	
20	F.D	*	*	98	96	97	97	95	95	92	91	94	95	95	94	87	94	95	*	*	20
	ANG	*	*	1	0	2	0	3	7	9	10	9	6	3	0	5	0	1	*	*	
	S/N	*	*	1	19	29	29	33	36	39	37	38	35	35	28	28	19	1	*	*	
	DBW	*	*	158	140	130	126	123	120	117	120	120	122	123	129	131	140	158	*	*	
10	F.D	*	*	*	98	97	96	97	95	97	98	98	96	97	92	92	94	94	*	*	10
	ANG	*	*	*	0	0	5	1	3	5	5	4	3	0	5	1	1	0	*	*	
	S/N	*	*	*	11	27	26	29	32	34	29	30	31	29	26	23	15	-1	*	*	
	DBW	*	*	*	148	132	128	125	123	121	122	122	123	129	131	132	144	161	*	*	
0	F.D	*	*	*	98	98	97	92	98	97	98	98	98	95	96	94	94	*	*	*	0
	ANG	*	*	*	2	1	3	5	1	2	2	1	0	5	3	1	0	*	*	*	
	S/N	*	*	*	4	25	24	23	28	30	21	21	22	27	26	25	6	*	*	*	
	DBW	*	*	*	155	134	131	128	126	124	124	125	131	131	132	132	153	*	*	*	
-10	F.D	*	*	*	93	96	96	94	96	95	98	96	97	97	96	94	96	*	*	*	-10
	ANG	*	*	*	2	0	1	4	6	7	0	6	5	3	1	0	1	*	*	*	
	S/N	*	*	*	4	23	26	22	28	30	33	22	25	27	26	28	1	*	*	*	
	DBW	*	*	*	155	136	133	131	128	127	123	131	131	132	133	131	158	*	*	*	
-20	F.D	*	*	*	91	91	94	93	96	97	96	97	97	96	95	93	97	*	*	*	-20
	ANG	*	*	*	1	0	0	2	3	4	4	4	3	2	0	2	0	*	*	*	
	S/N	*	*	*	3	23	24	24	26	29	27	25	24	26	24	22	3	*	*	*	
	DBW	*	*	*	156	136	135	133	131	130	132	132	132	133	135	137	156	*	*	*	
-30	F.D	*	*	*	93	91	88	94	98	98	98	98	98	97	90	91	92	*	*	*	-30
	ANG	*	*	*	1	1	4	1	1	2	2	2	1	0	4	1	1	*	*	*	
	S/N	*	*	*	1	20	22	24	25	26	26	26	26	24	23	20	5	*	*	*	
	DBW	*	*	*	158	139	137	135	134	133	133	133	133	135	136	139	154	*	*	*	
-40	F.D	*	*	*	92	99	98	98	99	99	99	99	98	76	82	89	91	*	*	*	-40
	ANG	*	*	*	2	0	2	3	4	0	1	1	0	5	3	0	0	*	*	*	
	S/N	*	*	*	5	17	19	21	22	23	24	23	19	24	21	18	8	*	*	*	
	DBW	*	*	*	154	142	140	138	137	136	135	136	140	135	138	141	151	*	*	*	
-50	F.D	*	*	*	99	99	99	99	98	97	97	93	83	72	77	90	88	*	*	*	-50
	ANG	*	*	*	2	0	1	2	3	4	4	5	4	3	2	0	2	*	*	*	
	S/N	*	*	*	9	15	17	19	20	22	22	22	17	21	19	16	8	*	*	*	
	DBW	*	*	*	150	144	142	140	139	137	137	137	142	138	140	143	151	*	*	*	
-60	F.D	*	*	99	99	99	99	99	98	98	98	95	89	75	77	88	91	90	*	*	-60
	ANG	*	*	1	1	3	0	1	2	3	3	3	3	2	1	0	2	0	*	*	
	S/N	*	*	1	11	13	15	16	18	19	19	18	18	16	10	10	6	-2	*	*	
	DBW	*	*	158	148	146	144	143	141	140	140	141	141	143	149	149	153	162	*	*	
-70	F.D	98	95	99	99	99	99	99	99	99	99	97	92	89	81	85	92	93	97	98	-70
	ANG	0	0	1	2	3	0	0	1	1	1	2	1	1	0	3	2	1	0	0	
	S/N	3	1	8	9	10	12	13	15	15	14	15	10	10	8	9	10	10	11	3	
	DBW	156	158	151	150	149	147	146	144	144	145	144	149	149	151	150	149	149	148	156	
-80	F.D	98	98	97	97	99	99	98	99	99	99	97	96	95	94	96	96	97	98	98	-80
	ANG	1	1	2	2	3	3	3	0	0	0	0	0	0	3	3	2	2	1	1	
	S/N	8	8	4	5	3	4	5	7	8	8	5	5	9	11	11	11	10	10	8	
	DBW	151	151	155	154	156	155	154	152	151	151	154	154	150	148	148	148	149	149	151	

GEOGRAPHIC LONGITUDE

Figure II-45

MAR GMT 24 SUNSPOT TO

TRANSMITTER 60.01N - 0.01W FREQUENCY 12.40MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																					
	F.D	25	25	50	49	46	41	41	30	21	16	17	22	29	33	37	41	44	22	25	
80	ANG	13	13	0	1	3	5	7	10	13	14	13	10	8	5	3	1	0	13	13	80
	S/N	39	43	43	46	48	50	51	53	54	53	52	48	46	45	44	41	37	41	39	
	DBW	125	121	121	118	116	114	113	111	110	111	112	116	118	119	120	123	127	123	125	
	F.D	44	46	43	36	53	48	42	17	-	-	-	8	20	16	24	12	23	34	44	
70	ANG	8	8	9	11	0	3	8	15	-	-	-	15	8	4	0	11	9	8	8	70
	S/N	36	40	42	42	45	49	52	53	-	-	-	49	46	49	35	37	36	35	36	
	DBW	128	124	122	122	119	115	112	111	-	-	-	115	118	115	129	127	128	129	128	
	F.D	44	44	43	51	39	54	42	17	-	-	-	5	-	13	-	11	29	36	44	
60	ANG	0	5	6	7	10	0	6	14	-	-	-	15	-	1	-	8	5	4	0	60
	S/N	37	33	35	40	41	39	47	49	-	-	-	54	-	46	-	42	41	39	37	
	DBW	127	131	129	124	123	125	117	115	-	-	-	110	-	118	-	122	123	125	127	
	F.D	47	49	50	47	55	34	52	37	-	-	-	21	13	-	6	21	34	41	47	
50	ANG	1	2	3	4	6	11	2	9	-	-	-	10	3	-	8	4	2	1	1	50
	S/N	33	34	36	39	36	34	40	51	-	-	-	54	50	-	43	43	39	35	33	
	DBW	131	130	128	125	128	130	124	113	-	-	-	110	114	-	121	121	125	129	131	
	F.D	48	51	57	55	51	54	17	48	33	18	32	36	-	-	12	25	33	39	48	
40	ANG	3	4	0	1	4	7	12	4	10	14	10	4	-	-	4	1	0	3	3	40
	S/N	28	30	32	38	38	37	46	50	54	56	54	52	-	-	42	40	36	26	28	
	DBW	136	134	132	126	125	126	118	114	110	108	110	112	-	-	122	124	128	138	136	
	F.D	54	60	60	48	59	50	46	21	54	51	55	16	8	11	17	7	30	42	54	
30	ANG	1	1	2	7	1	4	9	14	3	5	3	14	9	5	2	7	2	1	1	30
	S/N	20	23	29	33	36	40	45	48	51	52	51	44	43	43	41	34	27	21	20	
	DBW	144	141	135	131	126	121	119	116	113	112	113	120	121	121	123	130	137	143	144	
	F.D	57	63	66	63	51	59	44	46	30	28	38	48	25	23	-	20	27	42	57	
20	ANG	2	2	0	2	6	1	5	9	12	13	12	9	5	2	-	2	0	2	2	20
	S/N	11	15	23	32	35	39	43	46	48	45	44	44	43	41	-	32	23	14	11	
	DBW	153	149	141	132	128	122	120	118	116	119	120	120	121	123	-	132	141	150	153	
	F.D	32	37	70	66	61	47	55	45	64	68	74	50	47	35	11	16	21	20	32	
10	ANG	1	1	0	2	4	7	2	5	6	7	5	5	2	0	5	0	1	1	1	10
	S/N	3	6	15	30	34	36	39	44	45	41	43	43	41	40	34	30	18	7	3	
	DBW	161	158	149	134	128	124	122	120	119	120	120	121	123	124	129	134	146	157	161	
	F.D	26	32	39	71	67	58	59	57	56	57	61	64	40	32	20	12	9	12	26	
0	ANG	0	3	0	0	2	5	0	2	4	4	3	1	7	5	3	1	1	0	0	0
	S/N	-3	-0	11	22	35	35	34	41	43	33	35	40	36	35	35	27	13	2	-3	
	DBW	168	165	153	142	128	126	124	122	121	122	122	124	128	129	129	137	151	162	168	
	F.D	18	18	25	33	66	61	52	62	64	66	68	53	56	51	36	19	11	8	18	
-10	ANG	2	2	3	1	1	3	6	0	1	1	0	7	5	3	1	0	2	2	2	-10
	S/N	-8	-4	9	25	35	37	35	40	41	39	35	35	36	35	34	24	5	-4	-8	
	DBW	173	169	155	139	129	127	125	124	123	125	129	129	128	129	130	140	159	169	173	
	F.D	*	29	30	39	37	60	56	55	58	57	58	62	62	56	35	20	16	17	*	
-20	ANG	*	0	1	0	1	2	4	5	6	6	6	5	3	2	0	2	1	0	*	-20
	S/N	*	-9	6	24	34	35	37	38	39	35	35	35	35	35	34	21	5	-10	*	
	DBW	*	174	158	140	130	129	127	126	125	129	129	129	129	129	130	143	159	175	*	
	F.D	*	*	52	51	45	49	62	69	70	68	70	72	69	45	36	30	15	*	*	
-30	ANG	*	*	1	1	5	1	2	2	3	4	3	2	1	1	4	1	1	*	*	-30
	S/N	*	*	4	24	32	34	35	36	37	35	35	35	35	34	32	23	7	*	*	
	DBW	*	*	160	140	132	130	129	128	127	129	129	129	129	130	132	141	157	*	*	
	F.D	*	*	60	55	55	51	60	81	81	80	67	49	29	30	44	38	12	*	*	
-40	ANG	*	*	0	1	3	4	0	0	1	2	2	2	1	5	3	0	0	*	*	-40
	S/N	*	*	7	25	31	32	34	35	35	36	34	34	34	32	31	25	4	*	*	
	DBW	*	*	157	139	133	132	130	129	129	128	130	130	130	132	133	139	160	*	*	
	F.D	*	63	61	61	60	59	57	52	59	57	31	8	18	24	48	45	12	7	*	
-50	ANG	*	1	2	0	1	3	4	5	0	1	1	0	5	3	2	1	2	1	*	-50
	S/N	*	-7	14	27	30	31	32	33	34	34	33	23	31	31	29	24	13	-8	*	
	DBW	*	172	150	137	134	133	132	131	130	130	131	141	133	133	135	140	151	173	*	
	F.D	*	67	63	59	64	63	61	58	55	54	28	8	21	24	42	52	46	44	*	
-60	ANG	*	0	2	4	1	2	3	4	4	5	5	4	3	2	1	0	3	1	*	-60
	S/N	*	14	22	27	28	29	30	31	32	31	30	29	28	23	24	20	16	8	*	
	DBW	*	150	142	137	136	135	134	133	132	133	134	135	136	141	140	144	148	156	*	
	F.D	73	65	68	64	68	66	65	63	62	61	37	15	9	29	41	56	59	66	73	
-70	ANG	1	1	2	3	0	1	2	2	3	3	3	3	2	2	1	4	3	2	1	-70
	S/N	19	18	21	24	25	27	27	29	29	28	28	21	22	25	24	21	22	22	19	
	DBW	145	146	143	140	139	137	137	135	135	136	136	143	142	139	140	143	142	142	145	
	F.D	67	67	65	63	69	68	68	67	66	61	44	30	25	29	44	61	64	66	67	
-80	ANG	3	3	3	3	0	0	1	1	1	1	2	2	1	1	1	0	3	3	3	-80
	S/N	24	23	20	20	18	19	19	22	22	22	22	21	25	26	24	29	22	22	24	
	DBW	140	141	144	144	146	145	145	142	142	142	142	143	139	138	140	135	142	142	140	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-46

MAR GMT 24 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 16.60MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																					GEOGRAPHIC LATITUDE
	F.D	-	-	16	16	12	9	9	-	-	-	-	-	-	-	7	11	12	-	-	
80	ANG	-	-	0	1	3	5	7	-	-	-	-	-	-	-	3	1	0	-	-	80
	S/N	-	-	37	48	51	53	54	-	-	-	-	-	-	-	46	43	31	-	-	
	DBW	-	-	130	119	116	114	113	-	-	-	-	-	-	-	121	124	136	-	-	
	F.D	13	14	12	8	14	13	9	-	-	-	-	-	-	-	-	-	-	-	13	
70	ANG	8	8	9	11	0	3	8	-	-	-	-	-	-	-	-	-	-	-	8	70
	S/N	39	43	45	45	40	51	54	-	-	-	-	-	-	-	-	-	-	-	39	
	DBW	128	124	122	122	127	116	113	-	-	-	-	-	-	-	-	-	-	-	128	
	F.D	-	13	12	13	7	15	7	-	-	-	-	-	-	-	-	-	-	-	-	
60	ANG	-	5	6	7	10	0	6	-	-	-	-	-	-	-	-	-	-	-	-	60
	S/N	-	37	38	43	44	39	50	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	130	129	124	123	128	117	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	7	17	11	16	-	8	-	-	-	-	-	-	-	-	-	-	-	-	
50	ANG	-	2	3	4	7	-	2	-	-	-	-	-	-	-	-	-	-	-	-	50
	S/N	-	39	40	42	39	-	42	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	128	127	125	128	-	125	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	7	16	7	8	-	5	-	-	-	-	-	-	-	-	-	-	-	
40	ANG	-	-	0	2	4	7	-	4	-	-	-	-	-	-	-	-	-	-	-	40
	S/N	-	-	27	41	43	41	-	52	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	140	126	124	126	-	115	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	6	6	6	11	-	-	-	8	7	8	-	-	-	-	-	-	-	-	
30	ANG	-	4	5	7	1	-	-	-	3	5	3	-	-	-	-	-	-	-	-	30
	S/N	-	32	37	37	42	-	-	-	54	55	54	-	-	-	-	-	-	-	-	
	DBW	-	135	130	130	125	-	-	-	113	112	113	-	-	-	-	-	-	-	-	
	F.D	8	11	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	
20	ANG	2	0	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	20
	S/N	24	26	-	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	
	DBW	143	141	-	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	143	
	F.D	-	-	6	7	-	-	-	-	8	10	16	-	-	-	-	-	-	-	-	
10	ANG	-	-	1	2	-	-	-	-	7	8	7	-	-	-	-	-	-	-	-	10
	S/N	-	-	29	36	-	-	-	-	49	47	47	-	-	-	-	-	-	-	-	
	DBW	-	-	138	131	-	-	-	-	118	120	120	-	-	-	-	-	-	-	-	
	F.D	-	-	-	6	-	-	7	-	-	-	6	7	-	-	-	-	-	-	-	
0	ANG	-	-	-	1	-	-	0	-	-	-	4	2	-	-	-	-	-	-	-	0
	S/N	-	-	-	33	-	-	28	-	-	-	44	44	-	-	-	-	-	-	-	
	DBW	-	-	-	134	-	-	137	-	-	-	122	123	-	-	-	-	-	-	-	
	F.D	-	-	-	-	11	8	-	6	7	8	9	9	-	-	-	-	-	-	-	
-10	ANG	-	-	-	-	2	4	-	0	1	2	1	0	-	-	-	-	-	-	-	-10
	S/N	-	-	-	-	36	40	-	30	41	44	42	44	-	-	-	-	-	-	-	
	DBW	-	-	-	-	131	127	-	137	126	123	125	123	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	19	16	11	13	12	13	15	14	10	-	-	-	-	-	
-20	ANG	-	-	-	-	-	3	4	6	6	7	7	6	4	2	-	-	-	-	-	-20
	S/N	-	-	-	-	-	40	41	42	43	39	39	39	39	37	-	-	-	-	-	
	DBW	-	-	-	-	-	127	126	125	124	128	128	128	128	130	-	-	-	-	-	
	F.D	-	-	-	-	9	11	20	20	21	20	21	22	20	5	-	-	-	-	-	
-30	ANG	-	-	-	-	5	1	3	3	4	5	5	6	2	1	-	-	-	-	-	-30
	S/N	-	-	-	-	36	38	40	41	41	39	39	39	40	30	-	-	-	-	-	
	DBW	-	-	-	-	131	129	127	126	126	128	128	128	127	137	-	-	-	-	-	
	F.D	-	-	-	15	-	-	5	15	14	14	-	-	-	-	9	-	-	-	-	
-40	ANG	-	-	-	1	-	-	0	1	2	3	-	-	-	-	3	-	-	-	-	-40
	S/N	-	-	-	32	-	-	26	39	37	38	-	-	-	-	36	-	-	-	-	
	DBW	-	-	-	135	-	-	141	128	130	129	-	-	-	-	131	-	-	-	-	
	F.D	-	-	-	6	6	5	-	-	-	-	-	-	-	-	12	10	-	-	-	
-50	ANG	-	-	-	1	2	3	-	-	-	-	-	-	-	-	2	1	-	-	-	-50
	S/N	-	-	-	23	31	34	-	-	-	-	-	-	-	-	34	29	-	-	-	
	DBW	-	-	-	144	136	133	-	-	-	-	-	-	-	-	133	138	-	-	-	
	F.D	-	8	7	8	7	7	-	-	-	-	-	-	-	-	8	14	10	9	-	
-60	ANG	-	2	3	0	1	2	-	-	-	-	-	-	-	-	1	0	3	2	-	-60
	S/N	-	19	26	31	27	31	-	-	-	-	-	-	-	-	29	26	22	17	-	
	DBW	-	148	141	136	140	136	-	-	-	-	-	-	-	-	138	141	145	150	-	
	F.D	23	23	9	10	9	-	-	-	-	-	-	-	-	-	8	20	19	17	23	
-70	ANG	2	2	3	0	1	-	-	-	-	-	-	-	-	-	1	0	3	3	2	-70
	S/N	25	24	26	28	30	-	-	-	-	-	-	-	-	-	28	26	27	27	25	
	DBW	142	143	141	139	137	-	-	-	-	-	-	-	-	-	139	141	140	140	142	
	F.D	19	18	17	19	5	-	-	-	-	-	-	-	-	-	-	14	20	18	19	
-80	ANG	3	3	4	0	0	-	-	-	-	-	-	-	-	-	-	0	0	4	3	-80
	S/N	30	29	26	26	13	-	-	-	-	-	-	-	-	-	-	27	30	27	30	
	DBW	137	138	141	141	154	-	-	-	-	-	-	-	-	-	-	140	137	140	137	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-47

MAR GMT 24 SUNSPOT 70

TRANSMITTER 60.01N - 0.01W FREQUENCY 22.10MC/S

VERTICAL SH 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																					GEOGRAPHIC LATITUDE
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
80	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
70	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
60	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
50	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
40	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
30	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
20	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-10	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-10
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-20	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-20
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-30	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-30
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-40	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-40
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-50	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-50
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-60	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-60
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-70	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-70
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-80	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-80
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

180 160 140 120 100 80 60 40 20 0 -20 -40 -60 -80 -100 -120 -140 -160 -180

GEOGRAPHIC LONGITUDE

Figure II-48

MAR GMT 12 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 4.20MC/S

VERTICAL SH OL 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																					
	F.D	99	99	99	99	99	99	99	99	89	75	89	99	99	99	99	99	99	99	99	
80	ANG	8	8	9	13	15	18	23	18	53	90	53	18	23	18	15	13	9	8	8	80
	S/N	34	34	37	34	36	37	42	45	46	45	47	46	44	42	41	38	31	34	34	
	DBW	117	117	114	117	115	114	109	106	105	105	104	105	107	109	110	113	120	117	117	
	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	
70	ANG	2	2	3	4	7	21	2	5	8	9	8	32	26	21	7	4	3	2	2	70
	S/N	25	25	28	32	34	28	24	27	28	29	28	26	26	27	33	30	24	25	25	
	DBW	126	126	123	119	117	123	127	124	123	122	123	125	125	124	118	121	127	126	126	
	F.D	99	98	97	98	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	
60	ANG	4	4	4	5	11	23	26	29	31	32	31	29	26	22	11	10	9	4	4	60
	S/N	20	15	16	17	20	11	2	-1	1	2	5	1	5	13	23	22	21	21	20	
	DBW	131	136	135	134	131	140	149	153	150	149	146	150	146	138	128	129	130	130	131	
	F.D	99	99	99	99	99	99	*	*	*	*	*	*	99	99	99	99	99	99	99	
50	ANG	6	6	6	6	7	23	*	*	*	*	*	*	26	23	7	6	6	6	6	50
	S/N	18	17	17	14	15	0	*	*	*	*	*	*	-10	7	21	20	19	19	18	
	DBW	133	133	134	137	136	151	*	*	*	*	*	*	162	144	130	131	132	132	133	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	
40	ANG	2	3	3	3	4	*	*	*	*	*	*	*	*	*	4	3	3	2	2	40
	S/N	15	14	16	20	16	*	*	*	*	*	*	*	*	*	19	18	17	15	15	
	DBW	135	135	135	131	135	*	*	*	*	*	*	*	*	*	132	133	134	134	135	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	
30	ANG	0	0	0	1	1	*	*	*	*	*	*	*	*	*	0	0	0	0	0	30
	S/N	13	11	11	13	13	*	*	*	*	*	*	*	*	*	12	12	9	16	13	
	DBW	137	140	140	138	136	*	*	*	*	*	*	*	*	*	139	139	140	133	137	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	
20	ANG	4	4	4	5	5	*	*	*	*	*	*	*	*	*	4	4	4	4	4	20
	S/N	4	5	4	5	4	*	*	*	*	*	*	*	*	*	1	1	1	3	4	
	DBW	146	146	147	146	145	*	*	*	*	*	*	*	*	*	146	146	147	146	146	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	
10	ANG	2	2	2	2	3	*	*	*	*	*	*	*	*	*	3	2	2	2	2	10
	S/N	0	0	2	3	0	*	*	*	*	*	*	*	*	*	-5	-2	4	-1	0	
	DBW	151	151	149	148	148	*	*	*	*	*	*	*	*	*	148	148	144	151	151	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	
0	ANG	0	0	0	1	6	*	*	*	*	*	*	*	*	*	-3	1	0	0	0	0
	S/N	-7	-8	-5	-1	6	*	*	*	*	*	*	*	*	*	0	-3	-7	-7	-7	
	DBW	158	158	157	152	144	*	*	*	*	*	*	*	*	*	146	151	156	156	158	
	F.D	99	*	99	99	*	*	*	*	*	*	*	*	*	*	*	99	99	*	99	
-10	ANG	3	*	3	3	*	*	*	*	*	*	*	*	*	*	*	0	4	*	3	-10
	S/N	-10	*	-9	-10	*	*	*	*	*	*	*	*	*	*	*	-0	-9	*	-10	
	DBW	162	*	161	162	*	*	*	*	*	*	*	*	*	*	*	150	159	*	162	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	99	*	*	*	*	
-20	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	*	*	*	*	-20
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-9	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	161	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	99	*	*	*	*	
-30	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	2	*	*	*	*	-30
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-10	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	162	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	99	99	*	*	
-40	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	0	*	*	-40
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-7	-7	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	159	159	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-49

MAR GMT 12 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 6.20MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	96	99	99	99	99	97	93	74	30	10	31	77	94	98	99	99	99	99	96	80
	ANG	8	8	9	11	13	17	23	34	58	90	58	34	22	16	13	11	9	8	8	
	S/N	41	41	44	41	42	44	49	51	50	46	51	52	50	48	47	44	38	41	41	
	DBW	114	114	111	114	113	111	106	104	105	109	104	103	105	107	108	111	117	114	114	
70	F.D	97	95	96	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	97	70
	ANG	2	2	2	3	5	8	13	5	8	10	8	16	13	8	5	3	2	2	2	
	S/N	32	33	36	40	41	42	38	43	43	44	44	42	41	41	40	37	32	33	32	
	DBW	123	122	119	115	114	113	117	112	112	111	111	113	114	114	115	118	123	122	123	
60	F.D	91	87	86	90	99	99	99	99	99	99	99	99	99	99	99	98	97	94	91	60
	ANG	9	9	10	6	0	9	16	12	14	15	14	18	16	13	0	5	5	9	9	
	S/N	29	24	25	26	35	27	24	22	19	19	23	26	26	30	41	31	31	31	29	
	DBW	126	131	130	129	120	128	131	133	136	136	132	129	129	125	114	124	124	124	126	
50	F.D	96	95	94	96	99	99	99	99	99	99	99	99	99	99	99	99	99	98	96	50
	ANG	5	6	6	3	3	1	15	3	4	4	4	20	18	16	6	6	5	5	5	
	S/N	28	28	28	24	25	17	5	-2	-1	0	1	5	12	24	31	31	30	29	28	
	DBW	127	126	127	131	130	138	150	158	157	156	154	150	143	131	124	124	125	126	127	
40	F.D	98	98	98	97	99	99	99	99	*	*	*	99	99	99	99	99	99	99	98	40
	ANG	2	2	3	0	4	13	15	0	*	*	*	16	15	13	3	2	2	2	2	
	S/N	27	27	27	28	26	12	7	-4	*	*	*	-5	10	15	30	29	27	27	27	
	DBW	127	127	128	127	128	143	148	160	*	*	*	161	145	140	125	126	127	127	127	
30	F.D	99	99	99	99	99	99	99	*	*	*	*	*	*	99	99	99	99	99	99	30
	ANG	6	4	0	0	1	14	15	*	*	*	*	*	*	14	0	0	6	4	6	
	S/N	23	24	25	20	21	3	-5	*	*	*	*	*	*	4	24	30	18	19	23	
	DBW	132	131	130	135	131	151	161	*	*	*	*	*	*	151	131	124	135	135	132	
20	F.D	99	99	99	99	99	99	*	*	*	*	*	*	*	99	99	99	99	99	99	20
	ANG	3	4	4	4	4	0	*	*	*	*	*	*	*	0	4	4	4	3	3	
	S/N	19	20	19	19	17	2	*	*	*	*	*	*	*	3	15	15	16	19	19	
	DBW	136	135	136	136	135	152	*	*	*	*	*	*	*	152	135	136	136	135	136	
10	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	10
	ANG	1	1	2	2	2	*	*	*	*	*	*	*	*	*	2	2	2	1	1	
	S/N	15	15	16	18	15	*	*	*	*	*	*	*	*	*	12	12	14	13	15	
	DBW	140	140	139	137	137	*	*	*	*	*	*	*	*	*	135	137	138	140	140	
0	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	0
	ANG	4	4	0	0	1	*	*	*	*	*	*	*	*	*	1	0	0	0	4	
	S/N	11	11	12	9	13	*	*	*	*	*	*	*	*	*	10	9	10	10	11	
	DBW	144	143	143	145	140	*	*	*	*	*	*	*	*	*	139	142	142	143	144	
-10	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	-10
	ANG	2	2	3	3	3	*	*	*	*	*	*	*	*	*	0	4	4	3	2	
	S/N	7	7	9	9	9	*	*	*	*	*	*	*	*	*	6	7	9	7	7	
	DBW	148	148	146	146	146	*	*	*	*	*	*	*	*	*	146	146	145	146	148	
-20	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	-20
	ANG	1	1	1	1	1	*	*	*	*	*	*	*	*	*	2	2	1	1	1	
	S/N	4	4	4	7	8	*	*	*	*	*	*	*	*	*	8	8	10	4	4	
	DBW	151	151	151	148	147	*	*	*	*	*	*	*	*	*	146	146	144	150	151	
-30	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	-30
	ANG	0	0	0	0	0	*	*	*	*	*	*	*	*	*	0	0	0	0	0	
	S/N	2	2	2	2	2	*	*	*	*	*	*	*	*	*	5	3	2	3	2	
	DBW	153	153	153	153	153	*	*	*	*	*	*	*	*	*	150	152	153	152	153	
-40	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	-40
	ANG	3	3	3	3	3	*	*	*	*	*	*	*	*	*	3	3	3	3	3	
	S/N	1	0	1	0	-2	*	*	*	*	*	*	*	*	*	-1	1	0	1	1	
	DBW	154	155	154	155	158	*	*	*	*	*	*	*	*	*	157	154	155	154	154	
-50	F.D	99	99	99	99	*	*	*	*	*	*	*	*	*	*	*	99	99	99	99	-50
	ANG	2	2	2	2	*	*	*	*	*	*	*	*	*	*	*	2	2	2	2	
	S/N	-1	-1	-1	-1	*	*	*	*	*	*	*	*	*	*	*	-1	-2	-1	-1	
	DBW	157	157	157	157	*	*	*	*	*	*	*	*	*	*	*	157	158	157	157	
-60	F.D	99	99	99	99	*	*	*	*	*	*	*	*	*	*	*	*	*	99	99	-60
	ANG	1	1	1	1	*	*	*	*	*	*	*	*	*	*	*	*	*	1	1	
	S/N	-4	-4	-4	-4	*	*	*	*	*	*	*	*	*	*	*	*	*	-5	-4	
	DBW	160	160	160	160	*	*	*	*	*	*	*	*	*	*	*	*	*	161	160	
-70	F.D	*	97	96	99	*	*	*	*	*	*	*	*	*	*	*	99	99	*	*	-70
	ANG	*	0	0	0	*	*	*	*	*	*	*	*	*	*	*	0	0	*	*	
	S/N	*	-8	-5	-8	*	*	*	*	*	*	*	*	*	*	*	-6	-10	*	*	
	DBW	*	164	161	164	*	*	*	*	*	*	*	*	*	*	*	162	166	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-50

MAR GMT 12 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 8.30MC/S

VERTICAL SM 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE																				
	F.D	90	97	96	94	91	83	62	23	-	-	-	26	65	84	91	94	95	96	90	
80	ANG	8	8	9	11	13	18	25	38	-	-	-	38	25	17	13	11	9	8	8	80
	S/N	46	46	49	46	47	48	53	54	-	-	-	56	55	53	52	49	43	46	46	
	DBW	113	113	110	113	112	111	106	105	-	-	-	103	104	106	107	110	116	113	113	
	F.D	90	88	88	98	98	97	95	91	82	78	87	95	98	99	99	96	95	93	90	
70	ANG	2	2	3	3	5	8	11	15	20	23	20	15	11	7	5	3	2	2	2	70
	S/N	38	38	41	45	46	47	44	49	49	50	50	48	46	46	45	43	37	38	38	
	DBW	121	121	118	114	113	112	115	110	110	109	109	111	113	113	114	116	122	121	121	
	F.D	74	66	64	66	98	99	89	99	99	99	99	99	99	99	98	91	89	82	74	
60	ANG	10	11	11	12	0	2	16	7	8	9	8	7	16	2	11	10	10	10	10	60
	S/N	36	31	32	32	35	39	32	38	36	35	41	42	35	41	38	38	37	38	36	
	DBW	123	128	127	127	124	120	127	121	123	124	118	117	124	118	121	121	122	121	123	
	F.D	84	77	70	73	88	96	99	99	99	99	99	99	99	99	99	97	95	92	84	
50	ANG	6	7	7	8	8	9	6	4	5	8	8	12	10	8	6	6	6	6	6	50
	S/N	36	36	35	31	31	28	23	19	22	23	25	27	29	35	38	38	37	36	36	
	DBW	123	123	124	128	128	131	136	140	137	136	134	132	130	124	121	121	122	123	123	
	F.D	93	90	88	84	92	99	99	99	99	99	99	99	99	99	99	98	97	95	93	
40	ANG	2	3	3	4	4	6	10	1	1	1	1	14	13	6	3	2	2	2	2	40
	S/N	36	35	35	35	33	32	13	16	12	4	7	11	16	35	37	36	35	36	36	
	DBW	123	124	124	124	125	127	146	143	147	155	152	148	143	124	122	123	123	123	123	
	F.D	94	95	97	96	99	99	99	99	99	99	99	99	99	99	99	99	98	94	94	
30	ANG	6	0	0	1	1	9	9	11	8	8	12	11	9	8	0	0	0	6	6	30
	S/N	32	33	29	31	30	19	14	5	0	-8	-5	0	9	21	28	34	35	29	32	
	DBW	127	126	130	128	126	138	145	154	159	168	165	159	150	138	129	123	122	130	127	
	F.D	96	96	98	97	99	99	99	*	*	*	*	99	99	99	99	99	98	95	96	
20	ANG	4	4	4	5	5	7	7	*	*	*	*	9	8	6	4	4	4	4	4	20
	S/N	29	29	28	29	26	15	6	*	*	*	*	-10	2	15	23	24	25	29	29	
	DBW	130	130	131	130	130	142	153	*	*	*	*	170	157	142	130	130	131	130	130	
	F.D	98	98	99	98	99	99	99	*	*	*	*	*	*	99	99	99	99	97	98	
10	ANG	1	1	2	2	2	8	9	*	*	*	*	*	*	8	2	2	2	2	1	10
	S/N	26	26	27	28	25	2	-8	*	*	*	*	*	*	2	20	22	25	25	26	
	DBW	133	133	132	131	131	154	168	*	*	*	*	*	*	155	131	131	132	133	133	
	F.D	96	98	99	98	99	99	*	*	*	*	*	*	*	99	99	99	99	98	96	
0	ANG	4	0	0	0	1	7	*	*	*	*	*	*	*	8	1	0	0	0	4	0
	S/N	23	23	24	23	23	-1	*	*	*	*	*	*	*	-0	20	18	22	23	23	
	DBW	136	136	135	136	134	159	*	*	*	*	*	*	*	159	133	136	135	135	136	
	F.D	99	99	99	99	98	99	*	*	*	*	*	*	*	99	99	99	99	99	99	
-10	ANG	2	2	3	3	4	8	*	*	*	*	*	*	*	7	0	4	4	3	2	-10
	S/N	20	20	21	20	21	-5	*	*	*	*	*	*	*	-3	16	18	21	21	20	
	DBW	139	139	138	139	138	165	*	*	*	*	*	*	*	163	139	139	137	138	139	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	99	99	99	
-20	ANG	1	1	1	1	2	*	*	*	*	*	*	*	*	*	2	2	2	1	1	-20
	S/N	18	18	18	20	20	*	*	*	*	*	*	*	*	*	20	19	20	18	18	
	DBW	141	141	141	139	139	*	*	*	*	*	*	*	*	*	138	139	139	141	141	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	99	99	99	98	99	99	
-30	ANG	0	0	0	0	0	*	*	*	*	*	*	*	*	6	0	0	0	0	0	-30
	S/N	16	16	16	16	16	*	*	*	*	*	*	*	*	-9	16	16	15	16	16	
	DBW	143	143	143	143	143	*	*	*	*	*	*	*	*	169	143	143	144	143	143	
	F.D	99	99	99	99	99	*	*	*	*	*	*	*	*	*	99	99	98	99	99	
-40	ANG	3	3	3	3	3	*	*	*	*	*	*	*	*	*	3	3	3	3	3	-40
	S/N	15	14	15	14	12	*	*	*	*	*	*	*	*	*	12	13	13	15	15	
	DBW	144	145	144	145	147	*	*	*	*	*	*	*	*	*	147	146	146	144	144	
	F.D	99	98	98	98	99	*	*	*	*	*	*	*	*	*	99	99	97	98	99	
-50	ANG	2	2	2	2	2	*	*	*	*	*	*	*	*	*	2	2	2	2	2	-50
	S/N	13	13	13	13	5	*	*	*	*	*	*	*	*	*	4	12	11	12	13	
	DBW	146	146	146	146	154	*	*	*	*	*	*	*	*	*	155	147	148	147	146	
	F.D	99	97	95	95	99	*	*	*	*	*	*	*	*	*	99	98	98	98	99	
-60	ANG	1	1	1	1	1	*	*	*	*	*	*	*	*	*	1	1	1	1	1	-60
	S/N	10	10	11	11	-4	*	*	*	*	*	*	*	*	*	-10	1	2	8	10	
	DBW	149	149	148	148	164	*	*	*	*	*	*	*	*	*	170	158	157	151	149	
	F.D	99	88	83	99	*	*	*	*	*	*	*	*	*	*	*	99	99	99	99	
-70	ANG	0	1	1	0	*	*	*	*	*	*	*	*	*	*	*	0	0	0	0	-70
	S/N	1	7	9	7	*	*	*	*	*	*	*	*	*	*	*	3	2	3	1	
	DBW	158	152	150	152	*	*	*	*	*	*	*	*	*	*	*	156	157	156	158	
	F.D	97	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	99	97	
-80	ANG	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	1	3	-80
	S/N	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-7	0	
	DBW	159	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	167	159	

180 160 140 120 100 80 60 40 20 0 -20 -40 -60 -80 -100 -120 -140 -160 -180

GEOGRAPHIC LONGITUDE

Figure II-51

MAR GMT 12 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 12.40MC/S
VERTICAL 5H 0L 0DEG ANT= 0DB
PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	61	65	60	51	37	17	-	-	-	-	-	-	5	21	36	45	51	58	61	80
	ANG	10	10	12	14	17	21	-	-	-	-	-	-	27	21	17	14	13	11	10	
	S/N	51	51	54	50	51	52	-	-	-	-	-	-	58	57	56	54	47	51	51	
	DBW	113	113	110	114	113	112	-	-	-	-	-	-	106	107	108	110	117	113	113	
70	F.D	55	54	56	75	72	66	54	34	16	11	24	52	74	82	83	74	69	61	55	70
	ANG	4	4	4	5	6	9	13	19	24	27	24	18	12	8	6	4	4	3	4	
	S/N	44	44	47	50	52	53	49	54	55	55	55	54	52	52	51	48	42	44	44	
	DBW	120	120	117	114	112	111	115	110	109	109	109	110	112	112	113	116	122	120	120	
60	F.D	26	10	39	48	64	79	88	87	88	90	93	98	99	97	95	54	48	38	26	60
	ANG	13	13	0	1	1	2	4	6	7	8	7	5	3	2	0	13	13	13	13	
	S/N	41	36	38	37	43	45	45	46	44	43	48	50	48	47	43	43	42	43	41	
	DBW	123	128	126	127	121	119	119	118	120	121	116	114	116	117	121	121	122	121	123	
50	F.D	35	8	-	-	17	43	67	94	96	97	97	99	92	93	91	77	64	53	35	50
	ANG	8	8	-	-	10	11	11	0	1	1	1	0	10	8	7	7	7	8	8	
	S/N	42	42	-	-	37	36	33	31	39	41	42	39	40	43	44	44	43	43	42	
	DBW	122	122	-	-	127	128	131	133	125	123	122	125	124	121	120	120	121	121	122	
40	F.D	59	48	30	17	27	75	91	91	93	94	96	99	99	99	98	82	76	71	59	40
	ANG	4	5	5	6	6	6	6	3	3	3	3	3	5	4	3	3	3	3	4	
	S/N	43	42	41	42	40	38	34	34	33	31	32	34	38	41	44	43	43	43	43	
	DBW	121	122	123	122	124	126	130	130	131	133	132	130	126	123	120	121	121	121	121	
30	F.D	74	66	64	54	65	94	96	99	97	97	98	99	98	98	93	88	81	75	74	30
	ANG	0	1	1	2	2	2	2	0	0	0	0	3	2	1	0	0	0	0	0	
	S/N	41	42	40	41	41	38	33	28	26	25	26	29	33	36	36	37	36	36	41	
	DBW	123	122	124	123	123	126	131	136	138	139	138	135	131	126	126	127	128	128	123	
20	F.D	70	70	70	59	68	89	98	99	96	96	97	98	98	96	91	85	73	65	70	20
	ANG	5	5	6	7	6	6	0	0	1	1	1	0	0	5	4	5	5	5	5	
	S/N	39	39	36	36	37	31	28	19	16	18	19	19	32	27	32	34	36	39	39	
	DBW	125	125	128	128	127	133	136	145	148	146	145	145	132	133	127	127	128	125	125	
10	F.D	74	77	81	68	78	93	97	98	95	95	96	98	98	97	95	91	81	72	74	10
	ANG	2	2	3	4	4	3	2	2	3	3	3	2	2	3	3	2	3	3	2	
	S/N	37	37	38	36	36	29	19	11	6	2	4	9	18	25	30	32	36	37	37	
	DBW	127	127	126	128	128	135	145	153	158	162	160	155	146	135	127	128	128	127	127	
0	F.D	73	76	81	61	57	96	99	99	98	98	98	98	98	98	96	92	84	73	73	0
	ANG	0	0	1	2	3	1	0	1	1	1	1	1	1	2	1	1	1	1	0	
	S/N	35	35	36	35	36	26	12	4	-0	-5	-4	4	14	23	29	31	36	36	35	
	DBW	129	129	128	129	128	138	152	160	165	168	166	160	150	138	129	130	128	128	129	
-10	F.D	86	88	72	72	52	97	99	99	97	98	99	98	98	98	97	93	85	78	86	-10
	ANG	3	3	4	5	1	0	0	1	0	0	0	2	1	1	0	0	0	4	3	
	S/N	33	33	34	30	33	20	1	-3	-7	-8	-6	0	11	22	27	30	34	34	33	
	DBW	131	131	130	134	131	144	193	198	172	173	171	164	153	142	134	134	130	130	131	
-20	F.D	88	89	91	91	89	95	98	*	*	*	*	99	99	99	91	90	85	81	88	-20
	ANG	2	2	2	2	2	3	2	*	*	*	*	0	4	3	2	2	2	2	2	
	S/N	31	31	31	31	31	16	-0	*	*	*	*	-8	-0	16	31	31	31	32	31	
	DBW	133	133	133	133	133	148	165	*	*	*	*	173	165	148	133	133	133	132	133	
-30	F.D	89	90	88	88	94	97	98	*	*	*	*	*	99	98	94	90	83	83	89	-30
	ANG	1	1	1	1	1	1	1	*	*	*	*	*	1	1	1	1	1	1	1	
	S/N	30	29	30	30	30	12	-0	*	*	*	*	*	-2	13	29	29	29	30	30	
	DBW	134	135	134	134	134	152	165	*	*	*	*	*	167	151	135	135	135	134	134	
-40	F.D	87	88	86	87	97	99	99	*	*	*	*	*	99	99	99	91	84	82	87	-40
	ANG	0	0	0	0	0	0	0	*	*	*	*	*	1	0	0	0	0	0	0	
	S/N	28	28	29	29	27	8	-10	*	*	*	*	*	-8	8	26	27	24	29	28	
	DBW	136	136	135	135	137	156	175	*	*	*	*	*	173	156	138	137	140	135	136	
-50	F.D	78	79	78	73	96	98	*	*	*	*	*	*	*	99	99	89	80	75	78	-50
	ANG	3	3	3	3	2	2	*	*	*	*	*	*	*	3	2	2	3	3	3	
	S/N	27	28	28	29	24	3	*	*	*	*	*	*	*	2	21	23	25	27	27	
	DBW	137	136	136	135	140	161	*	*	*	*	*	*	*	162	143	141	139	137	137	
-60	F.D	77	70	53	53	97	99	*	*	*	*	*	*	*	99	99	88	82	76	77	-60
	ANG	2	2	3	3	2	1	*	*	*	*	*	*	*	2	1	1	2	2	2	
	S/N	25	26	26	27	18	2	*	*	*	*	*	*	*	-7	10	16	16	23	25	
	DBW	139	138	138	137	146	162	*	*	*	*	*	*	*	172	154	148	148	141	139	
-70	F.D	71	43	32	38	96	99	*	*	*	*	*	*	*	*	99	98	92	83	71	-70
	ANG	1	2	2	2	1	0	*	*	*	*	*	*	*	*	0	0	1	1	1	
	S/N	17	23	24	24	6	-7	*	*	*	*	*	*	*	*	4	15	18	18	17	
	DBW	147	141	140	140	158	172	*	*	*	*	*	*	*	*	160	149	146	146	147	
-80	F.D	46	39	70	93	99	*	*	*	*	*	*	*	*	*	*	99	99	98	46	-80
	ANG	1	1	0	0	0	*	*	*	*	*	*	*	*	*	*	2	2	2	1	
	S/N	16	8	-4	-8	-10	*	*	*	*	*	*	*	*	*	*	-5	3	12	16	
	DBW	148	156	169	173	175	*	*	*	*	*	*	*	*	*	*	170	161	152	148	

