Documents of the Regional Administrative Radio Conference to establish a plan for the broadcasting service in the band 1605-1705 kHz in Region 2 (1st session) (RARC BC-R2(1))

(Geneva, 1986)

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INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 1-E
25 November 1985
Original : English
French
Spanish

PLENARY MEETING

Note by the Secretary-General

AGENDA OF THE CONFERENCE

The agenda of the Conference is contained in Resolution No. 913 adopted by the Administrative Council at its 39th session.

The text of the Resolution is attached.

R.E. BUTLER

Secretary-General

Annex : 1

ANNEX

R No. 913 FIRST SESSION OF THE REGIONAL ADMINISTRATIVE RADIO CONFERENCE TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1 605 - 1 705 kHz IN REGION 2 - BC-R2(1)

The Administrative Council,

considering

a) Recommendation 504 of the 1979 WARC;

b) Resolution 1 of the Plenipotentiary Conference, Nairobi, 1982;

considering further the results of the consultation conducted by telegram on 6 April 1984;

resolves

1. that the first session of the Conference shall be convened in Geneva on 14 April 1986 for a duration of three weeks;

2. that the agenda of the first session shall be the following :

2.1 to establish the basis for the preparation of a Plan for the broadcasting service in Region 2 (1 605 - 1 705 kHz), taking into account the following non-exhaustive list of items :

2.1.1 definitions;

2.1.2 propagation data;

2.1.3 modulation standards;

2.1.4 the effect of receiver characteristics upon AM broadcast standards;

2.1.5 protection ratios, required values for the usable field strength and for the nominal usable field strength;

2.1.6 transmitting antenna characteristics and transmitter powers;

2.1.7 planning methods and guidelines for the agreement;

2.2 to establish the technical criteria, as appropriate, for the sharing of the band 1 625 - 1 705 kHz between the broadcasting service and other services in Region 2 taking into account Nos. 419 and 481 of the Radio Regulations;

2.3 if necessary, to establish and identify specific guidelines for preparatory work, including computer software development, to be carried out before the second session of the Conference and to set dates for the completion of this work;

2.4 to specify the manner in which broadcasting requirements for inclusion in the Plan should be submitted to the IFRB and to fix the date by which they should be submitted;

2.5 to establish a draft agenda for the second session of the Conference, relating to the establishment of an agreement and an associated plan, to be submitted to the Administrative Council;

3. that administrations are encouraged to begin considering their broadcasting requirements for the use of the 1 605 - 1 705 kHz band in order that they may be prepared to submit their requirements to the IFRB by the date established by the first session of the Conference;

4. that the second session of the Conference shall be convened in 1988 for a duration of approximately four weeks at a place to be determined;

invites the CCIR to prepare all the necessary technical bases in accordance with Recommendation 504 of the 1979 WARC;

invites the IFRB to provide technical assistance in the preparation and organization of the Conference;

instructs the Secretary-General to take all necessary steps for convening the Conference.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 2-E
25 November 1985
Original : English
French
Spanish

PLENARY MEETING

Note by the Secretary-General

CREDENTIALS OF DELEGATIONS

1. Under Article 67 of the International Telecommunication Convention, Nairobi, 1982, the delegation sent by a Member of the Union to a conference shall be duly accredited in accordance with Nos. 381 to 387 of the Convention.

2. To facilitate consultation, I hereby transmit to the Conference the text of the aforesaid Article 67 (see Annex).

R.E. BUTLER

Secretary-General

Annex : 1

ANNEX

ARTICLE 67

Credentials for Delegations to Conferences

380 1. The delegation sent by a Member of the Union to a conference shall be duly accredited in accordance with Nos. 381 to 387.

381 2. (1) Accreditation of delegations to Plenipotentiary Conferences shall be by means of instruments signed by the Head of State, by the Head of the Government or by the Minister for Foreign Affairs.

382 (2) Accreditation of delegations to administrative conferences shall be by means of instruments signed by the Head of State, by the Head of the Government, by the Minister for Foreign Affairs or by the Minister responsible for questions dealt with during the conference.

383 (3) Subject to confirmation prior to the signature of the Final Acts, by one of the authorities mentioned in Nos. 381 or 382, delegations may be provisionally accredited by the Head of the diplomatic mission of the country concerned to the government of the country in which the conference is held. In the case of a conference held in the country of the seat of the Union, a delegation may also be provisionally accredited by the Head of the Permanent Delegation of the country concerned to the United Nations Office at Geneva.

384 3. Credentials shall be accepted if they are signed by the appropriate authority mentioned under Nos. 381 to 383, and fulfil one of the following criteria:

385 – they confer full powers;

386 – they authorize the delegation to represent its government, without restrictions;

387 – they give the delegation, or certain members thereof, the right to sign the Final Acts.

388 4. (1) A delegation whose credentials are found to be in order by the Plenary Meeting shall be entitled to exercise the right to vote of the Member concerned and to sign the Final Acts.

389 (2) A delegation whose credentials are found not to be in order by the Plenary Meeting shall not be entitled to exercise the right to vote or to sign the Final Acts until the situation has been rectified.

390 5. Credentials shall be deposited with the secretariat of the conference as early as possible. A special committee as described in No. 471 shall be entrusted with the verification thereof and shall report on its conclusions to the Plenary Meeting within the time specified by the latter. Pending the decision of the Plenary Meeting thereon, a delegation of a Member of the Union shall be entitled to participate in the conference and to exercise the right to vote of the Member concerned.

391 6. As a general rule, Members of the Union should endeavour to send their own delegations to conferences of the Union. However, if a Member is unable, for exceptional reasons, to send its own delegation, it may give the delegation of another Member powers to vote and sign on its behalf. Such powers must be conveyed by means of an instrument signed by one of the authorities mentioned in Nos. 381 or 382.

392 7. A delegation with the right to vote may give to another delegation with the right to vote a mandate to exercise its vote at one or more meetings at which it is unable to be present. In such a case it shall, in good time, notify the Chairman of the conference in writing.

393 8. A delegation may not exercise more than one proxy vote.

394 9. Credentials and the transfer of powers sent by telegram shall not be accepted. Nevertheless, replies sent by telegram to requests by the Chairman or the secretariat of the conference for clarification of credentials shall be accepted.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Addendum 1 to
Document 3-E
16 December 1985

PLENARY MEETING

Note by the Secretary-General

At the request of the Director of the CCIR, I am sending you herewith an Addendum to the Report "Technical Bases for the First Session of the Regional Administrative Radio Conference to establish a Plan for the Broadcasting Service in the Band 1605-1705 kHz in Region 2". This Report is contained in Document No.3.

R.E. BUTLER

Secretary-General

Annex

ANNEX

NOTE FROM THE CHAIRMAN OF CCIR STUDY GROUP 10

After the conclusion of the Final Meeting of CCIR Study Group 10, which according to the provisions of Resolution 24-5 approved the CCIR Report to this Conference, Study Group 8 held its Final Meeting in which further consideration was given to Chapter 9 of the report.

The resulting additional comments are contained in the letter from the Chairman of Study Group 8 reported in the Annex, and are submitted as complementary information to the CCIR report.

C. TERZANI
Chairman of
CCIR Study Group 10

Annex

LETTER FROM THE CHAIRMAN OF STUDY GROUP 8
TO THE CHAIRMAN OF STUDY GROUP 10

REPORT OF JOINT INTERIM WORKING PARTY 10-3-8/1

Study Group 8 considered Chapter 9 of the report of Joint Interim Working Party 10-3-8/1 and wishes to make the following comments:

1. In the maritime mobile service narrow-band direct printing signals can be generated using different modulation methods leading to emissions classified as F1B or or J2B. In effect F1B and J2B signals are the same and there is no distinction between the interference characteristics of both cases. Therefore it is recommended to deal with both cases by only one entry F1B/J2B in Table 9-I in Chapter 9 of the final report of the JIWP 10-3-8/1, and to indicate in the CO-column of this table the figure -3 dB. The figure -3 dB itself was not discussed in Study Group 8. It was noted that the figure +5 dB in the OC-column applies only when the frequency separation between the assigned frequency of the F1B/J2B emission is equal to 1.4 kHz, which in the case of an F1B/J2B signal is just an arbitrary frequency offset.

2. It was further noted that in the case of J3E a single value of the protection ratio cannot be given for the OC-case. The J3E protection ratio is a function of whether the interfering signal is above, coincident with or below the carrier of the wanted signal. It is further recommended that protection ratios be included for the J3E case of co-channel interference, the type of interference which is likely to occur in a shared band and for which information can be found in Report 525.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) **RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2**

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 3-E
25 November 1985
Original : English

PLENARY MEETING

Note by the Secretary-General

At the request of the Director of the CCIR, I am sending you herewith the CCIR's Report to the Conference, prepared in response to Administrative Council Resolution 913.

This document, which contains technical information, comprises the final reports of both Interim Working Party 6/4 and Joint Interim Working Party 10-3-8/1; these reports were approved by CCIR Study Groups 6 and 10 respectively.

R.E. BUTLER

Secretary General

Annex: 1

[Doc. No. 3]

INTERNATIONAL TELECOMMUNICATION UNION

CCIR

INTERNATIONAL
RADIO CONSULTATIVE
COMMITTEE

REPORT

TECHNICAL BASES FOR THE FIRST SESSION OF THE REGIONAL ADMINISTRATIVE RADIO CONFERENCE TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1 605 - 1 705 kHz IN REGION 2 (BC-R2(1))

Conclusions from Joint Interim Working Party 10-3-8/1 and Interim Working Party 6/4;
(Resolution No. 913 of the ITU Administrative Council, 1984)

GENEVA, 1985

INTERNATIONAL TELECOMMUNICATION UNION

CCIR

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REPORT

TECHNICAL BASES FOR THE FIRST SESSION OF THE REGIONAL ADMINISTRATIVE RADIO CONFERENCE TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1 605 - 1 705 kHz IN REGION 2 (BC-R2(1))

Conclusions from Joint Interim Working Party 10-3-8/1 and Interim Working Party 6/4; (Resolution No. 913 of the ITU Administrative Council, 1984)

GENEVA, 1985

Note by the Director, CCIR

The attached report contains the technical bases for the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 in Region 2 (BC-R2(1)). It was prepared on behalf of CCIR Study Groups 10, 3 and 8 by Joint Interim Working Party 10-3-8/1.

JIWP 10-3-8/1 drafted the report at Lima, Peru under the chairmanship of Mr. C. Romero Sanjines. The subject of sky-wave propagation was prepared on behalf of Study Group 6 by Interim Working Party 6/4 chaired by Mr. J. Wang (United States).

IWP 6/4 report (chapter 3 of this text) was approved by CCIR Study Group 6 by correspondence in mid-August 1985, while JIWP 10-3-8/1 report was approved without modifications by the responsible CCIR Study Group 10 at its final meeting (17 October - 1 November 1985).

The attached report results from the integration and the inclusion of minor editorial amendments of both reports by the CCIR Secretariat.

The Appendix to the attached report contains also comments resulting from discussions in Study Group 10 at its final meeting. Copies of the JIWP 10-3-8/1 report have already been circulated prior to its approval by Study Group 10 to the administrations of Region 2 for information. I am therefore pleased to transmit herein the final consolidated CCIR report which contains the updated technical information necessary for the forthcoming Conference.

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INTRODUCTION

The ITU Administrative Council, at its 39th session in 1984, adopted Resolution No. 913, which established the agenda for the first sesssion of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (BC-R2(1)), to be convened in Geneva on 14 April 1986 for a duration of three weeks. By the same Resolution the Administrative Council invited the CCIR:

to prepare all the necessary technical bases in accordance with Recommendation No. 504 of the 1979 WARC.

Due to the fact that the frequency band 1 625 - 1 705 kHz is shared in Region 2 on an equal basis between the broadcasting, fixed and mobile services and that Recommendation No. 504 of the 1979 WARC asked the CCIR to bear in mind the allocations to other services than broadcasting in Regions 1 and 3, CCIR Study Groups 3, 8 and 10 were involved in the preparation.

In accordance with CCIR Resolution 24-5 and in consultation with the Chairmen of Study Groups 3, 8 and 10, it was decided to set up Joint Interim Working Party 10-3-8/1 under the chairmanship of Mr. C. Romero Sanjines (Peru).

JIWP 10-3-8/1 announced by Circulars CE 3/1111, CE 8/1373 and CE 10/1272, was empowered to prepare on behalf of Study Groups 10, 3 and 8 the technical bases for the forthcoming Conference except for matters concerning sky-wave propagation.

This decision took account of the fact that Study Group 6 had already undertaken the necessary ionospheric propagation studies for the Conference, following the provisions of Decision 57. This Decision adopted at Study Group 6 interim meeting (Geneva, 1983) reactivated IWP 6/4 under the Chairmanship of Mr. J. Wang (United States). Both IWP 6/4 and JIWP 10-3-8/1 met in Lima (respectively once and twice) at the kind invitation of the Peruvian Administration.

IWP 6/4 report was finalized and approved by correspondence by Study Group 6 in August 1985. JIWP 10-3-8/1 report was to be approved according to the provisions of Resolution 24-5 by Study Group 10 at its final meeting before its submission as a conference document.

In consideration of the involved delay, copies of the JIWP 10-3-8/1 were distributed prior to its approval by Study Group 10 to Region 2 administrations for information.

This report has been prepared taking into account the technical parameters laid down in the Rio Agreement to allow for a certain homogeneity in the planning procedures.

Specific attention was given to the problem of the compatibility with other services sharing the same band. Here and in some other areas such as the receiver characteristics to be used for planning purposes, definite information appears to be still lacking.

In these cases, results of specific contributions or other, more recent, relevant material has been considered.

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CHAPTER 1

DEFINITIONS AND SYMBOLS

1.1 Definitions

In addition to the definitions given in the Radio Regulations, the following definitions and symbols apply. In those instances where the following definitions differ from or are not included in the Rio de Janeiro Final Acts, the source of the definition is provided.

1.1.1 Broadcasting channel (in AM)

A part of the frequency spectrum, equal to the necessary bandwidth of AM sound broadcasting stations, and characterized by the nominal value of the carrier frequency located at its centre.

1.1.2 Objectionable interference

Interference caused by a signal exceeding the maximum permissible field strength within the protected contour, according to the terms of an agreement.

1.1.3 Protected contour

Continuous line that delimits the area of service which is protected from objectionable interference.

1.1.4 Service area

Area delimited by the contour within which the calculated level of the ground-wave field strength is protected from objectionable interference in accordance with the provisions of an agreement.

1.1.5 Usable field strength (E_u)

Minimum value of the field strength required to provide satisfactory reception under specified conditions in the presence of atmospheric noise, man-made noise and interference in a real situation (or resulting from a frequency assignment plan).

1.1.6 Nominal usable field strength (E_{nom})

Agreed minimum value of the field strength required to provide satisfactory reception, under specified conditions, in the presence of atmospheric noise, man-made noise and interference from other transmitters. The value of nominal usable field strength has been employed as the reference for planning.

1.1.7 Audio-frequency (AF) signal-to-interference ratio (Recommendation 447-2)

The ratio (expressed in decibels) between the values of the voltage of the wanted signal and the voltage of the interference, measured under specified conditions[1], at the audio-frequency output of the receiver.

1.1.8 Audio-frequency (AF) protection ratio

Agreed minimum value of the audio-frequency signal-to-interference ratio corresponding to a subjectively defined reception quality. This ratio may have different values according to the type of service desired.

1.1.9 Radio-frequency (RF) wanted-to-interfering signal ratio (Recommendation 447-2)

The ratio (expressed in decibels) between the values of the radio-frequency voltage of the wanted signal and the interfering signal, measured at the input of the receiver under specified conditions[1].

1.1.10 Radio-frequency (RF) protection ratio

The desired radio-frequency signal-to-interference ratio which, in well-defined conditions[1], makes it possible to obtain the audio-frequency protection ratio at the output of a receiver.

1.1.11 Relative radio-frequency protection ratio (Recommendation 560-1)

This ratio is the difference, expressed in decibels, between the protection ratio when the carriers of the wanted and unwanted transmitters have a frequency difference of Δf (Hz or kHz) and the protection ratio when the carriers of these transmitters have the same frequency.

1.1.12 Class B station

A station intended to provide coverage over one or more population centres and the contiguous rural areas located in its service area and which is protected against interference accordingly.

1.1.13 Class C station

A station intended to provide coverage over a city or town and the contiguous suburban areas located in its service area, and which is protected against interference accordingly.

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[1] These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission characteristics (type and percentage modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

1.1.14 Day-time operation

Operation between the times of local sunrise and local sunset.

1.1.15 Night-time operation

Operation between the times of local sunset and local sunrise.

1.1.16 Synchronized network

Two or more broadcasting stations whose carrier frequencies are identical and which broadcast the same programme simultaneously.

In a synchronized network the difference in carrier frequency between any two transmitters in the network should not exceed 0.1 Hz. The modulation delay between any two transmitters in the network should not exceed 100 µs, when measured at either transmitter site.

1.1.17 Station power

Unmodulated carrier power supplied to the antenna.

1.1.18 Ground wave

Electromagnetic wave which is propagated along the surface of the Earth or near it and which has not been reflected by the ionosphere.

1.1.19 Sky wave

Electromagnetic wave which has been reflected by the ionosphere.

1.1.20 Sky-wave field strength, 50% of the time

The sky-wave field strength during the reference hour which is exceeded for 50% of the nights of the year. The reference hour is the period of one hour beginning one and a half hours after sunset and ending two and a half hours after sunset at the midpoint of the short great-circle path.

1.1.21 Characteristic field strength (E_c)

The field strength, at a reference distance of 1 km in a horizontal direction, of the ground-wave signal propagated along perfectly conducting ground for 1 kW station power, taking into account losses in a real antenna.

Note 1 - The gain (G) of the transmitting antenna relative to an ideal short vertical antenna is given by the following equation:

$$G = 20 \log \frac{E_c}{300} \text{ dB} \qquad (1)$$

where:

E_c: units of mV/m.

Note 2 - The effective monopole radiated power (e.m.r.p.) is given by the following equation:

$$\text{e.m.r.p.} = 10 \log P_t + G \text{ dB(kW)} \qquad (2)$$

where:

P_t: station power (kW).

1.1.22 Selectivity of a receiver (Recommendation 332-4)

A measure of its ability to discriminate between a wanted signal to which the receiver is tuned and unwanted signals.

1.1.23 Sensitivity of a receiver (Recommendation 331-4)

A measure of its ability to receive weak signals and to produce an output having usable strength and acceptable quality.

1.2 Symbols

Hz:	hertz
kHz:	kilohertz
W:	watt
kW:	kilowatt
mV/m:	millivolt/metre
μV/m:	microvolt/metre
dB:	decibel
dB(μV/m):	decibels with respect to 1 μV/m
dB(kW):	decibels with respect to 1 kW
mS/m:	millisiemens/metre

CHAPTER 2

GROUND-WAVE PROPAGATION

2.1 Ground conductivity

2.1.1 For ground-wave propagation calculations one should use the CCIR Atlas of Ground Conductivity that contains the information communicated to the IFRB following a decision of the First Session of the Regional Administrative MF Broadcasting Conference (Region 2) (Buenos Aires, 1980), the modifications introduced during the Second Session (Rio de Janeiro, 1981) and the modifications submitted in accordance with § 2.1.3, Chapter 2, of the Rio de Janeiro Final Acts.

2.2 Field-strength curves for ground-wave propagation

It is recommended that for planning purposes, a single set of curves, calculated for 1 655 kHz on the same basis as those in the Rio de Janeiro Final Acts, be used for determining ground-wave propagation in the frequency range 1 605 - 1 705 kHz. These curves are essentially the same as those in Graph 2 in Annex I, which was calculated for 1 665 kHz.

An alternate approach is to use Graphs 1 and 2 from the curves which were developed for the Rio de Janeiro Conference. Graph 1 applies from 1 520 - 1 610 kHz and could be used for 1 610 kHz, and Graph 2 applies from 1 620 to 1 710 kHz and could be used from 1 620 to 1 700 kHz. This approach has the disadvantage of adding a degree of complexity, but the advantage of providing a better continuity with the Rio de Janeiro Agreement and avoiding the possible confusion created by having two curves (Graph 19 in the Rio de Janeiro Agreement and the possible single set of curves in the forthcoming agreement) both referring to 1 610 kHz.

Annex E to the Report by the First Session of the Regional Administrative MF Broadcasting Conference (Region 2), Buenos Aires, 1980 (Annex II to this Report), contains a mathematical discussion relating to the calculation of these ground-wave curves. The corresponding computer program is available in the IFRB.

Equivalent curves may be calculated by using the program GRWAVE (see Report 714-1 and Recommendation 368-4).

2.3 Calculation of ground-wave field strength

Using the CCIR Atlas of Ground Conductivity, the relevant conductivity or conductivities for the chosen path are determined. If only one conductivity is representative, the method for homogeneous paths is used. If several conductivities are involved, the method for non-homogeneous paths is used.

2.3.1 Homogeneous paths

The vertical component of the field strength for a homogeneous path is represented in the graph in Annex I as a function of distance, for various values of ground conductivity.

The distance in kilometres is shown on a logarithmic scale on the abscissa. The field strength is shown on a linear scale on the ordinate in decibels above 1 μV/m. The graph is standardized for a characteristic field strength of 100 mV/m corresponding to an effective monopole radiated power (e.m.r.p.) of -9.5 dB relative to 1 kW. The straight line marked "100 mV/m at 1 km" is the field strength on the assumption that the antenna is erected on a surface of perfect conductivity.

For omnidirectional antenna systems having a different characteristic field strength, correction must be made according to the following equations:

$$E = E_o \times \frac{E_c}{100} \times \sqrt{P} \qquad (1a)$$

if field strengths are expressed in mV/m, and

$$E = E_o + E_c - 100 + 10 \log P \qquad (1b)$$

if field strengths are expressed in dB(μV/m).

For directional antenna systems, the correction must be made according to the following equations:

$$E = E_o \times \frac{E_R}{100} \qquad (2a)$$

if field strengths are expressed in mV/m, and

$$E = E_o + E_R - 100 \qquad (2b)$$

if field strengths are expressed in dB(μV/m),

where:

E: resulting field strength,

E_o: field strength read from the graph,

E_R: actual radiated field strength at a particular azimuth at 1 km,

E_c: characteristic field strength,

P: station power (kW).

Annex I contains three pairs of scales to be used with Graph 2. Each pair contains one scale labelled in decibels and another in millivolts per metre. Each pair can be cut out and trimmed as a unit to be used as sliding ordinate scales. The scales allow graphical conversion between decibels and millivolts per metre, and are used to make graphical determinations of field strengths. Other methods of making calculations on the graph may be used, including the use of dividers to adjust for values of E_R that differ from 100 mV/m at 1 km. However, any method used will follow steps similar to those discussed below.

For both omnidirectional and directional antenna systems the value of E_R must be found. For omnidirectional systems E_R can be determined by using the following equations:

$$E_R = E_c\sqrt{P} \qquad (3a)$$

if field strengths are expressed in mV/m, and

$$E_R = E_c + 10 \log P \qquad (3b)$$

if field strengths are expressed in dB(μV/m).

To determine the field strength at a given distance, the scale is placed at the given distance with the 100 dB(μV/m) point of the scale resting on the appropriate conductivity curve. The value of E_R is then found on the scale; the point on the underlying graph (which lies underneath the E_R point of the scale) yields the field strength at the given distance.

To determine the distance at a given field strength, the E_R value is found on the sliding scale and that point is placed directly at the level of the given field strength on the graph. The scale is then moved horizontally until the 100 dB(μV/m) point of the scale with the applicable conductivity curve. The distance may then be read from the abscissa of the underlying graph.

2.3.2 Non-homogeneous paths

In this case, the equivalent distance (or Kirke) method is recommended. To apply this method the appropriate graph in Annex I can also be used.

Consider a path whose sections S_1 and S_2 have end-point lengths corresponding to d_1 and d_2 - d_1 and conductivities δ_1 and σ_2 respectively, as shown in the following figure:

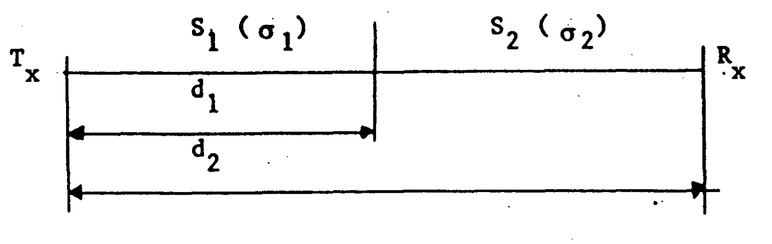

FIGURE 2.1

The method is applied as follows:

a) taking section S_1 first, we read the field strength corresponding to conductivity σ_1 at distance d_1 on the graph;

b) as the field strength remains constant at the soil discontinuity, the value immediately after the point of discontinuity must be equal to that obtained in a) above. As the conductivity of the second section is σ_2, the curve corresponding to conductivity σ_2 gives the equivalent distance to that which would be obtained at the same field strength arrived at in a). This equivalent distance is d. Distance d is larger than d_1 when σ_2 is larger than σ_1. Otherwise d is less than d_1;

c) the field strength at the real distance d_2 is determined by taking note of the corresponding curve for conductivity σ_2 similar to that obtained at equivalent distance $d + (d_2 - d_1)$;

d) for successive sections with different conductivities, procedures b) and c) are repeated.

CHAPTER 3

SKY-WAVE PROPAGATION

3.1 Recent studies

3.1.1 Effects of frequency

Extensive data in the 535 - 1 605 kHz band collected by the Federal Commissions Commission (FCC) of the United States of America conclusively show that sky-wave field strengths for transition hours are highly frequency dependent. For example, at sunset (or sunrise), signals of a 1 530 kHz station are consistently about 15 dB stronger than those of a 700 kHz station. As the evening goes on, frequency dependence diminishes. At about two hours after sunset, field strengths of a higher-frequency station are typically 3 to 5 dB stronger than those of a lower-frequency station. At midnight, frequency dependence is so slight (typically 1 to 3 dB, in favour of the higher-frequency station) that it may be neglected entirely. Because the study is so extensive, it seems to be safe to say that at night-time (from 2 hours after sunset and on), sky-wave propagation conditions at 1.7 MHz and at 1.6 MHz are very similar. During transition hours, however, signals of stations in the new band are expected to be significantly stronger than those in the lower band.

3.1.2 Effects of latitude

A major drawback of the current method for Region 2 (535 - 1 605 kHz) is that the method does not take into account the effects of latitude, which happens to be a very, if not the most, influential factor. Furthermore, the populated areas of Region 2 cover a range of geomagnetic latitude of more than 120 degrees, wider than any other Region of the ITU. Thus, latitudinal effects are particularly important for the current study.

MF sky-wave field strength decreases with increasing geomagnetic latitude. This correlation, according to Recommendation 435-4 (1982), can be described by the squared tangent function of the latitude. Extensive data collected in the mid-latitude areas of Region 2 show a more or less similar latitude dependence. Data from the high latitude areas of Region 2 show that measured field strengths are usually weaker than those predicted by any of the prediction methods available. Data collected in the low-latitude areas show a strong opposite trend. It should be mentioned that data from the high-latitude and the low-latitude areas of Region 2 cannot be considered extensive.

3.1.3 Daytime sky-wave propagation

It is difficult to collect daytime sky-wave field strengths for a number of reasons. Nevertheless, the FCC did manage to collect a considerable amount of daytime sky-wave data representing different levels of solar activity. Before analyzing daytime data, some stringent tests were performed to make sure that the data collected were actually sky-wave. Measurements of eight paths are believed to be sky-wave and have been studied. An analysis of the FCC daytime sky-wave data shows that:

3.1.3.1 The annual medial value of sky-wave field strength at noon is about 45 dB lower than the corresponding value at midnight. This agrees quite well with data collected in Japan and Europe. If one considers the winter season alone, however, the picture can be quite different. In the high-latitude areas where night-time winter anomaly is pronounced, the difference between daytime and night-time field strengths can be drastically smaller. For example, during the period of 1 November, 1941, to 31 January, 1942, signals of WLW (700 kHz, Cincinnati, Ohio) were detected in Portland, Oregon (path length = 3,192 km, midpoint geomagnetic latitude = 53.2 degrees N) regularly around noon with a median value of 6 dB above 1 μV/m. The corresponding night-time (6 hours after sunset) value was only 17.3 dB above 1 μV/m. The difference was about 11 dB. The typical difference between night-time and daytime field strengths for the winter months, as observed in the United States of America, is usually between 25 and 30 dB.

3.1.3.2 Day-to-day fluctuation of midday field strengths is more pronounced with signals in the upper end of the MF band than in the lower end of the band.

3.1.3.3 Daytime sky-wave field strengths vary with solar activity in a similar manner as that of night-time (see also section 3.1.4).

3.1.3.4 The seasonal variation of the median value of daytime field strengths is very apparent. Field strengths are strongest in the winter months.

3.1.4 Effects of solar and magnetic activity

Solar activity reduces MF night-time sky-wave field strengths. The reduction is three or four times greater in North America than in Europe but in tropical latitudes it is believed to be negligible. An analysis of data collected in Region 2 suggests that the reduction is a function of geomagnetic latitude, frequency, distance and sunspot number (Report 431-3, 1982). However, for planning purposes calculations should be based on minimum value of solar activity.

Evidence based on some United States - Canada paths shows that a dominant factor in reducing MF night-time sky-wave field strength is the magnetic-activity-related absorption. An additional factor which contributes sporadically to the field strength reduction, during October through February, is the winter-anomaly-related absorption. These factors can cause large variation in median field strength (Report 431-1, 1982).

For planning purposes magnetic dependencies can be neglected. Short-term effects of magnetic storms have been studied recently. Storm-related absorption, particularly during the first 5 to 10 days immediately following the onset of a storm, increases with increasing frequency. For example, when monitored in Grand Island, Nebraska, the signal of KSTP (1 500 kHz, Minneapolis, Minnesota) decreased by 33 dB while the signal of WCCO (830 kHz, St. Paul, Minnesota) decreased by only 19 dB when a magnetic storm struck the world (19 March, 1950; Ap = 84). Storm-related absorption is usually less severe in tropical latitudes. It should also be mentioned that storm-related absorption has virtually no diurnal variation. Storms affect daytime field strength and night-time field strength in a similar manner.

3.1.5 Field strengths exceeded for different percentages of time

Based on extensive data collected in Region 2, it has been observed that during a year of low-solar activity:

3.1.5.1 In the low-latitude areas, (40 degrees or less, geomagnetic) the field strength exceeded for 1% of the time is about 9.5 dB greater than the annual median value. This difference increases to about 15 dB in the high-latitudes areas (60 degrees or greater).

3.1.5.2 In the low-latitude areas, the field strength exceeded for 10% of the time is about 6 dB greater than the median value. This difference increases to about 10 dB in the high-latitude areas.

3.1.5.3 For planning purposes, 12.25 dB and 8 dB may be added to the median value in order to determine the values exceeded for 1% and 10% of the time, respectively.

3.1.6 Seasonal variation of sky-wave field strength

Night-time field strength measurements made in the low-latitude areas of Region 2 (e.g. Mexico, the Caribbean) show very little seasonal variation. Measurements made in the mid-latitude areas of the Region show only a slight minimum in the summer months, typically 5 or 6 dB below the median value. Measurements made in Europe show a more pronounced minimum in the summer together with maxima in spring and autumn (Report 431-3, 1982). See section 3.1.3.4 for daytime field strength variation.

3.1.7 Field strengths at two hours and six hours after sunset

Different reference hours are being used by different administrations in different Regions of ITU. In Region 2, two hours after sunset (SS + 2) at the midpoint of a path has been adopted as the reference hour. In Region 1, six hours after sunset (SS + 6) has been in use. In Australia, midnight has been the traditional reference hour. Recommendation 435-4 (1982), Figure 3, suggests that field strength at six hours after sunset is 2.5 dB stronger than that of two hours after sunset. A study of Region 2 data reveals that:

3.1.7.1 The CCIR-recommended figure of 2.5 dB is most accurate for short paths (i.e. one hop) regardless of direction.

3.1.7.2 This figure is also accurate for north-south paths regardless of path length.

3.1.7.3 For multi-hop east-west paths, the difference between field strengths at six and two hours after sunset can be considerably larger than 2.5 dB.

3.1.8 Short paths

The original FCC curve covers the distance range of, approximately, 161 to 4,300 km. The first session of the Regional Administrative MF Broadcasting Conference (Buenos Aires, March 1980) adopted the metric version of the FCC curve for use in Region 2. The curves were extended to cover 100 to 10,000 km. A question has been raised: How to estimate sky-wave field strengths when the length is shorter than 100 km? It should be noted that there is virtually no data available from short propagation paths. The procedure described in this section is based on logical reasoning.

Medium waves are usually reflected by the E layer of the ionosphere, which spans the altitude range of 90 to 130 km (Report 725-1, 1982). It should be mentioned that Figure 2, chapter 3, Annex 2 (Elevation angle vs distance) of the Final Acts of the Regional Administrative MF Broadcasting Conference (Region 2), Rio de Janeiro, 1981 (hereafter called the Rio Final Acts for short), corresponds to a height of 96.5 km (60 miles). Thus, even for a receiving point only 1 km away from the transmitter, sky-wave may have to travel 193 km (96.5 km up, 96.5 km down) to reach its destination. As the great-circle distance between the two points in increased to, say, 100 km, the actual "slant distance" is only 217 km. In this case, the great-circle distance has increased by 100 times while the slant distance only increased by 12%. Therefore, sky-wave must travel nearly as far to reach receivers near the transmitter as it does to reach receivers several hundred kilometres away. Locations near the transmitter do not have much advantage as far as sky-wave is concerned. In other words, when great-circle distances are sufficiently small, slant distances are, more or less, constant, and sky-wave field strengths increase very little with decreasing distance. Had slant distance been adopted, there would have been no problem since slant distance is never less than about 200 km. In Region 2, however, the great-circle distance has been in use for decades. An alternative procedure for calculating sky-wave field strengths for short paths may be desirable.

3.1.8.1 It is suggested that if the great-circle distance, d, is less than 200 km:

a) the actual great-circle distance be used in determining elevation angle;

b) in using the field strength curve in the Rio Final Acts (Annex 2, chapter 3, Figure 4, Rio Final Acts) for frequencies above 1 605 kHz, if this method is adopted, the reading corresponding to d = 200 km is to be used. In other words, it is suggested that Figure 4 should be a horizontal line for distances between 0 and 200 km.

3.1.9 Diurnal variation

The hourly median field strengths vary from hour to hour, particularly during sunrise and sunset.

Figure 3-1 shows the average variation F referred to the value at two hours after sunset at the path midpoint, for the sunrise and sunset periods.

These curves apply to the band 1 605 - 1 705 kHz, for 50% of the time.

Some values are tabulated in Table 3.I.

They may be calculated by the following equations for F (dB), that is for $20 \log_{10} F$. The variable t is the time relative to sunrise or sunset at the path midpoint.

Sunrise:

$$F\ (dB) = -6.616 - 10.112\,t - 2.034\,t^2 + 0.423\,t^3 \qquad (1)$$

Sunset:

$$F\ (dB) = -7.938 + 10.050\,t - 2.310\,t^2 - 0.577\,t^3 \qquad (2)$$

TABLE 3.I

DIURNAL CURVES FOR 1655 kHz

	SUNRISE		SUNSET	
t(h)	F (dB)	F	F (dB)	F
- 2.00	2.08	1.270	- 32.66	0.0233
- 1.75	2.57	1.345	- 29.51	0.0335
- 1.50	2.54	1.339	- 26.26	0.0486
- 1.25	2.01	1.260	- 22.98	0.0709
- 1.00	1.03	1.126	- 19.72	0.103
- 0.75	- 0.36	0.959	- 16.53	0.149
- 0.50	- 2.13	0.782	- 13.47	0.212
- 0.25	- 4.23	0.614	- 10.59	0.296
0.00	- 6.63	0.466	- 7.94	0.401
0.25	- 9.28	0.344	- 5.58	0.526
0.50	-12.14	0.247	- 3.56	0.664
0.25	-15.18	0.174	- 1.94	0.800
1.00	-18.35	0.121	- 0.78	0.915
1.25	-21.62	0.0830	- 0.11	0.987
1.50	-24.94	0.0566	- 0.01	0.999
1.75	-28.28	0.0385	- 0.52	0.942
2.00	-31.60	0.0263	- 1.69	0.823

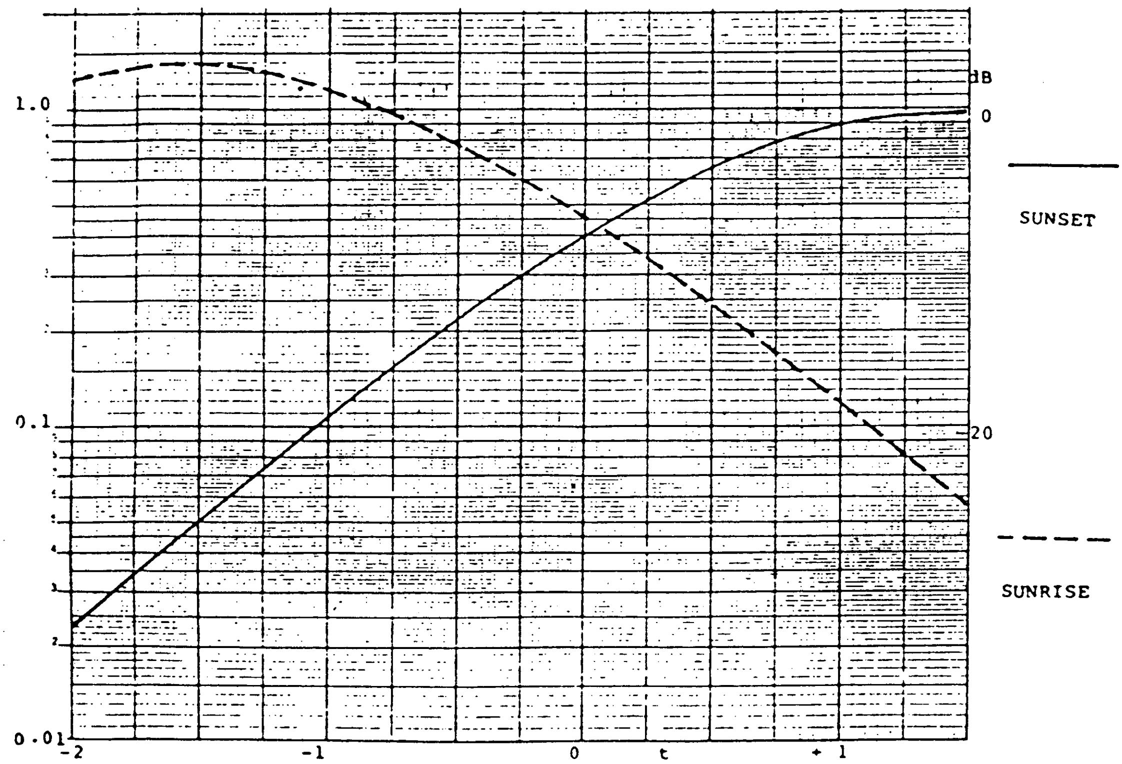

FIGURE 3-I

Diurnal curves for 1 655 kHz

3.2 Available field strength prediction methods

3.2.1 The FCC method

The FCC method is based on short-term measurements taken in the spring of 1935, a year of low solar activity. It includes curves for field strength exceeded for 10% and 50% of the time, for distances from 100 to 2,675 miles (approximately, 169 to 4,300 km). These curves are normalized to 100 millivolts per metre at 1 mile. These curves are presented as a function of distance only and were later adopted for use in North America by agreement. This method offers reasonable results when applied to the mid-latitude areas (e.g. southern United States).

3.2.2 The Cairo curves

Under the auspices of the CCIR, some short-term measurements between North and South America, between North America and Europe, etc., were carried out by several administrations in the late 1930s. A Working Group under the leadership of Dr. B. van del Pol (Holland) was established to study the results. This Working Group developed two separate curves: one for propagation paths distant from the Earth's magnetic poles (i.e., low-latitude paths) and one for propagation paths that pass near the Earth's magnetic poles (i.e., high-latitude paths). The former is better known as the Cairo north-south curve because it was derived from measurements made on transequatorial paths; the latter is better known as the Cairo east-west curve because it was derived from measurements made across the Atlantic. These curves were officially adopted by the CCIR at the 1938 meeting held in Cairo; hence, they are collectively called the Cairo curves.

The 1975 LF/MF Conference adopted the Cairo north-south curve for official use in Asia. Field-strength measurements conducted by the Asia Pacific Broadcasting Union (ABU) indicate that the Cairo curve is preferable for that part (i.e., low geomagnetic latitude) of the world. It has also been reported that, for very long paths, the Cairo curve, in general, yields the highest field strength prediction.

When converted to the same conditions, the two Cairo curves and the FCC curves are very similar for distances up to about 1,400 km. At 3,000 km, the north-south (low-latitude) curve is about 8 dB greater than the east-west curve. At 5,000 km, the north-south curve is about 18 dB greater than the east-west curve. The FCC (50%) curve is near the average of the two Cairo curves.

3.2.3 The CCIR method and simplification for planning purposes in Region 2

Recognizing the need for a simple field-strength prediction method for world-wide application, the CCIR in 1966 established an ad hoc Working Group known as the Interim Working Party (IWP) 6/4. In 1974, under the leadership of Dr. P. Knight (United Kingdom), IWP 6/4 adopted the USSR method with modifications (e.g., United Kingdom sea-gain term). The method is recommended by the CCIR for provisional use. The 1975 LF/MF Conference adopted this method for official use in Region 1 and part of Region 3.

When compared with measured data from different parts of Region 2, the CCIR method shows better overall results than the FCC curves. However, qualitatively, certain limitations became apparent. Briefly stated, they are:

a) the method has a tendency to underestimate field-strength levels in low-latitude areas and to overestimate in high-latitude areas;

b) measurements taken in North America suggest that when other factors are equal, the field strength of a higher-frequency path tends to be stronger. The frequency-dependent term of the CCIR formula is of the opposite sense;

c) for very long paths, this method has a tendency to underestimate field-strength levels.

In preparation for the 1980 Regional Administrative Broadcasting Conference (Region 2), IWP 6/4 of the CCIR held a special meeting in Geneva (October 1979). A set of modifications to the CCIR method was adopted. These modifications, which were designed to make the CCIR method more reflective to the environment of Region 2, include:

3.2.3.1 In using the CCIR formula for sky-wave field strength, 1 000 kHz is used regardless of frequency. This not only simplifies the calculation but also reconciles the differences in frequency dependence as observed in different regions.

3.2.3.2 A loss factor (k) of the CCIR method was modified in such a way that the accuracy in the high-latitude areas and the low-latitude areas is improved without affecting the prediction in the average-latitude areas.

3.2.3.3 For planning purposes the sunspot number is assumed to be zero.

3.2.3.4 It should be emphasized that these modifications are derived from studies of data collected in different parts of Region 2. It should be mentioned that this method is flexible and can be further simplified. For example, sea gain and polarization coupling loss can be deleted if administrations so desire. The simplified version of the CCIR method can be found in Report 575-2 (1982), section 7; or Annex IV to this report.

3.2.4 The Region 2 method (535 - 1 605 kHz)

The first session of the Regional Administrative Broadcasting Conference for Region 2 (Buenos Aires, March 1980) considered all the available methods and decided that:

a) the metric version of the FCC curve, normalized to a characteristic field strength of 100 mV/m at 1 km, is to be used for paths up to 4,250 km in length;

b) for paths greater than 4,250 km in length, the Cairo north-south curve, converted to 100 mV/m at 1 km and "lowered" by 5.4 dB, is to be used. This lowering allows the Cairo and the FCC curves to intersect with each other smoothly at 4,250 km. This composite FCC/Cairo curve was originally adopted by Permanent Technical Committee II, Inter-American Conference on Telecommunications (PTC II/CITEL) at a meeting held in Brasilia, Brazil (July 1979; C. Romero (Peru), Chairman);

c) the first session decided against the adoption of the sea gain factor. Instead, it invited the CCIR to carry out further studies (Recommendation C). The polarization coupling loss factor from the CCIR method was adopted by the first session but deleted by the second session (Rio de Janeiro, November-December 1981) for reasons of simplicity. Furthermore, the second session of the Conference also decided that in calculating interregional interference, the arithmetic mean of the signal strengths calculated both by the official Region 2 method and the method described in CCIR Recommendation 435-3 is to be used.

Details of this method can be found in the Rio Final Acts or Annex III to this report.

3.2.5 The modified FCC method

Recognizing the basic limitations with the current FCC (hence, the Region 2) method, and in preparation for the forthcoming 1 605 - 1 705 kHz RARC, a new latitude-dependent term has been developed (IWP 6/4 Document 101, June 1984). The application of the method for Region 2 described in the Rio Final Acts, with the inclusion of this term has the following features:

3.2.5.1 The modified method is simple to use. A hand-held calculator would suffice. In many cases, a pencil and a straight edge would be all that is needed. A computer is not necessary.

3.2.5.2 The modified method is fully compatible with the existing model. Computer programs being used by the administrations and the IFRB can be changed very easily.

3.2.5.3 The modified method takes into account the effects of latitude by utilizing the mean geomagnetic latitude ϕ of a path involved. Conversion from geographic to geomagnetic coordinates is straightforward (see, for example, Annex IV, Figure 6).

3.2.5.4 The curve corresponding to $\phi = 35^o$ is extremely close to the Cairo north-south curve. The difference is about 1.5 dB, on the r.m.s. basis.

3.2.5.5 The curve corresponding to $\phi = 45^o$ is similar to the current curve for Region 2, which is the new metric version of the FCC curve. The Region 2 curve and the new modified curve for $\phi = 45^o$ are about 2.5 dB apart, on the r.m.s. basis.

3.2.5.6 The curve for $\phi = 59^o$ has been adopted by the FCC for use between Alaska and the lower 48 states of the United States of America.

3.3 Comparison of prediction methods

Data from propagation paths within Region 2 as well as from interregional paths have been studied. Region 2 data have been divided into three groups according to mid-point geomagnetic latitudes. In the mid-latitude and high-latitude cases, only measured field strengths for a year of low solar activity (i.e., the worst-case data) were studied. Table 3.II summarizes prediction errors of the different prediction methods mentioned in this report. In this study, an error is defined as the difference, in dB, between the calculated field strength and the measured field strength.

TABLE 3.II

Prediction errors

Case	RMS Errors for different methods				Geographical areas where measurements were taken
	A	B	C	D	
0^o - 44.9^o	9.9	7.8	7.7	8.2	BR, MEX, USA, USA-ARG, CEN AM-USA
45^o - 52.5^o	4.7	6.0	4.1	5.8	USA
> 52.5^o	11.1	13.4	4.6	6.8	USA, CAN-USA
SUB-TOTAL	8.1	8.7	5.4	6.9	
INTERREGIONAL PATHS	13.6	17.2	11.1	8.9	ALL ITU REGIONS
TOTAL	10.97	13.96	8.51	8.05	

All figures are in dB

A - the Region 2 method
B - the Cairo curves
C - the simplified CCIR method
D - the modified FCC method

A careful study of the results of this comparative study and results of previous work (Report 431-3, 1982) suggests that:

3.3.1 As expected, the Region 2 method works well in the mid-latitude areas of the region. When used in the low-latitude areas, however, it usually under predicts field strength levels. When used in the high-latitude areas, on the other hand, it almost always over predicts. From a frequency management point of view, it means that in the low-latitude areas, sky-wave contours for a given signal level, calculated by the Region 2 method, are usually considerably smaller than the actual ones. The calculated contours in the high-latitude areas, on the other hand, are usually much larger than the actual ones.

3.3.2 Much the same can be said about the Cairo curve, except its inaccuracy when applied to the high-latitude areas is more obvious. It should be mentioned that for long paths over sea water, the Cairo curve consistently offers good results.

3.3.3 The simplified CCIR method for planning purposes in Region 2 yields promising results. When compared to measured data collected in Region 2, it offers closer agreement with observations than the other methods. When compared to measurements made over interregional paths, it offers reasonable overall results too. However, it has been reported that when applied to paths longer than, say, 4,000 km, this method has a tendency to underestimate field strength levels.

3.3.4 Like the simplified CCIR method, the modified FCC method contains a latitude-dependent term. Unlike the simplified CCIR method, the modified FCC method seems to work well for long paths as well as short paths. This method links the Cairo curve and the FCC curve together.

3.4 Conclusions

Based on the latest study on frequency dependence, the Region 2 method, as described in the Rio Final Acts, for calculating night-time sky-wave field strengths in the band 535 - 1 605 kHz can be extended to 1 705 kHz without introducing significant additional errors. (For details of this method, see Annex III.)

If administrations in Region 2 prefer a somewhat more advanced approach to improve the accuracy of prediction, there are two alternative methods. The simplified CCIR method for planning purposes in Region 2 (see Annex IV) and the modified FCC method (see Annex V) should be considered.

CHAPTER 4

BROADCASTING STANDARDS

4.1 Class of emission

It is recommended that the plan be established for a system with double-sideband amplitude modulation with full carrier A3E.

Classes of emission other than A3E, for instance to accommodate stereophonic systems, could also be used on the condition that the energy level outside the necessary bandwidth does not exceed that normally expected in an A3E emission and that the emission be receivable by conventional receivers employing envelope detectors without increasing appreciably the level of distortion.

4.2 Necessary bandwidth of emission

For planning purposes, a necessary bandwidth of 10 kHz is recommended in conformity with the provision of the MFBC-R2 Plan. The protection ratio selected allows operation with 20 kHz occupied bandwidth without an appreciable increase in interference.

4.3 Channel spacing

The Regional Administrative MF Broadcasting Conference (Region 2), 1981, accepted a channel spacing of 10 kHz and carrier frequencies which are integral multiples of 10 kHz, beginning at 540 kHz. Since many modern receivers use frequency synthesis in tuning, it is recommended that the same channel spacing be used up to 1 700 kHz.

4.4 Protection ratios in MF broadcasting (Recommendation 560-1, Report 794-1)

4.4.1 Protection ratio values for planning purposes

The RF protection ratios specified by the CCIR for broadcasting relate to the interference between broadcast transmissions using amplitude modulation.

The protection ratios quoted refer, in all cases, to the ratios at the input to the receiver, no account having been taken of the effect of using directional receiving antennas.

Protection ratios depend on several parameters, among which transmission standards and receiver characteristics play an important role. Apart from technical factors there are others of a physiological and a psychological nature which have to be respected. It is, therefore, extraordinarily difficult to determine generally agreed values of protection ratios, even if both the transmission standards and the receiver characteristics are given.

For planning purposes, the Regional Administrative MF Broadcasting Conference (Region 2) adopted a co-channel protection ratio of 26 dB, a first adjacent channel protection ratio of 0 dB and a second adjacent channel protection ratio of -29.5 dB. These ratios were used for both the ground-wave and sky-wave protection. These same values could be used in the 1 605 - 1 705 kHz band in Region 2.

Night-time protection, computed for two hours after sunset, is afforded for 50% of the nights of the year. According to Recommendation 560, the margin value for short term fading has been incorporated in the radio-frequency protection ratio value indicated above.

4.4.2 Relative radio-frequency protection ratio curves

The relative radio-frequency protection ratio is the difference, expressed in decibels, between the protection ratio when the carriers of the wanted and unwanted transmitters have a frequency difference of Δf (Hz or kHz) and the protection ratio when the carriers of these transmitters have the same frequency.

Once a value for the co-channel radio-frequency protection ratio (which is equal to the audio-frequency protection ratio) has been determined, then the radio-frequency protection ratio, expressed as a function of the carrier-frequency spacing, is given by the curves of Figure 4.1:

- curve A, when a limited degree of modulation compression is applied at the transmitter input, such as in good quality transmissions, and when the bandwidth of the audio-frequency modulating signal is of the order of 10 kHz;

- curve B, when a high degree of modulation compression (at least 10 dB greater than in the preceding case) is applied by means of an automatic device and when the bandwidth of the audio-frequency modulating signal is of the order of 10 kHz;

- curve C, when a limited degree of modulation compression (as in the case of curve A) is applied and when the bandwidth of the audio-frequency modulating signal is of the order of 4.5 kHz;

- curve D, when a high degree of modulation compression (as in the case of curve B) is applied by means of an automatic device and when the bandwidth of the audio-frequency modulating signal is of the order of 4.5 kHz.

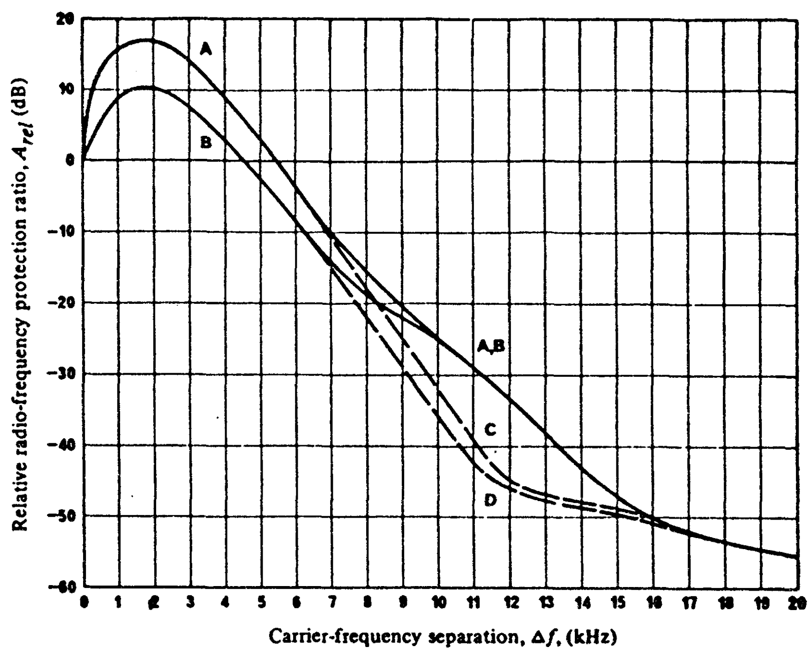

FIGURE 4.1

Relative value of the radio-frequency protection ratio as a function of the carrier-frequency separation

The curves A, B, C and D are valid only when the wanted and unwanted transmissions are compressed to the same extent. They have been obtained mainly from measurements and calculations with a reference receiver representative of good quality receivers used for reception in band 6 (MF). The overall frequency response curve of the European Broadcasting Union (EBU) reference receiver used passes through -3 dB, -24 dB and -59 dB at 2 kHz, 5 kHz and 10 kHz, respectively.

In Region 2 the protection ratio has been generally calculated on the basis of values close to curve A in Figure 4.1. For the first adjacent channel, the absolute value is 0 dB. That is, where the co-channel protection ratio is 26 dB and the relative radio-frequency protection ratio for the adjacent channel at 10 kHz is -26 dB (see Figure 4.1), the absolute protection ratio for the adjacent channel becomes zero.

For the second adjacent channel, the Regional Administrative MF Broadcasting Conference (Region 2) adopted a protection ratio of -29.5 dB (the reference value is 26 dB for the same channel).

4.4.3 Radio-frequency protection ratios for synchronized broadcasting transmitters

It is well known that the radio-frequency protection ratios for transmitters working in the same channel can be improved considerably by synchronizing techniques, thereby increasing the effective service areas of these transmitters. Actual values for these protection ratios depend on various factors, including the synchronization method, but with the criteria in definition 1.1.16, a co-channel protection ratio of 8 dB is recommended.

For the purpose of determining interference caused by synchronized networks, the following procedure taken from the Final Acts of the 1981 Regional Administrative MF Broadcasting Conference (Region 2) is recommended.

If any two transmitters are less than 400 km apart, the network should be treated as a single entity, the value of the composite signal being determined by the quadratic addition of the interfering signals from all the individual transmitters in the network. If the distances between all the transmitters are equal to or greater than 400 km, the network should be treated as a set of individual transmitters.

It is also recommended that for the purpose of determining sky-wave interference received by any one member of a network, the value of the interference caused by the other elements of the network should be determined by the quadratic addition of the interfering signals from all those elements. In any case, where ground-wave interference is a factor it should be taken into account.

4.4.4 Application of protection criteria

4.4.4.1 Value of protected contours

Within the national boundaries, the protected contour should be determined by using the nominal usable field strength or the usable field strength determined at the site of the protected station.

4.4.4.2 Protection outside national boundaries

No station should have the right to be protected beyond its national boundary which should be deemed to encompass only its land area, including islands.

No broadcasting station should be assigned a frequency separated by 10, 20 or 30 kHz from that of a station in another country if the 25 mV/m contours overlap over land.

4.4.4.3 Application of protection ratios

The interfering signal should not exceed the field-strength value of the protected contour, which should be the greatest of the following, divided by the protection ratio:

- the nominal usable field strength;
- the usable field strength; or
- the field strength at the national boundary.

CHAPTER 5

RECEIVER CHARACTERISTICS AND THEIR IMPACT ON STANDARDS USED FOR PLANNING

5.1 Introduction

A number of planning criteria, namely minimum and nominal usable field strength, co- and adjacent-channel protection ratios, necessary bandwidth of emission and channel spacing must be established taking representative values of receiver characteristics into consideration. Equivalent field strengths of man-made noise, atmospheric noise and typical receiver noise in the frequency band 1 605 - 1 705 kHz are of quite comparable magnitude for day-time propagation as well as night-time propagation over Region 2 and this has some impact on the nominal usable field strengths to use for planning.

Minimum performance specifications for low-cost sound broadcasting receivers for individual and community reception are presently given in CCIR Recommendations 415-1 and 416-1, while Report 617-2 shows the results of measurements carried out on several receivers by some administrations. It is worth recalling that these specifications were recommended by the CCIR to assist manufacturers in the design and development of low-cost sound-broadcasting receivers suitable for production in large quantities. Therefore it is to be stressed that the data contained in these Recommendations which originated in 1963 are not representative of present production receiver performance.

CCIR studies on receiver characteristics to be used for planning purposes and on reference receiver characteristics are currently being carried out by IWP 10/7.

Following are descriptions and tentative values of typical receiver characteristics commonly referred to when deciding on planning criteria. The planning criteria proposed in this report were selected so as to allow a representative broadcast receiver to produce a "fair" quality of sound.

5.1.1 Sensitivity

5.1.1.1 Definition

For planning purposes, "sensitivity" is understood to mean "noise-limited sensitivity" defined for amplitude modulation receivers in IEC Publication 315-3. This refers to a chosen value of audio-frequency signal-to-noise ratio which is defined in IEC Publication 315-3, clause 72.

Other limitations may be significant, for example, impulsive noise, galactic noise, atmospheric noise, man-made noise, etc., depending on the location and on the receiving antenna used.

5.1.1.2 Conditions of measurements and typical values

Conditions of measurements are according to IEC Publication 315-3, clauses 76 and 77.

No specific signal-to-noise ratio is standardized at this moment. but the following typical values are compatible with the planning criteria:

- an audio frequency signal-to-noise ratio of 26 dB for 50 mW output and 30% modulation at 400 Hz,
- an average value for receiver sensitivity of 46 dB (μV/m) (200 μV/m)[1].

5.2 Overall selectivity of the receiver

5.2.1 Definition

For planning purposes, "receiver selectivity" is as per IEC Publication 315-7, i.e., the frequency selectivity of the overall receiver.

5.2.2 Conditions of measurements and results

The method of measurement is according to IEC Publication 315-3, clauses 15-18, i.e., by the single-signal method. As a guide to this Conference, results of measurements on medium-priced HF receivers currently in use can be useful.

Measurements on the overall frequency response (RF and AF, excluding the loudspeaker) of receivers currently in use in Europe, Asia and North America show a wide range of variation with respect to the EBU reference receiver mentioned in Recommendation 560-1. The results of the above measurements are shown in Figure 5.1. It is nevertheless to be noted that current MF receivers are more closely represented by the wide-band selectivity range of measured performance.

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1 From the CCIR Report concerning Technical Bases for the first session of the World Administrative Radio Conference for the Planning of HF Bands Allocated to the Broadcasting Service and consistent with the recommended value of E_{nom} of 500 μV/m.

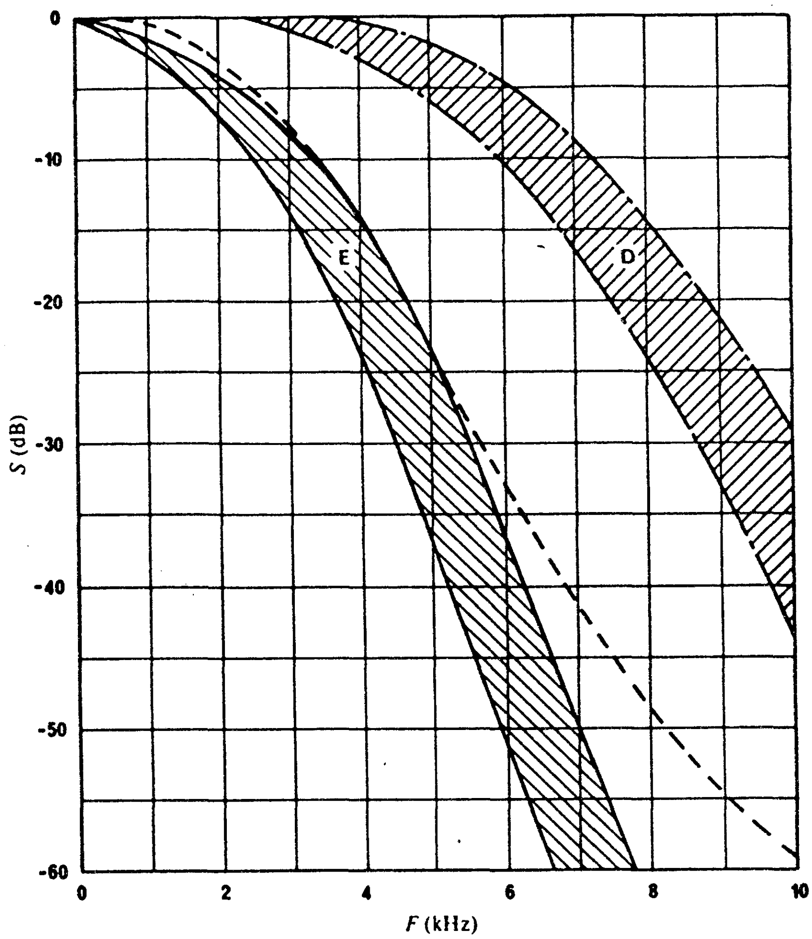


FIGURE 5.1

Receiver selectivity curves

- - - : EBU MBF receiver
curves D: wideband
E: narrowband

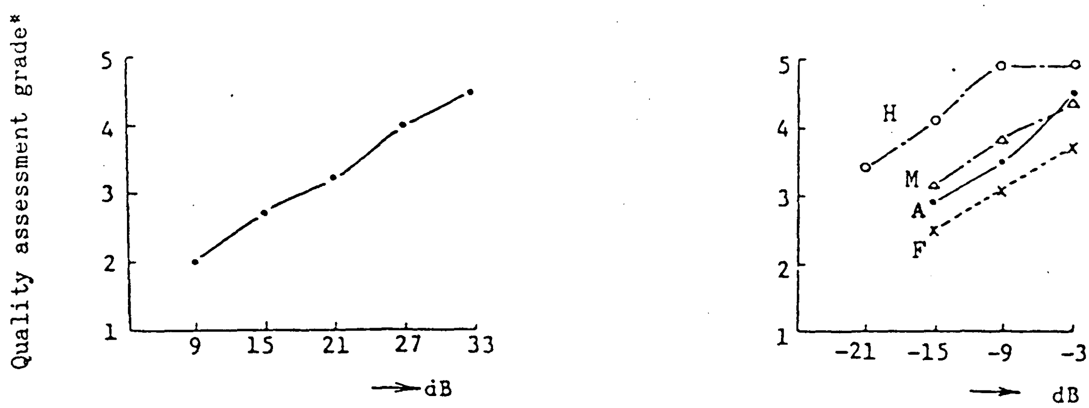
5.3 Relationship between reception quality and radio-frequency wanted-to-interfering signal ratio

5.3.1 Description

From subjective listening tests involving a specialized or non-specialized audience, RF wanted-to-interfering signal protection ratios can be determined which can be related to the subjective assessment of the quality or of the impairment of the quality of sound.

5.3.2 Measurements and results

Results of subjective assessments carried out in Japan concerning the relationship between reception quality and radio-frequency wanted-to-interfering signal ratio are shown in Figure 5.2a for co-channel interference and Figure 5.2b for adjacent-channel interference. Listening tests were made by ten experts using three HF receivers (A, F, H), using a high degree of compression on the wanted and interfering signals; the audio-frequency bandwidth was 4.5 kHz.



(a) In case of co-channel interference

(b) In case of adjacent-channel (10 kHz spacing) interference

M: results for average of three receivers

FIGURE 5.2

Relationship between reception quality and radio-frequency wanted-to-interfering signal ratio

* See Recommendation 562-1.

CHAPTER 6

REQUIRED FIELD STRENGTH

6.1 Minimum usable field strength (E_{min})

The minimum usable field strength should be evaluated numerically using reference atmospheric and man-made noise data, from data concerning signal strength variability and the intrinsic receiver noise level.

6.1.1 Atmospheric noise data

Use should be made of the atmospheric noise data contained in Report 322-2.

The following noise zones were adopted by the Regional Administrative MF Broadcasting Conference (Region 2), 1981, for the band 535 - 1 605 kHz:

Noise zone 1

Comprises the whole of Region 2 with the exception of noise zone 2.

Noise zone 2

Comprises the area within the line defined by the coordinates 20° S - 45° W, the meridian 45° W to the coordinates 16° N - 45° W, the parallel 16° N to the coordinates 16° N - 68° W, the meridian 68° W to the coordinates 20° N - 68° W, the parallel 20° N to the coordinates 20° N - 75° W, the meridian 75° W to the coordinates 16° N - 75° W, the parallel 16° N to the coordinates 16° N - 80° W, the meridian 80° W to the north-east coast of Panama, the frontier between Panama and Colombia, the south-east coast of Panama and the meridian 82° W to the parallel 20° S, and the parallel 20° S, with the exception of Chile and Paraguay, until the frontier between Paraguay and Brazil until 45° W. Bolivia is entirely included in noise zone 2 as are the archipelago of San Andrés and Providencia and the islands belonging to Colombia and the Colon Archipelago or the Galapagos Islands (Ecuador).

Grenada is included in noise zone 1 night-time and noise zone 2 day-time.

The maps of noise zones are shown in Figure 6.1.

However, studies on the r.m.s. value of the field-strength equivalent of atmospheric noise power, for 50% of the time, in the new band do indicate some differences between the noise zones, in particular when a "representative" set of antenna noise factors is taken from Report 322-2, for noise zone 1, i.e. factors that represent a median value for the noise zone not only in absolute value but also in terms of geographical representation.

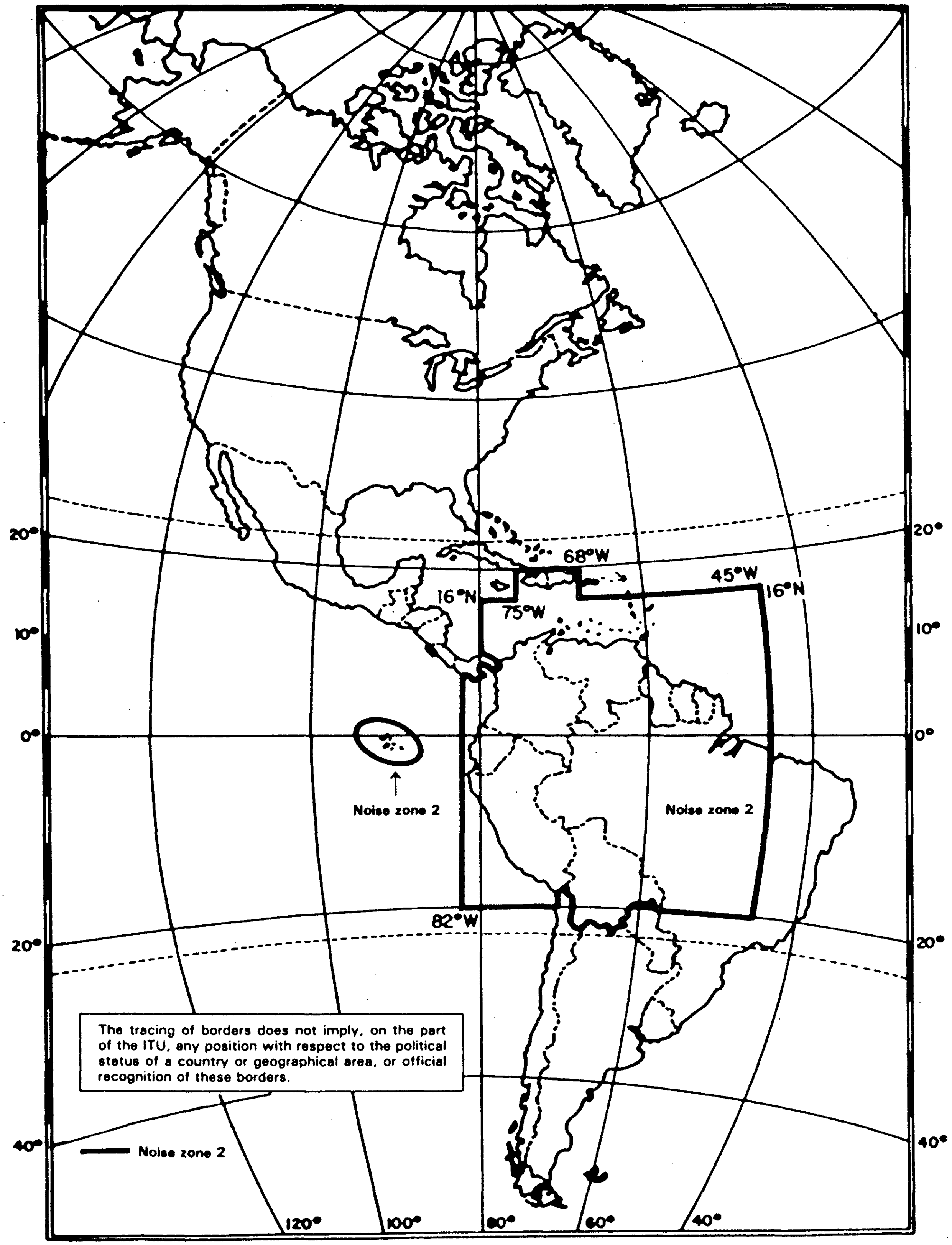


FIGURE 6.1

Noise zones

The important result however is when all noise sources, i.e. atmospheric, man-made and receiver noise, are combined with the interference contribution from other stations. At this point it can be shown for the values of E_{nom} that are proposed further in the text, that noise is not the limiting factor but rather interference. In this context, different noise zones may not be necessary for planning in this new band.