GEOGRAPHIC LONGITUDE

Figure II-52

MAR GMT 12 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 16.60MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	18	13	10	6	-	-	-	-	-	-	-	-	-	-	-	5	8	11	18	80
	ANG	12	12	13	15	-	-	-	-	-	-	-	-	-	-	-	14	13	12	12	
	S/N	53	53	56	53	-	-	-	-	-	-	-	-	-	-	-	56	50	53	53	
	DBW	114	114	111	114	-	-	-	-	-	-	-	-	-	-	-	111	117	114	114	
70	F.D	21	11	13	24	20	15	7	-	-	-	-	7	24	36	37	38	32	25	21	70
	ANG	4	4	5	6	8	10	14	-	-	-	-	19	14	10	8	6	5	4	4	
	S/N	47	47	50	53	54	55	52	-	-	-	-	56	55	54	53	51	45	47	47	
	DBW	120	120	117	114	113	112	115	-	-	-	-	111	112	113	114	116	122	120	120	
60	F.D	-	-	-	7	8	20	38	44	47	52	63	77	83	70	61	47	39	8	-	60
	ANG	-	-	-	1	2	3	5	8	10	10	9	6	4	2	1	0	0	13	-	
	S/N	-	-	-	39	47	48	49	50	48	48	53	54	51	50	48	46	50	46	-	
	DBW	-	-	-	128	120	119	118	117	119	119	114	113	116	117	119	121	117	121	-	
50	F.D	6	-	-	-	-	-	57	66	73	78	82	88	48	52	45	36	23	16	6	50
	ANG	8	-	-	-	-	-	0	1	1	2	1	0	13	11	10	9	8	8	8	
	S/N	45	-	-	-	-	-	40	36	45	47	47	44	44	46	47	47	46	46	45	
	DBW	122	-	-	-	-	-	127	131	122	120	120	123	123	121	120	120	121	121	122	
40	F.D	21	13	-	-	-	10	35	49	56	62	69	80	85	84	76	43	34	31	21	40
	ANG	4	5	-	-	-	7	8	9	9	9	9	7	6	5	4	5	5	5	4	
	S/N	46	45	-	-	-	42	40	43	42	39	41	42	44	46	47	46	46	46	46	
	DBW	121	122	-	-	-	125	127	124	125	128	126	125	123	121	120	121	121	121	121	
30	F.D	31	22	-	-	-	48	57	78	78	82	86	94	79	78	65	49	34	32	31	30
	ANG	1	1	-	-	-	3	4	4	4	4	4	3	3	2	1	2	2	1	1	
	S/N	45	45	-	-	-	43	41	38	37	36	37	38	41	43	45	45	44	44	45	
	DBW	122	122	-	-	-	124	126	129	130	131	130	129	126	124	122	122	123	123	122	
20	F.D	26	26	6	9	20	52	66	75	73	76	79	84	84	68	58	41	24	22	26	20
	ANG	6	6	7	0	0	0	0	1	1	2	1	1	0	6	6	7	7	6	6	
	S/N	43	43	40	39	40	37	37	34	32	31	32	32	32	36	40	40	40	43	43	
	DBW	124	124	127	128	127	130	130	133	135	136	135	135	135	130	126	127	127	124	124	
10	F.D	23	28	13	-	8	37	54	63	69	71	75	75	79	78	69	52	25	21	23	10
	ANG	4	4	4	-	5	5	5	6	4	4	4	6	5	4	4	4	4	4	4	
	S/N	41	41	41	-	40	36	32	28	25	20	22	25	30	35	37	40	40	41	41	
	DBW	126	126	126	-	127	131	135	139	142	147	145	142	137	131	126	127	127	126	126	
0	F.D	22	26	14	-	-	46	66	78	75	76	80	83	82	80	71	57	30	22	22	0
	ANG	2	2	2	-	-	3	3	2	2	3	3	2	3	3	2	3	2	2	2	
	S/N	40	40	37	-	-	34	28	23	20	12	11	21	27	34	38	39	40	40	40	
	DBW	127	127	130	-	-	133	139	144	147	150	149	145	140	133	127	128	127	127	127	
-10	F.D	47	52	11	13	-	51	71	79	74	78	84	86	85	83	75	58	27	32	47	-10
	ANG	0	0	0	1	-	1	1	0	1	1	1	1	2	1	1	1	1	0	0	
	S/N	38	38	25	35	-	32	24	18	16	13	14	18	25	32	38	38	39	38	38	
	DBW	129	129	142	132	-	135	143	149	151	154	152	148	142	135	129	129	128	129	129	
-20	F.D	43	45	41	40	17	40	72	77	84	90	94	92	88	87	60	46	27	26	43	-20
	ANG	3	3	4	4	4	4	0	0	1	1	0	0	4	4	4	4	4	4	3	
	S/N	37	37	37	35	35	26	26	14	10	8	7	8	17	27	35	34	34	37	37	
	DBW	130	130	130	132	132	141	141	153	157	159	160	159	150	140	132	133	133	130	130	
-30	F.D	40	43	40	41	37	56	60	66	76	76	79	76	81	80	68	56	37	26	40	-30
	ANG	2	2	2	3	3	3	3	3	2	3	3	3	2	2	2	2	3	2	2	
	S/N	36	36	36	36	36	27	17	10	5	2	4	9	18	28	35	35	35	36	36	
	DBW	131	131	131	131	131	140	150	157	162	165	163	158	149	139	132	132	132	131	131	
-40	F.D	34	37	35	37	38	64	74	86	90	90	93	86	89	88	82	60	40	24	34	-40
	ANG	1	1	2	2	1	1	1	1	1	1	1	2	1	1	0	1	1	1	1	
	S/N	35	35	35	35	34	24	13	5	1	1	3	8	13	23	34	32	33	35	35	
	DBW	132	132	132	132	133	143	154	162	166	166	164	159	154	144	133	135	134	132	132	
-50	F.D	34	37	35	29	44	66	79	90	93	94	95	90	92	87	81	63	46	30	34	-50
	ANG	0	0	0	0	0	0	0	0	0	1	1	0	0	3	3	0	0	0	0	
	S/N	33	34	34	34	32	21	10	1	-2	-3	0	0	8	18	30	32	31	32	33	
	DBW	134	133	133	133	135	146	157	166	170	171	167	168	159	149	137	135	136	135	134	
-60	F.D	28	21	9	9	22	65	80	92	95	96	97	93	95	94	91	58	44	27	28	-60
	ANG	3	3	4	3	3	3	2	2	3	3	3	3	2	2	2	3	3	3	3	
	S/N	31	31	30	30	28	17	7	0	-4	-6	-5	0	3	9	21	23	23	29	31	
	DBW	136	136	137	137	139	150	160	168	172	174	173	168	164	158	146	144	144	138	136	
-70	F.D	6	9	-	-	18	75	86	96	97	*	99	99	96	96	92	68	39	22	6	-70
	ANG	2	2	-	-	2	1	1	1	1	*	2	2	1	1	1	1	2	2	2	
	S/N	19	28	-	-	20	13	2	-4	-9	*	-6	-3	1	6	18	25	25	24	19	
	DBW	148	139	-	-	147	154	165	172	177	*	174	171	166	161	149	142	142	143	148	
-80	F.D	-	-	-	7	54	87	97	*	*	*	*	99	97	97	94	89	79	64	-	-80
	ANG	-	-	-	1	1	0	0	*	*	*	*	0	0	0	0	0	0	0	-	
	S/N	-	-	-	7	3	-1	-5	*	*	*	*	-5	-4	0	5	10	15	19	-	
	DBW	-	-	-	160	164	169	173	*	*	*	*	173	172	168	162	157	152	148	-	

GEOGRAPHIC LONGITUDE

Figure II-53

MAR GMT 12 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 22.10MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
80	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	6	-	-	
70	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	5	-	-	70
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	53	48	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	118	123	-	-	
	F.D	-	-	-	-	-	-	-	-	-	6	11	21	28	15	9	16	10	-	-	
60	ANG	-	-	-	-	-	-	-	-	-	10	10	8	5	3	2	0	0	-	-	60
	S/N	-	-	-	-	-	-	-	-	-	51	56	57	54	53	51	43	51	-	-	
	DBW	-	-	-	-	-	-	-	-	-	120	115	114	117	118	120	128	120	-	-	
	F.D	-	-	-	-	-	-	5	14	21	27	34	38	38	6	-	5	-	-	-	
50	ANG	-	-	-	-	-	-	0	1	2	3	2	1	0	11	-	9	-	-	-	50
	S/N	-	-	-	-	-	-	39	42	50	52	52	51	43	49	-	49	-	-	-	
	DBW	-	-	-	-	-	-	132	129	121	119	119	120	128	122	-	122	-	-	-	
	F.D	-	-	-	-	-	-	-	-	5	9	15	17	24	23	20	9	-	-	-	
40	ANG	-	-	-	-	-	-	-	-	10	10	10	9	8	6	6	5	-	-	-	40
	S/N	-	-	-	-	-	-	-	-	48	45	46	47	48	49	50	49	-	-	-	
	DBW	-	-	-	-	-	-	-	-	123	126	125	124	123	122	121	122	-	-	-	
	F.D	-	-	-	-	-	-	-	13	27	36	46	54	15	13	16	7	-	-	-	
30	ANG	-	-	-	-	-	-	-	5	5	6	6	5	4	3	2	2	-	-	-	30
	S/N	-	-	-	-	-	-	-	44	44	43	44	45	46	47	48	47	-	-	-	
	DBW	-	-	-	-	-	-	-	127	127	128	127	126	125	124	123	124	-	-	-	
	F.D	-	-	-	-	-	-	-	7	16	20	24	19	22	16	22	-	-	-	-	
20	ANG	-	-	-	-	-	-	-	2	2	3	3	2	1	0	0	-	-	-	-	20
	S/N	-	-	-	-	-	-	-	39	40	40	41	41	42	34	45	-	-	-	-	
	DBW	-	-	-	-	-	-	-	132	131	131	130	130	129	137	126	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	19	24	29	27	10	9	10	-	-	-	-	
10	ANG	-	-	-	-	-	-	-	-	0	0	0	0	6	5	5	-	-	-	-	10
	S/N	-	-	-	-	-	-	-	-	36	32	32	35	37	41	43	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	135	139	139	136	134	130	128	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	6	6	10	9	14	10	12	-	-	-	-	
0	ANG	-	-	-	-	-	-	-	-	5	6	6	5	5	4	4	-	-	-	-	0
	S/N	-	-	-	-	-	-	-	-	33	27	25	32	36	40	43	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	138	142	141	139	135	131	128	-	-	-	-	
	F.D	-	-	-	-	-	-	-	6	6	9	18	18	22	15	11	-	-	-	-	
-10	ANG	-	-	-	-	-	-	-	3	4	4	4	4	3	3	2	-	-	-	-	-10
	S/N	-	-	-	-	-	-	-	29	29	27	28	31	34	38	42	-	-	-	-	
	DBW	-	-	-	-	-	-	-	142	142	144	143	140	137	133	129	-	-	-	-	
	F.D	-	-	-	-	-	-	-	5	12	22	35	46	50	45	8	-	-	-	-	
-20	ANG	-	-	-	-	-	-	-	1	2	2	2	1	1	0	5	-	-	-	-	-20
	S/N	-	-	-	-	-	-	-	24	24	25	26	28	31	33	38	-	-	-	-	
	DBW	-	-	-	-	-	-	-	147	147	146	145	143	140	138	133	-	-	-	-	
	F.D	-	-	-	-	-	-	-	-	-	8	11	6	11	10	14	5	-	-	-	
-30	ANG	-	-	-	-	-	-	-	-	-	0	0	4	4	3	3	3	-	-	-	-30
	S/N	-	-	-	-	-	-	-	-	-	21	22	23	28	33	39	38	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	150	149	148	143	138	132	133	-	-	-	
	F.D	-	-	-	-	-	-	-	5	7	7	10	20	25	24	13	8	-	-	-	
-40	ANG	-	-	-	-	-	-	-	2	3	3	3	3	2	2	1	1	-	-	-	-40
	S/N	-	-	-	-	-	-	-	20	18	19	20	23	27	31	37	37	-	-	-	
	DBW	-	-	-	-	-	-	-	151	153	152	151	148	144	140	134	134	-	-	-	
	F.D	-	-	-	-	-	-	-	9	12	14	18	28	33	31	19	22	10	-	-	
-50	ANG	-	-	-	-	-	-	-	1	1	2	2	1	1	0	0	0	0	-	-	-50
	S/N	-	-	-	-	-	-	-	13	17	17	19	22	23	28	33	31	34	-	-	
	DBW	-	-	-	-	-	-	-	158	154	154	152	149	148	143	138	140	137	-	-	
	F.D	-	-	-	-	-	-	-	-	13	18	24	38	41	33	24	18	9	-	-	
-60	ANG	-	-	-	-	-	-	-	-	0	0	0	0	0	3	3	3	3	-	-	-60
	S/N	-	-	-	-	-	-	-	-	14	13	12	15	19	21	27	27	26	-	-	
	DBW	-	-	-	-	-	-	-	-	157	158	159	156	152	150	144	144	145	-	-	
	F.D	-	-	-	-	-	-	-	9	14	19	26	32	41	41	26	10	-	-	-	
-70	ANG	-	-	-	-	-	-	-	2	3	3	3	3	3	2	2	2	-	-	-	-70
	S/N	-	-	-	-	-	-	-	12	12	10	11	12	15	20	27	29	-	-	-	
	DBW	-	-	-	-	-	-	-	159	159	161	160	159	156	151	144	142	-	-	-	
	F.D	-	-	-	-	-	-	11	17	23	29	35	40	46	44	33	21	11	-	-	
-80	ANG	-	-	-	-	-	-	1	1	2	2	2	2	2	1	1	1	1	-	-	-80
	S/N	-	-	-	-	-	-	12	5	7	7	8	14	17	19	22	24	26	-	-	
	DBW	-	-	-	-	-	-	159	166	164	164	163	157	154	152	149	147	145	-	-	

GEOGRAPHIC LONGITUDE

Figure II-54

MAR GMT 24 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 4.20MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	99	99	99	99	99	98	95	86	65	47	60	82	90	95	97	98	98	98	99	80
	ANG	8	8	9	11	13	17	23	35	58	90	59	36	24	18	14	11	9	8	8	
	S/N	34	36	39	39	41	43	44	47	46	43	45	47	44	42	40	30	33	34	34	
	DBW	117	115	112	112	110	108	107	104	105	108	106	104	107	109	111	121	118	117	117	
70	F.D	99	99	99	99	99	99	99	97	94	90	91	95	96	97	98	99	99	99	99	70
	ANG	1	2	2	3	5	8	11	16	22	25	22	17	12	9	6	4	3	2	1	
	S/N	23	25	30	33	35	36	39	41	40	41	40	38	35	37	35	32	26	23	23	
	DBW	128	126	121	118	116	115	112	110	111	110	111	113	116	114	116	119	125	128	128	
60	F.D	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	60
	ANG	8	8	8	9	0	2	4	7	9	10	9	7	5	3	1	10	9	8	8	
	S/N	5	3	11	17	24	28	30	32	32	32	36	36	35	33	29	23	16	9	5	
	DBW	146	148	140	134	127	123	121	119	119	119	115	115	116	118	122	128	135	142	146	
50	F.D	*	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	*	50
	ANG	*	5	5	5	7	9	11	1	3	3	3	2	0	10	8	6	5	5	*	
	S/N	*	-8	-1	8	12	14	15	21	30	28	29	31	26	23	22	17	3	-7	*	
	DBW	*	160	153	143	139	137	136	130	121	120	119	120	125	128	129	134	148	159	*	
40	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	40
	ANG	*	*	*	3	4	5	7	8	10	10	10	9	8	6	4	2	*	*	*	
	S/N	*	*	*	3	16	15	16	22	22	17	19	21	21	20	19	5	*	*	*	
	DBW	*	*	*	148	135	136	135	129	127	129	128	129	130	131	132	146	*	*	*	
30	F.D	*	*	*	99	99	99	99	99	99	99	99	99	99	99	99	99	*	*	*	30
	ANG	*	*	*	0	1	2	3	5	6	6	6	6	4	2	1	0	*	*	*	
	S/N	*	*	*	-6	14	16	18	17	16	15	16	16	18	17	15	-1	*	*	*	
	DBW	*	*	*	158	137	135	133	133	131	132	132	132	133	134	136	153	*	*	*	
20	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	20
	ANG	*	*	*	*	4	6	1	2	3	2	2	2	1	0	5	*	*	*	*	
	S/N	*	*	*	*	5	5	11	12	11	11	12	11	13	15	5	*	*	*	*	
	DBW	*	*	*	*	146	145	139	136	135	135	135	136	137	136	146	*	*	*	*	
10	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	10
	ANG	*	*	*	*	2	3	5	6	0	0	6	6	5	4	3	*	*	*	*	
	S/N	*	*	*	*	3	1	2	3	5	5	-7	-3	3	3	0	*	*	*	*	
	DBW	*	*	*	*	148	147	144	143	139	133	147	147	147	147	148	*	*	*	*	
0	F.D	*	*	*	*	99	99	99	99	99	*	*	99	99	99	99	*	*	*	*	0
	ANG	*	*	*	*	1	2	3	4	4	*	*	3	3	2	1	*	*	*	*	
	S/N	*	*	*	*	-2	1	-6	-2	-3	*	*	-7	0	2	-0	*	*	*	*	
	DBW	*	*	*	*	154	149	148	147	147	*	*	149	149	149	152	*	*	*	*	
-10	F.D	*	*	*	*	*	99	99	99	99	99	*	99	99	99	*	*	*	*	*	-10
	ANG	*	*	*	*	*	0	1	2	2	2	*	2	1	0	*	*	*	*	*	
	S/N	*	*	*	*	*	-2	-7	-5	-4	-7	*	-8	0	-2	*	*	*	*	*	
	DBW	*	*	*	*	*	154	151	152	151	151	*	151	151	154	*	*	*	*	*	
-20	F.D	*	*	*	*	*	*	99	99	99	99	99	*	99	99	*	*	*	*	*	-20
	ANG	*	*	*	*	*	*	0	1	1	1	1	*	0	4	*	*	*	*	*	
	S/N	*	*	*	*	*	*	-5	-9	-8	-4	-9	*	0	-10	*	*	*	*	*	
	DBW	*	*	*	*	*	*	155	158	158	154	153	*	150	162	*	*	*	*	*	
-30	F.D	*	*	*	*	*	*	*	*	99	*	*	*	99	99	99	*	*	*	*	-30
	ANG	*	*	*	*	*	*	*	*	3	*	*	*	3	2	1	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	-10	*	*	*	-9	-10	-8	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	162	*	*	*	161	162	160	*	*	*	*	
-40	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-40
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-50	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-50
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-60	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-60
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-70	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-70
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
-80	F.D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-80
	ANG	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	S/N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	DBW	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

GEOGRAPHIC LONGITUDE

Figure II-55

MAR GMT 24 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 6.20MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	99	98	97	97	95	90	76	48	18	7	15	39	64	80	87	91	93	95	99	80
	ANG	8	8	9	11	13	18	25	41	61	90	61	42	27	19	14	11	10	8	8	
	S/N	41	43	46	46	47	49	50	51	49	44	49	51	50	48	46	37	39	41	41	
	DBW	114	112	109	109	108	106	105	104	106	111	106	104	105	107	109	118	116	114	114	
70	F.D	99	99	99	99	98	97	95	86	71	58	62	75	83	89	93	99	99	99	99	70
	ANG	1	1	2	3	5	8	11	17	24	29	25	18	13	9	6	4	2	1	1	
	S/N	31	32	38	41	42	44	46	47	45	46	46	44	42	44	42	40	34	31	31	
	DBW	124	123	117	114	113	111	109	108	110	109	109	111	113	111	113	115	121	124	124	
60	F.D	99	99	99	99	99	99	99	97	94	91	90	94	95	97	98	98	99	99	99	60
	ANG	8	8	8	9	0	2	4	7	9	10	10	8	5	2	0	5	4	3	8	
	S/N	20	18	23	27	40	35	37	39	39	39	43	43	42	40	34	32	28	24	20	
	DBW	135	137	132	128	115	120	118	116	116	116	112	112	113	115	121	123	127	131	135	
50	F.D	99	99	99	99	99	98	96	98	97	96	95	96	96	92	97	99	99	99	99	50
	ANG	4	4	4	5	2	9	11	1	2	3	3	1	0	10	3	6	5	4	4	
	S/N	9	11	15	19	22	24	24	28	37	37	38	39	37	33	32	29	20	12	9	
	DBW	146	144	140	136	133	131	131	127	118	116	115	116	118	122	123	126	135	143	146	
40	F.D	99	99	99	99	99	99	99	97	94	92	90	94	95	97	98	99	99	99	99	40
	ANG	1	1	1	2	3	5	7	9	10	11	11	10	8	6	0	2	1	1	1	
	S/N	-6	-2	6	19	28	25	26	32	32	27	29	31	31	31	30	21	7	-3	-6	
	DBW	162	158	149	136	127	130	129	123	121	124	123	123	124	124	125	134	148	159	162	
30	F.D	*	*	*	99	99	99	99	99	97	95	94	97	98	99	99	99	*	*	*	30
	ANG	*	*	*	6	0	2	3	5	6	6	6	6	4	2	1	6	*	*	*	
	S/N	*	*	*	4	22	26	29	27	28	27	28	28	29	28	25	5	*	*	*	
	DBW	*	*	*	151	133	128	126	126	124	125	125	125	126	127	130	150	*	*	*	
20	F.D	*	*	*	99	99	99	99	99	99	99	98	99	99	98	99	99	*	*	*	20
	ANG	*	*	*	3	4	6	0	2	2	2	2	1	1	6	5	3	*	*	*	
	S/N	*	*	*	-3	20	18	23	23	23	24	24	24	24	19	20	-3	*	*	*	
	DBW	*	*	*	159	135	135	130	129	128	127	128	128	130	135	135	159	*	*	*	
10	F.D	*	*	*	*	99	99	99	99	98	98	97	99	99	99	99	*	*	*	*	10
	ANG	*	*	*	*	2	3	5	6	6	6	6	6	5	4	3	*	*	*	*	
	S/N	*	*	*	*	18	16	16	18	17	9	10	12	18	17	14	*	*	*	*	
	DBW	*	*	*	*	137	136	134	133	132	136	136	136	136	136	137	*	*	*	*	
0	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	0
	ANG	*	*	*	*	0	1	3	4	4	4	4	3	3	2	1	*	*	*	*	
	S/N	*	*	*	*	9	15	10	13	12	2	3	10	16	16	14	*	*	*	*	
	DBW	*	*	*	*	146	138	137	136	136	137	137	137	137	138	140	*	*	*	*	
-10	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-10
	ANG	*	*	*	*	3	0	1	2	2	2	2	1	1	0	4	*	*	*	*	
	S/N	*	*	*	*	5	18	9	11	13	11	7	10	15	10	5	*	*	*	*	
	DBW	*	*	*	*	150	137	140	140	139	139	139	139	140	145	150	*	*	*	*	
-20	F.D	*	*	*	*	99	99	99	99	99	99	99	99	98	98	99	*	*	*	*	-20
	ANG	*	*	*	*	4	3	4	0	0	0	0	0	4	4	2	*	*	*	*	
	S/N	*	*	*	*	5	8	6	10	11	10	8	3	8	8	6	*	*	*	*	
	DBW	*	*	*	*	150	147	147	143	143	144	142	146	147	147	149	*	*	*	*	
-30	F.D	*	*	*	*	99	99	99	99	99	99	99	99	99	99	99	*	*	*	*	-30
	ANG	*	*	*	*	1	2	3	3	3	5	4	3	3	2	1	*	*	*	*	
	S/N	*	*	*	*	4	6	7	8	9	7	6	7	9	7	9	*	*	*	*	
	DBW	*	*	*	*	151	149	148	147	146	148	148	147	146	148	146	*	*	*	*	
-40	F.D	*	*	*	*	99	99	99	99	99	99	99	98	98	98	99	*	*	*	*	-40
	ANG	*	*	*	*	0	0	1	1	2	2	2	2	2	1	0	*	*	*	*	
	S/N	*	*	*	*	1	2	3	4	5	7	7	7	5	4	3	*	*	*	*	
	DBW	*	*	*	*	154	153	152	151	150	148	148	148	150	151	152	*	*	*	*	
-50	F.D	*	*	*	*	99	99	99	99	99	99	99	97	96	98	98	*	*	*	*	-50
	ANG	*	*	*	*	1	3	0	0	1	1	1	1	1	0	2	*	*	*	*	
	S/N	*	*	*	*	-2	0	0	1	2	3	5	5	3	1	0	*	*	*	*	
	DBW	*	*	*	*	158	156	155	154	153	152	150	150	152	154	156	*	*	*	*	
-60	F.D	*	*	*	*	99	99	99	99	99	99	99	95	92	94	96	*	*	*	*	-60
	ANG	*	*	*	*	1	2	2	3	0	0	0	0	3	3	1	*	*	*	*	
	S/N	*	*	*	*	-5	0	-1	-1	0	0	-1	5	0	-4	-5	*	*	*	*	
	DBW	*	*	*	*	161	156	157	157	155	155	157	150	156	160	161	*	*	*	*	
-70	F.D	*	*	*	*	99	99	99	99	99	99	99	99	94	95	96	99	*	*	*	-70
	ANG	*	*	*	*	0	1	2	2	2	3	3	2	2	2	0	1	*	*	*	
	S/N	*	*	*	*	-8	-2	-5	-4	-3	-4	-4	-5	-6	-7	-5	-2	*	*	*	
	DBW	*	*	*	*	164	158	161	160	159	160	160	161	162	163	161	158	*	*	*	
-80	F.D	*	*	*	99	*	99	99	*	99	99	99	99	96	95	95	95	95	95	*	-80
	ANG	*	*	*	0	*	1	1	*	1	2	1	1	1	1	1	0	0	2	*	
	S/N	*	*	*	-4	*	-8	-10	*	-9	-9	-8	-4	-2	-2	-3	4	-3	-9	*	
	DBW	*	*	*	160	*	164	166	*	165	165	164	160	158	158	159	151	159	165	*	

GEOGRAPHIC LONGITUDE

Figure II-56

MAR GMT 24 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 8.30MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.O	96	91	90	87	80	66	41	15	-	-	-	9	22	50	66	74	82	86	96	80
	ANG	8	9	10	11	14	20	30	41	-	-	-	42	30	23	16	12	10	9	8	
	S/N	46	48	51	51	52	53	54	55	-	-	-	55	54	52	51	42	45	46	46	
	DBW	113	111	108	108	107	106	105	104	-	-	-	104	105	107	108	117	114	113	113	
70	F.O	98	98	98	95	94	90	81	59	35	22	26	40	57	71	80	93	96	97	98	70
	ANG	1	1	2	3	5	8	12	19	28	31	28	22	15	10	6	4	3	2	1	
	S/N	37	38	43	46	48	49	51	52	49	50	50	48	47	49	48	45	39	37	37	
	DBW	122	121	116	113	111	110	108	107	110	109	109	111	112	110	111	114	120	122	122	
60	F.O	97	97	97	94	97	96	94	87	78	68	65	71	78	84	92	79	93	96	97	60
	ANG	3	3	4	5	0	2	4	7	10	12	11	9	6	3	1	11	5	4	3	
	S/N	30	27	30	33	42	40	43	44	44	44	48	49	48	46	41	39	36	33	30	
	DBW	129	132	129	126	117	119	116	115	115	115	111	110	111	113	118	120	123	126	129	
50	F.O	98	99	99	99	94	91	84	92	88	84	81	82	82	64	79	96	98	97	98	50
	ANG	0	0	5	1	7	9	12	1	3	3	3	2	0	12	9	2	1	0	0	
	S/N	23	24	26	27	29	30	30	34	43	44	46	45	39	39	39	37	31	25	23	
	DBW	136	135	133	132	130	129	129	125	116	114	113	114	120	120	120	122	128	134	136	
40	F.O	99	99	99	99	97	97	94	84	74	65	61	62	67	78	86	97	98	98	99	40
	ANG	1	1	2	2	3	5	7	9	11	12	12	11	9	7	5	2	1	1	1	
	S/N	12	15	21	29	32	31	33	39	40	36	38	39	38	38	37	31	22	15	12	
	DBW	147	144	138	130	127	127	126	120	118	121	120	120	121	121	122	128	137	144	147	
30	F.O	97	97	99	99	98	98	96	93	84	79	75	77	88	91	98	99	99	96	97	30
	ANG	2	2	3	0	0	2	3	5	7	7	7	6	4	3	1	0	3	2	2	
	S/N	-5	-1	6	29	30	32	35	36	37	35	37	36	36	36	34	29	5	-4	-5	
	DBW	165	161	153	130	129	124	123	122	120	122	122	122	123	123	125	130	154	164	165	
20	F.O	*	*	99	99	98	97	98	96	92	91	90	92	92	94	96	98	99	*	*	20
	ANG	*	*	3	3	2	6	1	2	3	3	2	2	1	0	3	2	1	*	*	
	S/N	*	*	-3	13	29	25	31	32	33	33	34	33	33	27	29	14	-3	*	*	
	DBW	*	*	163	146	130	130	125	124	123	124	124	124	125	130	130	145	163	*	*	
10	F.O	*	*	*	99	99	98	96	92	94	92	83	86	86	89	97	99	*	*	*	10
	ANG	*	*	*	1	0	3	5	6	0	0	7	6	6	4	1	0	*	*	*	
	S/N	*	*	*	8	28	23	26	28	29	28	21	23	27	26	24	8	*	*	*	
	DBW	*	*	*	151	131	131	128	127	126	123	131	131	131	131	131	151	*	*	*	
0	F.O	*	*	*	99	99	99	98	95	92	90	89	91	90	92	97	98	*	*	*	0
	ANG	*	*	*	0	0	1	3	4	4	4	4	4	3	2	1	1	*	*	*	
	S/N	*	*	*	5	21	23	20	24	25	13	14	21	26	26	25	1	*	*	*	
	DBW	*	*	*	154	138	132	131	130	129	132	132	132	132	132	132	158	*	*	*	
-10	F.O	*	*	*	*	99	99	98	96	93	91	90	92	92	93	98	98	*	*	*	-10
	ANG	*	*	*	*	2	0	1	2	2	3	2	2	1	0	0	2	*	*	*	
	S/N	*	*	*	*	18	20	19	24	25	24	21	23	26	22	27	-10	*	*	*	
	DBW	*	*	*	*	141	139	134	132	132	132	132	133	133	137	132	170	*	*	*	
-20	F.O	*	*	*	*	96	96	96	93	95	93	91	89	89	85	99	*	*	*	*	-20
	ANG	*	*	*	*	2	4	0	0	1	1	1	1	0	4	2	*	*	*	*	
	S/N	*	*	*	*	18	20	24	22	24	24	23	20	19	20	19	*	*	*	*	
	DBW	*	*	*	*	141	139	133	135	135	135	134	136	140	139	140	*	*	*	*	
-30	F.O	*	*	*	*	97	95	94	93	95	92	91	89	90	92	98	*	*	*	*	-30
	ANG	*	*	*	*	0	3	3	3	4	4	4	4	3	3	1	*	*	*	*	
	S/N	*	*	*	*	18	20	19	21	22	19	19	19	22	21	19	*	*	*	*	
	DBW	*	*	*	*	141	139	140	138	137	140	140	140	137	138	140	*	*	*	*	
-40	F.O	*	*	*	*	96	95	94	96	94	91	90	86	86	89	91	99	*	*	*	-40
	ANG	*	*	*	*	0	0	1	2	2	3	3	3	2	1	0	0	*	*	*	
	S/N	*	*	*	*	15	16	17	18	19	19	19	19	20	18	17	-2	*	*	*	
	DBW	*	*	*	*	144	143	142	141	140	140	140	140	139	141	142	162	*	*	*	
-50	F.O	*	*	*	*	96	94	94	96	94	92	91	81	79	86	89	*	*	*	*	-50
	ANG	*	*	*	*	2	3	0	0	1	2	2	2	1	0	3	*	*	*	*	
	S/N	*	*	*	*	13	14	15	16	17	18	18	18	18	16	14	*	*	*	*	
	DBW	*	*	*	*	146	145	144	143	142	141	141	141	141	143	145	*	*	*	*	
-60	F.O	*	*	*	*	99	99	99	97	97	96	95	79	76	78	83	*	*	*	*	-60
	ANG	*	*	*	*	1	2	3	3	0	0	0	0	0	3	2	*	*	*	*	
	S/N	*	*	*	*	10	13	13	13	14	14	11	11	14	10	9	*	*	*	*	
	DBW	*	*	*	*	149	146	146	146	145	145	148	148	145	149	150	*	*	*	*	
-70	F.O	*	*	*	99	99	99	99	97	96	94	93	89	76	80	82	99	*	*	*	-70
	ANG	*	*	*	0	1	1	2	2	3	3	3	3	3	2	2	1	*	*	*	
	S/N	*	*	*	2	7	11	10	11	11	11	9	8	7	8	10	6	*	*	*	
	DBW	*	*	*	157	152	148	149	148	148	148	150	151	152	151	149	153	*	*	*	
-80	F.O	*	99	99	99	99	99	98	97	96	95	94	93	82	82	81	81	82	83	*	-80
	ANG	*	2	2	0	0	1	1	1	2	2	2	2	2	1	1	1	0	0	*	
	S/N	*	1	-0	2	-1	6	5	3	4	4	5	9	11	11	11	10	5	13	*	
	DBW	*	158	160	157	161	153	154	156	155	155	154	150	148	148	148	149	154	146	*	

GEOGRAPHIC LONGITUDE

Figure II-57

MAR GMT 24 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 12.40MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	60	55	49	43	32	18	-	-	-	-	-	-	-	-	10	23	36	48	60	80
	ANG	11	11	13	15	18	23	-	-	-	-	-	-	-	-	19	15	13	12	11	
	S/N	51	53	55	55	56	57	-	-	-	-	-	-	-	-	55	47	49	51	51	
	DBW	113	111	109	109	108	107	-	-	-	-	-	-	-	-	109	117	115	113	113	
70	F.D	76	77	77	70	64	50	33	13	-	-	-	-	-	16	32	46	64	72	76	70
	ANG	2	3	3	5	7	11	16	21	-	-	-	-	-	12	9	7	4	3	2	
	S/N	43	44	49	51	53	54	55	56	-	-	-	-	-	54	53	50	45	43	43	
	DBW	121	120	115	113	111	110	109	108	-	-	-	-	-	110	111	114	119	121	121	
60	F.D	47	50	49	44	77	71	60	42	25	16	14	-	8	19	45	57	27	39	47	60
	ANG	11	12	12	14	1	3	6	10	12	14	13	-	8	5	2	0	12	12	11	
	S/N	39	35	37	38	43	46	48	49	49	48	53	-	53	51	50	44	42	41	39	
	DBW	125	129	127	126	121	118	116	115	115	116	111	-	111	113	114	120	122	123	125	
50	F.D	73	80	74	72	60	47	68	56	44	35	31	14	14	27	9	30	49	68	73	50
	ANG	2	2	6	7	9	12	0	3	5	5	5	3	2	0	11	9	7	2	2	
	S/N	36	36	36	34	35	36	35	41	49	50	51	50	48	50	44	43	40	38	36	
	DBW	128	128	128	130	129	128	129	123	115	114	113	114	116	114	120	121	124	126	128	
40	F.D	85	82	85	83	76	69	49	31	16	37	7	-	-	-	22	55	69	76	85	40
	ANG	2	2	3	3	4	6	10	12	13	0	14	-	-	-	7	4	3	2	2	
	S/N	31	32	35	39	37	38	39	45	47	46	44	-	-	-	44	41	36	32	31	
	DBW	133	132	129	125	126	125	125	119	117	118	120	-	-	-	120	123	128	132	133	
30	F.D	73	75	87	87	81	74	61	44	30	22	18	-	12	22	42	60	72	67	73	30
	ANG	4	4	0	0	1	3	5	8	9	9	9	-	6	5	3	1	0	4	4	
	S/N	24	26	28	31	38	39	44	44	45	43	43	-	43	43	42	36	25	21	24	
	DBW	140	138	136	133	124	122	120	120	119	121	121	-	121	121	122	128	139	143	140	
20	F.D	72	76	84	85	73	80	68	53	42	37	33	17	16	24	42	50	65	66	72	20
	ANG	2	2	2	3	6	0	2	4	5	5	4	4	3	2	0	3	3	2	2	
	S/N	15	18	21	29	36	34	41	43	43	42	42	42	42	41	36	29	21	17	15	
	DBW	149	146	143	135	127	127	122	121	121	122	122	122	122	123	128	135	143	147	149	
10	F.D	71	77	84	86	81	72	54	56	47	42	37	21	18	8	24	51	64	65	71	10
	ANG	0	0	0	1	3	5	7	1	1	1	1	1	0	6	5	2	1	0	0	
	S/N	6	9	17	26	35	33	37	41	41	37	38	36	31	36	35	26	17	9	6	
	DBW	158	155	147	138	127	127	124	123	123	124	125	128	133	128	128	138	147	155	158	
0	F.D	67	76	83	86	85	78	63	42	30	23	20	11	10	13	25	46	57	58	67	0
	ANG	1	0	0	1	1	2	4	6	7	6	6	6	5	4	3	0	0	2	1	
	S/N	-1	0	9	20	33	33	32	38	39	26	28	36	36	36	35	24	12	3	-1	
	DBW	166	164	155	144	130	128	126	125	125	129	129	128	128	128	129	140	152	161	166	
-10	F.D	76	77	80	82	84	80	66	48	35	28	23	15	14	17	27	43	53	66	76	-10
	ANG	0	0	2	3	0	1	2	4	4	4	4	3	3	2	1	1	1	0	0	
	S/N	-4	-2	4	14	29	33	31	37	37	35	35	35	35	35	33	20	6	-2	-4	
	DBW	169	167	160	150	135	131	129	127	127	129	129	129	129	129	131	144	158	167	169	
-20	F.D	*	80	76	71	66	74	63	49	40	30	23	20	19	20	43	55	67	72	*	-20
	ANG	*	1	2	3	0	0	1	2	2	3	3	2	1	1	0	2	2	1	*	
	S/N	*	-9	2	14	28	29	33	35	36	35	35	34	34	31	33	14	-0	-10	*	
	DBW	*	174	162	150	136	135	131	129	128	129	129	130	130	133	131	150	165	175	*	
-30	F.D	*	*	84	82	69	59	60	58	50	38	33	31	31	26	30	54	68	*	*	-30
	ANG	*	*	1	1	3	4	0	0	0	1	1	0	0	5	3	1	0	*	*	
	S/N	*	*	-5	14	32	33	37	33	34	32	32	29	33	33	30	15	-0	*	*	
	DBW	*	*	170	150	132	131	127	131	130	132	132	135	131	131	134	149	165	*	*	
-40	F.D	*	*	84	85	73	67	60	54	44	35	32	25	25	33	39	48	63	*	*	-40
	ANG	*	*	3	0	1	2	3	3	4	5	5	4	4	3	2	0	0	*	*	
	S/N	*	*	-7	11	30	31	31	32	32	29	29	29	32	31	30	15	-4	*	*	
	DBW	*	*	172	153	134	133	133	132	132	135	135	135	132	133	134	149	169	*	*	
-50	F.D	*	*	89	86	69	69	62	55	45	37	34	17	15	26	37	39	57	*	*	-50
	ANG	*	*	2	3	3	0	1	2	3	3	3	3	2	2	1	0	2	*	*	
	S/N	*	*	-9	12	29	29	30	30	31	31	28	29	30	29	28	10	-5	*	*	
	DBW	*	*	174	152	135	135	134	134	133	133	136	135	134	135	136	154	170	*	*	
-60	F.D	*	*	90	87	80	71	67	55	41	31	25	26	22	29	37	22	51	*	*	-60
	ANG	*	*	1	2	2	3	0	1	2	2	2	2	1	1	0	3	1	*	*	
	S/N	*	*	-8	14	26	25	28	28	29	28	27	28	27	23	23	10	-9	*	*	
	DBW	*	*	173	150	138	139	136	136	135	136	137	136	137	141	141	154	174	*	*	
-70	F.D	*	*	94	86	78	68	56	51	40	31	25	13	25	31	31	9	31	*	*	-70
	ANG	*	*	0	1	2	3	4	0	0	1	1	0	0	0	3	3	2	*	*	
	S/N	*	*	-0	20	23	23	26	26	26	25	22	19	18	22	24	19	3	*	*	
	DBW	*	*	165	144	141	141	138	138	138	139	142	145	146	142	140	145	161	*	*	
-80	F.D	*	85	80	74	66	57	48	39	31	25	20	17	31	31	30	30	30	32	*	-80
	ANG	*	0	0	1	2	2	3	3	4	4	4	3	3	3	3	2	2	1	*	
	S/N	*	20	12	16	15	19	21	19	16	16	16	20	22	23	23	23	22	22	*	
	DBW	*	144	152	148	149	145	143	145	148	148	148	144	142	141	141	141	142	142	*	
		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	

GEOGRAPHIC LONGITUDE

Figure II-58

MAR GMT 24 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 16.60MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	12	21	17	12	6	-	-	-	-	-	-	-	-	-	-	-	-	7	12	80
	ANG	12	12	13	15	18	-	-	-	-	-	-	-	-	-	-	-	-	12	12	
	S/N	53	55	58	58	58	-	-	-	-	-	-	-	-	-	-	-	-	53	53	
	DBW	114	112	109	109	109	-	-	-	-	-	-	-	-	-	-	-	-	114	114	
70	F.D	25	28	28	33	28	18	7	-	-	-	-	-	-	-	-	-	13	20	25	70
	ANG	4	4	5	6	8	11	16	-	-	-	-	-	-	-	-	-	5	4	4	
	S/N	46	47	52	54	55	56	58	-	-	-	-	-	-	-	-	-	48	46	46	
	DBW	121	120	115	113	112	111	109	-	-	-	-	-	-	-	-	-	119	121	121	
60	F.D	-	8	7	36	36	29	19	9	-	-	-	-	-	-	-	9	-	-	-	60
	ANG	-	12	12	0	2	4	7	10	-	-	-	-	-	-	-	1	-	-	-	
	S/N	-	39	40	37	49	49	51	52	-	-	-	-	-	-	-	45	-	-	-	
	DBW	-	128	127	130	118	118	116	115	-	-	-	-	-	-	-	122	-	-	-	
50	F.D	12	15	17	16	19	11	26	18	10	6	-	-	-	-	-	-	-	9	12	50
	ANG	7	7	8	9	10	12	1	3	5	5	-	-	-	-	-	-	-	7	7	
	S/N	42	41	40	37	38	38	40	43	51	53	-	-	-	-	-	-	-	43	42	
	DBW	125	126	127	130	129	129	127	124	116	114	-	-	-	-	-	-	-	124	125	
40	F.D	39	33	31	28	35	19	6	-	-	-	-	-	-	-	-	-	11	23	39	40
	ANG	3	4	4	5	6	8	10	-	-	-	-	-	-	-	-	-	4	3	3	
	S/N	39	40	41	43	41	42	42	-	-	-	-	-	-	-	-	-	42	40	39	
	DBW	128	127	126	124	126	125	125	-	-	-	-	-	-	-	-	-	125	127	128	
30	F.D	28	31	28	30	34	24	13	-	-	-	-	-	-	-	-	-	8	18	28	30
	ANG	0	1	1	2	3	4	6	-	-	-	-	-	-	-	-	-	1	0	0	
	S/N	34	36	38	41	44	45	47	-	-	-	-	-	-	-	-	-	36	31	34	
	DBW	133	131	129	126	123	122	120	-	-	-	-	-	-	-	-	-	131	136	133	
20	F.D	17	22	14	16	37	22	9	-	-	-	-	-	-	-	-	-	-	11	17	20
	ANG	3	3	6	6	0	1	3	-	-	-	-	-	-	-	-	-	-	3	3	
	S/N	29	30	31	36	40	43	45	-	-	-	-	-	-	-	-	-	-	30	29	
	DBW	138	137	136	131	127	124	122	-	-	-	-	-	-	-	-	-	-	137	138	
10	F.D	12	20	13	18	24	12	10	-	-	-	-	-	-	-	-	-	-	8	12	10
	ANG	1	1	4	4	5	6	0	-	-	-	-	-	-	-	-	-	-	1	1	
	S/N	23	25	29	34	40	40	30	-	-	-	-	-	-	-	-	-	-	25	23	
	DBW	144	142	138	133	127	127	137	-	-	-	-	-	-	-	-	-	-	142	144	
0	F.D	9	18	17	24	27	14	-	-	-	-	-	-	-	-	-	-	-	-	9	0
	ANG	2	2	2	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	2	
	S/N	16	19	23	32	39	40	-	-	-	-	-	-	-	-	-	-	-	-	16	
	DBW	151	148	144	135	128	127	-	-	-	-	-	-	-	-	-	-	-	-	151	
-10	F.D	11	11	14	20	26	16	-	-	-	-	-	-	-	-	-	-	-	-	11	-10
	ANG	1	1	0	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	1	
	S/N	13	14	13	28	38	39	-	-	-	-	-	-	-	-	-	-	-	-	13	
	DBW	154	153	154	139	129	128	-	-	-	-	-	-	-	-	-	-	-	-	154	
-20	F.D	20	14	-	-	11	20	9	-	-	-	-	-	-	-	-	-	-	7	20	-20
	ANG	2	2	-	-	1	1	2	-	-	-	-	-	-	-	-	-	-	2	2	
	S/N	9	12	-	-	37	37	38	-	-	-	-	-	-	-	-	-	-	11	9	
	DBW	158	155	-	-	130	130	129	-	-	-	-	-	-	-	-	-	-	156	158	
-30	F.D	22	23	15	10	14	11	7	6	-	-	-	-	-	-	-	-	-	8	22	-30
	ANG	0	0	2	3	4	0	0	0	-	-	-	-	-	-	-	-	-	0	0	
	S/N	4	7	15	25	37	37	26	26	-	-	-	-	-	-	-	-	-	7	4	
	DBW	163	160	152	142	130	130	141	141	-	-	-	-	-	-	-	-	-	160	163	
-40	F.D	18	24	22	17	31	25	19	11	6	-	-	-	-	-	-	-	-	6	18	-40
	ANG	1	1	1	1	2	3	3	4	4	-	-	-	-	-	-	-	-	1	1	
	S/N	2	5	13	24	35	36	36	37	36	-	-	-	-	-	-	-	-	1	2	
	DBW	165	162	154	143	132	131	131	130	131	-	-	-	-	-	-	-	-	166	165	
-50	F.D	8	18	27	24	32	27	20	11	6	-	-	-	-	-	-	-	-	-	8	-50
	ANG	3	3	0	0	1	1	2	2	3	-	-	-	-	-	-	-	-	-	3	
	S/N	0	3	13	25	34	35	35	35	34	-	-	-	-	-	-	-	-	-	0	
	DBW	168	164	154	142	133	132	132	132	133	-	-	-	-	-	-	-	-	-	168	
-60	F.D	9	22	25	20	22	15	8	-	-	-	-	-	-	-	6	-	-	-	9	-60
	ANG	2	2	3	3	0	0	1	-	-	-	-	-	-	-	0	-	-	-	2	
	S/N	-3	2	12	25	32	29	33	-	-	-	-	-	-	-	18	-	-	-	-3	
	DBW	171	165	155	142	135	138	134	-	-	-	-	-	-	-	149	-	-	-	171	
-70	F.D	*	30	31	26	16	9	6	-	-	-	-	-	-	-	-	-	-	-	*	-70
	ANG	*	1	2	2	3	3	0	-	-	-	-	-	-	-	-	-	-	-	*	
	S/N	*	0	16	27	29	28	22	-	-	-	-	-	-	-	-	-	-	-	*	
	DBW	*	167	151	140	138	139	145	-	-	-	-	-	-	-	-	-	-	-	*	
-80	F.D	10	24	18	12	8	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-80
	ANG	0	1	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	S/N	-9	22	22	22	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-9	
	DBW	177	145	145	145	147	-	-	-	-	-	-	-	-	-	-	-	-	-	177	

GEOGRAPHIC LONGITUDE

Figure II-59

MAR GMT 24 SUNSPOT 70

TRANSMITTER 80.01N - 0.01W FREQUENCY 22.10MC/S

VERTICAL 5H 0L 0DEG ANT= 0DB

PWR= 0.10KW 3 MC/S MAN. NOISE = -148 DBW REQ.S/N= 0DB

GEOGRAPHIC LATITUDE		180	160	140	120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120	-140	-160	-180	GEOGRAPHIC LATITUDE
80	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
70	F.D	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70
	ANG	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
60	F.D	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60
	ANG	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
50	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
40	F.D	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40
	ANG	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
30	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
20	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-10	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-10
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-20	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-20
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-30	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-30
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-40	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-40
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-50	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-50
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-60	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-60
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-70	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-70
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-80	F.D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-80
	ANG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	S/N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	DBW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

GEOGRAPHIC LONGITUDE

Figure II-60

PAGE INTENTIONALLY LEFT BLANK

PAGE LAISSEE EN BLANC INTENTIONNELLEMENT

APPENDIX III

VERTICAL RADIATION PATTERN OF BUOY ANTENNA USED IN THE CALCULATIONS

POWER GAIN OF GROUNDED VERTICAL ANTENNA

HEIGHT 5.00 METERS CONDUCTIVITY 5.0000 -MHOS/METER DIELECTRIC CONSTANT 81.0

	40	-9.7	-7.0	-4.8	-3.2	-2.0	-1.1	-0.5	0.0	0.6	1.1	1.7	1.5	1.3	0.9	0.5	-0.1	-1.0	-2.3	40	
	39	-9.6	-6.8	-4.7	-3.1	-1.9	-1.0	-0.3	0.1	0.8	1.2	1.9	1.7	1.5	1.1	0.7	0.2	-0.6	-1.8	39	
	38	-9.5	-6.7	-4.6	-3.0	-1.7	-0.8	-0.2	0.3	0.9	1.4	2.1	1.9	1.6	1.4	1.0	0.4	-0.3	-1.4	38	
	37	-9.3	-6.6	-4.5	-2.8	-1.6	-0.7	-0.1	0.4	1.0	1.5	2.2	2.0	1.8	1.6	1.2	0.7	0.0	-1.0	37	
	36	-9.2	-6.5	-4.3	-2.7	-1.5	-0.6	0.0	0.5	1.2	1.6	2.4	2.2	2.0	1.8	1.4	1.0	0.4	-0.6	36	
	35	-9.1	-6.4	-4.2	-2.6	-1.4	-0.5	0.2	0.6	1.3	1.8	2.5	2.4	2.2	2.0	1.7	1.2	0.7	-0.2	35	
	34	-9.0	-6.3	-4.1	-2.5	-1.3	-0.4	0.3	0.8	1.4	1.9	2.6	2.5	2.4	2.1	1.9	1.5	1.0	0.2	34	
V	33	-8.9	-6.2	-4.0	-2.4	-1.2	-0.3	0.4	0.9	1.5	2.0	2.8	2.7	2.5	2.3	2.1	1.7	1.3	0.6	33	V
E	32	-8.8	-6.1	-3.9	-2.3	-1.1	-0.2	0.5	1.0	1.7	2.2	2.9	2.8	2.7	2.5	2.3	2.0	1.6	0.9	32	E
R	31	-8.7	-6.0	-3.8	-2.2	-1.0	-0.1	0.6	1.1	1.8	2.3	3.0	2.9	2.8	2.7	2.5	2.2	1.8	1.3	31	R
T	30	-8.6	-5.9	-3.7	-2.1	-0.9	0.0	0.7	1.2	1.9	2.4	3.2	3.1	3.0	2.8	2.7	2.4	2.1	1.6	30	T
I	29	-8.6	-5.8	-3.7	-2.0	-0.8	0.1	0.8	1.3	2.0	2.5	3.3	3.2	3.1	3.0	2.9	2.7	2.4	1.9	29	I
C	28	-8.5	-5.7	-3.6	-1.9	-0.7	0.2	0.9	1.4	2.1	2.6	3.4	3.3	3.3	3.2	3.0	2.9	2.6	2.2	28	C
A	27	-8.4	-5.7	-3.5	-1.9	-0.6	0.3	0.9	1.4	2.2	2.7	3.5	3.4	3.4	3.3	3.2	3.1	2.8	2.5	27	A
L	26	-8.3	-5.6	-3.4	-1.8	-0.6	0.4	1.0	1.5	2.2	2.8	3.6	3.6	3.5	3.5	3.4	3.3	3.1	2.8	26	L
	25	-8.3	-5.5	-3.4	-1.7	-0.5	0.4	1.1	1.6	2.3	2.9	3.7	3.7	3.6	3.6	3.5	3.4	3.3	3.1	25	
R	24	-8.2	-5.4	-3.3	-1.6	-0.4	0.5	1.2	1.7	2.4	3.0	3.8	3.8	3.8	3.7	3.7	3.6	3.5	3.3	24	R
A	23	-8.1	-5.4	-3.2	-1.6	-0.3	0.6	1.2	1.8	2.5	3.0	3.9	3.9	3.9	3.8	3.8	3.8	3.7	3.6	23	A
D	22	-8.1	-5.3	-3.2	-1.5	-0.3	0.6	1.3	1.8	2.5	3.1	4.0	4.0	4.0	4.0	4.0	3.9	3.9	3.8	22	D
I	21	-8.0	-5.3	-3.1	-1.5	-0.2	0.7	1.4	1.9	2.6	3.2	4.0	4.1	4.1	4.1	4.1	4.1	4.1	4.0	21	I
A	20	-8.0	-5.2	-3.1	-1.4	-0.2	0.7	1.4	1.9	2.7	3.3	4.1	4.1	4.2	4.2	4.2	4.2	4.2	4.2	20	A
T	19	-7.9	-5.2	-3.0	-1.4	-0.1	0.8	1.5	2.0	2.7	3.3	4.2	4.2	4.2	4.3	4.3	4.4	4.4	4.4	19	T
I	18	-7.9	-5.1	-3.0	-1.3	-0.1	0.8	1.5	2.0	2.8	3.4	4.2	4.3	4.3	4.4	4.4	4.5	4.5	4.6	18	I
O	17	-7.8	-5.1	-2.9	-1.3	-0.0	0.9	1.6	2.1	2.8	3.4	4.3	4.3	4.4	4.5	4.5	4.6	4.7	4.7	17	O
N	16	-7.8	-5.0	-2.9	-1.2	0.0	0.9	1.6	2.1	2.9	3.5	4.3	4.4	4.5	4.5	4.6	4.7	4.8	4.9	16	N
	15	-7.8	-5.0	-2.8	-1.2	0.0	1.0	1.6	2.2	2.9	3.5	4.4	4.4	4.5	4.6	4.7	4.8	4.9	5.0	15	
A	14	-7.7	-5.0	-2.8	-1.2	0.1	1.0	1.7	2.2	2.9	3.5	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.2	14	A
N	13	-7.7	-5.0	-2.8	-1.2	0.1	1.0	1.7	2.2	3.0	3.6	4.5	4.5	4.6	4.7	4.8	4.9	5.1	5.3	13	N
G	12	-7.7	-4.9	-2.8	-1.1	0.1	1.0	1.7	2.2	3.0	3.6	4.5	4.5	4.6	4.7	4.9	5.0	5.2	5.4	12	G
L	11	-7.7	-4.9	-2.8	-1.1	0.1	1.0	1.7	2.2	3.0	3.6	4.5	4.6	4.7	4.8	4.9	5.0	5.2	5.4	11	L
E	10	-7.6	-4.9	-2.8	-1.1	0.1	1.0	1.7	2.2	3.0	3.6	4.5	4.6	4.7	4.8	4.9	5.1	5.3	5.5	10	E
	9	-7.6	-4.9	-2.8	-1.1	0.1	1.0	1.7	2.2	3.0	3.6	4.5	4.6	4.6	4.8	4.9	5.1	5.3	5.5	9	
	8	-7.7	-4.9	-2.8	-1.1	0.1	1.0	1.7	2.2	2.9	3.6	4.4	4.5	4.6	4.7	4.9	5.1	5.3	5.5	8	
	7	-7.7	-4.9	-2.8	-1.2	0.1	1.0	1.6	2.2	2.9	3.5	4.4	4.5	4.6	4.7	4.8	5.0	5.2	5.5	7	
	6	-7.7	-5.0	-2.8	-1.2	0.0	0.9	1.6	2.1	2.8	3.4	4.3	4.4	4.5	4.6	4.7	4.9	5.1	5.4	6	
	5	-7.8	-5.0	-2.9	-1.3	-0.1	0.8	1.5	2.0	2.7	3.3	4.2	4.2	4.3	4.4	4.6	4.8	5.0	5.2	5	
	4	-7.8	-5.1	-3.0	-1.4	-0.2	0.7	1.3	1.8	2.5	3.1	4.0	4.0	4.1	4.2	4.3	4.5	4.7	5.0	4	
	3	-8.0	-5.3	-3.2	-1.7	-0.5	0.4	1.0	1.5	2.2	2.8	3.6	3.6	3.7	3.8	3.9	4.1	4.3	4.5	3	
	2	-8.3	-5.7	-3.7	-2.1	-1.0	-0.1	0.5	0.9	1.6	2.1	2.9	2.9	2.9	3.0	3.0	3.2	3.4	3.6	2	
	1	-9.3	-6.8	-4.9	-3.4	-2.4	-1.6	-1.1	-0.7	-0.2	0.2	0.9	0.8	0.7	0.7	0.8	0.8	0.9	1.1	1	
		3	4	5	6	7	8	9	10	12	14	16	18	20	22	24	26	28	30		

FREQUENCY MC/S

Figure III-1. Vertical radiation pattern of buoy antenna used in the calculations.

GPO 835-065

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PLENARY MEETING

KINGDOM OF THE NETHERLANDS

Proposals for the work of the Conference

Agenda Item 1 :

The use of single sideband technique in the Maritime Mobile Service in the bands available to that service between 1605 and 4000 kc/s and in the exclusive HF Maritime Mobile Radiotelephone bands.

Proposals

a) Draft resolution relating to the conversion from double sideband operation to single sideband operation in the frequency bands 1605 - 4000 kc/s and 4000 - 23000 kc/s by the maritime mobile service.

b) Consequential revision of Articles 28, 33 and 35 and Appendix 3 of the Radio Regulations.

c) New Appendix 17A.

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Ref.

HOL/70(1)

DRAFT RESOLUTION

Relating to the Conversion from Double Sideband Operation (DSB) to Single Sideband Operation (SSB) in the Frequency bands 1605 - 4000 kc/s and 4000 - 23000 kc/s by the Maritime Mobile Service

The World Administrative Radio Conference, Geneva, 1967,

considering

a) Recommendation No. 28 of the Administrative Radio Conference, Geneva, 1959;

b) Resolution No. 3 of the Administrative Radio Conference, Geneva, 1959;

c) Recommendation No. 3, contained in the Final Report of the Panel of Experts, Geneva, 1963;

d) that the trend towards congestion and saturation in the bands between 4 and 27.5 Mc/s equally applies to the band 1605 - 4000 kc/s;

e) that the conversion from double sideband to single sideband operation in the bands 1605 - 4000 kc/s and 4000 - 23000 kc/s should be completed as soon as possible;

f) that suitable equipment for single sideband operation in the bands referred to in paragraph e) above was not sufficiently available on the date of commencement of the conversion (1 January, 1967) as recommended by the Panel of Experts;

g) that for economical reasons a depreciation period of 7 to 10 years is considered necessary;

resolves

that the conversion from double sideband to single sideband operation in the frequency bands 1605 - 4000 kc/s and 4000 - 23000 kc/s by coast and ship stations operating on Maritime Mobile radiotelephone channels shall take place in accordance with the following schedule.

Ref.

HOL/70(1) (cont.)

A. Frequency bands between 1605 and 4000 kc/s :

1. Coast stations shall be equipped for single sideband operation not later than 1 January, 1970.

2. Coast stations shall cease double sideband operation not later than 1 January, 1970.

3. Administrations should, if possible, endeavour to cease the installation of double sideband equipment on board ship stations not later than 1 January, 1970.

4. During the period of conversion from double sideband to single sideband operation, ship stations, already equipped with single sideband equipment, and coast stations, shall be able to use full carrier (A3H) emission to permit communication with stations using either double sideband or single sideband emissions.

5. Double sideband and A3H emissions by ship stations and A3H emissions by coast stations shall cease on 1 January, 1980. However, on the frequency of 2182 kc/s, the use of single sideband emissions using full carrier may be continued.

B. Frequency bands between 4000 and 23000 kc/s :

1. Coast stations shall be equipped for single sideband operation not later than 1 January, 1970.

2. Coast stations shall cease double sideband operation not later than 1 January, 1970.

3. Administrations should, if possible, endeavour to cease the installation of double sideband equipment on board ship stations not later than 1 January, 1970.

4. During the period of conversion from double sideband to single sideband operation, ship stations, already equipped with single sideband equipment, and coast stations, shall be able to use full carrier (A3H) emission to permit communication with stations using either double sideband or single sideband emissions.

5. Double sideband and A3H emissions by ship stations and A3H emissions by coast stations shall cease on 1 January, 1977.

Ref.

HOL/70(2)

Article 28

Section IV -
Ship stations using radiotelephony

MOD 984 a) send class A3H and receive class A3 and A3H emissions on 2182 kc/s;

Reasons :

To be consistent with the proposal for the introduction of single sideband emissions and to permit communication with survival craft stations. See also proposal relating to Agenda Item 5 (HOL/73(14)).

MOD 985 b) send, in addition class A3A and class A3J emissions on at least two working frequencies;

MOD 986 c) receive, in addition, class A3A and class A3J emissions on all the other frequencies necessary for their service.

HOL/70(3)

Article 33

Section I - General provisions

ADD 1215A (3) Radiotelephone stations of the maritime mobile service shall comply with the provisions of Appendix 17A.

Reasons :

To make Appendix 17A mandatory for radiotelephone stations of the maritime mobile service.

Ref.

HOL/70(4)

Article 35

Section II -
Bands between 1605 and 4000 kc/s

MOD 1325 (3) Except for transmissions authorized on 2182 kc/s, all transmissions on the frequencies between ~~2170~~ 2173.5 and ~~2194~~ 2190.5 kc/s are forbidden.

Reasons :

To reduce the guard band of 2182 kc/s as a result of the technical developments in equipment.

With respect to the two 3.5 kc/s channels thus being made available (2170 - 2173.5 kc/s and 2190.5 - 2194 kc/s), the Netherlands Administration has, at this time, no specific proposals to make. It is, however, considered that the possible use of these two channels should be in conformity with the Table of Frequency Allocations, that is to say for additional calling purposes.

MOD 1337 (2) Coast stations open to the public correspondence service on one or more frequencies between 1605 and 2850 kc/s shall also be capable of transmitting ~~and receiving class A3 emissions~~ on 2182 kc/s with class A3H emissions and be capable of receiving classes A3 and A3H emissions on 2182 kc/s.

Reasons :

See proposal relating to No. 984 (HOL/70(2)).

MOD 1341 (2) The ~~carrier~~ peak envelope power of mobile radiotelephone stations operating in the authorized bands between 1605 and 2850 kc/s shall not exceed ~~100~~ 400 watts.

Ref.

HOL/70(4) (cont.)

MOD 1342 (3) The ~~carrier~~ peak envelope power of coast radiotelephone stations, operating in the authorized bands between 1605 and 3800 kc/s, shall be limited to :

- ~~2~~ 8 kilowatts for coast stations located north of latitude 32° N;
- ~~3.5~~ 14 kilowatts for coast stations located south of latitude 32° N.

Reasons :

To provide in the Radio Regulations a comparable power level for single sideband emissions.

MOD 1350 (2) During the periods mentioned above, except for the transmissions provided for in Article 36, transmissions shall cease within the band ~~2170 - 2194~~ 2173.5 - 2190.5 kc/s.

Reasons :

See proposal relating to No. 1325.

Ref.

HOL/70(5)

APPENDIX 3

Table of Frequency Tolerances

Band : 1605 to 4000 kc/s :

MOD 2. Land Stations :

after Land Stations, add the reference h);

MOD 3. Mobile Stations :

after a) Ship Stations, add the reference i).

Band : 4 to 29.7 Mc/s :

MOD 2. Land Stations :

after a) Coast Stations, add the reference h);

MOD 3. Mobile Stations :

a) Ship Stations :

after 2) Emission other than class A1, add the reference i).

Notes referring to Table of Frequency Tolerances

ADD h) For coast radiotelephone station transmitters installed after 1 January, 1970 the tolerance is 20 c/s.

i) For ship radiotelephone station transmitters (other than those referred to in No. 987) installed after 1 January, 1970 the tolerance is 100 c/s.

Reasons :

To include in the table the frequency tolerances recommended by the C.C.I.R.

See also proposal relating to Appendix 17A (HOL/70(6)).

Ref.

HOL/70(6) ADD

APPENDIX 17A

Technical and operational provisions for radiotelephone stations using single sideband emissions in the maritime mobile bands 1605 - 4000 kc/s and 4000 - 23000 kc/s

(See Articles 28 and 35 and Appendix 17)

1. a) For the class of emission A3A the carrier shall be reduced to 16 dB ± 2 dB below peak envelope power.

   b) For the class of emission A3J the carrier shall be reduced to not less than 40 dB below peak envelope power.

2. The carrier frequency of the transmitters shall be maintained within the following tolerances :

   a) coast stations : ± 20 cycles per second;

   b) ship stations : ± 100 cycles per second; The short-term limits (of the order of 15 minutes) of ship stations shall be ± 40 cycles per second.

3. The transmitter audio-frequency band shall be 350 to 2700 cycles per second, with a permitted amplitude variation of 6 dB.

4. The unwanted frequency modulation of the carrier shall be sufficiently low to prevent harmful distortion.

5. Coast and ship stations shall use upper sideband emissions.

6. Frequency bands between 1605 and 4000 kc/s :

Ref.

HOL/70(6)
(cont.)

6.1 The channel arrangements shall be such that two single sideband channels of at least 3 kc/s bandwidth each are accommodated within each existing double sideband channel of at least 6 kc/s bandwidth.

6.2 The carrier frequency of a station operating in the upper half of a double sideband channel shall be the same as the carrier frequency of the double sideband channel.

6.3 The carrier frequency of a station operating in the lower half of a double sideband channel shall be 3000 cycles per second below the carrier frequency of the double sideband channel.

6.4 The assigned frequency will be 1400 cycles per second higher than the carrier frequency.

7. Frequency bands between 4000 and 23000 kc/s :

7.1 A station utilizing single channel single sideband or two channel independent sideband emissions shall be considered to be in accordance with the Table of Appendix 17 (Revised) if

7.1.1 it operates in the channels with assigned frequencies at the appropriate values listed in the Table;

7.1.2 the necessary bandwidth does not extend beyond the upper or lower limits provided for these emissions in accordance with the Table.

7.2 In the Table of Appendix 17 (Revised) both the assigned and carrier frequencies are shown.

Ref.

HOL/70(6)
(cont.)

7.3 If an administration assigns frequencies other than those indicated above, its radiotelephone service shall not cause harmful interference to radiotelephone stations of the maritime mobile service which use frequencies assigned to them in accordance with Appendix 17 (Revised).

7.4 Independent sideband emission may be used by agreement between administrations concerned and affected in those instances where adjacent single sideband channels are assigned to a coast station.

Reasons :

To include the technical characteristics for single sideband emissions as recommended by the C.C.I.R. as well as the technical characteristics contained in the present Appendix 17, in one new appendix to the Radio Regulations.

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PLENARY MEETING

KINGDOM OF THE NETHERLANDS

Proposals for the work of the Conference

Agenda Item 2.1 :

Frequency bands for coast and ship radiotelephone stations in the 6 Mc/s band

Proposal

Amend Appendices 15 and 17 to provide a number of frequencies for coast and ship radiotelephone stations in the 6 Mc/s band.

See proposals relating to Agenda Item 3, Nos. 447, 448 and 449 (HOL/72(9), Document No. 72).

Reasons :

To meet the increasing requirements of the maritime mobile radiotelephone service.

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Agenda Item 2.2 :

Frequencies for intership radiotelephone traffic

Proposal

The working frequencies listed in Appendix 15, Section B (revised), may be used for intership radiotelephone traffic.

See proposals relating to Agenda Item 3, Nos. 449 (HOL/72(9)) and 1357 (HOL/72(11), Document No. 72).

Reasons :

In accordance with No. 1255, the ship-shore working frequencies listed in Appendix 17 may be used for intership radiotelephone communications.

This provision has proved to be very unsatisfactory, due to interference caused to the public correspondence service. To meet the requirements for intership radiotelephony in the HF maritime mobile bands, the present provision under No. 1357 should be retained.

Agenda Item 2.3 :

The possible use of the high traffic bands
by tankers of 12500 tons gross

Proposal

Ref.

HOL/71(7)

Article 32

SUP 1155

MOD 1156 §20. (1) Ship stations shall use the high traffic band (see No. 1151) or the low traffic band (see No. 1153) according to traffic requirements.

MOD 1157 (2) Each administration shall itself determine the rules according to which ship stations under its jurisdiction are to use the high traffic band or the low traffic band.

Reasons :

To permit ships of any category having a large volume of traffic to use the high traffic bands, which are not now being fully utilized.

Agenda Item 2.5 :

Frequencies to be used by coast stations for wide-band telegraphy, facsimile and special transmission systems

Proposal

Ref.

HOL/71(8)

Article 7

MOD 453 g) Coast stations, telegraphy, wide-band telegraphy, facsimile, and special transmission systems.

Reasons :

In No. 1188 working frequencies are assigned to ship stations using wide-band telegraphy, facsimile and special transmission systems.

However, the Radio Regulations do not explicitly indicate the frequencies on which coast stations should employ these types of emission. The proposed amendment will bring the relevant provisions into line with one another.

See also proposal relating to Agenda Item 3, No. 453 (HOL/72(9), Document No. 72).

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Proposals for the work of the Conference

Agenda Item 3 :

Consequential revision of Appendices 15, 17 and 25 to the Radio Regulations

Proposals

a) Revision of Articles 7, 32 and 35 of the Radio Regulations.

b) Consequential revision of Appendix 15.

c) Consequential revision of Appendix 17.

d) Consequential revision of Appendix 25.

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Ref.

HOL/72(9)

Article 7

Section IV. Maritime Mobile Service

MOD 447 a) Ship stations, telephony (duplex)

~~4063----4133~~	4063 - 4140	kc/s[1]
	6200 - 6211	kc/s
~~8195----8265~~	8195 - 8280	kc/s
~~12330---12400~~	12330 - 12421	kc/s
~~16460---16530~~	16460 - 16558	kc/s
~~22000---22070~~	22000 - 22092	kc/s

Reasons

In order to meet the increasing requirements of the maritime mobile radiotelephone service, the greater part of the frequencies listed in the present Appendix 15, Section B, is transferred to the ship station telephony bands.

ADD 447.1[1] (footnote)

For particular conditions concerning the use of 6204 kc/s see No. 1353.

Reasons :

Consequential upon the inclusion of the frequencies listed in the present Appendix 15, Section B, in the revised bands allocated to the radiotelephone service.

MOD 448 b) Coast Stations, telephony (duplex)

~~4368----4438~~	4361 - 4438	kc/s
	6514 - 6525	kc/s
~~8745----8815~~	8730 - 8815	kc/s
~~13130---13200~~	13109 - 13200	kc/s
~~17290---17360~~	17262 - 17360	kc/s
~~22650---22720~~	22628 - 22720	kc/s

Ref.

HOL/72(9)
(contd.)

Reasons :

To provide for corresponding coast station telephone channels, a similar portion of the coast station telegraphy bands, at present adjacent to the lower end of the coast station telephony bands, is transferred to the latter bands.

MOD 449 c) Ship stations, telephony ~~(single-sideband only)~~ (simplex/duplex)

~~4133----4140~~		
~~6200----6211~~	6211 - 6215	kc/s
~~8273----8280~~	8280 - 8284.5	kc/s
~~12407---12421~~	12421 - 12429	kc/s
~~16537---16562~~	16558 - 16573	kc/s
~~22078---22100~~	22092 - 22096	kc/s

Reasons :

1. By reducing the frequency spacing in the existing high traffic bands so as :

a) to obtain the same number of frequencies within a smaller band, and

b) to reserve a portion of the remaining part of the high traffic bands for teleprinter and data transmission systems,

it is possible to move up the present bands for wide-band telegraphy etc., in order to provide frequency space for the purposes indicated in Nos. 449 and 450.

2. To obtain additional radiotelephone channels for general use of all maritime mobile stations. These frequencies could be used for the following purposes :

a) as ship-shore working frequencies for ships wishing to communicate with a coast station of a nationality other than their own and which are not provided with a working frequency associated with that of the coast station in accordance with Appendix 17.

Ref.

HOL/72(9) (contd.)

b) in case of poor receiving conditions on the working frequency associated with that of the coast station in accordance with Appendix 17, the coast station may request a ship to change to transmission on one of these frequencies.

c) for single channel simplex operation between ship and coast stations with limited power, when traffic density is high on the duplex working frequencies.

d) for inter-ship communication.

See also proposal relating to Agenda Item 3, No. 1357 (HOL/72(11)).

MOD 450 d) Ship stations, telephony (~~double-sideband~~ calling channel)

	4140 - 4144 kc/s
~~8265---8273~~	8284.5 -8288 kc/s
~~12400---12407~~	12429 - 12434 kc/s
~~16530---16537~~	16573 - 16578 kc/s
~~22070---22078~~	22096 - 22100 kc/s

Reasons :

The Netherlands Administration is of the opinion that calling frequencies for radiotelephony are essential. When no calling frequencies are provided a ship station calling a coast station should use the working frequency associated with that of the coast station in accordance with Appendix 17.

It will be impractical for a ship, calling coast stations of other nationalities, to be equipped with numerous crystals.

See also proposal relating to No. 449.

Ref.

HOL/72(9) (contd.)

MOD 451 e) Ship stations, wideband telegraphy, facsimile, and special transmission systems

~~4140----4160~~	4144 - 4164	kc/s
~~6211----6240~~	6215 - 6244	kc/s
~~8280----8320~~	8288 - 8327.5	kc/s
~~12421---12471~~	12434 - 12484	kc/s
~~16562---16622~~	16578 - 16638	kc/s
~~22100---22148~~	22100 - 22148	kc/s

Reasons :

See proposal relating to No. 449 (HOL/72(9)).

ADD 451 A e) (bis) Ship stations, teleprinter and data transmission

4164 - 4170.5	kc/s
6244 - 6255.75	kc/s
8327.5 -8341	kc/s
12484 - 12511.5	kc/s
16638 - 16682	kc/s
22148 - 22191	kc/s

Reasons :

See proposals relating to No. 449 (HOL/72(9)) and Agenda Item 7.1 (Document No. 75).

MOD 452 f) Ship stations, telegraphy

~~4160----4238~~	4170.5 - 4231	kc/s
~~6240----6357~~	6255.75 - 6346	kc/s
~~8320----8476~~	8341 - 8461	kc/s
~~12471---12714~~	12511.5 - 12693	kc/s
~~16622---16952~~	16682 - 16924	kc/s
~~22148---22400~~	22191 - 22378	kc/s
~~25070---25110~~ ‡	25070 - 25110	kc/s ‡

Reasons :

The frequency bands assigned to low traffic ships are reduced to accommodate the coast station telegraphy bands to be transferred as proposed in No. 453.

Ref.

HOL/72(9) (contd.)

See also proposal relating to No. 449 (HOL/72(9)).

MOD 452.1 (footnote)

[1] The frequencies in the band 25070 - 25110 kc/s shall be used as working frequencies in addition to frequencies in the band 22148 - ~~22400~~ 22378 kc/s.

Reasons :

To be consistent with the proposal relating to No. 452.

MOD 453 g) Coast stations, telegraphy, wideband telegraphy ~~and~~, facsimile and special transmission systems.

~~4238----4368~~	4231 - 4361 kc/s
~~6357----6525~~	6346 - 6514 kc/s
~~8476----8745~~	8461 - 8730 kc/s
~~12714---13130~~	12693 - 13109 kc/s
~~16952---17290~~	16924 - 17262 kc/s
~~22400---22650~~ [1]	22378 - 22628 kc/s [1]

Reasons :

Consequential upon the proposals relating to Nos. 448 and 452, the coast station telegraphy bands to be transferred are accommodated in a part of the low traffic ship telegraphy bands cleared for that purpose.

See also proposal relating to Agenda Item 2.5 (HOL/71(8), Document No. 71).

MOD 453.1 (footnote)

[1] Frequencies in the bands 25010 - 25070 kc/s, 25110 - 25600 kc/s, and 26100 - 27500 kc/s may be assigned to coast stations. They are then considered as frequencies additional to those in the band ~~22400---22650~~ 22378 - 22628 kc/s.

Reasons :

To be consistent with the proposal relating to No. 453.

Ref.

HOL/72(10)

Article 32

See also proposals relating to Agenda Items 1 (Document No. 70), 2.3 (HOL/71(7), Document No. 71) and 7.1 (Document No. 75).

Section V - Bands between 4000 and 27500 kc/s

A. General provisions

MOD 1149 §18.(1) Each of the bands reserved for ship radiotelegraph stations, except for the band 25070-25110 kc/s, shall be divided into five ~~four~~ parts, beginning at the low frequency end :

NOC 1150

ADD 1150 A a) (bis) a band of working frequencies for ship stations using teleprinter and data transmission systems;

NOC 1151

NOC 1152

NOC 1153

Reasons :

See proposals relating to No. 451A (HOL/72(9)) and Agenda Item 7.1 (Document No. 75).

C. Traffic

MOD 1173 (3) Working frequencies assigned to coast stations using the bands between 4000 and 27500 kc/s are included within the following band limits :

Ref.

HOL/72(10)
(contd.)

~~4238-to--4368~~	4231 to 4361 kc/s
~~6357-to--6525~~	6346 to 6514 kc/s
~~8476-to--8745~~	8461 to 8730 kc/s
~~12714-to-13130~~	12693 to 13109 kc/s
~~16952-to-17290~~	16924 to 17262 kc/s
~~22400-to-22650-~~	22378 to 22628 kc/s (see No. 453.1)

Reasons :

See proposal relating to No. 453 (HOL/72(9)).

D. Assignment of Frequencies to Mobile Stations

1. Calling frequencies of ship stations

MOD 1175 (2) In the band 4177 to 4187 kc/s, the calling frequencies shall be uniformly distributed. They shall be preferably spaced 0.5 kc/s ~~1-kc/s~~ apart. The extreme frequencies assignable are 4178 and 4186 kc/s as indicated in Section A of Appendix 15.

MOD 1176 (3) In each of the other maritime mobile service bands between 4000 and 18000 kc/s, the calling frequencies shall be in harmonic relationship with those in the band 4177 to 4187 kc/s. In the band 22220 to 22270 kc/s, the preferable spacing of calling frequencies is ~~5-kc/s~~ 2.5 kc/s.

Reasons :

The reduced frequency spacing will increase the number of calling frequencies in each band.

2. Working Frequencies of Mobile Stations

MOD 1181 §33.(1) The working frequencies for high traffic ships in the band ~~4160~~ 4170.5 to 4177 kc/s are so spaced as to provide channels ~~1.5~~ 0.5 kc/s wide, the extreme frequencies assignable being ~~4161~~ 4171 and 4176 kc/s as shown in Section A of Appendix 15.

Ref.

HOL/72(10) (contd.)

Reasons :

See proposals relating to No. 452 (HOL/72(9)) and Agenda Item 7.1 (Document No. 75).

MOD 1182 (2) In the band 4187 to ~~4238~~ 4231 kc/s, the working frequencies of low traffic ships are spaced 0.5 kc/s apart, the extreme frequencies assignable being 4188 and ~~4236.5~~ 4229.5 kc/s as indicated in Section A of Appendix 15.

Reasons :

See proposal relating to No. 452 (HOL/72(9)).

MOD 1185 a) in the high traffic band, the working frequencies are spaced ~~6~~ 2.5 kc/s apart, the extreme frequencies assignable being ~~22151~~ 22192 and 22217 kc/s.

Reasons :

See proposals relating to No. 452 (HOL/72(9)) and Agenda Item 7.1 (Document No. 75).

MOD 1186 b) in the low traffic band, the working frequencies are spaced 2.5 kc/s apart, the extreme frequencies assignable being 22272.5 and ~~22395~~ 22375 kc/s.

Reasons :

See proposal relating to No. 452 (HOL/72(9)).

MOD 1187 §36. In the 25 Mc/s band, the frequency separation shall be ~~3~~ 2.5 kc/s. The extreme frequencies which may be assigned are, as shown in Section A of Appendix 15 : 25075 and 25105 kc/s.

Reasons :

The reduced frequency spacing will increase the number of frequencies.

Ref.

HOL/72(10) (contd.)

MOD 1188 §37. The working frequencies assigned to ship stations using wide-band telegraphy, facsimile and special transmission systems are included within the following band limits :

~~4140 to 4160~~	4144 to 4164	kc/s
~~6211 to 6240~~	6215 to 6244	kc/s
~~8280 to 8320~~	8288 to 8327.5	kc/s
~~12421 to 12471~~	12434 to 12484	kc/s
~~16562 to 16622~~	16578 to 16638	kc/s
22100 to 22148 kc/s		

Reasons :

See proposal relating to No. 451 (HOL/72(9)).

ADD b) (bis) Working Frequencies for Ship Stations using Teleprinter and Data Transmission Systems.

ADD 1191 A §38(bis) The Working frequencies assigned to ship stations using teleprinter and data transmission systems are included within the following band limits :

4164 - 4170.5	kc/s
6244 - 6255.75	kc/s
8327.5- 8341	kc/s
12484 - 12511.5	kc/s
16638 - 16682	kc/s
22148 - 22191	kc/s

ADD 1191 B §38(ter)(1) Each administration shall assign to each ship station under its jurisdiction and employing teleprinter and data transmission systems, one or more series of working frequencies designated in Section A of Appendix 15. The total number of series assigned to each ship shall be determined by traffic requirements.

Ref.

HOL/72(10) (contd.)

ADD 1191 C (2) When ship stations employing teleprinter and data transmission systems are assigned less than the total number of working frequencies in a band, the administration concerned shall assign working frequencies to such ships in accordance with an orderly system of rotation that will ensure approximately the same number of assignments on any one working frequency.

Reasons :

See proposals relating to Nos. 449, 451 A (HOL/72(9)) and Agenda Item 7.1 (Document No. 75).

MOD 1192 §39. The working frequencies assigned to high traffic ships are included within the following band limits :

~~4160~~	4170.5	to	4177	kc/s
~~6240~~	6255.75	to	6265.5	kc/s
~~8320~~	8341	to	8354	kc/s
~~12471~~	12511.5	to	12531	kc/s
~~16622~~	16682	to	16708	kc/s
~~22148~~	22191	to	22220	kc/s

Reasons :

See proposals relating to No. 452 (HOL/72(9)) and Agenda Item 7.1 (Document No. 75).

MOD 1196 §42. Working frequencies assigned to low traffic ships shall be included within the following band limits :

4187	to	~~4238~~	4231	kc/s
6280.5	to	~~6357~~	6346	kc/s
8374	to	~~8476~~	8461	kc/s
12561	to	~~12714~~	12693	kc/s
16748	to	~~16952~~	16924	kc/s
22270	to	~~22400~~	22378	kc/s

Reasons :

See proposal relating to No. 452 (HOL/72(9)).

Ref.

HOL/72(11)

Article 35

See also proposals relating to Agenda Item 1 (HOL/70(4), Document No. 70).

Section III. Bands between 4000 and 23000 kc/s

A. Call, Reply and Safety

MOD 1352 §14. In the bands authorized for radiotelephony, ship stations may use, for calling, one of the following frequencies :

	4140.5 kc/s
~~8269~~	8284.5 kc/s
~~12403.5~~	12429 kc/s
~~16533.5~~	16573 kc/s
~~22074~~	22096 kc/s

Reasons :

See proposal relating to No. 450 (HOL/72(9)).

SUP 1356

Reasons :

After the mandatory conversion to single sideband No. 1356 is unnecessary.

MOD 1357 (2) Administrations may assign ~~these~~ the frequencies of Section B of Appendix 15 to ships of any category according to traffic requirements and to coast stations for single sideband single channel simplex operation. Such stations shall not use a power in excess of 1 kW peak envelope power.

Reasons :

See proposal relating to Agenda Item 3, No. 449 (HOL/72(9)).

APPENDIX 15

Section A

Ref.