TABLE 6.I

Noise levels

Area	Median value dB(μV/m) f = 1.56 MHz; bandwidth = 10 kHz	
	Day-time	Night-time
Noise zone 1	19.86	31.86
Noise zone 2	16.85	37.36
Man-made radio noise	15.85	15.85

Lower noise levels have been found in certain areas of North and South America with the exception of the tropical zone.

When "representative" values of antenna noise factors for noise zone 1 are taken, the following noise levels are obtained:

TABLE 6.II

Noise levels

Area	Median value dB(μV/m) f = 1.56 MHz; bandwidth = 10 kHz	
	Day-time	Night-time
Noise zone 1	0	31.86
Noise zone 2	16.85	37.36
Man-made radio noise	15.85	15.85

6.1.2 Man-made noise data

Figure 6.2 comes from Report 258-4 (endorsed by Recommendation 372-3) and contains reference curves showing the variation with frequency of median man-made noise power for four environmental categories. For planning purposes, curve A related to the "business category" is proposed for use since it represents the worst-case situation.

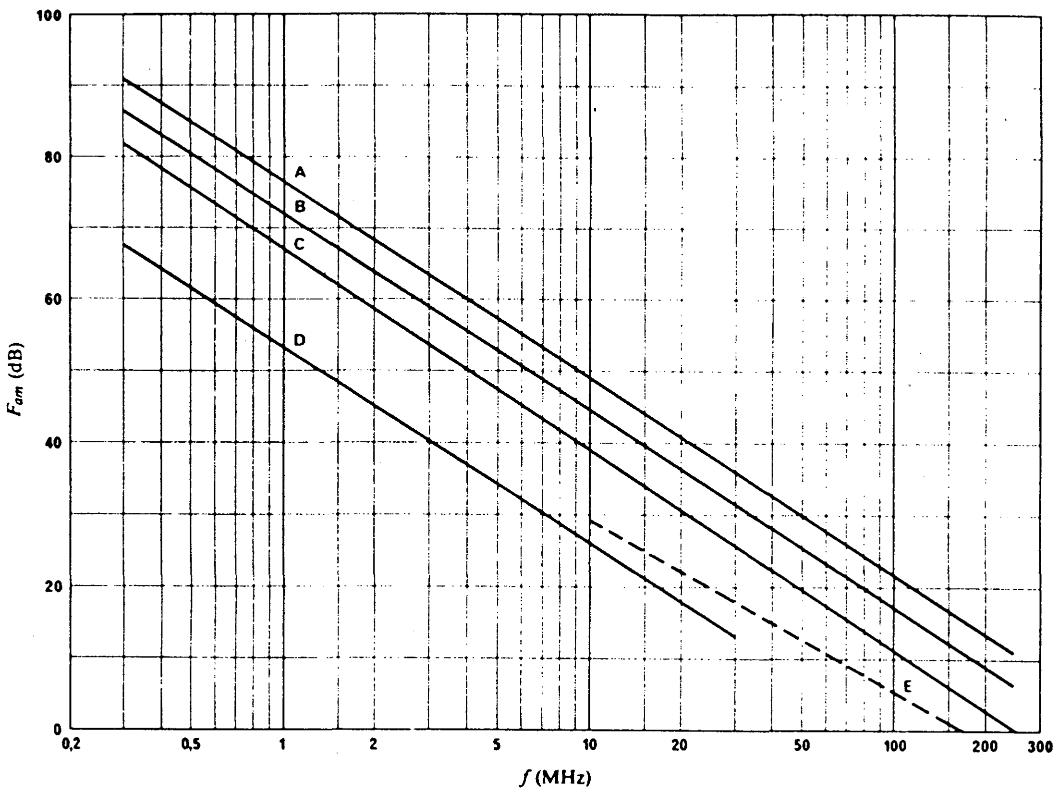


FIGURE 6.2

Median values of man-made noise power for a short vertical lossless grounded monopole antenna

Environmental category:

A: business
B: residential
C: rural
D: quiet rural
E: galactic

6.1.3 Intrinsic receiver noise level

When the intrinsic noise level of the reference receiver exceeds the atmospheric or man-made noise level, the minimum usable field strength should be based on the intrinsic receiver noise level.

Up to now the term "intrinsic noise level" has not been defined in IEC or CCIR publications. If such a definition is to be introduced it might be sensible to base it on field strength and call the resultant quantity an "equivalent receiver intrinsic noise field strength" (E_i^o).

For a receiver with a linear envelope detector characteristic, E_i^o is given by:

$$E_i^o \text{ (dB } (\mu V/m)) = E_c \text{ (dB } (\mu V/m)) + 20 \log m - \text{SNR (dB)} \qquad (1)$$

where:

E_c: carrier field strength for a wanted signal-to-noise ratio with a modulation depth m,

m: modulation depth (%/100),

SNR: audio signal-to-noise ratio (dB).

The receiver studies in progress in several Region 2 countries may add useful data on this topic.

6.2 Carrier-to-noise ratio (C/N)

For planning purposes, the requirement exists to adopt reference values of RF C/N power ratios at the receiver input to give a defined satisfactory reception performance for some specified fraction of the time. This depends on:

- the audio-frequency S/N ratio needed to give the defined satisfactory performance for a steady signal;
- the C/N ratio at the RF input to a reference receiver needed to give the required audio-frequency S/N ratio;
- the allowances to take account of short- (within an hour) and long-term (from day-to-day) variations of both the signals and the noise;
- the specified fraction of the time.

6.2.1 Audio-frequency signal/noise ratio

The method of measurement described in IEC Publication 315-3 clauses 75-77, CCIR Recommendations 560-1, 562-1 and Report 617-2 all point to an AF S/N ratio of 26 dB for steady-state conditions, based on the proposed protection ratio of 26 dB. If this ratio is used, the limiting constraint that will reduce this grade of sound in terms of planning criteria is the availability of the desired and interfering signals which are determined at 50% of the time.

6.2.2 Radio-frequency carrier/noise ratio

Several papers suggest the use of the same value for RF C/N as for AF S/N.

6.3 Nominal usable field strength

The following values of nominal usable field strength have been adopted for planning purposes by the Regional Administrative MF Broadcasting Conference (Region 2), 1981, for the band 535 - 1 605 kHz.

TABLE 6.III

Noise zone 1		Noise zone 2	
Class A station Ground-wave Day-time: co-channel adjacent-channel	 100 µV/m 500 µV/m	Class A station Ground-wave Day-time: co-channel adjacent-channel	 250 µV/m 500 µV/m
Night-time: Sky-wave	500 µV/m 500 µV/m, 50% of the time	Night-time: Sky-wave	1 250 µV/m 1 250 µV/m, 50% of the time
Class B station Ground-wave Day-time: Night-time	 500 µV/m 2 500 µV/m	Class B station Ground-wave Day-time: Night-time	 1 250 µV/m 6 500 µV/m
Class C station Ground-wave Day-time: Night-time:	 500 µV/m 4 000 µV/m	Class C station Ground-wave Day-time Night-time:	 1 250 µV/m 10 000 µV/m

For the 1 605 - 1 705 kHz band, the following values of nominal usable field strength are suggested:

Class B	ground-wave	Day-time:	500 µV/m
		Night-time:	2 500 µV/m
Class C	ground-wave	Day-time:	500 µV/m
		Night-time:	4 000 µV/m

6.4 Usable field strength (for definition see § 1.1.5)

6.4.1 Overall usable field strength

The overall usable field strength E_u due to the individual interference contributions is calculated on an RSS basis, using the expression:

$$E_u = \sqrt{(a_1 E_1)^2 + (a_2 E_2)^2 + \ldots\ldots\ldots (a_i E_i)^2 \ldots} \qquad (2)$$

where:

E_i: field strength of the ith interfering transmitter (i µV/m);

a_i: radio-frequency protection ratio associated with the ith interfering transmitter (see Figure 4.1 and add 26 dB co-channel protection ratio) and expressed as a numerical ratio of field strengths.

Since each individual usable field-strength contribution is, by definition, equal to the individual interfering field strength weighted by the associated protection ratio, the overall E_u calculated on an RSS basis takes into account the effect of frequency offsets between each interfering carrier and the wanted carrier.

6.4.2 50% exclusion principle

The 50% exclusion principle allows a significant reduction in the number of calculations.

With this method, the values of the individual usable field-strength contributions are arranged in descending order of magnitude. If the second value is less than 50% of the first value, the second value and all subsequent values are neglected. If the second value is not less than 50% of the first, an RSS value is calculated for the first and second values. The calculated RSS value is then compared to the third value in the same manner by which the first value was compared to the second and a new RSS value is calculated if required. The process is continued until the next value to be compared is less than 50% of the last calculated RSS. At that point the last calculated RSS value is considered to be the usable field strength E_u.

For planning purposes, if the contribution of a new station is greater than the smallest value considered in calculating the RSS value, the contribution of the new station is unacceptable even if it is less than 50% of the RSS value. However, the new contribution is acceptable if the RSS value determined by inserting the contribution of the new station into the list of contributors is smaller than the nominal usable field strength E_{nom}.

Annex VI provides examples of the procedure based on the root sum square and on the 50% exclusion principle adopted by the Regional Administrative MF Broadcasting Conference (Region 2), 1981.

6.4.3 Calculation of sky-wave interference to Class B or C stations

For a Class B or C station, the RSS of the interference should be calculated site-to-site and the resulting protected contour should be determined using the ground-wave method in Chapter 2.

CHAPTER 7

TRANSMITTING ANTENNA CHARACTERISTICS AND TRANSMITTER POWER

7.1 Transmitting antenna characteristics

7.1.1 Antenna patterns

The CCIR Book of "Antenna Diagrams" published in 1978, is the only CCIR publication presenting information on MF antenna directivity in the form requested in Recommendation 414. The publication provides, inter alia, the theoretical directivity patterns in space for simple vertical antennas, arrays of vertical antennas and arrays of horizontal half-wave dipoles.

A micro-computer program for calculating LF and MF antennas with up to 4 vertical elements in any position on perfect or imperfect ground has been developed by the CCIR Secretariat. The program is written in BASIC and is available for a variety of computers.

7.1.1.1 Vertical antennas

These antennas consist of one or more vertical conductors close to the ground, and fed between their base and ground. The radiation is vertically polarized everywhere.

Figure 7.1 provides the vertical radiation patterns of single vertical antennas of different heights, as a function of wavelength. It thus indicates field strength as a function of elevation angle at a distance of 1 km, assuming a reference transmitter power of 1 kW.

The antenna gain in dB can be obtained directly for any elevation angle from the relationship:

$$\text{antenna gain (dB)} = 20 \log \frac{\text{field strength (mV/m) at 1 km}}{300 \text{ mV/m}}$$

The denominator of 300 mV/m is the reference value of field strength provided at a distance of 1 km and at an elevation angle of 0^o above a perfectly conducting plane of the reference short vertical antenna when fed with a 1 kW transmitter power.

There are innumerable different radiation patterns that can be obtained with arrays of two or more elements, even though they are identical. They vary according to the elements, their geometrical lay-out and the feed characteristics of each element.

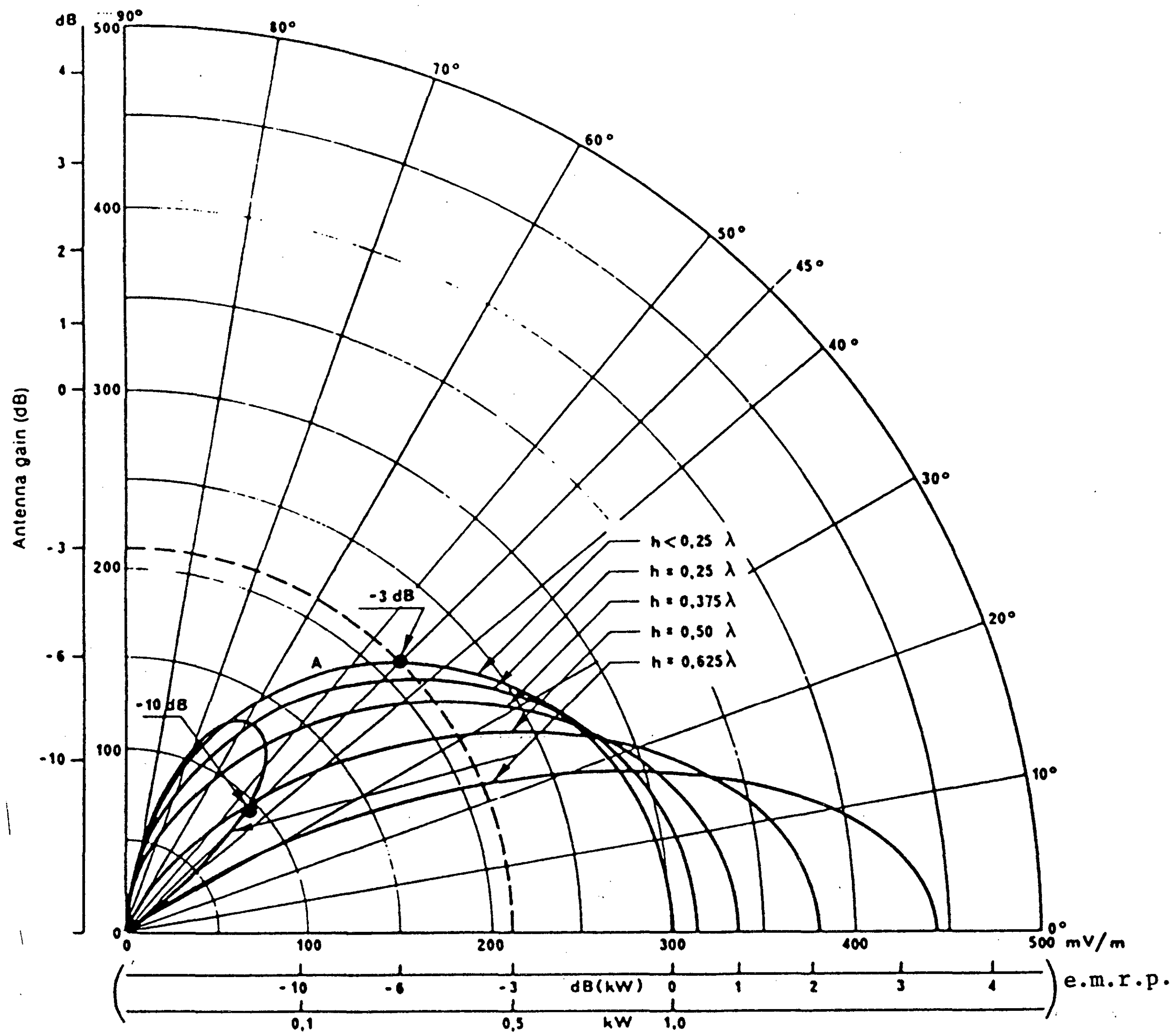


FIGURE 7.1

Effective monopole-radiated power (e.m.r.p.), and field strength at a distance of 1 km as a function of elevation angle, for different height vertical antennas

(A transmitter power of 1 kW is assumed)

A: short vertical antenna

Once a usable frequency has been found in a location for a new station, a calculation is then made of permissible radiation in each direction to protect other existing stations from both night- and day-time interference due to the new station. The permissible radiation in each direction will then determine the antenna radiation pattern to be used to provide protection to these other stations. In some cases an omnidirectional pattern may meet the requirements.

7.1.2 High-efficiency antennas in the MF band (Report 401-4)

Attention should first be drawn to the economic benefits - as soon as transmitting power reaches 10 kW - of high efficiency antennas, i.e. essentially of antennas with very low losses (particularly in the ground) or concentrating radiation in the wanted areas. Among the antennas having been produced as full-scale models and used for the verification of diagrams, mention may be made of the following.

7.1.2.1 Anti-fading antennas

A high-efficiency anti-fading antenna should be of sectionalized construction and have a total electrical height ranging from $2\lambda/3$ to λ, to produce the necessary rapid rise of sky-wave field strength near the point where it equals that of the ground wave. The effect of the resistive component of the antenna current on the vertical radiation pattern of a sectionalized tower can be reduced or compensated by multiple feeding. It should be noted that the location and extent of the fading zone varies due to changes in the properties of the reflecting ionospheric layers.

In practice, the fading zone is somewhat larger than that calculated. This might be due, on the one hand, to variations of the E-layer reflection and, on the other hand, to F-layer reflections. These factors should be taken into account in the design of the antennas.

7.1.2.2 Antennas with variable radiation pattern

With these antennas, which have multiple feeding points that can be switched, two vertical radiation patterns can be obtained, for example, one for the day (maximum radiation at 0°) and the other at night (large lobe at 40° or 60°) for a sky-wave service.

7.1.2.3 Directional antennas with reduced radiation over wide sectors

Report 401-4 refers to various directional transmitting antennas employing vertical-mast radiators for LF and MF broadcasting characterized by very low radiation over wide sectors, both in elevation and azimuth. Such antennas make it possible to reduce the interference in overcrowded frequency bands. Some practical installations are described and details are given of the attenuation that can be obtained (30 dB at present) as well as the stability of the antenna adjustments verified over several years.

7.1.3 Variation of the vertical antenna pattern

Report 401-4 also indicates the variations of the vertical antenna pattern depending on ground conductivity and taking into account the curvature of the Earth. With the aid of curves from Report 401-4, the variations of radiation can be determined, and experiments have confirmed these results. It should be added that these variations of the radiation pattern are due to reflection on the ground at a certain distance from the antenna. The results given assume a no-loss antenna, i.e. an antenna having a sufficiently extensive Earth network.

Figure 7.2 shows the characteristic field strengths for vertical antennas of various heights for a particular ground system.

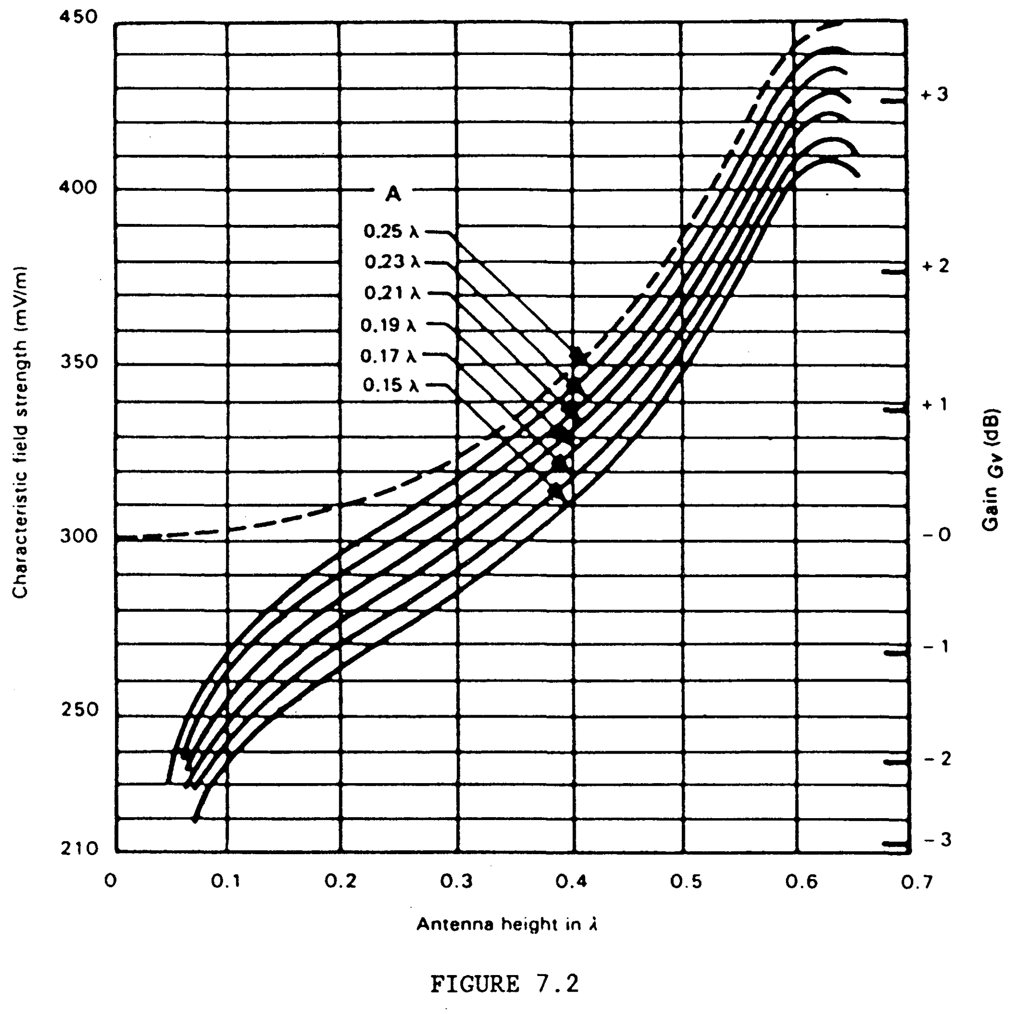


FIGURE 7.2

Characteristic field strengths for simple vertical antennas, using 120-radial ground systems

A: radius of ground system

Full lines: real antenna correctly designed

Dashed line: ideal antenna on a perfectly conducting ground

7.1.4 Horizontal radiation patterns of directional antennas

The procedures for calculating theoretical, expanded and augmented (modified expanded) directional antenna patterns are given in Appendix 3 of Annex 2 of the Final Acts of the Regional Administrative MF Broadcasting Conference (Region 2), Rio de Janeiro, 1981.

7.1.5 Top-loaded and sectionalized antennas

Stations may employ top-loaded or sectionalized towers, either because of space limitations or to vary the radiation characteristics from those of a simple vertical antenna. This is done to achieve desired coverage or to reduce interference.

Calculation procedures are given in Appendix 4 of Annex 2 of the Final Acts of the Regional Administrative MF Broadcasting Conference (Region 2), Rio de Janeiro, 1981.

7.1.6 Reduction of sky wave in MF broadcasting

The natural rotational frequency of electrons in the Earth's magnetic field is called "gyrofrequency". The Earth's magnetic field varies from place to place. At the same time, gyrofrequency varies from about 700 kHz (near the magnetic equator) to about 1 800 kHz (near the poles), as illustrated in Figure 7.3.

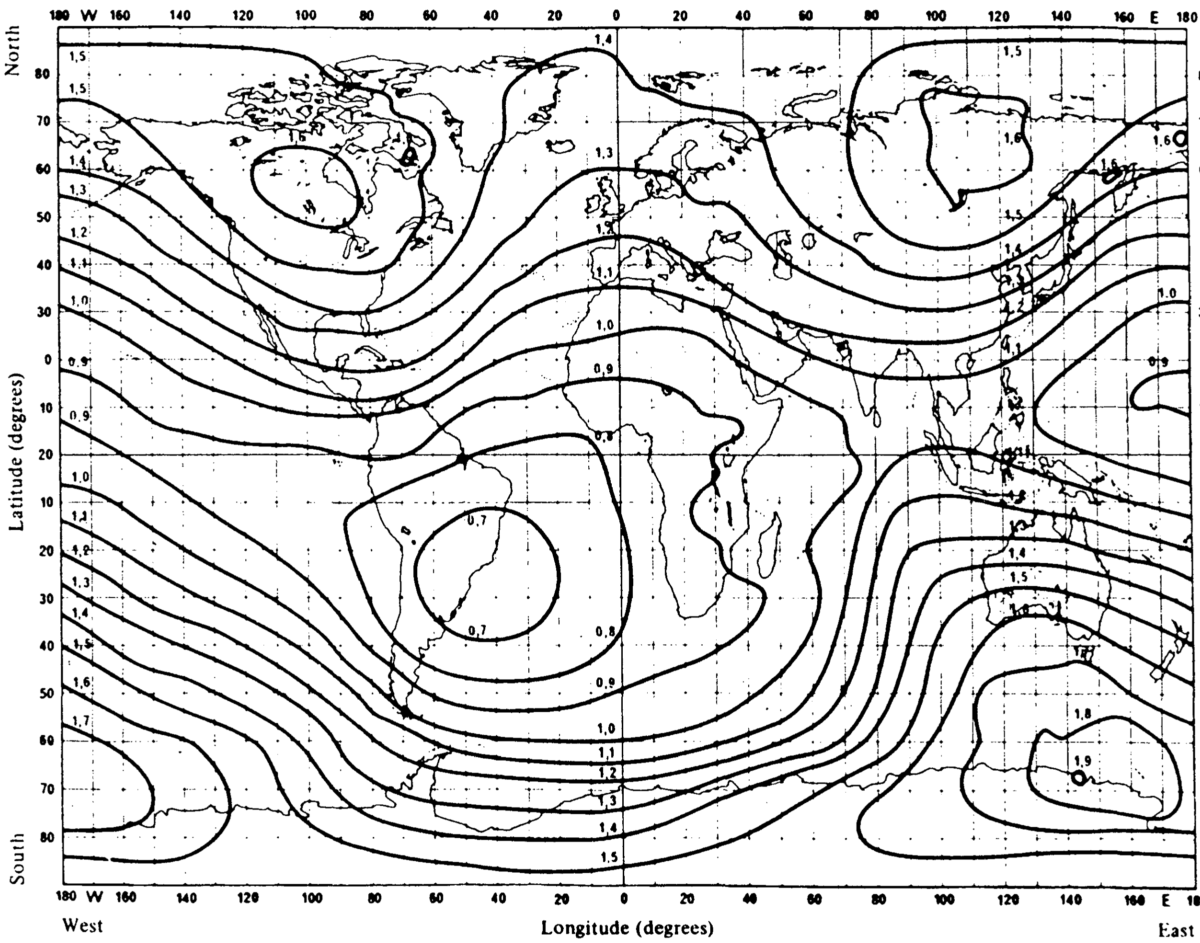


FIGURE 7.3

World-wide distribution of gyro-frequency (MHz)

Upon entering the ionized media, a radio wave is split into two components: ordinary wave and extraordinary wave. The former suffers less absorption than does the latter. If the frequency of the incident wave equals the gyrofrequency, the extraordinary wave will suffer maximum absorption.

Studies have been carried out in Australia to investigate a method of sky-wave field strength reduction which exploits the high absorption of extraordinary waves for transmission frequencies near the gyrofrequency. The transmitting antenna for this system is required to radiate a signal polarized in such a manner that waves entering the ionosphere do so exclusively through extraordinary modes. The system is termed orthogonal transmission (see Report 461).

7.2 Receiving antennas

Report 619 indicates that in MF reception by sky wave the use of two (ferrite) antennas in cross-polarization improves quality because it reduces fading.

7.3 Power considerations

7.3.1 Station power limits by class of station

It has been found helpful by a number of countries in reducing overall interference, simplifying planning and generally improving spectrum management, to categorize transmitting stations into classes and to apply differing maximum stations powers to those classes (see in Chapter 8 the classes of station adopted by the Regional Administrative MF Broadcasting Conference (Region 2)).

If used together with appropriate planning procedures such an approach is more likely to match the available channels to the coverage objectives.

It should also be noted that for equal power of stations causing mutual interference, the coverage areas are independent of transmitter power since mutual power increases will be matched by a mutual increase in interference.

Where specific target areas require higher field strengths, the use of directional antennas is generally the most efficient means of achieving the increase, the desired coverage being provided while restricted radiation in other directions permits increased re-use of the frequency in these directions.

7.3.2 Radiated power

Recommendation 561-1 recommends that the term e.m.r.p. (effective monopole radiated power), i.e. the product of transmitter power and antenna gain in the relevant direction of azimuth and elevation, be employed to define and determine radiation from transmitters in the MF band (for the definition of e.m.r.p. see RR 157).

CHAPTER 8

PLANNING

8.1 Planning criteria

8.1.1 Percentage of time

In calculating the field strength of the interfering sky-wave signal, the sky-wave field strength 50% of the time has been used at the Regional Administrative MF Broadcasting Conference (Region 2), 1981.

8.1.2 Class of station

The following categories of station have been adopted by the Regional Administrative MF Broadcasting Conference (Region 2), 1981.

8.1.2.1 Class A station

A station intended to provide coverage over extensive primary and secondary service areas and which is protected against interference accordingly.

New Class A stations will have a power not exceeding 100 kW day/50 kW night.

8.1.2.2 Class B station

A station intended to provide coverage over one or more population centres, and the rural areas contiguous to them, located in its primary service area and which is protected against interference accordingly.

The maximum station power is 50 kW.

8.1.2.3 Class C station

A station intended to provide coverage over a city or town and the contiguous suburban areas, located in its primary service area and which is protected against interference accordingly.

During night-time, the maximum station power is 1 kW.

During day-time, the maximum station power is:

- 1 kW in noise zone 1,
- 5 kW in noise zone 2.

8.1.2.4 Since the frequency band 1 605 - 1 705 kHz is much narrower than the 535 - 1 605 kHz band dealt with at the above Conference, a different class or classes of stations might be considered.

8.1.2.5 In particular, the provision for Class A stations would impose serious restrictions on the number of stations that could be assigned, as would a limit of night power as high as 50 kW. In the process of deciding on classes of stations for this band, a trade-off will have to be made between maximizing assignment capacity and maximizing the extent of coverage area. These two factors are discussed below.

8.2 Assignment capacity

Since co-channel night-time interference considerations cause greater restrictions on assignment capacity, the following table is based only on this consideration.

If the use of non-directional antenna systems is assumed, the number of possible assignments will decrease with increasing power and with the extent of the service area protected. The following table (based on short antennas and the sky-wave propagation curve adopted by the Regional Administrative MF Broadcasting Conference (Region 2), 1981, shows the relationship between these factors:

Separation between assignments (km)				
	Protected contour (mV/m)			
Power (W)	(Sky wave) 0.5	2.5	4	5
250	(1)	600	250	200
1 000	(1)	1 100	800	550
5 000	(1)	1 600	1 300	1 200
10 000	2 900	1 800	1 500	1 400
50 000	4 200	2 200	1 900	1 800

(1) No-sky wave service attainable at this power.

If directional antennas are used, assignment capacity can be greatly increased. For example, a Canadian study showed that nine assignments could be made in an area of 100 by 400 km using five alternate channels (i.e., 1 620, 1 640, 1 660, 1 680 and 1 700 kHz) and reserving the other five channels for use in adjacent areas. The study was based on powers of 10 kW and protected contours of 0.5 mV/m day and 5 mV/m night and showed that 3-tower antenna systems were needed for separations of 100 to 200 km and 2-tower systems for greater separations.

The subject of assignment capacity is also addressed in Annex A of the Report to the second session of the Regional Administrative MF Broadcasting Conference (Region 2), Rio de Janeiro, 1981. Although this annex is primarily concerned with adding new assignments to a congested band, the approach taken may be of interest.

8.3 Planning coverage

Any planning method will strongly depend upon the constraints imposed on the use of the band and to possible station classifications (i.e., power limitation, night-time protection, etc.). The following table shows the radius of service expected over a range of powers assuming an E_u of 2.5 mV/m for different ground conductivities. Since conductivity in large cities is generally 4 mS/m or less, that column should be used to assess the maximum extent of urban coverage, bearing in mind that a signal of 2.5 mV/m may not be adequate in areas subject to industrial noise. While the table was based on non-directional antennas, it also provides a good estimate of directional service bearing in mind that the antenna site will not coincide with the centre of the service area, but will be displaced in the direction of minimum radiation.

Power (W)	Characteristic field strength (mV/m at 1 km)	Service radius (km) for given conductivity in mS/m (assume 2.5 mV/m E_u)		
		1	4	10
250	240	5.2	9	15
1 000	240	6.5	13	22
5 000	300	12	20	34
10 000	300	15	24	40
50 000	300	22	36	58

8.4 Planning options

Particular attention should be given to maintaining the maximum degree of flexibility in any broadcasting plan to be developed for the 1 605 - 1 705 kHz band. This would have to be consistent with the general need to satisfy demand and obtain adequate protection for future broadcasting services.

To achieve this flexibility, the first decision that must be made concerns the form of the plan. Should it be an allotment plan or an assignment plan or one using features of both? For the purpose of this initial discussion, the essential difference between these two forms of plans lies in the specification of the location of the station. In allotment planning an area can be specified within which the station may be located and afforded protection. In assignment planning, a specific transmitter site is given.

After the form of the plan is decided, the planning method must be developed. Since the primary goals of planning are to distribute the resource and obtain international recognition for stations implemented in accordance with the plan (protection), the planning method will need to be tailored to the form of the plan (allotment or assignment). These two cases are contrasted below.

8.4.1 Allotment planning

Allotment planning involves three basic steps. First, there is a need to develop a list of allotments based upon the general requirements of administrations. Then this list must be examined to determine the conformity of the allotments with the agreed interference objectives of the conference. Finally, an adjusted list of allotments that has been accepted by all would become the plan. It also is important to establish a set of implementation criteria which define the conditions to be met and the steps to be taken to bring into use stations in conformity with the plan. These conditions would specify a simple way to determine whether the station would exceed the interference levels accepted by the conference. Under this system, one or more stations could be brought into use within the allotment area and there would be no need to modify the plan as long as the agreed protection levels to the allotments of other countries were not exceeded. If the agreed interference levels were exceeded, the allotment plan would have to be modified in accordance with the procedure adopted by the conference.

Specific methods will need to be developed to facilitate the several stages of allotment planning. In contrast with the assignment planning case, emphasis would be on methods of distribution of the channels, and not the establishment of acceptable interference levels between stations, which would take place after the conference, when specific station requirements become known and station assignments are made.

8.4.1.1 Allotment planning criteria

The development and implementation of an allotment plan poses many questions. The answers to these questions help define the concept of allotment planning. For example, since requirements are to be specified in terms of areas, rather than specific transmitter sites, how should the areas be defined and, in general, how large should they be? Such decisions will greatly influence the ease of implementation of an allotment plan and its capacity. The size of the allotment area would determine the degree of station implementation flexibility after the conference. In addition to defining the permitted area in which stations may be implemented in accordance with the plan, the protection to be afforded such stations is also defined within the allotment area. Thus, the layout of allotment areas will determine the class of service on that channel, i.e., Class B and Class C.

Certain specifications of the shape of the allotment area might make it difficult to confirm analytically that a station is located within the allotment area. In the case of irregular shapes other than national boundaries, this would require the creation of a massive data base of allotment boundaries. In addition, time-consuming computer routines would be required to determine which side of the allotment boundary the station is on. However, if the shape can be defined mathematically, no such data base or software would be required.

The shape of an allotment could also influence the complexity of the analysis required for plan development. Since an allotment plan designates a frequency channel, for use by a country within certain geographic areas indicating the level of protection to be afforded, the analysis of such a plan is done by constructing various scenarios of station implementation and comparing the resulting interference levels with tentatively agreed levels. Such analysis would be used to adjust the allotments and develop realizable agreed protection levels. A likely scenario would be to place a station on the edge of an allotment area nearest to another co-channel allotment. A mathematically describable shape for the allotment would simplify the determination of that nearest point.

The size of an allotment is related to the protection requirement for the stations to be implemented. Allotment areas should define contiguous regions where a common level of protection would be required for any stations to be implemented on that channel. Such a formulation would allow one or more stations to be implemented successfully by adjusting their powers so that they protect each other while receiving an acceptable level of interference from other countries. An additional constraint on allotment size is the need to protect the allotments of other countries. Large allotments may not result in additional flexibility if the agreed protection cannot be afforded with desired station powers over the entire allotment.

An approach to the application of allotment planning is given in Annex VII.

8.4.2 Assignment planning

The successive stages of assignment planning might be:

- to develop a list of assignments based upon the specific requirements of administrations;

- identify and resolve the resulting interference levels, and then to adopt an adjusted list of stations that has been accepted by all i.e., the plan.

The resulting interference levels within the plan form the basis for procedures for the subsequent modification of the plan. As a result of assignment planning, administrations obtain the right to bring into use specific assignments in the plan. The right to bring into use assignments differing from those specified in the plan would require modification of the plan. The precise conditions under which modifications could be made would have to be developed at the conference. Typically, the agreement of other countries would be required only if the interference levels accepted in the plan are exceeded by the differing assignment. Additionally, if appropriate provision is made in the agreement, it would be possible to transfer radiation and protection rights to locations other than those specifically set forth in the plan. Specific methods will need to be developed to facilitate the different stages of assignment planning. Major emphasis would be on the resolution of interference levels between stations.

8.4.2.1 Assignment planning criteria

As with allotment planning, assignment planning attempts to provide a satisfactory distribution of assignments to respond to the list of broadcasting requirements that have been identified. However, there is a difference in their methodology. With assignment planning, four elements need to be considered:

- development of a list of requirements;
- establishment of technical parameters for the planned stations;
- application of protection criteria; and
- development of a system for optimizing the distribution of the planned assignments by frequency.

The optimization process involves the theoretical goal of how best to satisfy requirements in each country and the practical adjustments needed to resolve conflicts between national plans.

Assignments appearing in the plan would have specific radiation and protection rights. This would facilitate subsequent modifications to the plan since interference calculations would follow procedures similar to those applied today in the existing band. Also, it is possible to provide considerable flexibility in an assignment plan for the transfer of radiation rights from one location to another. In effect, planned assignments in the plan would act as an "umbrella" for making subsequent adjustments to national plans. This ability to substitute assignments resulting from actual needs for those in the plan resulting from perceived needs (the list of requirements) would be an important provision that would have to be included in the new regional agreement for the extended spectrum. As part of the assignment planning process, computer resources would be needed to examine frequencies available. To do this it would be necessary to develop a computer program to investigate as many of the possible permutations as possible in order to ensure that the plan adopted would be the most efficient one possible.

CHAPTER 9

COMPATIBILITY WITH OTHER SERVICES

9.1 Introduction

According to the provisions of RR 8-22, the band 1 625 - 1 705 kHz in Region 2 is also allocated on a permitted basis to the fixed, mobile and aeronautical radionavigation services and on a secondary basis to the radiolocation service. Furthermore the temporary allocation as per RR 481 should also be taken into account. In Region 1 the band 1 606.5 - 1 705 kHz is allocated on a primary basis to the fixed, maritime mobile and land mobile services except for the 1 625 - 1 635 kHz band which is allocated on a primary basis to the radiolocation service. In Region 3 the band 1 606.5 - 1 705 kHz is allocated on a primary basis to the fixed, mobile, radiolocation and radionavigation services.

Inter-regional and intra-regional compatibility between the broadcasting service and the fixed, mobile, aeronautical and radiolocation services should take into account the different classes of emission used by the various services.

While the broadcasting service is using A3E class, the classes of emission used by the fixed and mobile stations are:

A3E, A2A, A2B, F1B, J2B, J3E, H2A, H2B.

Protection ratio values for co-channel operation and for suitable frequency separation should be evaluated in a combination of interference cases involving the broadcasting service and the other services; there is no apparent need to evaluate them however for the cases not involving broadcasting. It is worthy of note that Region 1 has held a conference on planning of the MF maritime mobile and aeronautical radionavigation services in March 1985 and the technical parameters in the report of that Conference must be taken into consideration.

9.2 Protection ratios

Table 9.I[1] shows the protection ratio values to be considered for planning purposes between the concerned services. According to the specific cases the value is given for co-channel interference (CO) or for off-channel interference (OC).

In the wanted HF fixed service case, values are indicated for just usable (JU), marginally commercial (MC) and good commercial (GC) quality and in the telegraph communication case they should be specified for a character error ratio, P_E of 10^{-2}, 10^{-3} and 10^{-4} (see Recommendation 339-5), but since the protection ratios do not significantly vary for P_E values up to 10^{-6}, a single figure is given (see Report 525-2).

For the broadcasting service, a value of 26 dB has been indicated in § 4.4.1 for co-channel protection ratio between broadcasting emissions and the same criteria has been applied to derive the figures given in the case where interfering services other than broadcasting are considered.

The values reported in the column could be modified when inter-regional sharing is to be considered, in fact as adopted by the Regional Administrative Radio Conference for the Maritime Mobile Service and the Aeronautical Radionavigation Service in certain parts of the MF band in Region 1 (RARC MM-R1), the co-channel radio-frequency protection ratio necessary to protect the maritime mobile service from like interference is 20 dB for single-sideband telephony (J3E modulation) and 8 dB for narrow-band direct printing telegraphy (F1B modulation).

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[1] Report 302-1 gives some detailed information on the protection to be granted to the broadcasting service in shared bands in tropical zones. The Report data, although needing some updating, could be taken as representative values of protection ratios needed by a broadcasting signal in the case of interfering A3A, A2A and A2B signals. It should be noted however, that Region 1, for its maritime mobile service, which is the most constraining case for Region 2, will be using F1B and J3E types of emissions which are not covered by Report 302-1, nor is the inverse condition, i.e., when A3E, A2A and A2B signals should be protected against an interfering broadcasting signal.

Compatibility problems and sharing criteria between the broadcasting service and the other services are not fully investigated, although a comprehensive study is being carried out in CCIR Study Group 3. Preliminary results based on contributions received are nevertheless indicated in Table 9.I. Further improvements or amendments might be expected and made available to the Conference after the CCIR Final Meetings (1985).

TABLE 9-I

Steady-state protection ratios (dB)*

Interfering signal / Wanted signal		A3E (BC)		A3E (fixed)		A2A/A2B		F1B		J2B		J3E		H2A/H2B		Class of emission
		CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	Interfering condition[1)]
A3E (BC)		26		26		31		47			43		38		37	
A3E (fixed)	JU MC GC	-7 5 26														
A2A/A2B	$P_E<10^{-6}$	5														
F1B	$P_E<10^{-6}$	-3														
J2B	$P_E<10^{-6}$		5													
J3E	JU MC GC		-19 -7 14													
H2A/H2B	$P_E<10^{-6}$		-1													
Class of emission	Service grade															

* Ratio of wanted-to-interfering signals whose powers are expressed in terms of p.e.p. (PX) (see Recommendation 240-3 (MOD I)).

1) CO (co-channel interference) and OC (off-channel interference) are the cases when the frequency separation between the assigned frequency of the wanted signal and that of the interfering signal is approximately zero and about 1.4 kHz respectively.

9.3 Protected contours

9.3.1 Broadcasting contours

Broadcasting contours are defined in §§ 6.3 and 6.4

9.3.2 Contours for the maritime-mobile service

The following values of the minimum field strength to be based on ground-wave service, which include allowances for variations in noise level with time and signal fading with time, were established by the (RARC MM-R1):

Class of emission F1B:

22.5 dBμV/m north of and on parallel 30° N

42.5 dBμV/m south of parallel 30° N

Class of emission J3E:

37 dBμV/m north of and on parallel 30° N

57 dBμV/m south of parallel 30° N

9.4 Procedures for calculating protection

9.4.1 Inter-regional protection

In calculating inter-regional interference, the field strength should be determined by taking the arithmetic mean of the signal strengths, expressed in dBu for a specified e.m.r.p., calculated both by the method described in Annex I to CCIR Recommendation 435-4 and by the method used within Region 2. Signal strengths calculated by the Region 2 method should be increased by 2.5 dB to allow for the different reference hours of the two methods. The value determined in accordance with the above should be applied when it is midnight at the mid-point of the inter-regional path, provided that the entire path is in darkness. Signal strengths at other times are unlikely to exceed this value.

9.4.2 Protection to the broadcasting service

Broadcasting assignments or allotments should be protected in accordance with § 4.4.4. Usable field-strength values should be calculated using broadcasting assignments only because other services operate intermittently.

9.4.3 Protection to other services

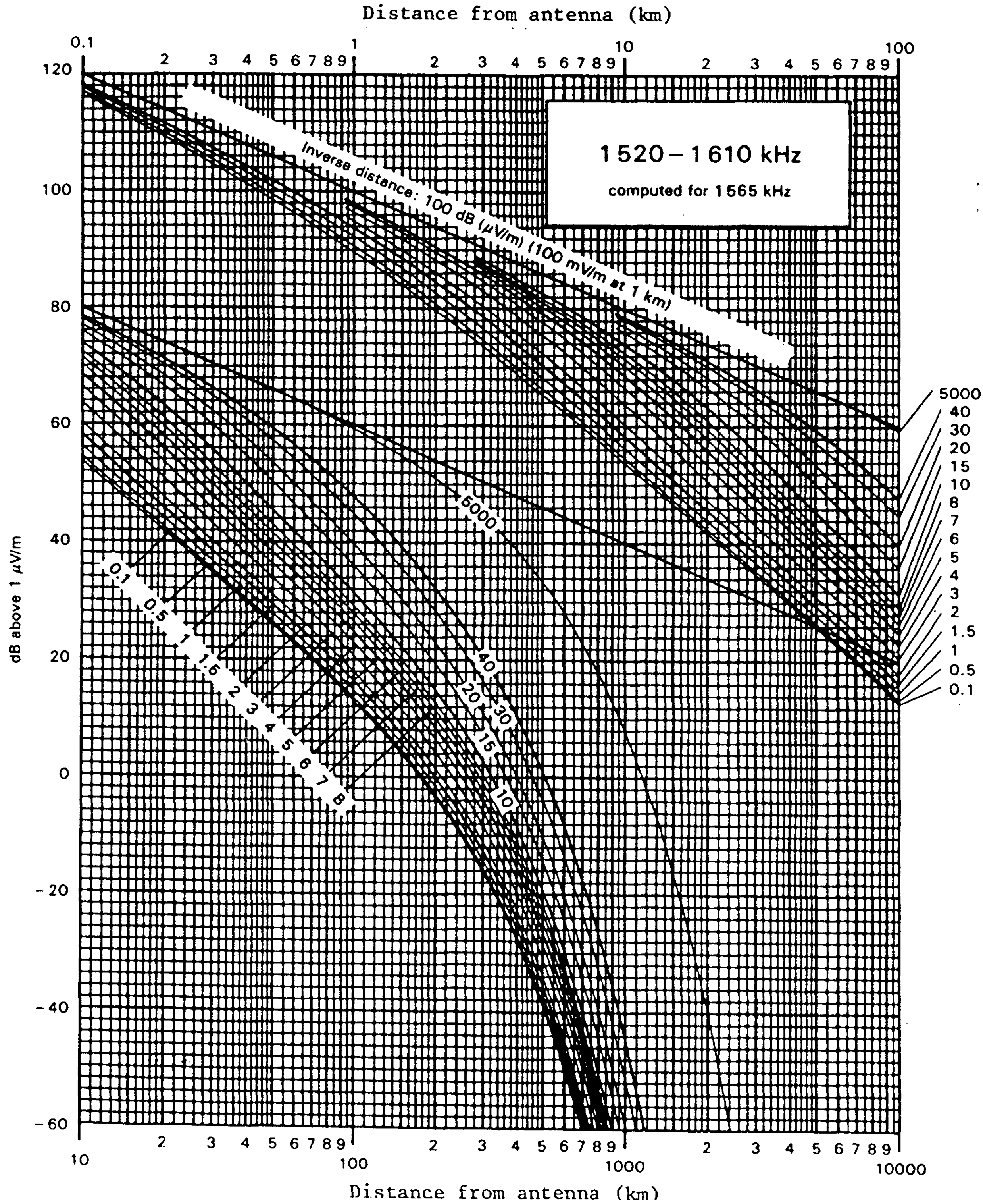
Assignments in services other than broadcasting should be protected to the field-strength contour corresponding to the greatest of:

- the values adopted by a conference,
- the minimum usable field strength,
- the field strength at the extent of the service range defined in the Master Register.

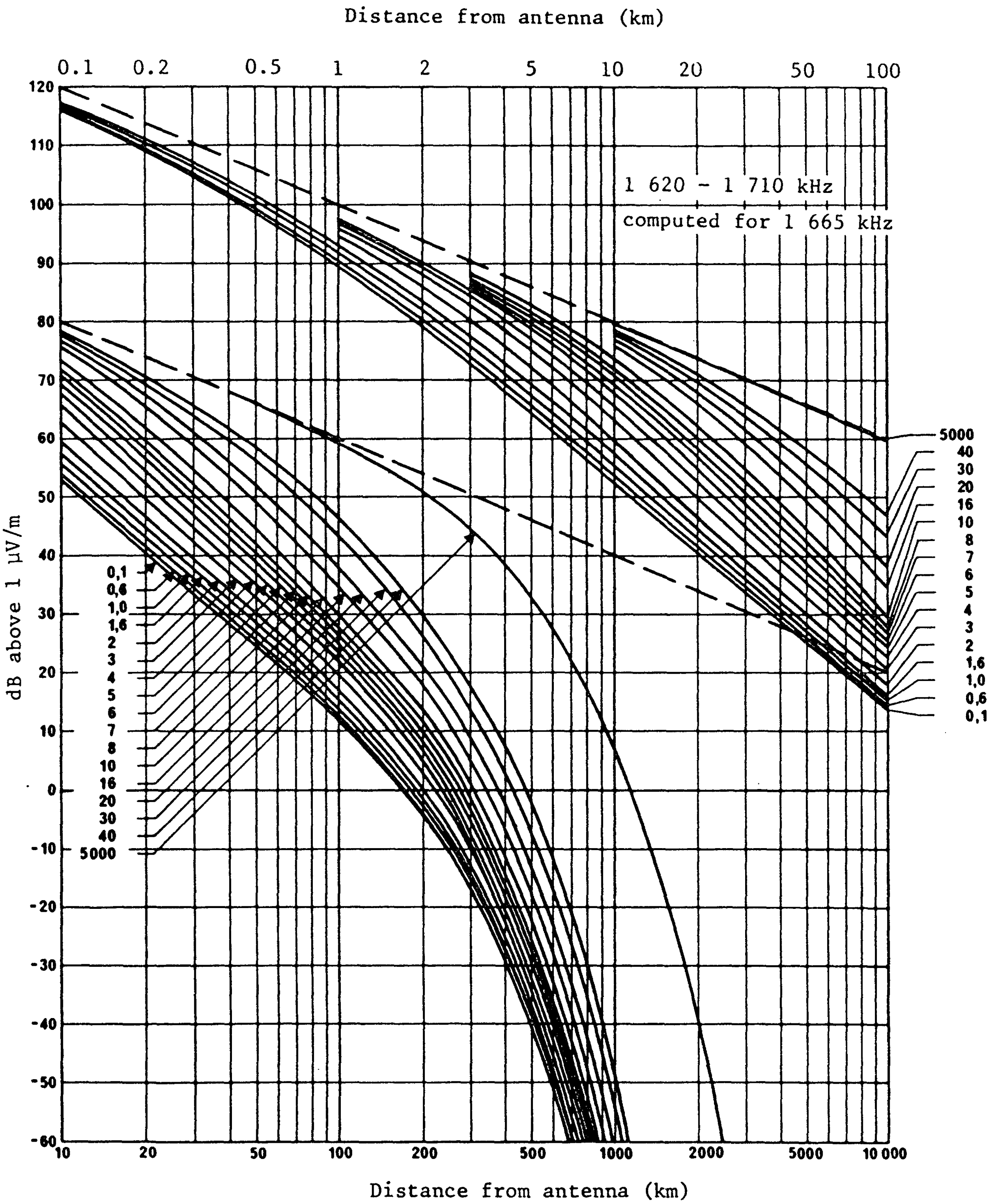
ANNEX I

Field-strength curves for ground-wave propagation

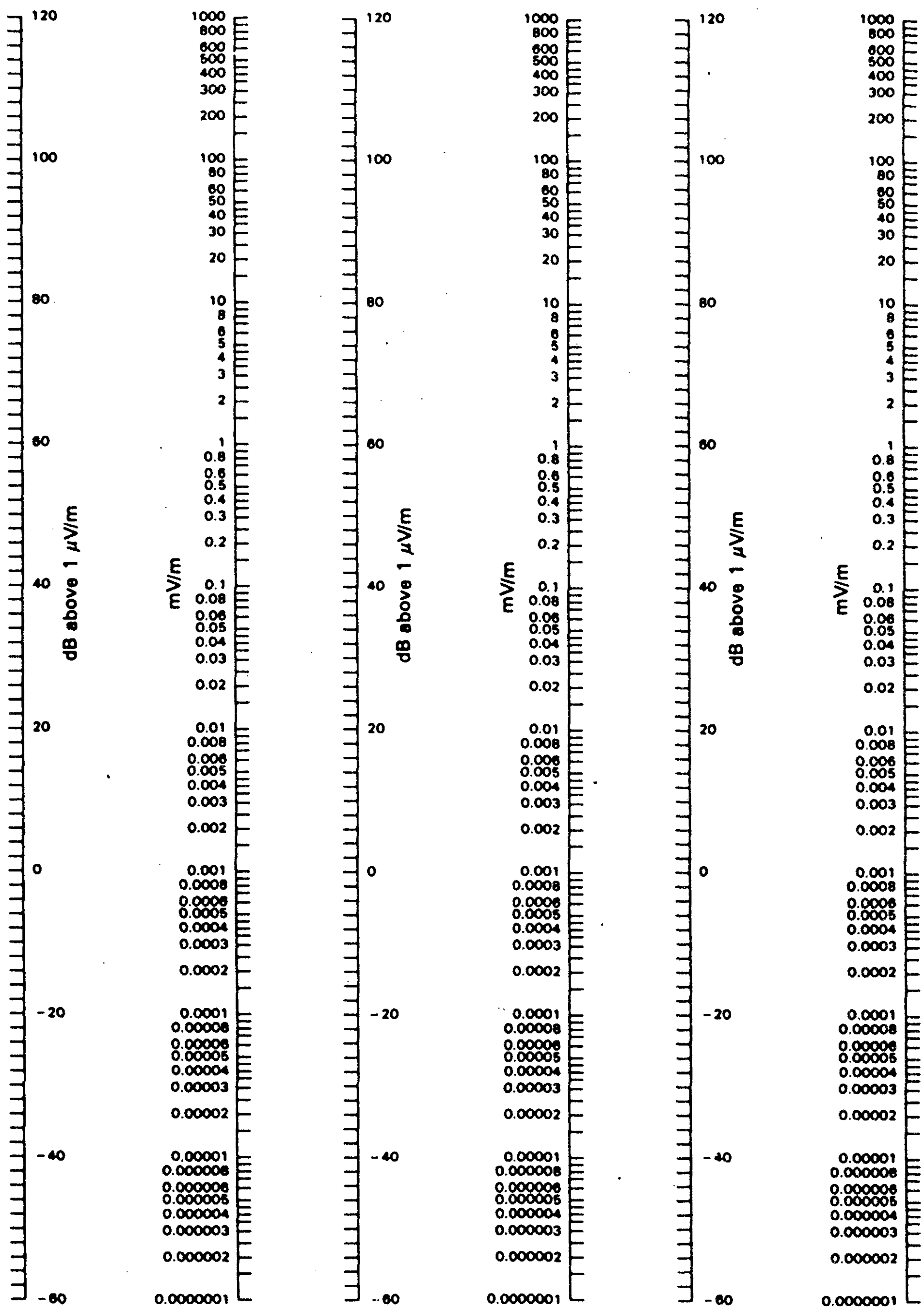
The curves are labelled with the ground conductivities in millisiemens/metre. All curves, except the 5,000 mS/m (sea water) curve, are derived for a relative dielectric constant of 15. The sea-water curve is derived for a dielectric constant of 80.



GRAPH 1 - Ground-wave field strength versus distance



GRAPH 2 - Ground-wave field strength versus distance



GRAPH 3 - <u>Scale for use with ground-wave field strength Graphs 1 and 2</u>

ANNEX II

Mathematical discussion and computer program for ground-wave curves

Introduction

A computer program has been written to calculate ground-wave field strengths at metric distances [McMahon, 1979] using the Norton surface wave equation [Norton, 1936] at distances within the radio horizon, and using the Bremmer residue series [Bremmer, 1949] for distances beyond the radio horizon.

Field-strength curves calculated by the Norton equation and by the Bremmer residue series are parallel for a considerable distance on either side of the horizon. However, the values of field strength calculated by the two methods differ by as much as 10% in this region. The method used in the computer program to merge the Norton field strengths and the Bremmer field strengths into a smooth continuous curve is to normalize the Bremmer fields to the Norton fields at the horizon by calculating a factor which when multiplied by the Bremmer field makes the product equal to the Norton field at the horizon. This same factor is then used to adjust the Bremmer field strengths at greater distances. This factor is calculated for each change in frequency, or in ground constants.

This annex contains a section giving information on the mathematical methods used to calculate the field strengths using the Norton surface wave equation and the Bremmer residue series.

Mathematical discussion

I. Norton surface-wave equation

Norton gives the following equation for A, the surface wave attenuation factor:

$$A = \left| 1 + i\sqrt{\pi p_1} e^{-p_1} \, erfc\,(-i\sqrt{p_1}) \right| \qquad [\text{Norton, 1936}]$$

p_1 is the complex numerical distance which is calculated from the following factors:

$$\chi = 17.9731\ \sigma/f$$

$$b_1 = \tan^{-1}((\varepsilon-1)/\chi)$$

$$b_2 = \tan^{-1}(\varepsilon/\chi)$$

$$b = 2b_1 - b_2$$

$$p = \pi D\ \overline{\cos(b_2)}^2 / \chi\lambda \cos(b_1)$$

$$p_1 = p\ e^{ib}$$

where:

σ: ground conductivity (mS/m),

ε: relative dielectric constant of the ground,

f: frequency (MHz),

λ: wavelength (m),

D: distance from the antenna (kms).

The erfc ($-i\ p_1$) is defined as:

$$\mathrm{erfc}(-i\sqrt{p_1}) = (2/\sqrt{\pi}) \cdot \int_{-i\sqrt{p_1}}^{\infty} e^{-t^2}\, dt$$ [Abramowitz and Stegon, 1970] p.297, §7.1.2.

This function cannot be evaluated in closed form and most of the labour in calculating A lies in obtaining suitable series to evaluate erfc ($-i\sqrt{p_1}$) for the full ranges of possible values in p and b.

Mathematical discussion

II. Computer program evaluation of Norton surface-wave equation

Field strengths out to distances of 80.467/(cube root of the frequency in MHz) kilometres are calculated in the computer program using the Norton surface-wave equation. The program uses five different methods of calculation depending upon the values of p, the numerical distance, and b (the angle of p).

1) p less or equal to 0.65; b any value

For this range of numerical distances, the computer program uses the w(z) function. Abramowitz and Stegon [1970] equations 7.13, 7.18, p.297.

$$w(z) = e^{-z^2} \cdot \mathrm{erfc}\,(-iz) = \sum_{n=0}^{\infty} (iz)^n / \Gamma(n/2 + 1)$$

where $\Gamma\,(n/2 + 1)$ is a gamma function which is evaluated by the formulae in Abramowitz and Stegon [1970], Chapter VI.

If the substitution $\sqrt{p_1} = z$ is made in the w(z) summation:

$$A = \left| 1 + i\sqrt{\pi p_1} \cdot w(\sqrt{p_1}) \right|$$

2) p between 0.65 and 5; b less than $\pi/2$

For this range of p and b, the computer program uses the infinite 2p series given by Norton [1936], p. 1386.

$A = |u + iv|$

where:

$$u = 1 - 2p\cos b + \frac{(2p)^2}{1\cdot 3}\cos 2b - \frac{(2p)^3}{1\cdot 3\cdot 5}\cos 3b + \cdots$$
$$+ \sqrt{\pi p}e^{-p\cos b}\sin\left(p\sin b - \frac{b}{2}\right)$$
$$v = -2p\sin b + \frac{(2p)^2}{1\cdot 3}\sin 2b - \cdots$$
$$+ \sqrt{\pi p}e^{-p\cos b}\cos\left(p\sin b - \frac{b}{2}\right).$$

3) p between 5 and 20; b less than $\pi/4$

For this range of p and b, the program calculates A using the following equations:

erfc (z) = 1 - erf (z) [Abramowitz and Stegon, 1970] § 7.1.2, p. 297.

$\mathrm{erf}(\overline{z}) = \overline{\mathrm{erf}\ (z)}$ [Abramowitz and Stegon, 1970] § 7.1.2, p. 297.

$$\mathrm{erf}(x + iy) = \mathrm{erf}(x) + (e^{-x^2}/2\pi x)\ .\ (1-\cos(2xy)-i\sin(2xy) +$$
$$(2/\pi . e^{-x^2}\ .\ \sum_{n=1}^{\infty} ((e^{-.25n^2})/(n^2 + 4x^2)).(f_n\ (x,y) + ig_n\ (x,y))$$

$f_n\ (x,y) = 2x - 2x\cosh(ny)\cos(2xy) + n\sinh(ny)\sin(2xy)$

$g_n\ (x,y) = 2x\cosh(ny)\sin(2xy) + n\sinh(ny)\cos(2xy)$
[Abramowitz and Stegon, 1970] § 7.1.29, p.299

$\mathrm{erf}(x) = 1 - (a_1t + a_2t^2 + a_3t^3 + a_4t^4 + a_5t^5)\ .\ e^{-x^2}$
[Abramowitz and Stegon, 1970] § 7.1.29, p. 299

$t = 1/(1 + px)$ $p = .3275911$

$a_1 = .254829592$ $a_2 = -.284496736$ $a_3 = 1.421413741$

$a_4 = -1.453152027$ $a_5 = 1.061405429$

Solution of the preceding equations yields $\mathrm{erfc}(-i\sqrt{p_1})$

$A = |1 + i\sqrt{\pi p_1}\ e^{-p_1}\ \mathrm{erfc}(i\sqrt{p_1})|$

4) p between 5 and 20, b greater, or equal to $\pi/4$ or p between 0.65 and 20, b greater than $\pi/2$

In this range the computer program uses the following identity to calculate A:

$$2e^{z^2}\int^{\infty} e^{-t^2}\,dt = \frac{1}{z} + \frac{1/2}{z} + \frac{1}{z} + \frac{3/2}{z} + \frac{2}{z} + \cdots$$

[Abramowitz and Stegon, 1970] § 7.1.14, p. 298.

If z is set equal to $-i\sqrt{p_1}$ the continued fraction (C.F.) equals:

$e^{-p}\sqrt{\pi}\,\mathrm{erfc}(-i\sqrt{p_1})$ and, $A = \left|1 + i\sqrt{1} \cdot (C.F.)\right|$

5) p greater than 20, b any value

In this range of parameter values, the computer program calculates the w(z) function from the following polynomial equation:

$$w(z) = iz(.4613135/(z^2 -.1901635) + .9999216/(z^2 -1.7844297)+$$

$$.002883894/(z^2 -5.5253437))$$ [Abramowitz and Stegon, 1970] bottom p. 328.

As in 1) previously, the substitution $\sqrt{p_1} = z$ is made, and:

$$A = \left|1 + i\sqrt{\pi p_1} \cdot w(\sqrt{p_1})\right|.$$

Mathematical discussion

III. Bremmer residue series

Bremmer [1949] defines the attenuation factor for the ground wave over the radio horizon as follows:

$$A_1 = \sqrt{2\pi\chi}\sum_{s=o}^{\infty} \frac{e^{i\tau_s\chi}}{(2\tau_s - 1/\delta_e^2)}$$

A_1 is the additional attenuation above the inverse distance attenuation. τ_s are terms of the Bremmer residue series.

As defined by Bremmer:

$$\chi = (2\pi a/\lambda_{km})^{1/3} \cdot Do/a$$

where:

Do: distance from the transmitter to the receiver measured along the Earth's surface.

a: radius of the Earth.

Bremmer used 6370 km for the radius of the Earth. This is the actual average radius of the Earth. In the computer program, a radius of 8493 km (4/3 x 6370) was used for a. This change was made to conform to the usual practice to account for diffraction and because fields calculated by the Bremmer series with this larger radius were found to correspond more nearly to those given by the existing FCC ground-wave curves and to CCIR ground-wave curves (see Recommendation 368-4).

With this change and using the relationship between λ, the wavelength and f, the frequency in MHz:

$$\chi = 0.006635 \; . \; f^{1/3} \; . \; D$$

where:

D: distance from the antenna (kms).

If χ is defined as previously given by Norton in I:

$$\chi = 17{,}9731 \; \sigma/f$$

where σ in milli-Siemens/metre is the ground conductivity. Then using ε for the relative ground dielectric constant, the following parameters used by Bremmer may be calculated:

$$\Psi_e = \tan^{-1}(\varepsilon/\chi) - .5 \; . \; \tan^{-1}((\varepsilon-1)/\chi)$$

$$K_e = 0.01957\sqrt{\varepsilon^2 + \chi^2})/(4.\sqrt{(\varepsilon-1)^2 + \chi^2}.f^{1/3})$$

$$\delta e = K_e . e^{i(2{,}356 - \Psi e)} \quad (\Psi e \text{ in radians})$$

The residue series given by Bremmer [1949] § 3,is as follows:

when K_e is small (Ψ_e in degrees):

$$\text{Im } \tau_0 = 1.607 - K_e \sin(45° + \psi_e) - 1.237\, K_e^3 \sin(75° + 3\,\psi_e) + \\ + \tfrac{1}{2} K_e^4 \sin(4\,\psi_e) - 2.755\, K_e^5 \sin(75° - 5\,\psi_e) \ldots$$

$$\text{Im } \tau_1 = 2.810 - K_e \sin(45° + \psi_e) - 2.163\, K_e^3 \sin(75° + 3\,\psi_e) + \\ + \tfrac{1}{2} K_e^4 \sin(4\,\psi_e) - 8.422\, K_e^5 \sin(75° - 5\,\psi_e) \ldots$$

$$\text{Im } \tau_2 = 3.795 - K_e \sin(45° + \psi_e) - 2.921\, K_e^3 \sin(75° + 3\,\psi_e) + \\ + \tfrac{1}{2} K_e^4 \sin(4\,\psi_e) - 15.36\, K_e^5 \sin(75° - 5\,\psi_e) \ldots$$

$$\text{Re } \tau_0 = 0.928 + K_e \cos(45° + \psi_e) + 1.237\, K_e^3 \cos(75° + 3\,\psi_e) - \\ - \tfrac{1}{2} K_e^4 \cos(4\,\psi_e) - 2.755\, K_e^5 \cos(75° - 5\,\psi_e) \ldots$$

$$\text{Re } \tau_1 = 1.622 + K_e \cos(45° + \psi_e) + 2.163\, K_e^3 \cos(75° + 3\,\psi_e) - \\ - \tfrac{1}{2} K_e^4 \cos(4\,\psi_e) - 8.422\, K_e^5 \cos(75° - 5\,\psi_e) \ldots$$

when K_e is large (Ψ_e in degrees):

$$\text{Im}\,\tau_0 = 0.7003 - 0.6183\,\frac{\sin(15^\circ - \psi_e)}{K_e} + 0.2364\,\frac{\cos(2\,\psi_e)}{K_e^2}\,.$$

$$- 0.0533\,\frac{\sin(15^\circ + 3\,\psi_e)}{K_e^3} - 0.00226\,\frac{\sin(60^\circ - 4\,\psi_e)}{K_e^4}\,..$$

$$\text{Im}\,\tau_1 = 2.232 - 0.1940\,\frac{\sin(15^\circ - \psi_e)}{K_e} + 0.0073\,\frac{\cos(2\,\psi_e)}{K_e^2} +$$

$$+ 0.0120\,\frac{\sin(15^\circ + 3\,\psi_e)}{K_e^3} + 0.00160\,\frac{\sin(60^\circ - 4\,\psi_e)}{K_e^4}\,..$$

$$\text{Re}\,\tau_0 = 0.4043 + 0.618\,\frac{\cos(15^\circ - \psi_e)}{K_e} - 0.2364\,\frac{\sin(2\,\psi_e)}{K_e^2}$$

$$- 0.0533\,\frac{\cos(15^\circ + 3\,\psi_e)}{K_e^3} + 0.00226\,\frac{\cos(60^\circ - 4\,\psi_e)}{K_e^4}\,..$$

$$\text{Re}\,\tau_1 = 1.288 + 0.194\,\frac{\cos(15^\circ - \psi_e)}{K_e} - 0.0073\,\frac{\sin(2\,\psi_e)}{K_e^2} +$$

$$+ 0.0120\,\frac{\cos(15^\circ + 3\,\psi_e)}{K_e^3} - 0.00160\,\frac{\cos(60^\circ - 4\,\psi_e)}{K_e^4}\,..$$

To improve convergence of the series for distances near the radio horizon, the number of terms in each series has been increased to eight in the computer program. The additional terms have been calculated by the methods given by Bremmer [1949] § 4, p. 44-45. In this section, Bremmer lists the first six zeros of each series according to the Hankel approximation. The remaining two additional terms were calculated by the tangent approximation.

For K_e small, in the tangent approximation, the zeros are given as follows:

$$\tau_{s,0} = \frac{1}{2}\left\{3\pi\left(s + \frac{3}{4}\right)\right\}^{2/3} e^{i\pi/3}$$

where τ_s is the term number starting at zero.