HOL/72(12) MOD

Frequencies assignable to Ship Radiotelegraph Stations using the Maritime Mobile Service Bands between 4 and 27.5 Mc/s

kc/s

Band (Mc/s)	Limits	Assignable frequencies wide-band telegraphy facsimile and special transmission systems	Assignable frequencies teleprinter and data transmission	Assignable working frequencies for high traffic ships	Calling frequencies	Assignable working frequencies for low traffic ships: Group A	Assignable working frequencies for low traffic ships: Group B	Limits
4	4144	4146 ---------- 4162 5 frequencies spaced 4	4166.....4169.75	4171.....4176 11 frequencies spaced 0.5	4178 ---------- 4186 17 frequencies spaced 0.5	4188.....4208.5 84 frequencies spaced 0.5	4209.....4229.5	4231
6	6215	6217 ---------- 6241 7 frequencies spaced 4	6246.75....6254.625	6256.5.....6264 11 frequencies spaced 0.75	6267 ---------- 6279 17 frequencies spaced 0.75	6282.....6312.75 84 frequencies spaced 0.75	6313.5...6344.25	6346
8	8288	8290 ---------- 8326 10 frequencies spaced 4	8329.....8339.5	8342.....8352 11 frequencies spaced 1	* 8356 ---------- 8372 17 frequencies spaced 1	8376.....8417 84 frequencies spaced 1	8418.....8459	8461
12	12434	12436 ---------- 12480 12 frequencies spaced 4	12484.5....12509.25	12513.....12528 11 frequencies spaced 1.5	12534 ---------- 12558 17 frequencies spaced 1.5	12564.....12625.5 84 frequencies spaced 1.5	12627....12688.5	12693
16	16578	16580 ---------- 16636 15 frequencies spaced 4	16640.....16679	16684.....16704 11 frequencies spaced 2	16712 ---------- 16744 17 frequencies spaced 2	16752.....16834 84 frequencies spaced 2	16836....16918	16924
22	22100	22102 ---------- 22146 12 frequencies spaced 4	22150.....22189	22192.....22217 11 frequencies spaced 2.5	22225.....22265 17 frequencies spaced 2.5	22272.5...22322.5 42 frequencies spaced 2.5	22325....22375	22378
25	25070		Assignable working frequencies to ships of all categories 25075 ---------- 25105 13 frequencies spaced 2.5					25110

* For particular conditions concerning the use of 8364 kc/s see No. 1179.

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APPENDIX 15

Ref.

Section B

HOL/72(12) (contd.) MOD Carrier frequencies in kc/s for Ship Radiotelephone stations using the Maritime Mobile Service Bands between 4 and 23 Mc/s

Band Mc/s	Limits	kc/s: Radiotelephone single sideband working frequencies*	kc/s: Radiotelephone single sideband calling frequencies	Limits
4	4140	-----	4140.5	4144
6	6211	6211.5	------	6215
8	8280	8281	8284.5	8288
12	12421	12422 and 12425.5	12429	12434
16	16558	16559.....16569.5 4 frequencies spaced 3.5	16573	16578
22	22092	22092.5	22096	22100

Frequencies in this category may be assigned also to coast stations in accordance with the provisions of No. 1357.

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Ref.

HOL/72(13)

APPENDIX 17

Duplex channelling of the Maritime Mobile Radiotelephone Bands between 4000 and 23000 kc/s

(see Article 35)

MOD 1. The following Table (~~page-434~~) indicates the frequencies to be used by coast and ship stations in the bands allocated to the maritime mobile radiotelephone service between 4000 and 23000 kc/s.

NOC 2.

SUP 3.

SUP 4.

Reasons :

a) The technical characteristics contained in Appendix 17 are transferred to Appendix 17A.

See also proposal relating to Agenda Item 1 (HOL/70(6), Document No. 70).

b) To include in the revised Table of Appendix 17 the frequencies transferred from the present Appendix 15, Section B.

See also proposal relating to Agenda Item 3, Nos. 447 and 448 (HOL/72(9)).

c) A number of coast and ship station frequencies in the 4 and 8 Mc/s bands are changed so as to obtain a uniform frequency spacing in these bands.

d) In consequence of the conversion from double sideband to single sideband operation, it is desirable to include in the revised Table both the assigned and carrier frequencies for single sideband operation, as well as the carrier frequencies for double sideband operation.

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Ref.

HOL/72(13) MOD
(contd.)

APPENDIX 17

Table of transmitting frequencies (in kc/s)

4 Mc/s band

Series No	Coast Station Frequency					Ship Station Frequency				
	Single Sideband		Double Sideband	Single Sideband		Single Sideband		Double Sideband	Single Sideband	
	Assigned	Carrier		Carrier	Assigned	Assigned	Carrier		Carrier	Assigned
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	4362.8	4361.4				4134.6	4133.2			
2	4366.0	4364.6				4137.8	4136.4			
3	4369.2	4367.8	4371.0	4371.0	4372.4	4064.4 +	4063.0 +	4066.0	4066.0	4067.4
4	4375.6	4374.2	4377.4	4377.4	4378.8	4070.6	4069.2	4072.4	4072.4	4073.8
5	4382.0	4380.6	4383.8	4383.8	4385.2	4077.0	4075.6	4078.8	4078.8	4080.2
6	4388.4	4387.0	4390.2	4390.2	4391.6	4083.4	4082.0	4085.2	4085.2	4086.6
7	4394.8	4393.4	4396.6	4396.6	4398.0	4089.8	4088.4	4091.6	4091.6	4093.0
8	4401.2	4399.8	4403.0	4403.0	4404.4	4096.2	4094.8	4098.0	4098.0	4099.4
9	4407.6	4406.2	4409.4	4409.4	4410.8	4102.6	4101.2	4104.4	4104.4	4105.8
10	4414.0	4412.6	4415.8	4415.8	4417.2	4109.0	4107.6	4110.8	4110.8	4112.2
11	4420.4	4419.0	4422.2	4422.2	4423.6	4115.4	4114.0	4117.2	4117.2	4118.6
12	4426.8	4425.4	4428.6	4428.6	4430.0	4121.8	4120.4	4123.6	4123.6	4125.0
13	4433.2	4431.8	4435.0	4435.0	4436.4	4128.2	4126.8	4130.0	4130.0	4131.4

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Table of transmitting frequencies (in kc/s) (contd.)

6 Mc/s band

Series No	Coast Station Frequency					Ship Station Frequency				
	Single Sideband		Double Sideband	Single Sideband		Single Sideband		Double Sideband	Single Sideband	
	Assigned	Carrier		Carrier	Assigned	Assigned	Carrier		Carrier	Assigned
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	6516.4	6515.0				6202.4	6201.0			
2	6519.6	6518.2				6205.6	6204.2			
3	6522.8	6521.4				6208.8	6207.4			

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Ref.

HOL/72(13) (contd.) MOD

APPENDIX 17

Table of transmitting frequencies (in kc/s) (contd.)

8 Mc/s band

Series No	Coast Station Frequency					Ship Station Frequency				
	Single Sideband		Double Sideband	Single Sideband		Single Sideband		Double Sideband	Single Sideband	
	Assigned	Carrier		Carrier	Assigned	Assigned	Carrier		Carrier	Assigned
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	8733.4	8732.0				8266.6	8265.2			
2	8736.6	8735.2				8269.8	8268.4			
3	8739.8	8738.4				8273.0	8271.6			
4	8743.0	8741.6				8276.2	8274.8			
5	8746.2	8744.8	8748.0	8748.0	8749.4	8196.4+	8195.0+	8198.0	8198.0	8199.4
6	8752.6	8751.2	8754.4	8754.4	8755.8	8202.6	8201.2	8204.4	8204.4	8205.8
7	8759.0	8757.6	8760.8	8760.8	8762.2	8209.0	8207.6	8210.8	8210.8	8212.2
8	8765.4	8764.0	8767.2	8767.2	8768.6	8215.4	8214.0	8217.2	8217.2	8218.6
9	8771.8	8770.4	8773.6	8773.6	8775.0	8221.8	8220.4	8223.6	8223.6	8225.0
10	8778.2	8776.8	8780.0	8780.0	8781.4	8228.2	8226.8	8230.0	8230.0	8231.4
11	8784.6	8783.2	8786.4	8786.4	8787.8	8234.6	8233.2	8236.4	8236.4	8237.8
12	8791.0	8789.6	8792.8	8792.8	8794.2	8241.0	8239.6	8242.8	8242.8	8244.2
13	8797.4	8796.0	8799.2	8799.2	8800.6	8247.4	8246.0	8249.2	8249.2	8250.6
14	8803.8	8802.4	8805.6	8805.6	8807.0	8253.8	8252.4	8255.6	8255.6	8257.0
15	8840.2	8808.8	8812.0	8812.0	8813.4	8260.2	8258.8	8262.0	8262.0	8263.4

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Ref.

HOL/72(13) MOD
(contd.)

APPENDIX 17

Table of transmitting frequencies (in kc/s) (contd.)

12 Mc/s band

Series No	Coast Station Frequency					Ship Station Frequency				
	Single Sideband		Double Sideband	Single Sideband		Single Sideband		Double Sideband	Single Sideband	
	Assigned	Carrier		Carrier	Assigned	Assigned	Carrier		Carrier	Assigned
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	13110.4 +	13109.0 +				12401.4	12400.0			
2	13113.9	13112.5				12404.9	12403.5			
3	13117.4	13116.0				12408.4	12407.0			
4	13120.9	13119.5				12411.9	12410.5			
5	13124.4	13123.0				12415.4	12414.0			
6	13127.9	13126.5				12418.9	12417.5			
7	13131.4	13130.0	13133.5	13133.5	13134.9	12331.4 +	12330.0 +	12333.5	12333.5	12334.9
8	13138.4	13137.0	13140.5	13140.5	13141.9	12338.4	12337.0	12340.5	12340.5	12341.9
9	13145.4	13144.0	13147.5	13147.5	13148.9	12345.4	12344.0	12347.5	12347.5	12348.9
10	13152.4	13151.0	13154.5	13154.5	13155.9	12352.4	12351.0	12354.5	12354.5	12355.9
11	13159.4	13158.0	13161.5	13161.5	13162.9	12359.4	12358.0	12361.5	12361.5	12362.9
12	13166.4	13165.0	13168.5	13168.5	13169.9	12366.4	12365.0	12368.5	12368.5	12369.9
13	13173.4	13172.0	13175.5	13175.5	13176.9	12373.4	12372.0	12375.5	12375.5	12376.9
14	13180.4	13179.0	13182.5	13182.5	13183.9	12380.4	12379.0	12382.5	12382.5	12383.9
15	13187.4	13186.0	13189.5	13189.5	13190.9	12387.4	12386.0	12389.5	12389.5	12390.9
16	13194.4	13193.0	13196.5	13196.5	13197.9	12394.4	12393.0	12396.5	12396.5	12397.9

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Ref.

HOL/72(13) MOD
(contd.)

APPENDIX 17

Table of transmitting frequencies (in kc/s) (contd.)

16 Mc/s band

Series No	Coast Station Frequency					Ship Station Frequency				
	Single Sideband		Double Sideband	Single Sideband		Single Sideband		Double Sideband	Single Sideband	
	Assigned	Carrier		Carrier	Assigned	Assigned	Carrier		Carrier	Assigned
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	17263.4 +	17262.0 +				16531.4	16530.0			
2	17266.9	17265.5				16534.9	16533.5			
3	17270.4	17269.0				16538.4	16537.0			
4	17273.9	17272.5				16541.9	16540.5			
5	17277.4	17276.0				16545.4	16544.0			
6	17280.9	17279.5				16548.9	16547.5			
7	17284.4	17283.0				16552.4	16551.0			
8	17287.9	17286.5				16555.9	16554.5			
9	17291.4	17290.0	17293.5	17293.5	17294.9	16461.4 +	16460.0 +	16463.5	16463.5	16464.9
10	17298.4	17297.0	17300.5	17300.5	17301.9	16468.4	16467.0	16470.5	16470.5	16471.9
11	17305.4	17304.0	17307.5	17307.5	17308.9	16475.4	16474.0	16477.5	16477.5	16478.9
12	17312.4	17311.0	17314.5	17314.5	17315.9	16482.4	16481.0	16484.5	16484.5	16485.9
13	17319.4	17318.0	17321.5	17321.5	17322.9	16489.4	16488.0	16491.5	16491.5	16492.9
14	17326.4	17325.0	17328.5	17328.5	17329.9	16496.4	16495.0	16498.5	16498.5	16499.9
15	17333.4	17332.0	17335.5	17335.5	17336.9	16503.4	16502.0	16505.5	16505.5	16506.9
16	17340.4	17339.0	17342.5	17342.5	17343.9	16510.4	16509.0	16512.5	16512.5	16513.9
17	17347.4	17346.0	17349.5	17349.5	17350.9	16517.4	16516.0	16519.5	16519.5	16520.9
18	17354.4	17353.0	17356.5	17356.5	17357.9	16524.4	16523.0	16526.5	16526.5	16527.9

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Ref.

HOL/72(13) (contd.) MOD

APPENDIX 17

Table of transmitting frequencies (in kc/s) (contd.)

22 Mc/s band

Series No	Coast Station Frequency					Ship Station Frequency				
	Single Sideband		Double Sideband	Single Sideband		Single Sideband		Double Sideband	Single Sideband	
	Assigned	Carrier		Carrier	Assigned	Assigned	Carrier		Carrier	Assigned
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	22630.4	22629.0				22071.4	22070.0			
2	22633.9	22632.5				22074.9	22073.5			
3	22637.4	22636.0				22078.4	22077.0			
4	22640.9	22639.5				22081.9	22080.5			
5	22644.4	22643.0				22085.4	22084.0			
6	22647.9	22646.5				22088.9	22087.5			
7	22651.4	22650.0	22653.5	22653.5	22654.9	22001.4 +	22000.0 +	22003.5	22003.5	22004.9
8	22658.4	22657.0	22660.5	22660.5	22661.9	22008.4	22007.0	22010.5	22010.5	22011.9
9	22665.4	22664.0	22667.5	22667.5	22668.9	22015.4	22014.0	22017.5	22017.5	22018.9
10	22672.4	22671.0	22674.5	22674.5	22675.9	22022.4	22021.0	22024.5	22024.5	22025.9
11	22679.4	22678.0	22681.5	22681.5	22682.9	22029.4	22028.0	22031.5	22031.5	22032.9
12	22686.4	22685.0	22688.5	22688.5	22689.9	22036.4	22035.0	22038.5	22038.5	22039.9
13	22693.4	22692.0	22695.5	22695.5	22696.9	22043.4	22042.0	22045.5	22045.5	22046.9
14	22700.4	22699.0	22702.5	22702.5	22703.9	22050.4	22049.0	22052.5	22052.5	22053.9
15	22707.4	22706.0	22709.5	22709.5	22710.9	22057.4	22056.0	22059.5	22059.5	22060.9
16	22714.4	22713.0	22716.5	22716.5	22717.9	22064.4	22063.0	22066.5	22066.5	22067.9

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CONSEQUENTIAL REVISION OF APPENDIX 25

The problems raised by a possible revision of Appendix 25 are still under study.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 73-E
6 June 1967
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PLENARY MEETING

KINGDOM OF THE NETHERLANDS

Proposals for the work of the Conference

Ref. Agenda Item 5 :

Classes of emission to be used on the international distress and calling frequencies 500 kc/s and 2182 kc/s

Proposals

HOL/73(14) Article 28

Section III - Ship stations using radiotelegraphy

MOD 974 a) send class A2 or A2H and receive class A2 and A2H emissions on 500 kc/s;

MOD 975 b) send, in addition, class A1 and A2 (or A2H) emissions on at least two working frequencies;

MOD 976 c) receive, in addition, class A1, A2 and A2H emissions on all the other frequencies necessary for their service.

Section IV - Ship stations using radiotelephony

See also proposal relating to Agenda Item 1 (HOL/70(2))

MOD 984 a) send class A3H and receive class A3 and A3H emissions on 2182 kc/s;

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Ref.

HOL/73(14)
(cont.)

Section VI - Survival craft stations

MOD 995 - in the bands between 405 and 535 kc/s, be able to transmit on 500 kc/s using class A2 or A2H emissions, but see No. 677. If a receiver is provided for any of these bands, it shall be able to receive class A2 and A2H emissions on 500 kc/s.

MOD 996 - in the bands between 1605 and 2850 kc/s, be able to transmit on 2182 kc/s using class A3 or A3H emissions.

If a receiver is provided for any of these bands, it shall be able to receive class A3 and A3H emissions on 2182 kc/s.

HOL/73(15)

Article 32

Section II - Bands between 405 and 535 kc/s

MOD 1134 § 13. ~~(1)~~ Stations of the maritime mobile service open to public correspondence and using frequencies in the authorized bands between 405 and 535 kc/s shall, during their hours of service, remain on watch on 500 kc/s. This watch is obligatory only for class A2 and A2H emissions.

Ref.

HOL/73(16)

Article 35

Section II - Bands between 1605 and 4000 kc/s

MOD 1337 (2) Coast stations open to the public correspondence service on one or more frequencies between 1605 and 2850 kc/s shall also be capable of transmitting ~~and receiving class A3 emissions~~ on 2182 kc/s with class A3H emissions and be capable of receiving classes A3 and A3H emissions on 2182 kc/s.

Reasons :

To permit the use of the classes of emission A2H and A3H on the distress and calling frequencies 500 kc/s and 2182 kc/s respectively.

The C.C.I.R. considers the emissions A2H and A3H to be as effective as A2 and A3 emissions for use as alarm, distress, urgency and safety signals.

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MARITIME CONFERENCE
GENEVA, 1967

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PLENARY MEETING

KINGDOM OF THE NETHERLANDS

Proposals for the work of the Conference

Ref. Agenda Item 6 :

Examination of the pertinent portions of the revised International Code of Signals

Proposals

HOL/74(17) Article 19

Section III -
Formation of call signs

SUP 760

Reasons :

In the revised International Code of Signals the geographical section is deleted.

HOL/74(18) Article 33

Section I -
General provisions

ADD 1216 A In the case of language difficulties, stations of the maritime mobile service shall use the service abbreviations given in Appendix 13 and may communicate by means of the International Code of Signals.

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Ref.

HOL/74(18) (cont.)

Reasons :

To make the use of the Q Code, contained in Appendix 13 mandatory for radiotelephony when language difficulties arise.

The revised International Code of Signals is suitable for transmission by all means of communication, including radiotelephony.

APPENDIX 13

HOL/74(19) MOD

Miscellaneous abbreviations and signals to be used in radiotelegraphy and radiotelephony communications (see Articles 29 and 33)

Section I - Q code

MOD 5. Q code abbreviations are given the form of a question when followed

a) by a question mark in the case of radiotelegraphy communications;

b) by the letter T (spoken as TANGO) in the case of radiotelephony communications.

When an abbreviation is used as a question and is followed by additional or complementary information, the question mark or the letter T should follow this information.

Reasons :

To use the Q code for radiotelegraphy and radiotelephony communications.

Ref.

HOL/74(19) (cont.)

In the opinion of the Netherlands Administration the Q code and abbreviations relating to safety of navigation and search and rescue should be retained in Appendix 13. It is not mandatory to carry the International Code of Signals, whereas it is compulsory to carry the Radio Regulations on all ships fitted with radiotelegraph equipment.

HOL/74(20) SUP RECOMMENDATION No. 22

Reasons :

Since the revised International Code of Signals is to be used for all means of communication, there is no further need for a separate radiotelephone code.

HOL/74(21) SUP RECOMMENDATION No. 30

Reasons :

To be consistent with the proposed revision of Appendix 16.

Ref.

HOL/74(22) MOD

APPENDIX 16

Phonetic alphabet and figure code

(see Article 33)

1. When it is necessary to spell out call signs, service abbreviations and words, the following table shall be used :

A. Phonetic Alphabet Code

Letter to be transmitted	Word to be used	Spoken as *)
A	Alfa	AL FAH
B	Bravo	BRAH VOH
C	Charlie	CHAR LEE or SHAR LEE
D	Delta	DELL TAH
E	Echo	ECK OH
F	Foxtrot	FOKS TROT
G	Golf	GOLF
H	Hotel	HOH TELL
I	India	IN DEE AH
J	Juliett	JEW LEE ETT
K	Kilo	KEY LOH
L	Lima	LEE MAH
M	Mike	MIKE
N	November	NO VEM BER
O	Oscar	OSS CAH

*) The syllables to be emphasized are underlined.

Ref.

HOL/74(22)
(cont.)

Letter to be trans-mitted	Word to be used	Spoken as *)
P	Papa	PAH PAH
Q	Quebec	KEH BECK
R	Romeo	ROW ME OH
S	Sierra	SEE AIR RAH
T	Tango	TANG GO
U	Uniform	YOU NEE FORM or OO NEE FORM
V	Victor	VIK TAH
W	Whiskey	WISS KEY
X	X-ray	ECKS RAY
Y	Yankee	YANG KEY
Z	Zulu	ZOO LOO

B. Phonetic Figure Code

Figure to be trans-mitted	Word to be used	Spoken as
0	NADAZERO	NAH-DAH-ZAY-ROH
1	UNAONE	OO-NAH-WUN
2	BISSOTWO	BEES-SOH-TOO
3	TERRATHREE	TAY-RAH-TREE
4	KARTEFOUR	KAR-TAY-FOWER
5	PANTAFIVE	PAN-TAH-FIVE

*) The syllables to be emphasized are underlined.

Ref.

HOL/74(22)
(cont.)

Figure to be transmitted	Word to be used	Spoken as
6	SOXISIX	SOK-SEE-SIX
7	SETTESEVEN	SAY-TAY-SEVEN
8	OKTOEIGHT	OK-TOH-AIT
9	NOVENINE	NO-VAY-NINER
Decimal point	DECIMAL	DAY-SEE-MAL

Note : Each syllable should be equally emphasized. The second component of each code word is the code word used in the Aeronautical Mobile Service.

2. However, stations of the same country may use, when communicating between themselves, any other table recognized by their administration.

Reasons :

To use the phonetic figure table contained in the revised International Code of Signals.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 75-E
6 June 1967
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PLENARY MEETING

KINGDOM OF THE NETHERLANDS

Proposals for the work of the Conference

Agenda Item 7.1 :

Data transmission from ship stations

Proposal

To make available a band of working frequencies for ship stations using teleprinter and data transmission systems.

See proposals relating to Agenda Item 3, Nos. 451A (HOL/72(9)), 1150A, 1191A, 1191B and 1191C (HOL/72(10), Document No. 72).

Reasons :

To separate teleprinter and data transmissions from manual telegraph transmissions.

Ref. Agenda Item 7.2 :

Conditions for the use of emergency position-indicating radio beacons

HOL/75(23) Article 28

Section VI - Survival craft stations

ADD 999 A § 24. However, survival craft stations intended primarily as beacons to indicate the positions of survivors or the location of a mobile station in distress shall be capable of transmitting :

ADD 999 B a) on 2182 kc/s using the following types of emission depending upon the power of the beacon :

i) the emission specified in No. 1476 B for beacons producing a field strength equal to or less than 10 microvolts per metre at a distance of 30 nautical miles at sea level;

ii) the emission specified in No. 1476 C for beacons producing a field strength greater than 10 microvolts per metre at a distance of 30 nautical miles at sea level.

Class A3 or A3H emissions may also be used. If a receiver is provided, it shall be able to receive class A3 and A3H emissions.

or,

ADD 999 C b) on 121.5 and/or 243 Mc/s using the emission specified in No. 1476 D. Class A3 emission may also be used.
If a receiver is provided, it shall be able to receive class A3 emissions.

Ref.

HOL/75(24)

Article 36

Distress signal and traffic alarm, urgency and safety signals

Section I - General

ADD 1388 A (3) The characteristics of the emergency position-indicating radio beacon signal employed by survival craft stations are given in Nos. 1476 B, 1476 C and 1476 D.

ADD Section VIII A - Survival craft beacon signals

ADD 1476 A § 44 (bis) The emergency position-indicating radio beacon signal employed by survival craft stations consists of :

ADD 1476 B a) a keyed emission modulated by a tone of 1300 cycles per second (± 20 c/s), having a ratio of the period of the emission to the period of silence equal to or greater than 1, and an emission duration between one and five seconds. The keying signal shall be transmitted continuously;

or,

ADD 1476 C b) the radiotelephone alarm signal. The Morse letter "B" and/or the call sign of the ship to which the beacon belongs should be included by keying a carrier modulated by a tone of 1300 cycles per second (± 20 c/s) or 2200 cycles per second (± 35 c/s)

The keying cycle shall consist alternatively of the keying signal having a duration between 30 and 50 seconds, and a period of silence having a duration between 30 and 60 seconds;

Ref.

HOL/75(24)
(cont.)

or,

ADD 1476 D c) a swept tone modulation sweeping downward over a range of not less than 700 cycles per second, within the range 1600 to 300 cycles per second, with a repetition rate between two and three sweeps per second.

ADD 1476 E § 44 (ter) The emergency position-indicating radio beacon signal shall indicate that persons are in a distress situation, may no longer be on an aircraft or ship and that receiving facilities may not be available.

Reasons :

To include in the Radio Regulations the Recommendation of the C.C.I.R. concerning the use of emergency position-indicating radio beacons on 2182 kc/s, as well as the recommended practices adopted by I.C.A.O. concerning survival radio equipment on the frequencies 121.5 Mc/s and 243 Mc/s.

Agenda Item 7.4 :

Hours of service for ship stations

Opinion :

In the opinion of the Netherlands Administration the existing hours of service for ship stations are adequate and need not be changed.

Reasons :

1. The Netherlands Administration does not experience traffic congestion in the bands between 4000 and 27 500 kc/s during single operator watch periods, as referred to in Recommendation No. 27 of the Administrative Radio Conference, Geneva 1959.

2. Coast stations desiring to send messages of general interest to ship stations in different parts of the world, can reach these stations in four of the six zones at the same time.

If the hours of watchkeeping by single operator ships are staggered, as considered in Recommendation No. 27, the coast stations will have to increase the number of transmissions intended for all ships.

3. When eight hours listening watch is required by a radio officer, this watch shall be maintained during the hours of service as prescribed in Appendix 12 for ship stations placed in the second category.

For ship stations placed in the third category, administrations may choose other hours of listening or hours of service so long as the required eight hours listening watch by the radio officer is maintained.

As specified in No. 933, administrations are free to determine the category of service for their ship radiotelegraph stations and in this way may select a special system of watchkeeping which is not in accordance with Appendix 12.

Ref.

HOL/75(25) Agenda Item 7.5 :

Frequencies to be assigned for the transmission by television of port radar images

DRAFT RECOMMENDATION

to the C.C.I.R. relating to the transmission by television of port radar images

The World Administrative Radio Conference, Geneva 1967,

having noted

that some administrations have drawn attention to a need to provide for the transmission of port radar images by means of television when the use of normal radar systems on board ships sailing a harbour area would not appear to be feasible;

considering

a) that the use of such port radar images in the circumstances referred to above will contribute to the safety of navigation and thereby of human life in harbour areas;

b) that no sufficient information is available as to

- the minimum technical demands to be made upon the transmission by television of port radar images, and

- the frequency bands in which such a system could best be accommodated,

so as to provide for satisfactory operation;

Ref.

HOL/75(25) (cont.)

c) that, however, the transmission by television of port radar images, although being in the interest of shipping, does not come under the definition of the Maritime Mobile Service as given in No. 36 of the Radio Regulations and that, therefore, the Conference is not competent to take any decision in this matter;

invites the C.C.I.R.

to study the problems involved in the transmission by television of port radar images and to make recommendations concerning :

1. the technical standards for such a system, particularly with respect to the minimum bandwidth necessary;

2. the frequency bands in which such a system could best be accommodated.

Ref. Agenda Item 7.6 :

Establishment of a separate category for mobile radiotelephone traffic on inland waterways

Proposals

HOL/75(26)

Article 5

MOD 287 The frequency 156.8 Mc/s is the international safety and calling frequency for the maritime mobile VHF radiotelephone service. Administrations shall ensure that a guard-band of 75 kc/s on each side of the frequency 156.8 Mc/s is provided. The conditions for the use of this frequency are contained in Article 35.

In the bands 156.025-157.425 Mc/s, 160.625-160.975 Mc/s and 161.475-162.025 Mc/s, each administration shall give priority to the maritime mobile service on only such frequencies as are assigned to stations of the maritime mobile service by that administration (see Article 35).

Any use of frequencies in these bands by stations of other services to which they are allocated, should be avoided in areas where such use might cause harmful interference to the maritime mobile VHF radiotelephone service.

However, the frequency bands in which priority is given to the maritime mobile service, may be used for mobile radiotelephone communications on inland waterways, subject to agreement between administrations concerned and those having services operating in accordance with the Table, which may be affected.

Ref.

HOL/75(27)

APPENDIX 18

MOD *) For assistance in understanding the Table, see notes a) to h) below.

ADD h) The frequencies in this Table may also be used for mobile radiotelephone communications on inland waterways in accordance with the provisions of No. 287.

Reasons :

To permit the use of the frequencies listed in Appendix 18 for mobile radiotelephone communications on inland waterways.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Addendum No. 1 (Rev.) to
Document No. 76-E
29 August 1967
Original : English

PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

The Draft Resolution which follows cancels and replaces the proposals contained in Addendum No. 1 to Document No. 76 of 12 July 1967.

Ref.

G/Add. 76(62) Agenda Item 1 :

Use of single sideband technique in the maritime mobile service in the bands available to that service between 1605 and 4000 kc/s and in the exclusive HF maritime mobile radiotelephone bands.

RESOLUTION No. 1B

Relating to the conversion to single sideband operation of the double sideband radiotelephone frequencies assigned to the maritime mobile service in the bands between 1605-4000 kc/s assigned for communications between ships and coast stations

The Maritime World Administrative Radio Conference, Geneva, 1967,

considering,

a) that in the interests of economy in the use of the radio spectrum, each DSB channel should be sub-divided into two SSB channels, one in the upper and the other in the lower half of the DSB channel;

b) that the bandwidth occupied by the two SSB channels should not exceed that of the DSB channel;

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Ref.

G/Add. 76(62) (cont.)

c) the desirability of retaining the same registration (column 2) date for the two SSB channels as that of the corresponding DSB channel;

d) the need to meet, as far as possible, the provisions of RR No. 114, bearing in mind the procedure laid down in RR No. 534;

noting

a) Recommendation 258-1 of the C.C.I.R. in respect of the transmitter audio-frequency bandwidth (350 - 2700 c/s);

b) that operational efficiency should be improved by the use of a transmitter audio-frequency bandwidth of 250 - 2400 c/s;

decides :

that in the bands between 1605 - 4000 kc/s each DSB channel be sub-divided as follows :

1) a station operating in the upper half of the channel shall use the upper sideband derived from a nominal carrier frequency 100 c/s above the original DSB carrier frequency;

2) a station operating in the lower half of the channel shall use the upper sideband derived from a nominal carrier frequency 2.90 kc/s below the original DSB carrier frequency;

3) the transmitter audio-frequency band shall be 250 to 2400 c/s, with a permitted amplitude variation of 6 db.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Corrigendum No. 2 to
Document No. 76-E
17 August 1967

PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Page 5, Ref. G/76(29), No. 987B,

amend to read :

987B a) send class A3H emission and receive classes A3H and A3 emissions on 2182 kc/s;

Page 14, Ref. G/76(33),

amend to read :

ADD h) For coast station single sideband radiotelephone transmitters installed after 1 January 1970 the tolerance is 20 c/s.

ADD i) For ship station single sideband radiotelephone transmitters installed after 1 January 1970 the tolerance is 100 c/s.

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Corrigendum No. 1 to
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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Agenda Item 1

Page 7, opposite MOD 1337, last line read :

classes A3 and A3H emissions on 2182 kc/s.

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 76-E
20 June 1967
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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND, THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Ref. G/76(25)

Agenda Item 1 :

The use of single-sideband technique in the Maritime Mobile Service in the bands available to that service between 1605 and 4000 kc/s, and in the exclusive HF Maritime Mobile Radiotelephone bands

1. The United Kingdom proposes that

a) The following dates be adopted for the implementation of the single-sideband mode of operation :

	1605-4000 kc/s (except 2182 kc/s)	4000-27 500 kc/s
End of conversion period	1st January 1980	1st January 1977
Date by which coast stations shall have an SSB capability	1st January 1970	1st January 1970
Date by which the use of class A3 emission by coast stations shall cease. Class A3H emission shall be used in place of class A3 emission [1]	1st January 1973	1st January 1970

Note 1 : Class A3H emission should not be used by the coast station when working to ships equipped for SSB reception.

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Ref.

G/76(25) (cont.)

b) Ships' transmitters operating in accordance with Note c) of Appendix 3 should comply with the dates applicable to the conversion of the MF bands to SSB operation;

c) All equipment operating in the MF and HF bands shall comply with the relevant Recommendations of the C.C.I.R.;

d) A special study should be undertaken of the problems concerned with the use of SSB techniques on the international distress and calling frequency 2182 kc/s with particular reference to Survival Craft equipment.

2. a) Amendments to the Regulations in Articles 7, 23, 28 and 35 are in Annex I;

b) A new Appendix 17A dealing with Technical Characteristics for single sideband equipment is in Annex II;

c) Amendments to Appendix 3 are in Annex III;

d) A Resolution relating to the dates of conversion to single sideband is in Annex IV;

e) A Resolution relating to the conversion to single sideband operation in the bands 1605 to 4000 kc/s is under consideration and will be submitted later;

f) A Resolution relating to the study of problems concerning the application of single-sideband techniques on the international distress and calling frequency 2182 kc/s is in Annex V;

g) A Resolution concerning the procedure to be adopted in registering the radiotelephone frequencies in the band between 4000 and 23 000 kc/s is under consideration and will be submitted later.

Annexes : 5

ANNEX I

Ref. Agenda Item 1 :

Article 7

G/76(26) SUP 443 and 444

Reasons :

No longer applicable with the introduction of single sideband operation.

Article 23

G/76(27) MOD 863 (3) The holder of a radiotelephone operator's restricted certificate may carry out the radiotelephone service of any ship or aircraft station, when working on frequencies of the maritime mobile service, provided that :

- the operation of the transmitter requires only the use of simple external controls, and excludes all manual adjustments of frequency determining elements, with the stability of the frequencies maintained by the transmitter itself within the limits of tolerance specified by Appendix 3 and the power of the transmitter does not exceed the following :

  250 watts (Pc) for emission A3

  1000 watts (Pp) for emissions A3A, A3H and A3J.

Reasons :

To take account of conversion to single sideband operation, and to minimize the risk of harmful interference at long range in view of the increasing use of HF for radiotelephony.

Ref.			
G/76(28)	MOD	903	(2) For ship radiotelephone stations where the carrier power of the transmitter does not exceed 400 watts (Pp) and for aircraft radiotelephone stations operating on frequencies allocated exclusively to the aeronautical mobile service, each administration may itself fix the conditions for obtaining a restricted radiotelephone operator's certificate, provided that the operation of the transmitter requires only the use of simple external switching devices, excluding all manual adjustment of frequency determining elements, and that the stability of the frequencies is maintained by the transmitter itself within the limits of tolerance specified in Appendix 3. However, in fixing the conditions, administrations shall ensure that the operator has an adequate knowledge of radiotelephone operation and procedure particularly as far as distress, urgency and safety are concerned. This in no way contravenes the provisions of No. 906.

Reasons :

To take account of conversion to single sideband operation.

Ref.

G/76(29)

Article 28 (see also Agenda Item 5, G/58(5), Document No. 58)

MOD 983 § 19. All ship stations equipped with radiotelephony apparatus operating in the double sideband mode to work in the authorized bands between 1605 and 2850 kc/s shall be able to :

Reasons :

To cover double sideband operation only.

ADD 987A § 20 (bis) (1) All ship stations equipped with radiotelephony apparatus operating in the single sideband mode to work in the authorized bands between 1605 and 2850 kc/s shall be able to :

987B a) send and receive class A3H emissions on 2182 kc/s;

987C b) send, in addition, class A3H, A3A and A3J emissions on at least two working frequencies [1];

987D c) receive, in addition, class A3H, A3A and A3J emissions on all other frequencies necessary for their service;

987E (2) The provisions of Nos. 987C and 987D do not apply to apparatus provided solely for distress, urgency and safety purposes.

Reasons :

To provide for the use of the single sideband mode of operation.

ADD 987C.1 [1] In certain areas, administrations may reduce this requirement to one working frequency.

Reasons :

Consequential upon new No. 987C.

Ref.			
G/76(29) (cont.)	MOD	992	See Agenda Item 5 (G/58(5), Document No. 58)
	MOD	996	- in the bands between 1605 and 2850 kc/s, be able to transmit on 2182 kc/s using class A3 or A3H emissions. If a receiver is provided for any of these bands, it shall be able to receive class A3 and A3H emissions on 2182 kc/s.

Reasons :

To provide for the use of class A3H emissions.

Ref.
G/76(30)

Article 35

Section II - Bands between 1605 and 4000 kc/s

under title :

ADD 1322A Unless otherwise specified in these regulations the class of emission to be used in the public correspondence service shall be class A3A or class A3J using the upper sideband mode and a bandwidth not exceeding 2.7 kc/s; the normal method of operation for each coast station shall be indicated in the List of Coast Stations.

Reasons :

To specify the types of emission and use of the upper sideband mode in all cases.

MOD 1337 (2) Coast stations open to the public correspondence service on one or more frequencies between 1605 and 2850 kc/s shall also be capable of transmitting class A3 or A3H emissions on 2182 kc/s and receiving classes A3 or A3H emissions on 2182 kc/s.

Reasons :

To take account of single sideband operation.

MOD 1341 (2) The power of mobile radiotelephone stations, operating in the authorized bands between 1605 and 2850 kc/s shall not exceed the following :

- 100 watts (Pc) for classes A3 and A3H emissions;

- 400 watts (Pp) for classes A3A and A3J emissions.

Reasons :

To take account of single sideband operation.

Ref.

G/76(30) (cont.) MOD 1342 (3) The power of coast radiotelephone stations operating in the authorized bands between 1605 and 3800 kc/s shall not exceed the following :

- Coast stations located north of latitude 32 N	(2 kilowatts (Pc) for (class A3 and A3H emissions. (8 kilowatts (Pp) for (classes A3A and A3J (emissions.
- Coast stations located south of latitude 32 N	(3.5 kilowatts (Pc) for (class A3 and A3H emissions. (14 kilowatts (Pp) for class (A3A and A3J emissions.

Reasons :

To take account of single sideband operation.

ADD 1344A aa) the ship-shore working frequencies 2047.35 kc/s (carrier frequency 2046 kc/s, and 2050.35 kc/s (carrier frequency 2049 kc/s), if required by their service;

ADD 1345A ba) the intership frequencies 2054.35 kc/s (carrier frequency 2053 kc/s) and 2057.35 kc/s (carrier frequency 2056 kc/s), if required by their service. These frequencies may be used as additional ship-shore frequencies.

Reasons :

Consequential upon conversion to single-sideband operation.

Ref.

G/76(31)

Section III - Bands between 4000 and 23 000 kc/s

under title :

ADD 1351A Unless otherwise specified in these regulations, the class of emission to be used shall be class A3A or class A3J using the upper sideband mode and a bandwidth not exceeding 2.7 kc/s; the normal method of operation for each coast station shall be indicated in the List of Coast Stations.

Reasons :

To specify the types of emission and use of the upper sideband mode in all cases.

SUP 1352, 1356 and 1357

Reasons :

See Agenda Item 3 (G/77(42), Document No. 77)

MOD 1358 (4) Equipment intended for use on radiotelephony in these bands should conform to the Recommendations of the C.C.I.R. and other technical standards in Appendix 17A.

Reasons :

To provide for single sideband operation.

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ANNEX II

Ref. Agenda Item 1 :

G/76(32) ADD APPENDIX 17A

Technical characteristics for single sideband equipment used in the maritime mobile radiotelephony services in the bands 1605 to 3800 kc/s and 4000 to 23 000 kc/s

(See Articles 28 and 35 and Appendix 17)

1. In coast and ship station transmitters facilities should be provided for both class of emission A3A having a carrier reduction of 16 ± 2 db below peak envelope power, and class of emission A3J having a carrier reduction of not less than 40 db below peak envelope power.

2. The carrier frequency of the transmitters should be maintained within the following tolerances :

a) for coast stations : ± 20 c/s;

b) for ship stations : short-term limits (of the order of 15 min.) ± 40 c/s;

c) for ship stations : within ± 100 c/s of the reference value.

3. The carrier frequency of the receivers should be maintained within the following tolerances :

a) for coast stations : ± 20 c/s;

b) for ship stations the short-term limits (of the order of 15 min.) ± 40 c/s; (Note 1)

4. The channel arrangements should be such, that two SSB channels are accommodated within each existing DSB channel and the bandwidth of the SSB emissions should be kept within such limits as will permit this to be done.

Ref.

G/76(32)
(cont.)

5. The transmitter audio-frequency band should be 350 to 2700 c/s, with a permitted amplitude variation of 6 db; (Note 2)

6. The unwanted frequency modulation of the SSB carrier should be sufficiently low to prevent harmful distortion.

7. In the medium frequency maritime mobile radiotelephony bands, SSB ship stations should be able to insert a carrier at a level sufficient to permit satisfactory reception by DSB receivers when communicating with DSB stations.

8. In the particular case of transmissions on the radiotelephone calling and distress frequency 2182 kc/s, all transmissions should be made either by DSB, or by SSB with a carrier level sufficient to permit satisfactory reception by DSB receivers.

Nota 1 : This value may be maintained either manually or by other means.

Note 2 : These limits may need to be modified when selective calling is introduced.

ANNEX III

Ref. Agenda Item 1 :

G/76(33) MOD

APPENDIX 3

Table of frequency tolerances *

(See Article 12)

Band : 1605 to 4000 kc/s

2. Land stations :

In column 3, after 100, add h)
In column 3, after 50, add h)

3. Mobile Stations :

a) Ship stations
In column 3, after 200, add i)

Band : 4 to 29.7 Mc/s

2. Land stations :

a) Coast stations
In column 3, after 50, add h)
In column 3, after 30, add h)
In column 3, after 15, add h)

3. Mobile Stations :

a) Ship stations

2) Emission other than class A1 :
In column 3, after 50 c), add i)
In column 3, after 50, add i)

* Certain services may need tighter tolerances for technical and operational reasons.

Ref.

G/76(33)
(cont.)

Notes referring to table of frequency tolerances

ADD h) For coast station radiotelephone transmitters installed after 1st January 1970 the tolerance is 20 c/s.

ADD i) For ship station radiotelephone transmitters installed after 1st January 1970 the tolerance is 100 c/s.

Reasons :

To include the frequency tolerance for coast and ship station single sideband radiotelephone transmitters.

A N N E X IV

Ref. Agenda Item 1 :

G/76(34)

RESOLUTION No. 1A

Relating to the dates of implementation for the conversion to single-sideband operation of the double sideband radiotelephone services in the maritime mobile bands between 1605 and 23 000 kc/s

The Maritime World Administrative Radio Conference, Geneva, 1967,

considering

a) Recommendation No. 28 of the Administrative Radio Conference, Geneva, 1959,

b) Recommendation No. 3 of the Panel of Experts, established under Resolution No. 3 and Recommendation No. 37 of the same Conference;

c) Recommendation No. 258-1 of the C.C.I.R.,

decides

1. Bands between 1605 and 4000 kc/s (except 2182 kc/s)

1.1 that coast radiotelephone stations shall be capable of single sideband operation in the A3A or A3J mode on at least one frequency by 1st January, 1970;

1.2 that coast radiotelephone stations shall cease double-sideband operation (except for 2182 kc/s), and shall be equipped to use class A3H emissions in place of class A3 emissions, by 1st January, 1973;

Ref.

G/76(34) (cont.)

1.3 that, with the exception of the cases covered by Nos. 987 and 996 of the Radio Regulations, the conversion of ship radiotelephone stations from double-sideband to single sideband operation (A3A and A3J) shall commence not later than the 1st January 1970 and shall be completed by 1st January 1980;

1.4 that the use of class A3 and A3H emissions by ship radiotelephone stations and A3H emissions by coast radiotelephone stations shall cease (except for 2182 kc/s) by 1st January 1980.