For K_e large:

$$\tau_{s,\infty} = \frac{1}{2}\left\{3\pi\left(s + \frac{1}{4}\right)\right\}^{2/3} e^{i\pi/3}$$

Each series term was then calculated from these equations given by Bremmer [1949], p. 45:

K_e small:

$$\tau_s = \tau_{s,0} - \delta - \tfrac{2}{3}\,\tau_{s,0}\,\delta^3 + \tfrac{1}{2}\,\delta^4 - \tfrac{4}{5}\,\tau_{s,0}^2\,\delta^5 \ldots$$

K_e large:

$$\tau_s = \tau_{s,\infty} - \frac{1}{2\,\tau_{s,\infty}}\,\frac{1}{\delta} - \frac{1}{8\,\tau_{s,\infty}{}^3}\,\frac{1}{\delta^2} - \frac{\left(1 + \frac{3}{4\,\tau_{s,\infty}{}^3}\right)}{12\,\tau_{s,\infty}{}^2}\,\frac{1}{\delta^3}$$
$$- \frac{1}{32\,\tau_{s,\infty}{}^4}\left(\frac{7}{3} + \frac{5}{4\,\tau_{s,\infty}{}^3}\right)\frac{1}{\delta^4} \cdots .$$

where $\delta = \delta_e$, as previously defined.

Mathematical discussion

IV. Problems in calculation of ground-wave strengths

One of the most time-consuming operations connected with the development of the ground-wave field strength computer program was to find suitable methods of obtaining calculations for the Norton surface-wave attenuation factor for the ranges of parameters to be used. The present ranges of use for each series or other calculation method for the attenuation factor were determined experimentally by requiring each method of calculation to give consistent values with the adjacent calculation methods. From time to time during program development, as more field-strength values were calculated for the standard broadcast band for the required range of ground constants, it would be found that for a narrow range of values of p and b, a particular series, or calculation method, would give one, or several values of field strength at variance with values on either side of the inconsistent values. To the maximum extent possible, such regions have been eliminated by proper choice of ranges for each calculation method. The continued fraction solution was introduced into the computer program to cover a range where none of the other solution methods gave consistent values.

The Bremmer residue series was also found to contain such a region of inconsistency where neither K_e small or K_e large series gave consistent values. This region occurred for K_e values between 0.45 and 0.55. The problem was eliminated by linearly interpolating between each small and large series term prior to the Bremmer summation procedure.

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ANNEX III

The Region 2 method

The calculation of skywave field strength shall be conducted in accordance with the provisions which follow. (No account is taken in the Agreement of sea gain or of excess polarization coupling loss.)

List of symbols

d: short great-circle path distance (km)

E_c: characteristic field strength, mV/m at 1 km for 1 kW

$f(\theta)$: radiation as a fraction of the value $\theta = 0$ (when $\theta = 0$, $f(\theta) = 1$)

f: frequency (kHz)

F: unadjusted annual median skywave field strength, in dB(μV/m)

F_c: field strength read from Fig. 4 or Table III for a characteristic field strength of 100 mV/m

P: station power (kW)

θ: elevation angle from the horizontal (degrees)

General procedure

Radiation in the horizontal plane of an omnidirectional antenna fed with 1 kW (characteristic field strength, E_c) is known either from design data or, if the actual design data are not available, from Fig. 1.

Elevation angle θ is given by

$$\theta = \arctan\left(0.00752 \cot \frac{d}{444.54}\right) - \frac{d}{444.54} \qquad \text{degrees} \qquad (1)$$

$$0° < \theta < 90°$$

Alternatively, Table I or Fig. 2 may be used.

It is assumed that the Earth is a smooth sphere with an effective radius of 6,367.6 km and that reflections occur from an ionospheric height of 96.5 km.

The radiation $f(\theta)$ expressed as a fraction of the value at $\theta = 0$ at a pertinent elevation angle θ can be determined from Fig. 3 or Table II.

The product $E_c f(\theta)\sqrt{P}$ is thus determined for an omnidirectional antenna. For a directional antenna, $E_c f(\theta)\sqrt{P}$ can be determined from the antenna radiation pattern. $E_c f(\theta)\sqrt{P}$ is the field strength at 1 km at the appropriate elevation angle and azimuth.

The unadjusted skywave field strength F is given by:

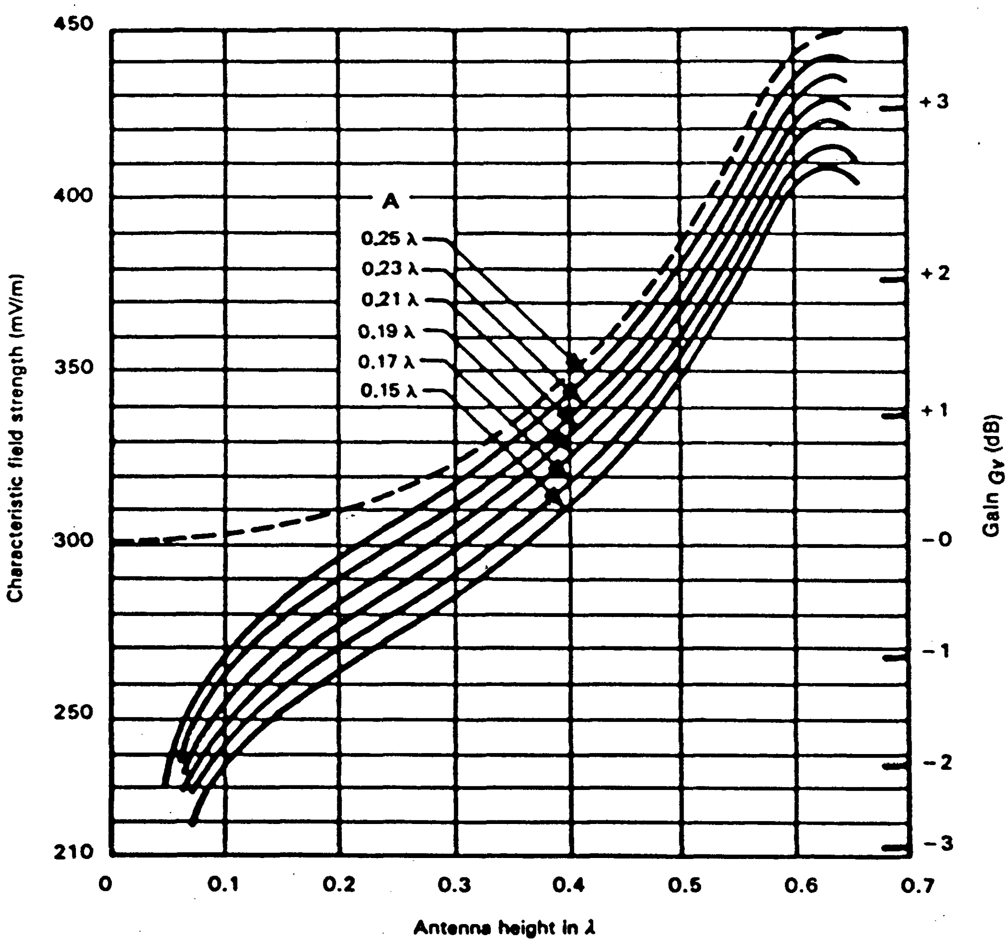
$$F = F_c + 20 \log \frac{E_c f(\theta)\sqrt{P}}{100} \quad \text{dB}(\mu\text{V/m}) \qquad (2)$$

where F_c is the direct reading from the field strength curve in Fig. 4 or Table III.

Note: Values of F_c in Fig. 4 and Table III are normalized to 100 mV/m at 1 km corresponding to an effective monopole radiated power (e.m.r.p.) or −9.5 dB(kW).

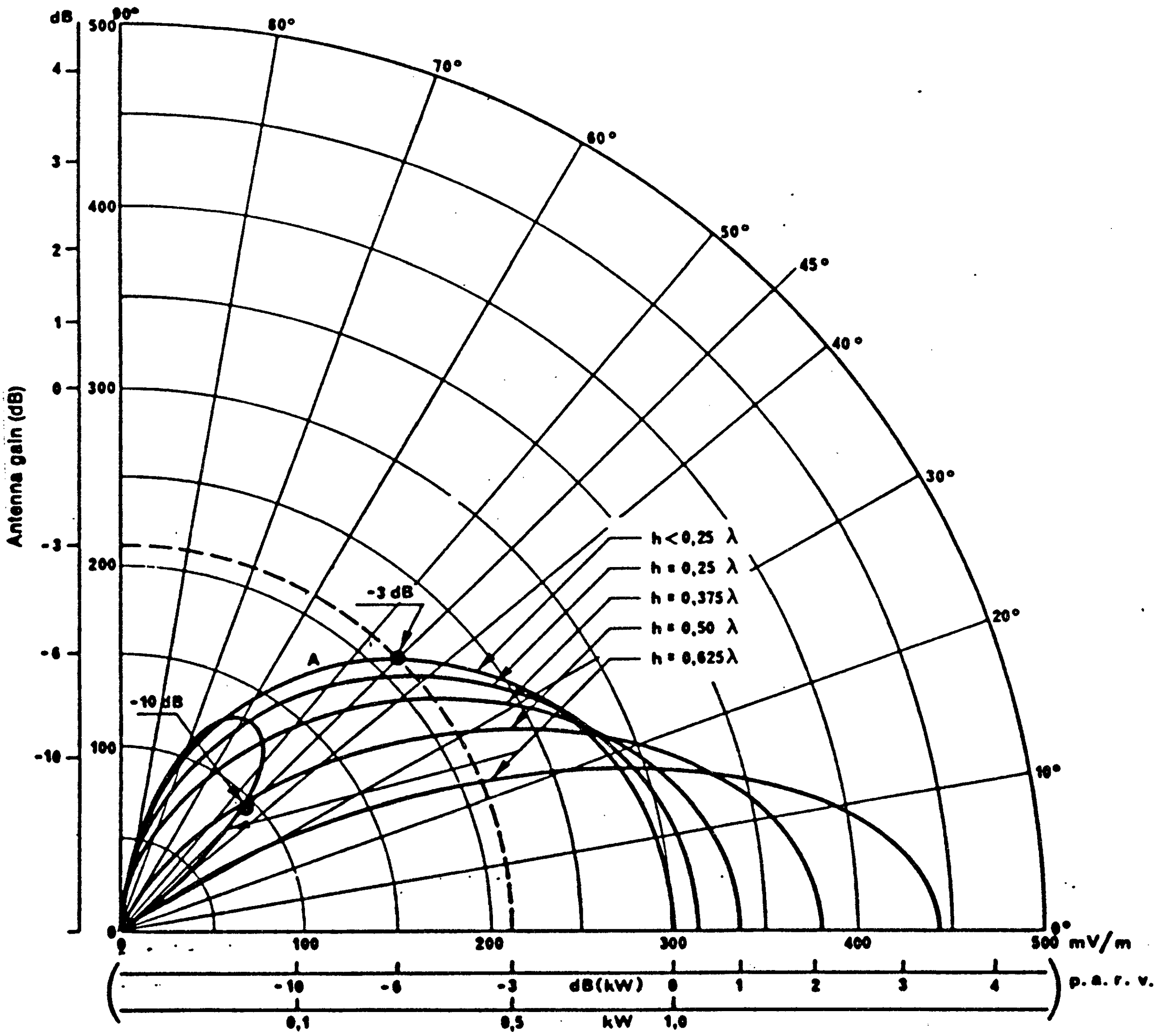
For distances greater than 4250 km, it should be noted that F_c can be expressed by:

$$F_c = \frac{231}{3 + d/1000} - 35.5 \quad \text{dB}(\mu\text{V/m}) \qquad (3)$$



A: Radius of ground system
Full lines: Real antenna correctly designed
Dashed line: Ideal antenna on a perfectly conducting ground

FIGURE 1 – *Characteristic field strengths for simple vertical antennas, using 120-radial ground systems*



A: Short vertical antenna

FIGURE 1a – *Effective monopole radiated power (e.m.r.p.) and field strength at a distance of 1 km as a function of elevation angle, for different heights of vertical antennas assuming a transmitter power of 1 kW*

TABLE I - *Elevation angle vs distance*

Distance (km)	Elevation angle (degrees)
50	75.3
100	62.2
150	51.6
200	43.3
250	36.9
300	31.9
350	27.9
400	24.7
450	22.0
500	19.8
550	18.0
600	16.3
650	14.9
700	13.7
750	12.6
800	11.7
850	10.8
900	10.0
950	9.3
1000	8.6
1050	8.0
1100	7.4
1150	6.9
1200	6.4
1250	5.9
1300	5.4
1350	5.0
1400	4.6
1450	4.3
1500	3.9
1550	3.5
1600	3.2
1650	2.9
1700	2.6
1750	2.3
1800	2.0
1850	1.7
1900	1.5
1950	1.2
2000	1.0
2050	0.7
2100	0.5
2150	0.2
2200	0.0
2250	0.0
2300	0.0
2350	0.0
2400	0.0

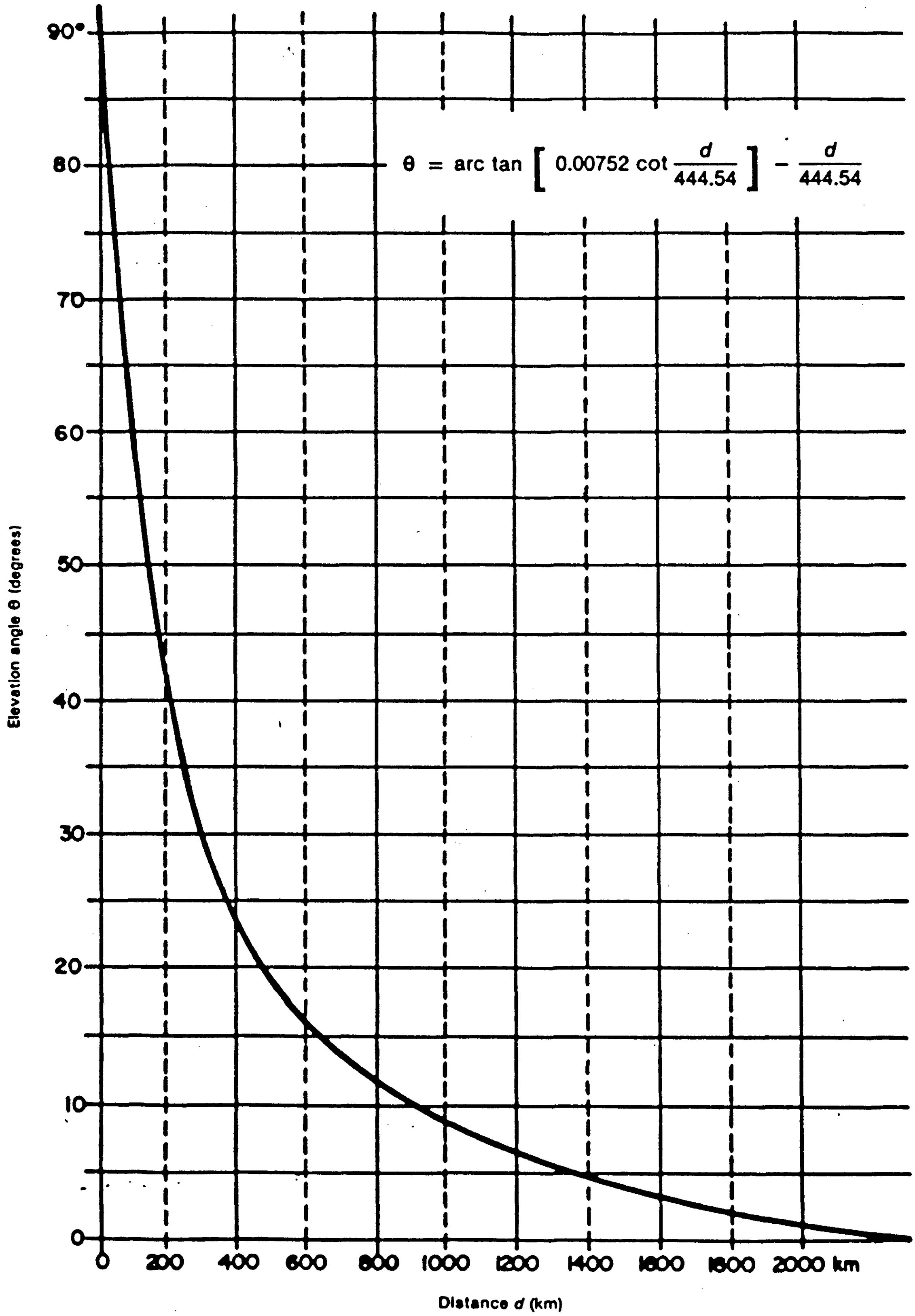


FIGURE 2 – *Elevation angle vs distance*

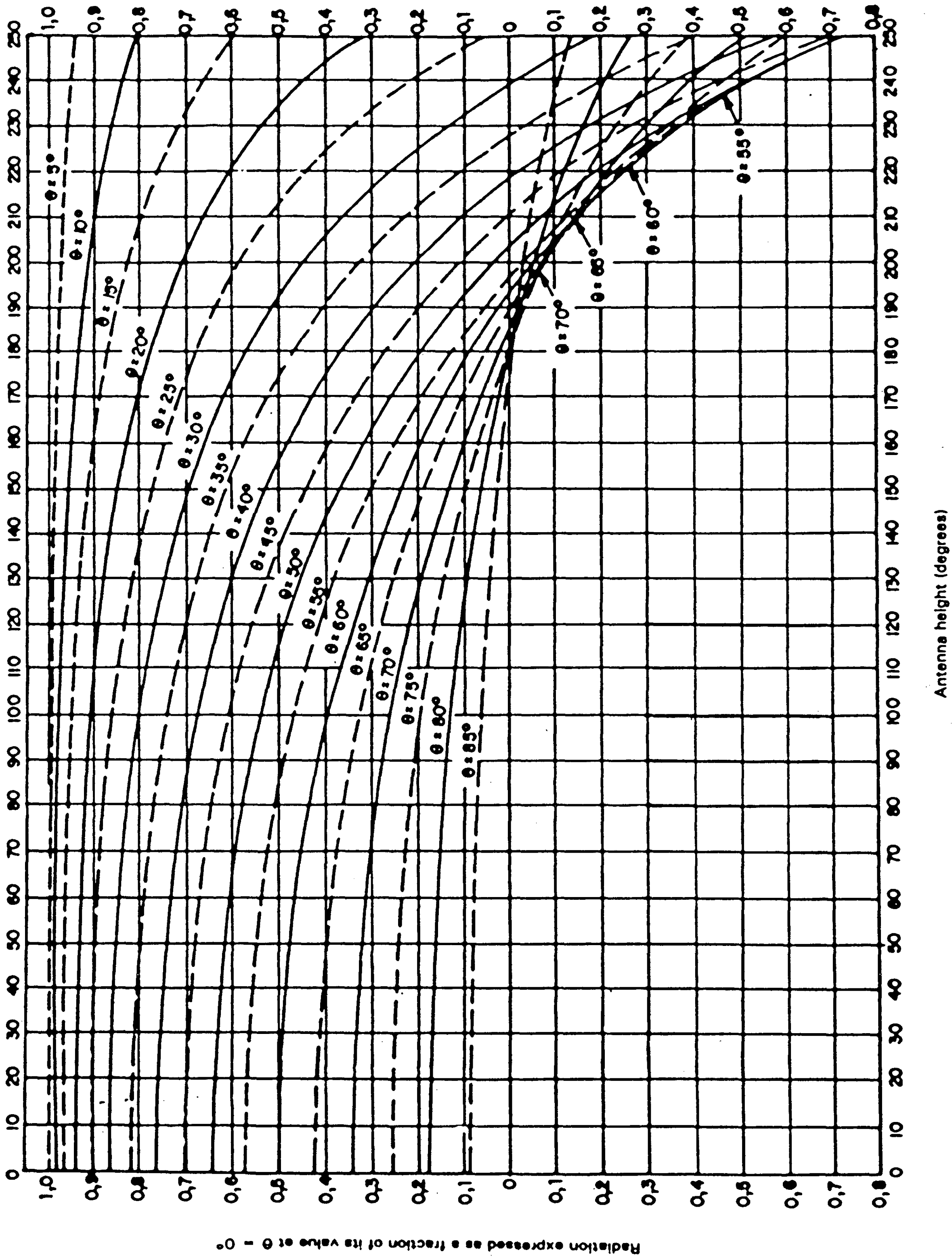


FIGURE 3 – *Vertical plane radiation of simple vertical antennas as a function of electrical tower height for various values of elevation angle (θ)*

TABLE II – *f(θ) values for simple vertical antennas*

Elevation angle (degrees)	f(θ)					
	0.11 λ	0.13 λ	0.15 λ	0.17 λ	0.19 λ	0.21 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.999	0.998	0.998	0.998	0.998	0.998
4	0.997	0.997	0.997	0.997	0.997	0.997
5	0.996	0.996	0.996	0.995	0.995	0.995
6	0.994	0.994	0.994	0.993	0.993	0.993
7	0.992	0.992	0.991	0.991	0.991	0.990
8	0.989	0.989	0.989	0.988	0.988	0.987
9	0.987	0.986	0.986	0.985	0.985	0.984
10	0.984	0.983	0.983	0.982	0.981	0.980
11	0.980	0.980	0.979	0.978	0.977	0.976
12	0.976	0.976	0.975	0.974	0.973	0.971
13	0.972	0.972	0.971	0.969	0.968	0.967
14	0.968	0.967	0.966	0.965	0.963	0.961
15	0.963	0.962	0.961	0.959	0.958	0.956
16	0.958	0.957	0.956	0.954	0.952	0.950
17	0.953	0.952	0.950	0.948	0.945	0.943
18	0.947	0.946	0.944	0.942	0.940	0.937
19	0.941	0.940	0.938	0.935	0.933	0.930
20	0.935	0.933	0.931	0.929	0.926	0.922
22	0.922	0.920	0.917	0.914	0.911	0.907
24	0.907	0.905	0.902	0.898	0.894	0.890
26	0.892	0.889	0.885	0.882	0.877	0.872
28	0.875	0.872	0.868	0.864	0.858	0.852
30	0.857	0.854	0.849	0.844	0.839	0.832
32	0.838	0.834	0.830	0.824	0.818	0.811
34	0.819	0.814	0.809	0.803	0.795	0.789
36	0.798	0.793	0.788	0.781	0.774	0.766
38	0.776	0.771	0.765	0.758	0.751	0.742
40	0.753	0.748	0.742	0.735	0.725	0.717
42	0.730	0.724	0.718	0.710	0.702	0.692
44	0.705	0.700	0.693	0.685	0.676	0.666
46	0.680	0.674	0.667	0.659	0.650	0.639
48	0.654	0.648	0.641	0.633	0.623	0.612
50	0.628	0.621	0.614	0.606	0.596	0.585
52	0.600	0.594	0.587	0.578	0.568	0.557
54	0.572	0.566	0.559	0.550	0.540	0.529
56	0.544	0.537	0.530	0.521	0.512	0.501
58	0.515	0.508	0.501	0.493	0.483	0.472
60	0.485	0.479	0.472	0.463	0.454	0.443

TABLE II *(continued)*

Elevation angle (degrees)	f(θ)					
	0.23 λ	0.25 λ	0.27 λ	0.29 λ	0.311 λ	0.35 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.998	0.998	0.998	0.998	0.998	0.997
4	0.997	0.996	0.996	0.996	0.996	0.995
5	0.995	0.994	0.994	0.994	0.993	0.992
6	0.992	0.992	0.991	0.991	0.990	0.989
7	0.990	0.989	0.988	0.988	0.987	0.985
8	0.987	0.986	0.985	0.984	0.983	0.980
9	0.983	0.982	0.981	0.980	0.978	0.975
10	0.979	0.978	0.977	0.975	0.973	0.969
11	0.975	0.973	0.972	0.970	0.968	0.963
12	0.970	0.968	0.966	0.964	0.962	0.955
13	0.965	0.963	0.961	0.958	0.955	0.949
14	0.959	0.957	0.955	0.952	0.948	0.941
15	0.953	0.951	0.948	0.945	0.941	0.932
16	0.947	0.944	0.941	0.937	0.933	0.924
17	0.941	0.937	0.934	0.930	0.925	0.914
18	0.934	0.930	0.926	0.921	0.916	0.904
19	0.926	0.922	0.918	0.913	0.907	0.894
20	0.919	0.914	0.909	0.904	0.898	0.883
22	0.902	0.897	0.891	0.885	0.877	0.861
24	0.885	0.879	0.872	0.865	0.856	0.837
26	0.866	0.859	0.852	0.843	0.833	0.811
28	0.846	0.833	0.830	0.820	0.809	0.795
30	0.825	0.816	0.807	0.797	0.784	0.758
32	0.803	0.794	0.784	0.772	0.759	0.729
34	0.780	0.770	0.759	0.747	0.732	0.701
36	0.756	0.746	0.734	0.721	0.705	0.671
38	0.732	0.720	0.708	0.694	0.677	0.642
40	0.706	0.695	0.681	0.667	0.649	0.612
42	0.681	0.668	0.654	0.639	0.621	0.582
44	0.654	0.641	0.627	0.611	0.593	0.552
46	0.628	0.614	0.600	0.583	0.564	0.523
48	0.600	0.587	0.572	0.555	0.536	0.494
50	0.573	0.559	0.544	0.527	0.507	0.465
52	0.545	0.531	0.515	0.498	0.479	0.436
54	0.517	0.503	0.487	0.470	0.451	0.408
56	0.488	0.474	0.459	0.442	0.423	0.381
58	0.460	0.446	0.431	0.414	0.395	0.354
60	0.431	0.418	0.403	0.387	0.368	0.328

TABLE II *(end)*

Elevation angle (degrees)	$f(\theta)$					
	0.40 λ	0.45 λ	0.50 λ	0.528 λ	0.55 λ	0.625 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	0.999	0.999	0.999	0.999
2	0.998	0.998	0.998	0.997	0.997	0.995
3	0.997	0.996	0.995	0.994	0.993	0.989
4	0.994	0.992	0.990	0.989	0.988	0.981
5	0.991	0.988	0.985	0.983	0.981	0.970
6	0.986	0.983	0.979	0.975	0.972	0.957
7	0.982	0.977	0.971	0.967	0.962	0.941
8	0.976	0.970	0.962	0.957	0.951	0.924
9	0.970	0.963	0.953	0.945	0.938	0.904
10	0.963	0.954	0.942	0.933	0.924	0.882
11	0.955	0.945	0.930	0.919	0.909	0.859
12	0.947	0.934	0.917	0.905	0.893	0.834
13	0.938	0.923	0.903	0.889	0.875	0.807
14	0.929	0.912	0.889	0.872	0.857	0.773
15	0.918	0.899	0.873	0.855	0.837	0.748
16	0.908	0.886	0.857	0.836	0.815	0.717
17	0.897	0.873	0.840	0.817	0.795	0.684
18	0.885	0.859	0.823	0.797	0.772	0.651
19	0.873	0.844	0.804	0.776	0.749	0.617
20	0.860	0.828	0.785	0.755	0.726	0.582
22	0.833	0.796	0.746	0.710	0.677	0.510
24	0.805	0.763	0.705	0.665	0.625	0.436
26	0.776	0.728	0.663	0.618	0.574	0.363
28	0.745	0.692	0.621	0.570	0.522	0.290
30	0.714	0.655	0.577	0.522	0.470	0.219
32	0.682	0.619	0.534	0.475	0.419	0.151
34	0.649	0.582	0.492	0.428	0.368	0.085
36	0.617	0.545	0.450	0.383	0.321	0.025
38	0.584	0.509	0.409	0.340	0.275	−0.031
40	0.552	0.473	0.370	0.298	0.231	−0.083
42	0.519	0.438	0.332	0.258	0.190	−0.129
44	0.488	0.405	0.296	0.221	0.152	−0.170
46	0.457	0.372	0.262	0.187	0.117	−0.205
48	0.427	0.341	0.230	0.155	0.085	−0.235
50	0.397	0.311	0.201	0.126	0.056	−0.259
52	0.369	0.283	0.174	0.099	0.031	−0.278
54	0.341	0.257	0.149	0.076	0.009	−0.291
56	0.315	0.232	0.126	0.055	−0.010	−0.300
58	0.289	0.208	0.105	0.037	−0.026	−0.304
60	0.265	0.186	0.087	0.021	−0.039	−0.304
62				0.003	−0.049	−0.300
64				−0.003	−0.056	−0.292
66				−0.011	−0.062	−0.281
68				−0.017	−0.064	−0.267
70				−0.022	−0.065	−0.250
72				−0.025	−0.064	−0.231
74				−0.026	−0.061	−0.210
76				−0.026	−0.056	−0.138
78				−0.024	−0.051	−0.163
80				−0.022	−0.044	−0.138

Note – When the negative sign (−) appears in the Table, it signifies only the existence of a secondary lobe having the opposite phase from the main lobe in the vertical radiation pattern. In order to perform the calculation, ignore the negative (−) and use only the absolute value $f(\theta)$ from the Table.

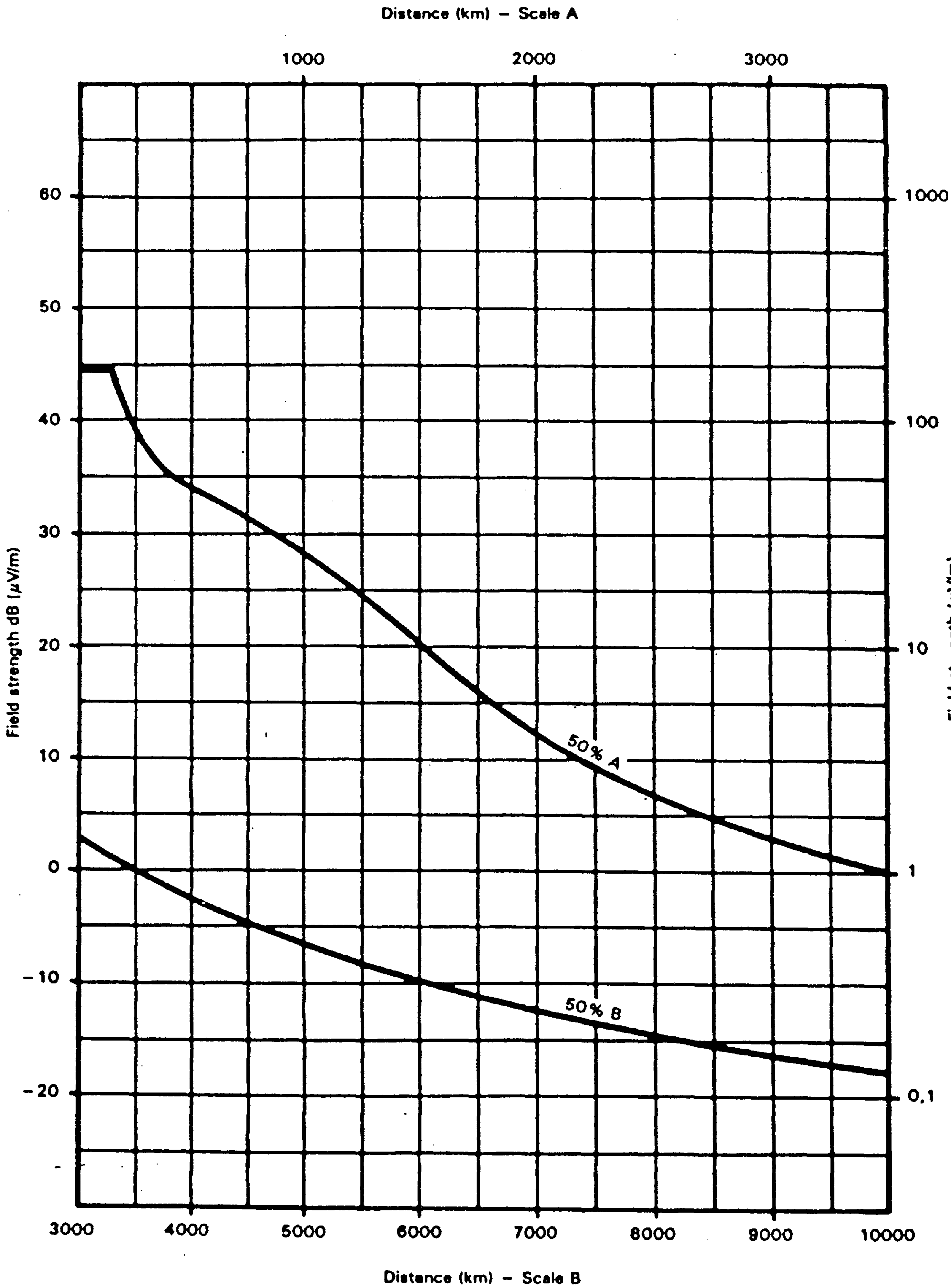


FIGURE 4 – *Skywave field strength vs distance for a characteristic field strength of 100 mV/m*

TABLE III – *Skywave field strength vs distance (100 to 10 000 km) for a characteristic field strength of 100 mV/m*

d (km)	F_c (dB(μV/m)) 50%	F_c (μV/m) 50%
0 – 200	39.28	92.06
250	37.79	77.54
300	36.75	68.82
350	35.86	62.06
400	35.13	57.08
450	34.46	52.86
500	33.92	49.45
550	33.40	46.78
600	32.94	41.36
650	32.45	41.95
700	31.94	39.54
750	31.32	36.81
800	30.73	34.40
850	30.18	32.30
900	29.51	29.89
950	28.83	27.63
1000	28.14	25.54
1050	27.44	23.56
1100	26.79	21.84
1150	25.98	19.91
1200	25.25	18.30
1250	24.50	16.78
1300	23.71	15.32
1350	22.90	13.97
1400	22.08	12.71
1450	21.25	11.55
1500	20.42	10.50
1550	19.59	9.53
1600	18.66	8.57
1650	17.75	7.72
1700	16.87	6.98
1750	16.04	6.34
1800	15.28	5.80
1850	14.52	5.32
1900	13.78	4.89
1950	13.05	4.49
2000	12.34	4.14
2100	11.15	3.61
2200	10.05	3.18
2300	8.92	2.79
2400	8.13	2.55
2500	7.09	2.26
2600	6.16	2.03
2700	5.32	1.85
2800	4.58	1.69
2900	3.81	1.55

TABLE III *(end)*

d (km)	F_c (dB(μV/m)) 50%	F_c (μV/m) 50%
3000	3.11	1.43
3100	2.45	1.33
3200	1.78	1.23
3300	1.18	1.15
3400	0.57	1.07
3500	0.02	1.00
3600	−0.53	0.94
3700	−1.08	0.88
3800	−1.59	0.83
3900	−2.08	0.79
4000	−2.52	0.75
4100	−3.01	0.71
4200	−3.46	0.67
4300	−3.90	0.64
4400	−4.33	0.61
4500	−4.74	0.58
4600	−5.15	0.55
4700	−5.54	0.53
4800	−5.93	0.51
4900	−6.30	0.48
5000	−6.67	0.46
5100	−7.02	0.45
5200	−7.37	0.43
5300	−7.71	0.41
5400	−8.04	0.40
5500	−8.37	0.38
5600	−8.68	0.37
5700	−8.99	0.36
5800	−9.29	0.34
5900	−9.59	0.33
6000	−9.88	0.32
6200	−10.43	0.30
6400	−10.97	0.28
6600	−11.48	0.27
6800	−11.97	0.25
7000	−12.44	0.24
7200	−12.90	0.23
7400	−13.33	0.22
7600	−13.75	0.21
7800	−14.15	0.20
8000	−14.54	0.19
8200	−14.92	0.18
8400	−15.28	0.17
8600	−15.63	0.17
8800	−15.97	0.16
9000	−16.29	0.15
9200	−16.61	0.15
9400	−16.91	0.14
9600	−17.21	0.14
9800	−17.50	0.13
10000	−17.77	0.13

ANNEX IV

The simplified CCIR method for planning purposes in Region 2

In preparation for a Regional Administrative Broadcasting Conference (535-1605 kHz, Region 2), IWP 6/4 considered available prediction methods and measurements taken in various parts of Region 2. In order to meet this requirement, some simplifications were made to the method described in the Annex to Recommendation 435. For planning purposes, the following formula may be used in Region 2:

$$E = M + G_S - L_p + 103 - 20 \log p - 10^{-3} kp. \quad (1)$$

where M = transmitter cymomotive force, M is given by

$$M = P + G_V + G_H. \quad (2)$$

P = radiated power, dB (kW).

G_V= antenna gain, dB, due to vertivle directivity. For an omni-directional antenna, Figure 1 may be used.

G_H= antenna gain, dB, due to horizontal directivity. G_H=0 for an omni-directional antenna.

G_s= sea gain, dB. For an idealized case (i.e., transmitter located on the coast), Figure 2 may be used. See Rec. 435-4 (1982), Sec. 2.3 for details.

L_p= polarization coupling loss, dB. Figures 3, 4 and 5 may be used. Equation is given in Figure 5.

p = slant distance, km. For paths longer than 1000 km, p is approximately equal to the great-circle distance, d. For shorter paths,

$$p = (d^2 + 40000)^{\frac{1}{2}} \quad (3)$$

k = basic loss factor; k is given by

$$k = 0.675 \, |\phi| + 0.2 + \tan^2 (\phi+3) \quad (4)$$

$$\phi = \tfrac{1}{2}(\phi_T + \phi_R) \quad (5)$$

ϕ_T = geomagnetic latitude* of the transmitter,)* degrees, southern
) latitudes negative,
ϕ_R = geomagnetic latitude of the receiver,) nothern positive.

Geomagnetic latitudes are given by:

$$\phi_T \text{ or } \phi_R = \arcsin \left[\sin \alpha \sin 78.5^\circ + \cos \alpha \cos 78.5^\circ \cos (69^\circ + \beta) \right] \quad (6)$$

where α and β are the latitude and longitude of the terminal respectively. Paths longer than 3000 km are divided into two equal sections which are considered separately. The value of φ for each half-path is derived by taking the average of the geomagnetic latitudes at one terminal and at the mid-point of the whole path, the geomagnetic latitude at the mid-point of the whole path being assumed to be the average of Φ_T and Φ_R. As a consequence:

$$\Phi = 0.25\ (3\Phi_T + \Phi_R) \text{ for the first half of the path and} \tag{7}$$

$$\Phi = 0.25\ (\Phi_T + 3\Phi_R) \text{ for the second half.} \tag{8}$$

The values of k calculated from equation (4) for the two half-paths are then averaged and used in equation (1).

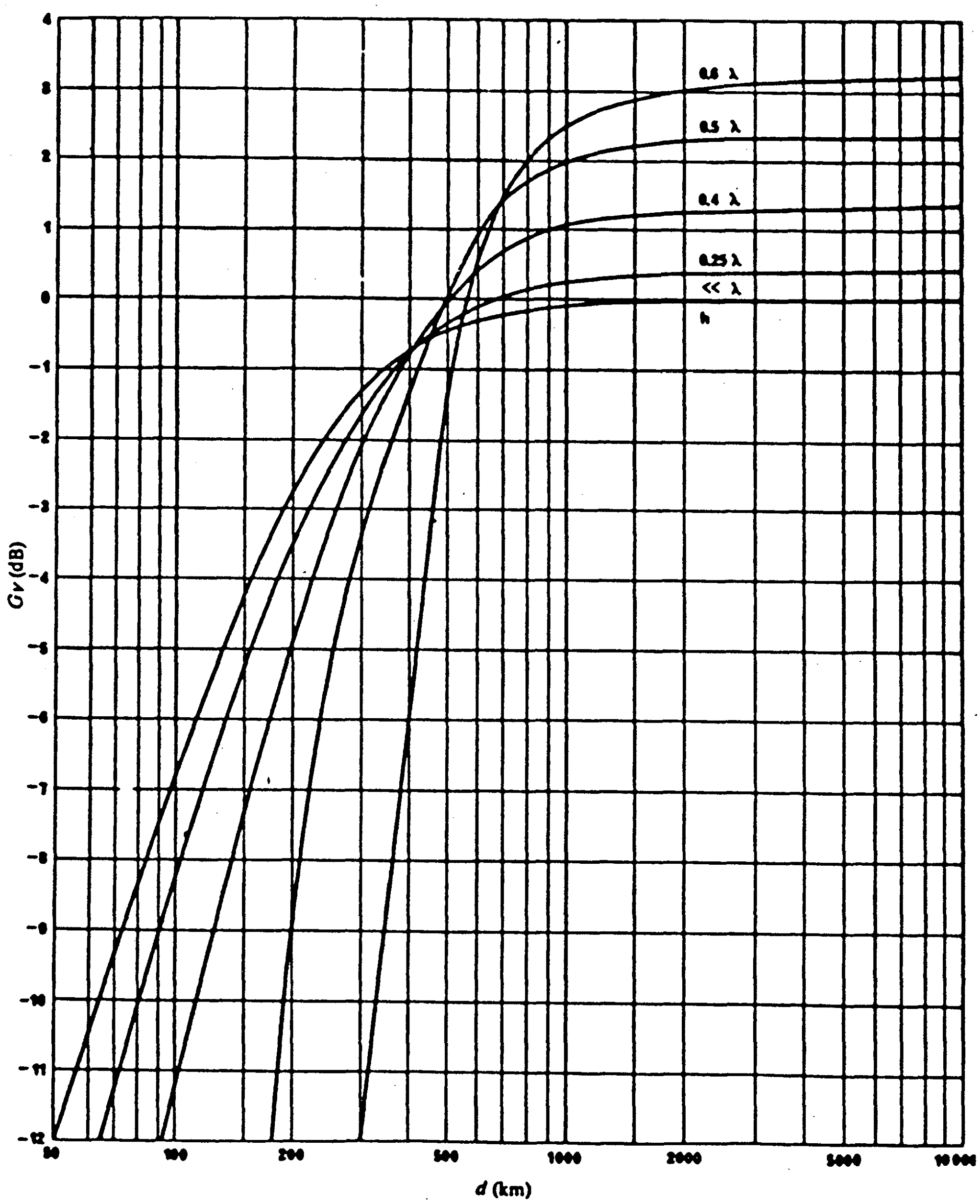
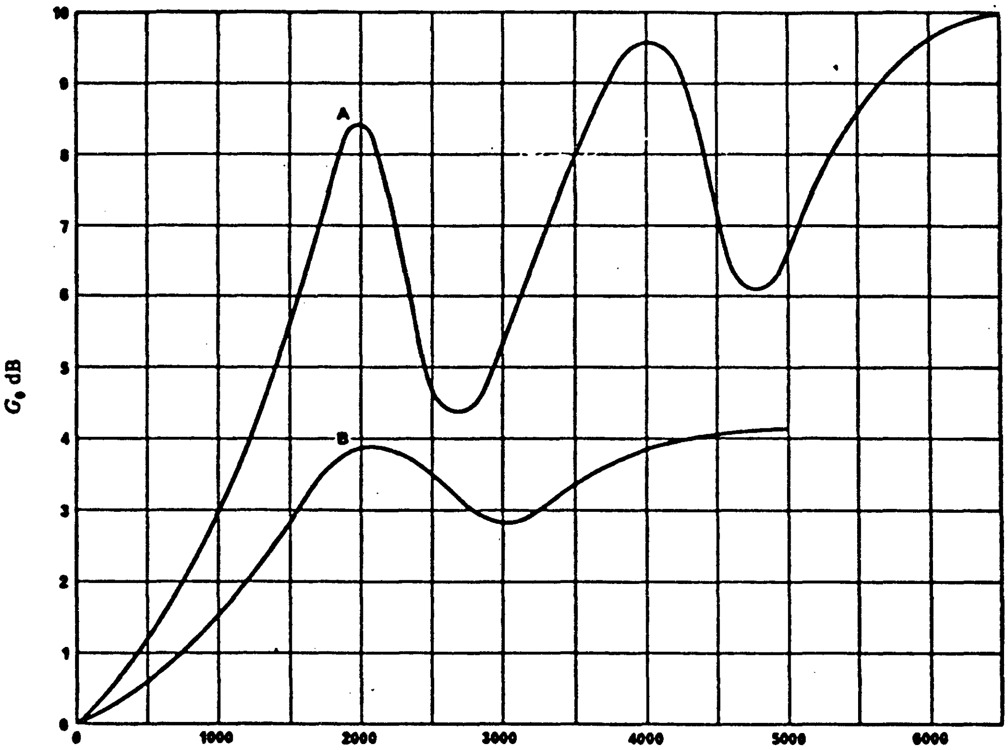


FIGURE 1 – *Transmitting antenna gain factor for single monopoles (Gv)*

h: antenna height



Ground distance, *d*, (km)
A: Band 6 B: Band 5

FIGURE 2

Sea gain (G_e) for a single terminal on the coast

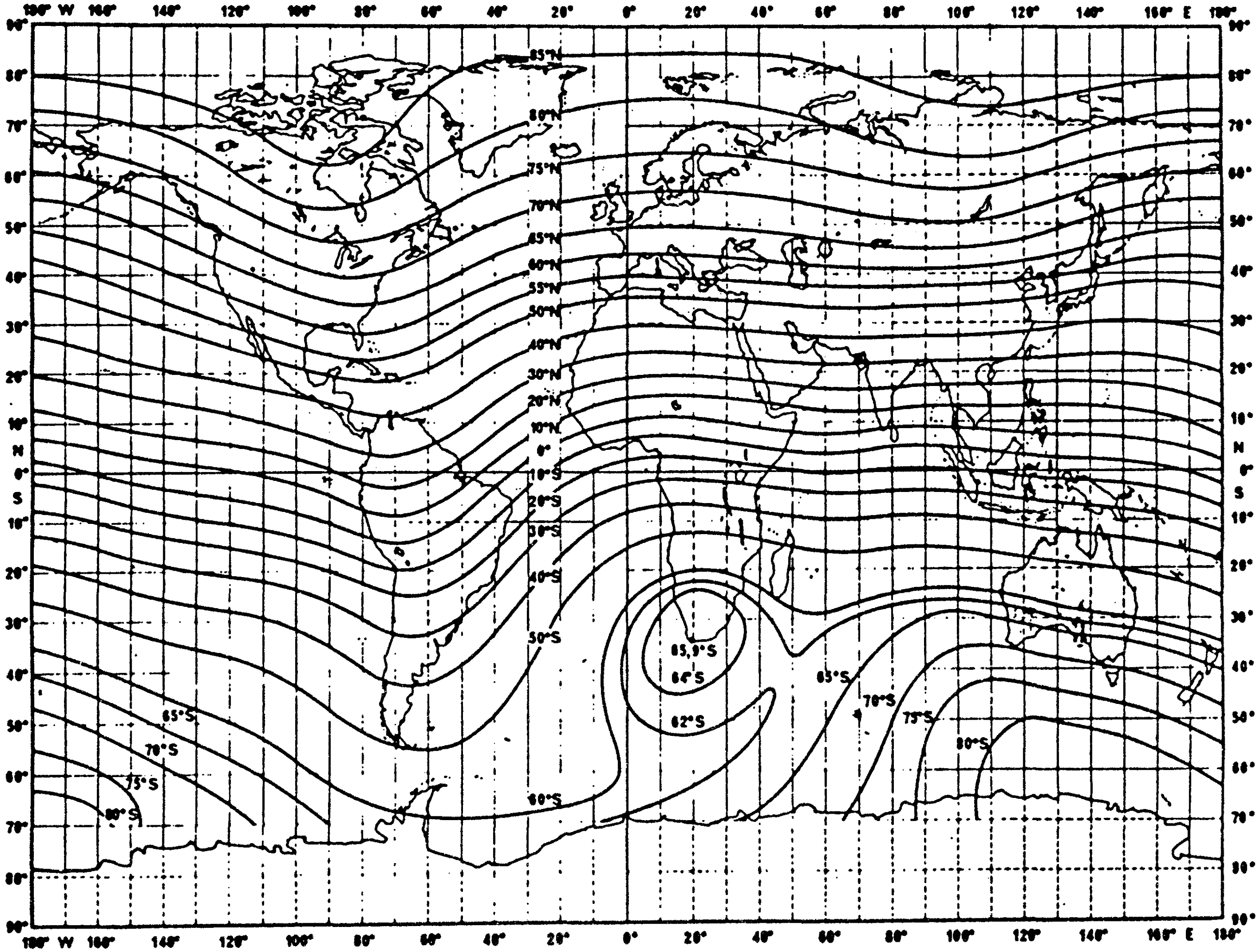


FIGURE 3. – *Map of magnetic dip (epoch 1975.0)*

(Source: Magnetic inclination or dip (epoch 1975.0) Chart No. 30 World U.S. Defense Mapping Agency Hydrographic Center)

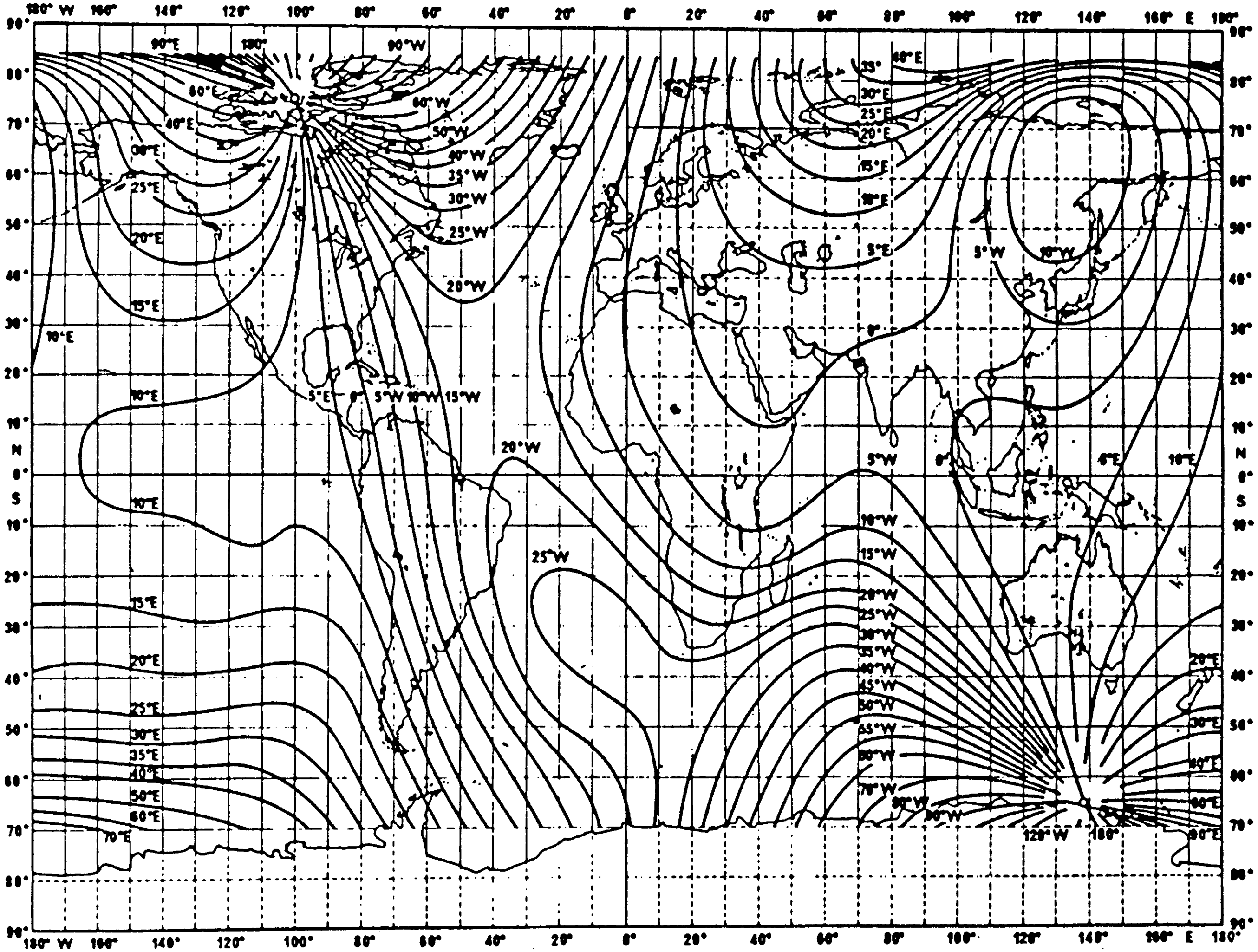


FIGURE 4 - *Map of magnetic declination (epoch 1975.0)*

(Source: Magnetic variation (epoch 1975.0) Chart No. 42, World U.S. Defense Mapping Agency Hydrographic Center)

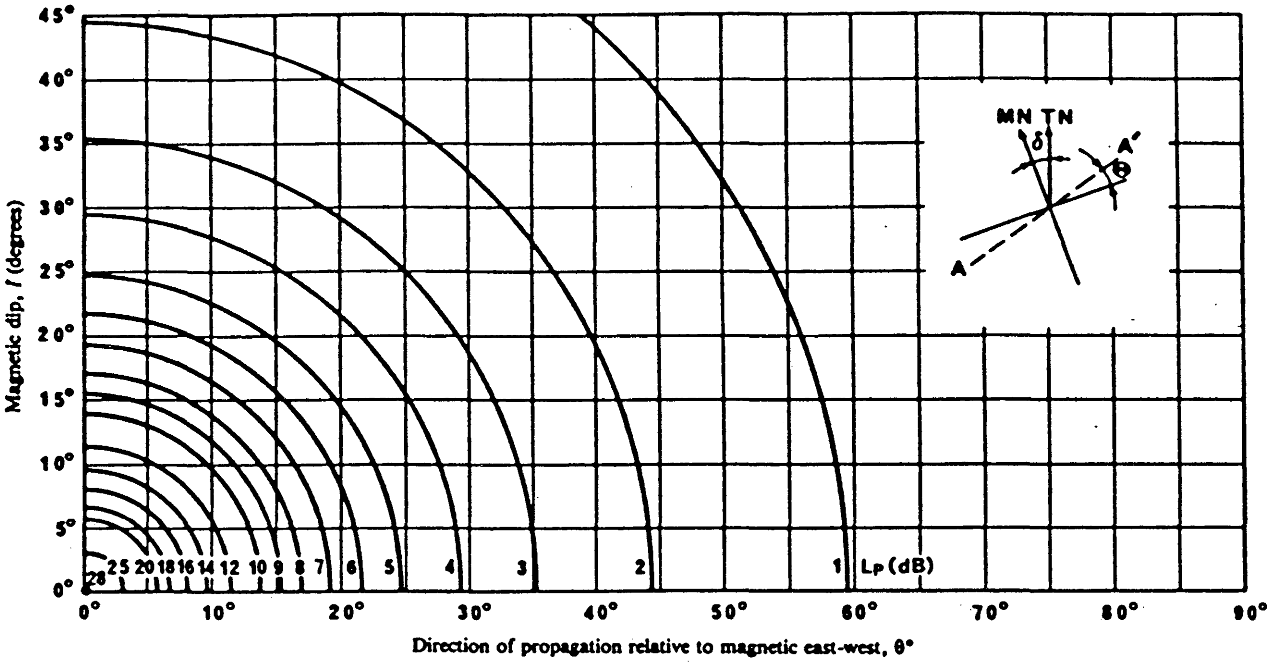


FIGURE 5 – *Excess polarization coupling loss L_P (for a single terminal)*

$$L_P = 180\,(36 + \theta^2 + I^2)^{-1/2} - 2$$

θ: arc sin [cos (α – δ)]

δ: magnetic declination, degrees E of true N

α: direction of propagation AA′, degrees E of true N (considered positive in the clockwise direction)

MN: magnetic north direction

TN: true north direction

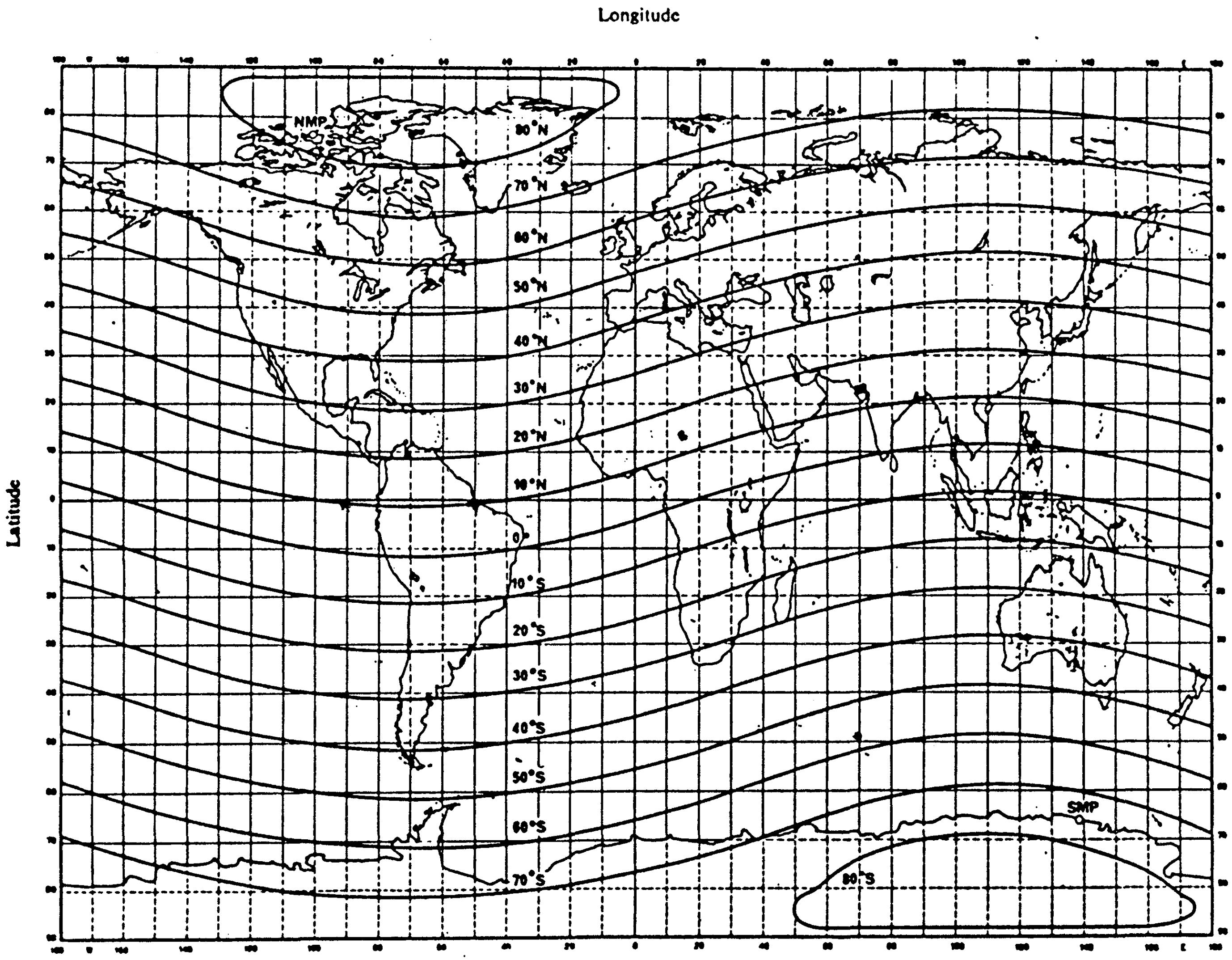


FIGURE 6

Geomagnetic latitudes

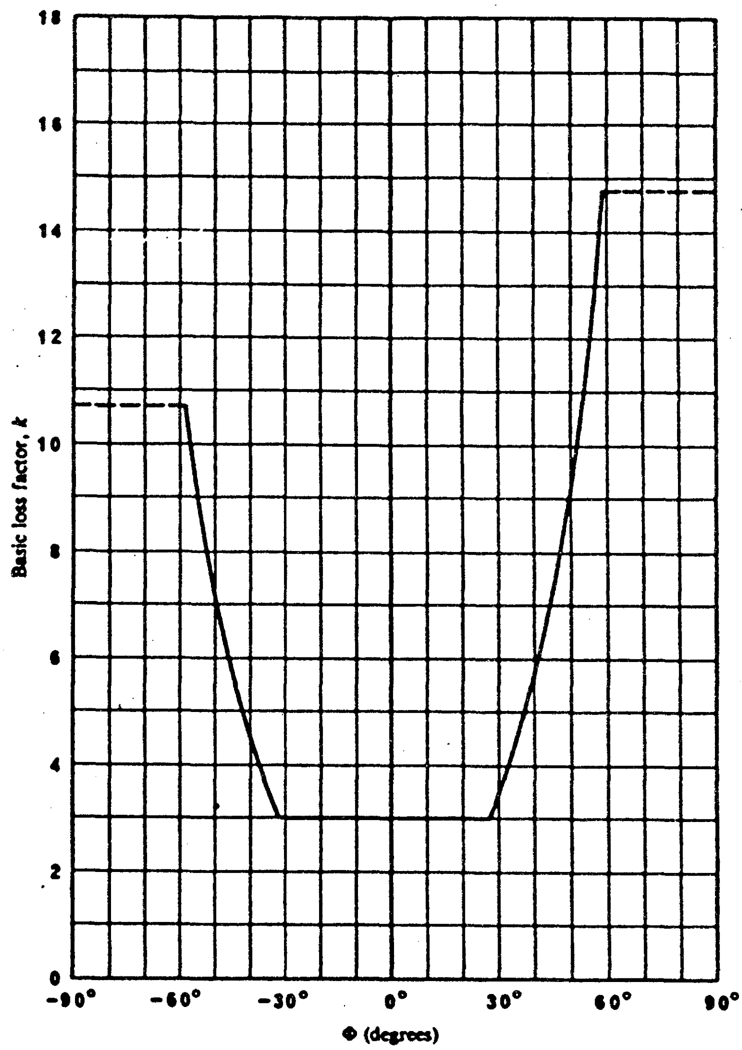


FIGURE 7 – *Basic loss factor k*

$-59° \leq \Phi \leq 59°$

$k \geq 3$

$k = 0.067\,|\Phi| + 0.2 + 3\tan^2(\Phi + 3°)$

ANNEX V

The modified FCC method

According to Chapter 3, Annex 2, Rio Final Acts, nighttime (2 hours after sunset) skywave field strength, 50% of the time, is given by:

$$F = F_c + 20 \log \frac{E_c f(\theta)\sqrt{P}}{100} \qquad (1)$$

(all equations are in dB (μV/m))

For distances less than 4,250 km, F_c is the direct reading from Figure 4 of the Rio Final Acts; no equation is available. For greater distances, F_c can be expressed by:

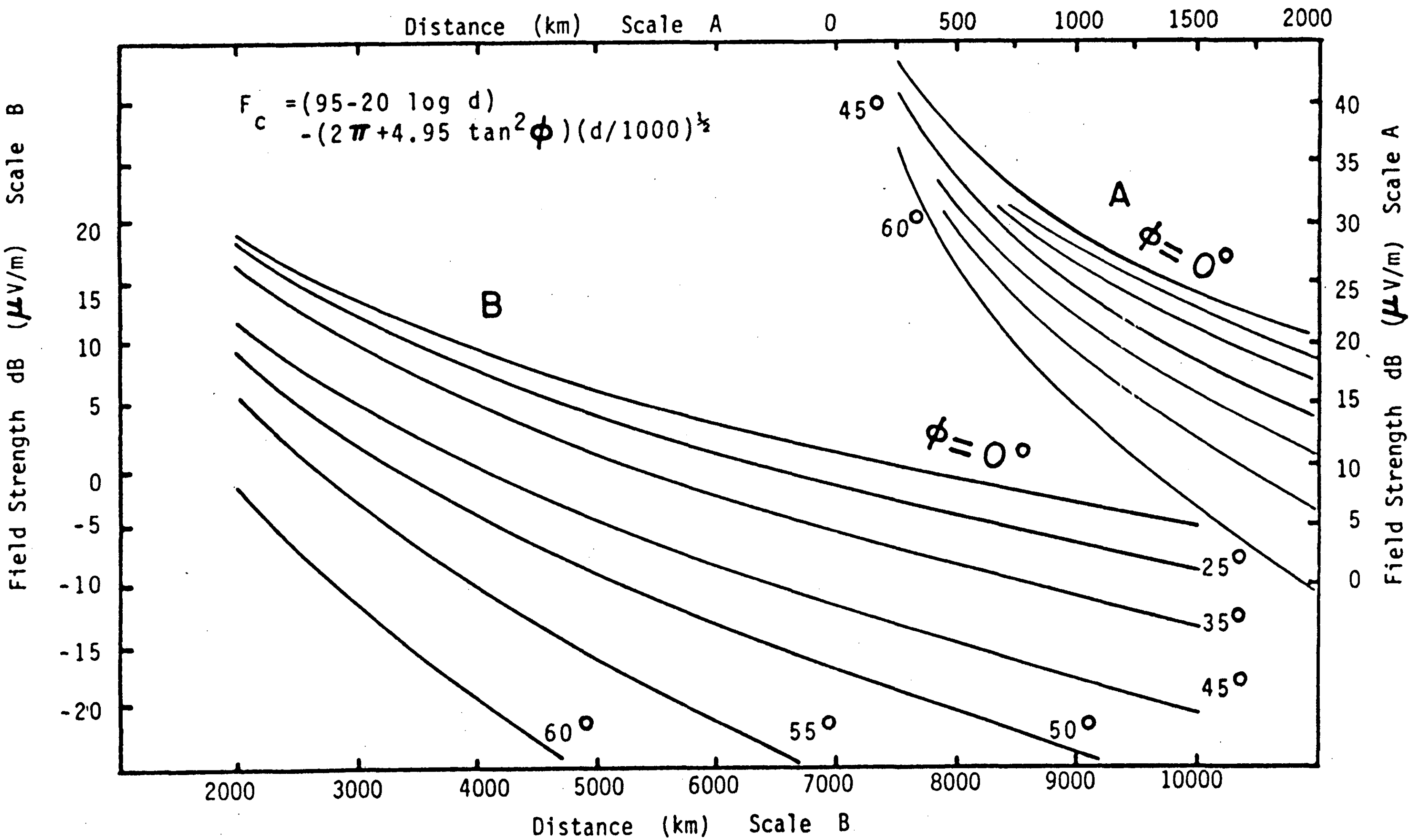
$$F_c = \frac{231}{3 + d/1000} - 35.5 \qquad (2)$$

It is suggested that for great-circle distances (d) greater than 200 km, F_c be given by:

$$F_c = (95 - 20 \log d) - (2\pi + 4.95 \tan^2\phi)\ (d/1000)^{\frac{1}{2}} \qquad (3)$$

Where ϕ= arithmetic mean of the geomagnetic latitude of the transmitter (ϕ_T) and that of the receiving site (ϕ_R) of a path. Northern latitudes are considered positive, sothern latitudes negative. If $|\phi|$ is greater than 60°, equation (3) is evaluated for ϕ= 60°. If d is less than 200 km, F_c is evaluated for d=200 km. However, the actual value of d is to be used in determining angle of departure (see also Section 3.1.8). Figure 6 or equations (7) and (8) in Annex IV may be used in determining ϕ. Figure 1 shows F_c for selected latitudes.

FIGURE 1 Skywave field strength vs distance (100 mV/m at 1 km, 50 %, 2 hours after sunset)



ANNEX VI

Examples of root sum square (RSS) addition of weighted interference contributions to determine usable field strength

The following tables illustrate the use of the RSS method and 50% exclusion principle. The first example applies to the case where the interfering carriers are co-channel with the wanted carrier. In the second example, one of the interfering carriers is offset from the wanted carrier by 3 kHz while a second interfering carrier is offset by 5 kHz. The remaining interfering carriers are co-channel with the wanted carrier, as in the first example.

TABLE VI-I

Example 1: all interfering signals are co-channel with the wanted signals

Interfering signal (1)	Interfering signal field strength		Protection ratio	Individual usable field strength contribution (UFS)		Calculated RSS		Remarks
	(μV/m)	(dB(μV/m))	(dB)	((dB(μV/m))	(μV/m)	(dB(μV/m))	(μV/m)	
A	140	42.9	26	68.9	2 800			
C	130	42.3	26	68.3	2 600	71.6	3 812	$\sqrt{A^2 + C^2}$
B	125	41.9	26	67.9	2 500	73.2	4 555	Individual UFS greater than 50% of $\sqrt{A^2 + C^2}$ therefore $\sqrt{A^2 + C^2 + B^2}$
D	65	36.3	26	62.3	1 300			Individual UFS less than 50% of $\sqrt{A^2 + C^2 + B^2}$ therefore disregard
E	52	34.3	26	60.3	1 040			- idem -

(1) In descending order of individual usable field strength contribution (UFS).

TABLE VI-II

Example 2: interfering signals A, B and C are co-channel with the wanted signal; interfering signal D' is 3 kHz offset; interfering signal E' is 5 kHz offset

Interfering signal (1)	Interfering signal field strength		Protection ratio	Individual usable field strength contribution (UFS)		Calculated RSS		Remarks
	(μV/m)	(dB(μV/m))	(dB)	((dB(μV/m))	(μV/m)	(dB(μV/m))	(μV/m)	
D' (3 kHz offset)	65	36.3	40	76.3	6 500			
A	140	42.9	26	68.9	2 800			Individual UFS less than 50% of D', therefore disregard
C	130	42.3	26	68.3	2 600			- idem -
B	125	41.9	26	67.9	2 500			- idem -
E' (5 kHz offset)	52	34.3	30	64.3	1 644			- idem -

(1) In descending order of individual usable field strength contribution (UFS)

ANNEX VII

An approach to allotment planning

1. Introduction

This paper studies the allotment planning concept under two different situations:

- between two countries which are sufficiently large geographically that the impact on other countries of allotments along their common boundary is minimal; and

- among a group of countries which are close geographically so that an allotment to any one country will have an impact on some or all countries in the group.

2. Concept

The main advantage of allotment planning relative to assignment planning is that it is not necessary to provide specific details concerning requirements many years before their implementation. This allows great flexibility in the establishment of future assignments and minimizes the effort required in the planning process. This concept appears to have particular merit in the case of planning for the opening of the new band.