2. Bands between 4000 and 23 000 kc/s

2.1 that coast radiotelephone stations shall be equipped for single sideband operation, A3H and either A3A or A3J emissions, and shall cease double-sideband operation by 1st January 1970;

2.2 that the conversion of ship radiotelephone stations from double sideband to single sideband operation (A3A and A3J) shall commence not later than the 1st January 1970, and shall be completed by 1st January 1977;

2.3 that the use of class A3 emissions by ship radiotelephone stations and class A3H emissions by coast radiotelephone stations shall cease by the 1st January 1977;

2.4 that the provisions of 2.2 and 2.3 shall not apply to ship radiotelephone stations operating in accordance with Note c) of Appendix 3 of the Radio Regulations; these stations shall be treated as ship radiotelephone stations operating in the band between 1605 and 4000 kc/s (see 1.3 and 1.4).

ANNEX V

Ref. Agenda Item 1 :

G/76(35)

RESOLUTION No. 1C

Relating to the study of the problems concerning the application of single-sideband techniques on the international distress and calling frequency 2182 kc/s

The World Administrative Radio Conference, Geneva, 1967,

considering

a) that, except for 2182 kc/s, the conversion to SSB operation of the DSB maritime mobile assignments in the band 1605-4000 kc/s will be complete by 1st January 1980;

b) that during the period of conversion, ship stations will use either class A3 or class A3H emission on 2182 kc/s;

c) that coast stations will use either class A3 or class A3H emission until 1st January 1973 and from that date only class A3H emission on 2182 kc/s;

d) that large numbers of portable radio equipments designed only for safety purposes use class A3 emission;

e) that there may be practical difficulties in design of portable equipment for safety purposes using single sideband emissions;

resolves

that a study be made by the C.C.I.R.[1] of the problems concerning the application of single sideband techniques on the frequency 2182 kc/s.

Note : [1] In cooperation, as necessary, with the Intergovernmental Maritime Consultative Organization.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 77-E
20 June 1967
Original : English

PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Agenda Item 3 :

Consequential revision of Appendices 15, 17 and 25 to the Radio Regulations

Comments

Revision of Appendices 15 and 17

The introduction of SSB operation will enable each of the DSB channels listed in Appendix 17 to be divided into two, provided that they are divided in accordance with the procedure laid down in paragraph 3 of that Appendix. However, it is doubtful whether this will provide enough additional channels to cater for the development of HF radiotelephone services taking place in all countries.

At the 1959 Geneva Radio Conference, ship channels for SSB operation in the 4, 6, 8, 12, 16 and 22 Mc/s bands and a DSB calling channel in the 8, 12, 16 and 22 Mc/s bands were provided (see Appendix 15, Section B). These frequencies are adjacent to the ship telephony bands and could therefore be utilised to provide additional SSB ship channels but no provision was made for corresponding coast station channels. These could be provided in each band by using a similar portion of the coast station telegraphy band which is adjacent to the lower end of the coast station telephony band and assigning it to radiotelephony. In turn the displaced telegraph coast station assignments could be accommodated in the low traffic ship telegraphy bands. This should present no real problems as Groups A and B of the low traffic ship bands are not uniformly loaded (see comments on Agenda Item 2.3, G/56(2), Document No. 56. However, it will be necessary to assign new frequencies to those ships now operating

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in the sections of the bands concerned and to rearrange the distribution of Group A and B frequencies to maintain reaonably balanced loading.

It will, of course, be necessary to coordinate the changes in the frequency assignments in the low traffic telegraph bands with those resulting from the introduction of single sideband operation in the HF radiotelephone bands.

The consequential changes resulting from these proposals are shown in Annex I.

To compensate in some measure for the loss of low traffic working frequencies it is proposed to reduce the frequency spacing in the present high traffic bands to provide an adequate number of working frequencies (for details see Annex II).

The remaining part of each of the high traffic bands has been set aside for direct printing telegraph systems using channels spaced at 500 c/s. (See proposals for Agenda Item 7.1, Document No. 60). In this section of the band it is not proposed to retain harmonic relationship between bands.

Since the frequencies in both the low and high traffic working bands are now spaced at 0.5 kc/s at 4 Mc/s there seems to be no object in retaining the existing spacing of 1 kc/s at 4 Mc/s in the calling bands. It is proposed therefore to reduce the spacing to 0.5 kc/s at 4 Mc/s to maintain uniform spacing throughout each band and correspondingly at 6, 8, 12, 16, 22 and 25 Mc/s.

The consequential changes to Appendix 17 resulting from these proposals are shown in Annex III; amendments to the Regulations, Articles 7, 32 and 35, in Annex IV, and a Resolution relating to the transfer of frequency assignments for coast station radiotelegraph assignments in Annex V.

Appendix 25

The preparation of a revised allotment plan would be an extremely difficult and time-consuming operation which almost certainly could not be completed within the seven weeks allotted to the Conference. It is therefore proposed that Appendix 25 be abrogated and the new SSB frequency assignments be included in the Master Frequency Register under an extension of the procedure for the notification and recording of frequencies contained in Article 9 of the Radio Regulations. The question of the precise form that this extension of the procedure might take is under consideration, and will be submitted as an annex to Agenda Item I.

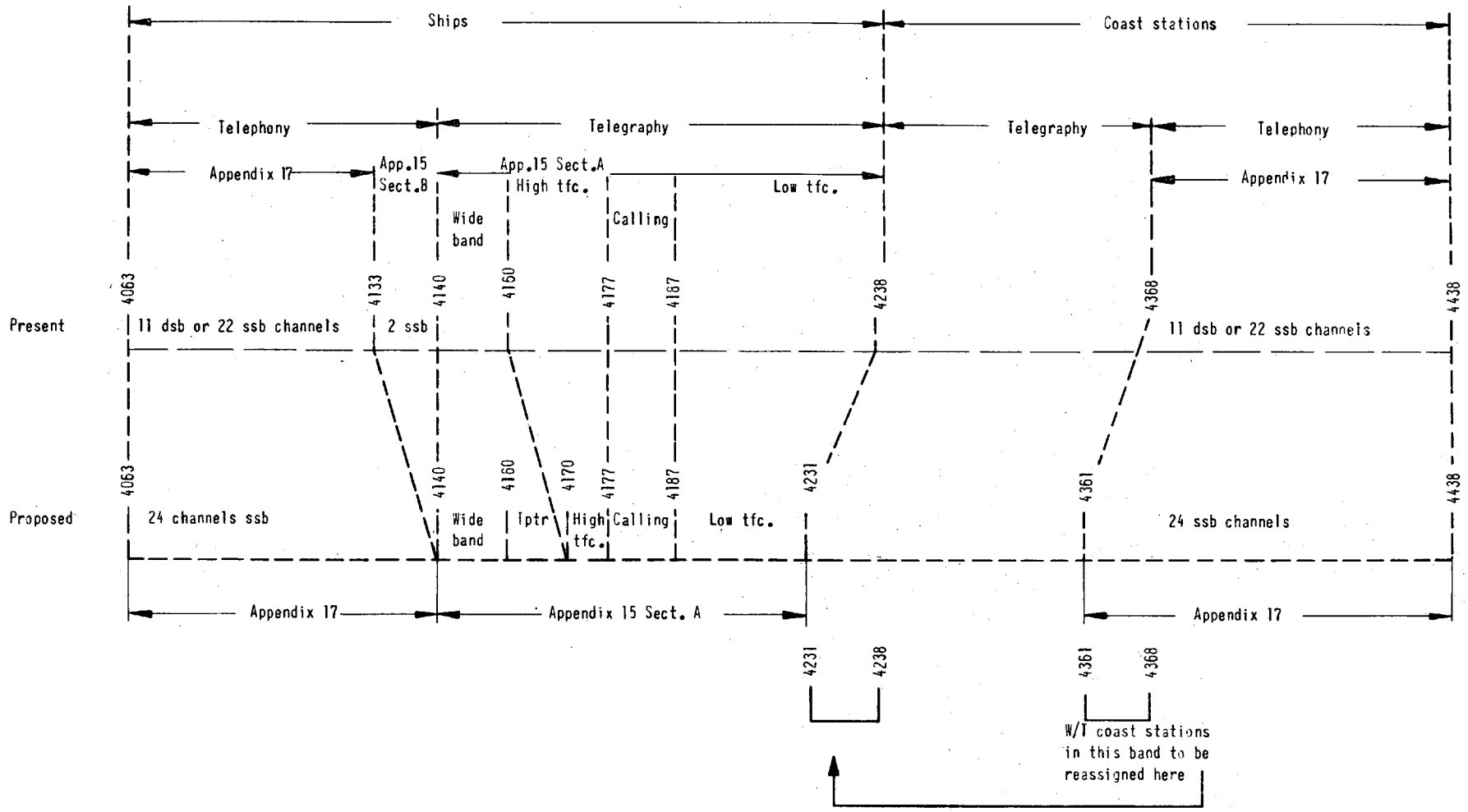
Annexes : 5

ANNEX I

Ref. Agenda Item 3

G/77(36)

(4 Mc/s)



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G/77(30)
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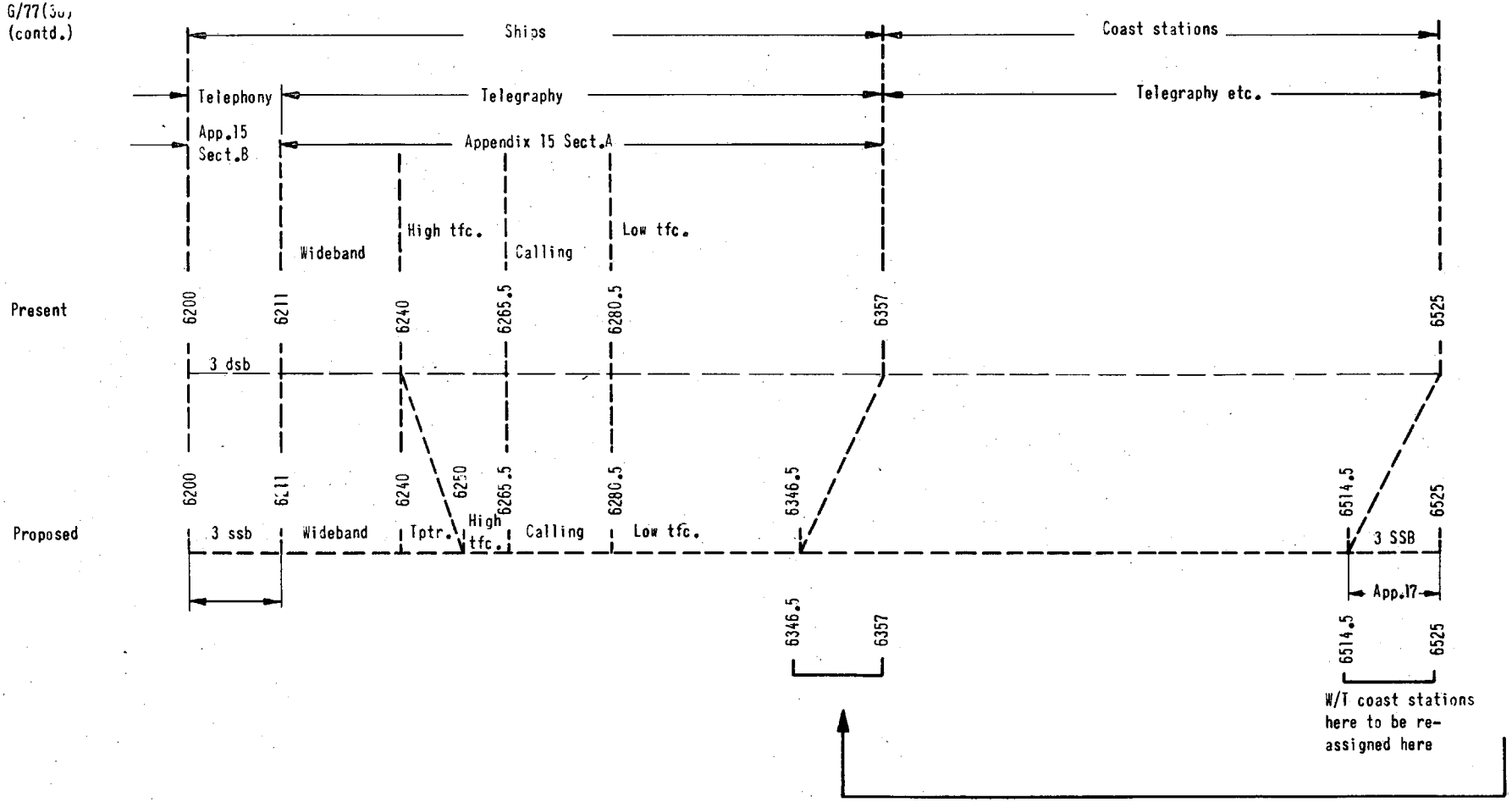
(6 Mc/s)



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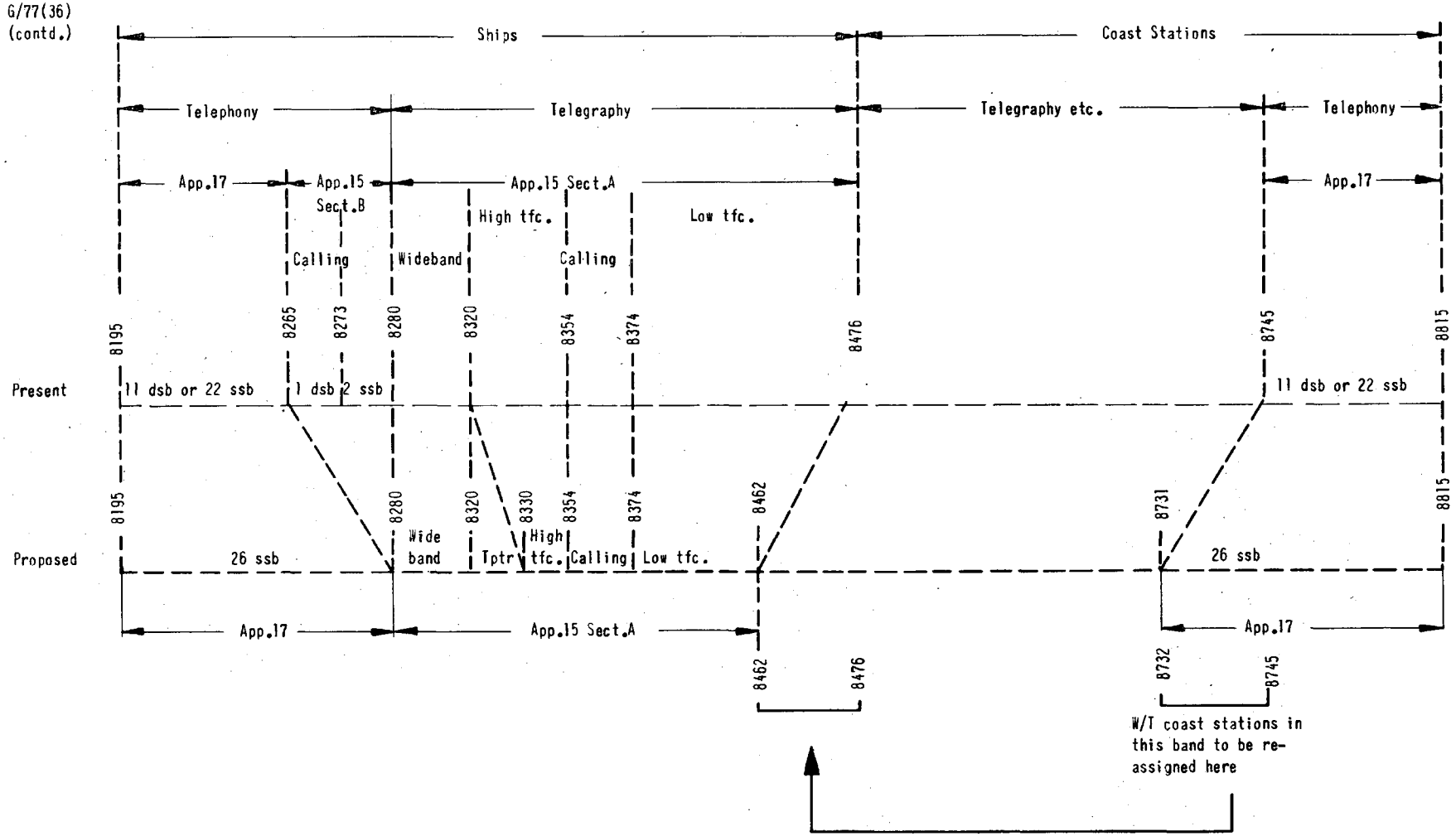
Ref.

G/77(36)
(contd.)

(8 Mc/s)



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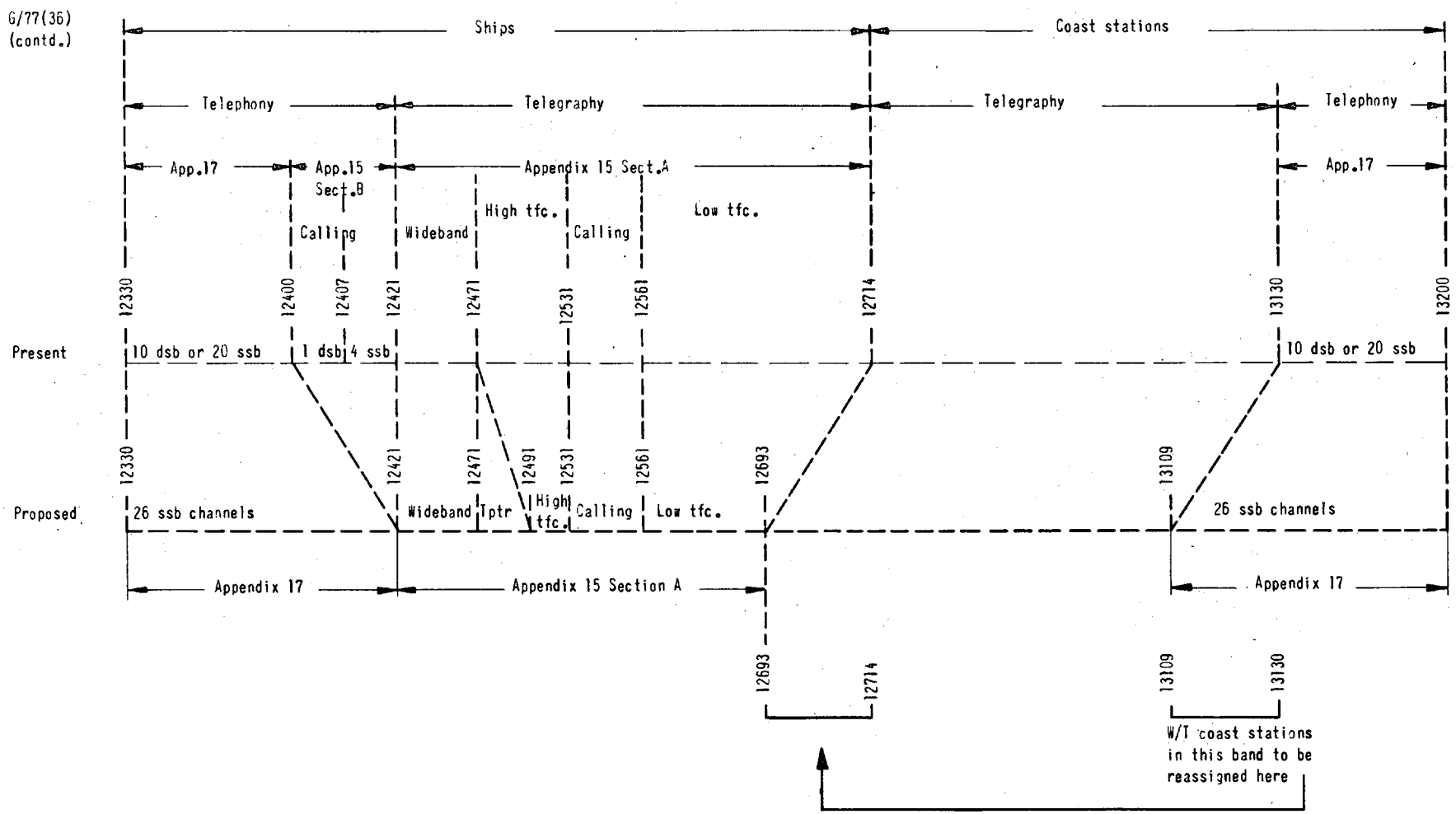
G/77(36)
(contd.)

(12 Mc/s)



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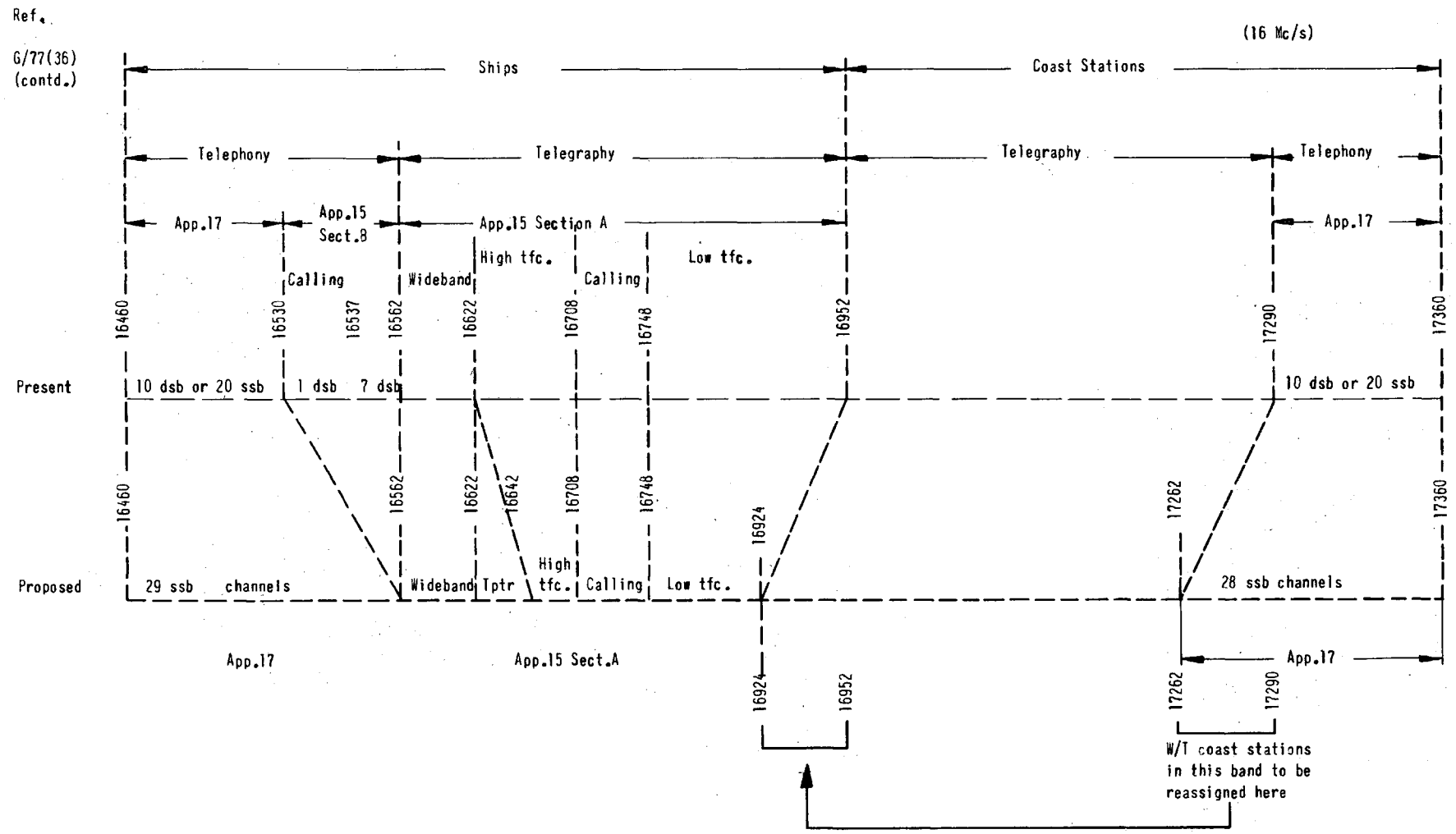
Ref.
G/77(36)
(contd.)
(16 Mc/s)
Ships
Coast Stations
Telephony
Telegraphy
Telegraphy
Telephony
App.17
App.15
Sect.B
App.15 Section A
App.17
Calling
Wideband
High tfc.
Calling
Low tfc.
16460
16530
16537
16562
16622
16708
16748
16952
17290
17360
Present
10 dsb or 20 ssb
1 dsb
7 dsb
10 dsb or 20 ssb
16460
16562
16622
16642
16708
16748
16924
17262
17360
Proposed
29 ssb channels
Wideband
Iptr
High
tfc.
Calling
Low tfc.
28 ssb channels
App.17
App.15 Sect.A
App.17
16924
16952
17262
17290
W/T coast stations
in this band to be
reassigned here

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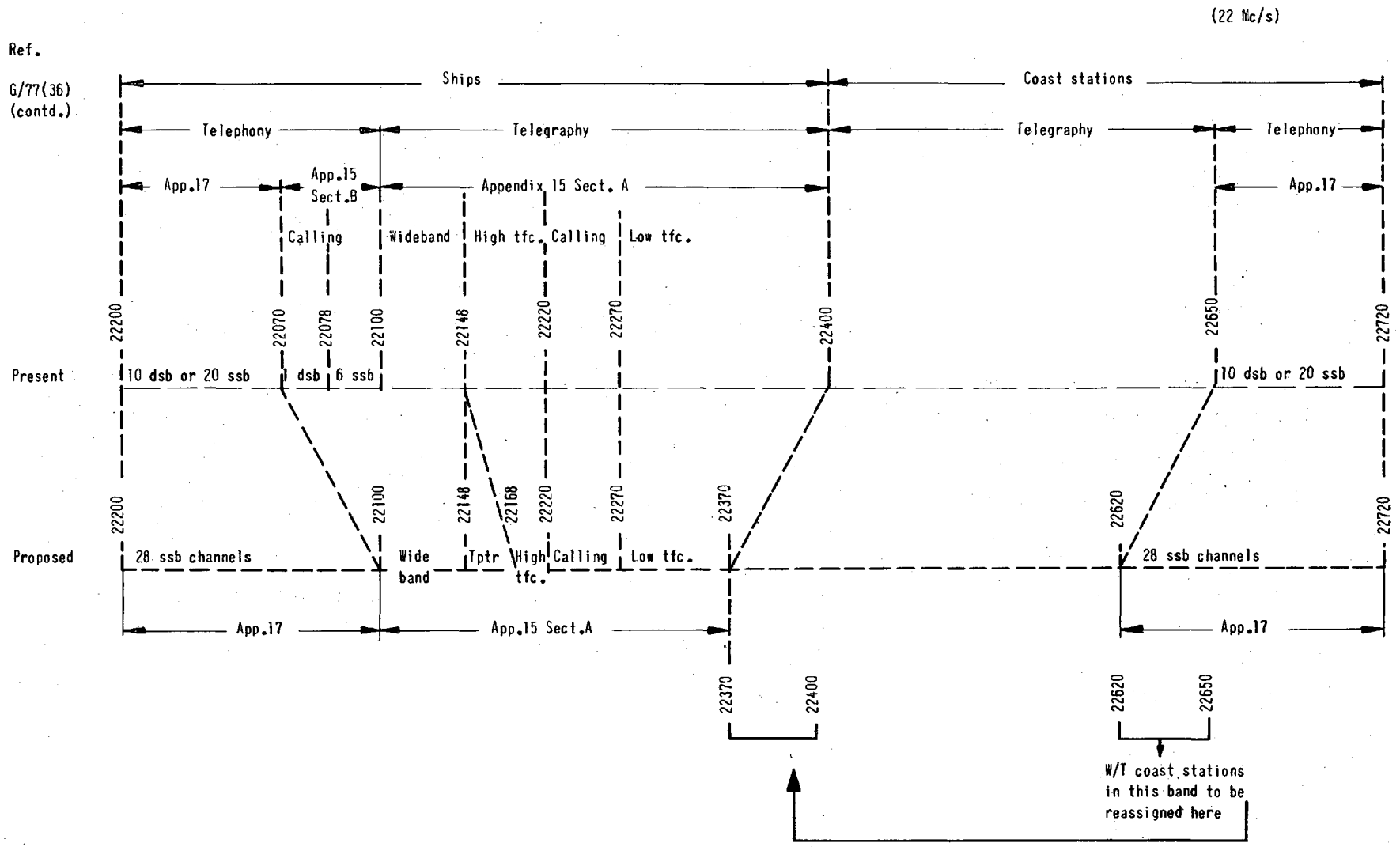
(22 Mc/s)
Ref.
G/77(36)
(contd.)
Ships
Coast stations
Telephony
Telegraphy
Telegraphy
Telephony
App.17
App.15
Sect.B
Appendix 15 Sect. A
App.17
Calling
Wideband
High tfc.
Calling
Low tfc.
22200
22070
22078
22100
22146
22220
22270
22400
22650
22720
Present
10 dsb or 20 ssb
1 dsb
6 ssb
10 dsb or 20 ssb
22200
22100
22148
22168
22220
22270
22370
22620
22720
Proposed
28 ssb channels
Wide
band
Tptr
High
tfc.
Calling
Low tfc.
28 ssb channels
App.17
App.15 Sect.A
App.17
22370
22400
22620
22650
W/T coast stations
in this band to be
reassigned here

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A N N E X II

Ref. Item 3

G/77(37)

APPENDIX 15

MOD Table of frequencies to be used by Ship Radiotelegraph Stations in the bands between 4 and 27.5 Mc/s allocated exclusively to the Maritime Mobile Service

(See Article 32)

MOD 1. The following table indicates the frequencies to be used by ship stations in the bands allocated to the Maritime Mobile Radiotelegraph Service between 4 and 27.5 Mc/s - see also Nos. 1174 to 1201 of Article 32.

MOD 2. The assignable frequencies in a given band for each usage are :

- indicated by the lowest and highest frequency in heavy type, assigned in that band;
- regularly spaced, the number of assignable frequencies and the spacing in kc/s being indicated in italics.

The vertical arrows indicate the harmonic relationship between the frequencies assigned in the different bands.

SUP 3.

Reasons :

Consequential upon the deletion of Section B following the inclusion of Section B frequencies in the revised bands allocated to the radiotelephone service.

SUP Section A (pages 427-428), and replace by attached table.

Reasons :

Consequential upon the proposals put forward in Article 32 (G/77(40)) and Article 35 (G/77(42)).

Ref.

G/77(37) (contd.) SUP Section B (page 429)

Reasons :

Consequential upon the inclusion of Section B frequencies in the revised bands allocated to the radiotelephone service.

Ref. G/77(37) (contd.)

Frequencies assignable to Ship Radiotelegraph Stations using the Maritime Mobile Service Band between 4 and 27.5 Mc/s

kc/s

Band Mc/s	Limits	Assignable frequencies wideband telegraphy facsimile & special transmission systems	Assignable frequencies direct printing telegraphy systems	Assignable working frequencies for high traffic ships	Calling frequencies	Assignable working frequencies for low traffic ships: Group A	Assignable working frequencies for low traffic ships: Group B	Limits
4	4140	4142 – 4158 5 Frequencies spaced 4	4160.25 – 4169.75 20 Frequencies spaced 0.5	4171 – 4176.5 12 Frequencies spaced 0.5	4178 – 4186 17 Frequencies spaced 0.5	4188 – 4208.5 84 Frequencies spaced 0.5	4209 – 4229.5	4231
6	6211	6213 – 6237 7 Frequencies spaced 4	6240.25 – 6249.75 20 Frequencies spaced 0.5	6252 – 6256.5 6 Frequencies spaced 0.75 6264.75 12 Frequencies spaced 0.75	6267 – 6279 17 Frequencies spaced 0.75	6282 – 6312.75 84 Frequencies spaced 0.75	6313.5 – 6344.25	6346.5
8	8280	8282 – 8318 10 Frequencies spaced 4	8320.25 – 8329.75 20 Frequencies spaced 0.5	8332 – 8342 10 Frequencies spaced 1.0 8353 12 Frequencies spaced 1.0	8356 – 8372 17 Frequencies spaced 1	8376 – 8417 84 Frequencies spaced 1	8418 – 8459	8462
12	12421	12424 – 12468 12 Frequencies spaced 4	12471.25 – 12490.75 40 Frequencies spaced 0.5	12495 – 12513 12 Frequencies spaced 1.5 12529.5 12 Frequencies spaced 1.5	12534 – 12558 17 Frequencies spaced 1.5	12564 – 12625.5 84 Frequencies spaced 1.5	12627 – 12688.5	12693
16	16562	16564 – 16620 15 Frequencies spaced 4	16622.25 – 16641.75 40 Frequencies spaced 0.5	16646 – 16684 19 Frequencies spaced 2 16706 12 Frequencies spaced 2	16712 – 16744 17 Frequencies spaced 2	16752 – 16834 84 Frequencies spaced 2	16836 – 16918	16924
22	22100	22132 – 22146 12 Frequencies spaced 4	22149.25 – 22167.75 40 Frequencies spaced 0.5	22172.5 – 22220 20 Frequencies spaced 2.5	22225 – 22265 17 Frequencies spaced 2.5	22272.5 – 22317.5 38 Frequencies spaced 2.5	22320 – 22365	22370
25	25070			Assignable working frequencies to ships of all categories 25075 – 25105 13 Frequencies spaced 2.5				25110

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A N N E X III

Ref. Agenda Item 3

G/77(38)

APPENDIX 17

Duplex channelling of the Maritime Mobile Radiotelephone bands between 4,000 and 23 000 kc/s

(See Article 35)

NOC 1.

NOC 2.

MOD 3. (a) Stations utilizing single sideband emissions shall be considered to be in accordance with Section B if the necessary bandwidth does not extend beyond the upper or lower limits of the bandwidth provided for single sideband emissions in accordance with the table.

(b) Stations employing double sideband emissions (A3) should operate with assigned frequencies listed in the table of Section A.

(c) Stations using single sideband channel emissions (A3A, A3H or A3J) shall operate on the upper sideband derived from the normal carrier frequencies listed in the table of Section B.

Reasons :

To provide for the introduction of single sideband operation.

NOC 4.

Ref.

G/77(38)
(contd.)

SECTION A

Table of double-sideband transmitting frequencies (in kc/s)

Series No.	4 Mc/s band		8 Mc/s band		12 Mc/s band		16 Mc/s band		22 Mc/s band	
	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency
1	4 371.1	4 066.1	8 748.1	8 198.1	13 133.5	12 333.5	17 293.5	16 463.5	22 653.5	22 003.5
2	4 377.4	4 072.4	8 754.4	8 204.4	13 140.5	12 340.5	17 300.5	16 470.5	22 660.5	22 010.5
3	4 383.8	4 078.8	8 760.8	8 210.8	13 147.5	12 347.5	17 307.5	16 477.5	22 667.5	22 017.5
4	4 390.2	4 085.2	8 767.2	8 217.2	13 154.5	12 354.5	17 314.5	16 484.5	22 674.5	22 024.5
5	4 396.6	4 091.6	8 773.6	8 223.6	13 161.5	12 361.5	17 321.5	16 491.5	22 681.5	22 031.5
6	4 403.0	4 098.0	8 780.0	8 230.0	13 168.5	12 368.5	17 328.5	16 498.5	22 688.5	22 038.5
7	4 409.4	4 104.4	8 786.4	8 236.4	13 175.5	12 375.5	17 335.5	16 505.5	22 695.5	22 045.5
8	4 415.8	4 110.8	8 792.8	8 242.8	13 182.5	12 382.5	17 342.5	16 512.5	22 702.5	22 052.5
9	4 422.2	4 117.2	8 799.2	8 249.2	13 189.5	12 389.5	17 349.5	16 519.5	22 709.5	22 059.5
10	4 428.6	4 123.6	8 805.6	8 255.6	13 196.5	12 396.5	17 356.5	16 526.5	22 716.5	22 066.5
11	4 434.9	4 129.9	8 811.9	8 261.9						

SECTION B

TABLE OF SINGLE SIDE BAND - TRANSMITTING FREQUENCIES (in kc/s)

Nominal Carrier frequencies

Series No.	4 Mc/s Band		8 Mc/s Band		12 Mc/s Band		16 Mc/s Band		22 Mc/s Band	
	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency
1	4368.0	4063.0	8745.0	8195.0	13130.2	12330.2	17290.2	16460.2	22650.2	22000.2
2	4371.1	4066.1	8748.1	8198.1	13135.5	12333.5	17293.5	16463.5	22653.5	22003.5
3	4374.3	4069.3	8751.3	8201.3	13137.2	12337.2	17297.2	16467.2	22657.2	22007.2
4	4377.4	4072.4	8754.4	8204.4	13140.5	12340.5	17300.5	16470.5	22660.5	22010.5
5	4380.7	4075.7	8757.7	8207.7	13144.2	12344.2	17304.2	16474.2	22664.2	22014.2
6	4383.8	4078.8	8760.8	8210.8	13147,5	12347.5	17307.5	16477.5	22667.5	22017.5
7	4387.1	4082.1	8764.1	8214.1	13151.2	12351.2	17311.2	16481.2	22671.2	22021.2
8	4390.2	4085.2	8767.2	8217.2	13154.5	12354.5	17314.5	16484.5	22674.5	22024.5
9	4393.5	4088.5	8770.5	8220.5	13158.2	12358.2	17318.2	16488.2	22678.2	22028.2
10	4396.6	4091.6	8773.6	8223.6	13161.5	12361.5	17321.5	16491.5	22681.5	22031.5
11	4399.9	4094.9	8776.9	8226.9	13165.2	12365.2	17325.2	16495.2	22685.2	22035.2
12	4403.0	4098.0	8780.0	8230.0	13168.5	12368.5	17328.5	16498.5	22688.5	22038.5
13	4406.3	4101.3	8783.3	8233.3	13172.2	12372.2	17332.2	16502.2	22692.2	22042.2
14	4409.4	4104.4	8786.4	8236.4	13175.5	12375.5	17335.5	16505.5	22695.5	22045.5
15	4412.7	4107.7	8789.7	8239.7	13179.2	12379.2	17339.2	16509.2	22699.2	22049.2
16	4415.8	4110.8	8792.8	8242.8	13182.5	12382.5	17342.5	16512.5	22702.5	22052.5
17	4419.1	4114.1	8796.1	8246.1	13186.2	12386.2	17346.2	16516.2	22706.2	22056.2
18	4422.2	4117.2	8799.2	8249.2	13189.5	12389.5	17349.5	16519.5	22709.5	22059.5
19	4425.5	4120.5	8802.5	8252.5	13193.2	12393.2	17353.2	16523.2	22713.2	22063.2
20	4428.6	4123.6	8805.6	8255.6	13196.5	12396.5	17356.5	16526.5	22716.5	22066.5
21	4431.8	4126.8	8808.8	8258.8						
22	4434.9	4129.9	8811.9	8261.9						
23	4361.7	4133.1	8732.4	8265.1	13109.2	12400.2	17262.2	16530.2	22622.3	22070.2
24	4364.8	4136.2	8735.5	8268.2	13112,5	12403.5	17265.5	16533.5	22625.5	22073.5
25			8738.7	8271.4	13116.2	12407.2	17269.2	16537.2	22619.2	22077.2
26			8741.8	8274.5	13119.5	12410.5	17272.5	16540.5	22632.5	22080.5
27					13123.2	12414.2	17276.2	16544.2	22636.2	22084.2
28					13126.5	12417.5	17279.5	16547.5	22639.5	22087.5
29							17283.2	16551.2	22643.2	22091.2
							17286.5	16554.5	22646.5	22094.5
	6 Mc/s Band									
	Coast Station Frequency	Ship Station Frequency								
31	6514.5	6203.5								
32	6518	6204								
33	6521.5	6207.5								

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A N N E X IV

Ref. Agenda Item 3

G/77(39) Article 7

MOD 447 (a) Ship stations, telephony

4 063 - 4 140 kc/s
6 200 - 6 211 kc/s
8 195 - 8 280 kc/s
12 330 - 12 421 kc/s
16 460 - 16 562 kc/s
22 000 - 22 100 kc/s

Reasons :

To include the frequency bands listed in Nos. 449 and 450 consequential upon the inclusion of these frequencies in a revised Appendix 17, Section B.

MOD 448 (b) Coast Stations, telephony

4 361 - 4 438 kc/s
6 514.5- 6 525 kc/s
8 731 - 8 815 kc/s
13 109 - 13 200 kc/s
17 262 - 17 360 kc/s
22 620 - 22 720 kc/s

Reasons :

To provide additional channels associated with the corresponding ship station frequencies formerly in Appendix 15, Section B.

SUP 449 and 450

Reasons :

Included in No. 447.

Ref.

G/77(39) (contd.)

MOD 452 (d) Ships stations, telegraphy

4 160- 4 231 kc/s 16 622-16 924 kc/s
6 240- 6 346.5 kc/s 22 148-22 370 kc/s
8 320- 8 462 kc/s 25 070-25 110 kc/s[1]
12 471-12 693 kc/s

Reasons :

To provide for coast station radiotelephone channels. Consequential upon amendment of No. 448.

MOD 453 (e) Coast stations, telegraphy, facsimile and special transmisssion systems

4 231 - 4 361 kc/s
6 346.5- 6 514.5 kc/s
8 462 - 8 731 kc/s
12 693 - 13 109 kc/s
16 924 - 17 262 kc/s
22 370 - 22 620 kc/s[1]

MOD 452.1 [1] The frequencies in the band 25 070 - 25 110 kc/s shall be used as working frequencies in addition to frequencies in the band 22 148 - 22 370 kc/s.

Reasons :

Consequential upon amendment of No. 452.

MOD 453.1 [1] Frequencies in the bands 25,010 - 25 070 kc/s, 25 110 - 25 600 kc/s, and 26 100 - 27 500 kc/s may be assigned to coast stations. They are then considered as frequencies additional to those in the band 22 370-22 620 kc/s.

Reasons:

Consequential upon amendment to No. 453.

Ref.

G/77(39)
(contd.)

Reasons :

Heading amended (see Agenda Item 2.5, G/56(3), Document No. 56. Frequency band amended consequential upon amendment of No. 448.

SUP 457

Reasons :

Appendix 25 replaced by procedure outlined in Annex V.

Ref. Article 32

G/77(40) MOD 1145 §17.(1) Mobile radiotelegraph stations equipped to operate in the bands specified in Nos. 1174, 1192 and 1196 shall employ only class A1 emission. However, other classes of emission are not precluded from the bands specified in No. 1192 provided that such emission can be contained within the normal working channels indicated in Appendix 15. Survival craft stations may use class A2 emissions in these bands (see Nos. 994 and 997).

Reasons :

Consequential upon the deletion of Section B, Appendix 15.

MOD 1146 (2) Mobile stations equipped to operate in the frequency bands authorized to ships for wide-band telegraphy, facsimile and special transmission systems may use any class of emissions provided that such emissions can be contained within the wide-band channels indicated in Appendix 15. However, manual Morse and telephony are excluded, except for operational signals.

Reasons :

Consequential upon the deletion of Section B of Appendix 15.

MOD 1149 §18.(1) Each of the bands reserved for ship radiotelegraph stations, except for the band 25 070 - 25 110 kc/s, shall be divided into five parts, beginning at the low frequency end :

Reasons :

Consequential upon new No. 1150A - to provide for direct-printing telegraph systems (see Agenda Item 7.1, G/60(14), Document No. 60).

MOD 1158 (3) The arrangement of the frequencies in the ship radiotelegraph bands is illustrated graphically in Appendix 15.

Ref.

G/77(40) (contd.)

Reasons :

Consequential upon the deletion of Section B, Appendix 15.

SUP 1173

Reasons :

Already covered by No. 453 (G/77(39) above).

MOD 1175 (2) In the band 4177 to 4187 kc/s, the calling frequencies shall be uniformly distributed. They shall be preferably spaced 0.5 kc/s apart. The extreme frequencies assignable are 4178 and 4186 kc/s as indicated in Appendix 15.

Reasons :

a) Consequential upon the deletion of Section B of Appendix 15, and

b) to improve distribution over the band.

MOD 1176 (3) In each of the other maritime mobile service bands between 4000 and 18 000 kc/s, the calling frequencies shall be in harmonic relationship with those in the band 4177 to 4187 kc/s. In the band 22 220 to 22 270 kc/s, the preferable spacing of calling frequencies is 2.5 kc/s.

Reasons :

To improve the distribution on the 22 Mc/s band.

MOD 1180 §32. In all bands the working frequencies for ship stations equipped to use wide-band telegraphy, facsimile and special transmission systems are spaced 4 kc/s apart. The frequencies assignable are shown in Appendix 15.

Ref.

G/77(40)
(contd.)

Reasons :

Consequential upon deletion of Section B of Appendix 15.

MOD 1181 §33.(1) The working frequencies for high traffic ships in the band 4170 to 4177 kc/s are so spaced as to provide channels 0.5 kc/s wide, the extreme frequencies assignable being 4171 band 4176.5 kc/s as shown in Appendix 15.

Reasons :

Consequential upon the amendment of Appendix 15, and to improve distribution over the band.

MOD 1182 (2) In the band 4187 to 4231 kc/s, the working frequencies of low traffic ships are spaced 0.5 kc/s apart, the extreme frequencies assignable being 4188 and 4229.5 kc/s as indicated in Appendix 15.

Reasons :

Consequential upon deletion of Section B of Appendix 15, and to provide additional coast station radiotelephone channels.

MOD 1183 §34. The working frequencies assigned to each ship station in the 6, 8, 12 and 16 Mc/s band shall be harmonically related to those assigned in the 4 Mc/s band, except as provided in Nos. 1179A and 1180.

Reasons :

To provide for the use of non-harmonically related frequencies in the bands provided for direct printing telegraph services (see Agenda Item 7.1, G/60(15), Document No. 60).

MOD 1184 §35. In case of the 22 Mc/s band, which is not in harmonic relationship with the other bands, the frequencies are spaced as follows, as shown in Appendix 15.

Ref.

G/77(40) (Contd.)

Reasons :

Consequential upon deletion of Section B of Appendix 15.

MOD 1185 (a) In the high traffic band, the working frequencies are spaced 2.5 kc/s apart, the extreme frequencies assignable being 22 172.5 and 22 220 kc/s.

Reasons :

Consequential upon extension of coast station telephony band. (See amended Nos. 448 and 452, G/77(39) above).

MOD 1186 (b) In the low traffic band, the working frequencies are spaced 2.5 kc/s apart, the extreme frequencies assignable being 22 272.5 and 22 365 kc/s.

Reasons :

Consequential upon amendment of No. 452.

MOD 1187 §36. In the 25 Mc/s band, the frequencies are spaced 2.5 kc/s apart, the extreme frequencies assignable being 25 075 and 25 105 kc/s, as shown in Appendix 15.

Reasons :

To provide additional channels, and consequential upon the deletion of Section B, Appendix 15.

MOD 1189 §38.(1) Each administration shall assign to each ship station under its jurisdiction and employing wide-band telegraphy, facsimile and special transmission systems, one or more series of working frequencies designated in Appendix 15. The total number of series assigned to each ship shall be determined by traffic requirements.

Reasons :

Consequential upon deletion of Section B of Appendix 15.

Ref.

G/77(40) (contd.)

MOD 1191 (3) However, within the limits of the bands given in No. 1188 administrations may, to meet the needs of specific systems, assign frequencies in a different manner from that shown in Appendix 15. Nevertheless, administrations shall take into account, as far as possible, the provisions of Appendix 15 concerning channelling and 4 kc/s spacing.

Reasons :

Consequential upon deletion of Section B, Appendix 15.

MOD 1192 §39. The working frequencies assigned to high traffic ships are included within the following band limits :

4 170	to	4 177	kc/s
6 250	to	6 265.5	kc/s
8 330	to	8 354	kc/s
12 491	to	12 531	kc/s
16 642	to	16 708	kc/s
22 168	to	22 220	kc/s.

Reasons :

a) To provide channels for direct-printing telegraph systems (Agenda Item 7.1, Document No. 60), and

b) Consequential upon the revision of channel spacing (see No. 1181 above).

MOD 1193 §40.(1) Each administration shall assign to each high traffic ship within its jurisdiction two or more series of working frequencies shown in Appendix 15 for vessels of this class. The total number of series assigned to each ship should be determined by the anticipated traffic volume.

Reasons :

Consequential upon the deletion of Section B of Appendix 15.

Ref.

G/77(40) (contd.)

MOD 1196 §42. Working frequencies assigned to low traffic ships shall be included within the following band limits :

4 187	to	4 231	kc/s
6 280.5	to	6 346.5	kc/s
8 374	to	8 462	kc/s
12 561	to	12.693	kc/s
16 748	to	16 924	kc/s
22 270	to	22 370	kc/s

Reasons :

To provide coast station radiotelegraph frequencies to replace those allocated to coast station radiotelephone services (see proposals for Appendix 17, G/77(38) above).

MOD 1197 §43.(1) In each of the low traffic bands, the assignable frequencies are divided into two equal Groups A and B, Group A comprising the frequencies in the lower half of the band and Group B the frequencies in the upper half (see Appendix 15).

Reasons :

Consequential upon deletion of Section B of Appendix 15.

Ref.			Article 33
G/77(41)	MOD	1236	§9.(1) A ship station calling a coast station by radiotelephony may use the working frequency associated with that of the coast station in accordance with Appendix 17.

Reasons :

Consequential upon the deletion of No. 1352 (G/77(42)).

MOD	1249	§13.(1) When a ship station is called by a coast station, it should reply on the working frequency associated with that of the coast station in accordance with Appendix 17.

Reasons :

Consequential upon deletion of No. 1352 (G/77(42)).

MOD	1250	(2) When a coast station is called by a ship station, the coast station should reply on the working frequency associated with that of the ship station in accordance with Appendix 17.

Reasons :

For clarification.

MOD	1255	§16. After a ship station has established contact with a coast station, or another ship station, traffic shall be exchanged on their respective working frequencies.

Reasons :

Consequential upon the deletion of No. 1352.

Ref. | Article 35

G/77(42) SUP 1352

Reasons :

Consequential upon the deletion of Section B, Appendix 15, and modification of No. 453 (G/77(39) above).

SUP 1354

Reasons :

Consequential upon deletion of No. 1352.

SUP 1356 and 1357

Reasons :

Consequential upon the deletion of Section B, Appendix 15.

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ANNEX V

Ref. Agenda Item 3

G/77(43)

RESOLUTION No. 3A

Relating to the transfer of frequency assignments for coast radiotelegraph stations in the bands exclusively allocated to the Maritime Mobile Service between 4 000 and 23 000 kc/s

The Maritime World Administrative Radio Conference, Geneva, 1967,

decides

1. that use by ships of the radiotelegraph working frequencies in the bands 4 231-4 238, 6 346.5-6 357, 8 462-8 476, 12 693-12 714, 16 924-16 952 and 22 370-22 400 kc/s shall cease by .....;

2. that the assignments for coast radiotelegraph stations entered in the Master International Frequency Register on that date shall be transferred in the frequency order in which they are then entered from the bands listed under a) to the corresponding bands listed under b) and provided that no changes are made in basic characteristics shall retain the registration dates (Column 2) then applicable.

a)	b)
4 361- 4 368 kc/s	4 231- 4 238 kc/s
6 514.5-6 525 kc/s	6 346.5-6 357 kc/s
8 731- 8 745 kc/s	8 462- 8 476 kc/s
13 109-13 130 kc/s	12 693-12 714 kc/s
17 262-17 290 kc/s	16 924-16 952 kc/s
22 620-22 650 kc/s	22 370-22 400 kc/s.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 78-E
20 June 1967
Original : English

PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Additional Agenda Item 9 *

Article 7

SUP 438

Reasons :

Covered by No. 1123.

SUP 439

Reasons :

Covered by No. 182.

SUP 455

Reasons :

Covered by No. 1139.

Article 19

ADD 777B (5) Ship's On-board Portable Stations

- the official name of the ship followed by a single letter or appropriate indicator.

Reasons :

To provide for the use of portable "on-board" equipment. The name of the ship followed by a single letter (with the use of the analogy given in Appendix 16 ALFA, BRAVO, CHARLIE, etc.) would avoid confusion with simultaneous operations on any other adjacent ship.

* Item not on the agenda of the W.A.R.C. but which the United Kingdom proposed that the Conference consider.

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Article 29

SUP 1006

Reasons :

Superfluous.

Article 32

MOD 1122 § 10. As an exception to the provisions of Nos. 1107, 1109, 1110 and 1111 and on condition that signals of distress, urgency and safety, and calls and replies are not interfered with, 500 kc/s may be used outside regions of heavy traffic for direction-finding but with discretion.

Reasons:

Consequential upon deletion of No. 1122.1.

SUP 1122.1

Reasons :

The provision is now out-of-date.

MOD 1148 (4) Coast radiotelegraph stations employing single channel class A1 of F1 emission operating in the maritime mobile exclusive bands between 4000 and 27500 kc/s shall at no time use mean power in excess of the following :

Band	Maximum mean power
4 Mc/s	5 kW
6 Mc/s	5 kW
8 Mc/s	10 kW
12 Mc/s	15 kW
15 Mc/s	15 kW
22 Mc/s	15 kW

Reasons :

Consequential upon new 1148A - to differentiate between powers required for single-channel and multi-channel emissions.

ADD 1148A (5) Coast radiotelegraph stations employing multi-channel telegraph emissions operating in the maritime mobile exclusive bands between 4000 and 27500 kc/s shall at no time use a mean power in excess of 2.5 kW per 500 c/s bandwidth.

Reasons :

To provide for maximum powers required in respect of multi-channel telegraph emissions.

SUP 1155

Reasons :

Consequential upon the amendment to No. 1156 - see Agenda Item 2.3 (G/56(2), Document No. 56).

Article 33

SUP 1210

Reasons :

Covered by No. 951

MOD 1215 (2) Radiotelephone stations of the maritime mobile service which participate in communications between ship stations and subscribers of the land telephone system, should as far as possible, avoid manual methods switching from transmission to reception and vice versa.

Reasons :

For clarification.

Reference to aircraft deleted as already covered by No. 951.

MOD 1219 (a) The mobile station whose emission causes interference to the correspondence of a mobile station with a coast station shall cease sending at the first request of the coast station.

Reasons :

Reference to aeronautical station deleted as already covered by No. 951.

MOD 1266 § 20.(1) If the station called is unable to accept traffic immediately, it should reply to the call as indicated in No. 1241 followed by "Wait .... minutes", indicating the probable duration of waiting time in minutes. If the probable duration exceeds ten minutes the reason for the delay shall be given. Alternatively the station called may indicate by any appropriate means, that it is not ready to receive traffic immediately.

Reasons :

Reference to aircraft deleted as already covered by No. 951.

SUP 1284

Reasons :

Included in new No. 1216A - see Agenda Item 6 (G/59(8), Document No. 59).

MOD 1285 (6) In transmitting groups of figures each figure shall be spoken separately and the transmission of each group or series of groups shall be preceded by the words "in figures".

Reasons :

Consequential upon new 1216B - see Agenda Item 6 - (G/59(8)).

Article 34

MOD 1317 (2) The information referred to in Nos. 1314 to 1316 should be furnished by mobile stations without prior request from the coast station, whenever such a measure seems appropriate. This information is furnished on the authority of the master or the person responsible for the mobile station.

Reasons :

Nos. 1317 and 1318 combined and amended for clarification.

SUP 1318

Reasons :

Combined with No. 1317 for clarification.

Article 35

SUP 1320

Reasons :

Covered by No. 951.

Under "B. Watch"

ADD 1353A § 15 (bis) The hours of service of coast stations open to public correspondence and the frequency or frequencies on which watch is maintained shall be indicated in the List of Coast Stations.

Reasons :

To provide for watchkeeping arrangements.

ADD 1367A (5) However, when within the service area of a Port Operations Coast Station, ship stations may maintain **watch either on** 156.80 Mc/s or on the appropriate port operations channel if watch cannot be maintained on both.

Reasons :

To permit watch being maintained on a port operations channel when in an area served by a port operations service.

Article 36

ADD 1462A § 38 (bis) A mobile station should not acknowledge receipt of a distress message transmitted by a land station under the conditions mentioned in Nos. 1452 to 1455 until the Master or person responsible has confirmed that the mobile station concerned is in a position to render assistance.

Reasons :

To avoid unnecessary acknowledgements which could interfere with distress working.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 79-E
28 June 1967
Original : English

PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Additional Agenda Item UK 10 *

Relating to the reduction of the guard-band for the International Distress and Calling Frequency, 2182 kc/s (RR 1325)

1. General

A study has been made of the effect of reducing the guard-band for the distress frequency, 2182 kc/s, from 24 kc/s to 17 kc/s (± 8.5 kc/s) and to 10 kc/s (± 5 kc/s).

The following data has been used to carry out the study :

a) The I.F.R.B. technical standard of 15 dB signal to interference for the reception of A3;

b) The I.F.R.B. technical standards A5 relating to propagation data;

c) Typical selectivity characteristics of a loudspeaker watch receiver and of a ship's main receiver as given in Annexes I and II respectively;

Note : When using the selectivity curves, the discrimination at the edge of the band has been used. Hence the assessments of separation distances quoted in Tables 1, 2 and 3 refer to the least favourable conditions.

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* Item not on the agenda of the W.A.R.C. but which the United Kingdom proposes that the Conference consider.

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d) A minimum signal to be protected of 25 uV/m in accordance with SAFCON;

e) Aerial efficiences of 75% for coast station; 25% for ship station and 0.35% for survival craft.

With the above data the effects of reducing the 2182 kc/s guard-band from 24 kc/s to 17 kc/s and 10 kc/s have been assessed. These assessments have been carried out at the limits of the range (25 uV/m at the receiver) for transmitter mean powers of a) 100 watts and 15 watts from a ship station transmitting the distress signal and b) 1 watt from a survival craft transmitting the distress signal. For each case the interfering signal in the channel adjacent to the guard-band has been taken as due to mean powers of i) 100 watt from a ship transmitter; ii) 1 kW from a coast station transmitter, using the SSB type of emission. No account has been taken of atmospheric noise.

2. Results of study

The results have been presented in the form of Tables 1, 2 and 3 showing the minimum separation necessary between an interfering station operating in a channel adjacent to the existing 24 kc/s guard-band and for the reduced guard-bands of 17 kc/s and 10 kc/s, at the limits of the service ranges (25 uV/m at the receiver) of ship and survival craft stations sending out the distress signal. The first figure in each box of columns 2, 3 and 4 refers to the case where the receiver selectivity characteristics of Curve A of Annex I is used, the figure in parenthesis referring to the case where Curve B of Annex II is used, for the reception of the distress signal on 2182 kc/s in the presence of an interfering signal.

TABLE 1

Interfering signal arising from a ship station (100 W) in the channel adjacent to the guard-band

Separation in kilometres between station sending and receiving distress signals. This range is determined by the power and type of station (shown in parenthesis) sending the distress call to give a field strength at the receiver of 25 uV/m. It does not take into account atmospheric noise.	Minimum separation in kilometres between interfering station and station receiving the distress call, for satisfactory reception of the distress call when using a receiver with the selectivity characteristic given in Curve A of Annex I. The figure in parenthesis is for reception on a receiver having the selectivity characteristics given in Curve B of Annex II.		
	24 kc/s Guard-band (2)	17 kc/s Guard-band (3)	10 kc/s Guard-band (4)
(1)			
310 (DAY) (100 W SHIP)	90 (35)	200 (95)	380 (300)
310 (NIGHT) (100 W SHIP)	90 (35)	200 (95)	1000 (350)
210 (DAY) (15 W SHIP)	90 (35)	200 (95)	380 (300)
210 (NIGHT) (15 W SHIP)	90 (35)	200 (95)	1000 (350)
20 (DAY) (1 W SURVIVAL CRAFT)	90 (35)	200 (95)	380 (300)
20 (NIGHT) (1 W SURVIVAL CRAFT)	90 (35)	200 (95)	1000 (300)

TABLE 2

Interfering signal arising from a coast station (1 kW) in the channel adjacent to the guard-band

Separation in kilometres between stations sending and receiving distress call. This range is determined by the power and type of stations (shown in parenthesis) sending the distress call to give a field at the receiver of 25 uV/m. It does not take into account atmospheric noise.	Minimum separation in kilometres between interfering station and station receiving distress call, for satisfactory reception of distress call when using a receiver with the selectivity characteristics given in Curve A of Annex I. The figure in parenthesis is for reception on a receiver having the selectivity characteristic given in Curve B of Annex II.		
	24 kc/s Guard-band (2)	17 kc/s Guard-band (3)	10 kc/s Guard-band (4)
(1)			
310 (DAY) (100 W SHIP)	250 (110)	400 (250)	600 (540)
310 (NIGHT) (100 W SHIP)	250 (110)	1200 (250)	3600 (2900)
210 (DAY) (15 W SHIP)	250 (110)	400 (250)	600 (540)
210 (NIGHT) (15 W SHIP)	250 (110)	1200 (250)	3600 (2900)
20 (DAY) (1 W SURVIVAL CRAFT)	250 (110)	400 (250)	600 (540)
20 (NIGHT) (1 W SURVIVAL CRAFT)	250 (110)	1200 (250)	3600 (2900)

Table 2 does not represent a case existing in practice because at present the channels adjacent to the 24 kc/s guard-band at 2182 kc/s are used only by ship stations. Table 3 has therefore been prepared to give a comparison in the cases of the adjacent channel interfering signal arising from a) a ship station when the guard-band is 24 kc/s and b) a coast station when the guard band is 17 kc/s and 10 kc/s.

TABLE 3

Comparison of ship and coast station interference to distress signal

Separation in kilometres between stations sending and receiving distress calls. This range is determined by the power and type of station (shown in parenthesis) sending the distress call, to give a field at the receiver of 25 uV/m. It does not take into account atmospheric noise.	Minimum separation in kilometres between interfering station and station receiving the distress call, for satisfactory reception of a distress call using a receiver with the selectivity characteristic given in Curve A of Annex I. The figure in parenthesis is for reception on a receiver having the selectivity characteristic given in Curve B of Annex II.		
	24 kc/s Guard-band (Ship station interfering) (2)	17 kc/s Guard-band (Coast station interfering) (3)	10 kc/s Guard-band (Coast station interfering) (4)
(1)			
310 (DAY) (100 W SHIP)	90 (35)	400 (250)	600 (540)
310 (NIGHT) (100 W SHIP)	90 (35)	1200 (250)	3600 (2900)
210 (DAY) (15 W SHIP)	90 (35)	400 (250)	600 (540)
210 (NIGHT) (15 W SHIP)	90 (35)	1200 (250)	3600 (2900)
20 (DAY) (1 W SURVIVAL CRAFT)	90 (35)	400 (250)	600 (540)
20 (NIGHT) (1 W SURVIVAL CRAFT)	90 (35)	1200 (250)	3600 (2900)

3. Comments on results

From Table 1 it may be seen that there would be serious degradation to the reception of distress calls on 2182 kc/s if the guard-band were reduced from 24 to 10 kc/s, exemplified by the greatly increased geographical separation needed between a station operating in a band adjacent to the guard-band and the station trying to receive a distress call. When the guard band is reduced from 24 kc/s to 17 kc/s the degradation of the service may not be considered to be nearly as serious. Further, from Table 1 it may be seen that the figures outside the bracket in Column 2 and the figures inside the bracket in Column 3 are nearly in agreement. This indicates that the same order of protection now exists with a guard-band of 24 kc/s, using a receiver with the selectivity characteristic of Curve A of Annex I, could be maintained with a guard-band of 17 kc/s, using a receiver with the selectivity characteristic of Curve B of Annex II.

Table 3 indicates the degradation to the reception of distress calls on 2182 kc/s if a coast station, instead of a ship station, operates in the channel adjacent to the guard-band and it may be seen that there would be a degradation from the present conditions pertaining to the reception of distress calls on 2182 kc/s if the guard-band were reduced from 24 kc/s to 17 kc/s, due to the greatly increased radiated power from a coast station relative to that of a ship station. However, short bursts of selective calling signals from a coast station may in fact cause little interference to a distress call, if restricted to the lower derived channel (2170 - 2173.5 kc/s).

4. Conclusions

It is concluded that there would be very good technical reasons for strongly resisting the reduction of the guard-band at 2182 kc/s from 24 to 10 kc/s, irrespective of the type of maritime service that would be operated in the bands made available. Further there are good technical reasons for resisting the reduction of the guard-band from 24 kc/s to 17 kc/s if the channels made available were to be used for coast station radiotelephony transmissions. However, there may not be an unacceptable degradation to the reception of distress calls on 2182 kc/s if the guard-band were reduced from 24 to 17 kc/s and the channels made available were used for ship-to-shore purposes; at coast station selective calling

signals in the lower derived channel (2170 - 2173.5 kc/s). The same order of protection as now exists could be maintained with the guard-band reduced from 24 kc/s to 17 kc/s by increasing the selectivity of the receiver from that given in Curve A of Annex I, to that given in Curve B of Annex II.

5. The necessary amendments to Articles 7 and 35 are given in Annex III.

Annexes : 3

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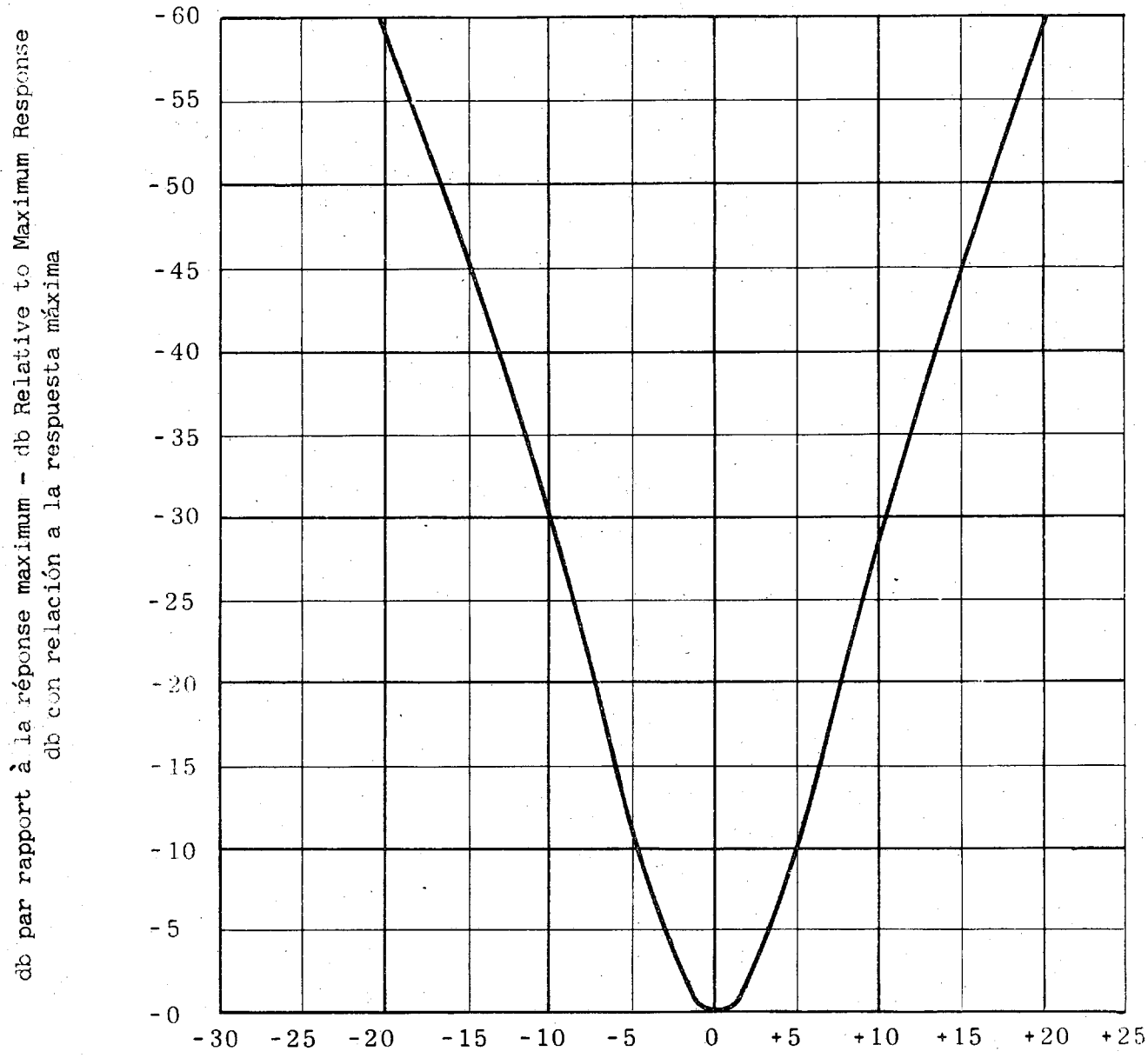
A N N E X E I - A N N E X I - A N E X O I

Courbe de sélectivité du récepteur "A" - Receiver Selectivity Curve "A"
Curva "A" de selectividad del receptor



Ecart par rapport à la fréquence d'accord, kHz - Frequencies Removed from Tune (kc/s)
Diferencia con relación a la frecuencia de sintonización (kc/s)

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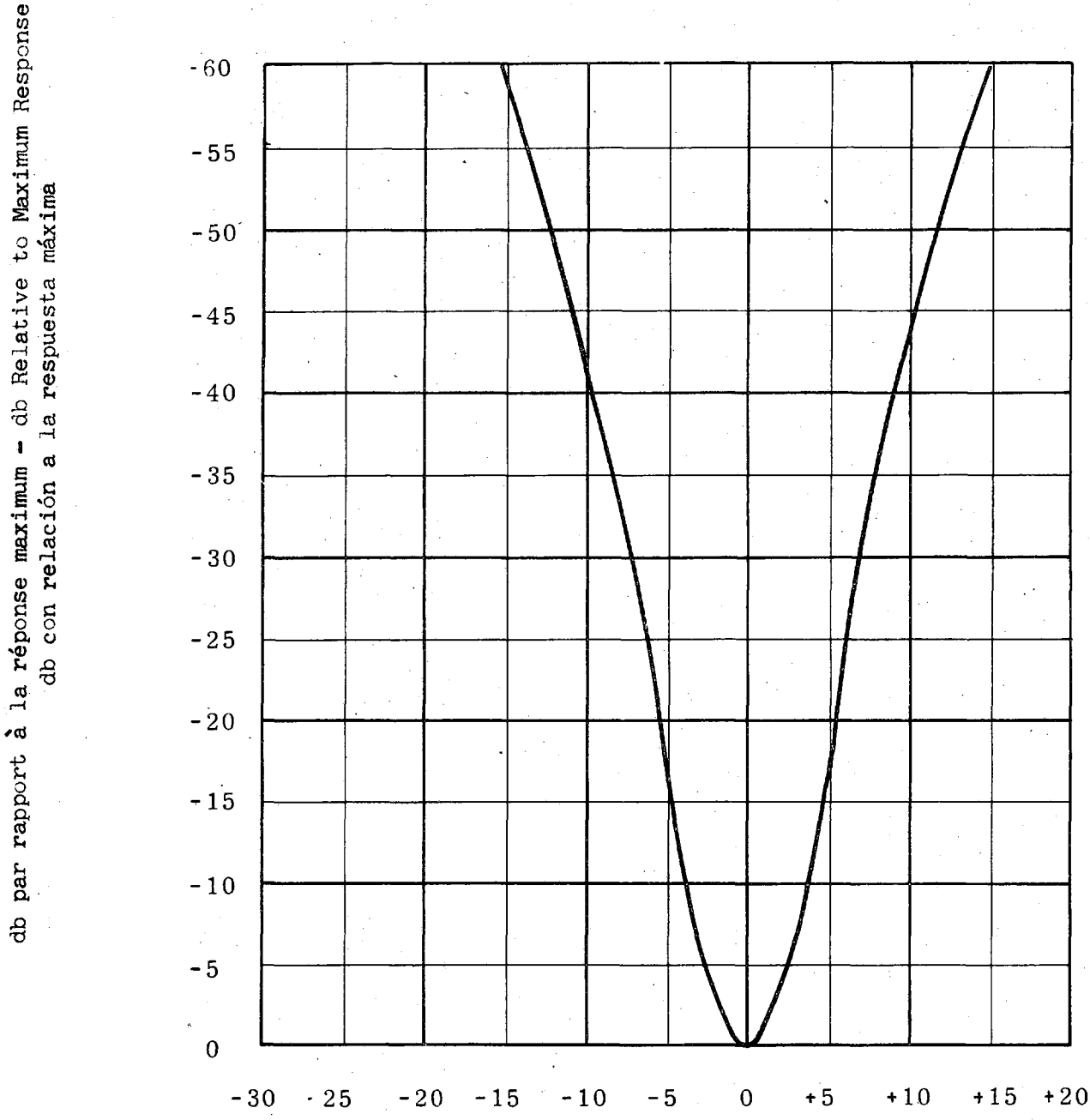
A N N E X E II - A N N E X II - A N E X O II

Courbe de sélectivité du récepteur "B" - Receiver Selectivity Curve "B"
Curva "B" de selectividad del receptor



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ANNEX III

Article 7

MOD 442 Replace :

- 2170-2194 kc/s : Guard-band for the distress frequency 2182 kc/s.

by

- 2170-2173.5 kc/s : Selective calling of ship stations by coast stations.
- 2173.5-2190.5 kc/s: Guard-band for the distress frequency 2182 kc/s.
- 2190.5-2194 kc/s : Ship stations calling and working to coast stations (see Nos. 1339A and 1344B).

Reasons :

To take advantage of the improvement of transmitter and receiver design to reduce the guard-band for 2182 kc/s to ± 8.5 kc/s.

Article 33

ADD 1248A c) on a working frequency to calls made on the frequency 2192.35 kc/s (carrier frequency 2191 kc/s). (See No. 1339A.)

Reasons :

To provide for coast stations to reply to calls made on 2192.35 kc/s when this is used as a supplementary calling frequency.

Article 35

MOD 1325 (3) Except for transmissions authorized on 2182 kc/s, all transmissions on the frequencies between 2173.5 and 2190,5 kc/s are forbidden.

Reasons :

To take advantage of the improvement of transmitter and receiver design to reduce the guard-band for 2182 kc/s to ± 8.5 kc/s.

ADD 1339A § 8 (bis) When 2182 kc/s is being used for distress the frequency 2192.35 kc/s (carrier frequency 2191 kc/s) may be used by ships as a supplementary frequency for calling coast stations. During this period ship stations shall not use 2192.35 kc/s as an international working frequency in those areas where it is in use as a supplementary calling frequency.

Reasons :

To provide alternative calling arrangements during periods of distress working.

ADD 1344B ab) the ship-shore working frequency 2192.35 kc/s (carrier frequency 2191 kc/s).

Reasons :

To provide for the use of an SSB channel consequent upon the reduction of the guard-band for 2182 kc/s.

MOD 1350 2) During the periods mentioned above, except for the transmissions provided for in Article 36, transmissions shall cease within the band 2173.5 - 2190.5 kc/s.

Reasons :

Consequent upon the amendment to No. 1325.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

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6 July 1967
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PLENARY MEETING

KINGDOM OF THE NETHERLANDS

Proposals for the work of the Conference

Agenda Item 3 :

Consequential revision of Appendix 25

Proposals

Annex 1 - Consequential revision of Appendix 25.

Annex 2 - Draft Resolution relating to the Notification and Recording of Frequency Assignments to Radiotelephone Coast Stations operating in the Bands allocated exclusively to the Maritime Mobile Service between 4000 and 23 000 kc/s during and after the period of conversion from double sideband to single sideband operation.

Annex 3 - Consequential partial revision of Article 9 of the Radio Regulations.

Annexes : 3

ARCHIVES U.I.T. GENEVE

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A N N E X 1

CONSEQUENTIAL REVISION OF APPENDIX 25

It is considered that both the retention of Appendix 25 in its present form and the establishment of a new plan for radiotelephone coast stations will be practically impossible. In view of :

a) the short time available to the Conference;

b) the lack of sufficient technical data; and

c) the impracticability of establishing in 1967 a plan which would not become effective until the end of the conversion period (1 January, 1977);

the Netherlands Administration proposes to abrogate Appendix 25 to the Radio Regulations and to deal with frequency assignments to radiotelephone coast stations operating in the HF bands under the normal procedure provided for in Article 9 of the Radio Regulations.

During the period of conversion to single sideband operation the notification and recording of frequency assignments should take place in accordance with a suitable procedure, which also contains provisions to be applied to those assignments to radiotelephone coast stations already recorded in the Master Register. It is proposed that such an interim procedure should be established in the form of a Resolution.

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Ref.

HOL/80(28)

ANNEX 2

DRAFT RESOLUTION

Relating to the Notification and Recording of Frequency Assignments to Radiotelephone Coast Stations operating in the Bands allocated exclusively to the Maritime Mobile Service between 4000 and 23 000 kc/s during and after the period of conversion from double sideband to single sideband operation.

The World Administrative Radio Conference, Geneva, 1967,

considering

a) that the Final Acts of this Conference will enter into force on the first of January, 1969;

b) that the Frequency Allotment Plan for radiotelephone coast stations contained in Appendix 25 to the Radio Regulations will be abrogated on that date;

c) that radiotelephone coast stations operating in the bands referred to in No. 448 of the Radio Regulations must be equipped for single sideband operation by the first of January 1970, and must be able to use full carrier (A3H) emission to permit communication with radiotelephone ship stations using both double sideband and single sideband emission until the first of January, 1977;

d) that the use of double sideband emission by radiotelephone ship stations in the bands referred to in No. 447 and the use of A3H emission by radiotelephone coast stations in the bands referred to in No. 448 of the Radio Regulations, must be discontinued by the first of January, 1977;

e) that some Administrations will change over, at their radiotelephone coast stations, to single sideband operation, or put new frequencies or stations for single sideband operation into use, before the first of January, 1970, where this can be done without causing harmful interference to radiotelephone coast stations operating in accordance with Column 4 of the Table in Appendix 17 (Revised) to the Radio Regulations and using class A3 emission;

Ref.

HOL/80(28) (contd.)

f) that, therefore, it will be necessary to provide for a procedure to facilitate the conversion from double sideband to single sideband operation;

resolves

1. during the period between the first of January, 1969, and the first of January, 1977, the notification and recording of frequency assignments to radiotelephone coast stations operating in the bands referred to in No. 448 of the Radio Regulations shall take place in accordance with the provisions laid down in the Annex to this Resolution.

2. As from the first of January, 1977, the notification and recording of frequency assignments to radiotelephone coast stations operating in the bands referred to in No. 448 of the Radio Regulations shall take place in accordance with the provisions of Article 9 of the Radio Regulations (Nos. 486-540), unless otherwise provided for in the Annex to this Resolution.

3. For the notification and recording of frequency assignments to radiotelephone ship stations operating in the bands referred to in No. 447 of the Radio Regulations and used for reception by particular radiotelephone coast stations, the provisions referred to in paragraph 1 or 2 above, as appropriate, shall be applied by analogy.

Annex

to Draft Resolution

Notification and Recording of Frequency Assignments to Radiotelephone Coast Stations operating in the Bands referred to in No. 448 of the Radio Regulations, during and after the period between 1 January, 1969, and 1 January, 1977.

Section I. Notification of Frequency Assignments

1. § 1.(1) In so far as this has not yet been done, any frequency assignment to a radiotelephone coast

Ref.

HOL/80(28)
(contd.)

station using single sideband operation and for which, on the corresponding double sideband channel, an entry is listed in the Master Register for double sideband operation, shall be notified to the International Frequency Registration Board in accordance with the provisions of Section I of Article 9 of the Radio Regulations. However, each notice shall reach the Board not later than 1 January, 1970.

2. (2) Similar notice shall be given for any frequency assignment to a radiotelephone coast station using single sideband operation and for which, on the corresponding double sideband channel, no entry is listed in the Master Register for double sideband operation.

3. § 2.(1) For any notification under item 1 above, an Administration shall, in principle, notify only the upper half of the original double sideband channel as the conversion from double sideband to single sideband operation.

4. (2) Exceptionally, however, if harmful interference has been experienced on the upper channel, an Administration may notify the lower channel as the conversion from double sideband to single sideband operation, after agreement has been reached with all interested and affected Administrations.

5. § 3. Exceptionally, any Administration may notify a frequency assignment to a radiotelephone coast station using independent sideband operation, when

6. a) two adjacent sideband channels for the particular station have received favourable findings by the Board;

7. b) the necessary bandwidth is confined within the limits of these two single sideband channels; and

8. c) the Administrations concerned and affected are in agreement.

Ref.

HOL/80(28) (contd.)

9. § 4.(1) The deletion of any recorded frequency assignment to a radiotelephone coast station using double sideband operation shall be notified to the Board not later than 1 January, 1970.

10. (2) Similar notice shall be given of the deletion of any recorded frequency assignment to a radiotelephone coast station using A3H emission, but not later than 1 January, 1977.

Section II. Examination of Notices and Recording of Frequency Assignments in the Master Register

11. § 5.(1) Frequency assignments notified to the Board between 1 January, 1969, and 1 January, 1970.

12. (2) The provisions of Nos. 496 to 540 of the Radio Regulations shall be applied.

13. (3) Where such assignments are to be recorded in the Master Register, the relevant date shall be entered in Column 2a or 2b in accordance with the provisions of No. 574 or 575 of the Radio Regulations, as appropriate.

14. (4) Any frequency assignment to a radiotelephone coast station satisfactory with respect to No. 501 of the Radio Regulations and with classes A3A, A3H and A3J emission, the assigned frequency of which is in conformity with a frequency listed in Column 2 or 6 of the Table in Appendix 17 (Revised) to the Radio Regulations, the necessary bandwidth of which is confined within the lower or the upper channel provided for in that Table, shall be so indicated by an appropriate symbol in the Remarks Column of the Master Register.

15. (5) Notices concerning frequency assignments to radiotelephone coast stations submitted to the Board under items 5 to 8 above, shall be treated as follows :

Ref.

HOL/80(28) (contd.)

16. a) the assignment shall be separately recorded in the Master Register;

17. b) the date to be entered in Column 2a or 2b shall be in accordance with the relevant provisions of Article 9 of the Radio Regulations.

18. § 6.(1) Frequency assignments already recorded in the Master Register for the bands listed in No. 448 of the Radio Regulations on 1 January, 1970.

19. (2) On 1 January, 1970, the Board shall re-examine the frequency assignments already recorded in the Master Register for the bands listed in No. 448 of the Radio Regulations, particularly with respect to their conformity with Section III of Article 35 of the Radio Regulations, and shall record against them a date in Column 2a or 2b as follows.

20. (3) For each listing for a radiotelephone coast station satisfactory with respect to No. 501 of the Radio Regulations and with classes A3A, A3H and A3J emission, the assigned frequency of which is in conformity with a frequency listed in Column 6 or 2 of the Table in Appendix 17 (Revised) to the Radio Regulations, the necessary bandwith of which is confined within the upper or the lower channel provided for in that Table and which is the conversion to single sideband operation of an allotment in Section I of Appendix 25 to the Radio Regulations previously notified to the Board as having been brought into use, the date of 3 December, 1951, shall be entered in Column 2a.

21. (4) For each listing for a radiotelephone coast station satisfactory with respect to No. 501 of the Radio Regulations and with classes A3A, A3H and A3J emission, the assigned frequency of which is in conformity with a frequency listed in Column 6 or 2 of the Table in Appendix 17 (Revised) to the Radio Regulations, the necessary bandwidth of which is confined within the upper or the lower channel provided for in that Table and which is the conversion to single sideband operation of an allotment in Section II of

Ref.

HOL/80(28) (contd.)

Appendix 25 to the Radio Regulations previously notified to the Board as having been brought into use, the provisions of Nos. 496 to 540 of the Radio Regulations shall be applied in the order in which the corresponding notice was received by the Board, except that no account shall be taken of listings with class A3 or A3B emission. The date of 4 December 1951, shall be entered in Column 2a or 2b, depending upon the finding of the Board resulting from the re-examination.

22. (5) For each listing for a radiotelephone coast station satisfactory with respect to No. 501 of the Radio Regulations and with classes A3A, A3H and A3J emission, the assigned frequency of which is in conformity with a frequency listed in Column 2 or 6 of the Table in Appendix 17 (Revised) to the Radio Regulations, the necessary bandwidth of which is confined within the lower or the upper channel provided for in that Table, but which is not the conversion to single sideband of an allotment in Section I or II of Appendix 25 to the Radio Regulations, the provisions of Nos. 496 to 540 of the Radio Regulations shall be applied, except that no account shall be taken of those listings with class A3 or A3B emission. The date to be entered in Column 2a or 2b, depending upon the finding of the Board resulting from the re-examination, shall be that which was relevant at the time No. 579 or 580 was applied.

23. (6) For each remaining listing for a radiotelephone coast station, the date of 1 January, 1970, shall be entered in Column 2b.

24. (7) For assignments to stations other than radiotelephone coast stations, the date of 2 January, 1970, shall be entered in Column 2b.

25. (8) The entries resulting from the application of item 2.1 c) of Resolution No. 1 of the Administrative Radio Conference, Geneva, 1959, shall be deleted.

26. § 7.(1) Frequency assignments notified to the Board after 1 January, 1970.

Ref.

HOL/80(28) (contd.)

27. (2) Except for those cases referred to hereafter, notices concerning frequency assignments to radiotelephone coast stations shall be treated in conformity with the provisions of Article 9 of the Radio Regulations (Nos. 486 - 540).

28. (3) Notices referred to in items 5 to 7 above shall be treated in conformity with the provisons of items 15 to 17 above.

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Ref.

A N N E X 3

HOL/80(29)

Consequential partial revision of Article 9 of the Radio Regulations

Article 9 shall be amended as follows :

MOD 500 § 9.(1) Except for notices referred to in Nos. ~~541,~~-~~547~~, 552, 561 and 568, the Board shall examine each notice with respect to

MOD 540 (5) The provisions of Nos. 537 to 539 do not apply to frequency assignments which are in conformity with the Allotment Plans appearing in Appendices ~~25,~~ 26 and 27 to these Regulations; such frequency assignments shall be entered in the Master Register on receipt of the notice by the Board.

SUP 541, 542, 543, 544, 545, 546, 547, 548, 549, 550 and 551.

MOD 573 § 26.(1) Frequency Bands :

10	-	2850	kc/s
3155	-	3400	kc/s
3500	-	3900	kc/s in Region 1
3500	-	4000	kc/s in Region 2
3500	-	3950	kc/s in Region 3
4063	-	4140	kc/s
4231	-	4438	kc/s
6200	-	6215	kc/s
6346	-	6525	kc/s
8195	-	8284.5	kc/s
8461	-	8815	kc/s
12 330	-	12 429	kc/s
12 693	-	13 200	kc/s
16 460	-	16 573	kc/s
16 924	-	17 360	kc/s
22 000	-	22 096	kc/s
22 378	-	22 720	kc/s

SUP 577, 578, 579, 580, 581, 582, 583, 584, 585 and 586.