The approach outlined in this report is based on the concept that the ten channels in the extended AM band 1 605 - 1 705 kHz will be divided into "priority" channel allotments and "non-priority" channel allotments in accordance with agreements among administrations at the Conference.

The priority channels of one country will be available to it to assign within its borders as and when it wishes, subject to some limitations on power or radiated power in order to allow for frequency re-use in other countries.

The non-priority channels are those which are priority channels in the neighbouring country but are available for assignment on condition that they do not exceed a specified field strength at the border.

3. Situation 1 - Two adjacent large countries

In order to maximize the use of channels, alternate channels rather than adjacent should be allotted as priority channels to each administration; for example: 1 610, 1 630, 1 650, 1 670 and 1 690 kHz could be allotted to one country and 1 620, 1 640, 1 660, 1 680 and 1 700 kHz could be allotted to the other. Some coordination would be needed to avoid the assignment of adjacent channels to adjacent cities on opposite sides of the common border.

3.1 Question

On the assumption that each country will have five "priority" channels as mentioned earlier, how feasible is it to use the other country's channels at a distance from the border such as 100 km?

3.2 Assumptions

Station A

- Station on a priority channel in country A, located approximately 30 km from the border, operating at 10 kW with a directional antenna* having maximum radiation towards country B, E_R = 2 V/m (night), 1.5 V/m (day).

- Protected contour at the border: 0.5 mV/m day, 5 mV/m night.

- Protection ratio: 26 dB.

Station B

- Located 100 km from border with directional antenna pointing away from border.

- Maximum radiation at 1 km, E_R = 2 V/m (night).

- Maximum permissible signal at the border of 25 μV/m day and 125 μV/m night.

Technical factors affecting both

- Propagation curves from the 1981 Rio de Janeiro Agreement used with ground-wave curves extrapolated to 1 655 kHz.

- Conductivity 10 mS/m and 4 mS/m.

3.3 Findings

Considering the above assumptions, it was found that a station could be assigned 100 km from the border in the other country with a directional antenna pointing away from the border and maximum power of 10 kW with 2 towers, day and 10 kW with 3 towers, night. The service expected is summarized in the table below. It is based on a day contour of 5 mV/m**, or higher if limited by interference; and at night, the maximum E_u which would be created by the country A station.

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* Country A also has the option of using an omnidirectional antenna but in doing so would limit its ability to effectively re-use the priority channel within its own country.

** 5 mV/m is the domestic standard in several Region 2 countries for service in a station's primary market.

The following table gives a summary of the extent of service expected from a 10 kW station for a conductivity of 10 and 4 mS/m under the above assumptions which represent a worst-case situation.

Conductivity (mS/m)	Service (km)					Percentage of Nights
	Day		Night		E_u	
	Major Lobe	Null	Major Lobe	Null	mV/M	
10	32(1)	3(1)	12	1	45	10
10	35(2)	6(2)	22	2	18	50
4	20	4.5	9	0.5	45	10
4	20	4.5	15	1	18	50

(1) Limited by ground-wave interference.

(2) Assuming no ground-wave interference.

3.4 Conclusions

It is evident from the above that it would be feasible to assign a non-priority channel within 100 km of the border using a simple directional antenna and provide a reasonable service, if the priority channel assignment is limited to 10 kW.

It follows that careful use of simple directional antennas will permit multiple re-use of both priority and non-priority channels at intervals of 100 km or more.

4. Situation 2 - group of countries

To assess the feasibility of this allotment planning concept for a group of countries an example was taken where the ten channels would have to be distributed among ten relatively small countries located within a total range of 2 000 km.

In order to investigate optimum distribution of channels, several powers and E_u values were used to determine their effects on service areas. This is shown in Table VII-I for two ground conductivities: 4 and 10 mS/m.

It was considered that a 10 kW station with an omnidirectional antenna would be used for each priority channel, giving a night-time service range of 18 - 30 km, and a 1 kW station with an omnidirectional antenna would be used for non-priority channels, giving a night-time service range of 11 - 18 km.

The required distance separation for co-channel frequency re-use was as follows:

Priority/priority channel: 1 400 km

Priority/non-priority channel: 600 km

Non-priority/non-priority channel: 400 km

Smaller separations could be used for stations with lower power or smaller service areas as shown in Table VII-I.

TABLE VII-I

Effect on night service radius and co-channel separation of varying E_u or power

Service radius (km)		E_u (mV/m) (with 10 kW ND power E_c = 1 000 mV/m at 1 km)	Power (kW) (with E_u = 5 mV/m 50% of nights)	Co-channel separation (km)
10 mS/m	4 mS/m			
30	18	5	10	1,400
25	15.6	6.4	6.1	1,250
20	12.5	13.5	1.6	850
15	9	21.5	0.54	450
10	6.3	45(1)	0.12(3)	100(1),(2)
5	3.3	120(1)	0.017(3)	100(1),(2)

(1) The very high E_u values predicted at short separations are questionable because sky-wave propagation is unreliable.

(2) When separation distances are shortened without a corresponding reduction in power, ground wave interference should also be considered and it will affect day and night service equally.

(3) For E_u values of the order of 5 mV/m or more, sky-wave interference from stations with a power of 100 W or less can be ignored.

4.1 Findings

Based on the use of omnidirectional antennas, it was found that at least one priority and one non-priority channel could be allotted to each country. In any specific area, the shape and size of each country and the relative position of neighbouring countries will also have an effect on the number of allotments.

Two means of increasing the re-use of both priority and non-priority channels are the use of directional antennas, and a reduction of the service areas.

4.2 Conclusion

Allotment planning can be feasible in a group of countries, and would provide a minimum number of allotments if a sizable night-time service area is required. The use of directional antennas, or reduced service areas with omnidirectional antennas, would provide more allotments or would permit multiple use of the agreed allotments as the study in Situation 1 shows. A trade-off will have to be made between type of antenna, service and number of stations.

APPENDIX

Note 1 - The definitions given in chapter 1 of this report deviate to some extent from those given in the relevant CCIR texts, a reason being that they have been mainly taken from the texts of the Regional Administrative MF Broadcasting Conference (Region 2).

Taking into account that this Joint Interim Working Party report is specifically intended to provide the technical basis for a regional planning conference that will extend the radio broadcasting in Region 2 to the new band 1 605 - 1 705 kHz. The opinion of the CCIR was to retain these definitions in the report on the condition that they are not used to modify the existing CCIR texts.

Note 2 - The following values of protection ratios for the HF fixed service have been proposed by Study Group 3 at its final meeting, to replace these in the existing Table 9-I of chapter 9.

TABLE 9-I

Steady state protection ratios (dB)[1]

Wanted signal \ Interfering signal		A3E(BC)
A3E (fixed)	JU	6
	MC	18
	GC	39
A2A/A2B	$Pc < 10^{-6}$	5
F1B	$Pc < 10^{-6}$	-3
J2B	$Pc < 10^{-6}$	5
J3E	JU	-6
	MC	6
	GC	27
H2A/H2B	$Pc < 10^{-6}$	-1
Class of emission	Service[2] Grade	

1 Ratio of wanted-to-interfering signals whose powers are expressed in terms of p.e.p.(PX). [See Recommendation 240-3 (MOD F).]

2 GC (Good Commercial), MC (Marginally Commercial), JU (Just Usable) for speech communications and Pc (Probability of character error) for telegraph communications are used only in HF fixed service.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 4-E
13 January 1986
Original: English

PLENARY MEETING

United States of America

PROPOSALS FOR THE WORK OF THE CONFERENCE

INTRODUCTION

The United States of America is of the view that use of the 1605- 1705 kHz band by the MF broadcasting service can make a valuable contribution to a quality aural broadcasting service in Region 2. The United States plans to make extensive use of the expanded band for additional MF broadcasting stations, and has a strong interest in the successful planning of the band.

In order to meet the requirements for the most effective use of this band, the United States has:

--Developed technical, operational, and planning principles, permitting the most expeditious implementation of the expanded band, while satisfying the requirements of all countries on an equitable basis.

--Developed proposals involving a minimum of regulatory constraints with a maximum of flexibility, both in the development and implementation of any planning method, and the adoption of procedures permitting the growth of the AM broadcasting service in this expanded band in our Hemisphere.

The United States believes that, in order to achieve these objectives, the broadcasting standards to be applied to th band 1605-1705 kHz should be consistent with those applied to the existing MF broadcasting band. This view is predicated upon the belief that such consistency will facilitate the design of receiving equipment for use in the expanded band and expedite its availabilty to the public. Additionally, the location of the added broadcasting spectrum adjacent to the existing band provides the opportunity to treat both broadcasting segments in a similar manner, thereby expediting consolidation of the two bands into one.

The United States is proposing that the model that was used to develop the groundwave field strength curves for the existing MF broadcasting band be used for calculating the curves for the expanded band and is proposing a set of curves for adoption by the first session of the Conference. Similarly, the United States is proposing the adoption of a skywave propagation model that is basically the same as that used for the existing band with the addition of a latitude-dependent term to improve accuracy. The model being proposed is one of the methods considered by CCIR Interim Working Party 6/4.

One significant difference in what is being proposed for the expanded band and what is provided for in the 535-1605 kHz band is that the United States is not proposing to allow Class A stations or protection of secondary service. We will be submitting a separate proposal to the Conference on a planning method for use in the establishment of a broadcasting plan. Additional proposals will also be submitted to the Conference on inter-regional and intra-regional sharing, maximum power to be permitted for Class B stations, guidelines for a Region 2 agreement on use of the broadcasting service in the 1605-1705 kHz band, and a draft agenda for the second session of the Conference.

CHAPTER 1

The United States proposes the use of definitions in Chapter 1 of Annex 2 of the Rio de Janeiro Agreement wherever possible. Since the United States does not propose the use of this band for Class A stations, the definition of such a station or of secondary service would not be required.

Definitions and symbols

1. Definitions

In addition to the definitions given in the Radio Regulations, the following definitions and symbols apply to this Agreement.

USA/4/1 1.1 Broadcasting channel (AM)

A part of the frequency spectrum, equal to the necessary bandwidth of AM sound broadcasting stations, and characterized by the nominal value of the carrier frequency located at its center.

USA/4/2 1.2 Objectionable interference

Interference caused by a signal exceeding the maximum permissible field strength within the protected contour, in accordance with the values derived from this Annex.

USA/4/3 1.3 Protected contour

Continuous line that delimits the area of primary service which is protected from objectionable interference.

USA/4/4 1.4 Primary service area

Service area delimited by the contour within which the calculated level of the groundwave field strength is protected from objectionable interference in accordance with the provisions of Chapter 4.

[1.5 Secondary service area

This definition does not need to be included as such secondary service is not contemplated.]

USA/4/5 1.6 Nominal usable field strength (E_{nom})

Agreed minimum value of the field strength required to provide satisfactory reception, under specified conditions, in the presence of spheric noise, man-made noise and interference from other transmitters. The value of nominal usable field strength has been employed as the reference for planning.

USA/4/6 1.7 Usable field strength (E_u)

Minimum value of the field strength required to provide satisfactory reception under specified conditions in the presence of atmospheric noise, man-made noise, and interference in a real situation (or resulting from a frequency assignment plan).

USA/4/7 1.8 Audio-frequency (AF) protection ratio

Agreed minimum value of the audio-frequency signal-to-interference ratio corresponding to a subjectively defined reception quality. This ratio may have different values according to the type of service desired.

USA/4/8 1.9 Radio-frequency (RF) protection ratio

The desired radio-frequency signal-to-interference ratio which, in well-defined conditions, makes it possible to obtain the audio-frequency protection ratio at the output of a receiver. These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission characteristics (type and percent modulation, etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

[1.10 Class A station

This provision would not be included as stations providing secondary service are not contemplated.]

USA/4/9 1.11 Class B station

A station intended to provide coverage over one or more population centers and the contiguous rural areas located in its primary service area and which is protected against objectionable interference, accordingly.

USA/4/10 1.12 Class C station

A station intended to provide coverage over a city or town and the contiguous suburban areas located in its primary service area and which is protected against objectionable interference, accordingly.

USA/4/11 1.13 Daytime operation

Operation between the times of local sunrise and local sunset.

USA/4/12 1.14 Nighttime operation

Operation between the times of local sunset and local sunrise.

USA/4/13 1.15 Synchronized network

Two or more broadcasting stations whose carrier frequencies are identical and which broadcast the same program simultaneously.

In a synchronized network the difference in carrier frequency between any two transmitters in the network shall not exceed 0.1 Hz. The modulation delay between any two transmitters in the network shall not exceed 100 us, when measured at either transmitter site.

USA/4/14 1.16 Station power

Unmodulated carrier power supplied to the antenna.

USA/4/15 1.17 Groundwave

Electromagnetic wave which is propagated along the surface of the Earth or near it and which has not been reflected by the ionosphere.

USA/4/16 1.18 Skywave

Electromagnetic wave which has been reflected by the ionosphere.

[1.19 Skywave field strength, 10% of the time.

This provision would not be included, as there is no need to include 10% skywave calculations.]

USA/4/17 1.20 Skywave field strength, 50% of the time

The skywave field strength during the reference hour which is not exceeded for 50% of the nights of the year. The reference hour is the period of one hour beginning one and a half hours after sunset and ending two and a half hours after sunset at the midpoint of the short great-circle path.

USA/4/18 1.21 Characteristic field strength (E_c)

The field strength, at a reference distance of 1 km in a horizontal direction, of the groundwave signal propagated along perfectly conducting ground for 1 kW station power, taking into account losses in a real antenna.

Notes: a) The gain (G) of the transmitting antenna relative to an ideal short vertical antenna is given, in dB, by the following equation:

$$G = 20 \log \frac{E_c}{300}$$

Where E_c is in units of mV/m.

b) The effective monopole radiated power (e.m.r.p.) is given in dB(1 kW) by the following equation:

$$\text{e.m.r.p.} = 10 \log P_t + G$$

Where P_t is the station power in kW.

2. Symbols

Hz	:	hertz
kHz	:	kilohertz
W	:	watt
kW	:	kilowatt
mV/m	:	millivolt/meter
uV/m	:	microvolt/meter
dB	:	decibel
dB(uV/m)	:	decibels with respect to 1 uV/m
dB(kW)	:	decibels with respect to 1 kW
mS/m	:	millisiemens/meter

CHAPTER 2

At the first session of the Regional Administrative MF Broadcasting Conference (Region 2) held in Buenos Aires in 1980, a set of groundwave field strength curves were tentatively adopted for use in Region 2. These curves were formally adopted at the second session of the conference in Rio de Janeiro in 1981. The view of the United States is that the model developed for the above purpose can be used for calculating the curves for the expanded band. It is proposed that a graph depicting a set of curves calculated for 1655 kHz be applied to the band 1605 - 1705 kHz.

Groundwave propagation

2.1 Ground conductivity

USA/4/19 2.1.1 It is proposed that the Atlas of Ground Conductivity for use in the band 1605 - 1705 kHz be based on the information communicated to the IFRB in connection with the Second Session of the Regional Administrative MF Broadcasting Conference (Region 2), Rio de Janeiro, 1981, along with the modifications introduced during the First Session of the Planning Conference to plan the band 1605 - 1705 kHz (Geneva, 1986).

Furthermore, the following provisions should be included in the technical annex to the Agreement.

USA/4/20 (a) When an administration notifies to the IFRB data intended to modify the Atlas, the IFRB shall so inform all administrations having assignments in Region 2. After 90 days from the date on which this information is communicated by the IFRB, the IFRB shall modify the Atlas and communicate the modifications to all administrations.

USA/4/21 (b) No assignment in the Plan shall at any time be required to be modified as a result of the incorporation of these data.

USA/4/22 (c) A proposal to modify the Plan shall be evaluated on the basis of the values in the Atlas on the date the proposal was received by the IFRB.

USA/4/23 2.2 Field strength curves for groundwave propagation

The curves shown on Graph 1 are to be used for determining groundwave propagation in the frequency range 1605-1705 kHz. They are labelled with the ground conductivities in millisiemens/metre. All the curves, except the 5000 mS/m (sea water) curve, are derived for a relative dielectric constant of 15. The sea water curve is derived for a dielectric constant of 80.

2.3 Calculation of groundwave field strength

USA/4/24 2.3.1 Homogeneous paths

The vertical component of the field strength for a homogeneous path is represented in these graphs as a function of distance, for various values of ground conductivity.

The distance in kilometers is shown on a logarithmic scale on the abscissa. The field strength is shown on a linear scale on the ordinate in decibels above 1 uV/m. Graph 1 is standardized for a characteristic field strength of 100 mV/m corresponding to an effective monopole radiated power (e.m.r.p.) of -9.5 dB relative to 1 kW. The straight line marked "100 mV/m at 1 km" is the field strength on the assumption that the antenna is erected on a surface of perfect conductivity.

For omnidirectional antenna systems having a different characteristic field strength, correction must be made according to the following equations:

$$E = E_o \times \frac{E_c}{100} \times \sqrt{P}$$

if field strengths are expressed in mV/m, and

$$E = E_o + E_c - 100 + 10 \log P$$

if field strengths are expressed in dB(uV/m).

For directional antenna systems, the correction must be made according to the following equations:

$$E = E_o \times \frac{E_R}{100}$$

if field strengths are expressed in mV/m, and

$$E = E_o + E_R - 100$$

if field strengths are expressed in dB(uV/m).

Where E : resulting field strength

E_o : field strength read from graph 1

E_R : actual radiated field strength at a particular azimuth at 1 km

E_c : characteristic field strength

P : station power in kW.

Graph 2 consists of three pairs of scales to be used with Graph 1. Each pair contains one scale labelled in decibels and another in millivolts per meter. Each pair can be cut out and trimmed as a unit to be used as sliding ordinate scales. The scales allow graphical conversion between decibels and millivolts per meter, and are used to make graphical determinations of field strengths. Other methods of making calculations on graph 1 may be used, including the use of dividers to adjust for values of E_R that differ from 100 mV/m at 1 km. However, any method used will follow steps similar to those discussed below.

For both omnidirectional and directional antenna systems the value of E_R must be found. For omnidirectional systems E_R can be determined by using the following equations:

$$E_R = E_c \sqrt{P}$$

if field strengths are expressed in mV/m, and

$$E_R = E_c + 10 \log P$$

if field strengths are expressed in dB(uV/m).

To determine the field strength at a given distance, the scale is placed at the given distance with the 100 dB(uV/m) point of the scale resting on the appropriate conductivity curve. The value of E_R is then found on the scale; the point on the underlying graph (which lies underneath the E_R point of the scale) yields the field strength at the given distance.

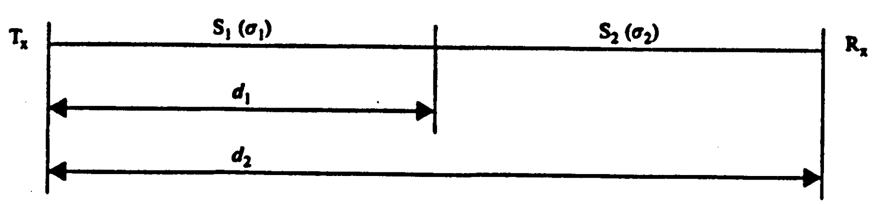
To determine the distance at a given field strength, the E_R value is found on the sliding scale and that point is placed directly at the level of the given field strength on the appropriate graph. The scale is then moved horizontally until the 100 dB(uV/m) point of the scale coincides with the applicable conductivity curve. The distance may then be read from the abscissa of the underlying graph.

Note: Annex E to the Report by the First Session of the Conference, Buenos Aires, 1980 (RARC-80) contains a mathematical discussion relating to the calculation of the groundwave curves.

USA/4/25 2.3.2 <u>Non-homogeneous paths</u>

In this case, the equivalent distance or Kirke method is to be used. To apply this method, graph 1 can also be used.

Consider a path whose sections S_1 and S_2 have endpoint lengths corresponding to d_1 and d_2-d_1, and conductivities σ_1 and σ_2 respectively, as shown on the following figure:



The method is applied as follows:

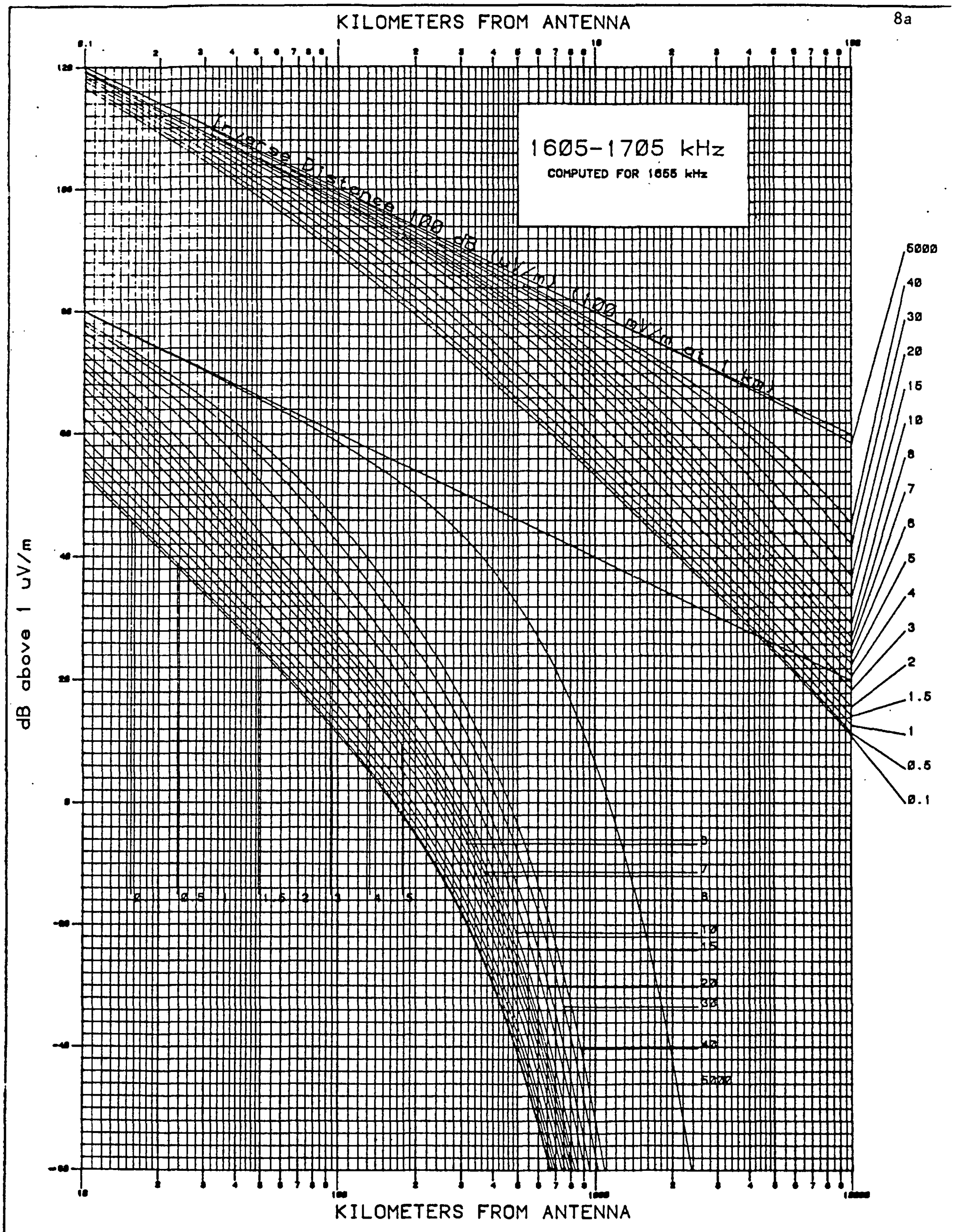
a) Taking section S_1 first, we read the field strength corresponding to conductivity σ_1 at distance d_1 on the graph corresponding to the operational frequency.

b) As the field strength remains constant at the soil discontinuity, the value immediately after the point of discontinuity must be equal to that obtained in a) above. As the conductivity of the second section is σ_2, the curve corresponding to conductivity σ_2 gives the equivalent distance to that which would be obtained at the same field strength arrived at in a). This equivalent distance is d. Distance d is larger than d_1 when σ_2 is larger than σ_1. Otherwise d is less than d_1.

c) The field strength at the real distance d_2 is determined by taking note of the corresponding curve for conductivity σ_2 similar to that obtained at equivalent distance $d + (d_2 - d_1)$.

d) For successive sections with different conductivities, procedures b) and c) are repeated.

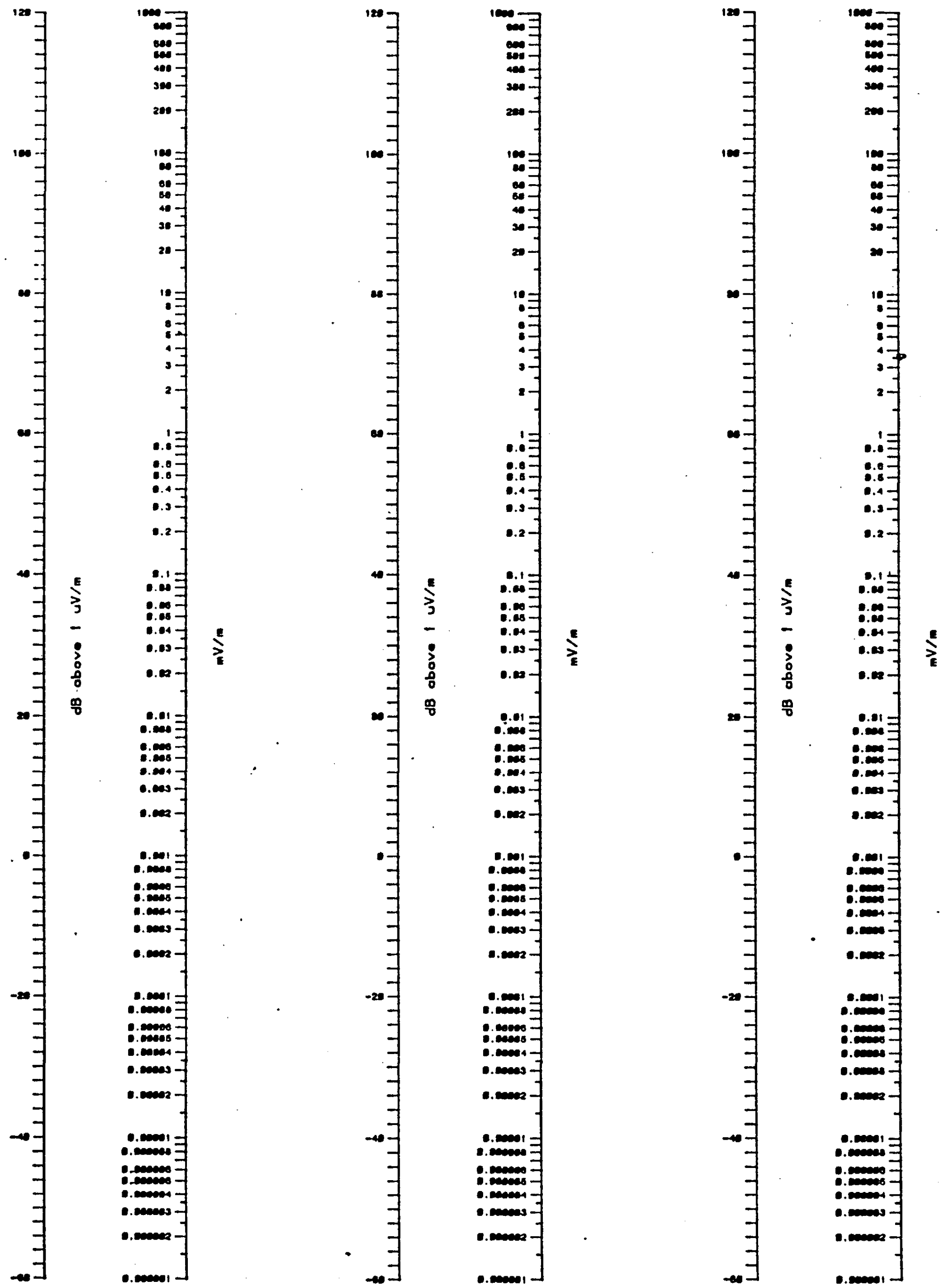
USA/4/26



GRAPH 1 - Ground wave field strength versus distance

USA/4/27

8b



GRAPH 2 - Scale for use with ground wave field field strength graph 1

CHAPTER 3

The importance of skywave propagation at these frequencies is two-fold. Because of the disadvantageous groundwave propagation characteristics of the expanded band, the distance to a given groundwave signal contour is reduced substantially. As a result, unrealistic night-time limits imposed by skywave interference can inappropriately restric a station's ability to provide adequate night-time coverage. Moreover, the skywave effects can extend beyond Region 2, an issue which needs to be considered when determining maximum permissible power limits. It is important to recognize that this band is to be shared by different services in different Regions of the ITU. Within ITU Region 2, this band is to be shared by broadcasting and two permitted services. Also, inter-regional sharing between different services requires an accurate skywave prediction method. Recognizing these points, the CCIR established in 1983 an interim working party--IWP 6/4. CITEL has also invited administrations to conduct necessary studies and to coordinate their views with IWP 6/4. As a result of these efforts, a propagation method was developed. It is closely based on the Region 2 method but with the inclusion of a latitude dependent term. This method has the advantage of improving accuracy while maintaining simplicity and compatability with the Region 2 method. For these reasons, the United States proposes that this method, which is described below, be used in the band 1605 - 1705 kHz.

Skywave propagation

JSA/4/28 3.1 List of symbols

d : short great-circle path distance (km)

E_c : characteristic field strength, mV/m at 1 km for 1 kW

$f(\theta)$: radiation as a fraction of the value $\theta = 0$ (when $\theta = 0$, $f(\theta) = 1$)

f : frequency (kHz)

F : unadjusted annual median skywave field strength, in dB(uV/m)

F_c : field strength for a characteristic field strength of 100 mV/m at 1 km

$F(50)$: skywave field strength, 50% of the time, in dB(uV/m)

P: station power (kW)

θ : elevation angle from the horizontal (degrees)

a_T: geographic latitude of the transmitting terminal (degrees)

a_R: geographic latitude of the receiving terminal (degrees)

b_T: geographic longitude of the transmitting terminal (degrees)

b_R: geographic longitude of the receiving terminal (degrees)

ϕ_T: geomagnetic latitude of the transmitting terminal (degrees)

ϕ_R: geomagnetic latitude of the receiving terminal (degrees)

ϕ: average geomagnetic latitude of a path under study (degrees)

Note: North and east are considered positive, south and west negative.

USA/4/29 3.2 General procedure

Radiation in the horizontal plane of an omnidirectional antenna fed with 1 kW (characteristic field strength, E_c) is known either from design data or, if the actual design data are not available, from Figure 1.

Elevation angle θ is given by

$$\theta = \arc\tan\left(0.00752 \cot \frac{d}{444.54}\right) - \frac{d}{444.54} \quad \text{degrees} \tag{1}$$

$$0 \leq \theta \leq 90°$$

Alternatively, Table 1 of Fig. 2 may be used.

It is assumed that the Earth is a smooth sphere with an effective radius of 6,367.6 km and that reflections occur from an ionospheric height of 96.5 km.

The radiation f(θ) expressed as a fraction of the value at θ = 0 at a pertinent elevation angle θ can be determined from Fig. 3 or Table II.

The product $E_c f(\theta) \sqrt{P}$ is thus determined for an omnidirectional antenna. For a directional antenna, $E_c f(\theta) \sqrt{P}$ can be determined from the antenna radiation pattern. $E_c F(\theta) \sqrt{P}$ is the field strength at 1 km at the appropriate elevation angle and azimuth.

The unadjusted skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c\ f(\theta)\ \sqrt{P}}{100} \quad \text{dB(uV/m)} \tag{2}$$

F_c is given by:

$$F_c = (95-20 \log d)-(2 + 4.95 \tan^2 \phi)(d/1000)^{1/2} \text{ dB (uV/m)} \tag{3}$$

Figure 4 and Table III show F_c for selected latitudes. If $|\phi|$ is greater than 60 degrees, equation (3) is evaluated for $|\phi|$ = 60 degrees. If d is less than 200 km, equation (3) is evaluated for d=200 km. However, the actual great-circle distance is to be used in determining elevation angle. See section 3.4 for calculation of great-circle distance and conversion from geographic latitude to geomagnetic latitude.

Note: Values of F_c are normalized to 100 mV/m at 1 km corresponding to an effective monople radiated power (e.m.r.p.) of -9.54 dB(kW).

USA/4/30 3.3 Skywave field strength, 50% of the time

This is given by:

$$F(50) = F \quad dB(uV/m) \qquad (4)$$

USA/4/31 3.4 Path parameters

Refer to section 3.1. The great-circle distance d (km) is given by:

$$d = 111.18 \text{ arc cos}[\sin a_T \sin a_R + \cos a_T \cos a_R \cos (b_R - b_T)] \qquad (5)$$

The geomagnetic latitude of the transmitting terminal, ϕ_T, is given by:

$$\phi_T = \text{arc sin } [\sin a_T \sin 78.5° + \cos a_T \cos 78.5° \cos (69° + b_T)] \qquad (6)$$

ϕ_R can be determined in a similar manner. And,

$$\phi = \tfrac{1}{2} (\phi_T + \phi_R) \qquad (7)$$

Alternatively, Figure 5 may be used.

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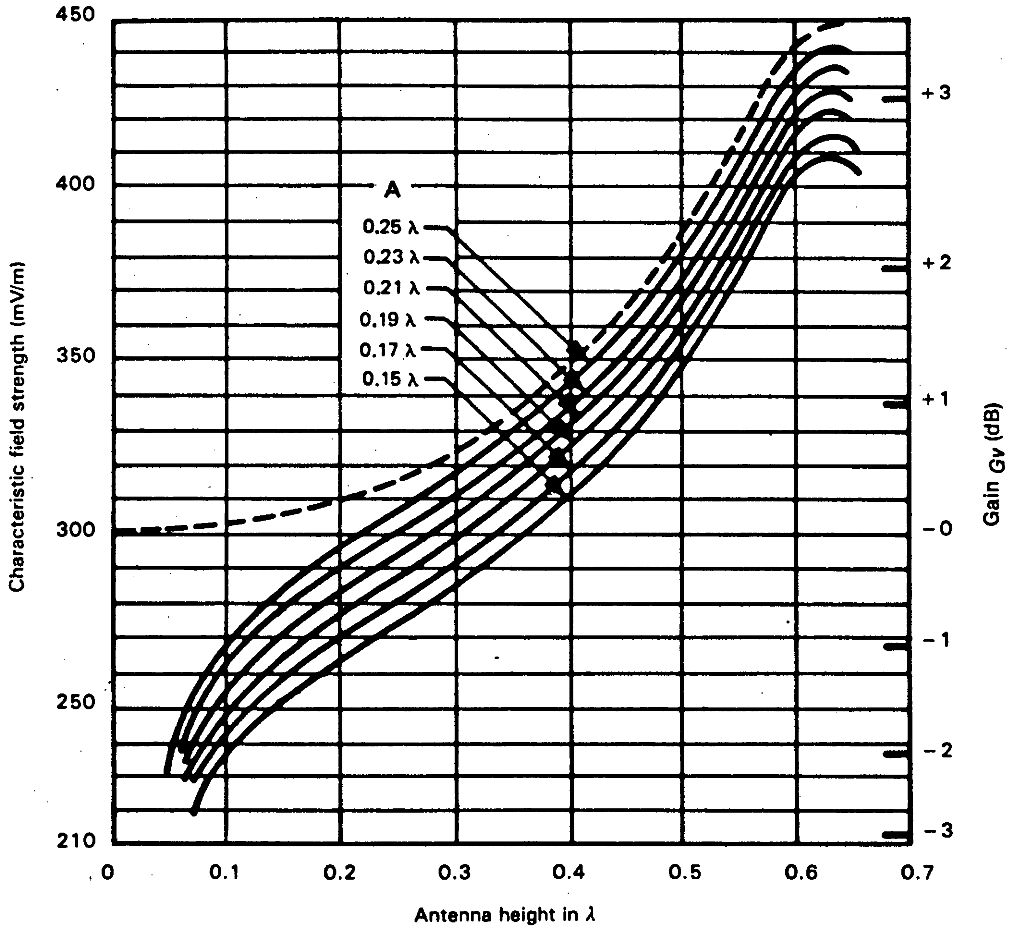
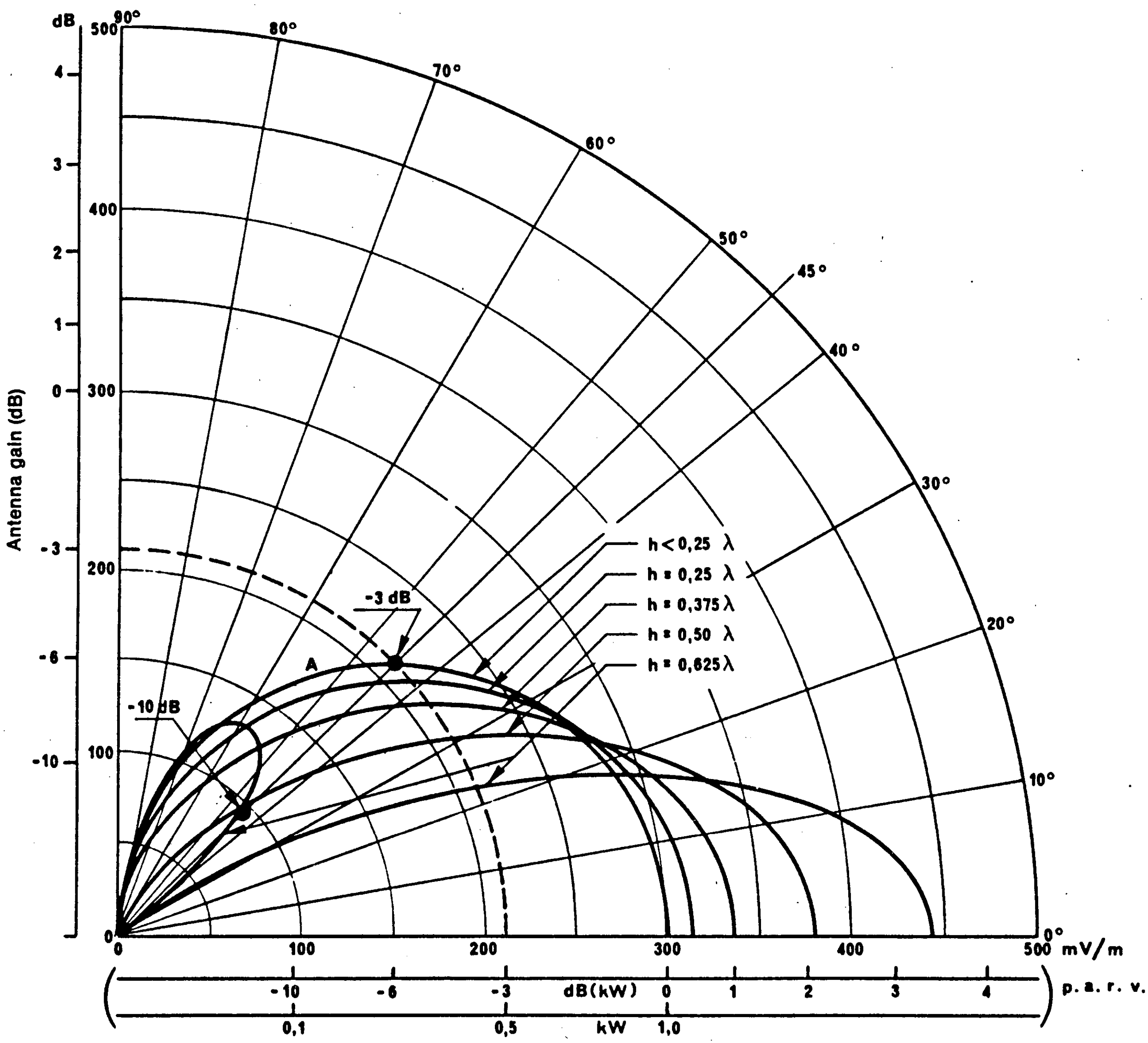


A: Radius of ground system
Full lines: Real antenna correctly designed
Dashed line: Ideal antenna on a perfectly conducting ground

FIGURE 1 – *Characteristic field strengths for simple vertical antennas, using 120-radial ground systems*

USA/4/33



A: Short vertical antenna

FIGURE 1*a* – *Effective monopole radiated power (e.m.r.p.) and field strength at a distance of 1 km as a function of elevation angle, for different heights of vertical antennas assuming a transmitter power of 1 kW*

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TABLE I – *Elevation angle vs distance*

Distance (km)	Elevation angle (degrees)
50	75.3
100	62.2
150	51.6
200	43.3
250	36.9
300	31.9
350	27.9
400	24.7
450	22.0
500	19.8
550	18.0
600	16.3
650	14.9
700	13.7
750	12.6
800	11.7
850	10.8
900	10.0
950	9.3
1000	8.6
1050	8.0
1100	7.4
1150	6.9
1200	6.4
1250	5.9
1300	5.4
1350	5.0
1400	4.6
1450	4.3
1500	3.9
1550	3.5
1600	3.2
1650	2.9
1700	2.6
1750	2.3
1800	2.0
1850	1.7
1900	1.5
1950	1.2
2000	1.0
2050	0.7
2100	0.5
2150	0.2
2200	0.0
2250	0.0
2300	0.0
2350	0.0
2400	0.0

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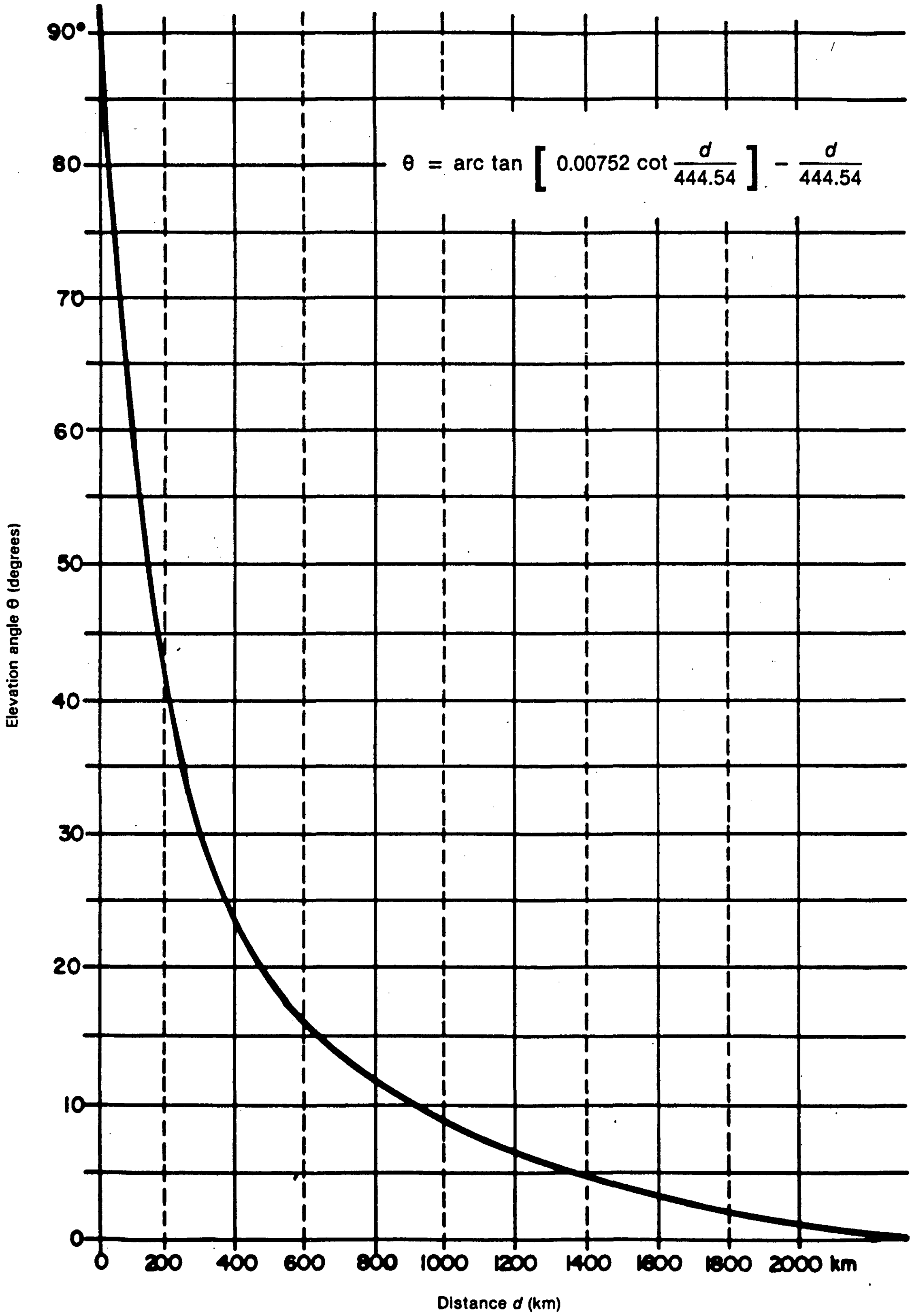

FIGURE 2 – *Elevation angle vs distance*

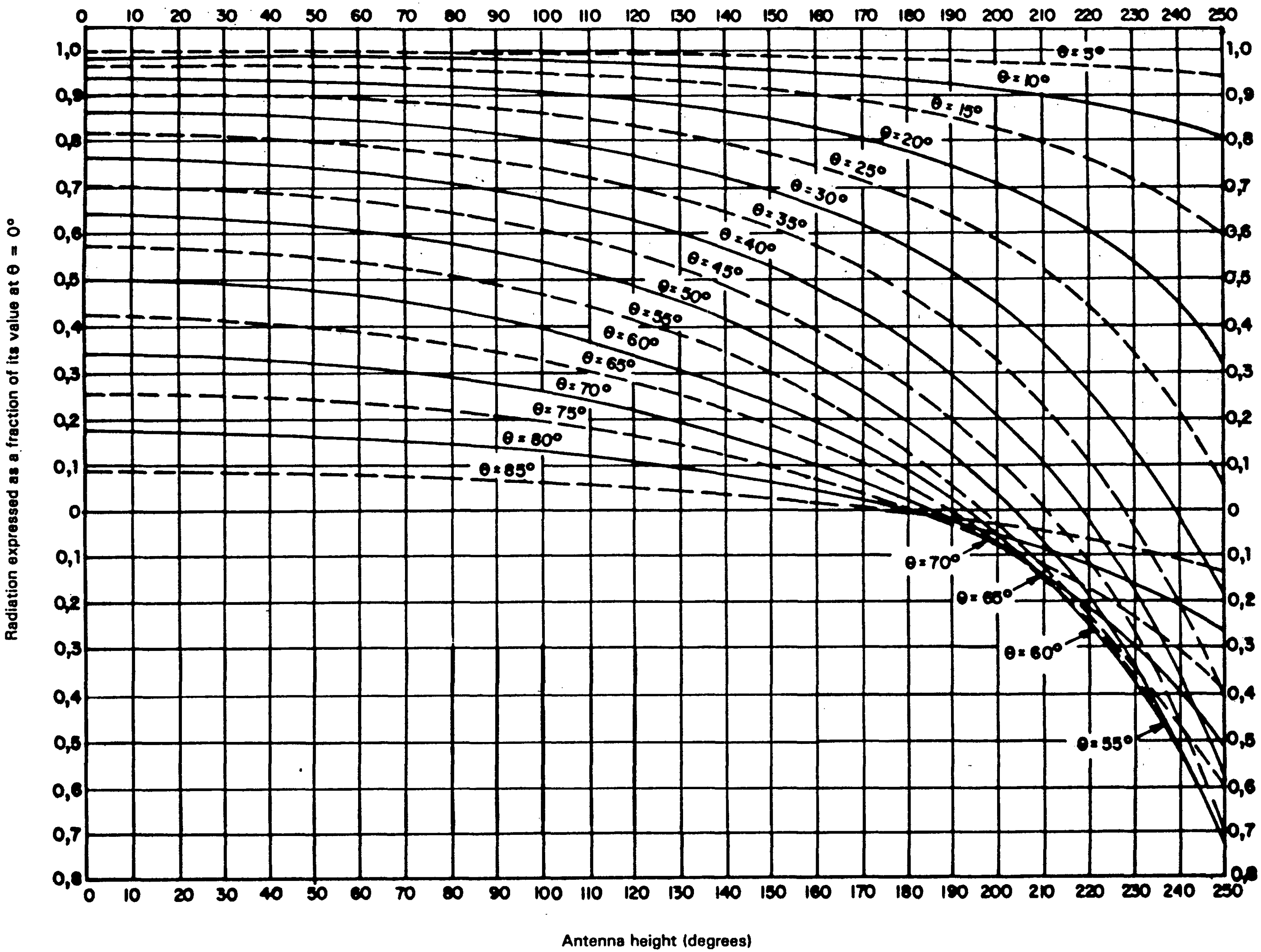

FIGURE 3 – *Vertical plane radiation of simple vertical antennas as a function of electrical tower height for various values of elevation angle (θ)*

USA/4/37

TABLE II – *f(θ) values for simple vertical antennas*

Elevation angle (degrees)	f(θ)					
	0.11 λ	0.13 λ	0.15 λ	0.17 λ	0.19 λ	0.21 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.999	0.998	0.998	0.998	0.998	0.998
4	0.997	0.997	0.997	0.997	0.997	0.997
5	0.996	0.996	0.996	0.995	0.995	0.995
6	0.994	0.994	0.994	0.993	0.993	0.993
7	0.992	0.992	0.991	0.991	0.991	0.990
8	0.989	0.989	0.989	0.988	0.988	0.987
9	0.987	0.986	0.986	0.985	0.985	0.984
10	0.984	0.983	0.983	0.982	0.981	0.980
11	0.980	0.980	0.979	0.978	0.977	0.976
12	0.976	0.976	0.975	0.974	0.973	0.971
13	0.972	0.972	0.971	0.969	0.968	0.967
14	0.968	0.967	0.966	0.965	0.963	0.961
15	0.963	0.962	0.961	0.959	0.958	0.956
16	0.958	0.957	0.956	0.954	0.952	0.950
17	0.953	0.952	0.950	0.948	0.945	0.943
18	0.947	0.946	0.944	0.942	0.940	0.937
19	0.941	0.940	0.938	0.935	0.933	0.930
20	0.935	0.933	0.931	0.929	0.926	0.922
22	0.922	0.920	0.917	0.914	0.911	0.907
24	0.907	0.905	0.902	0.898	0.894	0.890
26	0.892	0.889	0.885	0.882	0.877	0.872
28	0.875	0.872	0.868	0.864	0.858	0.852
30	0.857	0.854	0.849	0.844	0.839	0.832
32	0.838	0.834	0.830	0.824	0.818	0.811
34	0.819	0.814	0.809	0.803	0.795	0.789
36	0.798	0.793	0.788	0.781	0.774	0.766
38	0.776	0.771	0.765	0.758	0.751	0.742
40	0.753	0.748	0.742	0.735	0.725	0.717
42	0.730	0.724	0.718	0.710	0.702	0.692
44	0.705	0.700	0.693	0.685	0.676	0.666
46	0.680	0.674	0.667	0.659	0.650	0.639
48	0.654	0.648	0.641	0.633	0.623	0.612
50	0.628	0.621	0.614	0.606	0.596	0.585
52	0.600	0.594	0.587	0.578	0.568	0.557
54	0.572	0.566	0.559	0.550	0.540	0.529
56	0.544	0.537	0.530	0.521	0.512	0.501
58	0.515	0.508	0.501	0.493	0.483	0.472
60	0.485	0.479	0.472	0.463	0.454	0.443

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TABLE II *(continued)*

Elevation angle (degrees)	$f(\theta)$					
	0.23 λ	0.25 λ	0.27 λ	0.29 λ	0.311 λ	0.35 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.998	0.998	0.998	0.998	0.998	0.997
4	0.997	0.996	0.996	0.996	0.996	0.995
5	0.995	0.994	0.994	0.994	0.993	0.992
6	0.992	0.992	0.991	0.991	0.990	0.989
7	0.990	0.989	0.988	0.988	0.987	0.985
8	0.987	0.986	0.985	0.984	0.983	0.980
9	0.983	0.982	0.981	0.980	0.978	0.975
10	0.979	0.978	0.977	0.975	0.973	0.969
11	0.975	0.973	0.972	0.970	0.968	0.963
12	0.970	0.968	0.966	0.964	0.962	0.955
13	0.965	0.963	0.961	0.958	0.955	0.949
14	0.959	0.957	0.955	0.952	0.948	0.941
15	0.953	0.951	0.948	0.945	0.941	0.932
16	0.947	0.944	0.941	0.937	0.933	0.924
17	0.941	0.937	0.934	0.930	0.925	0.914
18	0.934	0.930	0.926	0.921	0.916	0.904
19	0.926	0.922	0.918	0.913	0.907	0.894
20	0.919	0.914	0.909	0.904	0.898	0.883
22	0.902	0.897	0.891	0.885	0.877	0.861
24	0.885	0.879	0.872	0.865	0.856	0.837
26	0.866	0.859	0.852	0.843	0.833	0.811
28	0.846	0.833	0.830	0.820	0.809	0.795
30	0.825	0.816	0.807	0.797	0.784	0.758
32	0.803	0.794	0.784	0.772	0.759	0.729
34	0.780	0.770	0.759	0.747	0.732	0.701
36	0.756	0.746	0.734	0.721	0.705	0.671
38	0.732	0.720	0.708	0.694	0.677	0.642
40	0.706	0.695	0.681	0.667	0.649	0.612
42	0.681	0.668	0.654	0.639	0.621	0.582
44	0.654	0.641	0.627	0.611	0.593	0.552
46	0.628	0.614	0.600	0.583	0.564	0.523
48	0.600	0.587	0.572	0.555	0.536	0.494
50	0.573	0.559	0.544	0.527	0.507	0.465
52	0.545	0.531	0.515	0.498	0.479	0.436
54	0.517	0.503	0.487	0.470	0.451	0.408
56	0.488	0.474	0.459	0.442	0.423	0.381
58	0.460	0.446	0.431	0.414	0.395	0.354
60	0.431	0.418	0.403	0.387	0.368	0.328

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TABLE II *(end)*

Elevation angle (degrees)	$f(\theta)$					
	0.40 λ	0.45 λ	0.50 λ	0.528 λ	0.55 λ	0.625 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	0.999	0.999	0.999	0.999
2	0.998	0.998	0.998	0.997	0.997	0.995
3	0.997	0.996	0.995	0.994	0.993	0.989
4	0.994	0.992	0.990	0.989	0.988	0.981
5	0.991	0.988	0.985	0.983	0.981	0.970
6	0.986	0.983	0.979	0.975	0.972	0.957
7	0.982	0.977	0.971	0.967	0.962	0.941
8	0.976	0.970	0.962	0.957	0.951	0.924
9	0.970	0.963	0.953	0.945	0.938	0.904
10	0.963	0.954	0.942	0.933	0.924	0.882
11	0.955	0.945	0.930	0.919	0.909	0.859
12	0.947	0.934	0.917	0.905	0.893	0.834
13	0.938	0.923	0.903	0.889	0.875	0.807
14	0.929	0.912	0.889	0.872	0.857	0.773
15	0.918	0.899	0.873	0.855	0.837	0.748
16	0.908	0.886	0.857	0.836	0.815	0.717
17	0.897	0.873	0.840	0.817	0.795	0.684
18	0.885	0.859	0.823	0.797	0.772	0.651
19	0.873	0.844	0.804	0.776	0.749	0.617
20	0.860	0.828	0.785	0.755	0.726	0.582
22	0.833	0.796	0.746	0.710	0.677	0.510
24	0.805	0.763	0.705	0.665	0.625	0.436
26	0.776	0.728	0.663	0.618	0.574	0.363
28	0.745	0.692	0.621	0.570	0.522	0.290
30	0.714	0.655	0.577	0.522	0.470	0.219
32	0.682	0.619	0.534	0.475	0.419	0.151
34	0.649	0.582	0.492	0.428	0.368	0.085
36	0.617	0.545	0.450	0.383	0.321	0.025
38	0.584	0.509	0.409	0.340	0.275	−0.031
40	0.552	0.473	0.370	0.298	0.231	−0.083
42	0.519	0.438	0.332	0.258	0.190	−0.129
44	0.488	0.405	0.296	0.221	0.152	−0.170
46	0.457	0.372	0.262	0.187	0.117	−0.205
48	0.427	0.341	0.230	0.155	0.085	−0.235
50	0.397	0.311	0.201	0.126	0.056	−0.259
52	0.369	0.283	0.174	0.099	0.031	−0.278
54	0.341	0.257	0.149	0.076	0.009	−0.291
56	0.315	0.232	0.126	0.055	−0.010	−0.300
58	0.289	0.208	0.105	0.037	−0.026	−0.304
60	0.265	0.186	0.087	0.021	−0.039	−0.304
62				0.003	−0.049	−0.300
64				−0.003	−0.056	−0.292
66				−0.011	−0.062	−0.281
68				−0.017	−0.064	−0.267
70				−0.022	−0.065	−0.250
72				−0.025	−0.064	−0.231
74				−0.026	−0.061	−0.210
76				−0.026	−0.056	−0.138
78				−0.024	−0.051	−0.163
80				−0.022	−0.044	−0.138

Note – When the negative sign (−) appears in the Table, it signifies only the existence of a secondary lobe having the opposite phase from the main lobe in the vertical radiation pattern. In order to perform the calculation, ignore the negative (−) and use only the absolute value $f(\theta)$ from the Table.

TABLE III - Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m.

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
0-200	46.17	203.4574	46.01	199.7683	45.43	186.8867	43.96	157.6842	39.53	94.7147
250	43.90	156.6680	43.72	153.4954	43.07	142.4722	41.42	117.8230	36.47	66.6392
300	42.02	126.1266	41.82	123.3314	41.11	113.6631	39.30	92.3093	33.88	49.4450
350	40.40	104.7304	40.19	102.2257	39.43	93.5977	37.47	74.7566	31.62	38.0894
400	38.98	88.9709	38.76	86.6981	37.94	78.8988	35.85	62.0462	29.59	30.1752
450	37.72	76.9207	37.48	74.8381	36.61	67.7174	34.40	52.4825	27.76	24.4320
500	36.58	67.4351	36.33	65.5120	35.41	58.9589	33.08	45.0689	26.08	20.1307
550	35.53	59.7930	35.27	58.0059	34.31	51.9358	31.86	39.1832	24.52	16.8266
600	34.57	53.5183	34.29	51.8487	33.29	46.1953	30.74	34.4183	23.07	14.2352
650	33.68	48.2840	33.39	46.7172	32.35	41.4276	29.69	30.4974	21.70	12.1669
700	32.84	43.8589	32.54	42.3829	31.46	37.4139	28.70	27.2260	20.42	10.4915
750	32.06	40.0746	31.75	38.6794	30.63	33.9955	27.77	24.4640	19.20	9.1169
800	31.32	36.8059	31.00	35.4833	29.84	31.0547	26.89	22.1079	18.04	7.9764
850	30.62	33.9579	30.29	32.7007	29.10	28.5022	26.06	20.0797	16.93	7.0208
900	29.95	31.4572	29.62	30.2595	28.39	26.2696	25.26	18.3198	15.87	6.2133
950	29.32	29.2464	28.98	28.1030	27.71	24.3030	24.50	16.7818	14.85	5.5255
1000	28.72	27.2798	28.36	26.1861	27.07	22.5601	23.77	15.4291	13.87	4.9356
1050	28.14	25.5207	27.77	24.4729	26.45	21.0066	23.07	14.2325	12.92	4.4265
1100	27.58	23.9394	27.21	22.9339	25.85	19.6150	22.39	13.1684	12.01	3.9845
1150	27.05	22.5115	26.67	21.5451	25.28	18.3625	21.74	12.2177	11.12	3.5988
1200	26.53	21.2165	26.14	20.2866	24.73	17.2306	21.11	11.3645	10.27	3.2607
1250	26.04	20.0378	25.64	19.1418	24.19	16.2036	20.50	10.5958	9.43	2.9628
1300	25.56	18.9609	25.15	18.0967	23.68	15.2685	19.91	9.9007	8.63	2.6995
1350	25.09	17.9741	24.68	17.1396	23.18	14.4142	19.34	9.2699	7.84	2.4657

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
1400	24.64	17.0669	24.22	16.2603	22.69	13.6313	18.79	8.6958	7.07	2.2574
1450	24.21	16.2306	23.78	15.4503	22.22	12.9119	18.25	8.1716	6.32	2.0713
1500	23.78	15.4577	23.35	14.7021	21.76	12.2490	17.72	7.6916	5.60	1.9045
1550	23.37	14.7416	22.93	14.0094	21.32	11.6367	17.21	7.2512	4.88	1.7544
1600	22.97	14.0766	22.52	13.3665	20.88	11.0698	16.71	6.8459	4.19	1.6192
1650	22.58	13.4577	22.12	12.7687	20.46	10.5438	16.22	6.4722	3.50	1.4970
1700	22.20	12.8806	21.74	12.2115	20.05	10.0547	15.74	6.1268	2.84	1.3862
1750	21.83	12.3415	21.36	11.6913	19.64	9.5991	15.28	5.8071	2.18	1.2857
1800	21.46	11.8369	20.99	11.2046	19.25	9.1739	14.82	5.5104	1.54	1.1942
1850	21.11	11.3638	20.63	10.7487	18.87	8.7763	14.38	5.2347	0.91	1.1107
1900	20.76	10.9196	20.27	10.3208	18.49	8.4041	13.94	4.9780	0.29	1.0345
1950	20.43	10.5018	19.93	9.9186	18.12	8.0549	13.51	4.7386	-0.31	0.9648
2000	20.09	10.1084	19.59	9.5401	17.76	7.7270	13.09	4.5151	-0.91	0.9008
2050	19.77	9.7373	19.26	9.1832	17.41	7.4185	12.68	4.3060	-1.49	0.8421
2100	19.45	9.3869	18.94	8.8465	17.06	7.1280	12.28	4.1102	-2.07	0.7880
2150	19.14	9.0555	18.62	8.5282	16.72	6.8540	11.88	3.9265	-2.64	0.7382
2200	18.83	8.7419	18.30	8.2271	16.38	6.5953	11.49	3.7541	-3.19	0.6923
2250	18.53	8.4446	18.00	7.9419	16.06	6.3508	11.11	3.5919	-3.74	0.6499
2300	18.24	8.1626	17.70	7.6714	15.73	6.1194	10.73	3.4393	-4.28	0.6106
2350	17.95	7.8947	17.40	7.4147	15.42	5.9002	10.36	3.2955	-4.82	0.5743
2400	17.66	7.6400	17.11	7.1708	15.11	5.6923	9.99	3.1599	-5.34	0.5405
2450	17.38	7.3977	16.83	6.9388	14.80	5.4949	9.63	3.0318	-5.86	0.5092
2500	17.11	7.1669	16.54	6.7179	14.50	5.3075	9.28	2.9107	-6.37	0.4801
2550	16.84	6.9468	16.27	6.5075	14.20	5.1292	8.93	2.7962	-6.88	0.4530

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
2600	16.57	6.7369	16.00	6.3068	13.91	4.9594	8.59	2.6877	-7.38	0.4278
2650	16.31	6.5364	15.73	6.1152	13.62	4.7978	8.25	2.5849	-7.87	0.4042
2700	16.05	6.3448	15.46	5.9323	13.34	4.6436	7.91	2.4873	-8.35	0.3823
2750	15.79	6.1616	15.20	5.7574	13.06	4.4966	7.59	2.3948	-8.83	0.3617
2800	15.54	5.9862	14.95	5.5901	12.78	4.3562	7.26	2.3068	-9.31	0.3425
2850	15.30	5.8183	14.70	5.4299	12.51	4.2220	6.94	2.2231	-9.77	0.3246
2900	15.05	5.6573	14.45	5.2765	12.24	4.0937	6.62	2.1435	-10.24	0.3077
2950	14.81	5.5029	14.20	5.1295	11.98	3.9709	6.31	2.0677	-10.69	0.2919
3000	14.57	5.3547	13.96	4.9884	11.72	3.8534	6.00	1.9955	-11.15	0.2771
3050	14.34	5.2125	13.72	4.8530	11.46	3.7408	5.70	1.9267	-11.59	0.2632
3100	14.11	5.0758	13.48	4.7230	11.20	3.6328	5.39	1.8610	-12.04	0.2501
3150	13.88	4.9444	13.25	4.5981	10.95	3.5293	5.10	1.7982	-12.47	0.2379
3200	13.66	4.8180	13.02	4.4779	10.71	3.4299	4.80	1.7383	-12.91	0.2263
3250	13.44	4.6963	12.79	4.3624	10.46	3.3345	4.51	1.6810	-13.34	0.2154
3300	13.22	4.5792	12.57	4.2512	10.22	3.2428	4.22	1.6262	-13.76	0.2051
3350	13.00	4.4663	12.35	4.1441	9.98	3.1546	3.94	1.5738	-14.18	0.1954
3400	12.78	4.3575	12.13	4.0409	9.74	3.0698	3.66	1.5236	-14.60	0.1863
3450	12.57	4.2526	11.91	3.9414	9.51	2.9883	3.38	1.4755	-15.01	0.1776
3500	12.36	4.1514	11.70	3.8455	9.28	2.9097	3.10	1.4294	-15.42	0.1695
3550	12.16	4.0537	11.49	3.7529	9.05	2.8341	2.83	1.3852	-15.82	0.1618
3600	11.95	3.9593	11.28	3.6636	8.82	2.7611	2.56	1.3428	-16.22	0.1545
3650	11.75	3.8682	11.07	3.5773	8.60	2.6909	2.29	1.3021	-16.62	0.1476
3700	11.55	3.7801	10.87	3.4940	8.38	2.6231	2.03	1.2631	-17.01	0.1410
3750	11.35	3.6949	10.66	3.4134	8.16	2.5577	1.77	1.2255	-17.40	0.1348

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
3800	11.16	3.6125	10.46	3.3356	7.94	2.4945	1.51	1.1894	-17.79	0.1289
3850	10.96	3.5328	10.26	3.2602	7.72	2.4335	1.25	1.1547	-18.18	0.1234
3900	10.77	3.4556	10.07	3.1873	7.51	2.3746	0.99	1.1214	-18.56	0.1181
3950	10.58	3.3808	9.87	3.1168	7.30	2.3177	0.74	1.0892	-18.93	0.1131
4000	10.39	3.3084	9.68	3.0485	7.09	2.2627	0.49	1.0583	-19.31	0.1083
4050	10.21	3.2383	9.49	2.9823	6.89	2.2094	0.24	1.0286	-19.68	0.1038
4100	10.02	3.1702	9.30	2.9182	6.68	2.1580	0.00	0.9999	-20.05	0.0995
4150	9.84	3.1043	9.12	2.8560	6.48	2.1081	-0.24	0.9722	-20.41	0.0954
4200	9.66	3.0403	8.93	2.7958	6.28	2.0599	-0.49	0.9456	-20.78	0.0915
4250	9.48	2.9782	8.75	2.7373	6.08	2.0132	-0.73	0.9199	-21.13	0.0878
4300	9.30	2.9179	8.56	2.6806	5.88	1.9679	-0.96	0.8951	-21.49	0.0842
4350	9.13	2.8594	8.38	2.6255	5.68	1.9240	-1.20	0.8711	-21.85	0.0808
4400	8.95	2.8026	8.21	2.5721	5.49	1.8815	-1.43	0.8480	-22.20	0.0776
4450	8.78	2.7474	8.03	2.5202	5.30	1.8403	-1.66	0.8257	-22.55	0.0746
4500	8.61	2.6937	7.85	2.4698	5.11	1.8003	-1.89	0.8041	-22.89	0.0717
4550	8.44	2.6416	7.68	2.4208	4.92	1.7615	-2.12	0.7833	-23.24	0.0689
4600	8.27	2.5909	7.51	2.3732	4.73	1.7239	-2.35	0.7632	-23.58	0.0662
4650	8.10	2.5415	7.34	2.3269	4.54	1.6873	-2.57	0.7437	-23.92	0.0637
4700	7.94	2.4936	7.17	2.2819	4.36	1.6518	-2.79	0.7249	-24.26	0.0613
4750	7.77	2.4469	7.00	2.2381	4.18	1.6174	-3.02	0.7066	-24.59	0.0589
4800	7.61	2.4014	6.83	2.1955	3.99	1.5839	-3.24	0.6890	-24.93	0.0567
4850	7.45	2.3572	6.67	2.1541	3.81	1.5513	-3.45	0.6719	-25.26	0.0546
4900	7.29	2.3141	6.50	2.1137	3.64	1.5197	-3.67	0.6554	-25.58	0.0526
4950	7.13	2.2721	6.34	2.0744	3.46	1.4890	-3.88	0.6394	-25.91	0.0506