MOD 635 § 47. The provisions of Sections V, VI (excepting No. 619) and VII of this Article shall not be applied to frequency assignments in conformity with the Allotment Plans contained in Appendices ~~25,~~ 26 and 27 to these Regulations.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 81-E
6 July 1967
Original : English

PLENARY MEETING

PEOPLE'S REPUBLIC OF POLAND

Proposals for the work of the Conference

Agenda Item 1

The proposal to modify the definition of power of radiotelephone transmitters in maritime mobile service stations operating in the authorized bands between 1605 and 3800 kc/s.

Ref.			Proposal
			It is proposed to modify the texts of No. 1341 and No. 1342 of the Radio Regulations, Geneva, 1959, to read as follows :
POL/81(1)	MOD	1341	(2) The ~~carrier~~ peak envelope power of mobile radiotelephone stations operating in the authorized bands between 1605 and 2850 kc/s shall not exceed ~~100~~ 500 watts.
	MOD	1342	(3) The ~~carrier~~ peak envelope power of coast radiotelephone stations, operating in the authorized bands between 1605 and 3800 kc/s, shall be limited to : - ~~2~~ 10 kilowatts for coast stations located north of latitude 32° N, - ~~3.5~~ 15 kilowatts for coast stations located south of latitude 32° N.

Reasons :

The introduction of A3A and A3J emissions into the maritime mobile service causes the difficulty of proper interpretation of the said Radio Regulations numbers where only carrier power is limited.

ARCHIVES U.I.T. GENEVE

Ref.

POL/81(1)
(contd.)

The purpose of these limitations was to prevent superfluous interference caused by remote stations operating in the same frequency band and it is necessary too to limit the power of single sideband transmitters both with the reduced and suppressed carriers. The proposed limitation of peak envelope power comprises both single sideband and double sideband emissions.

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GENEVA, 1967

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PLENARY MEETING

PEOPLE'S REPUBLIC OF POLAND

Proposals for the work of the Conference

Agenda Item 2.3

The proposal to amend No. 1156 of the Radio Regulations, Geneva, 1959.

Ref.			Proposal
			It is proposed to modify No. 1156 of the Radio Regulations, Geneva, 1956, to read as follows :
POL/82(2)	MOD	1156	§ 20.(1) Stations installed on passenger ships shall use the high traffic band ~~and whaling factory vessels, tankers above 40,000 tons gross and other cargo ships above 12,500 tons gross handling a large volume of traffic.~~ Factory Vessels, fisheries depot ships and other ships handling large volume of traffic may also use this band at the Administration's discretion (see No. 1151).

Reasons :

In practice the amount of traffic handled by a ship station is not always depending on ship's tonnage. Therefore, among the high traffic ship stations should be listed :

1. Passenger ships.
2. Fisheries depot ships.
3. Factory vessels.
4. Any other ships at the Administration's discretion.

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Ref.

POL/82(2)
(contd.)

The amount of traffic handled depends on the means of ship's exploitation and individual Administrations are well aware of the amount of correspondence passed by the particular ship station so it should be left to the Administration's discretion what traffic category is to be granted to the particular station. The proposed text extends the existing flexibility concerning the cargo ships above 12,500 tons gross to all ships pending the Administration's decision.

The listing here of fisheries depot ships and factory vessels (usually acting also as depot ships) is prompted by the tendency to separate the ever growing fisheries traffic into separate bands.

The specific characteristics of this traffic are causing the long periods of frequency occupation, the fact producing difficulties to other ships in exchange of their correspondence.

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MARITIME CONFERENCE
GENEVA, 1967

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PLENARY MEETING

PEOPLE'S REPUBLIC OF POLAND

Proposals for the work of the Conference

Agenda Item 5

Ref.			Proposal
			It is proposed to modify No. 1334 of the Radio Regulations, Geneva, 1959, to read as follows :
POL/83(3)	MOD	1334	(3) In addition, all ship stations should keep the maximum watch practicable on 2182 kc/s for receiving by any appropriate means the radiotelephone alarm signal described in No. 1465, as well as distress, urgency and safety signals,
			and, in consequence, to delete No. 1335 of the said Regulations :
	SUP	1335	

Background :

So far ship stations equipped for radiotelegraphy traffic, but having as well the radiotelephony means of communication were keeping watch only on the international distress frequency for radiotelegraphy 500 kc/s (International Convention for the Safety of Life at Sea, Section IV, part B, rule 6).

In this situation big ocean-going ships watching only on 500 kc/s could not hear distress calls of small craft transmitted on 2182 kc/s.

ARCHIVES U.I.T. GENÈVE

Ref.

POL/83(3)
(cont.)

To increase the safety of small ships and improve efficacy of assistance to shipwreck survivors the big ships should keep watch on both international distress frequencies 500 kc/s and simultaneously.

The introduction among the ship equipment of automatic position indicating beacon signals helping to locate the position of mobile station in distress and to look for survivors equipped with the above mentioned beacons working on 2182 kc/s stresses the necessity of keeping watch on this frequency and the need of introducing of this duty as a rule to all ship stations.

Ref.

POL/83(4)

DRAFT RESOLUTION No. ...

relating to the necessity of asking the I.M.C.O. Safety Committee to introduce into the International Convention for the Safety of Life at Sea, London, 1960, the amendments assuring keeping watch on the international distress frequency for radiotelephony by all ship stations

The World Administrative Radio Conference, Geneva, 1967,

considering that

a) so far the ship stations equipped for radiotelegraphy traffic but having as well the radiotelephony means of communications were keeping watch only on the international distress frequency for radiotelegraphy,

b) big ocean-going ships keeping watch on the international distress frequency for radiotelegraphy could not hear distress calls of small craft calling on the distress frequency for radiotelephony,

c) to increase the safety of small ships and to improve the efficacy of assistance to the shipwreck survivors big ships should keep watch on both international distress frequencies - for radiotelegraphy as well as for radiotelephony - simultaneously,

d) this Conference has adopted the necessary amendment of the Radio Regulations, Geneva, 1959, concerning this matter,

requests the Secretary General

to ask the I.M.C.O. Safety Committee to introduce into the pertinent part of the International Convention for Safety of Life at Sea, London, 1960, the rule imposing on all ship stations the duty to keep watch on the international distress frequency for radiotelephony 2182 kc/s.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 84-E
10 July 1967
Original : English

PLENARY MEETING

JAPAN

Proposals for the work of the Conference

Ref. Agenda Item 1 :

The use of single sideband technique in the Maritime Mobile Service in the bands available to that service between 1605 and 4000 kc/s and in the exclusive HF Maritime Mobile Radiotelephone bands.

Proposals

J/84(1) MOD Amend Article 5, Section IV. Table of Frequency Allocations as follows :

kc/s

2000 - 2194

Allocation to services		
Region 1	Region 2	Region 3
2000 - 2045 (NOC)	2000 - 2065 (NOC)	
2045 - 2065 (NOC)		
2065 - 2170 (NOC)	2065 - 2107 (NOC)	
	2107 - 2170 (NOC)	
2170 - 2173.5	Maritime mobile	
2173.5 - 2190.5	Mobile (distress and calling) 201	
2190.5 - 2194	Maritime mobile	

ARCHIVES U.I.T. GENEVE

Ref.

J/84(1) (cont.)

Reasons :

With many years' development of technical characteristics of radio equipment and wide use of SSB communication system, the guard band of 2182 kc/s should be reduced from 24 kc/s to 17 kc/s for effective use of frequencies. In connection with this proposal, it will be necessary to amend Nos. 442 to 444 and 1341 to 1345.

J/84(2) MOD 445 (4) In regions 2 and 3, the ~~frequency 2638 kc/s is~~ frequencies 2636 and 2639.5 kc/s are used as intership radiotelephony working frequencies in addition to the specific frequencies prescribed for common use in certain services. In Region 3, these frequencies are protected by a guard-band between 2634 and 2642 kc/s.

Reasons :

To convert DSB system to SSB system. These frequencies are so much used between ships that the separation between frequencies was made 3.5 kc/s within the range of the guard-band in order to minimize interference between adjacent channels. As for the technical standards for frequency assignment, refer to Agenda Item 3 (amendment to Appendix 17, Document No. 86).

J/84(3) MOD 449 (c) Coast stations and ship stations, telephony (~~single sideband~~ simplex channelling only)

4133 - 4140 kc/s

6200 - 6211 kc/s

8265 ~~8273~~ - 8280 kc/s

Ref.

J/84(3) (cont.)

12 400	~~12 407~~ -	12 421 kc/s
16 530	~~16 537~~ -	16 562 kc/s
22 070	~~22 078~~ -	22 100 kc/s

J/84(4) SUP 450

Reasons :

In conversion to SSB of DSB calling frequency bands for the maritime mobile radiotelephony mentioned in Section B of Appendix 15, it is proposed to use the frequency bands in No. 449 for simplex operation by coast and ship stations and to expand them up to the frequency bands in the double sideband calling channel allocated in No. 450, in order to make effective use of frequencies.

J/84(5) SUP 457

Reasons :

Consequential to the abrogation of Appendix 25. This provision is met by the convening of the present Conference (see Agenda Item 3, J/86(44), Document No. 86).

J/84(6) MOD 863

(3) The holder of a radiotelephone operator's restricted certificate may carry out the radiotelephone service of any ship or aircraft station, when working on frequencies of the maritime mobile service, provided that :

- the ~~carrier~~ peak envelope power of the transmitter does not exceed ~~50~~ 200 watts, or

Ref.

J/84(6) (cont.)

- the operation of the transmitter requires only the use of simple external switching devices, excluding all manual adjustment of frequency determining elements, with the stability of the frequencies maintained by the transmitter itself within the limits of tolerance specified by Appendix 3, and the ~~carrier~~ peak envelope power of the transmitter does not exceed ~~250 watts~~ 1000 watts.

J/84(7) MOD 903 (2) For ship radiotelephone stations where the ~~carrier~~ peak envelope power of the transmitter does not exceed ~~100~~ 400 watts and for aircraft radiotelephone stations operating on frequencies allocated exclusively to the aeronautical mobile service, ... (the rest unchanged).

Reasons :

Consequence of conversion to SSB system; it is desirable to indicate the value of carrier power of a DSB transmitter by that of peak envelope power of a SSB transmitter in accord therewith.

J/84(8) MOD 984 a) send ~~and receive~~ class A3 or A3H emissions and receive class A3 and A3H emissions on 2182 kc/s;

Reasons :

Consequence of conversion to SSB system; and in view of the C.C.I.R. Recommendation (No. 438) relating to the use of classes of emission on the frequency 2182 kc/s, amendment is in need.

In consideration of the advantage for the use of apparatus provided for distress purposes as mentioned in No. 987, and in view of the recognition of 17 kc/s as the guard band of 2182 kc/s, the use of class A3 emissions remains as it is.

Ref.

J/84(9) MOD 985 b) send, in addition, class A3J and A3A emissions if required for the public correspondence service, on at least two working frequencies; 1

Reasons :

As regards classification of emissions, in consideration of the possibility of reducing the effect of conversion to SSB because the carrier frequency of class A3H emissions, and even that of class A3A emissions decreased by 16 db would cause interference due to beat notes between carriers and interference due to cross-modulation between adjacent channel transmissions; of the fact that in Japan some 7000 ship stations are already carrying on communications with class A3J emissions; and of the C.C.I.R. Recommendation's (No. 258-1) intention of using class A3J emissions as a desirable objective and so forth, it is proposed to use in principle class A3J emissions and class A3A emissions if required for public correspondence.

J/84(10) MOD 986 c) receive, in addition, class A3J and A3A emissions if required for the public correspondence service, on all the other frequencies necessary for their service.

Reasons :

This corresponds to amendment to No. 985 and proposal was made of classes of emissions of the minimum necessity.

J/84(11) MOD 992 §22. (1) Any aircraft following a maritime course and required by national or international regulations to communicate, for safety purposes, with stations of the maritime mobile service shall be capable of transmitting class A2 or A2H

Ref.

J/84(11) (cont.)

and receiving class A2 and A2H emissions on the frequency 500 kc/s ~~preferably class A2 emissions,~~ or, on the frequency 2182 kc/s, transmitting class A3 or A3H and receiving class A3 and A3H emissions.

Reasons :

See proposal relating to No. 984 (J/84(8)).

J/84(12) MOD 996 - in the bands between 1605 and 2850 kc/s, be able to transmit on 2182 kc/s using class A3 or A3H emissions. If a receiver is provided for any of these bands, it shall be able to receive class A3 and A3H emissions on 2182 kc/s; 1

J/84(13) ADD footnote 996.1 1 In Regions 2 and 3, the frequencies in the band between 2088.5 and 2093.5 kc/s using class A1 emissions may be used.

Reasons :

See Agenda Item 7.2 (Document No. 89).

J/84(14) MOD 1236 §9. (1) A ship station calling a coast station by radiotelephony may use either the frequency ~~reserved for this purpose in accordance with~~ given in Section B of Appendix ~~15~~ 17, or the working frequency associated with that of the coast station in accordance with Section A of Appendix 17.

Ref.

J/84(15) MOD 1249 §13. (1) When a ship station is called by a coast station, it may reply either on the ~~calling~~ frequency given in Section B of Appendix ~~15~~ 17, or on the working frequency associated with that of the coast station in accordance with Section A of Appendix 17.

Reasons :

Consequential to the proposed amendment of Appendices 15 and 17 (see Agenda Item 3, Document No. 85).

J/84(16) SUP 1255

Reasons :

Consequence of abolishing the calling frequencies set out in Section B of Appendix 15 (see Nos. 450 and 1352, J/84(4) and J/84(25) respectively).

J/84(17) ADD 1322A §3. Apparatus in radiotelephone stations of the maritime mobile service installed for operation on frequencies in the authorized bands between 1605 and 4000 kc/s and in the authorized bands between 4000 and 23 000 kc/s shall satisfy the technical and operational conditions specified in Appendix 17.

Reasons :

In consequence of the rule-making of technical characteristics of SSB system, the stations employing SSB equipment shall conform to these technical conditions.

Ref.

J/84(18) ADD 1323A (1a) Whatever the class of emission used, the frequency 2182 kc/s always designates the carrier frequency on the emission.

Reasons :

With the amendment that the distress frequency may use class A3 or A3H emissions, it is necessary to indicate the frequency 2182 kc/s by carrier frequency.

J/84(19) MOD 1325 (3) Except for transmissions authorized on 2182 kc/s, all transmissions on the frequencies between ~~2170~~ 2173.5 and ~~2194~~ 2190.5 kc/s are forbidden.

Reasons :

The guard band for the distress frequency 2182 kc/s is proposed to be reduced to 17 kc/s.

J/84(20) MOD 1336 §8. (1) Coast stations which use 2182 kc/s for calling shall be able to use at least one other frequency in the authorized bands between 1605 and 2850 kc/s. These stations should be able to use the frequency 2192 kc/s for simplex operation, if required by their service. The frequency 2171.5 kc/s may be used as an additional frequency.

Reasons :

See proposal relating to No. 1339A (J/84(22)).

Ref.

J/84(21) MOD 1337 (2) Coast stations open to the public correspondence service on one or more frequencies between 1605 and 2850 kc/s shall also be capable of transmitting class A3 or A3H emissions and receiving class A3 and A3H emissions on 2182 kc/s.

Reasons :

See proposal relating to No. 984 (J/84(8)).

J/84(22) ADD 1339A §8a For the conduct of simplex telephony, all stations on ships making international voyages should be able to use :

ADD 1339B (1) the ship-shore working frequency 2192 kc/s, if required by their service;

ADD 1339C (2) the intership frequency 2171.5 kc/s, if required by their service. This frequency may be used as an additional ship-shore frequency.

Reasons :

Two channels derived from the reduction of the guard band of 2182 kc/s make international frequencies for communications between land and ship or between ships for the technical and operational convenience of ship stations having the transmitter and receiver on spot frequency. This matter is in line with the purport of Recommendation No. 28 of the Ordinary Administrative Radio Conference, Geneva, 1959.

Ref.

J/84(23) MOD 1350 (2) During the periods mentioned above, except for the transmissions provided for in Article 36, transmissions shall cease within the band ~~2170~~ 2173.5 - ~~2194~~ 2190.5 kc/s.

Reasons :

See proposal relating to No. 1325 (J/84(19)).

J/84(24) MOD 1351 § 13. All stations on ships making international voyages should be able to use the intership frequency ~~2638~~ 2639.5 kc/s, if required by their service.

Reasons :

See proposal relating to No. 445 (J/84(2)).

J/84(25) SUP 1352

Reasons :

Consequential to the proposed amendment of Nos. 449 (J/84(3)) and 450 (J/84(4)).

J/84(26) MOD 1354 §16. For each coast station open to public correspondence, the List of Coast Stations shall indicate the frequencies on which watch is maintained.

Ref.

J/84(26) (cont.)

Reasons :

Consequential to the proposed amendment of Nos. 449 (J/84(3)) and 450 (J/84(4)).

J/84(27) MOD 1355 §17. (1) For the conduct of duplex telephony, the frequencies of emission of the coast stations and of the corresponding ship stations shall be associated in pairs, as far as possible, as indicated in Section A of Appendix 17.

Reasons :

Consequence of changing the Table of Transmitting Frequencies of APPENDIX 17 into SECTION A of APPENDIX 17.

J/84(28) MOD 1356 (2) The single sideband working frequencies given in Section B of Appendix 17 are used for the conduct of simplex telephony. However, the class of emissions is limited to A3J. In addition, the peak envelope power of coast station transmitters using these frequency bands shall not exceed 1 kW (P_p).

Reasons :

For conversion to SSB system of DSB system for the maritime mobile radiotelephony, it is desirable to use frequency bands in new Section B of Appendix 17 for communications between ships or between ship and land for simplex operation, and for efficient utilization of these frequency bands, to limit emissions to class A3J emissions and restrict power for use in a coast station to 1 kW (P_p).

Ref.

J/84(29) SUP 1357

Reasons :

Consequential to the proposed amendment of Appendix 15.

J/84(30) SUP 1358

Reasons :

See proposal relating to No. 1322A (J/84(17)).

J/84(31) MOD

Amend Appendix 3, Table of frequency tolerances as follows :

APPENDIX 3

Table of frequency tolerances *)

(See Article 12)

1. Frequency tolerance is defined in Article 1 and is expressed in parts 10^6 or, in some cases, in cycles per second.

2. The power shown for the various categories of stations is the mean power as defined in Article 1.

---

* Certain services may need tighter tolerances for technical and operational reasons.

Ref.

J/84(31)
(cont.)

Frequency bands (lower limit exclusive, upper limit inclusive) and categories of stations	Tolerances applicable until 1 January 1966*) to transmitters in use and to those to be installed before 1 January 1964	Tolerances applicable to new transmitters installed after 1 January 1964 and to all transmitters after 1 January 1966*)
	*) 1 January 1970 in the case of all tolerances marked with an asterisk	
1	2	3
Band : 1605 to 4000 kc/s		
1. Fixed stations :		
-power 200 W or less	100	100
-power above 200 W	50	50
2. Land stations :		
-power 200 W or less	100	100 h)
-power above 200W	50	50 h)
3. Mobile stations :		
a) Ship stations	200	200 i)
b) Survival craft stations	-	300
c) Aircraft stations	200 *)	100 *)
d) Land mobile stations	200	200
4. Radiodetermination stations		
-power 200W or less	100	100
-power above 200 W	50	50
5. Broadcasting stations	50	20

Ref.

J/84(31)
(cont.)

1	2	3
Band : 4 to 29.7 Mc/s		
1. Fixed stations :		
-power 500 W or less	100	50
-power above 500 W	30	15
2. Land stations :		
a) Coast stations :		
-power 500 W or less	50	50 h)
-power above 500 W and less than or equal to 5 kW	50 *)	30*) h)
-power above 5 kW	50	15 h)
b) Aeronautical stations :		
-power 500 W or less	100	100
-power above 500 W	50	50
c) Base stations :		
-power 500 W or less	100	100
-power above 500 W	50	50
3. Mobile stations :		
a) Ship stations :		
1) Class A1 emission	200	200
2) Emission other than class A1 :		
-power 50 W or less	50 c)	50 c) i)
-power above 50 W	50	50 i)
b) Survival craft stations	200	200
c) Aircraft stations	200 *)	100 *)
d) Land mobile stations	200	200
4. Broadcasting stations	30	15

Ref.

J/84(31)
(cont.)

Notes referring to table of frequency tolerances

a) NOC

b) NOC

c) NOC

d) NOC

e) NOC

f) NOC

g) NOC

ADD h) The tolerance applicable to radiotelephone coast station transmitters after 1 January 1970 is 20 c/s.

ADD i) The tolerance applicable to radiotelephone ship station transmitters after 1 January 1974 is 100 c/s.

Reasons :

To amend the frequency tolerance necessary for SSB system in accordance with C.C.I.R.'s Recommendation.

Ref.

J/84(32)

RESOLUTION No. ....

Relating to the enforcement of the provisions of the Radio Regulations for SSB operation in a station in the maritime mobile service

The World Administrative Radio Conference, Geneva, 1967,

considering

1. that the provisions for DSB operation in a station in the maritime mobile service shall be abrogated on the date of coming into force of the Final Acts of this Conference;

2. that it is necessary to decide on the procedure for facilitating the transition from DSB operation to SSB operation in the stations concerned;

resolves

1. that a coast station and a ship station are permitted to operate with DSB radiotelephony equipments until 31 December 1969, and 31 December 1973 respectively. In this case, both stations shall conform to the conditions of the relevant provisions (except Article 9) of the Radio Regulations, Geneva, 1959;

2. that a coast station or a ship station employing SSB equipment before 1 January 1974 shall be able to send class A3H emissions and receive class A3 and A3H emissions when communicating with DSB stations;

3. that after 1 January 1974 a coast station or a ship station equipped for radiotelephony shall employ only class A3J emission. However, if required for the public correspondence service, class A3A emissions may also be used;

4. that notwithstanding those aforementioned, the use of class A3 or A3H emission on 2182 kc/s is permitted;

5. that the reduction of the guard band of 2182 kc/s shall come into force on 1 January 1974. The frequencies 2171.5 kc/s and 2192 kc/s made possible of new assignment by this reduction may be used on and after the said date.

Ref.

J/84(32)
(cont.)

Reasons :

In the Radio Regulations amendment has been made so that the equipment of a radio telephone station in the maritime mobile service in the frequency bands between 1605 and 4000 kc/s and between 4000 and 23 000 kc/s may be operated by SSB system. Therefore, it is necessary to provide for the procedure to be followed during and after the period of transition from the date of coming into force of these revised provisions until the date on which DSB operation is forbidden.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 85-E
10 July 1967
Original : English

PLENARY MEETING

JAPAN

Proposals for the work of the Conference

Agenda Item 2.3 :

The possible use of the high traffic bands by tankers of 12,500 tons gross.

Ref.			Proposal
	Amend No. 1156 as follows :		
J/85(33)	MOD	1156	§ 20 (1) Stations installed on passenger ships shall use the high traffic band. Stations on cargo ships handling a large volume of traffic and authorized by the Administration may also use this band (see No. 1151).

Reasons :

It is considered proper to place the standard for classification of ship stations (except passenger ships) using the high traffic band, not on tonnage, but on volume traffic handled and to leave the decision of standards to the Administration.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

Document No. 86-E
10 July 1967
Original : English

PLENARY MEETING

JAPAN

Proposals for the work of the Conference

Agenda Item 3 :

Consequential revision of Appendices 15, 17 and 25 to the Radio Regulations.

Ref.		Proposals
	1. Amend Appendix 15 as follows :	
J/86(34)	MOD (Heading)	APPENDIX 15

Table of frequencies to be used by Ship Radiotelegraph Stations in the bands between 4 and 27.5 Mc/s allocated exclusively to the Maritime Mobile Service

(See Articles 32, ~~35 and Appendix 17~~)

J/86(35) MOD 1. ~~This Appendix contains two Sections, A and~~ B.

For the use of frequencies in the band 4 to 27.5 Mc/s for radiotelegraphy (~~Section A)~~ see also Nos. 1174 to 1201 of Article 32.

~~For the use of frequencies in the band 4 to 23 Mc/s for radiotelephony (Section B) see also Nos. 1352 to 1358 of Article 35.~~

ARCHIVES U.I.T. GENÈVE

Ref.

J/86(36) MOD 2. In the table : ~~in Section A~~.

(the rest unchanged)

J/86(37) SUP 3.

J/86(38) MOD (Heading) ~~SECTION A~~

Frequencies assignable to ship radiotelegraph stations using the Maritime Mobile Service bands between 4 and 27.5 Mc/s

(the rest unchanged)

J/86(39) Delete Section B of Appendix 15.

Reasons :

The table in Section B of Appendix 15 will be changed into the table in Section B of Appendix 17 given in Annex II.

Ref.

2. Amend Appendix 17 as follows :

J/86(40)

APPENDIX 17

Technical standards of single sideband equipments used for the Maritime Mobile Radiotelephone Service in the bands 1605 to 4000 kc/s and 4000 to 23 000 kc/s and table of frequencies to be used in the bands 4000 to 23 000 kc/s (see Articles 28, 33 and 35)

1. Technical standards applicable to radiotelephone coast and ship stations using the frequency bands between 1605 and 23 000 kc/s :

(1) The upper sideband emissions shall always be used.

(2) Assigned frequencies to stations using single sideband emissions shall be 1500 c/s higher than carrier frequencies.

(3) The carrier power for classes of single sideband emissions shall be as follows :

a) For class A3H emissions, the carrier power shall be reduced not more than 6 db below peak envelope power of the emission;

b) For class A3J emissions, the carrier power shall be reduced not less than 40 db below peak envelope power of the emission;

c) For class A3A emissions, the carrier power shall be reduced 16 ± 2 db below peak envelope power of the emission.

(4) The transmitter audio-frequency band shall be 350 to 2700 c/s, with a permitted amplitude variation of 6 db.

(5) The short-term limits for the carrier frequency tolerance (of the order of 15 minutes) of ship stations shall be ± 40 c/s.

Ref.

J/86(40) (cont.)

Reasons :

The assigned frequency should be the centre of the necessary bandwidth. The necessary bandwidth for SSB telephony is 3 kc/s in Appendix 5 and C.C.I.R. Report, and in Japan too, as the assigned frequency, the value of 1500 c/s higher than carrier frequencies is already in force. Also, in E.A.R.C. (Aeronautical Mobile) held last year, + 1500 c/s was adopted. It is desirable to define 1500 c/s higher than carrier frequencies as the assigned frequency.

J/86(41)

2. Frequencies to be used by coast and ship stations in the bands allocated to the radiotelephone service between 4000 and 23 000 kc/s :

(1) The table in Section A indicates the frequencies for duplex channel to be used by coast and ship stations. One or more series of frequencies are assigned to each coast station, which uses these frequencies associated, as far as possible, in pairs; each pair comprises a transmitting and a receiving frequency. The series shall be selected with due regard to the areas served and so as to avoid, as far as possible, harmful interference between the services of different coast stations.

Note : It is necessary to change the words from "Appendix 17" to "Section A of Appendix 17" in No. 456. The Table in "Section A of Appendix 17" is given in Annex I.

Reasons :

To amend 1 and 2 in Appendix 17.

Ref.

J/86(42) (2) The table in Section B indicates the frequencies for simplex channel to be used by coast and ship stations.

a) For the use of these frequencies, see also No. 1356 of Article 35.

b) In the table in Section B, the working frequencies in a given band are :

- indicated by the lowest and highest frequency, in heavy type, in that band;

- regularly spaced, where there are more than two; the number of frequencies and the spacing in kc/s being indicated in italics.

Note : It is necessary to change the words from "Section A of Appendix 15" to "Appendix 15" in Nos. 1145, 1146, 1158, 1175, 1180 to 1182, 1184, 1187, 1189, 1191, 1193 and 1197. The table in "Section B of Appendix 17" is given in Amnex II.

Reasons :

To transfer 1 and 3 in Appendix 15 into Appendix 17.

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Ref.

J/86(43) APP 17

ANNEX I

SECTION A

~~Table of Transmitting Frequencies~~ Duplex Channelling of the Maritime Mobile Radiotelephone Bands between 4000 and 23000 kc/s (in kc/s)

Series No.	4 Mc/s Band		8 Mc/s Band		12 Mc/s Band		16 Mc/s Band		22 Mc/s Band	
	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency
1	4369.5	4064.5	8746.5	8196.5	13131.7	12331.7	17291.7	16461.7	22651.7	22001.7
2	4372.6	4067.6	8749.6	8199.6	13135.0	12335.0	17295.0	16465.0	22655.0	22005.0
3	4375.8	4070.8	8752.8	8202.8	13138.7	12338.7	17298.7	16468.7	22658.7	22008.7
4	4378.9	4073.9	8755.9	8205.9	13142.0	12342.0	17302.0	16472.0	22662.0	22012.0
5	4382.2	4077.2	8759.2	8209.2	13145.7	12345.7	17305.7	16475.7	22665.7	22015.7
6	4385.3	4080.3	8762.3	8212.3	13149.0	12349.0	17309.0	16479.0	22669.0	22019.0
7	4388.6	4083.6	8765.6	8215.6	13152.7	12352.7	17312.7	16482.7	22672.7	22022.7
8	4391.7	4086.7	8768.7	8218.7	13156.0	12356.0	17316.0	16486.0	22676.0	22026.0
9	4395.0	4090.0	8772.0	8222.0	13159.7	12359.7	17319.7	16489.7	22679.7	22029.7
10	4398.1	4093.1	8775.1	8225.1	13163.0	12363.0	17323.0	16493.0	22683.0	22033.0
11	4401.4	4096.4	8778.4	8228.4	13166.7	12366.7	17326.7	16496.7	22686.7	22036.7
12	4404.5	4099.5	8781.5	8231.5	13170.0	12370.0	17330.0	16500.0	22690.0	22040.0
13	4407.8	4102.8	8784.8	8234.8	13173.7	12373.7	17333.7	16503.7	22693.7	22043.7
14	4410.9	4105.9	8787.9	8237.9	13177.0	12377.0	17337.0	16507.0	22697.0	22047.0

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Ref.

J/86(43)
(cont.)

Series No.	4 Mc/s Band		8 Mc/s Band		12 Mc/s Band		16 Mc/s Band		22 Mc/s Band	
	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency	Coast Station Frequency	Ship Station Frequency
15	4414.2	4109.2	8791.2	8241.2	13180.7	12380.7	17340.7	16510.7	22700.7	22050.7
16	4417.3	4112.3	8794.3	8244.3	13184.0	12384.0	17344.0	16514.0	22704.0	22054.0
17	4420.6	4115.6	8797.6	8247.6	13187.7	12387.7	17347.7	16517.7	22707.7	22057.7
18	4423.7	4118.7	8800.7	8250.7	13191.0	12391.0	17351.0	16521.0	22711.0	22061.0
19	4427.0	4122.0	8804.0	8254.0	13194.7	12394.7	17354.7	16524.7	22714.7	22064.7
20	4430.1	4125.1	8807.1	8257.1	13198.0	12398.0	17358.0	16528.0	22718.0	22068.0
21	4433.3	4128.3	8810.3	8260.3						
22	4436.4	4131.4	8813.4	8263.4						

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ANNEX II

Ref.

J/86(43 bis) APP 17 ~~15~~

SECTION B

~~Carrier-Frequencies-in-kc/s~~ simplex channelling for ~~ship~~ radiotelephone stations using the Maritime Mobile Service bands between 4000 and 23 000 kc/s (in kc/s)

Band (Mc/s)	Limits	~~Radiotelephone (Double-sideband) Calling frequencies~~	Frequencies for Coast Stations and Ship Stations ~~Radiotelephone (Single-sideband) Upper-sideband carrier-frequencies~~	Limits
4	4133		4134.5 ~~4133~~ and 4138 ~~4136.5~~	4140
6	6200		6202 ~~6200.5~~ - - - - - - - - - - 6209 ~~6207.5~~ 3 Frequencies spaced 3.5	6211
8	8265	8267.5 8269	- - - - - - - - - - - - - - 8278 ~~8276.5~~ ~~8273~~ ~~and~~ 4 Frequencies spaced 3.5	8280
12	12400	12401.5 ~~12403.5~~	- - - - - - - - - - - - - - 12419 ~~12417.5~~ ~~12407~~ 6 ~~4~~ Frequencies spaced 3.5	12421
16	16530	16531.5 ~~16533.5~~	- - - - - - - - - - - - - - 16559.5 ~~16558~~ ~~16537~~ 9 ~~7~~ Frequencies spaced 3.5	16562
22	22070	22072.5 ~~22074~~	- - - - - - - - - - - - - - 22097 ~~22095.5~~ ~~22078~~ 8 ~~6~~ Frequencies spaced 3.5	22100

* For particular conditions concerning the use of 6204 kc/s see No. 1353.

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Ref.

J/86(44) 3. Delete Appendix 25 (see the reasons contained in Resolution).

It is proposed that Appendix 25 to the Radio Regulations Geneva, 1959, be abolished, and in consequence of abolishing Appendix 25, the relevant provisions of the Radio Regulations be revised as follows. In view of the above, a resolution related to the processing of frequency assignment notices is proposed.

J/86(45)	SUP	457	
J/86(46)	MOD	488	(3) Specific frequencies prescribed by these Regulations for common use by stations of a given service (for example, international distress frequencies 500 kc/s and 2182 kc/s, frequencies of ship radiotelegraph stations operating in their exclusive high frequency bands and frequencies contained in Section B of Appendix 17, etc.), shall not be notified to the Board.
J/86(47)	MOD	500	§9(1) Except for notices referred to in Nos. ~~541, 547~~, 552, 561 and 568, the Board shall examine each notice with respect to
J/86(48)	MOD	540	(5) The provisions of Nos. 537 to 539 do not apply to frequency assignments which are in conformity with the Allotment Plans appearing in Appendices 25, 26 and 27 to these Regulations; such frequency assignments shall be entered in the Master Register on receipt of the notice by the Board.
J/86(49)	SUP	541 - 551	
J/86(50)	MOD	573	§26(1) Frequency bands :

10 - 2850 kc/s

3155 - 3400 kc/s

3500 - 3900 kc/s in Region 1

Ref.

J/86(50)
(cont.)

3500	-	4000	kc/s in Region 2
3500	-	3950	kc/s in Region 3
4063	-	4133	kc/s
4238	-	4368	kc/s
4368	-	4438	kc/s
6357	-	6525	kc/s
8195	-	8265	kc/s
8476	-	8745	kc/s
8745	-	8815	kc/s
12 330	-	12 400	kc/s
12 714	-	13 130	kc/s
13 130	-	13 200	kc/s
16 460	-	16 530	kc/s
16 952	-	17 290	kc/s
17 290	-	17 360	kc/s
22 000	-	22 070	kc/s
22 400	-	22 650	kc/s
22 650	-	22 720	kc/s

J/86(51) SUP 577 - 586

J/86(52) MOD 635 §47 The provisions of Sections V, VI (excepting No. 619) and VII of this Article shall not be applied to frequency assignments in conformity with the Allotment Plans contained in Appendices 25, 26 and 27 to these Regulations.

J/86(53) MOD 793 c) the allotments in the Allotment Plans included in Appendices 25, 26 and 27.

Ref.

J/86(54)

RESOLUTION No.

Relating to the processing of frequency assignment notices to Coast Radiotelephone Stations operating in the frequency bands contained in No. 448 of the Radio Regulations

The World Administrative Radio Conference, Geneva, 1967,

considering

that Frequency Allotment Plan for Coast Radiotelephone Stations contained in Appendix 25 to the Radio Regulations (Geneva, 1959) shall be abrogated on the date of coming into force of the Final Acts of this Conference;

resolves

that during the period between the date of entry into force of the Final Acts of this Conference and 31 December 1969, notices of frequency assignments to stations in the bands listed in No. 448 shall be treated by the I.F.R.B. on the following 1. below. The entry recorded in the Master International Frequency Register in accordance with this processing shall be put under the re-examination by the Board on the following 2. below.

1. 1.1 the provisions of Nos. 496 to 540 shall be applied;

1.2 the relevant date to be recorded in the Master Register shall be entered in the appropriate part of Column 2 in conformity with the provisions of Nos. 574 or 575;

2. that on 1 January 1970, the Board shall re-examine all the frequency assignments which are contained in the Master Register for the bands listed in No. 448 of the Radio Regulations, as provided by the following items, and take an appropriate action;

2.1 if the frequency assignments to the coast radiotelephone stations operating with classes A3A, A3H and/or A3J emission are in conformity with an allotment plan in

Ref.

J/86(54)
(cont.)

Section I of Appendix 25 and they are converted to SSB operation in the upper half of the channel of DSB frequencies listed in the table of Appendix 17 and in addition the activation date has already been notified to the Board, the date of 3 December 1951 shall be entered in Column 2a.

However, if, due to the above shifting, any harmful interference is experienced mutually, either of SSB operation shall be able to be transferred to the lower half of the channel through coordination between the Administrations concerned. On this occasion, the date of 3 December 1951 shall be entered in Column 2a;

2.2 if the frequency assignments to the coast radiotelephone stations operating with classes A3A, A3H and/or A3J emission are in conformity with an allotment in Section II of Appendix 25 and they are converted to the SSB operation in the lower half of the channel of DSB frequencies listed in the table of Appendix 17 and in addition the activation date has already been notified to the Board, the date of 4 December 1951 shall be entered in Column 2a;

2.3 if the frequency assignments to the coast radiotelephone stations operating with classes A3A, A3H and/or A3J emission are not in conformity with the above mentioned paragraphs 2.1 and 2.2, and they are operated under the SSB system in the upper half or lower half of DSB frequencies listed in the table of Appendix 17, the Board shall apply the provisions of Nos. 496 to 540 in the order of the receipt of notice. The date to be entered in Column 2a or 2b shall be determined according to the finding by the Board, based on the following :

2.3.1 with respect to the assignments to which the provisions of No. 578 have been applied;

a) if the finding by the Board is favourable, the date of receipt of the original notice by the Board shall be entered in Column 2a;

Ref.

J/86(54)
(cont.)

b) if the finding by the Board is unfavourable, the date of receipt of the original notice by the Board shall be entered in Column 2b;

2.3.2 with respect to the assignments to which the provisions of Nos. 579 and 580 have been applied;

a) if the finding by the Board is favourable, the relevant date shall be entered in Column 2a;

b) if the finding by the Board is unfavourable, the relevant date shall be entered in Column 2b;

2.4 each entry of the radiotelephone coast stations which is not in conformity with the provisions of No. 501 shall be entered in Column 2b with the date of 1 January 1970;

2.5 if those entries related to 2.1 (c) of the Resolution No. 1 of the Ordinary Administrative Radio Conference, Geneva, 1959 and entries related to DSB are still in the Master Register, they shall be deleted from it.

Reasons :

1. Since 1959 when the Geneva Conference established the present Appendix 25, the Members of the I.T.U. have increased 31 in number from 101 to present 132 Therefore, with respect to the frequency allotment plan for the coast radiotelephone stations contained in Appendix 25, it may well be expected that new requirements will be made by these newly increased Members.

2. Moreover, it is considered that, even among the Members who participated in the Geneva Conference in 1959, there are not a few countries which are under the necessity of new frequency allotment or feel keenly the shortage in the frequency allotment plan.

3. Therefore, it is not considered appropriate that the frequency allotment plan contained in Appendix 25 should be left as it is.

Ref.

J/86(54)
(cont.)

4. On the one hand, out of the frequency allotment plan contained in Appendix 25, some individual allotments may never be brought into use and are still recorded in the Master Frequency Register under prior protection.

5. On the other hand, now that the conversion of DSB to SSB has been assured of possible realization under the present circumstances, the schedule of transition to SSB system is expected to be put under study at this Conference. Accordingly, with respect to the communication channels contained in Appendix 25 also, it is expected that the same number of communication channels be created in the same manner as seen in the SSB conversion.

6. Therefore, viewed in the light of not only effective utilization of communication channel but also of meeting the demand of the Members, with respect to the frequencies for coast radiotelephone stations also, we should like to assign them in accordance with the general rules for frequency assignments, as in the case of the frequency assignments to coast radiotelegraph station. In view of the foregoing, the abolition of Appendix 25 is proposed.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

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PLENARY MEETING

JAPAN

Proposals for the work of the Conference

Agenda Item 4 :

Possible revision of Appendix 18 to the Radio Regulations.

Ref.:

Proposals

In Japan, in order to cope with great increase in radiotelephone traffic in the 164 - 174 Mc/s band connecting a ship with subscribers of the land telephone system, the operation in this band is already in practice by channel spacing of 25 kc/s. In the near future, in the international VHF channels too, it is considered necessary to reduce the spacing between channels from 50 kc/s to 25 kc/s for the relief of traffic congestion.

Therefore, it is desirable to decide on its future course and prepare for a smooth transition in this Conference.

For this reason, the following Recommendation is proposed :

J/87(55)

RECOMMENDATION No.

Relating to reduction in channel bandwidth in the VHF band (156 - 174 Mc/s) for radiotelephony in the Maritime Mobile Service

The World Administrative Radio Conference, Geneva, 1967,

considering

a) that for the relief of traffic congestion it is desirable to reduce the channel bandwidth from 50 kc/s to 25 kc/s on frequencies used for VHF radiotelephony in the Maritime Mobile Service;

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Ref.

J/87(55) (cont.)

b) that it is necessary to decide promptly on technical and operational requisites for facilitating the reduction in bandwidth mentioned above;

invites the C.C.I.R.

to carry out research in technique and operation necessary for reducing the channel bandwidth from 50 kc/s to 25 kc/s in the band 156 - 174 Mc/s for radiotelephony in the maritime mobile service, to prepare the report on these matters and to draw up the recommendation before the next World Administrative Radio Conference concerned;

and invites the Administrations

to study this problem for the purpose of transferring the channel bandwidth from 50 kc/s to 25 kc/s in the above frequency band, and to submit proposals therefore to the next World Administrative Radio Conference concerned.

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PLENARY MEETING

JAPAN

Proposals for the work of the Conference

Agenda Item 6 :

Examination of the pertinent portions of the revised International Code of Signals.

Ref.			Proposals
J/88(56)	SUP	760	

Reasons :

Because the geographical portion was deleted in the Revised International Code of Signals.

J/88(57)	MOD	1004	83. (1) In order to facilitate radiocommunications, stations of the mobile service shall use the service abbreviations given in Appendix 13 and the abbreviations in the International Code of Signals.

J/88(58)	MOD	1005	(2) In the maritime mobile service, only the service abbreviations given in Appendix 13 are to be used. However, the use of abbreviations in the International Code of Signals is not precluded.

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Ref.			
J/88(59)	MOD	1216	§5. (1) (no change in text)
J/88(60)	ADD	1216A	(2) In cases of language difficulties stations of the maritime mobile service should use the service abbreviations given in Appendix 13 and the abbreviations in the International Code of Signals.
J/88(61)	ADD	1400A	(5) In radiotelephony, in cases of language difficulties, the expressions in Nos. 1397 or 1399 should be replaced by the following expressions : Latitude Code letter L (Lima) followed by a four figure group (2 figures for degrees, 2 figures for minutes). Longitude Code letter G (Golf) followed by a five figure group (3 figures for degrees, 2 figures for minutes). If necessary, N (November) for Latitude North, or S (Sierra) for Latitude South, and either E (Echo) for Longitude East, or W (Whiskey) for Longitude West should be sent immediately following the figure group.

Ref.

Amend Appendix 13 as follows :

J/88(62) MOD (Heading) Miscellaneous abbreviations and signals to be used in ~~radiotelegraphy communications~~ radiocommunications

(see Articles 29 and 33)

J/88(63) MOD Section I. Q CODE

(Introduction) 3. Certain Q code abbreviations may be given as an affirmative or negative sense by sending the following signal or abbreviation respectively, immediately following the abbreviation.

a) In case of radiotelegraphy communications, "YES" or "NO".

b) In case of radiotelephony communications, "C" (pronounced as CHAR LEE or SHAR LEE) or "NO" (pronounced as NO VEM BER OSS CAH).

J/88(64) MOD

(Introduction) 5. Q code abbreviations are given the form of a question when followed by a question mark (in case of radiotelegraphy communications) or T (in case of radiotelephony communications, pronounced as TANG GO). When an abbreviation is used as a question and is followed by additional or complementary information, the question mark or T should follow this information.

Ref.

J/88(65) SUP (Q CODE) Suppress the following Q codes :

QRF, QSE, QSF, QTD, QTN, QTW, QTY, QTZ, QUB, QUG, QUH, QUI, QUJ, QUK, QUL, QUN, QUO, QUP, QUQ, QUR, QUS, QUT, QUU, QUW and QUY.

J/88(66) MOD

Abbreviation	Question	Answer or advice
QSC	Are you a low traffic ship station? (see Article 32, Section V)	I am a low traffic ship station.
QSQ	Is ... (name of person) on board?	... (name of person) is on board

---

J/88(67) MOD Put an asterisk *) against the following abbreviations or signals given in SECTION II :

ADS $\overline{\text{AR}}$ $\overline{\text{AS}}$ BK BQ CFM CL COL CP $\overline{\text{DDD}}$
DF DO ER ETA ITP KMH KTS MIN MPH MSG
NIL NW OL P PBL REF SIG SLT $\overline{\text{SOS}}$ SS
SVC SYS TFC TR TTT TU TXT $\overline{\text{VA}}$ WD XQ
XXX YES

Ref.

J/88(68) ADD Add the following abbreviations to SECTION II. MISCELLANEOUS ABBREVIATIONS AND SIGNALS :

*) AHR	I have another message to send.
**) AR	End of transmission.
**) AS	Waiting period.
**) C	Yes (Affirmative).
**) CORRECTION	Cancel my last word or group. The correct word or group follows; (pronounced as KOR-REK-SHUN).
*) CUL	I will see you later.
*) HW	How?
**) INTERCO	International Code Group(s) follow(s); (pronounced as IN-TER-CO)
*) NM	No more for you.
*) PSE	Please.
**) YZ	The wordswhich follow are in plain language.

Add the following notes at the end of SECTION II :

Notes : *) This abbreviation or signal is used only in case of radiotelegraphy communications.

**) This abbreviation or signal is used only in case of radiotelephony communications.

Reasons :

It is necessary to clarify what is to be used as one signal in case of radiotelegraphy communications, or the use of the same abbreviation different in meaning between the Radio Regulations and the revised International Code of Signals.

Ref.

J/88(69) Amend Appendix 16 as follows :

APPENDIX 16

Phonetic alphabet and figure code

(see Article 33)

1. When it is necessary to spell out call signs, service abbreviations and words, the following table shall be used :

M ~~Figure or mark~~ to be transmitted	Letter to be transmitted	Word to be used	Spoken as *)
~~1~~	A	Alfa	AL FAH
~~2~~	B	Bravo	BRAH VOH
~~3~~	C	Charlie	CHAR LEE or SHAR LEE
4	D	Delta	DELL TAH
~~5~~	E	Echo	ECK OH
~~6~~	F	Foxtrot	FOKS TROT
~~7~~	G	Golf	GOLF
~~8~~	H	Hotel	HOH TELL
9	I	India	IN DEE AH
~~0~~	J	Juliett	JEW LEE ETT
~~Comma~~	K	Kilo	KEY LOH
~~Fraction bar~~	L	Lima	LEE MAH
~~Break signal~~	M	Mike	MIKE
~~Full stop (period)~~	N	November	NO VEM BER
	O	Oscar	OSS CAH

Ref.

J/88(69)
(cont.)

M ~~Figure or~~ mark to be transmitted	Letter to be transmitted	Word to be used	Spoken as *)
	P	Papa	PAH PAH
	Q	Quebec	KEH BECK
	R	Romeo	ROW ME OH
	S	Sierra	SEE AIR RAH
	T	Tango	TANG GO
	U	Uniform	YOU NEE FORM or OO NEE FORM
	V	Victor	VIK TAH
	W	Whiskey	WISS KEY
	X	X-ray	ECKS RAY
	Y	Yankee	YANG KEY
	Z	Zulu	ZOO LOO
Full stop (period)		Stop	STOP

*) ~~Each transmission of figures or marks is preceded and followed by the words "as a number" or "as a mark" respectively, spoken twice, e.g., the number 1959 will read, "as a number, as a number Alfa, India, Echo, India, as a number, as a number".~~

*) The syllables to be emphasized are underlined.

J/88(70) ADD 2. When it is necessary to spell out figures, the following table shall be used :

Ref.

J/88(70) (cont.)

Figure to be transmitted	Word to be used	Spoken as
0	NADAZERO	NAH-DAH-ZAY-ROH
1	UNAONE	OO-NAH-WUN
2	BISSOTWO	BEES-SOH-TOO
3	TERRATHREE	TAY-RAH-TREE
4	KARTEFOUR	KAR-TAY-FOWER
5	PANTAFIVE	PAN-TAH-FIVE
6	SOXISIX	SOK-SEE-SIX
7	SETTESEVEN	SAY-TAY-SEVEN
8	OKTOEIGHT	OK-TOH-ATT
9	NOVENINE	NO-VAY-NINER
Decimal or Point	DECIMAL	DAY-SEE-MAL

Note : Each syllable should be equally emphasized. The second component of each code word is the code word used in the Aeronautical Mobile Service.

J/88(71) MOD 2 3. (No change in text).

Reasons :

In the conceptions that the I.T.U. bears the responsibility for the signals in the radiocommunication procedure and, on the other hand, the I.M.C.O. is responsible for the signals concerning navigation, search and rescue activities, it is necessary to secure coordination with the revised International Code of Signals prepared by the I.M.C.O.

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PLENARY MEETING

JAPAN

Proposals for the work of the Conference

Agenda Item 7.2

Conditions of the use of emergency position-indicating beacons.

Ref.			Proposals
J/89(72)	MOD	41	Survival craft station : A mobile station in the maritime or aeronautical mobile service intended solely for survival purposes and located on any lifeboat, life-raft or other survival equipment [1].
J/89(73)	ADD	41.1	[1] Survival craft stations include the emergency position-indicating radio beacons which are intended to indicate the positions of survivors or the location of a mobile station in distress.
J/89(74)	MOD	996	- in the bands between 1605 and 2850 kc/s, be able to transmit on 2182 kc/s using class A3 or A3H emissions. If a receiver is provided for any of these bands, it shall be able to receive class A3 and A3H emissions on 2182 kc/s; [1]

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Ref.			
J/89(75)	ADD footnote	996.1	1 In Regions 2 and 3, the frequencies in the band between 2088.5 and 2093.5 kc/s using class A1 emissions may be used.
J/89(76)	ADD	999A	§24. Equipment provided for use in survival craft stations shall, if emergency position-indicating radio beacons are included, be able to transmit on 2182 kc/s the signals defined in Nos. 1476B or 1476C. If a receiver is provided, it shall be able to receive class A3 and A3H emissions on 2182 kc/s;1
J/89(77)	ADD footnote	999A.1	1 In Japan, there exist emergency position-indicating radio beacons which transmit the distress signal and identification on frequencies between 2088.5 and 2093.5 kc/s using class A1 emissions.
			Add the following next to Article 36, Section VIII :
J/89(78)	ADD		Section VIII A. Signals of emergency position-indicating radio beacons

Ref.			
J/89(79)	ADD	1476A	§44a. The signal of an emergency position-indicating radio beacon may consist either of of the following :
J/89(80)	ADD	1476B	(a) A keyed emission modulated by a tone of 1300 c/s (± 20c/s) having a ratio of the period of the emission to the period of silence equal to or greater than 1, and an emission duration between 1 and 5 seconds.
J/89(81)	ADD	1476C	(b) The radiotelephone alarm signal accompanied by the Morse letter "B" and/or the identification (including the call sign of the ship to which the beacon belongs) by keying a carrier modulated by a tone of 1300 cycles (± 20 c/s) or of 2200 cycles (± 35 c/s) (see No. 1465).
J/89(82)	ADD	1476D	The keying signal given in No. 1476B should be transmitted continuously.
J/89(83)	ADD	1476E	The signal given in No. 1476C should consist alternately of the keying signal having a duration between 30 and 50 seconds, followed by a period of silence having a duration between 30 and 60 seconds.

Ref.

J/89(84) ADD 1476F The keying signal given in Nos. 1476D or 1476E may be interrupted by speech transmission.

Reasons :

To lay down conditions for the use of the emergency position-indicating radio beacon. In Japan there is already in wide use the automatic apparatus for distress information using class A1 emissions on 2091 kc/s. Therefore, it is requested that in Regions 2 and 3, where the band 2088.5 - 2093.5 kc/s is reserved exclusively for calling, the band between 2088.5 and 2093.5 should be designated as a safety frequency band in the radiotelegraph maritime mobile service and be added to frequencies with which survival craft stations shall be provided (see No. 455).

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GENEVA, 1967

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PLENARY MEETING

JAPAN

Proposals for the work of the Conference

Additional Agenda Item *) :

Other problems in the maritime mobile service.

Proposals

1. Amend No. 1013 as follows :

MOD 1013 (2) However, in the bands between 4000 and 27 500 kc/s, when the conditions of establishing contact are difficult, the call signals may be transmitted more than three times, but not more than ten times each. ~~In this case, the call signs of the called and the calling station shall be transmitted in alternate sequence up to a total of twenty call signs altogether (e.g. ABC ABC de WXYZ WXYZ ... or ABC ABC ABC de WXYZ WXYZ WXYZ ...). This call may be sent three times at intervals of two minutes; thereafter it shall not be repeated until an interval of fifteen minutes has elapsed.~~ (e.g. ABC de WXYZ ABC de WXYZ ... (at intervals of two minutes) or ABC (six times) de WXYZ (four times) ABC (four times) de WXYZ (six times)(at intervals of two minutes) or ABC (ten times) de WXYZ (ten times) (at intervals of two minutes), etc.) (see Nos. 1077 to 1080.)

Reasons :

In order to facilitate the establishment of contact in the bands between 4000 and 27 500 kc/s, the call signs of the called and the calling stations are to be transmitted not more than ten times each according to the traffic condition and the call is to be made in such methods as shown by example.

*) Item not on the agenda of the W.A.R.C. but which Japan proposes that the Conference consider.

ARCHIVES U.I.T. GENÈVE

2. Amend Nos. 455, 996, 1139 and 1140 as follows, and insert No. 996.1 after No. 996 :

MOD	455	(3) In Regions 2 and 3 the band 2088.5 - 2093.5 kc/s is reserved exclusively for calling and safety (telegraphy only).
MOD	996	- in the bands between 1605 and 2850 kc/s, be able to transmit on 2182 kc/s using class A3 or A3H emissions. If a receiver is provided for any of these bands, it shall be able to receive class A3 and A3H emissions on 2182 kc/s;[1]
ADD footnote	996.1	[1] In Regions 2 and 3, the frequencies in the band between 2088.5 and 2093.5 kc/s using class A1 emissions may be used. (See Agenda Item 7.2, Document No. 89.)
MOD	1139	§16. (1) The band 2088.5 - 2093.5 kc/s is the calling and safety band for the maritime mobile service of radiotelegraphy in those parts of the bands between 1605 and 2850 kc/s in which radiotelegraphy is authorized.
MOD	1140	(2) Frequencies in the band 2088.5 - 2093.5 kc/s may be used for calls, replies and safety. These frequencies may also be used for messages preceded by the urgency or safety signals and, if necessary, for distress messages.

Reasons :

It is requested that in Regions 2 and 3, in the bands between 1605 - 2850 kc/s, frequencies in the band between 2088.5 - 2093.5 kc/s should be designated as a safety frequency band in the radiotelegraphy maritime mobile service. (See Agenda Item 1, Document No. 84 and 7.2, Document No. 89).

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3. Amend No. 196 as follows :

MOD	196	In Japan, the band 1605 - 1800 kc/s is also allocated on a permitted basis to the maritime radionavigation service using continuous wave systems with a mean power of not more than 50 watts.

Reasons :

At the Ordinary Administrative Radio Conference, Geneva, 1959, Japan made a proposal that the frequency band 1605 - 1800 kc/s should be usable also for the maritime radionavigation service pursuant to the footnote in addition to the fixed service and mobile service. Further, as a result of the deliberation at the Conference, our proposal for the addition of this footnote submitted with the intent of the additional allocation to the services contained in the List on the condition (that it shall be a permissible service with power limitation), namely, with such words which should have been expressed as "is also allocated", was agreed at the Conference. Nevertheless, in the footnote of the Final Acts, it was laid down as follows without the word "also"; "In Japan, the band 1605 - 1800 kc/s is allocated on a permitted basis to the maritime radionavigation service using continuous wave system with a mean power of not more than 50 watts".

In consequence, it has come to be usable only for the maritime radionavigation service in lieu of the fixed service and mobile service.

As the result, it has caused unexpected serious consequences that all of the frequency assignments to the stations for fixed service and mobile service, which are essential to Japan in this band, have been obliged to treat as out-of-band assignments.

Therefore, with a view to rectifying the above-mentioned expression contained in the provisions, the amendment to No. 196 is proposed.

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PLENARY MEETING

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,
THE CHANNEL ISLANDS AND THE ISLE OF MAN

Proposals for the work of the Conference

Agenda Item 7.3 :

Conditions for the use of selective calling devices

Selective calling

1. Basic requirements

Discussions at C.C.I.R. Study Group XIII meetings on the introduction of selective calling in the maritime mobile service have in the past been centred around its use in radiotelephony services. However, at the Special Meeting in April 1967 opinions expressed indicated that it is now being regarded as a system in its own right - a system by which a coast station can establish contact with a ship, irrespective of the type of radiocommunication equipment fitted on the ship or the type of traffic to be exchanged.

To be fully effective such a system should, within practical limits, be capable of contacting ships at any time and without regard to the nationalities of the stations concerned. This can only be achieved if :

a) a common system is used by all countries;

b) common international calling frequencies are used;

c) the same system is used on all calling frequencies;

d) in areas served by several coast stations and particularly in the European Area of Region I, a means of identifying the calling station can be provided; and

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e) a means of indicating and recording receipt of a selective call can be provided on board ship.

To this end, the Special Meeting of C.C.I.R. Study Group XIII, Geneva, April 1967, adopted the Draft Recommendation D.a (251-1) and Draft Resolution D.b.

However, the introduction of an international selective calling system on international channels need not preclude the use of this system (or other systems) of selective calling on national channels if an administration so desires.

2. Frequencies for selective calling

Provision is made in the Radio Regulations for the use of 156.8 Mc/s, 500 kc/s and 2182 kc/s as international calling frequencies and the use of these frequencies for selective calling also would avoid the need for a separate receiver on the ship. There might also be an improvement in the watch already being maintained for safety purposes.

Selective calling will presumably be used as an alternative to the normal calling methods and since the duration of a selective call, (including any coast station identification), will not normally exceed three seconds, compared with about fifteen seconds for a call on radiotelephony or radiotelegraphy, interference to safety services is unlikely to arise for some time to come. However, it might be desirable to earmark alternative or additional frequencies for selective calling in the MF and VHF bands for future use.

In the HF bands, no coast station frequencies have yet been set aside for international calling, and it will be necessary to make provision for one frequency in each of the 4, 8, 12, 16 and 22 Mc/s bands. It would be convenient to use one of the SSB channels provided as a result of the U.K. proposals for Appendix 15B/17 and it is suggested that the following nominal carrier frequencies might be used :

4361.7 kc/s
8732.4 kc/s
13 109.2 kc/s
17 262.2 kc/s
22 622.3 kc/s

Since these frequencies are paired it is suggested that the corresponding ship-to-shore frequencies (i.e. 4133.1, 8265.1, 12 400.2, 16 530.2 and 22 070.2 kc/s respectively) could be used for :

a) replies by ships to selective calls made by coast stations;

b) intership working or

c) as an international common ship-to-shore working frequency;

d) selective calling in the ship-to-shore direction if such a system is required.

3. Calling procedure

Using the recommended selective calling system the duration of one complete call is approximately three seconds and since the effectiveness of the system is high, constant repetition of a call is unnecessary. It is proposed that the repetition of calls to an individual ship should preferably not exceed two per half-hour and that there should be a minimum period of five minutes between consecutive calls.

4. Type of traffic on hand

The type of traffic on hand might, for example, be indicated by variations in the identification numbering of the calling station, details of which might be published in the List of Coast Stations.

5. Proposed amendments to the Radio Regulations to provide for selective calling are included in Annex 1.

Annex : 1

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Ref.

ANNEX

Item 7.3 :

Article 19

G/91(48) MOD 737 § 2. A station shall be identified either by a call sign or other recognized means of identification. Such recognized means of identification may be one or more of the following necessary for complete identification: name of station, location of station, operating agency, official registration mark, flight identification number, ship's selective call number, characteristic signal, characteristic of emission or other clearly distinguishing features readily recognized internationally.

Reasons :

To provide for the use of selective call numbers in the maritime service.

MOD 750 § 11. (1) Each country shall choose the call signs and the selective call number of its stations from the international series allocated to it, and shall, in accordance with Article 20, notify to the Secretary General the call signs which it has assigned together with the information which is to appear in Lists I to VI inclusive. These notifications do not include call signs assigned to amateur and experimental stations.

Reasons :

To provide for the inclusion of selective call numbers of stations in the maritime mobile service.

MOD 776 (2) Ship stations

- a call sign (see Nos. 765 and 766); or

Ref.

G/91(48) (cont.)

- the official name of the ship preceded, if necessary, by the name of the owner on condition that there is no possible confusion with distress, urgency and safety signals; or

- the selective call numbers

Reasons :

To provide for the selective call numbers.

G/91(49) ADD New Section IVA.

ADD Heading :

Selective call numbers in the maritime mobile service

ADD Sub-heading :

Formation of ships' selective call numbers and coast station identification numbers

ADD 783A § 25 (bis) (1) The ten digits from 0 to 9 inclusive shall be used to form selective call numbers.

ADD 783B (2) However, combinations of numbers commencing with the digits 00 (zero, zero) shall not be used when forming the identification numbers for coast stations.

ADD 783C (3) Ships' selective call numbers and coast station identification numbers in the international series are formed as indicated in Nos. 783D, 783E and 783F.

Ref.

G/91(49) (cont.)

ADD 783D (4) Coast station identification numbers

- four figures (see No. 2)

ADD 783E (5) Ship stations selective call numbers

- five figures

ADD 783F (6) Predetermined groups of ship stations

- five figures, as listed in No. 783L

ADD Sub-heading :

Allocation of international series and assignment of ships' selective call numbers and coast station identification numbers

ADD 783G § 25 (ter) (1) Coast stations open to the international public correspondence service shall be given selective call numbers from the international series allocated to each country as indicated in No. 783H.

ADD 783H (2) Table of allocation to coast stations of identification numbers.

Identification number	Allocated to (country)
To be completed by Conference	

Ref.

G/91(49) (cont.)

ADD 783I §§ 25 (quater) (1) Ship stations open to the international public correspondence service shall be allocated selective call numbers as indicated in Nos. 783J, 783K and 783L.

ADD 783J (2) Table of allocation to ship stations of selective call numbers for use in all Regions.

Selective call number	Allocated to
To be completed by Conference	

ADD 783K (3) Table of allocation to ship stations of selective call numbers for use in a Region.

Selective call number	Allocated to
To be completed by Conference	

ADD 783L (4) Table of allocation of selective call numbers for predetermined groups of ships.

Selective call number	Allocated to
To be completed by Conference	

Reasons :

To provide for the use of selective calling devices.

Ref
G/91(50)

Article 28A

Selective calling in the maritime mobile service

ADD 999B

§ 1. The characteristics of the international selective calling system shall be in accordance with the recommendations of the C.C.I.R.

Method of calling

ADD 999C

§ 2. (1) The call shall consist of :

- the selective call number of the ship station called;
- the identification number of the coast station calling;
- the whole repeated twice.

ADD 999D

(2) When a station called does not reply, the call should not normally be repeated until after an interval of at least [five] minutes and should not then normally be renewed until after a further interval of [30] minutes.

Reply to calls

ADD 999E

§ 3. The reply to calls should be made in accordance with :

Nos. 1022-1023 when using radiotelegraphy

Nos. 1241-1253 when using radiotelephony

Frequencies and classes of emission to be used

ADD 999F

§ 4. Calls shall be radiated on one or more of the following frequencies as appropriate :

Ref.

G/91(50)
(cont.)

Frequency	Class of emission
500 kc/s	A2H
2182 kc/s	A2H
*) 2170.5 kc/s	A2H
4361.7 Mc/s)	
8732.4 Mc/s)	
13 109.2 Mc/s)	A2H
17 262.2 Mc/s)	
22 622.3 Mc/s)	
156.8 Mc/s	F2
any working frequency listed for this purpose in the List of Coast Stations)	A2H

*) when brought into use

Reasons :

To provide for the use of selective calling devices.

Ref.

Article 29

G/91(51) ADD 1013B (4) When selective calling is used the provisions of Article 28A shall be observed.

Reasons :

To provide for the use of selective calling devices - see new Article 28A.

G/91(52)

Article 33

MOD 1224 (3) When selective calling is used the provisions of Article 28A shall be observed.

Reasons :

To provide for the use of selective calling devices - see new Article 28A.

G/91(53)

Appendix 9

List V. List of ship stations.

. . . . . .

MOD 2nd and 3rd lines :

below the call sign :

- the selective call number;
- the basic ship charge per word for a radiotelegram;[1]
- if appropriate, the basic ship charge for a radiotelephone call of three minutes.[1]

. . . . . .

Reasons :

To provide for the inclusion of the selective call number.

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[1] These charges are fixed or approved by each administration.

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MARITIME CONFERENCE
GENEVA, 1967

Document No. 92-E
20 July 1967
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PLENARY MEETING

FEDERAL REPUBLIC OF GERMANY

Proposal for the work of the Conference

Agenda Item 6

Ref. APPENDIX 13

RFA/92(18) ADD New abbreviations

Abbreviation	Question	Answer or Advice
ADD Q ...	Listen on 2182 kc/s for signals of emergency position-indicating radio beacons.	
ADD Q ...	Have you received the signal of an emergency position-indicating radio beacon?	I have received the signal of an emergency position-indicating radio beacon.

Reasons :

To provide signals for use in radiotelegraphy and in case of language difficulties in radiotelephony (see proposal ADD 1476 I (RFA/94(27), Document No. 94).

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MARITIME CONFERENCE
GENEVA, 1967

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PLENARY MEETING

FEDERAL REPUBLIC OF GERMANY

Proposal for the work of the Conference

Agenda Item 7

Ref.			Article 36
RFA/93(19)	ADD	1431A	(2) If the bearings taken of the ship in distress give reason to doubt the correctness of the position indicated by the radio station in distress in accordance with Nos. 1395 or 1396, any radio station in the mobile service can, on the order of the master or person responsible for the ship, aircraft, vehicle or radio direction-finding station, transmit the results of the bearings or the position determined by radio direction-finding in the following order :

a) – – QTE the name or call sign of the radio station in distress;

the time of the bearing;

the true bearing of the radio station in distress (if indicated, classification in accordance with Appendix 23 § 8.(3));

– – QTH the name or call sign of the radio direction-finding station;

the position at the time of bearing (if indicated, with the following classification :

F = position of the transmitting station accurate to within 3 to 5 nautical miles;

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Ref.

RFA/93(19)
(cont.)

G = position of the transmitting station accurate to within 5 to 10 nautical miles).

b) - - QTF the name or call sign of the radio station in distress;

the time of determination of the position;

the determined position of the radio station in distress (if indicated, with classification in accordance with Appendix 23 § 8.(3)).

- - QRA the name or call sign of the control station.

MOD 1432 (3) Before sending one of these messages, the station shall .....(the rest unchanged).

Reasons :

In many distress cases this information can contribute to a more accurate indication of the position of the ship in distress and thus facilitate the search for that ship.

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PLENARY MEETING

FEDERAL REPUBLIC OF GERMANY

Proposals for the work
of the Conference

Agenda Item 7.2

Emergency position-indicating radio beacon
- based upon Recommendation 439 C.C.I.R. Oslo 1966

Ref.			Article 1
RFA/94(20)	ADD	41A	Floatable emergency position-indicating radio beacon. A mobile station in the maritime mobile service intended to facilitate search and rescue through the functions of quasi-alerting and of enabling homing, working automatically when afloat.

Article 28

RFA/94(21)	ADD		Section VII
	ADD	999A	Floatable emergency position-indicating radio beacon on 2182 kc/s. Floatable emergency position-indicating radio beacons working on 2182 kc/s shall be able to use class A2 emissions. Additionally, class A3 or A3H emissions may be used. - See also Article 36 Section VIII A (RFA/94(27)).

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Ref.

Article 35

RFA/94(22)	MOD	1323	§ 3. (1) The frequency 2182 kc/s is the international distress frequency for radiotelephony; it shall be used for this purpose by ship, aircraft, survival craft stations and by floatable emergency position-indicating radio beacons using frequencies in the authorized bands between 1605 and 4000 kc/s when requesting assistance from the maritime services. It is used for the distress call and distress traffic, for signals of floatable emergency position-indicating radio beacons, for the urgency signal and urgency messages and for the safety signal. Safety messages shall be transmitted, where practicable, on a working frequency after a preliminary announcement on 2182 kc/s.

RFA/94(23)	MOD	1334	§ 6. (3). In addition, ship stations should keep the maximum watch practicable on 2182 kc/s for receiving by any appropriate means the radiotelephone alarm signal described in No. 1465, as well as distress, urgency and safety signals including the signals of emergency position-indicating radio beacon described in Article 36, Section VIII A.

Article 36

RFA/94(24)	ADD	1388A	§ 5.(3) The characteristics of the signals of floatable emergency position-indicating radio beacons are given in Article 36, Section VIII A.

Ref.

RFA/94(25) ADD 1466A (3) The use of the radiotelephone alarm signal by floatable emergency position-indicating radio beacons is described in Article 36 Section VIII A.

RFA/94(26) ADD 1473A (1 A) The radiotelephone alarm signal may be used by floatable emergency position-indicating radio beacons of Type "H" No. 1476D.

RFA/94(27) ADD Section VIII A

Signals of floatable emergency position-indicating radio beacons

ADD 1476A The signals of floatable emergency position-indicating radio beacons consist of :

ADD 1476B (1) In type "L" 1 3 beacons :

a keyed emission modulated by a tone of 1300 c/s (± 20 c/s) having a ratio of the period of the emission to the period of silence equal to or greater than 1, and an emission duration between 1 and 5 seconds. The depth of modulation shall be between 30 and 90 per cent. This signal shall be transmitted continuously.

ADD 1476C (2) In type "H" 2 3 beacons :

ADD 1476D a) the radiotelephone alarm signal (No. 1465) followed by the Morse letter "B" and/or the call sign of the ship to which the beacon belongs, modulated by a tone of 1300 c/s (± 20 c/s) or of 2200 c/s (± 35 c/s), or

Ref.

RFA/94(27) (cont.)	ADD	1476E	b) a keyed emission modulated by a tone of 1300 c/s (± 20 c/s) having a ratio of the period of the emission to the period of silence equal to or greater than 1, and an emission duration between 1 and 5 seconds;
	ADD	1476F	The depth of modulation shall be between 30 and 90 per cent.
	ADD	1476G	These type "H" signals shall have a duration between 30 and 50 seconds and a period of silence lasting between 30 and 60 seconds.
	ADD	1476H	The purpose of the signals of floatable emergency position-indicating radio beacons is to indicate that one or more persons are in a distress situation, may no longer be on board and that other means of radiocommunications may not be available.
	ADD	1476I	Any station of the mobile service receiving one of these signals, while no distress or urgent traffic is being passed, shall inform other stations accordingly.
		1476.1	1 beacons producing a field strength equal to or less than 10 microvolts per metre at a distance of 30 nautical miles at sea level;
		1476.2	2 beacons producing a field strength greater than 10 microvolts per metre at a distance of 30 nautical miles at sea level;
		1476.3	3 beacons carried by ships of the U.S.A. may use a swept tone modulation sweeping downward over a range of not less than 700 c/s within the range 1600 to 300 c/s with a repetition rate of between two and three sweeps per second.

Reasons :

Insertion in the Regulations of provisions relating to emergency position-indicating beacons (see C.C.I.R. Recommendation No. 436).

Ref.

APPENDIX 3

Band 1605 to 4000 kc/s

Insert after 3. Mobile Stations, (between b) and c))

RFA/94(28)	ADD	b')	floatable emergency position-indicating radio beacons	- 300

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PLENARY MEETING

FEDERAL REPUBLIC OF GERMANY

Proposals for the work of the Conference

Technical Characteristics for Transmitters and Receivers used in the Maritime Mobile Service in the 156-174 Mc/s band*)

APPENDIX 19

ADD 5. For short-distance radiotelephone traffic it must be possible to reduce the power to 1 watt or less.

Reasons :

The port operations radio traffic is usually handled over short distances between coast stations and ship stations or between ship stations within or near ports or on rivers and near shores. In order to prevent interference to stations working on the same channels, it would be useful and necessary to have the possibility of reducing the power of the VHF radiotelephone installations to 1 watt or less. Reference is made in this connection to No. 27 (a) of the I.M.C.O. Document COM II/18 of 6 February 1967.

*) Item not on the agenda of the W.A.R.C. but which the Federal Republic of Germany proposes that the conference consider.

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MARITIME CONFERENCE
GENEVA, 1967

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PLENARY MEETING

INDIA

Proposals for the work of the Conference

Agenda Item 1

The use of single sideband technique in the Maritime Mobile Service in the bands available to that service between 1605 and 4000 kc/s and in the exclusive HF Maritime Mobile Radiotelephone bands.

Ref.	Proposal
IND/96(1)	Recognising that consequent upon the conversion to single sideband technique in the radiotelephone operations of the Maritime Mobile Service, the relevant provisions of the Radio Regulations will undergo considerable revision. It is proposed that the revised provisions may be published in a separate booklet and they may be given the same numbers suffixed with some symbol say letter "A" as those of the existing provisions appearing in the Radio Regulations, Geneva, 1959.

Reasons :

For ease of reference of Radio Regulations.

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MARITIME CONFERENCE
GENEVA, 1967

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PLENARY MEETING

INDIA

Proposals for the work of the Conference

Agenda Item 2.1

Frequency bands for coast and ship radiotelephone stations in the 6 Mc/s band.

Ref.	Proposal
IND/97(2)	**Article 7, Section IV**
Nos.447 & 448	Include two double sideband radiotelephone channels for use each by ship and coast stations in Region 3, in the 6 Mc/s band exclusively allocated for the Maritime Mobile Service.

Reasons :

The Radio Regulations, Geneva, 1959, do not provide for double sideband radiotelephone communication between ship and coast stations in the 6 Mc/s band. The need for radiotelephone communication facility between coast and ship stations on 6 Mc/s band is being felt for long, since under certain conditions frequencies in 4 Mc/s band are found to be too low while those in 8 Mc/s band too high to provide reliable R/T communication.

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
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PLENARY MEETING

INDIA

Proposals for the work of the Conference

Agenda Item 2.4

The desirability of accommodating requirements for oceanographic communications in the exclusive HF Maritime Mobile Service.

Ref.	Proposal
IND/98(3)	Article 7
	Recognising the utility and importance of oceanographic data and the desirability of accommodating oceanographic communications in the exclusive HF maritime mobile bands it is proposed that allocation of frequencies required for oceanographic communications may be made from the exclusive HF bands reserved for
451	(e) Ship stations wideband telegraphy, facsimile, and special transmission systems
	and
453	(g) Coast stations, telegraphy and facsimile.

Reasons :

It may not be desirable to meet the requirement from the exclusive HF maritime mobile bands for radio telegraphy or radio telephony, as a number of countries are likely to continue the use of radio telegraphy and double sideband radio telephony technique for Maritime Mobile Service for a considerable length of time to come.

ARCHIVES U.I.T. GENEV

INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
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PLENARY MEETING

INDIA

Proposals for the work of the Conference

Additional Agenda Item*)

Article 5, Section IV,
Table of Frequency Allocations -
10 kc/s to 50 Gc/s,
Radio Regulations, Geneva, 1959

Ref.			
IND/99(4)	MOD	199	In India, the band 1800-2000 kc/s is also allocated on a permitted basis to the aeronautical mobile service.

Reasons :

In India this band is to be allocated to other services including Maritime Mobile Service.

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*) Item not on the agenda of the W.A.R.C. but which India proposes that the Conference consider.

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INTERNATIONAL TELECOMMUNICATION UNION
MARITIME CONFERENCE
GENEVA, 1967

ARCHIVES U.I.T. GENÈVE

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PLENARY MEETING

LIST OF THE DOCUMENTS PUBLISHED BY THE CONFERENCE
(Documents Nos. 1 to 100)

Document No.	Title	Origin	Destination
1 (Rev.)	Agenda of the Conference	S.G.	Plenary Meeting
2 and Corr.	Recommendations and Opinion of the C.C.I.R. relevant to Items 5 and 7.2 of the Agenda of the Conference	S.G.	Plenary Meeting
3	Proposal concerning Agenda Item 2.3	F.R. of Germany	Plenary Meeting
4	Proposal concerning Agenda Item 1	F.R. of Germany	Plenary Meeting
5	Proposal concerning Agenda Item 7.4	F.R. of Germany	Plenary Meeting
6	Proposal concerning Agenda Item 6	F.R. of Germany	Plenary Meeting
7	Proposal concerning Appendix 16 of the Radio Regulations	F.R. of Germany	Plenary Meeting
8 and corr.	Proposals concerning Agenda Item 1	France	Plenary Meeting
9	Proposals concerning Agenda Item 2	France	Plenary Meeting
10	Proposals concerning Agenda Item 3	France	Plenary Meeting
11	Proposals concerning Agenda Item 4	France	Plenary Meeting
12	Proposals concerning Agenda Item 5	France	Plenary Meeting

ARCHIVES U.I.T. GENÈVE

Document No.	Title	Origin	Destination
13	Proposals concerning Agenda Item 6	France	Plenary Meeting
14	Proposals concerning Agenda Item 7	France	Plenary Meeting
15	Proposals concerning use on board ships of frequencies of the order of 27 Mc/s	France	Plenary Meeting
16	Proposals concerning Agenda Item 1	U.S.A.	Plenary Meeting
17	Proposals concerning Agenda Items 2.1 to 2.5	U.S.A.	Plenary Meeting
18	Proposals concerning Agenda Item 3	U.S.A.	Plenary Meeting
19	Proposals concerning Agenda Item 4	U.S.A.	Plenary Meeting
20	Proposals concerning Agenda Item 5	U.S.A.	Plenary Meeting
21	Proposals concerning Agenda Item 6	U.S.A.	Plenary Meeting
22 and add.	Proposals concerning Agenda Items 7.1 to 7.6	U.S.A.	Plenary Meeting
23	Proposals concerning the Amendment of Article 32 of the Radio Regulations (additional Agenda Item)	U.S.A.	Plenary Meeting
24	Proposals concerning the Amendment of No. 981 of the Radio Regulations (additional Agenda Item)	U.S.A.	Plenary Meeting
25	Proposals concerning the Amendment of Article 5 of the Radio Regulations (additional Agenda Item)	U.S.A.	Plenary Meeting

Document No.	Title	Origin	Destination
26	Proposals concerning the examination of the need for the retention of the calling frequency 143 kc/s and its associated guard band, 140 - 146 kc/s (additional Agenda Item)	U.S.A.	Plenary Meeting
27	Proposals concerning the modification of the maximum power authorized for coast telegraph stations when using other than A1 and single channel F1 emissions (additional Agenda Item)	U.S.A.	Plenary Meeting
28	Proposals concerning the establishment and use of a Manual for use by the Maritime Mobile Service (additional Agenda Item)	U.S.A.	Plenary Meeting
29	Proposals concerning the amendment of Nos. 863 and 903 of the Radio Regulations (additional Agenda Item)	U.S.A.	Plenary Meeting
30	Proposals concerning Agenda Item 7.2	Denmark, Norway and Iceland	Plenary Meeting
31 and Corr.	Proposals concerning Agenda Item 1	Italy	Plenary Meeting
32	Proposals concerning Agenda Items 2.3 and 2.4	Italy	Plenary Meeting
33 and Corr.	Proposals concerning Agenda Item 3	Italy	Plenary Meeting
34	Proposals concerning Agenda Item 4	Italy	Plenary Meeting
35	Proposals concerning Agenda Item 5	Italy	Plenary Meeting
36	Proposals concerning Agenda Item 7.2	Italy	Plenary Meeting
37	Proposals concerning Agenda Item 3	Denmark, Iceland, Norway and Sweden	Plenary Meeting

Document No.	Title	Origin	Destination
38	Proposals concerning Agenda Item 6	Denmark	Plenary Meeting
39	Proposals concerning Agenda Item 1	Canada	Plenary Meeting
40	Proposals concerning Agenda Item 2.1	Canada	Plenary Meeting
41	Proposals concerning Agenda Item 3	Canada	Plenary Meeting
42	Proposals concerning Agenda Item 4	Canada	Plenary Meeting
43	Proposals concerning Agenda Item 5	Canada	Plenary Meeting
44	Proposals concerning Agenda Item 6	Canada	Plenary Meeting
45	Proposals concerning Agenda Items 7.1 to 7.6	Canada	Plenary Meeting
46	Proposals concerning the amendment of Nos. 158 and 167 of the Radio Regulations (additional Agenda Item)	Canada	Plenary Meeting
47	Proposals for the work of the Conference	Malagasy Republic	Plenary Meeting
48	Proposals concerning Agenda Item 1	U.S.S.R.	Plenary Meeting
49	Proposals concerning Agenda Items 2.1 to 2.5	U.S.S.R.	Plenary Meeting
50	Proposals concerning Agenda Item 3	U.S.S.R.	Plenary Meeting
51	Proposals concerning Agenda Item 5	U.S.S.R.	Plenary Meeting
52	Proposals concerning Agenda Item 6	U.S.S.R.	Plenary Meeting
53	Proposals concerning Agenda Item 7.4	U.S.S.R.	Plenary Meeting

Document No.	Title	Origin	Destination
54	Proposals for the work of the Conference	Australia	Plenary Meeting
55	Proposals concerning Agenda Item 4	U.S.A.	Plenary Meeting
56	Proposals concerning Agenda Item 2	United Kingdom	Plenary Meeting
57	Proposals concerning Agenda Item 4	United Kingdom	Plenary Meeting
58	Proposals concerning Agenda Item 5	United Kingdom	Plenary Meeting
59 and corr.	Proposals concerning Agenda Item 6	United Kingdom	Plenary Meeting
60	Proposals concerning Agenda Items 7.1 to 7.6	United Kingdom	Plenary Meeting
61	Proposals relating to the use of 143 kc/s (additional Agenda Item)	United Kingdom	Plenary Meeting
62	Proposals relating to the Establishment of a Manual for use by the Maritime Mobile Services (additional Agenda Item)	United Kingdom	Plenary Meeting
63	Proposals concerning the deletion of Class B emissions (additional Agenda Item)	United Kingdom	Plenary Meeting
64	Proposals relating to a Re-classification of International Public Correspondence Categories of Ship Stations (additional Agenda Item)	United Kingdom	Plenary Meeting
65	Proposals relating to a revision of calling procedure (additional Agenda Item)	United Kingdom	Plenary Meeting
66	Proposals relating to the use of class A2H emissions on working frequencies	United Kingdom	Plenary Meeting

Document No.	Title	Origin	Destination
67	Proposals relating to amendments to the Additional Radio Regulations (additional Agenda Item)	United Kingdom	Plenary Meeting
68 and Corr.	Proposals relating to Operators Certificates for Ship Stations (additional Agenda Item)	United Kingdom	Plenary Meeting
69	Proposals concerning Agenda Item 2.4	U.S.A.	Plenary Meeting
70	Proposals concerning Agenda Item 1	Netherlands	Plenary Meeting
71	Proposals concerning Agenda Items 2.1 to 2.5	Netherlands	Plenary Meeting
72	Proposals concerning Agenda Item 3	Netherlands	Plenary Meeting
73	Proposals concerning Agenda Item 5	Netherlands	Plenary Meeting
74	Proposals concerning Agenda Item 6	Netherlands	Plenary Meeting
75	Proposals concerning Agenda Items 7.1 to 7.6	Netherlands	Plenary Meeting
76 and Add. and corr. 1 & 2	Proposals concerning Agenda Item 1	United Kingdom	Plenary Meeting
77	Proposals concerning Agenda Item 3	United Kingdom	Plenary Meeting
78	Proposals concerning Agenda Item 9 (additional Agenda Item)	United Kingdom	Plenary Meeting
79	Proposals relating to the reduction of the guard-band for the International Distress and Calling Frequency, 2182 kc/s (RR 1325)	United Kingdom	Plenary Meeting
80	Proposals concerning Agenda Item 3	Netherlands	Plenary Meeting
81	Proposals concerning Agenda Item 1	Poland	Plenary Meeting

Document No.	Title	Origin	Destination
82	Proposals concerning Agenda Item 2.3	Poland	Plenary Meeting
83	Proposals concerning Agenda Item 5	Poland	Plenary Meeting
84	Proposals concerning Agenda Item 1	Japan	Plenary Meeting
85	Proposals concerning Agenda Item 2.3	Japan	Plenary Meeting
86	Proposals concerning Agenda Item 3	Japan	Plenary Meeting
87	Proposals concerning Agenda Item 4	Japan	Plenary Meeting
88	Proposals concerning Agenda Item 6	Japan	Plenary Meeting
89	Proposals concerning Agenda Item 7.2	Japan	Plenary Meeting
90	Proposals concerning other problems in the maritime mobile service (additional Agenda Item)	Japan	Plenary Meeting
91	Proposals concerning Agenda Item 7.3	United Kingdom	Plenary Meeting
92	Proposals concerning Agenda Item 6	F.R. of Germany	Plenary Meeting
93	Proposals concerning Agenda Item 7	F.R. of Germany	Plenary Meeting
94	Proposals concerning Agenda Item 7.2	F.R. of Germany	Plenary Meeting
95	Proposals concerning Technical Characteristics for transmitters and receivers used in the Maritime Mobile Service in the 156-167 Mc/s bands (additional Agenda Item)	F.R. of Germany	Plenary Meeting

Document No.	Title	Origin	Destination
96	Proposals concerning Agenda Item 1	India	Plenary Meeting
97	Proposals concerning Agenda Item 2.1	India	Plenary Meeting
98	Proposals concerning Agenda Item 2.4	India	Plenary Meeting
99	Additional Agenda Item	India	Plenary Meeting
100	List of the documents of the Conference	S.G.	Plenary Meeting