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
5000	6.97	2.2313	6.18	2.0362	3.28	1.4591	-4.10	0.6239	-26.23	0.0488
5050	6.81	2.1914	6.02	1.9989	3.11	1.4300	-4.31	0.6089	-26.56	0.0470
5100	6.66	2.1526	5.86	1.9626	2.93	1.4017	-4.52	0.5943	-26.88	0.0453
5150	6.51	2.1147	5.70	1.9272	2.76	1.3741	-4.73	0.5802	-27.19	0.0437
5200	6.35	2.0778	5.54	1.8927	2.59	1.3473	-4.94	0.5665	-27.51	0.0421
5250	6.20	2.0418	5.39	1.8591	2.42	1.3212	-5.14	0.5532	-27.83	0.0406
5300	6.05	2.0067	5.23	1.8263	2.25	1.2958	-5.35	0.5404	-28.14	0.0392
5350	5.90	1.9724	5.08	1.7943	2.08	1.2711	-5.55	0.5279	-28.45	0.0378
5400	5.75	1.9389	4.93	1.7631	1.92	1.2470	-5.75	0.5157	-28.76	0.0365
5450	5.60	1.9063	4.77	1.7326	1.75	1.2235	-5.95	0.5040	-29.06	0.0352
5500	5.46	1.8744	4.62	1.7029	1.59	1.2006	-6.15	0.4925	-29.37	0.0340
5550	5.31	1.8433	4.47	1.6739	1.42	1.1783	-6.35	0.4814	-29.67	0.0328
5600	5.17	1.8129	4.33	1.6456	1.26	1.1565	-6.55	0.4706	-29.97	0.0317
5650	5.02	1.7832	4.18	1.6180	1.10	1.1353	-6.74	0.4602	-30.27	0.0306
5700	4.88	1.7542	4.03	1.5909	0.94	1.1146	-6.94	0.4500	-30.57	0.0296
5750	4.74	1.7259	3.89	1.5646	0.78	1.0944	-7.13	0.4401	-30.87	0.0286
5800	4.60	1.6982	3.74	1.5388	0.63	1.0747	-7.32	0.4304	-31.16	0.0277
5850	4.46	1.6711	3.60	1.5136	0.47	1.0555	-7.51	0.4211	-31.46	0.0267
5900	4.32	1.6446	3.46	1.4890	0.31	1.0367	-7.70	0.4120	-31.75	0.0259
5950	4.18	1.6187	3.32	1.4649	0.16	1.0184	-7.89	0.4031	-32.04	0.0250
6000	4.05	1.5934	3.18	1.4414	0.00	1.0005	-8.08	0.3945	-32.33	0.0242
6050	3.91	1.5686	3.04	1.4184	-0.15	0.9831	-8.27	0.3861	-32.62	0.0234
6100	3.78	1.5444	2.90	1.3959	-0.30	0.9660	-8.45	0.3780	-32.90	0.0226
6150	3.64	1.5207	2.76	1.3739	-0.45	0.9494	-8.63	0.3700	-33.19	0.0219

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
6200	3.51	1.4975	2.62	1.3524	-0.60	0.9331	-8.82	0.3623	-33.47	0.0212
6250	3.37	1.4748	2.49	1.3314	-0.75	0.9172	-9.00	0.3548	-33.75	0.0205
6300	3.24	1.4525	2.35	1.3108	-0.90	0.9017	-9.18	0.3475	-34.03	0.0199
6350	3.11	1.4308	2.22	1.2906	-1.05	0.8865	-9.36	0.3403	-34.31	0.0193
6400	2.98	1.4095	2.08	1.2709	-1.19	0.8717	-9.54	0.3334	-34.59	0.0186
6450	2.85	1.3886	1.95	1.2515	-1.34	0.8571	-9.72	0.3266	-34.86	0.0181
6500	2.72	1.3682	1.82	1.2326	-1.48	0.8429	-9.90	0.3200	-35.14	0.0175
6550	2.59	1.3481	1.69	1.2141	-1.63	0.8291	-10.07	0.3135	-35.41	0.0170
6600	2.47	1.3285	1.55	1.1960	-1.77	0.8155	-10.25	0.3073	-35.68	0.0164
6650	2.34	1.3093	1.42	1.1782	-1.91	0.8022	-10.42	0.3012	-35.95	0.0159
6700	2.21	1.2905	1.29	1.1608	-2.06	0.7892	-10.60	0.2952	-36.22	0.0154
6750	2.09	1.2720	1.17	1.1437	-2.20	0.7765	-10.77	0.2894	-36.49	0.0150
6800	1.97	1.2539	1.04	1.1270	-2.34	0.7641	-10.94	0.2837	-36.76	0.0145
6850	1.84	1.2362	0.91	1.1106	-2.48	0.7519	-11.11	0.2782	-37.02	0.0141
6900	1.72	1.2188	0.78	1.0946	-2.62	0.7400	-11.28	0.2728	-37.29	0.0137
6950	1.60	1.2017	0.66	1.0788	-2.75	0.7283	-11.45	0.2675	-37.55	0.0133
7000	1.47	1.1850	0.53	1.0634	-2.89	0.7169	-11.62	0.2624	-37.82	0.0129
7050	1.35	1.1686	0.41	1.0483	-3.03	0.7057	-11.79	0.2573	-38.08	0.0125
7100	1.23	1.1525	0.29	1.0334	-3.16	0.6947	-11.96	0.2524	-38.34	0.0121
7150	1.11	1.1367	0.16	1.0189	-3.30	0.6840	-12.12	0.2477	-38.60	0.0118
7200	0.99	1.1212	0.04	1.0046	-3.43	0.6735	-12.29	0.2430	-38.85	0.0114
7250	0.88	1.1060	-0.08	0.9906	-3.57	0.6632	-12.45	0.2384	-39.11	0.0111
7300	0.76	1.0911	-0.20	0.9769	-3.70	0.6531	-12.62	0.2340	-39.37	0.0108
7350	0.64	1.0765	-0.32	0.9634	-3.83	0.6432	-12.78	0.2296	-39.62	0.0104

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m

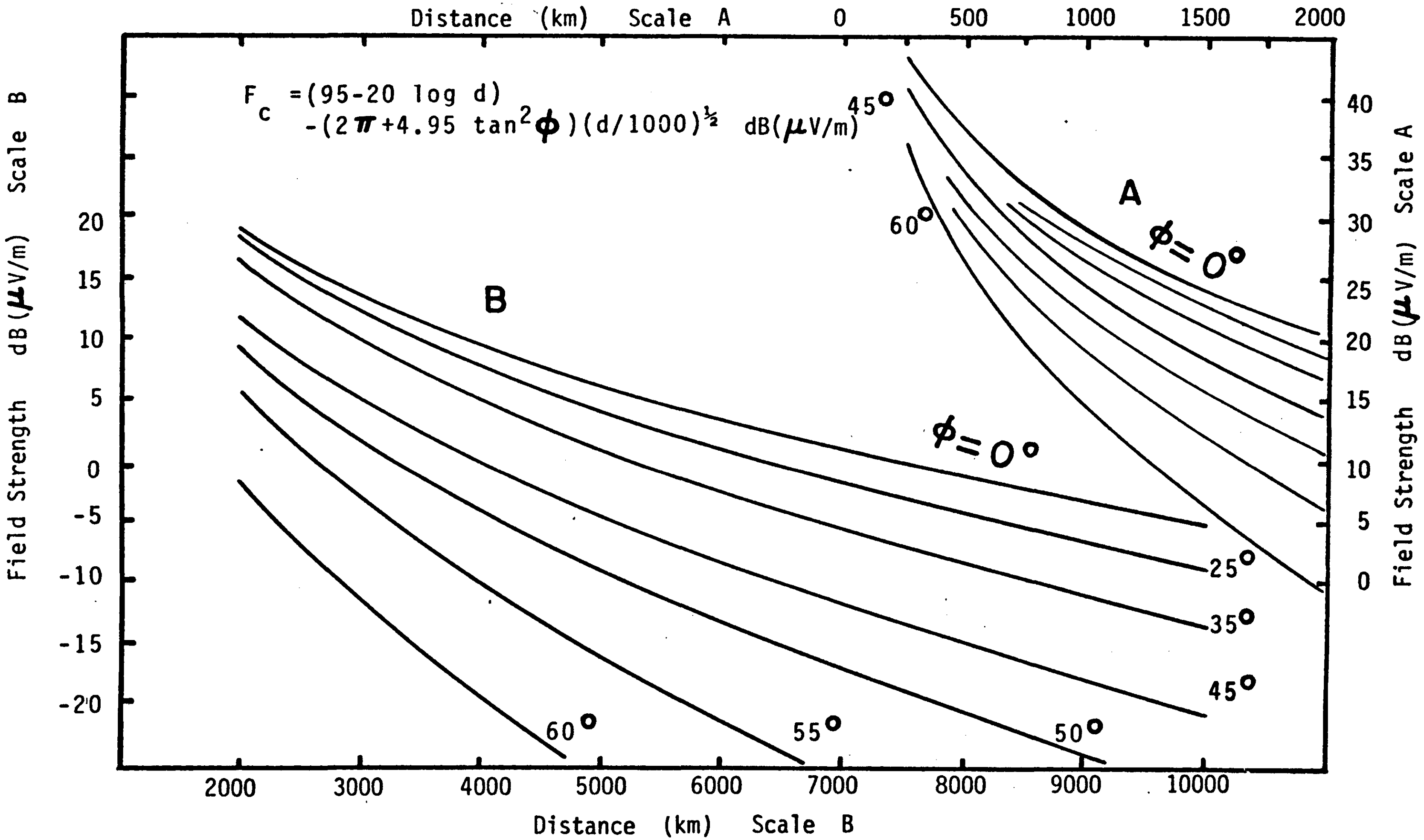
DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
7400	0.52	1.0621	-0.44	0.9502	-3.97	0.6335	-12.94	0.2254	-39.87	0.0101
7450	0.41	1.0480	-0.56	0.9372	-4.10	0.6240	-13.10	0.2212	-40.13	0.0099
7500	0.29	1.0341	-0.68	0.9245	-4.23	0.6147	-13.26	0.2172	-40.38	0.0096
7550	0.18	1.0205	-0.80	0.9120	-4.36	0.6055	-13.42	0.2132	-40.63	0.0093
7600	0.06	1.0072	-0.92	0.8997	-4.49	0.5966	-13.58	0.2093	-40.88	0.0090
7650	-0.05	0.9941	-1.03	0.8877	-4.62	0.5878	-13.74	0.2055	-41.12	0.0088
7700	-0.16	0.9812	-1.15	0.8759	-4.74	0.5792	-13.90	0.2018	-41.37	0.0085
7750	-0.28	0.9685	-1.27	0.8643	-4.87	0.5707	-14.06	0.1982	-41.62	0.0083
7800	-0.39	0.9561	-1.38	0.8529	-5.00	0.5625	-14.21	0.1947	-41.86	0.0081
7850	-0.50	0.9439	-1.50	0.8417	-5.12	0.5543	-14.37	0.1912	-42.11	0.0078
7900	-0.61	0.9319	-1.61	0.8307	-5.25	0.5464	-14.53	0.1878	-42.35	0.0076
7950	-0.72	0.9201	-1.73	0.8198	-5.38	0.5385	-14.68	0.1845	-42.59	0.0074
8000	-0.83	0.9085	-1.84	0.8092	-5.50	0.5309	-14.83	0.1813	-42.84	0.0072
8050	-0.94	0.8971	-1.95	0.7988	-5.62	0.5233	-14.99	0.1781	-43.08	0.0070
8100	-1.05	0.8859	-2.06	0.7885	-5.75	0.5159	-15.14	0.1750	-43.32	0.0068
8150	-1.16	0.8749	-2.18	0.7785	-5.87	0.5087	-15.29	0.1720	-43.55	0.0066
8200	-1.27	0.8641	-2.29	0.7686	-5.99	0.5016	-15.44	0.1690	-43.79	0.0065
8250	-1.38	0.8535	-2.40	0.7588	-6.12	0.4946	-15.59	0.1661	-44.03	0.0063
8300	-1.48	0.8430	-2.51	0.7493	-6.24	0.4877	-15.74	0.1632	-44.27	0.0061
8350	-1.59	0.8327	-2.62	0.7399	-6.36	0.4810	-15.89	0.1604	-44.50	0.0060
8400	-1.70	0.8226	-2.73	0.7306	-6.48	0.4743	-16.04	0.1577	-44.74	0.0058
8450	-1.80	0.8127	-2.83	0.7215	-6.60	0.4678	-16.19	0.1550	-44.97	0.0056
8500	-1.91	0.8029	-2.94	0.7126	-6.72	0.4615	-16.34	0.1524	-45.20	0.0055
8550	-2.01	0.7933	-3.05	0.7038	-6.84	0.4552	-16.49	0.1499	-45.43	0.0053

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
8600	-2.12	0.7838	-3.16	0.6952	-6.95	0.4490	-16.63	0.1474	-45.66	0.0052
8650	-2.22	0.7745	-3.26	0.6867	-7.07	0.4430	-16.78	0.1449	-45.89	0.0051
8700	-2.32	0.7653	-3.37	0.6783	-7.19	0.4370	-16.92	0.1425	-46.12	0.0049
8750	-2.43	0.7563	-3.48	0.6701	-7.31	0.4312	-17.07	0.1401	-46.35	0.0048
8800	-2.53	0.7474	-3.58	0.6620	-7.42	0.4254	-17.21	0.1378	-46.58	0.0047
8850	-2.63	0.7387	-3.69	0.6540	-7.54	0.4198	-17.36	0.1356	-46.81	0.0046
8900	-2.73	0.7301	-3.79	0.6462	-7.65	0.4142	-17.50	0.1334	-47.03	0.0044
8950	-2.83	0.7216	-3.90	0.6385	-7.77	0.4088	-17.64	0.1312	-47.26	0.0043
9000	-2.93	0.7133	-4.00	0.6309	-7.88	0.4034	-17.78	0.1291	-47.48	0.0042
9050	-3.03	0.7051	-4.10	0.6235	-8.00	0.3982	-17.93	0.1270	-47.71	0.0041
9100	-3.13	0.6970	-4.21	0.6161	-8.11	0.3930	-18.07	0.1249	-47.93	0.0040
9150	-3.23	0.6891	-4.31	0.6089	-8.23	0.3879	-18.21	0.1229	-48.15	0.0039
9200	-3.33	0.6813	-4.41	0.6018	-8.34	0.3829	-18.35	0.1210	-48.38	0.0038
9250	-3.43	0.6736	-4.51	0.5948	-8.45	0.3780	-18.49	0.1190	-48.60	0.0037
9300	-3.53	0.6660	-4.61	0.5879	-8.56	0.3731	-18.63	0.1171	-48.82	0.0036
9350	-3.63	0.6585	-4.72	0.5811	-8.67	0.3684	-18.76	0.1153	-49.04	0.0035
9400	-3.73	0.6511	-4.82	0.5744	-8.79	0.3637	-18.90	0.1135	-49.26	0.0034
9450	-3.82	0.6439	-4.92	0.5678	-8.90	0.3591	-19.04	0.1117	-49.47	0.0034
9500	-3.92	0.6368	-5.02	0.5613	-9.01	0.3546	-19.18	0.1099	-49.69	0.0033
9550	-4.02	0.6297	-5.12	0.5549	-9.12	0.3501	-19.31	0.1082	-49.91	0.0032
9600	-4.11	0.6228	-5.21	0.5486	-9.23	0.3457	-19.45	0.1065	-50.12	0.0031
9650	-4.21	0.6160	-5.31	0.5424	-9.33	0.3414	-19.59	0.1049	-50.34	0.0030
9700	-4.30	0.6092	-5.41	0.5363	-9.44	0.3372	-19.72	0.1033	-50.55	0.0030
9750	-4.40	0.6026	-5.51	0.5303	-9.55	0.3330	-19.86	0.1017	-50.77	0.0029
9800	-4.49	0.5961	-5.61	0.5244	-9.66	0.3289	-19.99	0.1001	-50.98	0.0028
9850	-4.59	0.5896	-5.70	0.5186	-9.77	0.3248	-20.12	0.0986	-51.19	0.0028
9900	-4.68	0.5833	-5.80	0.5128	-9.87	0.3209	-20.26	0.0971	-51.41	0.0027
9950	-4.78	0.5770	-5.90	0.5072	-9.98	0.3169	-20.39	0.0956	-51.62	0.0026
10000	-4.87	0.5709	-5.99	0.5016	-10.09	0.3131	-20.52	0.0942	-51.83	0.0026

FIGURE 4 Skywave field strength vs distance (100 mV/m at 1 km, 50 %, 2 hours after sunset)



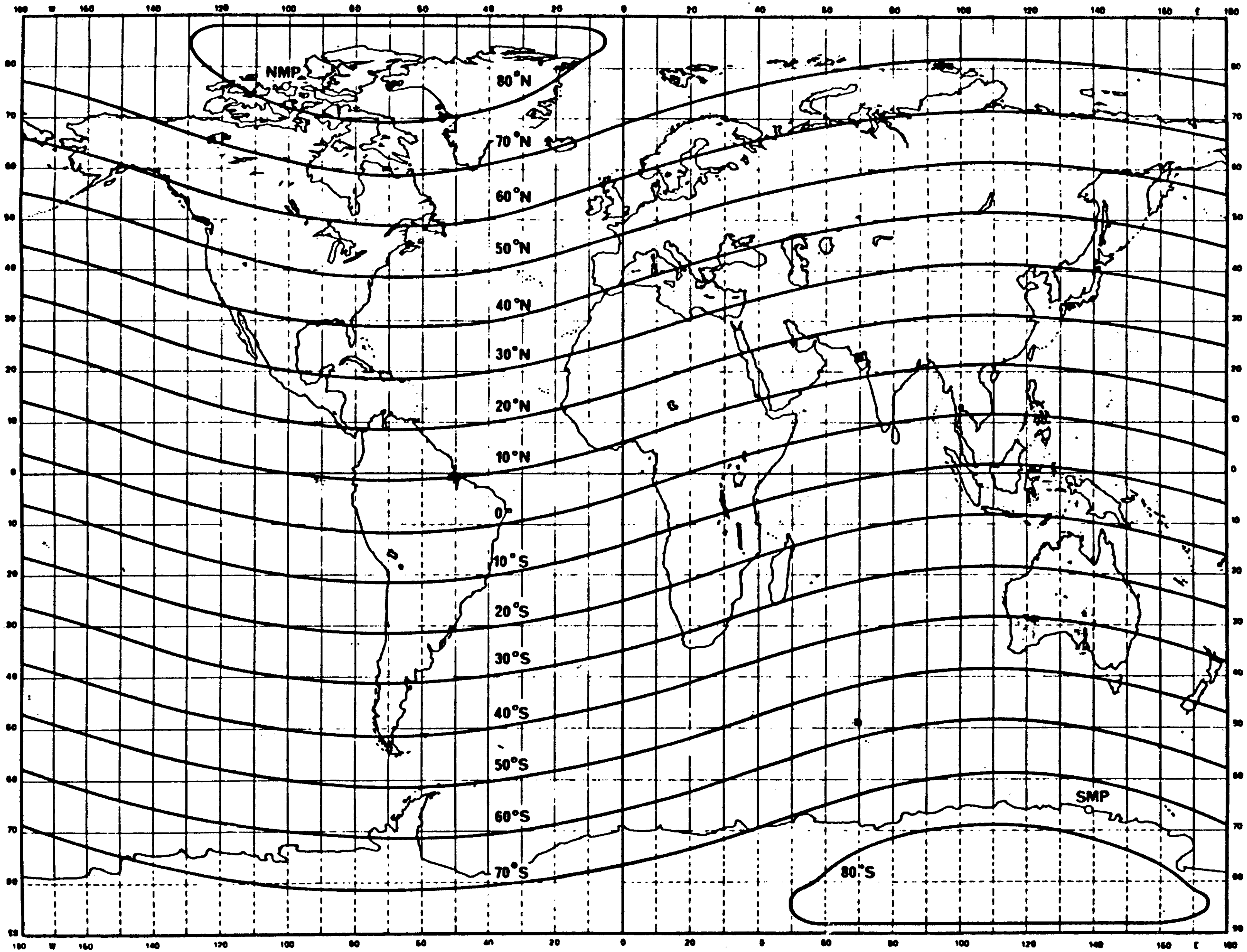


FIGURE 5 – FIGURA 5

USA/4/49

Carte des latitudes géomagnétiques – Geomagnetic Latitude Map – Mapa de latitudes geomagnéticas

CHAPTER 4

Broadcasting Standards

The United States is of the view that the modulation standards to be applied to the band, 1605 kHz to 1705 kHz, should be consistent with those applied to the existing MF broadcasting band, 535 kHz to 1605 kHz. This view is predicated upon the belief that such consistency will facilitate the design of receiving equipment for use in the expanded band and expedite its availability to the public. Additionally, the location of the added broadcasting spectrum adjacent to the existing band provides the opportunity to treat both broadcasting segments in a similar manner, thereby expediting consolidation of the two bands into one. With this in mind, the United States proposes that the following standards should apply for international purposes:

USA/4/50 Frequency Tolerances

As indicated in the Radio Regulations, the frequency tolerance should be 20 parts in 10^6 for powers of 10 kW or less, and 10 Hz for powers greater than 10 kW. In the case of the existing band, the United States recognizes that countries covered by the North American Regional Broadcasting Agreement (NARBA) are permitted to operate with a frequency tolerance of 20 Hz. However, since this exception does not apply to the expanded band, transmitting equipment which might be authorized that would exceed 10 kW will have to meet the 10 Hz tolerance.

USA/4/51 4.1 Channel spacing

The channel spacing in the expanded band should be maintained at 10 kHz. Use of the same 10 kHz channel spacing as is now used in the existing band, will ensure that new broadcasting services established in the expanded band will have the same opportunities for audio quality and stereophonic sound. Use of the same channel spacing will facilitate the early commencement of service in the expanded band.

The Plan is based on a channel spacing of 10 kHz and carrier frequencies which are integral multiples of 10 kHz, beginning at 1610 kHz.

USA/4/52 4.2 Class of emission

The standard class of emission should be A3E, double sideband amplitude modulation with full carrier. Classes of emission other than A3E should also be permitted on condition that the spectral distribution does not exceed that typical of an A3E emission and that there is no appreciable degradation of co-channel and adjacent channel protection. This latter provision is needed in order to provide for AM stereo in the expanded band as is now provided for in the existing 535-1605 kHz band.

The Plan is based upon double-sideband amplitude modulation with full carrier A3E.

Classes of emission other than A3E, for instance to accommodate stereophonic systems, could also be used on condition that the energy level outside the necessary bandwidth does not exceed that normally expected in A3E emission and that the emission is receivable by receivers employing envelope detectors without increasing appreciably the level of distortion.

USA/4/53 4.3 Bandwidth of emission

This Plan assumes a necessary bandwidth of 10 kHz, for which only a 5 kHz audio bandwidth can be obtained. While this might be an appropriate value for some administrations, others have successfully employed wider bandwidth systems having occupied bandwidths of the order of 20 kHz without adverse effects.

USA/4/54 4.4 Station power

[4.4.1 Class A This listing is not needed see, 1.10]

4.4.2 Class B The United States is continuing its studies related to the maximum power recommended for Class B stations. The United States' proposal in this regard will be made separately.

4.4.3 Class C

During night-time, the maximum station power shall be 1 kW.

During daytime, the mazimum station power shall be:

- 1 kW in noise zone 1
- 5 kW in noise zone 2

provided that the protection criteria given in paragraph 4.9 of this Chapter are met.

USA/4/55 4.5 Skywave interference calculations

The field strength of skywave interfering signals shall be calculated on the basis of 50% of the time.

USA/4/56 4.6 **TABLE IV - Nominal usable field strength(1)(2)**

	Noise Zone 1	Noise Zone 2
[4.6.1	This refers to Class A stations and as a result is inapplicable]	
4.6.2	Class B station (5)	Class B stations(5)
	Groundwave	Groundwave
	Daytime: 500 uV/m	Daytime: 1250 uV/m
	Night-time: 2500 uV/m	Night-time: 6500 uV/m
4.6.3	Class C station (5)	Class C station(5)
	Groundwave	Groundwave
	Daytime: 500 uV/m	Daytime: 1250 uV/m
	Night-time: 4000 uV/m	Night-time: 10,000 uV/m

(1) The nominal usable field strength values shown in the Table were used as the reference for planning (see definition in Chapter 1, paragraph 1.6 of this Annex).

(2) Higher values than those shown in the Table may be employed in order to satisfy noise limitations or special arrangements between two or more administrations.

[(3) This footnote is not required as it applies only to Class A stations.]

[(4) This footnote is not required as it applies only to Class A stations.]

(5) The protected contour during night-time operation for class B and C stations shall be the higher of the groundwave contour in 4.6.2 and 4.6.3 respectively, or the groundwave contour corresponding to the usable field strength of the station as defined in 4.7 and resulting from the Plan.

USA/4/57 4.7 Use of the root sum square (RSS) method to determine the usable field strength resulting from the weighted interfering signals

4.7.1 General

The overall usable field strength E_u due to two or more individual interference contributions is calculated on an RSS basis, using the expression:

$$E_u = \sqrt{(a_1E_1)^2 + (a_2E_2)^2 + \dots (a_iE_i)^2} \qquad (1)$$

where:

E_i is the field strength of the ith interfering transmitter (in uV/m);

a_i is the radio-frequency protecton ratio associated with the i^{th} interfering transmitter, expressed as a numerical ratio of field strengths.

USA/4/58 4.7.2 50% exclusion principle

The 50% exclusion principle allows a significant reduction in the number of calculations.

According to this principle, the values of the individual usable field strength contributions are arranged in descending order of magnitude. If the second value is less than 50% of the first value, the second value and all subsequent values are neglected. Otherwise an RSS value is calculated for the first and second values. The calculated RSS value is then compared with the third value in the same manner by which the first value was compared to the second and a new RSS value is calculated if required. The process is continued until the next value to be compared is less than 50% of the last calculated RSS value. At that point the last calculated RSS value is considered to be the usable field strength E_u.

For the purposes of this Agreement, if the contribution of a new station is greater than the smallest value previously considered in calculating the RSS value of assignments in the Plan, the contribution of the new station adversely affects assignments in conformity with this Agreement even if it is less than 50% of the RSS value. However, the new contribution does not adversely affect assignments in conformity with this Agreement if the RSS value determined by inserting the contribution of the new station in the list of contributors is smaller than the nominal usable field strength E_{nom}.

USA/4/59 4.8 Definition of noise zones

Noise zone 1

Comprises the whole of Region 2 with the exception of noise zone 2.

Noise zone 2

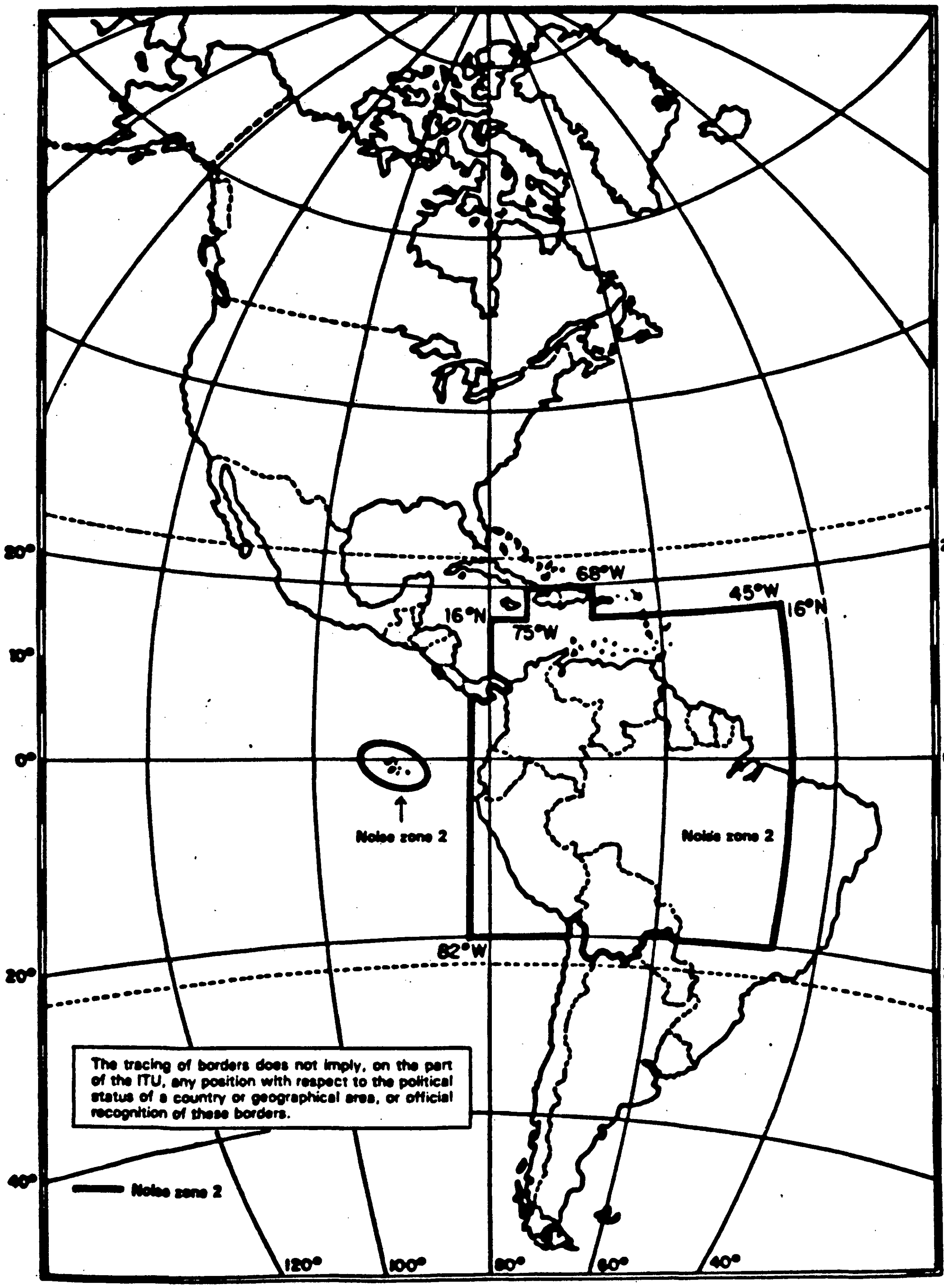
Comprises the area within the line defined by the coordinates 20° S-45°, the meridian 45° W to the coordinates 16° N-45° W, the parallel 16° N to the coordinates 16° N-68° W, the meridian 68° W to the coordinates 20° N-68° W, the parallel 20° N to the coordinates 20° N-75° W, the meridian 75° W to the coordinates 16° N-75° W, the parallel 16° N to the coordinates 16° N-80° W to the northeast coast of Panama, the frontier between Panama and Colombia, the southeast coast of Panama and the meridian 82° W to the parallel 20° S, and the parallel 20° S, with the exception of Chile and Paraguay, until the frontier between Paraguay and Brazil until 45° W. Bolivia is entirely included in noise zone 2 as are the archipelago of San Andres y Providencia and the islands belonging to Colombia and the Colon archipelago or the Galapagos Islands (Ecuador).

Note 1. - Grenada is included in noise zone 1 night-time and noise zone 2 daytime.

Note 2. - See the maps of noise zones on the following page.

USA/4/60

NOISE ZONES



USA/4/61 4.9 Channel protection ratios

The United States proposes that the co-channel protection ratios for stations not in a synchronized network should be 26 dB. This ratio has been successfully applied in the United States for many decades and has been verified by testing and has been included in various international agreements. In addition, on the basis that receivers in the expanded band will not change significantly from those in use for the existing band, the 1st and 2nd adjacent channel protection ratios shold be 0 dB and -29.5 dB, respectively. Their application here would be consistent with existing Regional usage.

USA/4/62 4.9.1 Co-channel protection ratio

The co-channel protection ratio is 26 dB.

USA/4/63 4.9.2 Adjacent channel protection ratio

- protection ratio for the first adjacent channel: 0 dB.
- protection ratio for the second adjacent channel: - 29.5 dB.

USA/4/64 4.9.3 Synchronized networks

In addition to the standards specified in the Agreement, the following additional standards apply to synchronized networks.

For the purpose of determining interference caused by synchronized networks, the following procedure shall be applied. If any two transmitters are less than 400 km apart, the network shall be treated as a single entity, the value of the composite signal being determined by the quadratic addition of the interfering signals from all the individual transmitters in the network. If the distances between all the transmitters are equal to or greater than 400 km, the network shall be treated as a set of individual transmitters.

For the purpose of determining skywave interference received by any one member of a network, the value of the interference caused by the other elements of the network shall be determined by the quadratic addition of the interfering signals from all of those elements. In any case, where groundwave interference is a factor it shall be taken into account.

The co-channel protection ratio between stations belonging to a synchronized network is 8 dB.

USA/4/65 4.10 Application of protection criteria

4.10.1 Value of protected contours

Within the national boundary of a country, the protected contour shall be determined by using the appropriate value of nominal usable field strength, or as otherwise determined in Note 5 to paragraph 4.6 for class B and C stations.

USA/4/66 4.10.2 Co-channel protection

4.10.2.1 Daytime protection of all classes of stations

During the daytime the groundwave contour of class B and C stations shall be protected against groundwave interference. The protected contour is the groundwave contour corresponding to the value of the nominal usable field strength. The maximum permissible interfering field strength at the protected contour is the value of the nominal usable field strength divided by the protection ratio. The effect of each interfering signal shall be evaluated separately, and the presence of interference from other stations in excess of this permissible level shall not reduce the necessity to limit interference which would result from proposed modifications or assignments. Where the protected contour would extend beyond the boundary of the country in which the station is located, the maximum permissible interfering field strength at the boundary is the calculated field strength of the protected station along the boundary divided by the protection ratio.

[4.10.2.2 This provision regarding protection to Class A stations is not needed, as protection to secondary service is not proposed by the United States.]

USA/4/67 4.10.2.3 Nighttime protection of class B and C stations

During the nighttime, the groundwave contour of class B and C stations shall be protected against skywave interference. The protected contour is the groundwave contour corresponding to the value of the greater of the nominal usable field strength or the usable field strength resulting from the Plan as determined at the site of the protected station in accordance with 4.7. The maximum permissible interfering field strength calculated at the site of the protected station in accordance with 4.7 shall not be exceeded at the protected contour. Where the protected contour would extend beyond the boundary of the country in which the station is located, the protected contour shall follow that part of the boundary.

USA/4/68 4.10.2.4 Modification of assignments

If a station of an administration causes interference to a station of the another administration and such interference is permitted in accordance with the terms of this Agreement, then in the event of a modification being proposed to the assignment corresponding to the former station, it will not be necessary to protect the assignment corresponding to the latter station beyond the level provided before the proposed modification.

USA/4/69 4.10.3 Adjacent channel protection

During the daytime and night-time, the groundwave contour of class B and C stations shall be protected against groundwave interference.

The protected contour during daytime is the groundwave contour corresponding to the value of the nominal usable field strength. The maximum permissible interfering field strength at the protected contour is the value of the nominal usable field divided by the protection ratio. The effect of each interfering signal shall be evaluated separately, and the presence of interference from other stations in excess of this permissible level shall not reduce the necessity to limit interference which would result from the proposed modifications or assignments.

The protected contour during night-time is the groundwave contour corresponding to the value of the nominal usable field strength or the usable field strength, whichever is stronger. The maximum permissible interfering field strength at the protected contour is the value of the protected contour divided by the protection ratio.

Where the protected contour, either daytime or night-time, would extend beyond the boundary of the country in which the station is located, the maximum permissible interfering field strength at the boundary is the calculated field strength of the protected assignment along the boundary dividied by the protection ratio.

USA/4/70 4.10.4 Protection outside national boundaries

USA/4/71 4.10.4.1 No station has the right to be protected beyond the boundary of the country in which the station is established, except when otherwise specified in a bilateral or multilateral arrangement.

USA/4/72 4.10.4.2 No broadcasting station shall be assigned a nominal frequency with a separation of 10 kHz from that of a station in another country if the 2500 uV/m contours overlap.

No broadcasting station shall be assigned a nominal frequency with a separation of 20 kHz from that of a station in another country if the 10,000 uV/m contours overlap.

No broadcasting station shall be assigned a nominal frequency with a separation of 30 kHz from that of a station in another country if the 25,000 uV/m contours overlap.

USA/4/73 4.10.4.3 In addition to the conditions described in 4.10.4.2, when the protected contour would extend beyond the boundary of the country in which the station is located, its assignment shall be protected in accordance with 4.10.2 and 4.10.3.

USA/4/74 4.10.4.4 For protection purposes, the boundary of a country shall be deemed to encompass only its land area, including islands.

CHAPTER 5

Radiation Characteristics of Transmitting Antennas

5. In carrying out the calculations indicated in Chapters 2 and 3, the following shall be taken into account:

USA/4/75 5.1 Omnidirectional antennas

Figure 1 of Chapter 3 shows the characteristic field of a simple vertical antenna as a function of its length and of the radius of the ground system.

It is clear that the characteristic field strength increases as the loss in the ground system is reduced to zero and as the antenna height is increased up to 0.625 wavelengths.

The increased characteristic field strength for antenna lengths up to 0.625 wavelengths is obtained at the expense of radiation at high angles as shown graphically in Figure 1a and numerically in Table II of Chapter 3.

USA/4/76 5.2 Considerations of the radiation patterns of directional antennas

The procedures for calculating theoretical, expanded and augmented (modified expanded) directional antenna patterns are given in Appendix 2.

USA/4/77 5.3 Top-loaded and sectionalized antennas

5.3.1 Calculation procedures are given in Appendix 3.

5.3.2 Many stations employ top-loaded or sectionalized towers, either because of space limitations or to vary the radiation characteristics from those of a simple vertical antenna. This is done to achieve desired coverage or to reduce interference.

5.3.3. The Administration using top-loaded or sectionalized antennas shall supply information concerning the tower structure of the antennas. Normally, one of the equations in Appendix 3 shall be employed to determine the vertical radiation characteristics of the antennas. Other equations may also be proposed by an Administration and shall be used in determining the vertical radiation characteristics of the antennas of that Administration, subject to the agreement of the other Administration.

APPENDIX 1

Proposed

Atlas of ground conductivity

To be published separately

USA/4/78 The United States recommends that the conductivity data base developed for use with the Region 2 AM broadcasting Agreement (RJ81) also be employed in the band 1605 - 1705 kHz.

LE TRACÉ DES FRONTIÈRES N'IMPLIQUE DE LA PART DE L'UIT AUCUNE PRISE DE POSITION QUANT AU STATUT POLITIQUE D'UN PAYS OU D'UNE ZONE GÉOGRAPHIQUE, NI AUCUNE RECONNAISSANCE OFFICIELLE DE CES FRONTIÈRES.

THE TRACING OF BORDERS DOES NOT IMPLY ON THE PART OF THE ITU ANY POSITION WITH RESPECT TO THE STATUS OF A COUNTRY OR GEOGRAPHICAL AREA, OR OFFICIAL RECOGNITION OF THESE BORDERS.

EL TRAZADO DE FRONTERAS EN LOS MAPAS NO IMPLICA QUE LA UIT TOME POSICIÓN EN CUANTO AL ESTATUTO POLÍTICO DE PAÍSES O ZONAS GEOGRÁFICAS NI EL RECONOCIMIENTO POR SU PARTE DE ESAS FRONTERAS.

APPENDIX 2

USA/4/79

Calculation of directional antenna patterns

Introduction

This Appendix describes methods to be employed in calculating the field strength produced by a directional antenna at a given point.

1. *General equations*

The theoretical directional antenna radiation pattern is calculated by means of the following equation, which sums the field strength from each element (tower) in the array.

$$E_T(\varphi, \theta) = \left| K_L \sum_{i=1}^{n} F_i f_i(\theta) \underline{/ \psi_i + S_i \cos\theta \cos(\varphi_i - \varphi)} \right| \qquad (1)$$

where:

$$f_i(\theta) = \frac{\cos(G_i \sin\theta) - \cos G_i}{(1 - \cos G_i)\cos\theta} \qquad (2)$$

where:

$E_T(\varphi, \theta)$: theoretical inverse distance field strength at one kilometre in mV/m for the given azimuth and elevation;

K_L: multiplying constant in mV/m which determines the pattern size (see paragraph 2.5 below for derivation of K_L);

n: number of elements in the directional array;

i: denotes the ith element in the array;

F_i: ratio of the theoretical field strength due to the ith element in the array relative to the theoretical field strength due to the reference element;

θ: vertical elevation angle, in degrees, measured from the horizontal plane;

$f_i(\theta)$: ratio of vertical to horizontal plane field strength radiated by the ith element at elevation angle θ;

G_i: electrical height of the ith element, in degrees;

S_i: electrical spacing of the ith element from the reference point in degrees;

φ_i: orientation of the ith element from the reference element (with respect to True North), in degrees;

φ: azimuth with respect to True North, in degrees;

ψ_i: electrical phase angle of field strength due to the ith element (with respect to the reference element), in degrees.

Equations (1) and (2) assume that:

- the current distribution in the elements is sinusoidal,
- there are no losses in the elements or in the ground,
- the antenna elements are base-fed, and
- the distance to the computation point is large in relation to the size of the array.

2. *Determination of values and constants*

2.1 *Determination of the multiplying constant K for an array*

The multiplying constant K for the loss-free case may be computed by integrating the power flow over the hemisphere, deriving an r.m.s. field strength and comparing the result with the case where the power is radiated uniformly in all directions over the hemisphere.

Thus:

$$K = \frac{E_s\sqrt{P}}{e_h} \quad \text{mV/m}$$

where:

K: no-loss multiplying constant (mV/m at 1 km);

E_s: reference level for uniform radiation over a hemisphere, equal to 244.95 mV/m at 1 km for 1 kW;

P: antenna input power (kW);

e_h: root mean square radiation pattern over the hemisphere which may be obtained by integrating $e(\theta)$ at each elevation angle over the hemisphere. The integration can be made using the trapezoidal method of approximation, as follows:

$$e_h = \left[\frac{\pi\Delta}{180}\left\{\tfrac{1}{2}[e(0)]^2 + \sum_{m=1}^{N}[e(m\Delta)]^2 \cos m\Delta\right\}\right]^{\frac{1}{2}} \qquad (3)$$

where:

Δ: interval, in degrees, between equally-spaced sampling points at different elevation angles θ;

m: an integer from 1 to N, which gives the elevation angle θ in degrees when multiplied by Δ, i.e. $\theta = m\Delta$;

N: one less than the number of intervals $\left(N = \frac{90}{\Delta} - 1\right)$;

$e(\theta)$: root mean square radiation pattern given by equation (1) with K equal to 1 at the specified elevation angle θ (the value of θ is 0 in the first term of equation (3) and $m\Delta$ in the second term); $e(\theta)$ is computed using equation (4).

$$e(\theta) = \left[\sum_{i=1}^{n}\sum_{j=1}^{n} F_i f_i(\theta) F_j f_j(\theta) \cos \psi_{ij} J_0(S_{ij} \cos \theta)\right]^{\frac{1}{2}} \qquad (4)$$

where:

i: denotes the ith element;

j: denotes the jth element;

n: number of elements in the array;

ψ_{ij}: difference in phase angles of the field strengths from the ith and jth elements in the array;

S_{ij}: angular spacing between the ith and jth elements in the array;

$J_0(S_{ij} \cos \theta)$: the Bessel function of the first kind and zero order of the apparent spacing between the ith and jth elements. In equation (4), S_{ij} is in radians. However when special tables of Bessel functions giving the argument in degrees are used, the values of S_{ij} should then be in degrees.

2.2 *Relationship between field strength and antenna current*

The field strength resulting from a current flowing in a vertical antenna element is:

$$E = \frac{R_c I\left[\cos(G \sin\theta) - \cos G\right]}{2\pi r \cos\theta} \times 10^3 \quad \text{mV/m} \qquad (5)$$

where:

E: field strength in mV/m;

R_c: resistivity of free space ($R_c = 120\pi$ ohms);

I: current at the current maximum, in amperes [1];

G: electrical height of the element, in degrees;

r: distance from the antenna, in metres;

θ: vertical elevation angle, in degrees.

---

[1] I is the current at the maximum of the sinusoidal distribution. If the electrical height of the element is less than 90°, the base current will be less than I.

At one kilometre and in the horizontal plane ($\theta = 0°$):

$$E = \frac{120\pi I(1-\cos G) \times 10^3}{2\pi(1000)} \qquad \text{mV/m} \tag{6}$$

hence:

$$E = 60\, I(1 - \cos G) \qquad \text{mV/m} \tag{7}$$

2.3 *Determination of no-loss current at current maximum*

For a tower of uniform cross-section or for a similar type of directional array element, the no-loss current at the current maximum is:

$$I_i = \frac{KF_i}{60(1-\cos G_i)} \tag{8}$$

where:

I_i: current at current maximum in amperes in the ith element;

K: no-loss multiplying constant computed as shown in paragraph 2.1 above.

The base current is given by $I_i \sin G_i$.

2.4 *Array power loss*

Power losses in a directional antenna system are of various types, including ground losses, antenna coupling losses, etc. The loss resistance for the array may be assumed to be inserted at the current maximum to allow for all losses. The power loss is:

$$P_L = \frac{1}{1000} \sum_{i=1}^{n} R_i I_i^2 \tag{9}$$

where:

P_L: total power loss, in kW;

R_i: assumed loss resistance, in ohms (one ohm, unless otherwise indicated) for the ith tower [1];

I_i: current at current maximum (or base current if the element is less than 90 degrees in electrical height) for the ith tower.

2.5 *Determination of a corrected multiplying constant*

To allow for power loss in the antenna system, the multiplying constant K can be modified, as follows:

$$K_L = K\left(\frac{P}{P + P_L}\right)^{\frac{1}{2}} \tag{10}$$

where:

K_L: multiplying constant after correction for the assumed loss resistance;

K: no-loss multiplying constant computed in paragraph 2.1 above;

P: array input power (kW);

P_L: total power loss (kW).

---

[1] The loss resistance shall in no way exceed a value such that the value of K_L (see paragraph 2.5) differs by more than ten percent from that calculated for a resistance of one ohm.

2.6 *r.m.s. value of radiation to be notified for directional antennas*

The radiation E_r for directional antennas is determined as follows:

$$E_r = K_L \, e(\theta) \qquad \text{mV/m at 1 km}$$

2.7 *Determination of expanded pattern values*

The expanded pattern is determined as follows:

$$E_{EXP}(\varphi, \theta) = 1.05 \left\{ [E_T(\varphi, \theta)]^2 + Q^2 \right\}^{\frac{1}{2}} \tag{11}$$

where:

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

$E_T(\varphi, \theta)$: theoretical pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

Q : quadrature factor, computed as:

$$Q = Q_0 \, g(\theta)$$

where:

Q_0 is the Q on the horizontal plane, and is normally the greatest of the following three quantities:

$$10.0 \quad ; \quad 10\sqrt{P} \quad \text{or} \quad 0.025 K_L \left[\sum_{i=1}^{n} F_i^2 \right]^{\frac{1}{2}}$$

$g(\theta)$ is computed as follows:

If the electrical height of the shortest tower is less than or equal to 180 degrees, then:

$g(\theta) = f(\theta)$ for the shortest tower.

If the electrical height of the shortest tower is greater than 180 degrees, then:

$$g(\theta) = \frac{\{[f(\theta)]^2 + 0.0625\}^{\frac{1}{2}}}{1.030776}$$

where $f(\theta)$ for the shortest tower is used.

Note: In comparing the electrical heights of the antenna towers to determine the shortest tower, the total apparent height (as determined by current distribution) is used for top-loaded and sectionalized towers.

2.8 *Determination of augmented (modified expanded) pattern values*

The purpose of the augmented (modified expanded) pattern is to put one or more "patches" on an expanded pattern. Each "patch" is referred to as an "augmentation". The augmentation may be positive (resulting in more radiation than that of the expanded pattern) or negative (resulting in less radiation than that of the expanded pattern). In no case shall the augmentation be so negative that the augmented (modified expanded) pattern radiation is below the theoretical radiation pattern.

Spans of augmentation may overlap. That is, an augmentation may itself be augmented by a subsequent augmentation. To ensure that the calculations are properly made, the augmentations are handled in increasing order of central azimuth of augmentation, starting at True North. If several augmentations have the same central azimuth, then they are considered in order of decreasing span (i.e. the one with the largest span is handled first). If more than one augmentation has the same central azimuth and the same span, then they are considered in ascending order of their effect.

$$E_{MOD}(\varphi, \theta) = \left\{[E_{EXP}(\varphi, \theta)]^2 + g^2(\theta) \sum_{i=1}^{a} A_i \cos^2 (180\, \Delta_i / \alpha_i)\right\}^{\frac{1}{2}} \tag{12}$$

where:

$E_{MOD}(\varphi, \theta)$: augmented (modified expanded) pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$g(\theta)$: same parameter as described for the expanded pattern (see paragraph 2.7);

a : number of augmentations;

Δ_i : difference between the azimuth at which the radiation is desired φ, and the central azimuth of augmentation of the ith augmentation. It will be noted that Δ_i must be less than or equal to one-half of α_i;

α_i : total span of the ith augmentation;

A_i : is the value of the augmentation given by the expression [1]:

$$A_i = [E_{MOD}(\varphi_i, \theta)]^2 - [E_{INT}(\varphi_i, \theta)]^2 \tag{13}$$

where:

φ_i : central azimuth of the ith augmentation;

$E_{MOD}(\varphi_i, \theta)$: augmented (modified expanded) horizontal plane radiation at the central azimuth of the ith augmentation, after applying the ith augmentation, but before applying subsequent augmentations;

$E_{INT}(\varphi_i, \theta)$: an interim value of radiation in the horizontal plane at the central azimuth of the ith augmentation. The interim value is the radiation obtained from applying previous augmentations (if any) to the expanded pattern, but before applying the ith augmentation.

APPENDIX 3

USA/4/80

Equations for the calculation of the normalized vertical radiation from top-loaded and typical sectionalized antennas

Basically, the equation is:

$$f(\theta) = \frac{E_\theta}{E_0}$$

where:

E_θ : radiation at a desired elevation angle, θ;

E_0 : radiation in the horizontal plane.

Specific equations for top-loaded and typical sectionalized antennas are given below.

These equations use one or more of four variables A, B, C and D, the values of which are given in columns 6, 7, 8 and 9 respectively, of Part II-C of Annex 1.

[1] When A_i is negative, there is negative augmentation; when A_i is positive, there is positive augmentation. A_i must not be so negative that $E_{MOD}(\varphi, \theta)$ falls below $E_T(\varphi, \theta)$ of any azimuth, φ, or elevation angle, θ.

1. *Top-loaded antenna* (when column 12 of Part II-A of Annex 1 is 1)

$$f(\theta) = \frac{\cos B \cos (A \sin \theta) - \sin \theta \sin B \sin (A \sin \theta) - \cos (A + B)}{\cos \theta [\cos B - \cos (A + B)]}$$

where:

A : electrical height of the antenna tower;

B : difference between the apparent electrical height (based on current distribution) and the actual height (A);

θ : the elevation angle with respect to the horizontal plane.

Note: When B is zero (i.e., when there is no top-loading), the equation reduces to that of a simple vertical antenna.

2. *Sectionalized tower* (when column 12 of Part II-A of Annex 1 is 2)

$$f\theta = \frac{\begin{array}{l}[\cos B \cos (A \sin \theta) - \cos (A + B)] \sin (C + D - A) + \sin B[\cos D \cos (C \sin \theta) - \sin \theta) \\ - \sin \theta \sin D \sin (C \sin \theta) - \cos (C + D - A) \cos (A \sin \theta)]\end{array}}{\cos \theta([\cos B - \cos (A + B)] \sin (C + D - A) + \sin B[\cos D - \cos (C + D - A)])}$$

where:

A : actual height of the lower section;

B : difference between the apparent electrical height (based on current distribution) of the lower section and the actual height of the lower section (A);

C : actual total height of the antenna;

D : difference between the apparent electrical height (based on current distribution) of the total tower and the actual height of the total tower (C);

θ : vertical angle with respect to the horizontal plane.

3. Administrations proposing to use other types of antenna should furnish details of their characteristics together with a radiation pattern.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) **RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2**

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 5-E
11 March 1986
Original : French

BUDGET CONTROL COMMITTEE

Note by the Secretary-General

BUDGET OF THE CONFERENCE

The budget of the Conference, as approved by the Administrative Council or the Union at its 40th Session (1985), is annexed hereto for the information of the Budget Control Committee.

It is emphasized that the estimated expenditure of this regional Conference do not form part of the ordinary budget of the Union. Under No. 115 of Article 15 of the International Telecommunication Convention, Nairobi, 1982, expenses shall be borne by all Members of Region 2 in accordance with their unit classification, and, on the same basis, by any Members of other Regions which would have participated to this Conference.

R.E. BUTLER
Secretary-General

Annex : 1

Section 20.6 - Regional Administrative Conferences
BC - R2 (1)

Items		Budget 1986 Swiss Francs
Subhead I	Preparatory work	
20.611	IFRB preparatory work	200,000
Subhead II	Staff expenses	
20.621	Salaries and related expenses of the Conference Secretariat staff	365,000
20.622	Salaries and related expenses of the translation, typing and reproduction services staff	336,000
20.623	Travel (recruitment)	14,000
20.624	Insurance	46,000
		761,000
Subhead III	Travel expenses	
20.631	Transport at the conference venue	-
20.632	Transport to and from the conference venue	-
20.633	Shipping of equipment to and from the confer.	-
		-
Subhead IV	Premises and equipment	
20.641	Premises, furniture, machines	35,000
20.642	Document production	20,000
20.643	Office supplies and overheads	20,000
20.644	Postage, telephone calls, telegrams	15,000
20.645	Technical installations	5,000
20.646	Sundry and unforeseen	10,000
		105,000
Subhead V	Other expenses	
20.651	Interest credited to the ordinary budget	37,000
Subhead VI	Final Acts	
20.661	Report to the Second Session	20,000
	Total, Section 20.6	1,123,000

N°	Section 20.6 Regional administrative conferences BC-R2 (1)	Expenditure 1984	Budget 1985	Budget 1986
			- Swiss francs -	

Preparatory work

The expenditure for 1985 included in the draft budget for 1986 are as follows :

IFRB preparatory work 100,000

For 1986 the IFRB is requesting an overall credit of 100,000 in order to continue the preparatory work for this Conference.

The total cost of preparatory work in 1985 and 1986 is therefore 200,000

N°	Section 20.6 Regional administrative conferences BC-R2 (1)	Expenditure 1984	Budget 1985	Budget 1986
			- Swiss francs -	

Salaries and related expenses of the conferences secretariat staff

It is foreseen that for the proper functioning of the Conference it is necessary to set up a secretariat comprising the staff shown in the table below (for language service, typing and reprography services and draughtsmen, see following page).

	Work before and after the Conference		Work during the Conference		
	Days	Sw.frs.	Number	Days	Sw.frs.
Chairman's secretary	7	1,295	1	19	3,515
Executive Secretariat	-	-	1	19	3,515
Common services					
- Interpretation (2 teams/ 3 teams)	18	11,880	24	400	223,009
- Minute-writers	24	7,194	8	110	29,679
- Language reference service	-	-	1	19	2,432
- Meeting room service	7	987	1	19	2,679
- Registration of delegates	7	987	1	19	2,679
- Document control	14	1,981	2	38	5,377
- Documents distribution	-	-	2	38	4,104
- Messengers/reception clerks	-	-	4	76	7,904
- Security guards	-	-	4	76	8,208
- Telephonists	-	-	1	19	2,223
- First-aid-service	-	-	1	19	2,679
Personnel/Finance	42	5,922	2	38	5,358
Editorial Committee	-	-	1	12	1,692
Additional staff CCIR/IFRB	-	-	-	-	-
		30,246			305,053
Provision for payment of overtime to General Services staff		5,000			25,000
Total		35,246			330,053
Rounded off to		35,000			330,000

365,000

N°	Section 20.6 Regional administrative conferences BC-R2 (1)	Expenditure 1984	Budget 1985	Budget 1986
			- Swiss francs -	

Salaries and related expenses for the translation, typing and reproduction services

Provision is made for the following expenses for language, typing, reproduction and draughtsmen's services.

A. Preparatory work (1986)

	Volume of	Calendar days	Sw.frs.
Translation			
Translaters	420	78	35,400
Revisers		33	17,000
Typists		49	5,700
Typing			
Typists	1,340	156	18,200
Reproduction			
Offset operators	400,000	-	-
Assemblers			
Draughtmen		7	1,100
TOTAL A			77,400
Rounded off to			77,000

B. Conference (19 days)

	Volume of work in pages *)	Number	Calendar days	Sw.frs.
Language Service				
Translators	1,025	10	190	86,300
Revisers		4	76	39,100
Typists		6	114	13,300
Typing				
Typists	2,575	16	304	35,600
Heads of team		7	133	21,600
Heads of section		3	57	10,100
Reprography				
G.4	600,000	4	76	9,700
G.3		2	38	4,400
G.2		10	190	20,500
Draughtsmen G.5		1	19	2,900
TOTAL B				243,500
Rounded off to				244,000

Nº	Section 20.6 Regional administrative conferences BC-R2 (1)	Expenditure 1984	Budget 1985	Budget 1986
			- Swiss francs -	
	TOTAL A + B		321,000	
	Provision for payment of overtime to General Services staff		15,000	336,000
	Travel expenses (recruitment)			
	Travel expenses entailed by recruitment of non-local supernumerary staff are estimated at			14,000
	Insurance Accident and sickness insurance expenses for supernumerary staff recruited specifically for the work of the Conference are estimated at		17,000	
	Provision is also made for covering the expenses entailed by the affiliation of a category of supernumerarx staff to the United Nations Joint Staff Pension Fund		29,000	46,000
	Premises, furniture, machines			
	a) Meeting rooms at the CICG have to be reserved for 19 days + 2 days for preparation and 2 days for clearing = 23 days (free of charge)		-	
	b) Use of simultaneous interpretation equipment		13,000	
	c) Maintenance of meeting rooms, security at night and weekends		12,000	
	d) Rental of furniture and machines		10,000	35,000
	Document production			
	The volume of documentation is estimated at 1,000,000 pages. The cost of producing this documentition is estimated at			20,000
	Supplies and overheads			20,000

N°	Section 20.6 Regional administrative conferences BC-R2 (1)	Expenditure 1984	Budget 1985	Budget 1986
			- Swiss francs -	

PTT

Mainly the cost of postage for dispatch of documents 15,000

Technical installations 5,000

Sundry and unforeseen 10,000

Interest credited to the ordinary budget

Under Article 43.1.iii) of the Financial Regulations, and on the basis of an interest rate of 4 % per annum for amounts advanced from the ordinary account over a period of 6 months, the interest credited to the Union budget is estimated at 37,000

Report to the second session

The first session of the Conference will draw up a report of some 150 pages to the second session.

The cost of reproducing the report is estimated at 20,000

N°	Section 35 Income	Income 1984	Budget 1985	Budget 1986
			- Swiss francs -	

Contributions of Members of the Union to defraying the expenses of Regional Conference BC - R2

The recapitulation of credits in Section 20.6 shows that the expenditure to be borne by the Members of Region 2 is estimated at 1,123,000 Swiss francs.

The Members of Region 2 are as follows :

		Contributory units
1.	Argentine Republic	3
2.	Bahamas (Commonwealth of the)	1/2
3.	Barbados	1/4
4.	Belize	1/8
5.	Bolivia (Republic of)	1/4
6.	Brazil (Federative Republic of)	3
7.	Canada	18
8.	Chile	1
9.	Colombia (Republic of)	1
10.	Costa Rica	1/4
11.	Cuba	1/2
12.	Denmark	5
13.	Dominican Republic	1/2
14.	El Salvador (Republic of)	1/4
15.	Ecuador	1/2
16.	United States of America	30
17.	France	30
18.	Grenada	1/8
19.	Guatemala (Republic of)	1/4
20.	Guyana	1/4
21.	Haiti (Republic of)	1/8
22.	Honduras (Republic of)	1/4
23.	Jamaica	1/4
24.	Mexico	1
25.	Nicaragua	1/2
26.	Panama (Republic of)	1/2
27.	Paraguay (Republic of)	1/2
28.	Netherlands (Kingdom of the)	10
29.	Peru	1/4
30.	United Kingdom of Great Britain and Northern Ireland	30
31.	Saint Vincent and the Grenadines	1/8
32.	Suriname (Republic of)	1/4
33.	Trinidad and Tobago	1
34.	Uruguay (Eastern Republic of)	1/2
35.	Venezuela (Republic of)	2
		142

N°	Section 35 Income	Income 1984	Budget 1985	Budget 1986
			- Swiss francs -	

The amount of the contributory unit for the BC-R2 Regional Administrative Conference is therefore estimated at :

$$\frac{1,123,000}{142} = 7,908 \text{ Swiss francs rounded off to } \underline{7,900 \text{ Swiss francs}}.$$

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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BUDGET CONTROL COMMITTEE

Note by the Secretary General

CONTRIBUTIONS OF NON-EXEMPT RECOGNIZED PRIVATE

OPERATING AGENCIES AND INTERNATIONAL ORGANIZATIONS

No. 623 of the International Telecommunication Convention, Nairobi, 1982 provides that :

> ..."The amount of the contribution per unit payable towards the expenses of administrative conferences by recognized private operating agencies which participate in accordance with No. 358 and by participating international organizations shall be fixed by dividing the total amount of the budget of the conference in question by the total number of units contributed by Members as their share of Union expenses..."

Since the budget of the First Session of the Regional Administrative Planning Conference for the Broadcasting Service in the band 1.605-1.705 KHz in Region 2 totals 1,123,000 Swiss Francs and the Members' Contributory units total 142, the amount of the contributory unit for recognized private operating agencies and international organizations which are not exempt under the provisions of Administrative Council Resolution No. 574 is 7,900 Swiss Francs. This figure may however have to be adjusted if the budget of the Conference is affected by changes in the United Nations common system of staff salaries and allowances.

A list of the non-exempt recognized private operating agencies and international organizations participating in the work of the Conference, with the number of contributory units chosen by them, will be published later.

R.E. BUTLER
Secretary-General

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Corrigendum 1 to Document 7-E
14 April 1986
Original : English

COMMITTEES 4, 5
WG OF THE PLENARY

Canada

PROPOSALS FOR THE WORK OF THE CONFERENCE

Page 14 : equation (3), add dB (uV/m) as units of F_c

Page 32 : The legend of the abcissa should read as follows :

"Antenna radiator height (h), in meters"

Page 45 : Section 9.2.2.1, 6th line, read :

"..radiotelephony (J3E modulation) and 8 dB for narrow-band direct..."

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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21 March 1986
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PLENARY MEETING

Canada

PROPOSALS FOR THE WORK OF THE CONFERENCE

TABLE OF CONTENTS

FIRST SESSION OF THE REGIONAL ADMINISTRATIVE RADIO CONFERENCE TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 KHZ IN REGION 2

INTRODUCTION

1.0 At the ITU World Administrative Radio Conference (WARC) 1979, an additional 100 kHz of spectrum in the 1605-1705 kHz band was provided for the AM broadcasting service in Region 2. This new frequency band will provide additional channels to the highly congested existing broadcasting band (535-1605 kHz) and will allow for much needed expansion of this service to the general public by the early 1990's.

1.1 Recommendation No. 504, "Relating to the Preparation of a Broadcasting Plan in the Band 1605-1705 kHz in Region 2", outlines the framework within which conference preparations for planning is to proceed. Although the Conference will stipulate the effective implementation date of any plan that is agreed upon, the Recommendation states that the broadcasting service shall not commence before July 1, 1987 for frequencies between 1625-1665 kHz and July 1, 1990 for frequencies between 1665-1705 kHz.

1.2 Canada intends to ensure that whatever form of broadcasting plan is developed, it should allow maximum flexibility in the future evolution of broadcasting in the Western Hemisphere. The geographical areas of countries in the Region vary from very large to very small and include countries with only one common border to one country bordering on ten others. In addition, the population densities vary from very sparce to highly concentrated. These large variations in geographical size and population density must be considered in any planning exercise that is undertaken. Due to the limited spectrum available for planning (100 kHz), it will be appropriate to utilize low power and directional antennas to enable equitable sharing of this band and to maximize the number of broadcasting channels that can be made available to countries on a priority basis.

1.3 From the information received to date, the types of broadcasting services envisaged include those somewhat similar to the existing ones in the 535-1605 kHz band, with a mixture of wide-area coverage and community coverage. In general, a predominant demand for lower power stations is expected.

1.4 In these proposals a Modified Allotment Planning Method is presented (see Section 8) which is a new approach in planning the important Broadcasting Service. This approach allows for the progressive use of broadcasting channels by a country, whenever and wherever those channels are required and without the need for coordination. In this way, the submission to the ITU of broadcasting requirements, as envisaged by the Agenda of the Conference, would not be required since the Plan is based on equal distribution of channels along the borders.

CAN/7/1 2. DEFINITIONS (AGENDA 2.1.1)

In addition to the definitions given in the Radio Regulations, the following definitions and symbols should apply.

CAN/ 7 /2 2.1 Broadcasting Channel

A part of the frequency spectrum, equal to the necessary bandwidth of AM sound broadcasting stations, and characterized by the nominal value of the carrier frequency located at its centre.

CAN/ 7 /3 2.2 Objectionable Interference

Interference caused by a signal exceeding the maximum permissible field strength within the protected contour, "according to the terms of an agreement".

CAN/ 7 /4 2.3 Protected Contour

Continuous line that delimits the area which is protected from objectionable interference.

CAN/ 7 /5 2.4 Priority Channel

Any channel designated in the Plan for the use of an administration within its boundaries or within a specified sub-national zone(s).

CAN/ 7 /6 2.5 Non-Priority Channel

Any channel which is not designated in the Plan for the use of an administration but which may be used by it after successful coordination.

CAN/ 7 /7 2.6 Sub-National Zones

An area(s) shown in the Plan within the national boundaries of an administration where a specific priority channel(s) has been designated for use by that administration.

CAN/ 7 /8 2.7 Service Area

Area delimited by the contour within which the calculated level of the groundwave field strength is protected from objectionable interference in accordance with the provisions of an agreement.

CAN/ 7 /9 2.8 Nominal Usable Field Strength (E_{nom})

Agreed minimum value of the field strength required to provide satisfactory reception, under specified conditions, in the presence of atmospheric noise, man-made noise and interference from other transmitters. The value of nominal usable field strength should be employed as the reference for planning.

CAN/ 7 /10 2.9 Audio-frequency (AF) Signal-to-interference Ratio (CCIR Recommendation No. 447-2)

The ratio (expressed in decibels) between the values of the voltage of the wanted signal and the voltage of the interference, measured under specified conditions[1], at the audio-frequency output of the receiver.

CAN/ 7 /11 2.10 Audio-frequency (AF) Protection Ratio

Agreed minimum value of the audio-frequency signal-to-interference ratio corresponding to a subjectively defined reception quality. This ratio may have different values according to the type of service desired.

CAN/ 7 /12 2.11 Radio-frequency (RF) Wanted-to-interfering Signal Ratio (CCIR Recommendation No. 447-2)

The ratio (expressed in decibels) between the values of the radio-frequency voltage of the wanted signal and the interfering signal, measured at the input of the receiver under specified conditions.[1]

CAN/ 7 /13 2.12 Radio-frequency (RF) Protection Ratio

The desired radio-frequency signal-to-interference ratio which, in well-defined conditions[1], makes it possible to obtain the audio-frequency protection ratio at the output of a receiver.

CAN/ 7 /14 2.13 Relative Radio-frequency Protection Ratio (CCIR Recommendation No. 560-1)

This ratio is the difference, expressed in decibels, between the protection ratio when the carriers of the wanted and unwanted transmitters have a frequency difference of f (Hz or kHz) and the protection ratio when the carriers of these transmitters have the same frequency.

CAN/ 7 /15 2.14 Day-time operation

Operation between the times of local sunrise and local sunset.

CAN/ 7 /16 2.15 Night-time operation

Operation between the times of local sunset and local sunrise.

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1 These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission characteristics (type and percentage of modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

CAN/7/17 2.16 Synchronized network

Two or more broadcasting stations whose carrier frequencies are identical and which broadcast the same programme simultaneously.

In a synchronized network the difference in carrier frequency between any two transmitters in the network should not exceed 0.1 Hz. The modulation delay between any two transmitters in the network should not exceed 100 us, when measured at either transmitter site.

CAN/7/18 2.17 Station power

Unmodulated carrier power supplied to the antenna.

CAN/7/19 2.18 Groundwave

Electromagnetic wave which is propagated along the surface of the Earth or near it and which has not been reflected by the ionosphere.

CAN/7/20 2.19 Skywave

Electromagnetic wave which has been reflected by the ionosphere.

CAN/7/21 2.20 Skywave field strength, 50% of the time

The skywave field strength during the reference hour which is exceeded for 50% of the nights of the year. The reference hour is the period of one hour beginning one and a half hours after sunset and ending two and a half hours after sunset at the midpoint of the short great-circle path.

CAN/7/22 2.21 Characteristic Field Strength (E_c)

The field strength, at a reference distance of 1 km in a horizontal direction, of the ground-wave signal propagated along perfectly conducting ground for 1 kW station power, taking into account losses in a real antenna.

In calculating E_c, the following should be considered:

(a) The gain (G) of the transmitting antenna relative to an ideal short vertical antenna is given by the following equation:

$$G = 20 \log \frac{E_c}{300} \text{ dB}$$

where: E_c: units of mV/m.

(b) The effective monopole radiated power (e.m.r.p.) is given by the following equation:

$$\text{e.m.r.p.} = 10 \log P_t + G \text{ dB (kW)}$$

where P_t is the station power (kW).

CAN/ 7 /23 2.22 Electrical height of the antenna radiator

The electrical height of the radiator expressed in degrees of a wavelength at the design frequency adjusted to take account of the velocity of propagation in the radiator.

CAN/ 7/24 2.23 Symbols

Hz:	hertz
kHz:	kilohertz
W:	watt
kW:	kilowatt
mV/m:	millivolt/metre
uV/m:	microvolt/metre
dB:	decibel
dB(uV/m):	decibels with respect to 1 uV/m
dB(kW):	decibels with respect to 1 kW
mS/m:	millisiemens/metre

3. PROPAGATION DATA (AGENDA 2.1.2)

CAN/ 7 /25 3.1 Ground conductivity

For groundwave propagation calculations in the band 1605-1705 kHz, the Atlas of Ground Conductivity should be used which contains information communicated to the IFRB in connection with the first and second sessions of the Regional Administrative MF broadcasting conference (Region 2), Buenos Aires (1980) and Rio de Janeiro (1981), and subsequent revisions.

The following provisions should also be included in an Agreement:

i) When an administration notifies to the IFRB data intended to modify the Atlas, the IFRB shall so inform all administrations of Region 2. After 90 days from the date on which this information is communicated by the IFRB, the IFRB shall modify the Atlas and communicate the modifications to all administrations.

ii) A proposal to modify assignments authorized according to the Plan shall be evaluated on the basis of the values in the Atlas on the date the proposal was received by the IFRB.

CAN/ 7 /26 3.2 Field Strength Curves for Groundwave Propagation

For planning purposes, the curves shown on Graph 3.1 are to be used for determining groundwave propagation in the frequency range 1605-1705 kHz. This single set of curves was calculated in accordance with section 2.2, Chapter 2 of the CCIR Report to the Conference, for 1655 kHz, and on the same basis as that used for the Final Acts of the 1981 Rio de Janeiro Conference.

The curves are labelled with ground conductivities in millisiemens/metre. All curves, except the 5000 mS/m (sea water) curve, are derived for a relative dielectric constant of 15. The sea water curve is derived for a dielectric constant of 80.

Annex E to the Report by the First Session of the Regional Administrative MF Broadcasting Conference (Region 2), Buenos Aires, 1980, contains a mathematical discussion relating to the calculation of the groundwave curves. The corresponding computer program is available at the IFRB.

CAN/ 7 /27 3.3 Calculation of groundwave field strength

Using the Atlas of Ground Conductivity, the relevant conductivity or conductivities for the chosen path are determined. If only one conductivity is representative, the method for homogeneous paths is used. If several conductivities are involved, the method for non-homogeneous paths is used.

CAN/ 7 /28 3.3.1 Homogeneous paths

The vertical component of the field strength for a homogeneous path is represented in Graph 3.1 as a function of distance, for various values of ground conductivity.

The distance in kilometres is shown on a logarithmic scale on the abscissa. The field strength is shown on a linear scale on the ordinate in decibels above 1 uV/m. The graph is standardized for a characteristic field strength of 100 mV/m corresponding to an effective monopole radiated power (e.m.r.p.) of -9.5 dB relative to 1 kW. The straight line marked "100 mV/m at 1 km" is the field strength on the assumption that the antenna is erected on a surface of perfect conductivity.

For omnidirectional antenna systems having a different characteristic field strength, correction must be made according to the following equations:

$E = E_0 \times \frac{E_c}{100} \times \sqrt{P}$ if field strengths are expressed in mV/m, and

$E = E_0 + E_c - 100 + 10 \log P$ if field strengths are expressed in dB (uV/m)

For directional antenna systems, the correction must be made according to the following equations:

$E = E_0 \times \frac{E_R}{100}$ if field strengths are expressed in mV/m, and

$E = E_0 + E_R - 100$ if field strengths are expressed in dB (uV/m).

Where E : resulting field strength

E_0 : field strength read from Graph 3.1

E_R : actual radiated field strength at a particular azimuth at 1 km

E_c : characteristic field strength

P : station power in kW.

The pair of scales following Graph 3.1 can be used in conjunction with that Graph. One scale is labelled in decibels and the other in millivolts per metre. These scales can be cut out and trimmed as a unit to be used as sliding ordinate scales. The scales allow graphical conversion between decibels and millivolts per metre, and are used to make graphical determinations of field strengths. Other methods of making calculations on the graph may be used, including the use of dividers to adjust for values of E_R that differ from 100 mV/m at 1 km. However, any method used will follow steps similar to those discussed below.

For both omnidirectional and directional antenna systems the value of E_R must be found. For omnidirectional systems E_R can be determined by using the following equations:

$E_R = E_c \sqrt{P}$ if field strengths are expressed in mV/m, and

$E_R = E_c + 10 \log P$ if field strengths are expressed in dB (uV/m).

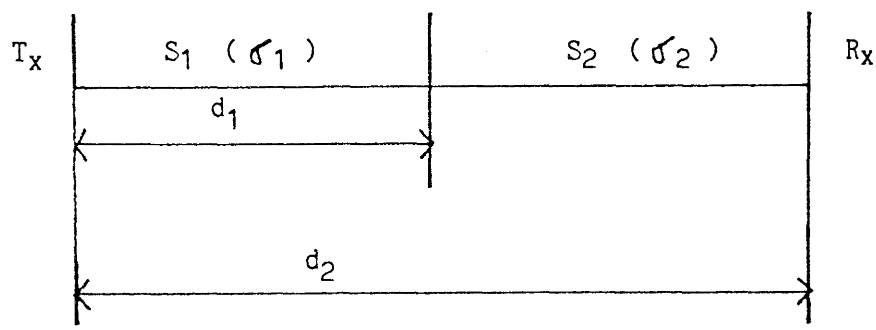
To determine the field strength at a given distance, the scale is placed at the given distance with the 100 dB (uV/m) point of the scale resting on the appropriate conductivity curve. The value of E_R is then found on the scale; the point on the underlying graph (which lies underneath the E_R point of the scale) yields the field strength at the given distance.

To determine the distance at a given field strength, the E_R value is found on the sliding scale and that point is placed directly at the level of the given field strength on the graph. The scale is then moved horizontally until the 100 dB (uV/m) point of the scale coincides with the applicable conductivity curve. The distance may then be read from the abscissa of the underlying graph.

CAN/ 7 /29 3.3.2 <u>Non-homogeneous paths</u>

In this case, the equivalent distance or Kirke method is to be used. To apply this method, Graph 3.1 can also be used.

Consider a path whose sections S_1 and S_2 have endpoint lengths corresponding to d_1 and $d_2 - d_1$, and conductivities σ_1 and σ_2 respectively, as shown on the following figure:



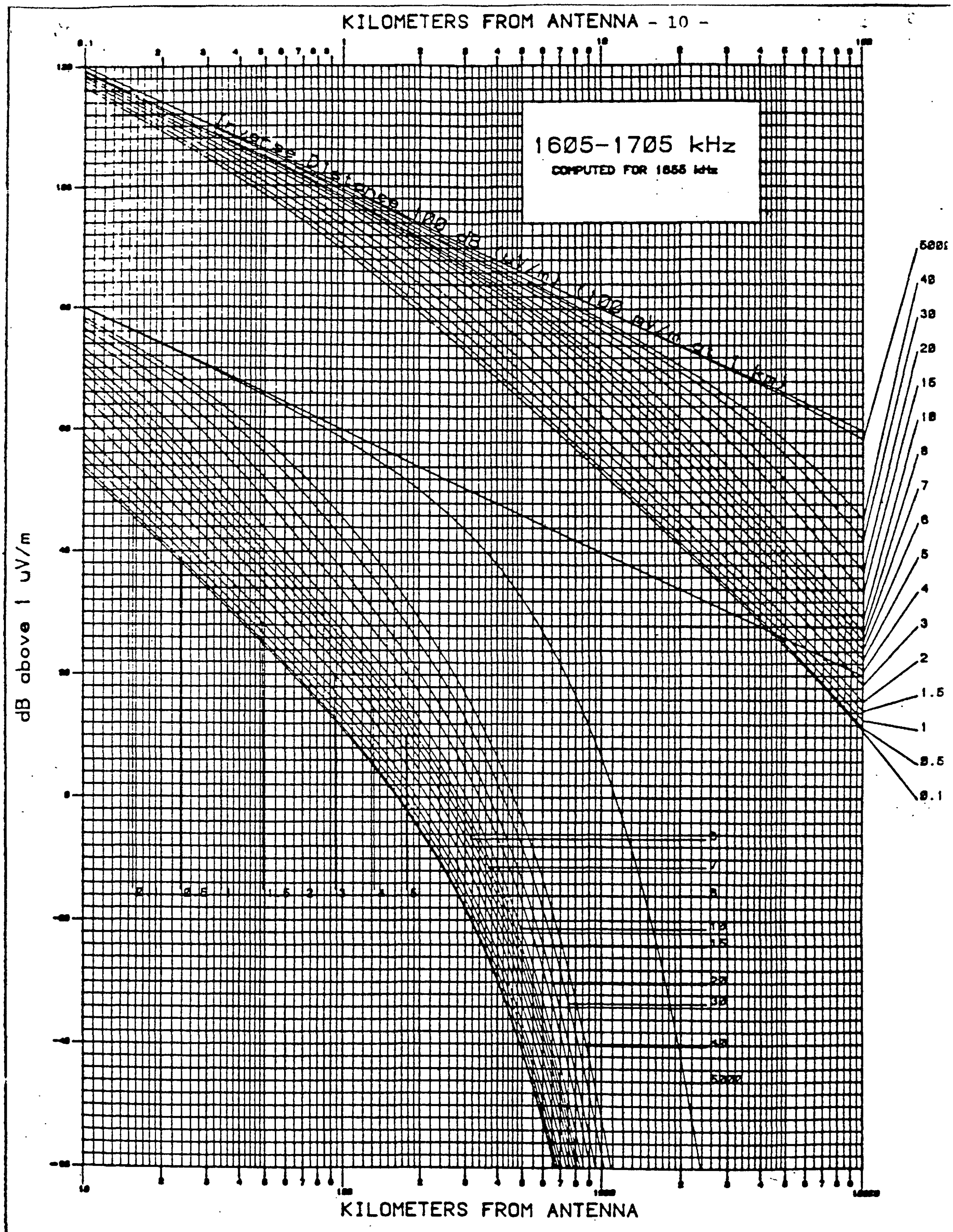
The method is applied as follows:

a) Taking section S_1 first, we read the field strength corresponding to conductivity σ_1 at distance d_1 on the graph.

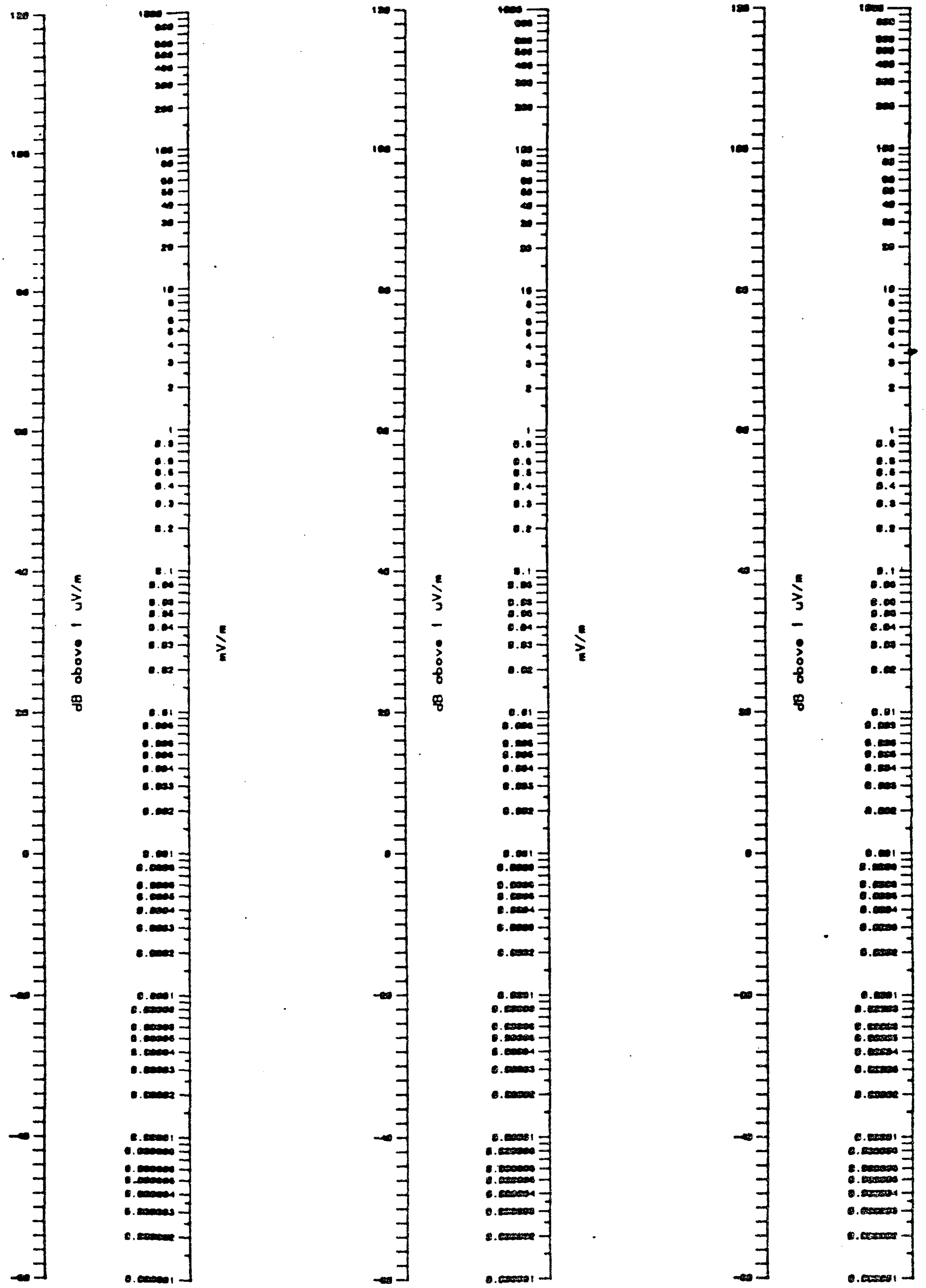
b) As the field strength remains constant at the soil discontinuity, the value immediately after the point of discontinuity must be equal to that obtained in a) above. As the conductivity of the second section is σ_2, the curve corresponding to conductivity σ_2 gives the equivalent distance to that which would be obtained at the same field strength arrived at in a). This equivalent distance is d. Distance d is larger than d_1 when σ_2 is larger than σ_1. Otherwise d is less than d_1.

c) The field strength at the real distance d_2 is determined by taking note of the corresponding curve for conductivity σ_2 similar to that obtained at equivalent distance $d + (d_2 - d_1)$.

d) For successive sections with different conductivities, procedures b) and c) are repeated.



GRAPH 3.1 – Ground wave field strength versus distance
(for a characteristic field strength of 100 mV/m)



- Scale for use with ground wave field strength graph 3.1

CAN/ 7 /30 3.4 Skywave propagation*

The calculation of skywave field strength should be conducted in accordance with the provisions which follow.

CAN/ 7 /31 3.4.1 List of symbols

d : short great-circle path distance (km)
E_c : characteristic field strength, mV/m at 1 km for 1 kW
$f(\theta)$: radiation as a fraction of the value $\theta = 0$ (when θ = ($f(\theta) = 1$)
f : frequency (kHz)
F : unadjusted annual median skywave field strength, in dB (uV/m)
F_c : field strength read from Figure 3.4
P : station power (kW)
θ : elevation angle from the horizontal (degrees)

CAN/ 7 /32 3.4.2 General procedure

The product $E_c\ f(\theta)\ \sqrt{P}$ gives the field strength at 1 km at the appropriate elevation angle and azimuth.

For an omnidirectional antenna, E_c and $f(\theta)$ are determined as follows:

Radiation in the horizontal plane of an omnidirectional antenna fed with 1 kW (characteristic field strength, E_c) is known either from design data or, if the actual design data are not available, from Figure 3.1.

Elevation angle, θ, is given by

$$\theta = \arctan\left(0.00752 \cot \frac{d}{444.54}\right) - \frac{d}{444.54} \quad \text{degrees} \qquad (1)$$

$0 \leqslant \theta \leqslant 90°$

Alternatively, Table 1 or Figure 3.2 may be used.

It is assumed that the Earth is a smooth sphere with an effective radius of 6,367.6 km and that reflections occur from an ionospheric height of 96.5 km.

* The skywave propagation method proposed herein is based on the method called "modified FCC method" in the CCIR report to the conference titled: "Technical bases for the first session of the regional administrative radio conference to establish a plan for the broadcasting service in the band 1605-1705 kHz in Region 2 (BC-R2(1)), Geneva, 1985. More details on this method are given in CCIR Document 6/183, dated May 30, 1985, which is the Final Report of IWP 6/4 on "Skywave Propagation" for the first session of the 1605-1705 kHz RARC (Region 2).

The radiation $f(\theta)$ expressed as a fraction of the value at $\theta = 0$ at a pertinent elevation angle θ can be determined from Figure 3.3 or Table II.

For a directional antenna, $E_c f(\theta) \sqrt{P}$ is determined from the antenna radiation pattern*.

The unadjusted skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c f(\theta) \sqrt{P}}{100} \quad \text{dB (uV/m)} \qquad (2)$$

where F_c is given by:

$$F_c = (95 - 20 \log d) - (2\pi + 4.95 \tan^2 \phi)(d/1000)^{1/2} \qquad (3)$$

Where ϕ = arithmetic mean of the geomagnetic latitude of the transmitter (ϕ_T) and that of the receiving site (ϕ_R) of a path. Northern latitudes are considered positive, southern latitudes negative. For F_c, for selected latitudes, see Figure 3.4 and for the map of geomagnetic latitudes, see Figure 3.5. If $|\phi|$ is greater than 60°, equation (3) is evaluated for $\phi = \pm 60°$. If d is less than 200 km, F_c is evaluated for d=200 km. The actual value of d is to be used however in determining the angle of departure.

Note: Values of F_c in equation (3) and in Figure 3.4 are normalized to 100 mV/m at 1 km corresponding to an effective monopole radiated power (e.m.r.p.) of -9.5 dB(kW) (See Figure 3.1a).

CAN/ 7 /33 3.5 Nocturnal variation of skywave field strength

Hourly median skywave field strengths vary during the night and at sunrise and sunset. Figure 3.6 shows the average variation referred to the value at 2 hours after sunset at the path midpoint for the band 1605-1705 kHz. This variation applies to field strengths occurring for 50% of the nights.

CAN/ 7 /34 3.6 Sunrise and sunset time

To facilitate the determination of the local time of sunrise and sunset, Figure 3.7 gives the times for various geographical latitudes and for each month of the year. The time is the local meridian time at the point concerned and should be converted to the appropriate standard time.

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* See Appendix 3 to Annex 2 of the Final Acts of the Regional Administrative MF Broadcasting Conference, Region 2, Rio de Janeiro, 1981 for the method of calculation.

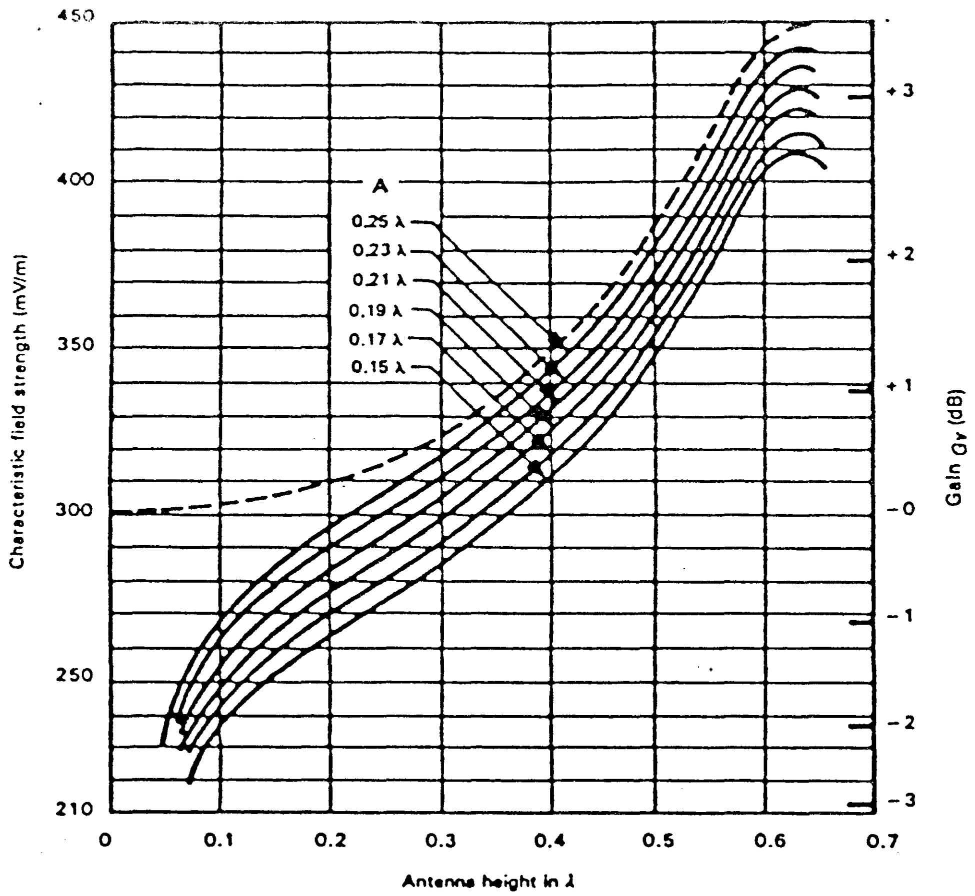

FIGURE 3.1 - Characteristic field strengths for simple vertical antennas, using 120-radial ground systems

A : radius of ground system

Full lines : real antenna correctly designed

Dashed line : ideal antenna on a perfectly conducting ground

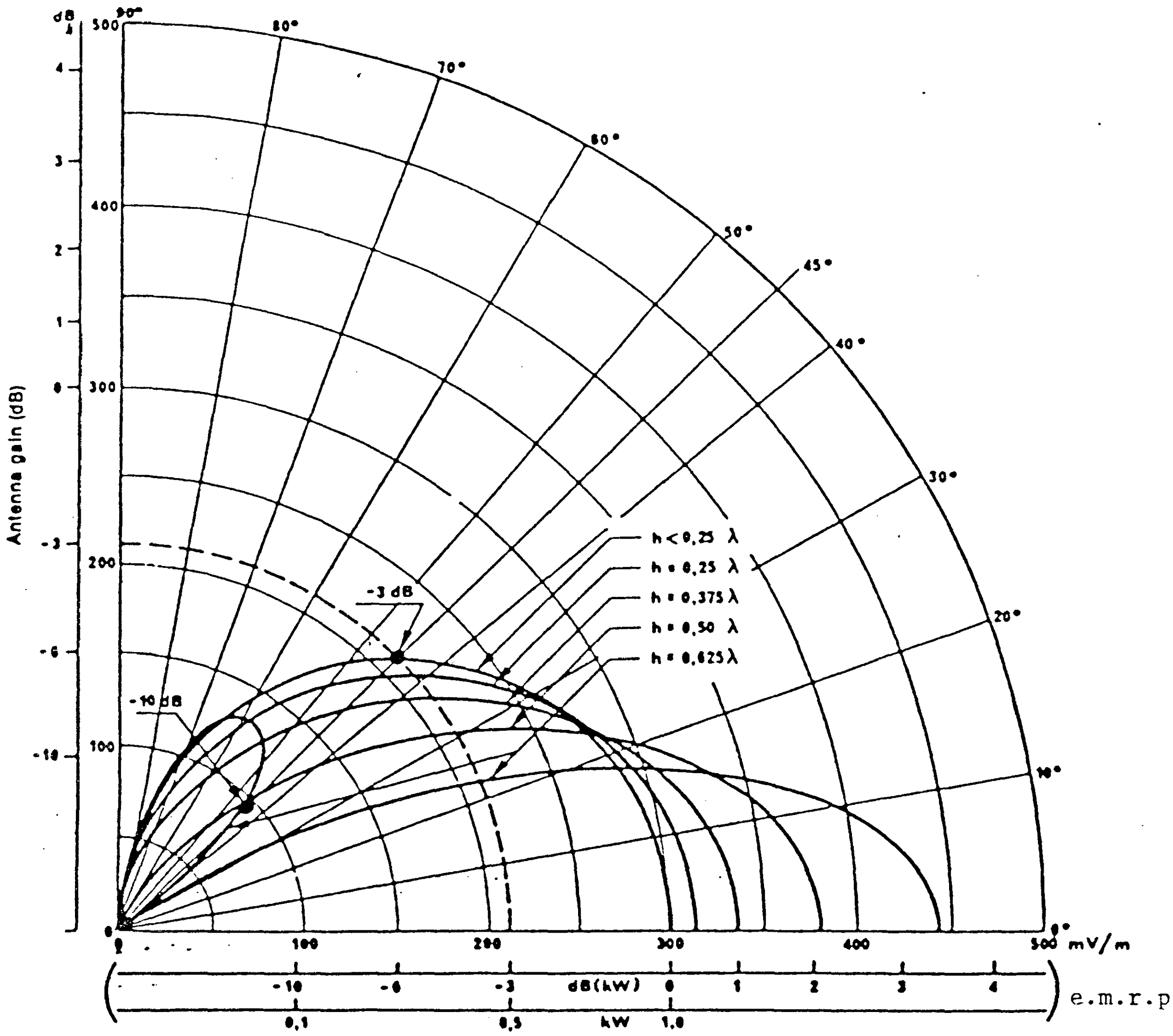

FIGURE 3.1 a - Effective monopole radiated power (e.m.r.p.) and field strength at a distance of 1 km as a function of elevation angle, for different heights of vertical antennae assuming a transmitter power of 1 kW

TABLE I - Elevation angle vs distance

Distance (km)	Elevation angle (degrees)
50	75.3
100	62.2
150	51.6
200	43.3
250	36.9
300	31.9
350	27.9
400	24.7
450	22.0
500	19.8
550	18.0
600	16.3
650	14.9
700	13.7
750	12.6
800	11.7
850	10.8
900	10.0
950	9.3
1000	8.6
1050	8.0
1100	7.4
1150	6.9
1200	6.4
1250	5.9
1300	5.4
1350	5.0
1400	4.6
1450	4.3
1500	3.9
1550	3.5
1600	3.2
1650	2.9
1700	2.6
1750	2.3
1800	2.0
1850	1.7
1900	1.5
1950	1.2
2000	1.0
2050	0.7
2100	0.5
2150	0.2
2200	0.0
2250	0.0
2300	0.0
2350	0.0
2400	0.0

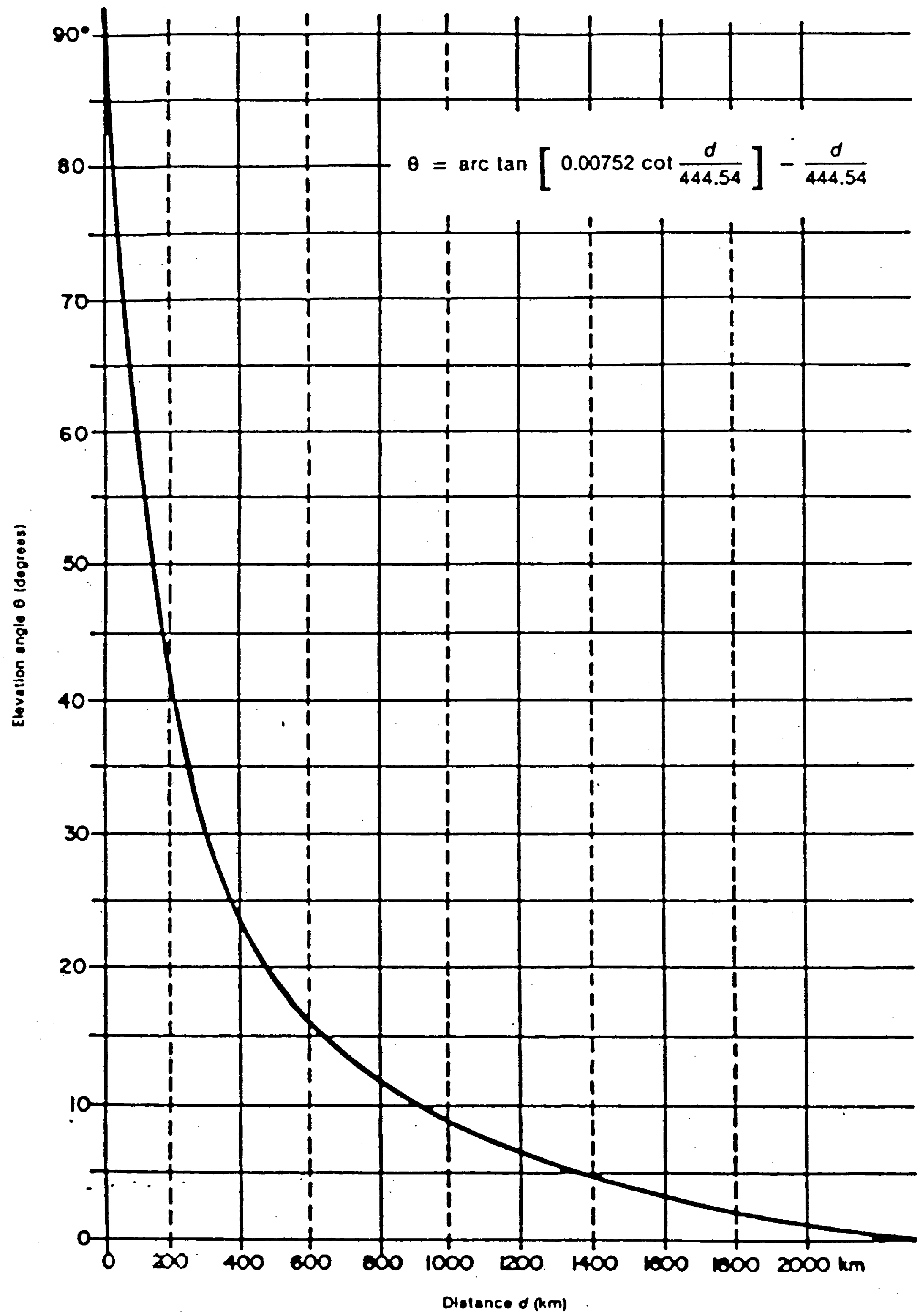

FIGURE 3.2 - Elevation angle vs distance

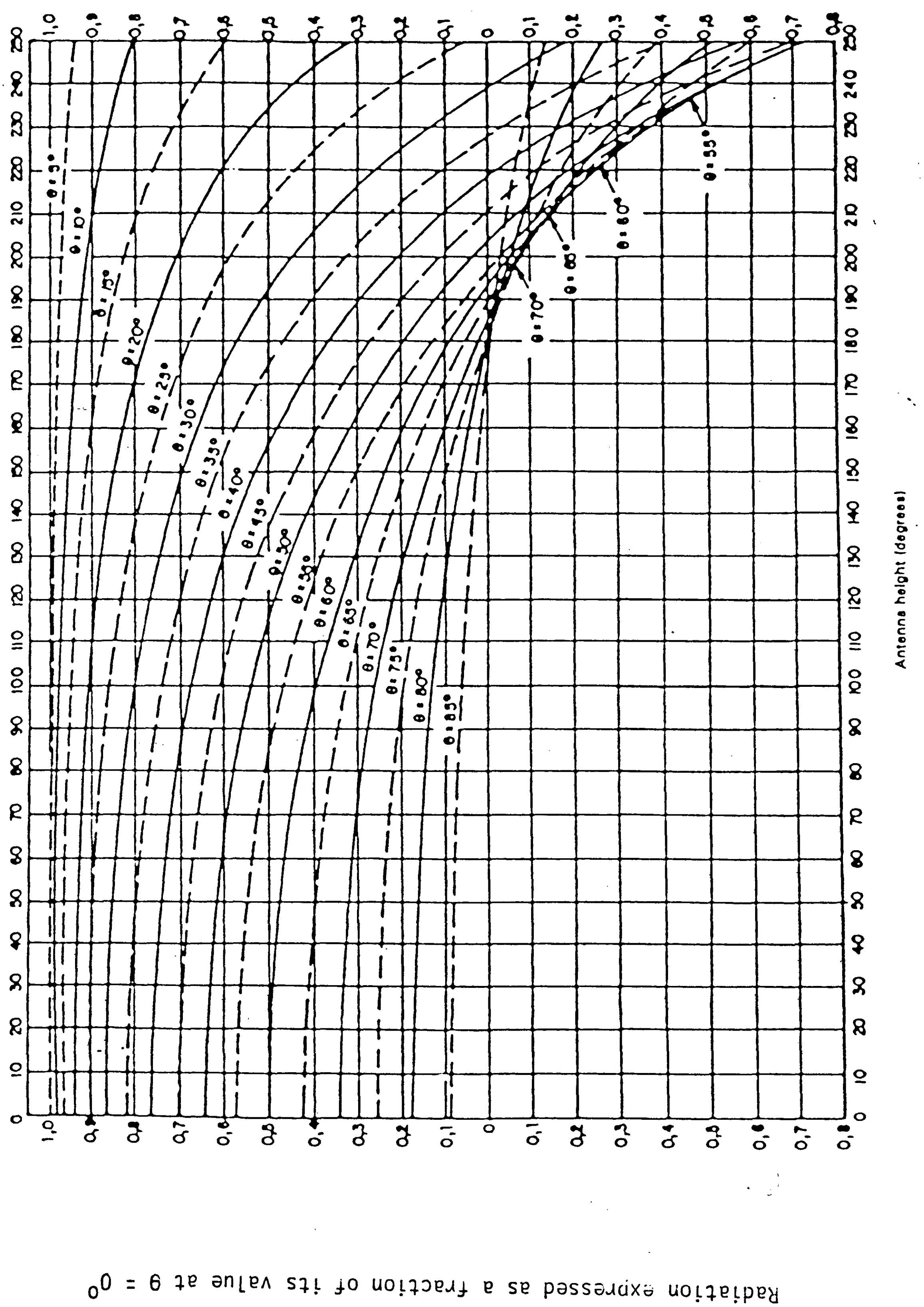

FIGURE 3.3 - Vertical plane radiation of simple vertical antennas as a function of electrical tower height for various values of elevation angle (θ)

TABLE 3-II - f(θ) values for simple vertical antennas

Elevation angle (degrees)	f(θ)					
	0.11 λ	0.13 λ	0.15 λ	0.17 λ	0.19 λ	0.21 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.999	0.998	0.998	0.998	0.998	0.998
4	0.997	0.997	0.997	0.997	0.997	0.997
5	0.996	0.996	0.996	0.995	0.995	0.995
6	0.994	0.994	0.994	0.993	0.993	0.993
7	0.992	0.992	0.991	0.991	0.991	0.990
8	0.989	0.989	0.989	0.988	0.988	0.987
9	0.987	0.986	0.986	0.985	0.985	0.984
10	0.984	0.983	0.983	0.982	0.981	0.980
11	0.980	0.980	0.979	0.978	0.977	0.976
12	0.976	0.976	0.975	0.974	0.973	0.971
13	0.972	0.972	0.971	0.969	0.968	0.967
14	0.968	0.967	0.966	0.965	0.963	0.961
15	0.963	0.962	0.961	0.959	0.958	0.956
16	0.958	0.957	0.956	0.954	0.952	0.950
17	0.953	0.952	0.950	0.948	0.945	0.943
18	0.947	0.946	0.944	0.942	0.940	0.937
19	0.941	0.940	0.938	0.935	0.933	0.930
20	0.935	0.933	0.931	0.929	0.926	0.923
22	0.922	0.920	0.917	0.914	0.911	0.907
24	0.907	0.905	0.902	0.898	0.894	0.890
26	0.892	0.889	0.885	0.882	0.877	0.872
28	0.875	0.872	0.868	0.864	0.858	0.852
30	0.857	0.854	0.849	0.844	0.839	0.832
32	0.838	0.834	0.830	0.824	0.818	0.811
34	0.819	0.814	0.809	0.803	0.796	0.789
36	0.798	0.793	0.788	0.781	0.774	0.766
38	0.776	0.771	0.765	0.758	0.751	0.742
40	0.753	0.748	0.742	0.735	0.726	0.717
42	0.730	0.724	0.718	0.710	0.702	0.692
44	0.705	0.700	0.693	0.685	0.676	0.666
46	0.680	0.674	0.667	0.659	0.650	0.639
48	0.654	0.648	0.641	0.633	0.623	0.612
50	0.628	0.621	0.614	0.606	0.596	0.585
52	0.600	0.594	0.587	0.578	0.568	0.557
54	0.572	0.565	0.559	0.550	0.540	0.529
56	0.544	0.537	0.530	0.521	0.512	0.501
58	0.515	0.508	0.501	0.493	0.483	0.472
60	0.485	0.479	0.472	0.463	0.454	0.443

TABLE 3-II (continued) - f(θ) values for simple vertical antennas

Elevation angle (degrees)	f(θ)					
	0.23λ	0.25λ	0.27λ	0.29λ	0.311λ	0.35λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.998	0.998	0.998	0.998	0.998	0.997
4	0.997	0.996	0.996	0.996	0.996	0.995
5	0.995	0.994	0.994	0.994	0.993	0.992
6	0.992	0.992	0.991	0.991	0.990	0.989
7	0.990	0.989	0.988	0.988	0.987	0.985
8	0.987	0.986	0.985	0.984	0.983	0.980
9	0.983	0.982	0.981	0.980	0.978	0.975
10	0.979	0.978	0.977	0.975	0.973	0.969
11	0.975	0.973	0.972	0.970	0.968	0.963
12	0.970	0.968	0.966	0.964	0.962	0.955
13	0.965	0.963	0.961	0.958	0.955	0.949
14	0.959	0.957	0.955	0.952	0.948	0.941
15	0.953	0.951	0.948	0.945	0.941	0.932
16	0.947	0.944	0.941	0.937	0.933	0.924
17	0.941	0.937	0.934	0.930	0.925	0.914
18	0.934	0.930	0.926	0.921	0.916	0.904
19	0.926	0.922	0.918	0.913	0.907	0.894
20	0.919	0.914	0.909	0.904	0.898	0.883
22	0.902	0.897	0.891	0.885	0.877	0.851
24	0.885	0.879	0.872	0.865	0.856	0.837
26	0.866	0.859	0.852	0.843	0.833	0.811
28	0.846	0.838	0.830	0.820	0.809	0.785
30	0.825	0.816	0.807	0.797	0.784	0.768
32	0.803	0.794	0.784	0.772	0.759	0.729
34	0.780	0.770	0.759	0.747	0.732	0.701
36	0.756	0.746	0.734	0.721	0.705	0.671
38	0.732	0.720	0.708	0.694	0.677	0.642
40	0.706	0.695	0.681	0.667	0.649	0.612
42	0.681	0.668	0.654	0.639	0.621	0.582
44	0.654	0.641	0.627	0.611	0.593	0.552
46	0.628	0.614	0.600	0.583	0.564	0.523
48	0.600	0.587	0.572	0.555	0.536	0.494
50	0.573	0.559	0.544	0.527	0.507	0.465
52	0.545	0.531	0.516	0.498	0.479	0.436
54	0.517	0.503	0.487	0.470	0.451	0.408
56	0.488	0.474	0.459	0.442	0.423	0.381
58	0.460	0.446	0.431	0.414	0.395	0.354
60	0.431	0.418	0.403	0.387	0.368	0.328

TABLE 3-II (continued) - f(θ) values for simple vertical antennas

Elevation angle (degrees)	f(θ)					
	0.40 λ	0.45 λ	0.50 λ	0.528 λ	0.55 λ	0.625 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	0.999	0.999	0.999	0.999
2	0.998	0.998	0.998	0.997	0.997	0.996
3	0.997	0.996	0.996	0.994	0.993	0.989
4	0.994	0.992	0.990	0.989	0.988	0.981
5	0.981	0.988	0.986	0.983	0.981	0.970
6	0.986	0.983	0.979	0.976	0.972	0.957
7	0.932	0.977	0.971	0.967	0.962	0.941
8	0.976	0.970	0.962	0.957	0.951	0.924
9	0.970	0.963	0.953	0.945	0.938	0.904
10	0.963	0.954	0.942	0.933	0.924	0.882
11	0.955	0.945	0.930	0.919	0.909	0.859
12	0.947	0.934	0.917	0.905	0.893	0.834
13	0.936	0.923	0.903	0.889	0.876	0.807
14	0.929	0.912	0.889	0.872	0.857	0.778
15	0.918	0.899	0.873	0.855	0.837	0.748
16	0.908	0.886	0.867	0.836	0.816	0.717
17	0.897	0.873	0.840	0.817	0.795	0.684
18	0.885	0.859	0.823	0.797	0.772	0.651
19	0.873	0.844	0.804	0.776	0.749	0.617
20	0.860	0.828	0.785	0.755	0.726	0.582
22	0.833	0.796	0.746	0.710	0.667	0.510
24	0.805	0.763	0.705	0.666	0.625	0.436
26	0.776	0.728	0.663	0.618	0.574	0.363
28	0.745	0.692	0.621	0.570	0.522	0.290
30	0.714	0.655	0.577	0.522	0.470	0.219
32	0.682	0.619	0.534	0.475	0.419	0.151
34	0.649	0.582	0.492	0.428	0.369	0.085
36	0.617	0.545	0.450	0.383	0.321	0.025
38	0.584	0.509	0.409	0.340	0.276	-0.031
40	0.552	0.473	0.370	0.298	0.231	-0.083
42	0.519	0.438	0.332	0.258	0.190	-0.129
44	0.488	0.405	0.296	0.221	0.162	-0.170
46	0.457	0.372	0.262	0.187	0.117	-0.205
48	0.427	0.341	0.230	0.135	0.085	-0.235
50	0.397	0.311	0.201	0.126	0.056	-0.259
52	0.369	0.283	0.174	0.099	0.031	-0.278
54	0.341	0.257	0.149	0.076	0.009	-0.291
56	0.316	0.232	0.126	0.055	-0.010	-0.300
58	0.289	0.208	0.106	0.037	-0.026	-0.304
60	0.265	0.186	0.087	0.021	-0.039	-0.304
62				0.008	-0.049	-0.300
64				-0.003	-0.056	-0.292
66				-0.011	-0.062	-0.281
68				-0.017	-0.064	-0.267
70				-0.022	-0.065	-0.250
72				-0.025	-0.064	-0.231
74				-0.025	-0.061	-0.210
76				-0.026	-0.056	-0.138
78				-0.024	-0.051	-0.163
80				-0.022	-0.044	-0.138

Note : When the negative sign (-) appears in the Table, it signifies only the existence of a secondary lobe having the opposite phase from the main lobe in the vertical radiation pattern. In order to perform the calculation, ignore the negative (-) and use only the absolute value of f(θ) from the Table.

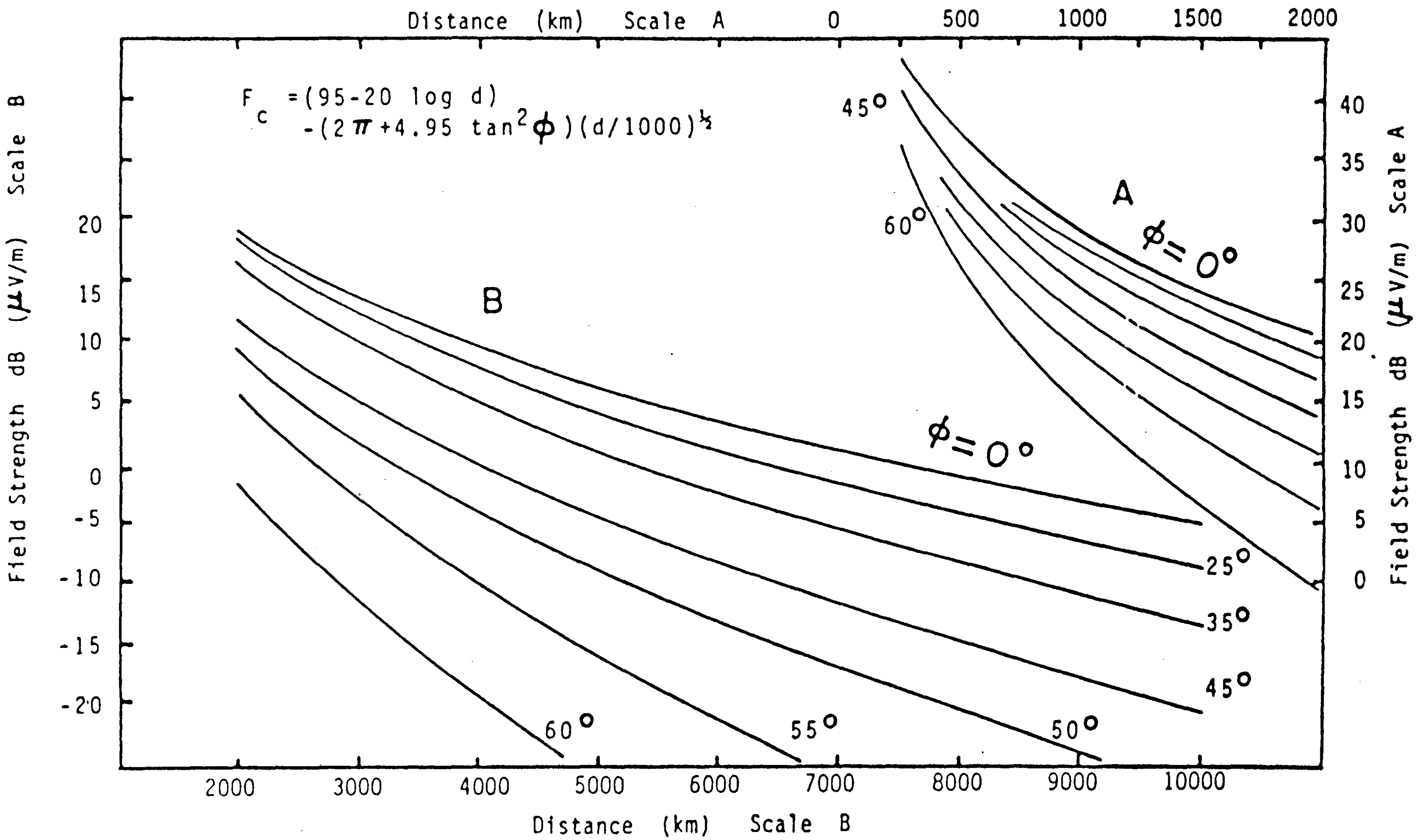

FIGURE 3.4 - Skywave field strength vs distance (for a characteristic field strength of 100 mV/m at 1 km, 50%, 2 hours after sunset)

Longitude

Latitude

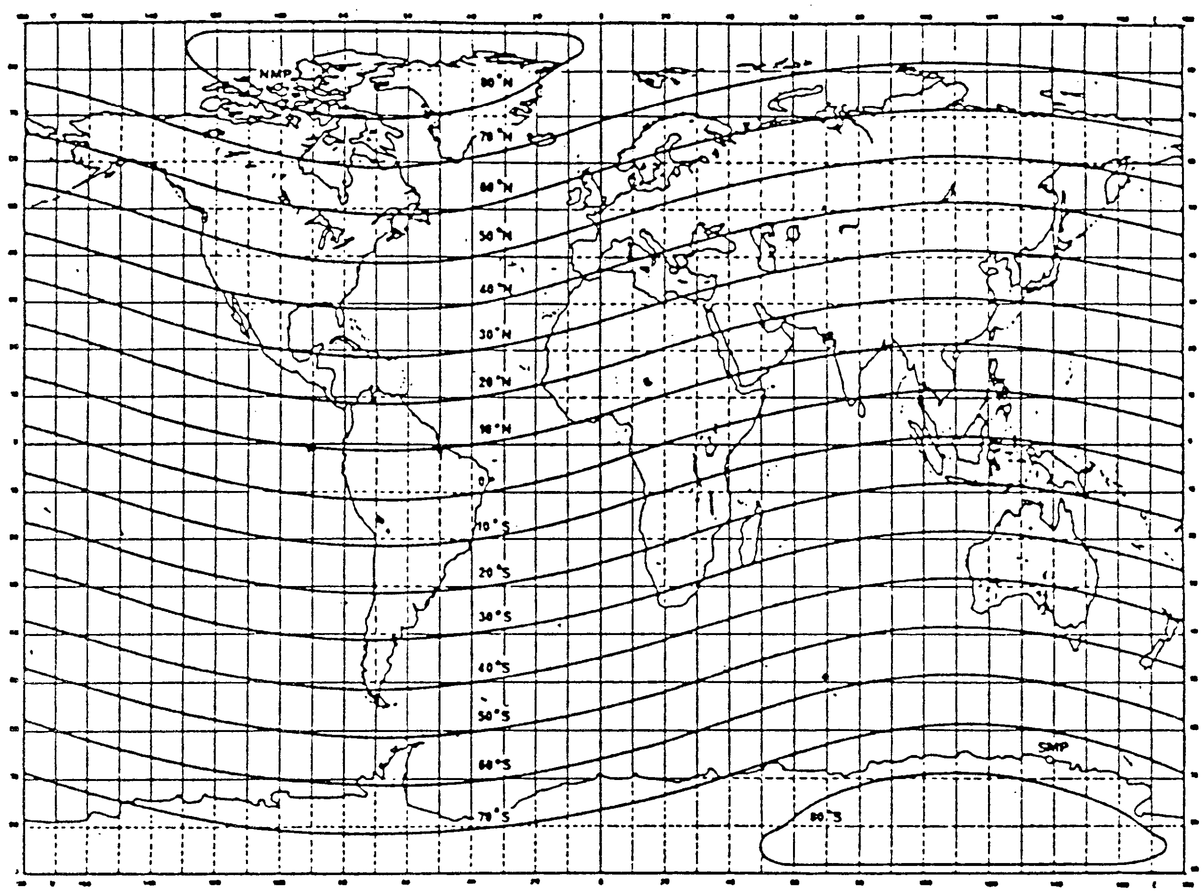

FIGURE 3.5

Geomagnetic latitudes

Φ_T or Φ_R are the geomagnetic latitudes of the transmitter or receiver. They are given by the equation:

$$\Phi_T \text{ or } \Phi_R = \text{arc sin} \left[\sin a \sin 78.5° + \cos a \cos 78.5° \cos (69° + b) \right] \text{ *}$$

where a_T or a_R and b_T or b_R are the latitude and longitude, in degrees, of the terminal respectively; b is positive east of the Greenwich meridian.

The geomagnetic latitudes at the transmitter and receiver are determined by assuming an Earth-centred dipole field model with northern pole at 78.5° N, 69° W geographic co-ordinates. Φ_T and Φ_R are taken as positive in the northern hemisphere and negative in the southern hemisphere.

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* From the CCIR Report to the First Session of the Regional Administrative MF Broadcasting Conference (Region 2), Geneva, 1979, paragraph 2.4.6.

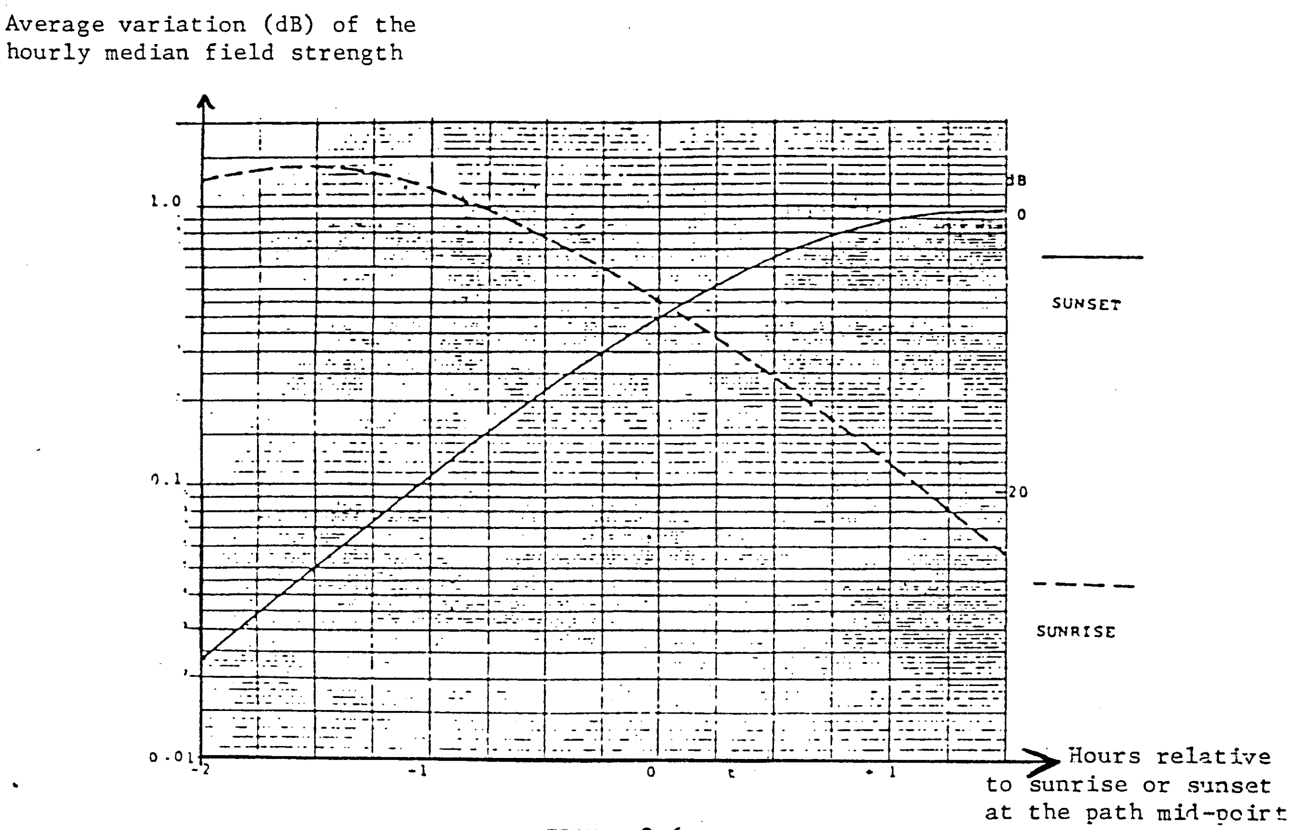


FIGURE 3.6

Diurnal Curves for the 1605-1705 kHz band

Calculated at 1655 kHz

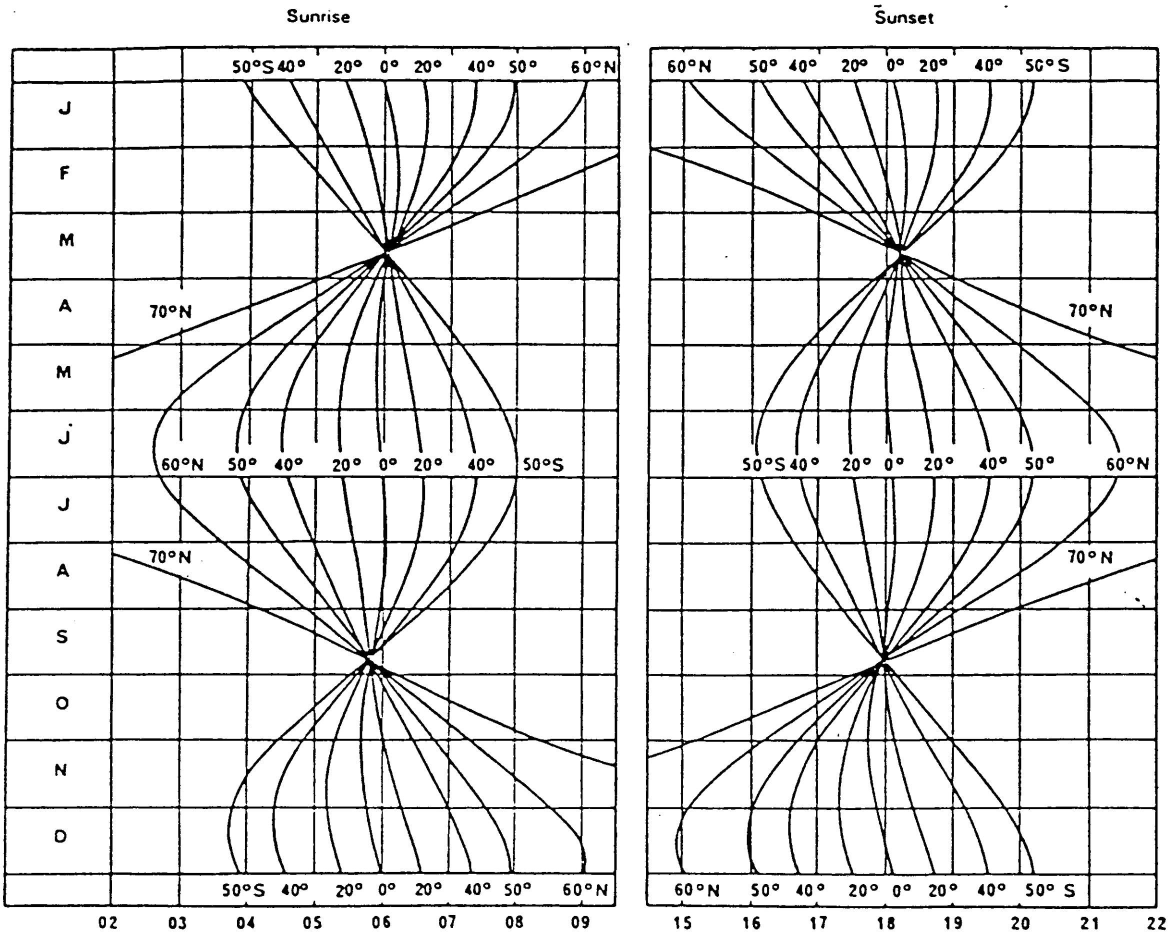


Figure 3.7: Local time at reflection point (hours)

CAN/ 7 /35 4. MODULATION STANDARDS (AGENDA 2.1.3)

The modulation standards applicable to the 1605-1705 kHz band should be compatible with those of the existing MF broadcasting band 535-1605 kHz. This would facilitate receiver design and accelerate band occupancy.

CAN/ 7 /36 4.1 Channel spacing

This Regional Plan should use a channel spacing of 10 kHz and carrier frequencies which are integral multiples of 10 kHz, from 1610 kHz to 1700 kHz. For convenience the channels could be identified as channel 1 to 10, channel one being at 1610 kHz.

CAN/ 7 /37 4.2 Class of emission

The Plan should be based upon double-sideband amplitude modulation with full carrier A3E.

Classes of emission other than A3E, for instance to accommodate stereophonic systems, could also be used on condition that the energy level outside the necessary bandwidth does not exceed that normally expected in A3E emission.

CAN/ 7 /38 4.3 Bandwidth of emission

The Plan should assume a necessary bandwidth of 10 kHz for which only 5 kHz audio bandwidth can be obtained. While this might be an appropriate value within some Administrations, others may wish to employ wider bandwidth systems with necessary bandwidths of the order of 20 kHz. However, the protection ratios selected should allow operation with 20 kHz occupied bandwidth without an appreciable increase in interference.

CAN/ 7 /39 4.4 Frequency tolerance

In accordance with Appendix 7 of the Radio Regulations.

CAN/ 7 /40 5. THE EFFECT OF RECEIVER CHARACTERISTICS UPON AM BROADCAST STANDARDS (AGENDA 2.1.4)

It is expected that receiver characteristics for this band will be similar to those of existing receivers in the 535-1605 kHz band. Therefore they should not impact on broadcast standards.

6. PROTECTION RATIOS, REQUIRED VALUES FOR THE USABLE FIELD STRENGTH AND FOR THE NOMINAL USABLE FIELD STRENGTH (AGENDA ITEM 2.1.5)

CAN/7/41 6.1 Channel protection ratios

- co-channel: 26 dB
- first adjacent channel: 0 dB
- second adjacent channel: -29.5 dB

CAN/7/42 6.2 Synchronized networks

In addition to the standards that should be specified in an Agreement, the following additional standards should apply to synchronized networks.

For the purpose of determining interference caused by synchronized networks, the following procedure should be applied. If any two transmitters are less than 400 km apart, the network should be treated as a single entity, the value of the composite signal being determined by the quadratic addition of the interfering signals from all the individual transmitters in the network. If the distances between all the transmitters are equal to or greater than 400 km, the network should be treated as a set of individual transmitters.

For the purpose of determining skywave interference received by any one member of a network, the value of the interference caused by the other elements of the network should be determined by the quadratic addition of the interfering signals from all of those elements. In any case, where groundwave interference is a factor it should be taken into account.

The co-channel protection ratio between stations belonging to a synchronized network should be 8 dB.

6.3 Application of protection criteria

CAN/7/43 6.3.1 Priority channel protection (see Section 8)

The signal strengths to be protected are the appropriate values of nominal usable field strength as shown in paragraph 6.4. The area to be protected is the border of a country and/or the sub-national zone(s).

The maximum permitted interfering field strength within the area is the value of the nominal usable field strength divided by the appropriate protection ratio. The interfering signal is considered to be the groundwave signal except for the co-channel night-time interference protection when it is the skywave signal. The effect of each interfering signal should be evaluated separately, and the presence of interference from other stations in excess of this permissible level should not reduce the necessity to limit interference which would result from proposed modifications or assignments.

CAN/ 7 /44 6.3.2 Non-priority channel protection

Assignments on non-priority channels are not specifically provided protection from assignments on priority channels. The amount of interference from priority channels is limited by restricting priority channel assignments to standard parameters as defined in section 7.1 or the equivalent. However, assignments on non-priority channels are protected from subsequent non-priority assignments. The protected contour encompasses the area where the actual field strength is equal to or greater than the appropriate value of E_{nom} found in paragraph 6.4.

The maximum permitted interfering field strength within the area is the value of the nominal usable field strength divided by the appropriate protection ratio. The interfering signal is considered to be the groundwave signal except for co-channel night-time interference protection when it is the skywave signal. The effect of each interfering signal should be evaluated separately and the presence of interference from other stations in excess of this permissible level should not reduce the necessity to limit interference which would result from proposed modifications or assignments.

CAN/ 7 /45 6.4 Nominal usable field strength

The nominal usable field strength for daytime should be 0.5 mV/m.

The value of nominal usable field strength for a priority channel corresponds to the field strength which would be subject to skywave interference from a co-channel standard parameter station separated by 550 km. For a non-priority channel, the value is 60% higher*. The following table provides values of E_{nom} at specific geomagnetic latitudes:

Geomagnetic latitudes:		0°	15°N 15°S	30°N 30°S	45°N 45°S	60°N 60°S
E_{nom}	Priority channels	3.2	3.1	2.8	2.1	0.9
(mV/m)	Non-priority channels	5.2	5.0	4.5	3.4	1.5

* On average, a non-priority channel assignment located between two priority channel zones could expect to have a usable field strength 3.2 times higher than the priority channel E_{nom}. If a 50% exclusion rule is applied, a new interfering signal should not exceed 1.6 times that E_{nom} value.

It is noteworthy to observe that a study has been undertaken to evaluate the impact noise (man-made, atmospheric and receiver) would have, in this new band, in determining the values of nominal usable field strength to use for planning. It has shown that the level of interference accepted from other stations is by far the limiting factor and hence noise per se has a small impact.

7. TRANSMITTING ANTENNA CHARACTERISTICS AND TRANSMITTER PARAMETERS (Agenda 2.1.6)

CAN/ 7 /46 7.1 Station parameters

The Plan should be based on the following standard parameters:

Station power:	1 kW, night/day
Antenna:	1/4 wave, night/day
Characteristic field strength (E_c):	300 mV/m

Other parameters may be used as long as the integrity of the Plan is not compromised. In any case, station powers should not exceed 10 kW day and night and only in exceptional cases could consideration be given to station powers up to 50 kW day.

CAN/ 7 /47 7.2 Transmitting antennas

In carrying out the calculations indicated in section 3, the following should be taken into account:

CAN/ 7 /48 7.2.1 Omnidirectional antennas

Figure 3.1 of section 3 shows the characteristic field of a simple vertical antenna as a function of its length and of the radius of the ground system. The characteristic field of an antenna with a loss-less ground system is also shown for comparison.

It is clear that the characteristic field strength increases as the loss in the ground system is reduced to zero and as the antenna height is increased up to 0.625 wavelengths.

The increased characteristic field strength for antenna lengths up to 0.625 wavelengths is obtained at the expense of radiation at high angles as shown graphically in Figure 3.1a and numerically in Table II of section 3.

CAN/ 7 /49 7.2.2 Considerations of the radiation patterns of directional antennas

Procedures for calculating theoretical, expanded and augmented (modified expanded) directional antenna patterns are given in Appendix 3 to Annex 2 of the Final Acts of the Regional

Administrative MF Broadcasting Conference (Region 2), Rio de Janeiro, 1981. These procedures can also be used for the 1605-1705 kHz band.

Other methods may be proposed by an administration and should be used by the IFRB in determining the directional antenna patterns of that concerned and provided that the method results in a complete description of the radiation in the horizontal and vertical planes.

CAN/ 7 /50 7.2.3 Top-loaded and sectionalized antennas

Calculation procedures are given in Appendices 4 and 6 to Annex 2 of the Final Acts of the Regional Administrative MF Broadcasting Conference (Region 2), Rio de Janeiro, 1981.

Stations may employ top-loaded or sectionalized towers, either because of space limitations or to vary the radiation characteristics from those of a simple vertical antenna. This is done to achieve desired coverage or to reduce interference.

Administrations using top-loaded or sectionalized antennas should supply information concerning the tower structure of the antennas. Normally, one of the equations in the Appendices stated above should be employed to determine the vertical radiation characteristics of the antennas. Other equations may also be proposed by an administration and should be used by the IFRB in determining the vertical radiation characteristics of the antennas of that administration, subject to the agreement of the other administrations concerned.

CAN/ 7 /51 7.2.4 Use of electrical height in field strength calculations

The electrical height of each antenna radiator is used in the calculation of field strengths produced by an omnidirectional or directional antenna.

This electrical height is given in Figure 7.1 hereafter taking the velocity of propagation in the radiator into consideration. The conversion curve given in Figure 7.1 applies to towers that are base fed and base insulated but not top-loaded.

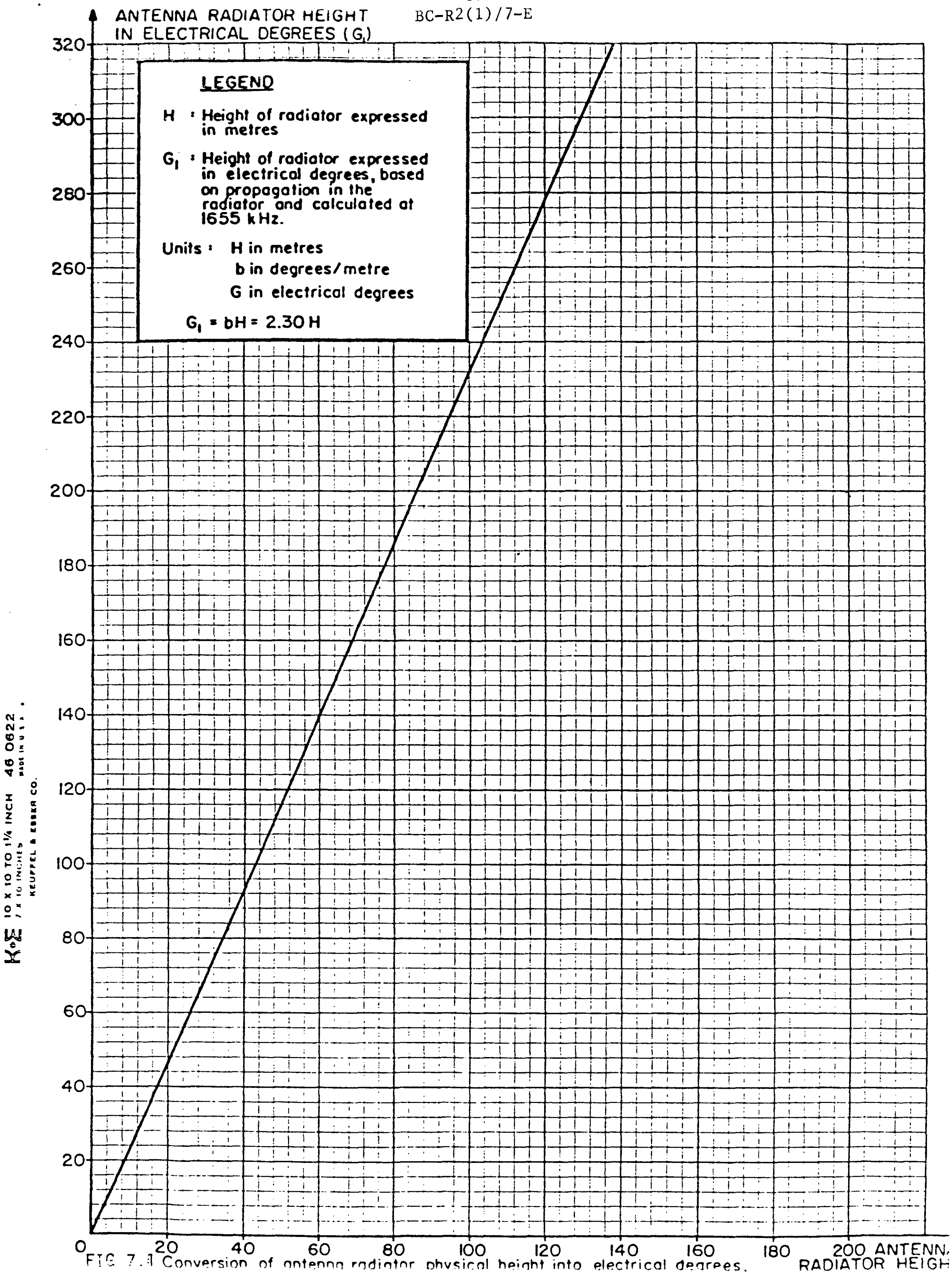


FIG 7.1 Conversion of antenna radiator physical height into electrical degrees.

PLANNING METHODS AND GUIDELINES FOR THE AGREEMENT (Agenda Item 2.1.7)

8. INTRODUCTION

Region 2 consists of over 30 countries with four main geographic areas: North America, Central America, Caribbean and South America. The primary languages of communications are French, English, Portuguese and Spanish.

The geographical areas of countries in the Region vary from very large to very small and include countries with only one common border to one country bordering on ten others. In addition, the population densities vary from very sparse to highly concentrated. These large variations in geographical size and population densities must be considered in any planning exercise that is undertaken.

8.1 Planning Options

Planning options are discussed in Section 8.4 of the CCIR Report which has been distributed as Conference document no. 3. Two basic options are discussed. The first is allotment planning, which involves the designation of allotment zones within which specified frequencies may be assigned with considerable flexibility in terms of siting and other parameters. The second is assignment planning which involves the development of a list of requirements for transmitter locations, and procedures for resolving incompatibilities, if possible.

Having weighed the relative merits of allotment and assignment planning, Canada is convinced that allotment planning is the preferable approach for this band for the following reasons:

- it does not require the prior specification of station requirements and transmitter sites by each administration many years before the need arises. This task has always been very difficult in the past.

- it provides an administration with full flexibility in the siting of stations in response to actual requirements in the future.

- it provides flexibility in choosing station parameters within few specified limitations.

- it is simple to develop.

CAN/ 7 /52 8.2. Modified Allotment Planning

It is proposed that the planning method described in Section 8 of this document be adopted by the Conference.

8.2.1 Planning principles

Canada's approach to allotment planning (called Modified Allotment Planning, or MAP), is based on four objectives: simplicity, flexibility, efficiency and equality in border areas. These objectives are embodied in the following principles:

a) Within a distance "x" from the borders between countries, the ten channels in the 1605-1705 kHz band will be divided equally so that each country will have priority channels protected for its use anywhere near the border. Beyond the distance (x) from a country's borders, all ten channels would be protected and available to that country on a priority basis.

b) Standard parameters for a station on priority channels will be specified, for day and night, to limit the radiated power towards other countries in order to facilitate channel re-use and establish distance "x".

c) A country can use another country's priority channels (i.e. use non-priority channels) provided it protects that country's border or zone of priority channels.

d) In cases where neighbouring countries have priorities on adjacent channels, procedures are needed to minimize the need for coordination.

e) Assignments may be made with parameters different from the standard parameters as long as the field strength at distance "x" from the border is not exceeded at night, and the 0.5 mV/m daytime contour does not extend into the neighbouring country, further than the 0.5 mV/m contour of a standard parameter station at the border.

f) An administration may assign an allotted priority channel as many times as possible within the designated zone provided the above principles are respected.

8.3 Methodology

8.3.1 Description

The MAP method is perhaps best understood by first looking at the final product. One end result of the MAP method could be a geographic map of Region 2, which shows priority channels allotted to each country. In some cases, the same channels would be allotted throughout a country while in others, the use of a particular group of channels may be restricted to only a portion of a country while another area of the same country may be allotted different channels. Provided a few technical and procedural rules are adhered to, administrations have the flexibility to use and re-use their priority channels for broadcasting stations as they see fit.

8.3.2 The Framework (Step 1)

The starting point in the MAP method is to identify the parameters of a standard station from which the standard night-time protection distance (x) is derived. Canada proposes that the standard parameters for day and night service should be a 1 kW transmitter power feeding a 1/4 wave omnidirectional antenna resulting in a characteristic field strength of 300 mV/m. This results in a night-time protection distance (x) of 550 km.* The standard parameters and distance (x) are the fundamental building blocks of the MAP method. While other values for standard parameter and the distance (x) may be used, the proposed ones have been found to provide a good trade-off between the re-use of channels and the provision of reasonable service areas.

8.3.3 Zones and basic entitlement of Priority Channels (Step 2)

The night-time service area of a station on a priority channel is protected provided other co-channel stations using standard paramaters are located no closer than 550 km. This distance is the controlling factor in making co-channel allotments, while the daytime service, later, becomes a factor in adjacent channel assignments (see 8.4.4).

Several conclusions can be drawn from the above. In the first place, if there is an area within a country which is at least 550 km from any other country, allotments do not have to be shared and all 10 channels may be allotted to that area as priority channels. Similarly, if there is an area within a country such that 2 and only 2 other countries are within 550 km of that area, that area could be identified and plotted on a map. The basic entitlement in this case is determined by dividing the total number of possible allotments (10) by the number of countries which may have to share those channels (3). The basic entitlement in this case is 3 with one channel left over.

*550 km is the distance at which a 1 kW station would protect a 2.5 mV/m nominal usuable field strength for 50% of the nights at geomagnetic latitude of 40^{o} using the propagation curves in Section 3.

The above two cases are shown in Table 8.1 which also shows the basic entitlement and number of channels left over for other cases. Note that at this stage, the areas plotted on maps are determined strictly on the basis of national boundaries. Only the number of channels in the basic entitlement for each country have been identified, not the frequencies of those channels. At the completion of step 2, a map may be produced. Figure 8.1 shows a possible distribution of these entitlements in South America, which also includes an arbitrary allotment of the left-over channels.

No. of neighbouring countries within 550 km of test area	Basic Channel Entitlement	Channels Left over
0	10	0
1	5	0
2	3	1
3	2	2
4	2	0

TABLE 8.1
Basic Channel Entitlement for Various border situations

8.3.4. Allotting channels and Exploring refinements (Step 3)

In this step an allotted channel should be understood to mean a particular frequency. For convenience the ten channels in the 1605-1705 kHz band are numbered 1 - 10 consecutively.

At this stage, one would simply allot channels until the basic channel entitlement has been satisfied, taking care to keep co-channel allotments separated by 550 km. In allotting channels, an attempt should be made to minimize adjacent channel relationships across national boundaries.

In a second stage, refinements could be made to:

a) utilize the "left over channels" in a fair manner;

b) distribute channels more evenly to locations where they are most needed by creating sub-national allotment zones.

c) provide more than the basic entitlement, depending on the individual situation.

FIGURE 8.1

POSSIBLE DISTRIBUTION OF PRIORITY CHANNEL ENTITLEMENT (STEP-2)

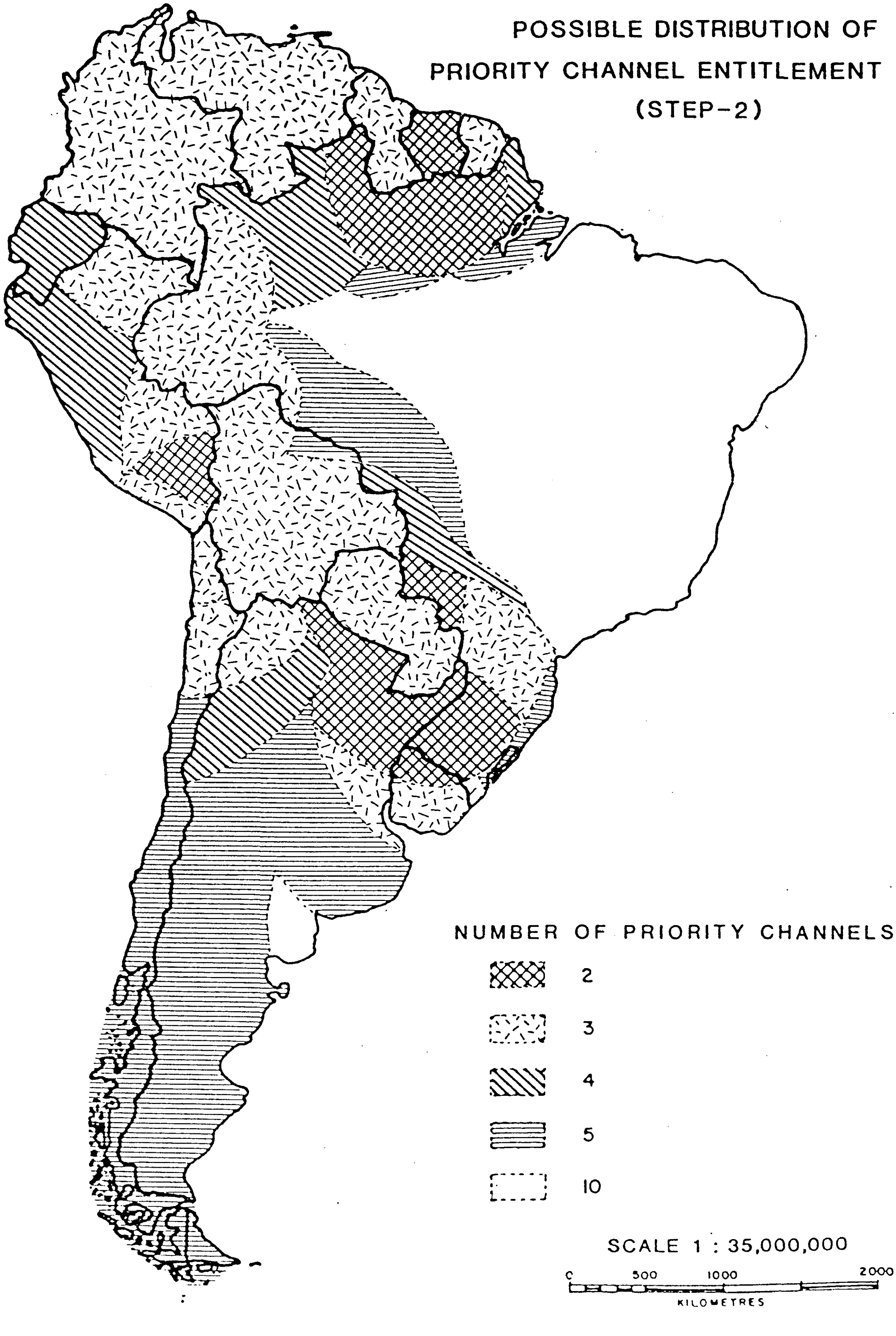


Figure 8.2 shows one possible arrangement which incorporates some of these refinements.

It is clear that improvements over the basic entitlement can be achieved, but the degree of improvement is dependent on the degree of compromise and co-operation between administrations. If agreement on the distribution of improvements over the basic entitlement cannot be reached, the plan will be considered to be acceptable provided the basic entitlement has been met.

The net result of Step 3 is therefore a map which designates zones and channels (frequencies) allotted to those zones. These are the priority channels for each country.

The designated zones must then be described to ensure that they are defined in an unambiguous manner. The description then becomes the official designation of the allotment zones, and the lines on the map could then be redrawn to correspond to it. This completes the planning process.

8.4. Implementation Criteria

The flow chart shown in figure 8.3 reflects the administrative steps that could be taken to implement assignments in accordance with this planning method. Following are the criteria to be used in the implementation.

8.4.1. Use of Priority Channels

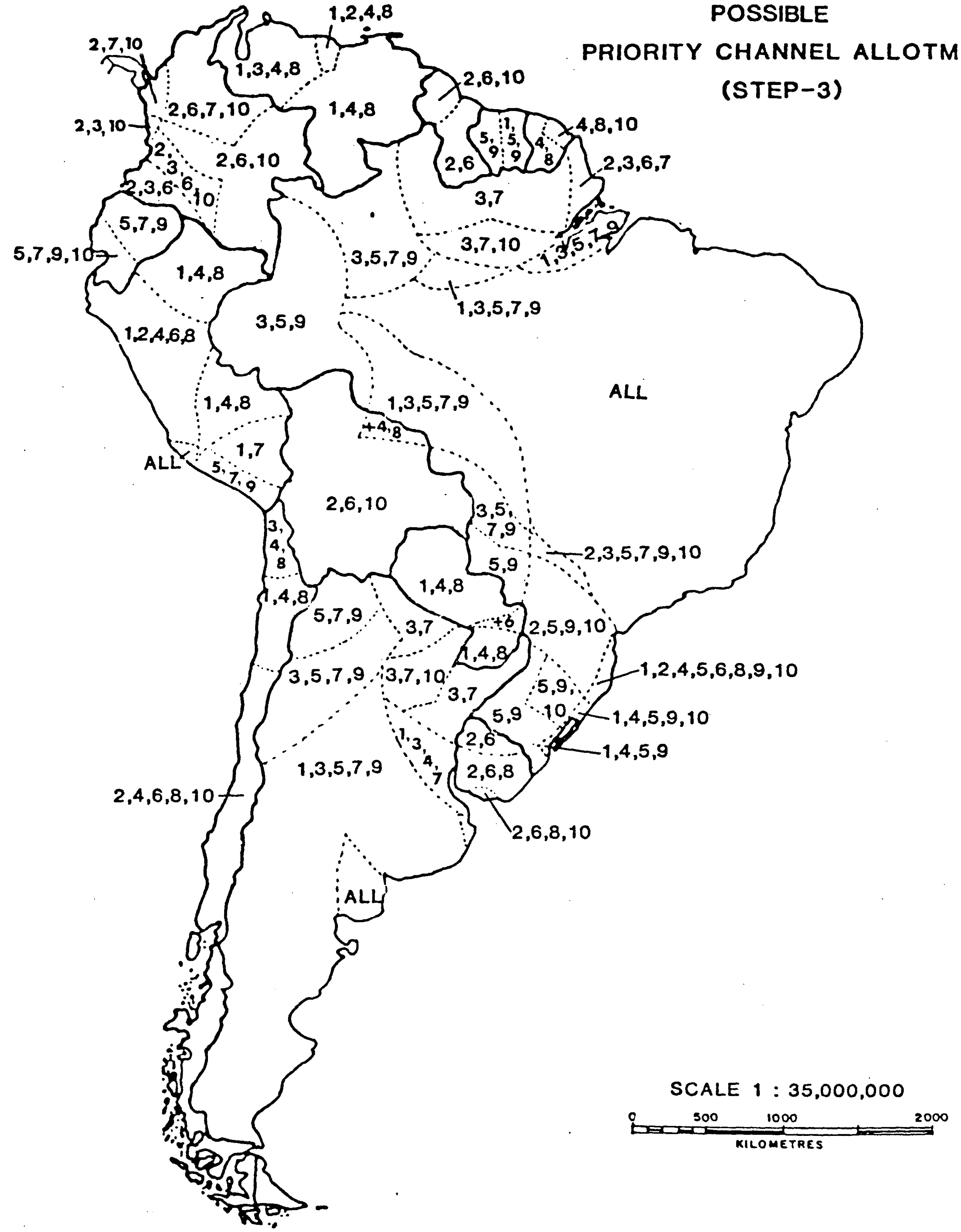
Because of the manner in which priority channels have been created, assignments may normally* be made without coordination anywhere within the designated zones, provided standard station parameters are used.

8.4.2. Use of non-standard Parameters on Priority Channels

A station may employ other than standard parameters provided it does not produce, in related zones within a neighbouring country, a field strength greater than the highest field strength which would be produced by any standard parameter station that could be legitimately assigned. For example, in the day time, the 0.5 mV/m contour should not extend into another country further than the contour of 0.5 mV/m of a standard parameter station at the border of the designated area. At night the field strength should be equivalent to that produced by a standard parameter station located at the closest point on the border, or sub-national zone, with respect to the neighbouring country. Equivalence should be determined at 550 km from that standard parameter station.

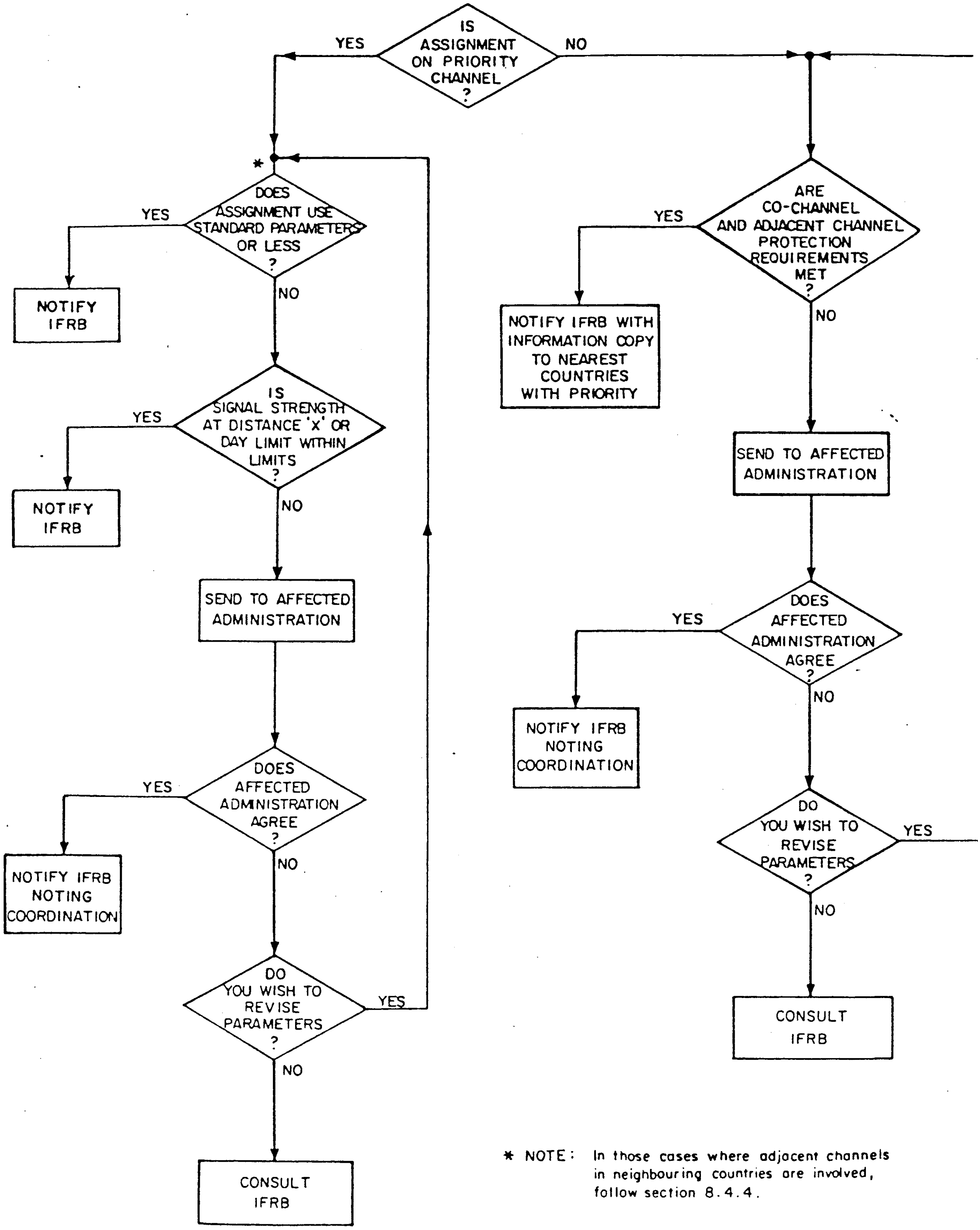
* In cases where neighbouring countries have priorities on adjacent channels, See Section 8.4.4.

FIGURE 8.2
POSSIBLE
PRIORITY CHANNEL ALLOTMENTS
(STEP-3)



IMPLEMENTATION FLOW CHART

FIGURE 8



* NOTE: In those cases where adjacent channels in neighbouring countries are involved, follow section 8.4.4.

8.4.3 Use of non-priority Channels

A country may use a channel not alloted to it in the Plan ; i.e. a non-priority channel provided:

a) It protects the designated zone, or country border, in which the channel is a priority; i.e. provided its signal within the designated zone or border of the other country does not exceed 25 uV/m in the daytime (to provide 26dB protection to the 0.5 mV/m contour) and, at night, that field strength which would be produced by a standard parameter station at 550 km from the designated zone or border.

b) It protects previously notified non-priority channel assignments.

Lower parameters or directional antennas could thus be used to locate stations closer to the border than 550 km. It should be noted that stations assigned in this manner will generally have smaller service areas than stations on priority channels.

8.4.4 Adjacent Channels

Neighbouring countries that have priority channels with first adjacent channel relationships across the border, need no coordination provided the 0.5 mV/m (Enom) groundwave contour of a proposed station does not extend beyond the border. Where the contour crosses the border and there is a population centre in that area, coordination between the neighbouring countries is preferable. This applies only within a small distance from the common border corresponding to the extent of the 0.5 mV/m contour of a standard parameter station, which in most cases ranges from 30-50 km depending on the conductivity.

If coordination is not practical in the early stages of implementation, the following procedure should be followed:

a) the channels that are non-adjacent to those of the neighbouring country should be assigned first;

b) if there are two pairs of adjacent channels, in neighbouring countries, one channel of one pair should be used initially by one administration leaving the neighbouring administration to use one channel of the other pair.

c) if there are still requirements to be satisfied in that particular area after a) or b) above have been followed, coordination with the neighbouring country would be necessary to determine the most efficient way of using the channels by both countries.

d) where the border falls on a body of water, the closest land mass shall be considered as the border.

9.0 SHARING CRITERIA

9. INTER-SERVICE CRITERIA FOR THE SHARING OF THE BAND 1625-1705 kHz BETWEEN THE BROADCASTING SERVICE AND OTHER SERVICES IN REGION 2
(Agenda 2.2)

In accordance with Article 8, the fixed and mobile services become permitted services at a time to be established by the Conference. The intention was to facilitate the preparation of the broadcasting plan without restrictions from other services. Thus in drawing up the plan, broadcasting will have prior choice of frequency and does not have to protect the other services. The sharing criteria developed in this section are designed to apply to the permitted services in order to protect broadcasting services in the Plan.

CAN/ 7/53 9.1.1 Protection of the broadcasting service

The broadcasting service in Region 2 may be subject to potential inter-service interference from services sharing the sub-band 1625-1705 kHz such as the fixed, mobile, radiolocation and aeronautical radionavigation services.

Protection in accordance with the criteria in paragraph 9.1.2 is to be given within the national boundary and/or sub-national zone for priority channels and within the service contours for non-priority channels.

CAN/ 7 /54 9.1.3 Protection ratio criteria

The proposed co-channel (zero frequency carrier spacing) radio frequency protection from a J3E emission is 28 dB. With respect to an F1B type of emission, the off-channel** (1 kHz) radio frequency protection ratio required to protect the broadcasting service is 45 dB. The radio frequency protection ratio curves (median values) appearing in Figures 9.1 and 9.2 are used to determine protection for various carrier spacings. This is based on recent laboratory tests made by this administration.

Except for the two cases stated above, the inter-service protection ratio values in Table 9-I, Chapter 9, of the CCIR Report to this conference should be used.

** CCIR Report 525-2 states values for good commercial quality (GC) for the CO and OC cases of 37 and 41 dB respectively, indicating that the co-channel protection ratio would be approximately 4 dB less than these results.

Wanted (Note 1)	A3E (Broadcasting)
Unwanted	J3E (Radiotelephony)
LPF at Rx	10 kHz
Grade of impairment	4 (as per CCIR Rec. 562-1)

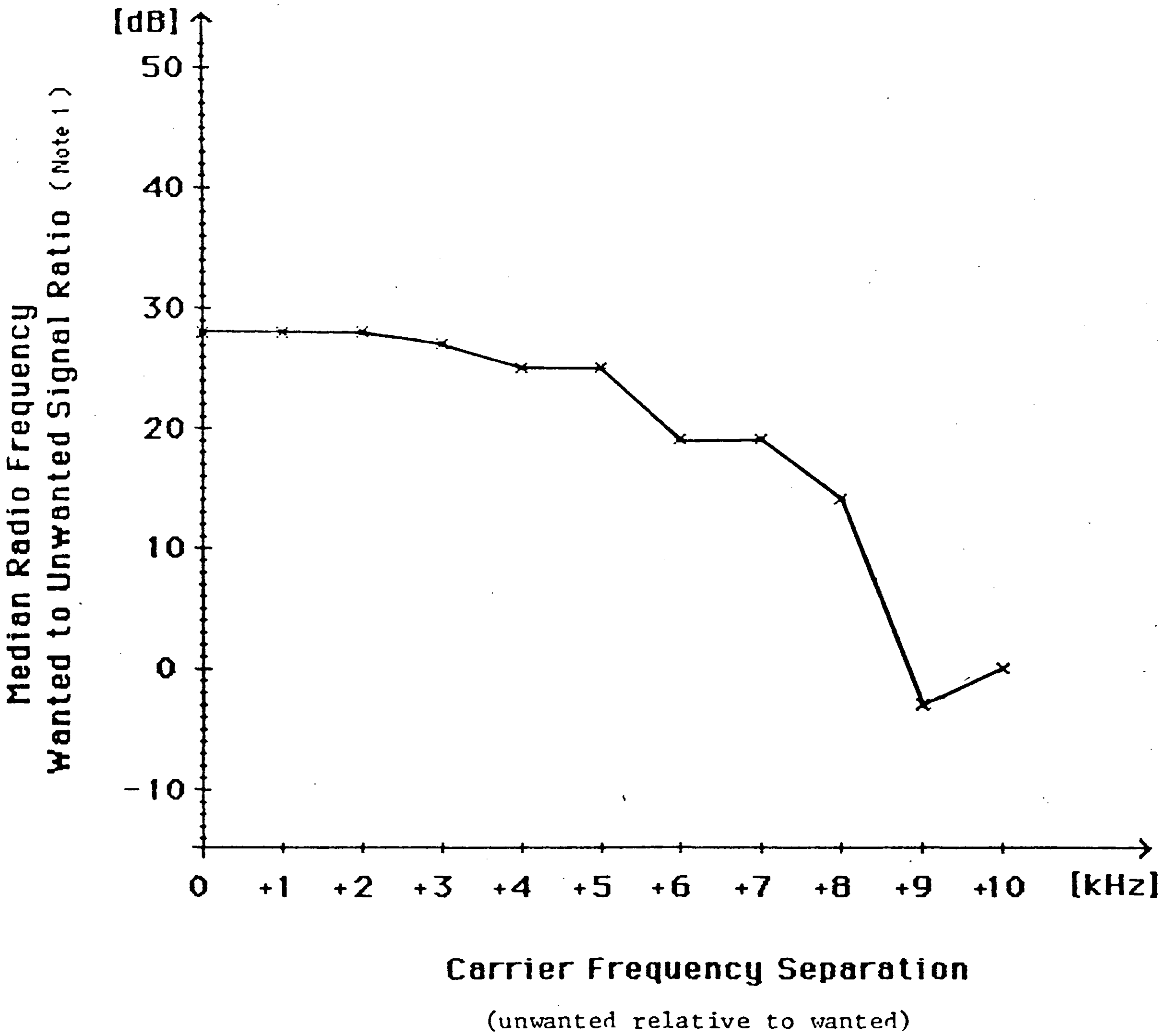


Figure 9.1- Median value of the radio frequency wanted (A3E) to unwanted (J3E) signal ratio as a function of the carrier frequency separation.

Note 1. - The Signal Ratio is defined as the ratio of the peak envelope power of the wanted signal to the peak envelope power of the unwanted signal

Wanted (Note 1)	A3E	(Broadcasting)
Unwanted	F1B	(Narrow-band direct printing telegraphy or selective digital calling)
LPF at Rx	10 kHz	
Grade of impairment	4	(as per CCIR Rec. 562-1)

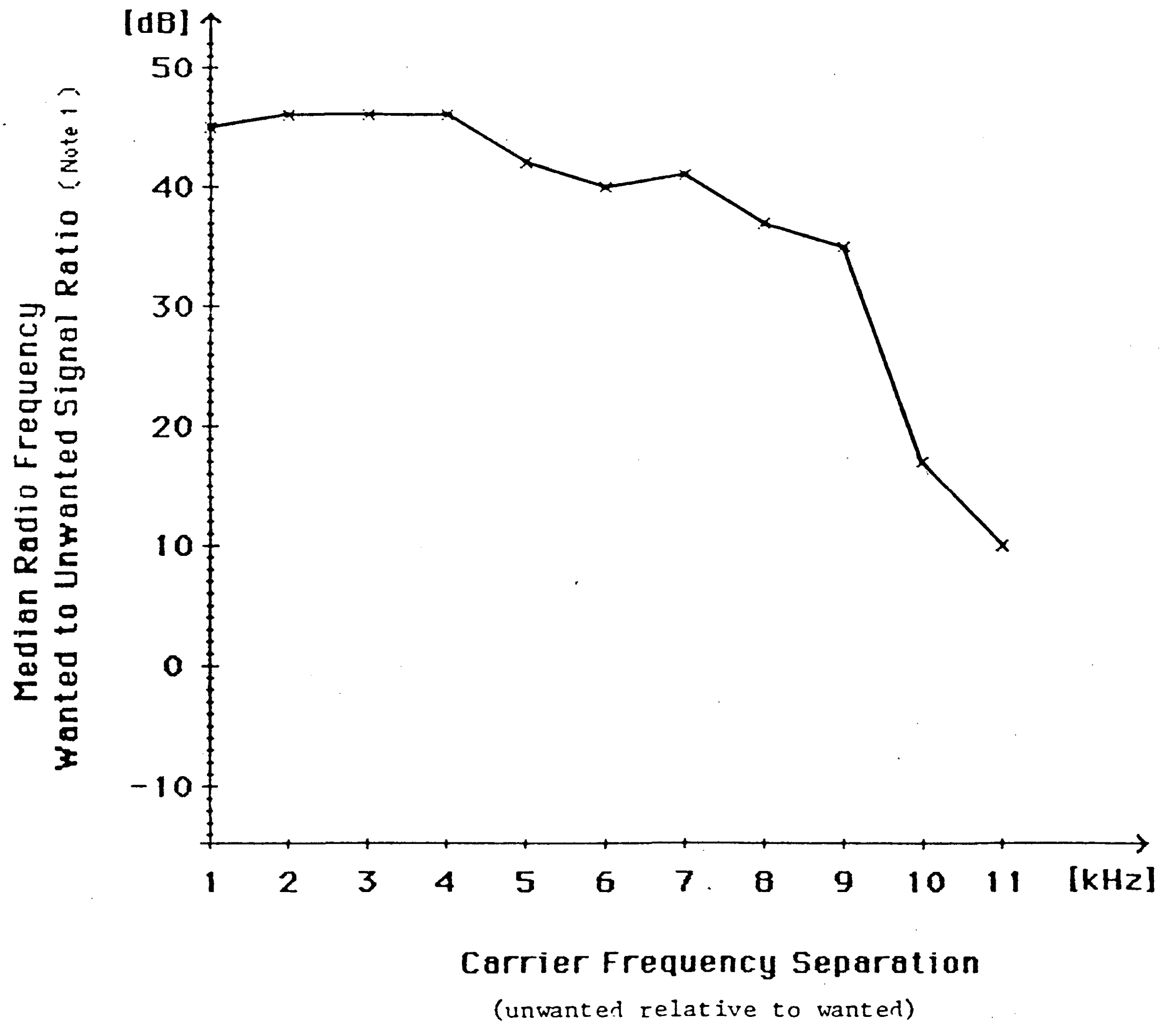


Figure 9.2 Median value of the radio frequency wanted (A3E) to unwanted (F1B) signal ratio as a function of the carrier frequency separation.

Note 1. - The Signal Ratio is defined as the ratio of the peak envelope power of the wanted signal to the mean power of the unwanted signal.

9.2 Inter-regional sharing in the 1605-1705 kHz band between broadcasting in Region 2 and other services in Regions 1 and 3

CAN/ 7/55 9.2.1 Protection of the broadcasting service

Protection in accordance with the criteria in paragraph 9.1.1 is to be given within the national boundary and/or sub-national zone, for priority channels, and within the service contours, for non-priority channels.

CAN/ 7/56 9.2.2 Protection of non broadcast services outside Region 2

Services sharing the frequency band 1605-1705 kHz such as the fixed, land mobile, maritime mobile, radiolocation and radionavigation services, may be subject to potential interference from the broadcasting service. The maritime mobile service is the most difficult to protect.

CAN/ 7/57 9.2.2.1 Protection ratio criteria

As adopted by the Regional Administrative Radio Conference for the planning of the MF Maritime Mobile and Aeronautical Radionavigation Services (Region 1), the co-channel radio frequency protection ratio necessary to protect the maritime mobile service from like-interference is 20 dB for single-sideband telegraphy (J3E modulation) and 8 dB for narrow-band direct printing telegraphy (F1B modulation). However, the protection ratios given in the CCIR Report* derived from the Conclusions from Joint Interim Working Party 10-3-8/1 of 14 dB (J3E) and -3 dB (F1B) for interference from broadcasting (A3E modulation) may be considered (in the absence of directly applicable measurement results).

* Technical Bases for the First Session of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1605-1705 kHz in Region 2 (BC-R2(1)).

CAN/ 7 /58 9.2.2.2 Minimum field strength to be protected

The following values of the minimum field strength to be protected based on groundwave service, which include allowances for variations in noise level with time and signal fading with time, were established by the RARC-MF (Region 1):

Class of emission F1B

22.5 dBuV/m, north of and on parallel 30° North

42.5 dBuV/m, south of parallel 30° North

Class of emission J3E

37 dBuV/m north, of and on parallel 30° North

57 dBuV/m south, of parallel 30° North

CAN/ 7/59 9.2.3 Calculation of field strengths in the case of inter-regional Interference

In calculating inter-regional interference, the field strengths shall be determined by taking the arithmetic mean of the signal strengths, expressed in dBu for a specified e.m.r.p., calculated both by the method described in Annex 1 to CCIR Recommendation 435-3 and by the method used within Region 2. Signal strengths calculated by the Region 2 method should be increased by 2.5 dB to allow for the different reference hours of the two methods. The value determined in accordance with the above shall be applied when it is midnight at the mid-point of the inter-regional path, provided that the entire path is in darkness. Signal strengths at other times are unlikely to exceed this value.

CAN/ 7 /60 GUIDELINES FOR PREPARATORY WORK TO BE CARRIED OUT BEFORE THE SECOND SESSION OF THE CONFERENCE (AGENDA 2.3)

Based on the Modified Allotment Planning Method, it is foreseen that little intersessional work will need to be done. This will best be identified at the Conference.

CAN/ 7 /61 SUBMISSION OF BROADCAST REQUIREMENTS (AGENDA 2.4)

Based on the Modified Allotment Planning Method, there should be no need for submission of station requirements as was done at the Rio Conference in 1981 because the Plan is based on equal distribution of channels along the borders.

CAN/ 7/62 DRAFT AGENDA FOR THE SECOND SESSION (AGENDA 2.5)

The agenda will be prepared at the Conference depending on the progress made.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 8-E
25 March 1986
Original: English

PLENARY MEETING

Brazil

PROPOSALS FOR THE WORK OF THE CONFERENCE

I. INTRODUCTION

Brazil welcomes the opportunity of collaborating once more in the works of an ITU Conference and is prepared to exert all necessary efforts towards a complete success of the Conference.

Brazil firmly believes that it is possible to take advantage of the work developed in PTC-II/CITEL meetings, in previous Conferences, particularly the RARC-81, and the preparatory work of CCIR. The Brazilian proposals for the Conference do take into account these works. Particularly the planning principles, method and criteria proposed herein are largely based on the findings of the IVth PTC-II meeting held in Fortaleza, Brazil, in February 1986.

Brazil understands that the technical parameters submitted in this proposal are achievable by the developing countries of the Region, including Brazil, and are capable, together with the planning principles and method proposed, of guaranteeing an equitable and efficient use of the resources of the band 1605-1705 kHz by all countries concerned.

Since planning would not take into account services other than the broadcasting service, and aware of the implications of either transferring services from one band to another, or adjusting current frequency assignments to the Plan, the Brazilian Administration understands that the Conference should take the utmost care at the time of establishing the dates before which the use of the band 1625-1705 kHz by the broadcasting service should not commence, in order not to impose unnecessarily strong economical, technical and operational constraints upon services currently utilizing this band.

II. DEFINITIONS AND SYMBOLS (Agenda item 2.1.1)

In addition to the definitions given in the Radio Regulations, the following definitions and symbols should apply to the work of the Conference:

II.1 - Definitions

B/8/1 1. Broadcasting channel (in AM)

A part of the frequency spectrum, equal to the necessary bandwidth of AM sound broadcasting stations, and characterized by the nominal value of the carrier frequency located at its centre.

B/8/2 2. Objectionable interference

Interference caused by a signal exceeding the maximum permissible field strength within the protected contour, in accordance with the values adopted by the Conference.

B/8/3 3. Protected contour

Continuous line that delimits the service area which is protected from objectionable interference.

B/8/4 4. Service area

Area delimited by the contour within which the calculated level of the groundwave field strength is protected from objectionable interference in accordance with the provisions of the Conference.

B/8/5 5. Minimum usable field strength (E_{min})

Agreed minimum value of the field strength required to provide satisfactory reception, under specified conditions, in the presence of atmospheric noise and man-made noise but in absence of interference from other transmitters.

B/8/6 6. Nominal usable field strength (E_{nom})

Agreed minimum value of the field strength required to provide satisfactory reception, under specified conditions, in the presence of atmospheric noise, man-made noise and interference from other transmitters. The value of nominal usable field strength shall be employed as the reference for planning.

B/8/7 7. Usable field strength (E_u)

Minimum value of the field strength required to provide satisfactory reception under specified conditions in the presence of atmospheric noise, man-made noise, and interference in a real situation.

B/8/8 8. Audio-frequency (AF) protection ratio

Agreed minimum value of the audio-frequency signal-to- interference ratio corresponding to a subjectively defined reception quality. This ratio may have different values according to the grade of service desired.

B/8/9 9. Radio-frequency (RF) protection ratio

The desired radio-frequency signal-to-interference ratio which, in well-defined conditions, makes it possible to obtain the audio-frequency protection ratio at the output of a receiver. These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission characteristics (type and percent modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

B/8/10 10. Daytime operation

Operation between the times of local sunrise and local sunset.

B/8/11 11. Nighttime operation

Operation between the times of local sunset and local sunrise.

B/8/12 12. Station power

Unmodulated carrier power supplied to the antenna.

B/8/13 13. Groundwave

Electromagnetic wave which is propagated along the surface of the Earth or near it, including the wave reflected in the surface of the Earth and the direct wave, and which has not been reflected by the ionosphere.

B/8/14 14. Skywave

Electromagnetic wave which has been reflected by the ionosphere.

B/8/15 15. Skywave field strength, 50% of the time

The skywave field strength during the reference hour which is exceeded for 50% of the nights of the year. The reference hour is the period of one hour beginning one and a half hours after sunset and ending two and a half hours after sunset at the midpoint of the short great-circle path.

B/8/16 16. Characteristic field strength (E_c)

The field strength, at a reference distance of 1 km in a horizontal direction, of the groundwave signal propagated along a perfectly conducting ground for 1 kW station power, taking into account losses in a real antenna.

II.2 - Symbols

Hz	: hertz
kHz	: kilohertz
W	: watt
kW	: kilowatt
mV/m	. millivolt/metre
uV/m	: microvolt/metre
dB	: decibel
dB(uV/m)	: decibels with respect to 1 uV/m
dB(kW)	: decibels with respect to 1 kW
mS/m	: millisiemens/metre

III. PROPAGATION (Agenda item 2.1.2)

III.1 - Groundwave propagation

B/8/17 Brazil proposes the adoption of a single family of curves of groundwave field strengths computed for the central frequency of the band, namely 1655 kHz. The same mathematical assumptions embodied in the curves adopted in RARC-81 should also apply in the band 1605-1705 kHz.

REASON: The width of the band under consideration permits the use of a single set of curves for the field strength without jeopardizing the precision.

B/8/18 In the case of calculation of field strength in non-homogeneous conductivity paths Brazil proposes the use of the Kirke method.

REASON: Notwithstanding recognizing the merits of the Millington method, the proposed one, due to its simplicity both for manual and computer use, is more appropriate for planning conferences (as was the case of RARC-81).

III.2 - Skywave propagation

B/8/19 Brazil proposes the adoption of the so called modified FCC method for calculating skywave field strengths. This method is described in Annex V of the CCIR Report to the Conference.

REASON: The precision of the method, its simplicity and coherent predictions for both short and long paths make it adequate for use in the planning process of RARC MFBC (R2). Moreover, this method is compatible with that adopted by RARC-81 for the band 535-1605 kHz.

IV. PROTECTION RATIO (Agenda item 2.1.5)

B/8/20 Brazil proposes that the protection ratio for co-channel broadcasting stations should be 26 dB. The protection ratio for the first and second adjacent channels should be 0 dB and -29.5 dB, respectively.

REASON:

These protection ratios proved to be adequate for the band 535-1605 kHz, and, in this respect, there is no fundamental difference vis-à-vis the band 1605-1705 kHz.

V. NOMINAL USABLE FIELD STRENGTH - E_{nom} (AGENDA ITEM 2.1.5)

V.1 - Minimum Usable Field Strength - E_{min}

B/8/21 The Brazilian Administration proposes the adoption of the following values of minimum usable field-strength, E_{min} (all decimal fractions rounded up):

TIME	NOISE ZONE 1		NOISE ZONE 2	
	uV/m	dB(uV/m)	uV/m	dB(uV/m)
DAY	1100	61	1800	65
NIGHT	3500	71	6200	76

REASON:

These figures for E_{min} are proposed in order to guarantee a minimum RF signal-to-noise ratio of 40 dB for 90% of the time to give an acceptable broadcasting quality. They were calculated taking into account the world distribution and characteristics of atmospheric radio noise of Report 322-2 of CCIR.

A number of 37 points spaced by 10^{o} intervals in latitude and longitude were considered within Region 2, encompassing noise zones 1 and 2. The same concept of noise zone adopted by RARC-81 was utilized.

The E_{min} values shown in the above table are the highest found among the four seasons of the year, in so far as we wish to assure a satisfactory reception all over the year.

By taking into account the noise upper decile, D_u, the E_{min} was calculated for 90% of the time.

The hourly average of the effective antenna noise within a time block, F_{am}, was obtained based upon Report 322-2 for each one of the four seasons and all four-hour time blocks, except that relating to the interval from 0000 to 0400 h (local time).

The root-mean-square noise field strength, E_n is given by:

$$E_n = F_{am} - 95.5 + 20 \log f \text{ (MHz)} + 10 \log b \text{ (Hz) dB(uV/m)}$$

where:

f = 1.655 MHz (central frequency of the expanded band)

b = RF bandwidth, taken as 10,000 Hz.

The final value of E_{min} is obtained from E_n by adding to it the noise upper decile, D_u, and the pertinent RF S/N ratio. A figure of 40 dB for this RF S/N ratio was employed.

V.2 - Nominal Usable Field Strength - E_{nom}

B/8/22 Brazil proposes that the nominal usable field strength for planning should be:

$$E_{nom} = E_{ref} = E_{min} + 3\text{dB}$$

The values of E_{nom} are given in the Table below.

VALUES OF NOMINAL USABLE FIELD STRENGTH - E_{nom}

TIME	NOISE ZONE 1		NOISE ZONE 2	
	uV/m	dB(uV/m)	uV/m	dB(uV/m)
DAY	1600	64	2500	68
NIGHT	5000	74	9000	79

REASON:

Any coverage area would be limited by the combined effects of noise and interference. When the influence of noise and interference is nearly equal a balanced situation is achieved. In this case, benefiting from CCIR practice and the decisions of WARC-HFBC/84, the nominal usable field strength, E_{nom}, should be 3 dB higher than the minimum usable field strength (according to CCIR Recommendation 499-2 the concepts of E_{nom} and E_{ref} are equivalent).

VI. PRINCIPLES, METHOD AND CRITERIA FOR PLANNING (AGENDA ITEM 2.1.7)

The Brazilian proposal concerning planning is divided into three items in such a way as to facilitate its comprehension. However, all the mentioned items present a great interrelation among them. Several planning principles will be found all along the text.

VI.1 - Planning Principles

B/8/23 The Brazilian Administration proposes that, for any planning method the Conference may elect, the following planning principles should be observed:

VI.1.1 - Planning should ensure:

a - an efficient utilization of the band;

b - an adequate service protection, to guarantee satisfactory reception conditions for the broadcasting stations of all Region 2 Administrations;

c - the necessary flexibility to accomodate the evolution of requirements of each Administration;

d - equitable use of the spectrum available for planning;

e - the conditions in order to facilitate the necessary process of transferring services currently using the band 1605-1705 kHz to other bands, according to particular constraints of each Administration;

f - a suitable time span in order to permit the necessary adjustments of the current frequency assignments of permitted services, due to the establishment of the Plan.

g - the possibility of any Administration to maintain the operation of services other than broadcasting in certain channels of the band 1605-1705 kHz, provided it does not have an adverse effect on the plan.

VI .2 - Planning method

B/8/24 The Brazilian Administration proposes the adoption of an allotment planning method by the Conference.

The Plan should be based on a maximum standard transmitter power of 1 kW and a 90° non-directional antenna. Higher transmitter power and /or different antenna could be used by a country at the time of bringing into operation a station or subsequent modifications, provided that the field strength within the neighbouring country does not exceed, at a given distance, the highest field strength of a station in the originating country established in accordance with the Plan with a transmitter power of 1 kW and a 90° non directional antenna.

The possibility should be left open for the case where a group of countries decide to develop at the Conference part of the Plan, consistent with the Regional Plan, subregionally, based on a transmitter power less than 1 kW (e.g, 0.25 or 0.5 kW).

REASON: This planning method is capable of meeting the planning principles indicated in the item VI.1.1.in an efficient and equitable way.

VI.3 - Planning criteria

B/8/25 The Brazilian Administration proposes the adoption of the following planning criteria:

VI.3.1 - No station should have the right to be protected beyond the boundary of the country in which the station is located;

VI.3.2 - Only the groundwave service area should be protected from interference;

VI.3.3 - In calculating the field strength of the interfering skywave signal, the skywave field strength 50% of the time should be used;

VI.4 - Procedures:

At the time of bringing into service an assignment in accordance with the Plan, the assignments at frequencies from 1580 to 1600 kHz included in the Rio de Janeiro Regional Plan should be taken into account.

The Brazilian Administration understands that the Conference should take the utmost care at the time of establishing the dates before which the use of the band 1625-1705 kHz by the broadcasting service should not commence, in order not to impose unnecessarily strong economical, technical and operational constraints upon services currently utilizing this band.

VII - INTERSESSIONAL WORK (Agenda item 2.3)

B/8/26 VII.1 - Development of software for planning

The IFRB should develop computer programs for the application of the planning method and the technical criteria established by the First Session of the Conference.

Serious consideration should be given to the possibility of having these programs available for use in microcomputers, so that a larger number of countries could benefit from its application.

These programs should be operational nine months prior to the Second Session of the Conference at the latest.

The IFRB should keep the Administrations informed about the progress of such work through regular reports.

B/8/27 VII.2 - Software tests developed in real conditions

The IFRB should conduct tests on the software developed for the application of the planning method using the technical criteria established by the First Session of the Conference.

After the aforementioned testing and six months before the beginning of the Second Session of the Conference at the latest, the IFRB should send a detailed report on the software developed and the result of its tests to the Administrations.

Administrations should follow the tests to be developed by the IFRB in compliance with the above mentioned and also assist the IFRB with any improvements which may prove necessary as a result of these tests.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

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PLENARY MEETING

Note by the Secretary-General

PARTICIPATION REQUESTS SUBMITTED BY INTERNATIONAL ORGANIZATIONS

1. In agreement with the Administrative Council and in application of Nos 349 and 372 of the Convention, those international organizations which seemed likely to be interested in the work of the Conference were notified that the Conference was to be held.

2. Formal application for admission to the Conference has been received from :

International Amateur Radio Union (IARU)

3. Pursuant to No. 351 of the Convention, the Conference is requested to decide whether this organization is to be allowed to participate in an advisory capacity.

R.E. BUTLER
Secretary-General

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

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PLENARY MEETING

LOSS OF THE RIGHT TO VOTE

Under the Nairobi Convention, 1982, a Member loses its right to vote :

a) For a non signatory Government, if it has not yet acceded to the Convention or, for a signatory Government, if it has not deposited an instrument of ratification at the end of a period of two years from the date of entry into force of the Convention;

b) When it is in arrears in its payments to the Union for so long as the amount of its arrears equals or exceeds the amount of the contribution due from it for the preceding two years (see No. 117 of the Convention).

At present, for one or other of the above reasons and until such time as the situation is rectified, the following Members do not have the right to vote :

Country (in French alphabetical order)	R= has not ratified (A= has not acceded to) the Convention	In arrears in the payment of contributions
ARGENTINE (Republic of)	R	-
BAHAMAS (Commonwealth of the)	A	-
BARBADOS	R	-
BOLIVIA (Republic of)	-	x
BRAZIL (Federative Republic of)	R	-
COSTA RICA	R	-
DOMINICAN REPUBLIC	A	x
ECUADOR	R	-
GRENADA	R	x
GUATEMALA (Republic of)	R	x
GUYANA	-	x
HONDURAS (Republic of)	-	x
JAMAICA	-	x
NICARAGUA	R	x
PANAMA (Republic of)	A	-
SAINT VINCENT AND THE GRENADINES	A	x
VENEZUELA (Republic of)	R	-

R.E. BUTLER
Secretary-General

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

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PLENARY MEETING

United States of America

ADDITIONAL PROPOSALS

PLANNING METHODS AND TRANSMITTING POWER

INTRODUCTION

The United States of America believes that the 1605-1705 kHz band can make an important contribution to quality aural broadcasting in Region 2. The accomplishment of this goal requires the development of a method for establishing a Regional plan which is both flexible and responsive to the needs of all administrations in the Region.

The United States is of the view that the planning method to be adopted should embody the following principles:

USA/11/81 Equitable Distribution - The planning method should provide a fair and equitable distribution of channels throughout the Region.

USA/11/82 Channel Re-use - The planning method should provide ample opportunity to re-use individual channels.

USA/11/83 Preservation of Future Rights - The planning method should recognize that administrations will construct and operate stations under different schedules. Therefore, the method must preserve the rights of administrations to use their allotments in the future at such times as they choose.

USA/11/84 The United States has concluded that allotment planning can best serve these objectives in meeting the needs of the Region. This method, based on mathematical principles, provides an efficient and an equitable distribution of channels. In addition, it avoids the need to identify specific requirements and to resolve the ensuing conflicts or "incompatibilities." Moreover, because it deals with allotments rather than specific assignments, it provides a mechanism to protect future rights without the need to identify them in advance.

Part One: Allotment Planning for Region 2

1. Introduction

A key decision of the Conference will be to determine the form of the Plan. The choice is between allotment or assignment planning. Since this decision will influence all other decisions of the Conference, it is discussed first in these proposals.

Assignment and allotment planning differ in the extent to which facilities and locations must be specified. In an allotment plan, an area is specified within which stations on a designated frequency may be located. Protection is afforded over the entire area. The area is larger than the expected service area of a future station, so that considerable flexibility is built into the Plan. In assignment planning, a specific transmitter site is given for each station, and the station is protected accordingly.

2. Allotment or Assignment Planning-- two different paths to the same end.

Under either approach to planning, before an administration may bring into use a station, its location and other basic characteristics must be firmly established and communicated to the IFRB. The conformity of the final assignment with the allotments or assignments appearing in the Plan, as the case may be, would then be determined in accordance with the instructions of the Conference. If it is found not to be in conformity with the Plan, and if the agreement of affected administrations has not been obtained, then the proposed assignment will need to be modified before such operation of the station may begin. Thus, in a step by step fashion, a list of agreed assignments is created. Eventually this same stage is reached under either planning approach. Since the end result is the same, the efficiency of these two approaches should be compared before a decision is reached by the Conference. Consideration should be given to the administrative problems to be expected in plan development and implementation by administrations after the Conference. In this new broadcasting band, which method is administratively more efficient?

3. The Advantage of Simplicity

It is of the utmost importance that the form of the Plan and the approach to its development be as simple as possible. The adoption of a plan that offers expanded broadcasting services to many areas and promises to be easy to implement would encourage the early production and distribution of the new receivers required for this band. A simple plan would not be encumbered with unnecessary details which would require frequent modification after the Conference, as much of the information included in the Plan initially would be speculative at best.

Assignment planning is directed to the creation of an agreed list of assigments at the time of the Conference. It is assumed that the exact site and other detailed station characteristics are known at the Conference. To facilitate the adoption of the Plan, the Conference must assess the compatibility of the requirements of administrations. These assessments are only as good as the station information they are based upon. A complex process of incompatibility resolution must then be undertaken either at the Conference, or deferred in difficult situations as was the case at Rio de Janeiro in 1981. If the site or other station characteristics upon which all these efforts were based subsequently change, later rounds of negotiations may be needed before stations may be brought into use. Assignment planning therefore is efficient only if the great majority of the assignments in the Plan are known in advance and are unlikely to be changed.

The United States believes that the detailed specification of the sites of stations and their other characteristics in the Plan would ultimately result in much greater administrative complexity and thus be an unnecessary encumbrance to the initial efficient development of the new band. The likelihood of there being many cases where the characteristics of an assignment would have to be changed after the Conference raises doubt as to the utility of a planning method that calls for a major effort to resolve incompatibilities at the Conference.

Assignment planning is more appropriate in a band with existing stations or where the demand for service in this new band is better known. This was the case in the development of the MF broadcasting plan in 1981 at Rio de Janeiro. Such a detailed form of planning would significantly reduce the flexibility needed to encourage the development of new broadcasting services in a new band where the exact sites are not known today. With allotment planning, each administration can be assured an equitable share of the new broadcasting channels without unnecessarily complicating the work of the Conference and without compromising on the protection of their future broadcasting services.

4. Allotment Planning-- the best way to stimulate the development of the new band.

The United States believes that it is preferable to divide the new broadcasting resource equitably among all the countries of the Region according to a simple method without specifying station locations and detailed characteristics. In order to develop an allotment plan, general characteristics (power and antenna) may be assumed, rather than specified on a case-by-case basis. These assumptions make possible interference calculations which are later used to determine the conformity of an administration's assignment with an allotment plan. This results in more flexibility in the choice of site, station power and antenna characteristics than would be the case in assignment planning.

Allotments should be distributed in such a manner as to permit considerable siting flexibility (in some cases country-wide) while providing the agreed levels of protection, using simple non-directional antennas. After the Conference, stations could be located anywhere in a given administration's allotment area, subject to the need to provide the agreed level of protection to the allotments of other countries on the same or adjacent channels. Since protection would be given to allotment areas rather than assignment sites, the calculations required could be far simpler than in the case of the Rio Plan.

An allotment approach would provide a straightforward method for the implementation and protection of stations at specific sites when that information becomes known by administrations.

Part Two: Transmitting Antenna Characteristics and Station Power

1. Introduction

In assignment planning, the antenna characteristics and station power of each proposed assignment are established at the Conference. In allotment planning, the development of the Plan is based upon an assumed antenna and power that would generally apply to all allotments throughout the Region. According to either planning method, it is desirable to establish a maximum power that may be employed when stations are implemented after the Conference, subject to the protection requirements of the Plan. Since the United States is proposing the use of allotment planning, we provide in this part proposals for both assumed characteristics for the development of the Plan and the maximum power to be used in the implementation of the Plan.

2. Planning Assumptions

USA/11/85 To facilitate the development of the Allotment Plan, the United States proposes that a one kilowatt station power and a 1/4 wavelength, non-directional transmitting antenna be assumed. These assumptions will permit an efficient re-use of channels throughout the Region, and will result in a plan with allotment areas large enough to provide administrations with considerable siting flexibility.

The use of non-directional antennas in the development of the Plan will benefit all countries, whether or not they intend to use directional antennas in this band in the future. It would be significantly more difficult to develop an allotment plan on the basis of the assumed use of directional antennas because coverage problems cannot be forseen if the specific transmitter locations are not known at the time of the Conference. In allotment planning, directional antennas can be used at the time of implementation of an assignment as an option that can increase the flexibility of the Plan, either to solve coverage problems or to provide the agreed level of protection to other countries.

3. Maximum Power

USA/11/86 When the Plan is implemented, in order to provide necessary coverage in certain situations, it is desirable to permit a greater transmitter power than that assumed in the development of the Plan. It is the responsibility of administrations to provide the agreed level of protection to the allotments of other countries. Powers greater than 1 kW might provide the required protection when station locations are a greater distance from the allotments of other administrations than the minimum separation of allotment areas appearing in the Plan, or when directional antennas are employed.

There is a need to specify a maximum value of station power, so as to insure that the aggregate interference levels do not become excessive. This recognizes that the cummulative effect of many high power stations, each providing the agreed level of protection may, in the aggregate be unacceptably high. The United States proposes that the maximum station power be 10 kW, to avoid unacceptably high aggregate interference levels and to minimize the possibility of inter-Regional interference.

USA/11/87

Part Three: Intra-Regional Sharing Criteria

1. Introduction

The agenda of the Conference calls for the establishment of the technical criteria, as appropriate, for the sharing of the band 1625-1705 kHz between the broadcasting service and other services in Region 2 taking into account Nos. 419 and 481 of the Radio Regulations. 1/ This part of the United States proposals places the issue in context and questions the appropriateness of establishing sharing criteria.

No. 481 provides for primary allocations in Region 2 in the 1605-1705 kHz band for the fixed, mobile and aeronautical radionavigation services until the date decided by this conference, after which time the band 1605-1625 kHz is allocated to the broadcasting service on an exclusive basis and the band 1625-1705 kHz is allocated to the broadcasting service on a primary basis, to the fixed and mobile services on a permitted basis and to the radiolocation service on a secondary basis. It is worth noting that the allocation to the aeronautical radionavigation service is only referred to in No. 481, and will cease after the date to be decided by the conference in accordance with that Regulation.

No. 419 defines the relationship between primary and permitted services: they have equal rights, except that in the preparation of frequency plans the primary service shall have prior choice of frequencies.

2. The Role of Sharing Criteria in Planning

Sharing criteria are used in planning to ensure that the stations to be implemented in conformity with the Plan and the existing and future stations of the other primary services in the planned band will not cause harmful interference to the other's services. In a band containing several existing stations in primary service allocations, the choice of frequency by the planned service should normally be constrained by the presence of the other primary services in the band. Since in this case the band to be planned by this Conference will have no other primary services after the date decided by the Conference, the Conference needs to decide whether any other services in the band should be considered at the time the band is planned.

1/ After the date decided by the Conference in accordance with No. 481, the portion from 1605-1625 kHz is allocated exclusively to broadcasting in Region 2.

It is the view of the United States that the selection of frequencies by the Conference for the broadcasting service should not be constrained by the temporary primary allocation to the fixed, mobile and aeronautical radionavigation services and that those services should either be given a permitted status or the use of the recorded frequency assignments in those services should be discontinued prior to developing the Plan. In the event that it is decided to continue any of these services, the capacity of the new band for broadcasting will correspondingly be reduced in those parts of Region 2 with requirements for non-broadcasting services. The United States urges that, rather than so reduce the opportunities for broadcasting in the new band, administrations attempt to reassign their non-broadcasting services to other bands, and that the planning of the new band for use by the broadcasting service be accomplished without regard for other radio services. In those cases where administrations wish to do so, the possibility should be left open for two or more countries to develop (consistent with the Regional Plan) a sub-regional plan which could provide local protection for other services.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

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PLENARY MEETING

Note of the Secretary-General

FINANCIAL RESPONSIBILITIES OF ADMINISTRATIVE CONFERENCES

The Plenipotentiary Conference, Nairobi, introduced new provisions into the International Telecommunication Convention with regard to the financial management of the Union's activities, including specific responsibilities of Administrative Conferences and of the Plenary Assemblies of the CCIs.

The Nairobi Convention came into force on 1 January 1984.

The attention of the Regional Administrative Planning Conference for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 is therefore drawn to the provisions of Article 80 of the Convention, and to the provisions of Resolution No. 48 of that Conference. The relevant provisions of the Convention and the complete text of the Resolution are reproduced in annexes as reference.

Attention is also invited to the relationship with the Administrative Council.

R.E. BUTLER
Secretary-General

Annexes : 2

ANNEX 1

ARTICLE 80

Financial Responsibilities of Administrative Conferences and Plenary Assemblies of the CCIs

627 1. Before adopting proposals with financial implications, administrative conferences and the Plenary Assemblies of the International Consultative Committees shall take account of all the Union's budgetary provisions with a view to ensuring that these proposals will not result in expenses beyond the credits which the Administrative Council is empowered to authorize.

628 2. No decision of an administrative conference or of a Plenary Assembly of an International Consultative Committee shall be put into effect if it will result in a direct or indirect increase in the expenses beyond the credits that the Administrative Council is empowered to authorize.

ANNEX 2

RESOLUTION No. 48

Impact on the Budget of the Union of Certain Decisions of Administrative Conferences and Plenary Assemblies of the International Consultative Committees

The Plenipotentiary Conference of the International Telecommunication Union (Nairobi, 1982),

noting

a) the need for effective financial management on the part of the Union and its Members, necessitating close control over all demands upon the annual budgets;

b) that administrative conferences and Plenary Assemblies of the CCIs have taken decisions or adopted resolutions or recommendations with financial implications including additional and unforeseen demands upon the annual budgets of the Union;

c) that the financial resources of the Union need therefore to be taken into account by all administrative conferences and by all Plenary Assemblies of the CCIs;

recognizing

that the decisions, resolutions or recommendations mentioned above may be crucial to the successful outcome of individual administrative conferences or Plenary Assemblies of the CCIs;

recognizing also

that the Administrative Council in reviewing and approving the annual budgets of the Union, is bound by the financial limitations of Additional Protocol I and may not of its own authority be able to satisfy all the demands made upon the budgets;

recognizing further

that the provisions of Articles 7, 69, 77 and 80 of the Convention reflect the importance of effective financial management;

resolves

1. that before adopting resolutions or taking decisions which are likely to result in additional and unforeseen demands upon the budgets of the Union, future administrative conferences and Plenary Assemblies of the CCIs, having regard to the need for economy, shall:

1.1 prepare and take into account estimates of the additional demands made on the budgets of the Union;

1.2 where two or more proposals are involved, arrange them in an order of priority;

1.3 prepare and submit to the Administrative Council a statement of the estimated budgetary impact, together with a summary of the significance and benefit to the Union of financing the implementation of those decisions, and an indication of priorities where appropriate;

2. that the Administrative Council shall take all such statements, estimates and priorities into account when reviewing, approving and deciding on the implementation of such resolutions and decisions within the limits of the budget of the Union.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

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PLENARY MEETING

Chile

PLANNING METHOD

1. Introduction

1.1 On the basis of the experience acquired with the implementation of the Rio de Janeiro Plan, Chile considers that the planning method applied to the broadcasting service in the band 1 605 - 1 705 kHz should be:

equitable: all countries in the Region enjoy equal rights as far as the use of the resource is concerned;

flexible: the planning is to guarantee a broadcasting service of good technical quality, without constituting an obstacle to adapting national plans to actual requirements in the future;

expeditious: minimum coordination procedures and fluidity in relations with the IFRB;

operative: simple calculation methods and procedures, suitable for processing in small computers or microcomputers.

1.2 After analyzing the procedures contained in the CCIR Report to RARC/BC-R2(1), Chile has reached the conclusion that the above characteristics would to a large extent be met by an allotment plan.

1.3 Chile has also been interested in Canada's studies for implementing an allotment planning method, based on an equitable distribution of certain channels for their priority use by each of the countries involved. While recognizing that the modified method recently prepared by Canada is reasonably satisfactory, Chile considers that it would be possible to arrive at a more realistically based allotment plan by introducing a few variations in its principles. This document suggests the parameters and procedures which in our view would improve the implementation of the Modified Allotment Planning method recently proposed by Canada at the PTC II/CITEL in Fortaleza, Brazil.

2. Principles

2.1 The Modified Allotment Planning method (MAP) guarantees for each country a particular number of priority channels, on the basis of an equal number of priority channels, being allotted to all immediately neighbouring countries.

2.2 For the purpose of implementation, the MAP method considers the following parameters:

a) maximum daytime and night-time power:

1 kW, associated with a 1/4 wave omnidirectional antenna;

b) E_{nom} = 500 μV/m by day and E_{nom} = 2500 μV/m by night;

c) the standard night-time distance for protecting priority channels is 550 km;

d) the 0.5 mV/m daytime contour does not extend into another country further than the 0.5 mV/m contour of a standard parameter station situated on the border.

3. Observations

Within the context set out in the introduction to this document, when tests were made of the above mentioned method and the results of using the parameters proposed by Canada were compared with results using parameters adopted by the RABC of Rio de Janeiro, 1981 (see Tables 1 and 2), the following observations emerged:

a) the proposed power does not consider the existence of noise zone 2, established in the Final Acts of the Rio de Janeiro RARC. The same applies to daytime and night-time E_{nom};

b) if the skywave field strength calculation method is applied without considering the geomagnetic latitude correction factor (Modified FCC method), the standard distance of 550 km is not representative of values obtained taking that factor into consideration;

c) in the case of island countries or territories at high geomagnetic latitudes, groundwave field strength (σ = 5000 mS/m) is more significant than skywave for the calculation of the interfering wave;

d) the priority channel broadcasts of a country could be overprotected on the border, which implies that they would be protected within the territory of the neighbouring country, beyond the conditions laid down in that respect by the Rio de Janeiro 1981 Agreement.

4. Proposals

CHL/13/1 4.1 Bearing in mind the results contained in Tables 1 and 2, arrived at by applying the procedures and parameters indicated in each case, Chile considers that the adoption of the following principles would facilitate the application of the MAP method proposed by Canada:

a) powers:

- noise zone 1: 1 kW by day and night
- noise zone 2: 5 kW by day and 1 kW by night
- all these values are related to the use of a 1/4 wave omnidirectional antenna;

b) E_{nom}:

- daytime: 500 μV/m noise zone 1 and 1250 μV/m noise zone 2;
- night-time: 4000 μV/m for both noise zones;

c) the standard distances to guarantee priority channel protection by day and by night will be calculated for each individual case in the light of the real values of ground conductivity and the respective geomagnetic latitudes;

d) countries will try not to exceed the E_{nom} values of their priority channels on their borders and, in any event, a country affected by non-compliance of this rule shall apply the protection ratio to the resultant field strength at the border, when implementing a national assignment in a priority channel of the other country (subject to the application of the terms set out in Annex 2, Chapter 4, section 4.10.4, of the Final Acts of the RABC, Rio de Janeiro, 1981.

CHL/13/2 4.2 Lastly, it may be pointed out that the benefit of converting the Allotment Plan into an assignment Plan is not appreciated. In this respect, the IFRB would need to issue a statement, setting out the advantages and disadvantages of the two alternatives in the light of the provisions of Article 12 of the Radio Regulations.

CHL/13/3

TABLE 1

Groundwave E_{nom} contour distances for different conductivity values

Ground conductivity (mS/m)	Noise zone 1		Noise zone 2		CAN method
	day-time (km)	night-time (km)	day-time (km)	night-time (km)	night-time (km)
Poor (2)	24	9	23	5.6	11
Fair (5)	36	14.5	35	9.1	17
Good (10)	53	21	52	15.1	26
Very good (30)	100	37	98	19.5	46
Sea (5000)	310	75	280	31	110

Conditions

a) Noise zone 1

- Daytime : P = 1 kW; E_{nom} = 500 μV/m
- Night-time: P = 1 kW; E_{nom} = 4000 μV/m

b) Noise zone 2

- Daytime : P = 5 kW; E_{nom} = 1250 μV/m
- Night-time: P = 1 kW; E_{nom} = 10 000 μV/m

c) CAN method

- Night-time: 1 kW, E_{nom} = 2500 μV/m

The curves of graph 1, Annex I of the CCIR report to RARC/BC-R2(1) were used for the calculations.

TABLE 2

Distance of the interfering station in the same channel from the E_{nom} contour of the protected station

Groundwave interference					Skywave interference			
Conductivity	daytime		night-time		GM LAT (0)	night-time		
(mS/m)	Noise zone 1 distance (km) (a)	Noise zone 2 distance (km) (a)	Noise zone 1 distance (km) (a)	Noise zone 2 distance (km) (a)		Noise zone 1 distance (km) (a)	Noise zone 2 distance (km) (a)	CAN method distance (km)(b)(c)
2	96	94	36	24	0	467	< 200	700
5	140	130	55	36	15	450	< 200	680
10	175	170	80	53	30	413	< 200	618
30	285	275	145	100	45	330	<200	490
5000	800	770	440	310	60	<200	<200	280

Calculations

- Co-channel protection ratio: 26 dB
- The modified FCC method was used to calculate the skywave.

(a) Table 1 conditions were taken into consideration.

(b) The values P = 1 kW and E_{nom} = 2500 μV/m were used.

(c) The modified CAN method considers only the standard distance of 550 km.

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PLENARY MEETING

Chile

TECHNICAL BASES FOR PLANNING THE BROADCASTING SERVICE IN THE BAND 1 605 - 1 705 kHz

Introduction

Bearing in mind that the band to be planned is an extension of the band allocated to the MF broadcasting service, the use of which in the countries of Region 2 is governed by the Rio de Janeiro Agreement and by the characteristics and technical data set out in the annexes thereto, the Chilean Administration considers that those characteristics and technical data should in general serve as the basis for planning the band 1 605 - 1 705 kHz subject to the introduction of such corrections as are essential, particularly those relating to signal propagation.

Accordingly, the technical data for planning the band 1 605 - 1 705 kHz are proposed below, having regard to Annex 2 to the MF Broadcasting Agreement for Region 2, Rio de Janeiro, 1981.

CHAPTER 1

Definitions and symbols

CHL/14/5 1. Terms and definitions that are used in this text but are not specifically defined in this Chapter shall have the meaning assigned to them in the Radio Regulations, the Final Acts of the Regional Administrative MF Broadcasting Conference (Region 2), Rio de Janeiro, 1981 and the CCIR Volumes, in the order of precedence indicated (see Appendix X).

Reasons:

The terms and symbols used in this text are mostly the same as those defined in the Final Acts of RABC-Rio de Janeiro, 1981. Many others appear in the CCIR Volumes. The content of Chapter 1 can therefore be considerably reduced and the reader will be helped by the glossary which it is proposed to give as an appendix.

2. Definitions

2.1 RABC-Rio de Janeiro, 1981

Regional Administrative MF Broadcasting Conference (Region 2), Rio de Janeiro, 1981.

2.2 RARC/BC-R2(1):

First session of the Regional Administrative Radio Conference to establish a plan for the Broadcasting Service in the band 1 605 - 1 705 kHz in Region 2.

CHAPTER 2

Groundwave propagation

CHL/14/6 2.1 Ground conductivity

2.1.1 The Atlas of Ground Conductivity forms Appendix 1 to Annex 2 to the Final Acts of RABC-Rio de Janeiro, 1981 and the modifications submitted in accordance with the provisions of section 2.1.3 of Chapter 2 of that Annex.

2.2 Field strength curves for groundwave propagation

2.2.1 The curves in Graph 1, Annex I of the CCIR report to RARC/BC-R2(1), shall be used for calculating the groundwave field strength in the band 1 605 - 1 705 kHz.

2.3 Calculation of groundwave field strength

2.3.1 In cases of homogeneous or non-homogeneous ground conductivity, the groundwave shall be calculated in accordance with the provisions of sections 2.3.1 and 2.3.2, Chapter 2, Annex 2 to the Final Acts of RABC-Rio de Janeiro, 1981.

CHAPTER 3

Skywave propagation

CHL/14/7 3.1 The calculation of skywave field strength shall be conducted using the method laid down in Chapter 3, Annex 2 to the Final Acts of RABC-Rio de Janeiro, 1981 and the correction factor for geomagnetic latitude shall be introduced by the following expression:

$$Fc = (95 - 20 \log d) - (2 + 4.95 \tan^2 \phi) (d/1000)^{1/2} \text{ dB } (\mu V/m) \quad (1)$$

where:

Fc = field strength for a characteristic field strength of 100 mV/m at 1 km.

ϕ = near geomagnetic latitude of the path considered

d = shorter great circle path distance.

If Ø is greater than or equal to 60°, equation (1) is calculated for Ø = 60°. If d is equal to or less than 200 km, the equation is calculated for d = 200 km. The real value of d must in all cases be used for determining the angle of elevation.

3.2 The Fc value obtained by applying formula (1) in the preceding section is introduced in equation (2), section 3.2, Chapter 3, Annex 2 to the Final Acts of RABC-Rio de Janeiro, 1981. The F value thus obtained represents the skywave field strength for 50% of the time.

CHAPTER 4

Broadcasting standards

CHL/14/8 4.1 Channel spacing

In the band 1 605 - 1 705 kHz there shall be a channel spacing of 10 kHz and carrier frequencies which are multiples of 10 kHz, beginning at 1 610 kHz.

CHL/14/9 4.2 Class of emission

The stations operating in the band 1 605 - 1 705 kHz shall have double sideband amplitude modulation with full carrier A3E.

Classes of emission other than A3E may also be used on condition that the energy level outside the necessary bandwidth does not exceed that normally expected in A3E emission and that the emission is receivable by conventional receivers employing envelope detectors without increasing appreciably the level of distortion (for instance, to accommodate stereophonic systems).

CHL/14/10 4.3 Bandwidth of emission

The Plan shall be based on a necessary bandwidth of 10 kHz, for which a 5 kHz audio bandwidth can be obtained. The occupied bandwidth may in no case exceed 20 kHz.

CHL/14/11 4.4 Station power

4.4.1 During night-time, the maximum station power shall be 1 kW.

4.4.2 During daytime, the maximum station power shall be:

- 1 kW in noise zone 1
- 5 kW in noise zone 2.

4.4.3 The above is subject to the proviso that the protection criteria given in section 4.9 and the procedures adopted in the planning method to be applied in the band 1 605 - 1 705 kHz are met.

4.5 Procedure governing skywave interference calculations

The field strength of the interfering skywave signal shall be calculated as laid down in Chapter 3 of this document, on the basis of 50% of the time.

CHL/14/12 4.6 Nominal usable field strength

4.6.1 Noise zone 1

Groundwave:

Daytime: 500 μV/m

Night-time: 4000 μV/m

4.6.2 Noise zone 2

Groundwave:

- Daytime: 1250 μV/m
- Night-time: (10000) μV/m (Chile proposes 4000 μV/m if the Allotment Planning method is adopted)

CHL/14/13 4.7 Evaluation of multiple interference contributions

If during the preparation of the Plan or as a result of modifications thereto it is required to evaluate the overall usable field strength due to two or more individual interference contributions, the root sum square method shall be used together with the 50% exclusion principle, both as described in section 4.7, Chapter 4, Annex 2 to the Final Acts of RABC-Rio de Janeiro, 1981.

CHL/14/14 4.8 Noise zones

The noise zones considered for the Plan shall be those defined in section 4.8, Chapter 4, Annex 2 to the Final Acts of RABC-Rio de Janeiro, 1981.

CHL/14/15 4.9 Protection ratios

4.9.1 The Plan shall be based on the same protection ratios as are established in the Final Acts of RABC-Rio de Janeiro, 1981, i.e.:

- 26 dB in the co-channel
- 0 dB in the first adjacent channel
- -29.5 dB in the second adjacent channel
- 8 dB in the co-channel between stations belonging to a synchronized network.

CHL/14/16 4.10 Application of protection criteria

(The application of protection criteria will depend on the planning method adopted.)

CHAPTER 5

Radiation characteristics of transmitting antennas

CHL/14/17 The provisions of Chapter 5, Annex 2, to the Final Acts of RABC-Rio de Janeiro, 1981 and of Appendices 3 and 4 of that annex shall be taken into account for calculating the groundwave and skywave field strengths

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Note by the Secretary-General

INVITATIONS

1. Members of the Union

On 10 May 1985, invitations to send delegations to the Conference were sent to the Members belonging to Region 2. That same day, the other Members were informed that the Conference was to be held.

The Annex to this document lists the replies received to date.

2. United Nations, specialized agencies

On 9 September 1985, invitations to send observers to the Conference were sent to the United Nations and to the following specialized agencies :

- United Nations Educational, Scientific and Cultural Organization (UNESCO)**)
- International Civil Aviation Organization (ICAO)*)
- International Maritime Organization (IMO)**)
- World Meteorological Organization (WMO)

3. Regional telecommunication organizations (Article 32 of the Convention)

On 9 September 1985, an invitation to send observers to the Conference was sent to the Inter-American Telecommunications Conference (CITEL).

R.E. BUTLER
Secretary-General

Annex : 1

*) Has accepted the invitation.

**) Has replied that it would not be able to send an observer.

ANNEX

COUNTRIES WHICH HAVE ANNOUNCED THEIR PARTICIPATION IN THE CONFERENCE

(in French alphabetical order)

(Position on 11 April 1986)

Argentine (Republic)

Barbados

Brazil (Federative Republic of)

Canada

Chile

Colombia (Republic of)

Costa Rica

Cuba

El Salvador (Republic of)

United States of America

France

Guatemala (Republic of)

Honduras (Republic of)

Jamaica

Mexico

Paraguay (Republic of)

Peru

United Kingdom of Great Britain and Northern Ireland

Suriname (Republic of)

Trinidad and Tobago

Uruguay (Eastern Republic of)

Venezuela (Republic of)

INTERNATIONAL TELECOMMUNICATION UNION

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PLENARY MEETING

Republic of Paraguay

PROPOSALS FOR THE WORK OF THE CONFERENCE

Introduction

Paraguay considers that the future use of the band 1 605 - 1 705 kHz by the broadcasting service will, provided that the planning method makes for efficient use of the band, be extremely useful to the great majority of the countries of the Region which, like Paraguay, are experiencing saturation of the band 525 - 1 605 kHz.

Paraguay takes the view that allowance should be made for the services other than broadcasting that are operating in the band 1 605 - 1 705 kHz, despite the virtually general view that this band will in the near future be allocated to the broadcasting service on an exclusive basis.

Paraguay considers that the correct design and manufacture of broadcasting stations in the band 1 605 - 1 705 kHz will make for high-quality sound-programme broadcasting given the increased possibility of using efficient antenna systems.

Agenda item 2.1.1 - Definitions and symbols

1. The Agreement should consider the following definitions and symbols in addition to those laid down in the Radio Regulations:

PRG/16/1 1. Broadcasting channel in AM

A part of the frequency spectrum equal to the necessary bandwidth of AM sound-broadcasting stations and characterized by the nominal value of the carrier frequency located at its centre.

PRG/16/2 2. Objectionable interference

Interference caused by a signal exceeding the maximum permissible field strength within the protected contour, in accordance with values determined in line with the provisions of the annex.

PRG/16/3 3. Protected contour

Continuous line that delimits the area of service which is protected from objectionable interference.

PRG/16/4 4. Service zone or service area (1)

Area delimited by the contour within which the calculated level of the ground-wave field strength is protected from objectionable interference in accordance with the decisions of the Conference.

(1) If "service area" is adopted, item 3 should read "area" instead of "zona" (referes to Spanish text).

PRG/16/5 5. Nominal usable field strength (E_{nom})

Agreed minimum value of the field strength required to provide satisfactory reception under specified conditions in the presence of atmospheric noise, man-made noise and interference from other emissions. The value of nominal usable field strength has been employed as the reference for planning.

PRG/16/6 6. Usable field strength (E_u)

Minimum value of the field strength required to provide satisfactory reception under specified conditions in the presence of atmospheric noise, man-made noise and interference in a real situation.

PRG/16/7 7. Audio-frequency (AF) protection ratio

Agreed minimum value of the audio-frequency signal-to-interference ratio corresponding to a subjectively defined reception quality. This ratio may have different values according to the type of service desired.

PRG/16/8 8. Radio-frequency (RF) protection ratio

The desired ratio-frequency signal-to-interference ratio which, in well-defined conditions, makes it possible to obtain the audio-frequency portection ratio at the output of a receiver. These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission charcteristics (type and percentage modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

PRG/16/9 9. Daytime operation

Operation between the times of local sunrise and local sunset.

PRG/16/10 10. Night-time operation

Operation between the times of local sunset and local sunrise.

PRG/16/11 11. Station power

Unmodulated carrier power supplied to the antenna.

PRG/16/12 12. Ground-wave

Electromagnetic wave which is propagated along the surface of the Earth or near it and which has not been reflected by the ionosphere.

PRG/16/13 13. Sky wave

Electromagnetic wave which has been reflected by the ionosphere.

PRG/16/14 14. Sky-wave field strength, 50% of the time

The sky-wave field strength during the reference hour which is exceeded for 50% of the nights of the year. The reference hour is the period of one hour beginning one and a half hours after sunset and ending two and a half hours after sunset at the midpoint of the short great-circle path.

PRG/16/15 15. Characteristic field strength (E_c)

The field strength, at a reference distance of 1 km in a horizontal direction, of the ground-wave signal propagated along perfectly conducting ground for 1 kW station power, taking into account losses in a real antenna.

2. Symbols

Hz:	hertz
kHz:	kilohertz
W:	watt
kW:	kilowatt
mV/m:	millivolt/metre
µV/m:	microvolt/metre
dB:	decibel
dB(µV/m)	decibels with respect to 1 µV/m
dB(kW):	decibels with respect to 1 kW
mS/m:	millisiemens/metre

3. Agenda item 2.1.1 - Propagation data

Ground-wave propagation

PRG/16/16 3.1 Ground conductivity

It is proposed that, for ground-wave propagation calculations, the CCIR Atlas of Ground Conductivity for the band 1 605 - 1 705 kHz should be based on the information communicated to the IFRB following a decision of the first session of the Regional Administrative MF Broadcastiang Conference (Region 2) (Buenos Aires, 1980), the modifications introduced during the second session (Rio de Janeiro, 1981) and the modifications submitted in accordance with § 2.1.3, Chapter 2, of the Rio de Janeiro Final Acts.

PRG/16/17 3.2 Field strength curves for ground-wave propagation

It is proposed that for planning purposes a single set of curves should be used for determining ground-wave propagation in the frequency range 1 605 -1 705 kHz. The set must be calculated for the mean frequency of 1 655 kHz.

PRG/16/18 3.3 Non-homogeneous conductivity

It is proposed that the equivalent distance (Kirke) method should be used for cases of propagation along paths of non-homogeneous conductivity; it is sufficiently acceptable owing to its simplicity for both manual and computer calculations and produced satisfactory results at the Rio de Janeiro Conference, 1981.

PRG/16/19 3.4 Sky-wave propagation

It is proposed that the modified FCC method described in Annex V of the CCIR Technical Bases prepared for this Conference (pages 82/83) should be adopted for calculating sky-wave propagation. It would be advantageous for the Conference to use this method owing to its precision for both short and long paths.

PRG/16/20 4. Agenda item 2.1.3 - Modulation standards

It is proposed that the modulation standards to be applied to the band 1 605 - 1 705 kHz should be the same as those at present governing the broadcasting band 535 - 1 605 kHz; this will facilitate the manufacture of receivers for use in the new band.

PRG/16/21 5. Agenda item 2.1.5 - Protection ratios

5.1 It is proposed that the co-channel, first adjacent and second adjacent channel protection ratios for stations in the new band should be 26 dB, 0 dB and -29.5 dB, respectively. These values have been producing acceptable results in the Region.

PRG/16/22 5.2 Nominal usable field strength

It is proposed that the following values should be adopted for the nominal usable field strength.

Period	Noise zone 1	Noise zone 2
Daytime	500 μV/m	1250 μV/m
Night-time	2500 μV/m	6500 μV/m

The above are ground-wave values.

PRG/16/23 6. Agenda item 2.1.7 - Planning methods and principles

6.1 Any planning method must ensure the most efficient use of the band 1 605 - 1 705 kHz.

6.2 It must guarantee sufficient flexibility as to permit the entry into operation of any stations required by administrations in the course of time.

6.3 The planning method must not require an immediate change in the services other than the broadcasting services at present in use in certain ranges of the band. It must enable each administration to effect the transfer of those services to other suitable bands as it is able to do so.

6.4 The method must guarantee equitable use of the spectrum to be used in planning.

The content of sections 6.1 - 6.4 constitutes planning principles.

PRG/16/24 7. Agenda item 2.1.7 - Planning criteria

It is proposed that the following criteria be adopted:

7.1 Only the ground-wave service area shall be protected from interference.

7.2 No station shall be entitled to require protection beyond the frontiers of its country.

7.3 The variation applied for the field strength for 50% of nights shall be used for calculating the field strength of the interfering sky-wave signal.

7.4 The maximum night-time station power shall be 1 kW.

7.5 The maximum daytime station power shall be 5 kW in noise zone 1 and 10 kW in noise zone 2.

PRG/16/25 8. Agenda item 2.1.7 - Planning method

The allotment planning method must be adopted.

Reasons:

Allotment planning will help to achieve the greatest possible degree of flexibility for the proper demand and protection of the future areas to be served.

Frequency reuse may be feasible in practice if the size of service areas is controlled by allotment planning.

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FOR INFORMATION

Paraguay

ANTENNA SYSTEM FOR THE BROADCASTING SERVICE
IN THE BAND 1 605 - 1 705 kHz

Introduction

In Region 2, the band 1 605 - 1 705 kHz is shared by the broadcasting, fixed and mobile services, the radiolocation service on a secondary basis and the aeronautical radionavigation service on a permitted basis. During the night the sky-wave levels are considerably higher in this frequency band than in lower frequencies such as 700 kHz. Furthermore, this portion of the frequency spectrum can only accommodate 10 channels, and it is dificult to use the same frequency for more than one purpose in small countries. For all these reasons, the antenna system must be regarded as a key factor for the success of any new broadcasting station in the band 1 605 - 1 705 kHz and hence of the future plan itself.

Plans for new broadcasting stations in this band should be based on the principle that even the most carefully selected equipment (transmitter, radio link, sound processors, studio consoles, etc.) will be only as good as the antenna system installed.

Countries like the United States, Canada or Mexico, which operate thousands of MF broadcasting stations, including hundreds on reused frequencies, can employ arrays of directional antennas with patterns designed for each particular case. However, generally for economic rather than technical reasons, many countries in the region do not use directional systems.

It is to be hoped that the lower radiating masts for frequencies in the new band and the shorter optimum lengths for ground plane radial wires will help to reduce costs and encourage the installation of directional arrays ensuring a high standard of performance both for individual stations and for the plan as a whole.

While it is agreed that all the problems connected with the vertical radiator, either series- or parallel-fed, or built up into directional arrays for MF frequencies, have been resolved, it would still be useful if the experts would continue their quest for new techniques aimed at reducing costs while maintaining or improving efficiency, thereby helping to plan antenna systems for the new band.

FACTORS CLOSELY RELATED TO THE ANTENNA SYSTEM ON WHICH THE EFFICIENCY OF THE PLAN WILL DEPEND

- Propagation
- Interference
- Coverage
- Signal reception.

Propagation

Propagation may be effected in a form ideal for the band, that is, close to the ground, known as ground-wave propagation, or in the non-ideal form of space or sky-wave propagation. When two propagation modes are combined, with wave trains containing the same information, we have what is known as multipath propagation.

Small countries will have to try to ensure that their broadcasts basically use ground-wave propagation, in order to avoid causing interference to the broadcasts of other countries. In some cases, antenna arrays with precise directional radiation patterns will be required in order to limit coverage to the target service area and leave open the possibility of frequency reuse. The adoption of precise directional patterns should not depend on arrays entailing complicated and costly adjustments; the use of two radiating masts almost always makes it possible to produce the wanted pattern, depending: a) on the physical separation between the masts versus wavelength; b) on the mast height in relation to the same parameter; c) on the suitable choice of a power level; d) on the feeder system, etc.

For big countries such as the United States of America, Canada, Brazil, Argentina and Mexico, frequency reuse will of course be much easier, whether directional systems are employed or not. However, non-directional systems should also be designed to ensure that propagation is effected largely in ground-wave mode by means of antennas with small vertical angles and transmitter powers not exceeding the level needed for the antenna to produce the field strength calculated for coverage of the service area. Directional configurations will be essential in border localities if a town in the adjacent country uses the same frequency and there is a risk that the proximity of the stations might result in mutual interference. Naturally, the station in the adjacent country would have to have an appropriate directional configuration. The use of low power levels to avoid mutual interference would not be the answer, since the service areas tend to grow and, if the power is kept within limits, the quality of service will eventually decline considerably owing inter alia to noise, which will increase as the town grows, and to some extent to absorption by buildings.

Since finding plots large enough to accommodate transmitting plant within towns or nearby villages to be served is no easy matter in most of the countries of Region 2 nowadays, a useful alternative would be to install the plant at a suitable site some 15-25 km from the town or village to be served and adopt a configuration that can be implemented with two masts so as to produce a radiation spectrum tailored to the individual case and providing the necessary coverage. It is well known that the two-mast solution almost invariably yields satisfactory results. If precisely defined lobes and very sharp nulls are not essential, the choice of a one-active-one-passive (parasitic element) mast arrangement on grounds of simplicity and economy would dispense with the relatively complicated system of feeders, phasors and couplers needed with two active masts. A two-active-mast formation would be required if radiation in the opposite direction had to be severely reduced and a cardioid pattern generated for covering the town and villages in question.

Interference

The interference caused by the signal from one broadcasting station to another operating on the same or an adjacent frequency is in most cases due to a transmitter power higher than is necessary or to multipath propagation; another reason might be that the stations are too close together and that the maximum permissible field strength within the protected contour of the affected station is consequently higher than need be. With the exception of sky-wave interference, of course, the other possible reasons indicated will be easy to check when preparing the plan.

Many broadcasting stations operating in the band 1 605 - 1 705 kHz may find that they have to use an isolated radiator reduced to one-quarter wavelength, either for reasons of economy, since the mean physical length of such a radiator would be about 43 m, because only small sites are available within the town or village, or because an isolated 1/4 λ radiator performs satisfactorily and is easy to adjust. Economy and space may argue in favour of a top-loaded 1/4 λ radiator, thereby reducing the physical length of the mast by some 7-8% of the wavelength in relation to an unloaded radiator. In the band 525 - 1 605 kHz, this type of antenna system using 1/4 λ in confined spaces between buildings is not uncommon in some countries of the region. The trouble is that most such antennas have poor ground planes owing to the short radial conductors, which are almost always less than 1/6 λ and consist of from 40 to 70 wires at most.

Poor ground characteristics should not be repeated in future new stations in the band 1 605 - 1 705 kHz, for the following reasons:

a) an isolated radiator with an electrical length of 1/4 λ and having a poor ground plane will give a radiation resistance appreciably lower than the theoretical normal, possibly between 10 and 20 ohms;

b) a top-loaded mast would increase the radiation resistance by 15-20 ohms, but this would still be below the theoretical normal;

c) a poor ground plane becomes a decisive factor in the antenna system's circuit performance, since radiation increases in the vertical plane and decreases in the horizontal plane;

d) if the transmission line impedance exceeds 200 ohms, as is often the case in unbalanced 5- or 6-wire lines, the high reactances in the impedance adapter will impair the audio-frequency response owing to the resultant higher selectivity.

Lastly, a poor ground plane may help to cause interference owing to the abnormal gain in relatively high degrees of radiation in the vertical plane and fading within its own service area.

Audio-frequency impairment would cause the noise signals to produce excessive interference to the reception of information from such an antenna system.

Coverage

The main purpose of broadcasting stations is to offer the greatest possible coverage so as to serve the maximum number of inhabitants within the service area. The use of a directional antenna system offers an effective means of providing and increasing coverage while causing little or no interference. If directional systems are used under a plan, all the stations which adopt them will benefit from reduced interference and increased coverage, since coverage is impaired not only though lack of power but also interference. Stepping up the transmitter power is not an ideal solution, since any increase in individual coverage may affect that of other transmitters due to interference. On the other hand, if two or more stations operating on the same frequency but with differing coverage arrangements were to adopt a directional system satisfactory to each, the solution would be really beneficial to all.

Another point to be borne in mind is that stations now exceeding their coverage with omnidirectional antenna systems and higher power levels than necessary, without causing interference to other stations, are in fact limiting the potential for future new stations.

Signal reception

MF broadcasting signals reaching a receiver antenna are often disturbed by other signals known as noise signals. These may be due to natural (background) or artificial (man-made) noise: the most powerful natural noise is produced by electrical storms, while man-made noise originates from a large number of sources such as HT lines, electric motors, fluorescent lighting systems, etc. Other unwanted broadcasting signals do of course constitute sometimes more persistent and more powerful sources of interference. The level of interference can in all cases be overcome only if the wanted signal is substantially more powerful than the interfering signals. This means that satisfactory reception quality depends essentially on the wanted broadcasting signal reaching the area in which the receiver is located with a field strength higher than that of the interfering signals.

Groundwave propagation of MF broadcasting signals is known to depend to a great extent on the ground conductivity over the entire path, the power fed to the antenna and particularly on the antenna to which the radio-frequency signal is applied.

Other equally important factors include the distance between the transmitting antenna and the receiver, natural and man-made obstacles along the propagation path and the curvature of the Earth. There is no doubt that the substantially higher level needed for usefully exceeding that of any interference should be achieved only through the use of a proper antenna system, whether directional or omnidirectional. Given the relative shortness of radiating masts for frequencies in the band 1 605 - 1 705 kHz, which incidentally offers a cost advantage, it might be both useful and feasible to employ larger mast cross-sections so as to improve the audio-frequency bandwidth. In the same way, it would be beneficial when designing antennas for, say, an omnidirectional system, to try to ensure that the radiation resistance and transmission line impedance values are as close as possible so that the impedance adapter reactances do not behave as selective audio-frequency circuits; this would help to achieve the desired reception quality.

Conclusions

Antenna systems for the band 1 605 - 1 705 kHz should be designed in such a way as to control sky-wave propagation with a view to reducing its intensity to the lowest possible levels; this would yield an ideal plan without interference from radio-frequency fields by either direct wave or sky-wave.

System gain may be of some secondary importance, since the main objective of the designer should be to secure the most suitable angular patterns of vertical and horizontal radiation with a view to minimizing multipath propagation, which causes both interference and distortion.

Finally, designers of broadcasting antennas for the band 1 605 - 1 705 kHz should concentrate on achieving the pattern best suited to the individual station and which least affects other users, either within or outside the country.

The sky-wave should not be used for service.

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

BC-R2(1) CARR CHARGÉE D'ÉTABLIR UN PLAN POUR LE SERVICE DE RADIODIFFUSION DANS LA BANDE 1605-1705 kHz DANS LA RÉGION 2

PREMIÈRE SESSION GENÈVE, AVRIL/MAI 1986

Corrigendum 1 au
Document 18(Rev.1)-F/E/S
21 avril 1986

REGLES PROVISOIRES CONCERNANT LA PARTICIPATION AUX CONFERENCES ADMINISTRATIVES REGIONALES DE MEMBRES N'APPARTENANT PAS A LA REGION CONCERNEE

Première page, lire COMMISSION 3 au lieu de SEANCE PLENIERE

PROVISIONAL RULES FOR ATTENDING REGIONAL ADMINISTRATIVE CONFERENCES BY MEMBERS NOT BELONGING TO THE REGION CONCERNED

First page, read COMMITTEE 3 instead of PLENARY MEETING

REGLAS PROVISIONALES SOBRE LA PARTICIPACION EN LAS CONFERENCIAS ADMINISTRAGIVAS REGIONALES DE MIEMBROS NO PERTENECIENTES A LA REGION DE QUE SE TRATE

Primera página, léase COMISION 3 en lugar de SESION PLENARIA

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 18(Rev.1)-E
18 April 1986
Original: French

PLENARY MEETING

Note by the Secretary-General

PROVISIONAL RULES FOR THE ATTENDANCE OF REGIONAL ADMINISTRATIVE CONFERENCES BY MEMBERS NOT BELONGING TO THE REGION CONCERNED

With the agreement of the majority of the Members of the Union, and pending the action which may be taken by the next Plenipotentiary Conference, the following Provisional Rules entered into force on 1 January 1986 :

a) Any Member of the Union not belonging to the Region concerned and not participating as an observer (as defined in No. 2010 of the Nairobi Convention) may attend a Regional Administrative Conference (see No. 50 of the said Convention) if it so wishes and for the sake of its own information.

b) Such a Member (see paragraph a) above) shall not have the right either to vote or to speak.

c) Such a Member (see paragraph a) above) shall be seated in a separate area of the conference room without microphone.

d) Such a Member (see paragraph a) above) shall not be liable for contributing, in accordance with No. 115 of the Nairobi Convention, to the expenses incurred by the regional administrative conference in question, but shall pay, per set of documents ordered, a documentation fee to be fixed in accordance with the Council's instructions ; the amount of such fee being reviewed periodically by the Council.

Since instructions have not yet been issued regarding the method to be used for calculating the price of a set of documents, it is suggested that the Budget Control Committee of this Conference should take a decision on the matter.

It is therefore proposed that the price of a set of documents for this Conference should be set at 300 Swiss francs, as follows :

- Salaries and related expenses of the translation, typing and reproduction services staff, as per budget	336,000
- Document production	20,000
- Report to the second session	20,000
	376,000
- 10 % for other services	37,600
	413,600
- Number of sets, as per budget* (420 pages + 1025 pages to be translated : 2)	1,384 sets
- Price per set	300 Sw.frs.

R.E. BUTLER
Secretary-General

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* See Document 5 of the present Conference:

Total volume of documents as per p.5: 400,000 + 600,000	1,000,000 pages
Number of pages per set: - pages translated into two languages as per p.5: 420 + 1,025	1,445 pages
hence pages translated into one language 1,445 : 2	722½ pages
Number of sets: 1,000,000 pages: 722½ pages	1,384 sets

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 18-E
14 April 1986
Original : French

PLENARY MEETING

Note by the Secretary-General

PROVISIONAL RULES FOR ATTENDING REGIONAL ADMINISTRATIVE CONFERENCES BY MEMBERS NOT BELONGING TO THE REGION CONCERNED

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Since instructions have not yet been issued regarding the method to be used for calculating the price of a set of documents, it is suggested that the Budget Control Committee of this Conference should take a decision on the matter.

It is therefore proposed that the price of a set of documents for this Conference should be set at 520 Swiss francs, as follows :

- Salaries and related expenses of the translation, typing and reproduction services staff, as per budget	336,000
- Document production	20,000
- Report to the second session	20,000
	376,000
- 10 % for other services	37,600
	413,600
- Number of sets, as per budget (420 pages + 1025 pages to be translated : 2)	722.50
- Price per set	572.--

R.E. BUTLER
Secretary-General

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) **RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2**

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 19-E
14 April 1986
Original: English/Spanish

NOTE BY THE SECRETARY-GENERAL

At the request of the Chairman of the Inter-American Telecommunications Conference (CITEL), I transmit hereby the text of a Resolution adopted in the fourth meeting of the Permanent Technical Committee II held in Fortaleza (Brazil) from 24 to 28 February 1986. This text is submitted to the Conference for information.

R.E. BUTLER
Secretary-General

Annex: 1

ANNEX

PTC.II/RES.17 (IV-85)

GUIDELINES FOR THE PLANNING OF MF BROADCASTING

THE FOURTH MEETING OF PTC.II: RADIOBROADCASTING

CONSIDERING:

a) The need to plan the broadcasting service in the band 1605-1705 kHz, according to Recommendation Nº 504 of WARC-79 and Resolution Nº 913 of the Administrative Council;

b) The characteristics of the propagation of the groundwave as well as the skywave in the band 1605-1705 kHz;

c) That the spectrum available for planning provides for only ten broadcasting channels;

d) That the treatment of the broadcasting requirements of all countries should be equitable;

e) That different countries may need different time spans:

- to transfer services currently using the band 1605-1705 kHz to other bands, or
- to implement the band for the broadcasting service;

RECOMMENDS:

That the Conference adopt, among others, the following guidelines:

a) Only the primary service area (groundwave) should be protected from interference;

b) In calculating the field strength of the interfering skywave signal, the curve relating to 50% of the time should be applied;

NOTE: Published as document PTC.II/105-86 rev.1 during the Meeting

c) The Plan should be based on a transmitter power of 1 kW and a 90° non-directional antenna. Higher transmitter power and/or different antenna could be used by a country at the time of bringing into operation a station or subsequent modifications, provided that the field strength within the neighbouring country does not exceed, at a given distance, the highest field strength of a station in the originating country established in accordance with the Plan with a transmitted power of 1 kW and a 90° non-directional antenna.

d) The possibility should be left open for the case where a group of countries decide to develop at the Conference part of the Plan, consistent with the Regional Plan, subregionally based on a transmitter power less than 1 kW (e.g. 0.25 or 0.5 kW).

e) The planning should be flexible enough to preserve the future rights of administrations in order to permit any country:

- to implement its broadcasting stations at a convenient date, and

- to maintain the operation of other services in certain channels of the band 1605-1705 kHz provided it does not have an adverse effect on the Plan.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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14 April 1986
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COMMITTEE 5

Cuba

PLANNING

1. Planning principles

The Regional Administrative Radio Conference has to estabish a plan for the broadcasting service in the 1 605 - 1 705 kHz band in Region 2.

This plan will be established in accordance with the principle that all countries, whether large or small, have equal rights. It will also have to be based on administrations' requirements and lead to satisfactory reception conditions for all countries, having due regard to the different situations prevailing in Region 2 countries and in particular to the needs of developing countries.

CUB/20/1 2. Basic considerations

In planning the service, the following basic considerations should be borne in mind:

a) the frequency spectrum is limited, as are the human and financial resources available;

b) rational and equitable channel distribution presents a particularly difficult problem in those parts of the Region where there are large numbers of countries or population groups in close proximity to each other;

c) so far as possible, an effort has to be made to meet administrations' requirements for the broadcasting service, with due allowance for the administrative subdivisions and languages involved;

d) the parameters adopted at this session for the different areas of the Region should be borne in mind;

e) attention should be given to the specific requirements of certain countries arising from the inadequacy of other possible broadcasting media in other frequency bands (e.g. VHF FM) and to the fact that the MF band is especially suitable and economic for mass communications.

CUB/20/2 3. Practical aspects of planning

The plan should provide only for the ground-wave service, which can be used to cover both large and small areas.

It is proposed that no provision should be made for the night-time sky-wave service, since it is only feasible in large countries. Small countries, such as most of those in Region 2, cannot use this service because sky-wave coverage is only effective for distances over 400 km.

In addition, because the sky-wave service covers wide areas, its protection contour extends to distances of over 1,000 km, requiring countries which never use this service to provide protection for stations in other countries that do. This prevents countries not using the sky-wave service from utilizing more frequencies, thus restricting coverage and the programming range.

Another factor to be borne in mind is that the 1 605 - 1 705 kHz band is not allocated exclusively to the broadcasting service, but has to be shared with the fixed and mobile services, which have to be afforded protection against interference.

CUB/20/3 4. Sky-wave propagation

On the basis of the nominal usable field strengths proposed by the Cuban Administration for the different areas in the Region, namely:

Nominal usable field strength

Noise area 1		Noise area 2	
Class B station		Class B station	
Daytime:	900 μV/m	Daytime:	900 μV/m
Night-time:	2900 μV/m	Night-time:	6300 μV/m
Class C station		Class C station	
Daytime:	1250 μV/m	Daytime:	1250 μV/m
Night-time:	4100 μV/m	Night-time:	8900 μV/m

and with the ground-wave propagation calculation method applicable in Region 2, for a short vertical omnidirectional antenna with a characteristic field strength of 300 mV/m at a distance of 1 km, taking the frequency for calculation purposes as 1 665 kHz and assuming transmitters with a power varying from 0.25 kW to 10 kW, we calculated the service radius that would be obtained for conductivity values of 1.4 and 10 mS/m.

The results are shown in Table I.

CUB/20/4 5. Sky-wave propagation

Since night-time co-channel interference imposes severe restrictions on the assignment capacity, on the basis of the nominal usable night-time field strength proposed by the Cuban Administration for the different noise areas in Region 2, assuming transmitters using a short vertical antenna with a characteristic field strength of 300 mV/m at 1 km and the sky-wave propagation calculation method applicable at present in the Region, for transmitters with power levels ranging from 0.25 to 10 kW and a protection ratio of 20:1, we calculated the distances that would have to be maintained for co-channel assignments.

The results are shown in Table II.

CUB/20/5 6. Conclusions

On the basis of the data shown in Tables I and II, the Cuban Administration proposes that the maximum daytime power should be 5 kW, while for the night-time service the power should be reduced by 1 kW.

The proposed power levels will make it possible to provide the minimum power level necessary to exceed the noise level. The power in these channels is limited so that they can be used repeatedly in all countries in the Region with different programmes.

This proposal has the feature that coverage of all stations can be maximized, ensuring that they all provide coverage with approximately the same nominal usable field strength.

In order to facilitate planning, consideration could be given to the possibility of using directional antennas in certain cases.

With the powers proposed, an analysis should be made of the feasibility of applying some elements of lattice planning method, which in our view may permit some improvements in the spacing of adjacent channels. From the standpoint of practical planning, geometrically regular lattices and linear channelling schemes are fairly easy to apply, but it should be pointed out that this method is essentially intended to be used as a guideline during the planning process.

Nevertheless, the Cuban Administration considers that the planning method adopted should be flexible, so that administrations can be given a specific area of their territory within which the station will be located.

CUB/20/6

TABLE I

Sky-wave propagation

Characteristic field strength, E_c, 300 mV/m at 1 km,
frequency 1 665 kHz

Power kW	Nominal usable field strength	Service radius in km for conductivity		
		1 mS/m	4 mS/m	10 ms/m
0.25	900	10	17	30
	1250	8.5	14	24
	2900	5.7	10	17
	4100	4.6	8.5	12.5
	6300	3.8	6.5	10
	8900	3.2	5.5	9
0.50	900	12	20	34
	1250	10	17	30
	2900	6.5	12	20
	4100	5.7	10	17
	6300	4.2	7.5	12
	8900	3.8	6.5	10
1.0	900	14	22	38
	1250	12	20	34
	2900	8	13	22
	4100	6.5	12	20
	6300	5.5	9.5	16
	8900	4.2	7.5	12
5.0	900	22	34	55
	1250	17	28	46
	2900	12	20	34
	4100	10	17	30
	6300	8	13	22
	8900	6.5	12	20
10.0	900	24	38	60
	1250	22	34	55
	2900	14	22	38
	4100	12	20	34
	6300	10	17	30
	8900	8	13	22

CUB/20/7

TABLE II

Sky-wave propagation

E_c = 300 mV/m at 1 km F (θ) = 1.0

	Co-channel station spacing			
Power kW	Protection contour mV/m			
	2.9	4.1	6.3	8.9
0.25	175	125	100	100
0.50	300	175	125	100
1.0	525	300	175	125
5.0	1100	875	550	325
10.0	1300	1100	825	550

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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COMMITTEE 4

Cuba

REQUIRED FIELD STRENGTH

CUB/21/8 1. Minimum usable field strength (E_{min})

Minimum value of the field strength required to provide a given reception quality, under specified receiving conditions, in the presence of atmospheric noise, man-made noise and the intrinsic receiver noise level.

The desired reception quality is determined, in particular, by the noise protection ratio, while receiving conditions include, inter alia, the type of transmission, the frequency band used, the characteristics of the receiver installation and the receiver operating conditions, and in particular the geographical area, time and season of the year.

CUB/21/9 1.1 Atmospheric noise data

For the calculation of atmospheric noise, CCIR Report 322-2 (World Distribution and Characteristics of Atmospheric Radio Noise), which is the only available general source of noise data, should be used.

The value of noise field strength (E_n) is obtained from the noise data contained in that Report, using the formula:

$$E_n = F_{am} - 95.5 + 20 \log f + 10 \log b \qquad (1)$$

$$f = \text{MHz} \quad b = \text{Hz}$$

For the centre of the frequency band 1 605 - 1 705 kHz, the value of f is taken as 1.65 MHz and the bandwidth 10 kHz, such that equation (1) becomes:

$$E_n = F_{am} - 51.15 \text{ dB}(\mu\text{V/m})$$

Report 322-2 gives the values F_{am} for each season of the year in six time blocks covering the whole day.

Ten locations in noise zone 1 and six locations in noise zone 2 were studied. For each location studied, typical values were obtained for the four seasons and the time periods 0800-1200 and 1200-1600 during the daytime and 1600-2000 and 2000-2400 during the night. These time blocks were selected to centre the atmospheric noise data at 1200 hours during the day and 2000 hours at night.

For each location, the mean value of F_{am} was calculated for the two daytime blocks for each season, after which the mean of the four seasonal means was obtained. The same procedure was applied for the two night-time blocks.

The results of the analysis are given in Table 1.

CUB/21/10 1.2 Man-made noise data

CCIR Report 258-4 contains reference curves showing the variation with frequency of median man-made noise power for four environmental categories, namely:

- Curve A: business
- Curve B: residential
- Curve C: rural
- Curve D: quiet rural (villages).

It is proposed that Curve A corresponding to man-made noise in a business environment should be used for planning purposes since it represents the worst-case situation.

We shall use a value of 15.85 dB(µV/m) corresponding to 6.2 µV.

CUB/21/11 1.3 Intrinsic receiver noise level

The equivalent receiver intrinsic noise field strength (E_i^o) is given by:

$$E_i = E_c + 20 \log m - SNR \quad dB(\mu V/m)$$

where:

E_c = noise-limited receiver sensitivity, 46 dB(µV/m)
m = modulation index, 0.3
SNR = AF signal-to noise ratio: 26 dB. Value used for receiver sensitivity measurement in accordance with CCIR Report 617-2.

Under these conditions, E_i^o = 9.54 dB(µV/m) corresponding to 3.0 µV.

CUB/21/12 2. Nominal usable field strength (E_u)

Minimum value of the field strength required to provide a desired reception quality, under specified receiving conditions, in the presence of atmospheric noise, man-made noise, intrinsic receiver noise and interference. The specific reception quality is determined, in particular, by the noise protection ratio.

CUB/21/13 3. Protection ratios

CUB/21/14 3.1 Audio-frequency (AF) protection ratio

Agreed minimum value of the audio-frequency signal-to-interference ratio corresponding to a reception quality subjectively defined as acceptable. Recommendation 562-1 points to a value of 26 dB for steady-state conditions, and that value is acceptable for planning purposes.

CUB/21/15 3.2 Radio-frequency (RF) protection ratio

The desired radio-frequency signal-to-interference ratio which, in well-defined conditions, makes it possible to obtain the audio-frequency protection ratio at the output of the receiver.

The RF signal-to-noise ratio (at the input) is approximately 10 dB higher than the AF signal-to-noise ratio (at the output) required for the reference receiver in stable propagation conditions and for a modulation index of 30%.

Under these conditions, the value of the RF protection ratio for planning purposes will be 36 dB, which is lower than the 40 dB proposed in CCIR Recommendation 560-1.

CUB/21/16 4. Interference due to other transmitters

A factor of 3 dB is considered for interference caused by other transmitters during the day and 9 dB during the night.

CUB/21/17 5. Calculation of the nominal usable field strength

	Noise zone 1		Noise zone 2	
	Day	Night	Day	Night
Total resulting noise field strength (μV/m)	16.77	21.20	16.90	27.80
Interference due to other transmitters (dB)	3.00	9.00	3.00	9.00
Protection ratio (dB)	36.00	36.00	36.00	36.00
E_{nom}	55.77	66.20	55.90	72.80

These calculations relate to the nominal usable field strength for a Class A station. 3 dB must be added for Class B stations and 6 dB for Class C stations, which gives the following results:

Noise zone 1	Noise zone 2
Class B station Daytime: 58.77 dB (μV/m) 867.9 μV/m Night-time: 69.20 dB (μV/m) 2884.0 μV/m	Class B station Daytime: 58.90 dB(μV/m) 881.0 μV/m Night-time: 75.80 dB (μV/m) 6165.9 μV/m
Class C station Daytime: 61.77 dB (μV/m) 1226.0 μV/m Night-time: 72.20 dB (μV/m) 4073.8 μV/m	Class C station Daytime: 61.90 dB (μV/m) 1244.5 μV/m Night-time: 78.80 dB (μV/m) 8709.6 μV/m

CUB/21/18 6. Conclusion

The Cuban Administration proposes that the following values of nominal usable field strength should be used for planning of the band 1 605 - 1 705 kHz:

Noise zone 1	Noise zone 2
Class B station Daytime: 59.00 dB (μV/m) 900 μV/m Night-time: 69.30 dB (υV/m) 2900 μV/m	Class B station Daytime: 59.00 dB(μV/m) 900 μV/m Night-time: 76.00 dB (μV/m) 6300 μV/m
Class C station Daytime: 62.00 dB (μV/m) 1250 μV/m Night-time: 72.30 dB (μV/m) 4100 μV/m	Class C station Daytime: 62.00 dB (μV/m) 1250 μV/m Night-time: 79.00 dB (μV/m) 8900 μV/m

CUB/21/19

TABLE 1

Noise zone 1

Typical value of F_{am} above kT_ob (dB)		
Location	Day	Night
Houston	46.4	71.9
San Francisco	31.6	60.7
New Zork	43.6	67.9
Havana	47.5	74.4
Mexico	46.1	69.6
Managua	55.1	77.1
Panama	56.9	80.0
Rio de Janeiro	42.5	71.9
Buenos Aires	37.8	67.0
Santiago	36.6	63.9

Noise zone 2

Typical value of F_{am} above kT_ob (dB)		
Location	Day	Night
Bogota	57.1	80.6
Quito	56.2	80.1
Lima	49.2	74.2
La Paz	53.6	77.3
Caracas	52.0	79.2
Georgetown	50.7	80.1

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 22-E
14 April 1986
Original: Spanish

COMMITTEE 4

Cuba

SKY-WAVE PROPAGATION

1. Introduction

Chapter 3 of the CCIR Report containing Technical Bases for the First Session of the Regional Administrative Planning Conference for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 explains the different field strength prediction methods available, namely:

a) the FCC method

b) the Cairo curves

c) the CCIR method and simplification for planning purposes in Region 2

d) the Region 2 method

e) the modified FCC method.

It should be emphasized that the CCIR method was approved for official use in Region 1 and part of Region 3 by the Regional Administrative LF/MF Broadcasting Conference, 1975.

In preparing the Regional Administrative Broadcasting Conference for Region 2 (Buenos Aires, 1980), CCIR Interim Working Party 6/4 held an extraordinary meeting at Geneva in October 1979, at which it approved a series of modifications to the CCIR method (Recommendation 435-3) as a result of the study of data collected in different sectors of Region 2.[1]

This method took into account such aspects as sea gain, polarization coupling loss and a factor dependent on geomagnetic latitude.

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1 See Chapter 2 of the Report to the First Session of the Regional Administrative MF Broadcasting Conference, Region 2, Geneva, 1979, for further details.

After considering the methods available, the first session of the Regional Administrative Broadcasting Conference for Region 2 (Buenos Aires, 1980) concluded that:

a) the FCC curves, converted to metric and normalized to a characteristic field strength of 100 mV/m at 1 km, should be used for paths of up to 4,250 km;

b) the Cairo north-south curve, converted to 100 mV/m at 1 km and reduced by 5.4 dB to make it match the FCC curve at 4,250 km, should be used for paths of more than 4,250 km;

c) use of the sea gain factor was not approved and the CCIR was invited to carry out further studies.

The second session of the Regional Administrative Broadcasting Conference (Rio de Janeiro, 1981) did not approve the use of the polarization coupling loss factor.

CUB/22/20 2. Comparison between the Region 2 method and the CCIR method

For comparing these two methods, it is assumed that we wish to calculate the distance at which a transmitter on a given frequency may be installed so as to cause no harmful interference to another transmitter already installed and operating on the same frequency.

Let us take a Class B station, already installed, with a service contour of 2500 μV/m, a protection ratio of 20:1 (26 dB) and a permitted interference level of 125 μV/m (42 dB (mV/m)).

The proposed station is a 10-kW transmitter with an antenna having a half-wavelength E_c = 385 mV/m at 1 km (2.1 dB).

Region 2 method

The sky-wave field strength is given by:

$$F = F_c + 20 \log \frac{E_c \ f(\Theta) \sqrt{P}}{100} \quad \text{dB (mV/m)}$$

where F_c for distances of up to 4,250 km is the field strength read directly from Figure 4 or Table III of the CCIR Report; F(Θ) is assumed to equal unity.

$$42 = F_c + 20 \log \frac{385 \times 1 \times \sqrt{10}}{100}$$

$$F_c \simeq 20.4 \text{ dB}$$

$$d = 1{,}500 \text{ km}$$

The distance at which the new transmitter will have to be sited is therefore 1,500 km.

CCIR method

$$F_o = F_c - G_{ant} - P_{tx}$$

where F_o is the field strength due to 1 kW radiated by a short vertical monopole antenna, F_c is the wanted field strength in dB(μV/m), G_{ant} is the characteristic antenna field strength in dB in relation to the short vertical monopole antenna and P_{tx} is the transmitter power in dB referred to 1 kW.

$$Fo = 42-2,\ 1-10 = 29.9 \text{ dB(mV/m)}$$

$$Fo \simeq 30 \text{ dB(mV/m)}$$

Using Figures 35a and 35b, which enable the application of this method to be simplified when making manual calculations, we find that the distance associated with this field strength ranges from 825 km (for $\emptyset = 60^o$) to 2,200 km (for $\emptyset$ between $+27^o$ and -30^o).

This means that a distance of 825 km would be adequate in Canada, for instance, whereas in the countries between Mexico and Argentina the distance would have to be 2,200 km.

CUB/22/21 3. Modified Region 2 method

For the first session of the Regional Administrative Planning Conference for the Broadcasting Service in the band 1 605 - 1 705 kHz in Region 2, a new term Fc dependent on geomagnetic latitude was developed for inclusion in the present Region 2 method.

The new term Fc is to replace the term Fc in the existing Region 2 method and it is suggested that it should be applied for distances of more than 200 km; it is defined by:

$$Fc = (95-20\log d) - (6.28+4tg^2\emptyset)\left(\frac{d}{1000}\right)^{1/2}$$

where $\emptyset$ is the arithmetic mean of the geomagnetic latitude of the transmitter ($\emptyset_T$) and that of the receiving site ($\emptyset_R$) of a path.

We shall use this method to study eight paths that are different but at constant distances in order to simplify the calculation, and shall determine the permitted power of a new transmitter to be installed, assuming, as in the above examples, a class B station with a service contour of 2500 μV/m and a permitted interference of 125 μV/m (42 dB(mV/m)) based on a protection ratio of 20:1 (26 dB). The antenna is assumed to have a characteristic field strength of 300 mV/m at 1 km. Distance between points: 1,120 km.

Point		Coordinates (degrees)		Geomagnetic latitude (degrees)
1.	Mexico	19°N	39°W	29.1°
2.	Havana	23°N	82°W	32.8°
3.	Oklahoma	35°N	95°W	46.0°
4.	Nevada	40°N	114°W	51.0°
5.	Pannsylvania	41°N	76°W	50.0°
6.	Puerto Rico	18°N	67°W	26.5°
7.	Honduras	14°N	87°W	24.0°
8.	Ontario	48°N	82°W	57.0°

A) Mexico-Havana

$\emptyset = 31°$ Fc = 25.54 dB(μV/m) P=5 kW

B) Havana-Oklahoma

$\emptyset = 39.4°$ Fc = 23.87 dB(μV/m) P=7.5 kW

C) Mexico-Oklahoma

$\emptyset = 37.6°$ Fc = 24.3 dB(μV/m) P=6.7 kW

D) Oklahoma-Nevada

$\emptyset = 48.5°$ Fc = 20.8 dB(μV/m) P=15.0 kW

E) Oklahoma-Pennsylvania

$\emptyset = 48°$ Fc = 21.0 dB(μV/m) P=14.45 kW

F) Oklahoma-Ontario

$\emptyset = 51.5°$ Fc = 19.2 dB(μV/m) P=21.8 kW

G) Havana-Puerto Rico

$\emptyset = 29.7°$ Fc = 25.7 dB(μV/m) P=4.8 kW

H) Havana-Honduras

$\emptyset = 28.4°$ Fc = 25.9 dB(μV/m) P=4.7 kW

It will be seen from the results obtained above that the new transmitter power may be much greater from the southern United States northwards than at the other points analyzed or, in other words, the distance at which the channel is repeated will be shorter in the United States and Canada than in the rest of the hemisphere; this is particularly disadvantageous to medium-sized and small countries, since they will be unable to use the new channels on a rational, fair and equitable basis.

CUB/22/22 Conclusions

The Communications Administration of the Republic of Cuba considers that, on the basis of the foregoing results, the sky-wave field strength calculation method should not take account of terms depending on geomagnetic latitude. It therefore proposes that the method currently applied in Region 2 should be adopted for calculation purposes.

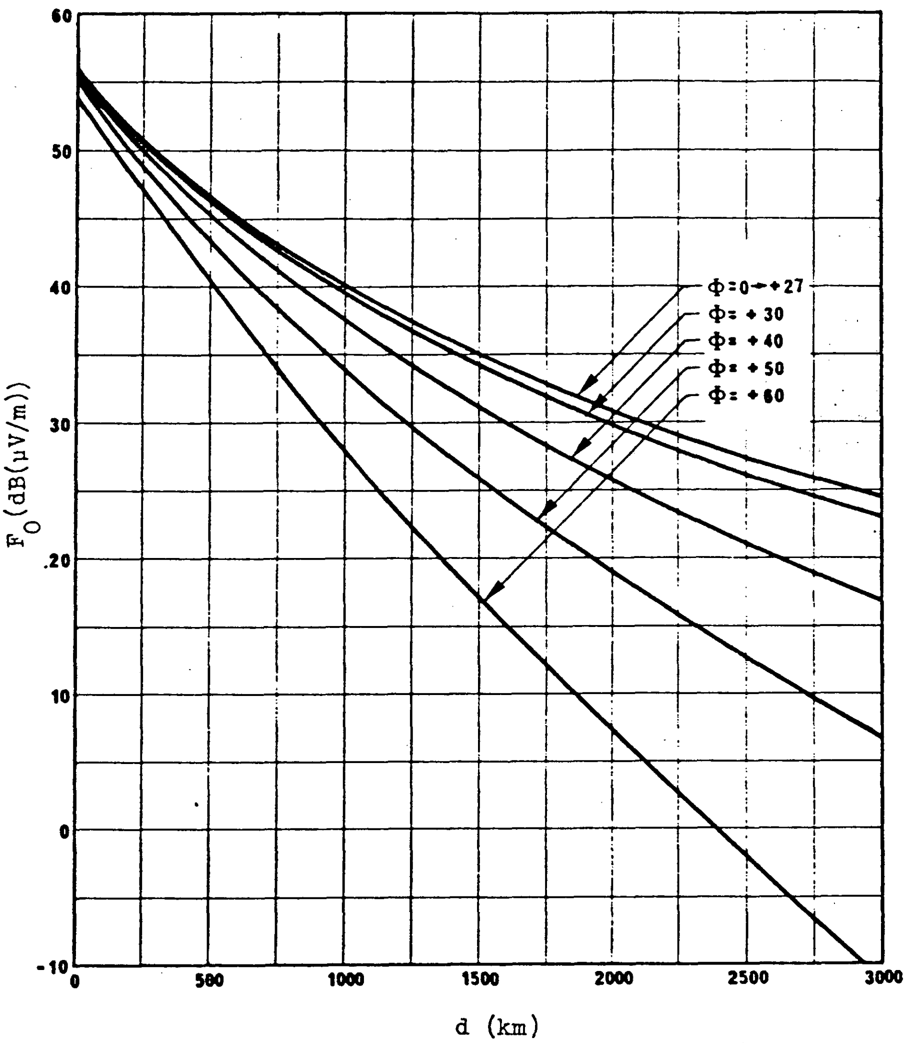


Fig. 35a - F_0 for constant Φ, and for G_S and L_P both zero

50%

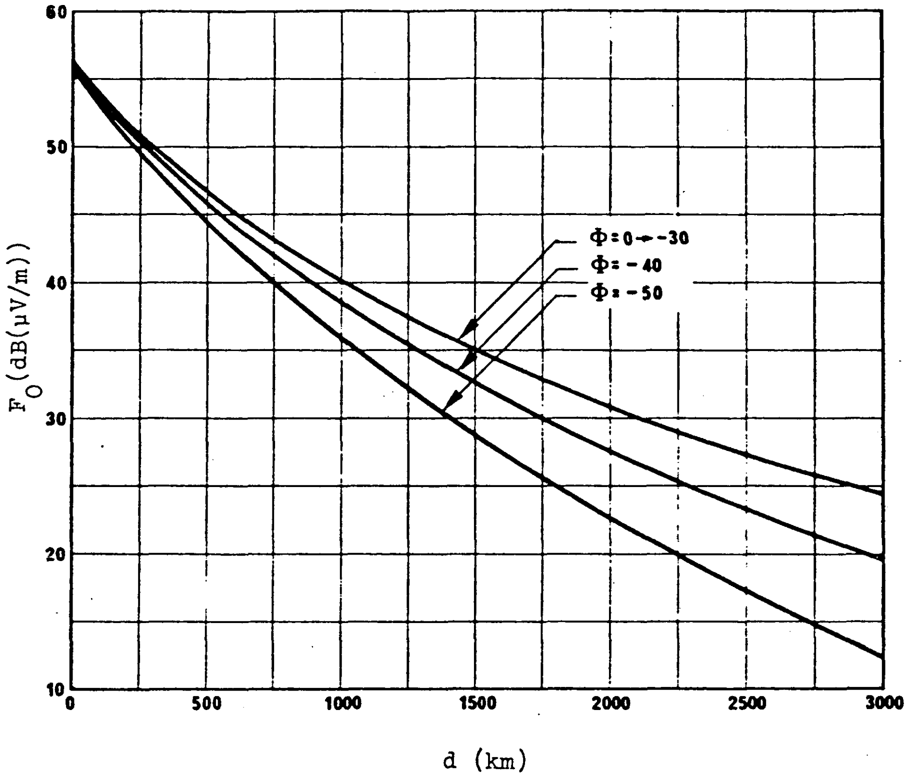
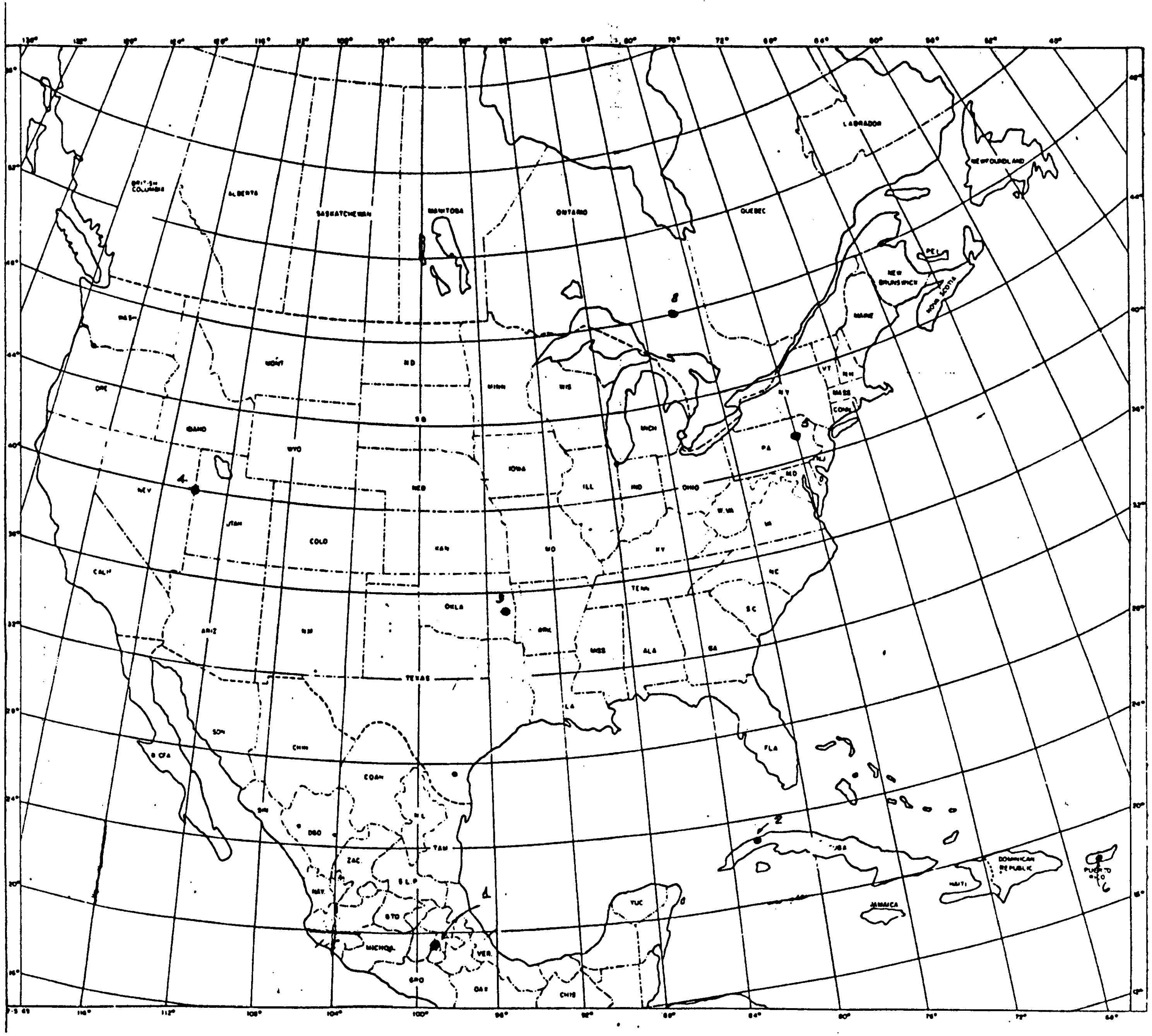


Fig. 35b - F_0 for constant Φ, and for G_S and L_P both zero

50%


BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
LABRADOR
NEWFOUNDLAND
NEW BRUNSWICK
NOVA SCOTIA
PEI
MAINE
WASH
ORE
CALIF
NEV
IDAHO
MONT
WYO
UTAH
COLO
ARIZ
NM
ND
SD
NEB
KAN
OKLA
TEXAS
MINN
IOWA
MO
ARK
LA
WIS
ILL
MICH
IND
OHIO
KY
TENN
MISS
ALA
GA
FLA
SC
NC
VA
W.VA
PA
NY
VT
NH
MASS
CONN
NJ
MD
SON
CHIH
COAH
DGO
ZAC
SLP
NL
TAM
NAY
GTO
MICHOA
VER
OAX
CHIS
YUC
CUBA
JAMAICA
HAITI
DOMINICAN REPUBLIC
PUERTO RICO
1
2
3
4
5
6
8

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 23-E
14 April 1986
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COMMITTEE 5

Argentine Republic

PROPOSALS FOR THE WORK OF THE CONFERENCE

COMPARATIVE STUDY OF RESULTS OBTAINED WITH THE ALLOTMENT AND ASSIGNMENT METHODS

(Agenda item 2.1.7)

1. Introduction

The Argentine Administration submits herewith the results of a planning exercise carried out using the channel allotment and assignment methods.

In doing so, it hopes to promote the more efficient use of the radio spectrum by suggesting criteria which may be used to assess the capacity of both methods to meet a larger number of requirements, particularly in critical planning areas of Region 2.

The study took account of information contained in documents submitted to the recent meeting of CITEL's "Broadcasting" PTC II at Fortaleza (Brazil) and was based on the following technical parameters:

Power: 1 kW for both daytime and night-time operation

Antenna type: omnidirectional, quarter-wave

Conductivity: 10 mS/m

Radius of protected contour (daytime), 0.5 mV/m: 50 km

Radius of protected contour (night-time), 2.5 mV/m: 20 km

Protection ratios: co-channel 26 dB
first adjacent channel 0 dB
second adjacent channel -29.5 dB

Minimum night-time distance of separation, co-channel: 550 km

Interfering field strength (daytime): 25 μV/m

Interfering field strength (night-time): 125 μV/m

2. Results

In the interests of simplification, the country taken for the comparative study was the medium-sized country used to demonstrate the allotment method described in Document CTP II/86-86 of the Fortaleza meeting.

Map No. 1 shows the results obtained by the allotment method, as set out in the above-mentioned document. It will be seen that 19 assignments could be made.

Map No. 2 shows that the assignment method enables 32 channels to be assigned for the same country and the same towns. This result does not exclude the corresponding assignments for neighbouring countries.

The Argentine Administration wishes to make it clear that the results are to be viewed simply as a comparative planning exercise; the channels shown in no way represent proposed assignments.

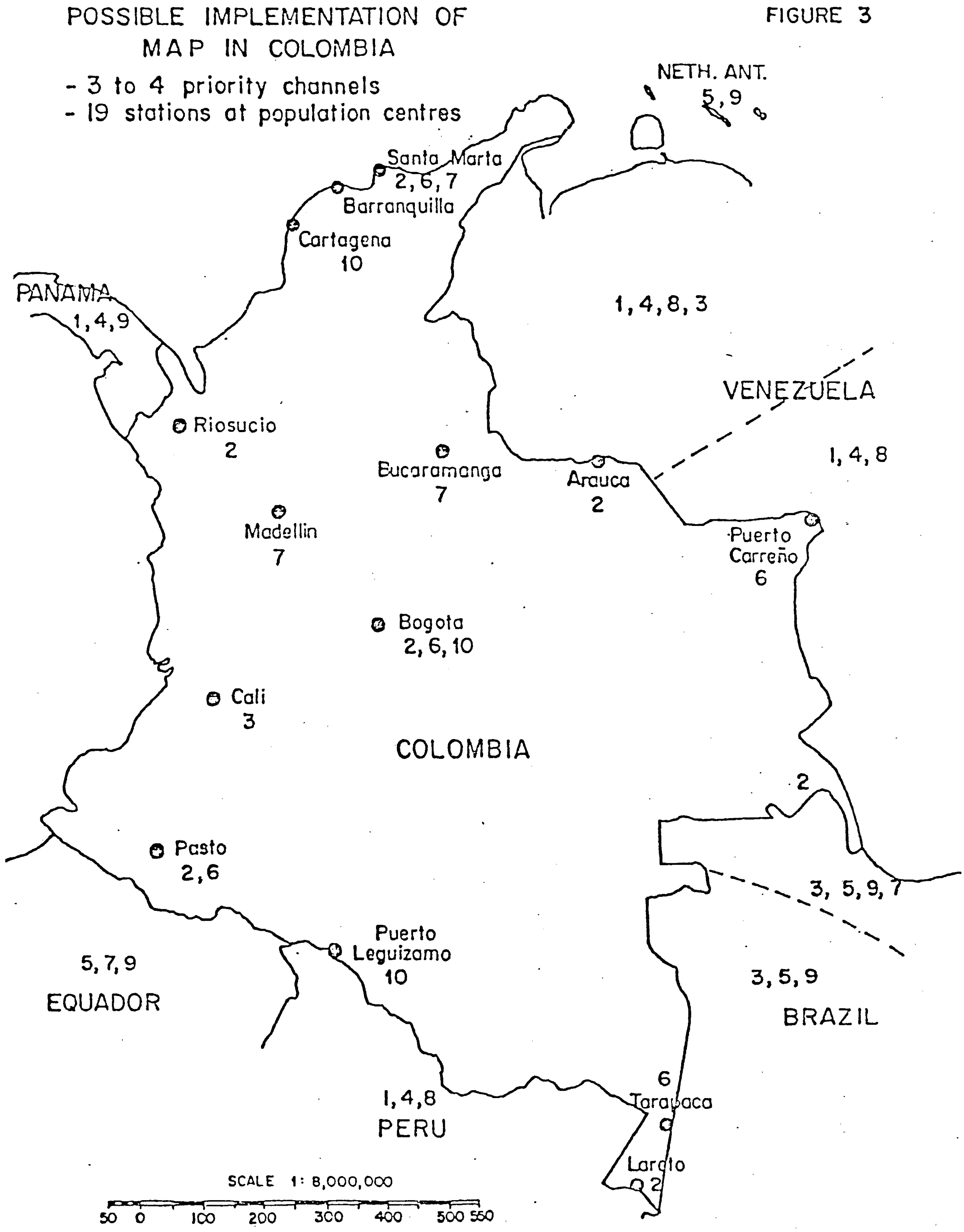
3. Conclusions

The results obtained show that, depending on the particular case, the assignment method produces approximately twice the number of assignments that can be obtained using the allotment method.

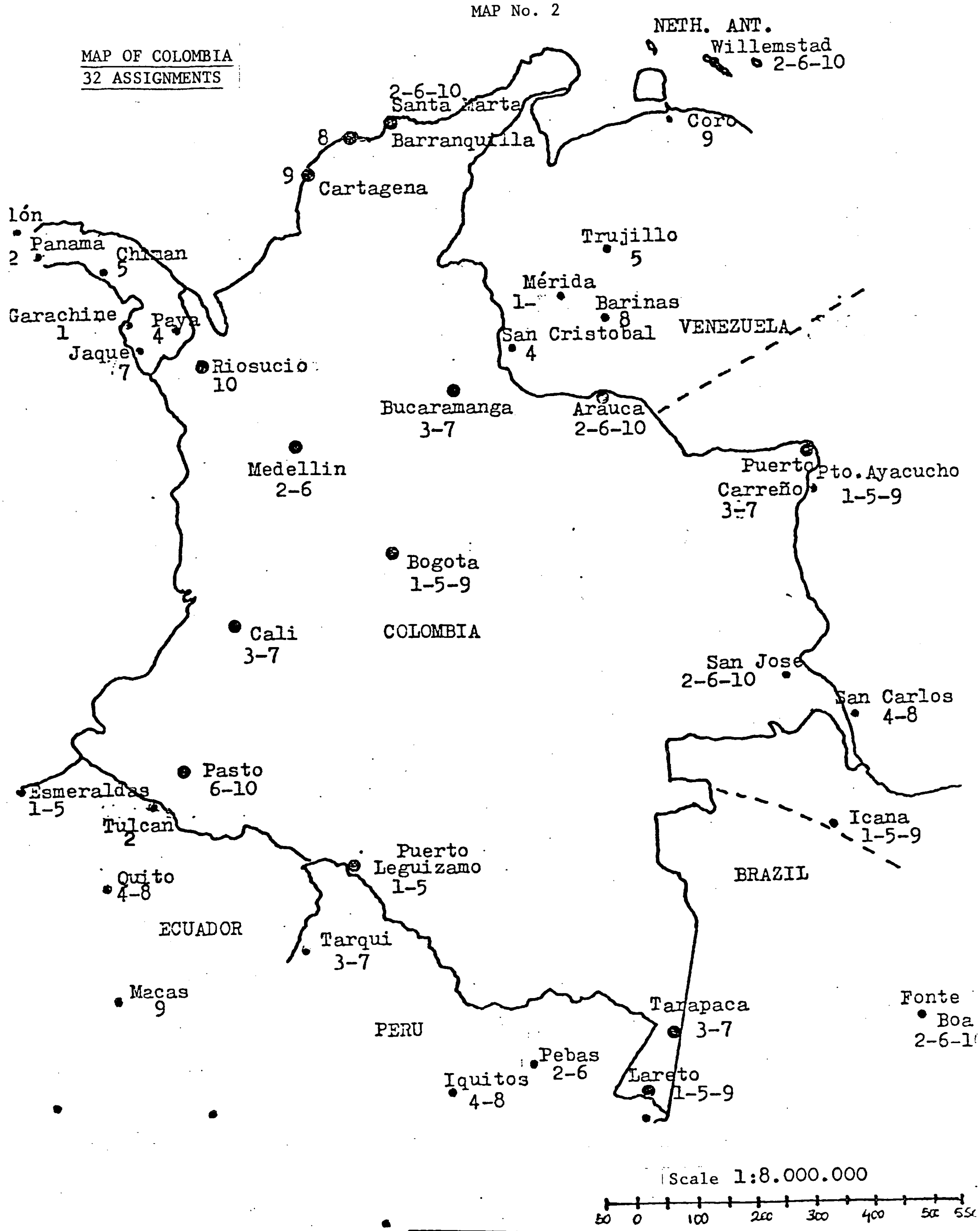
4. Proposal

ARG/23/1 On the basis of this study, the Argentine Administration proposes the adoption of the assignment method for planning purposes.

MAP No. 1


POSSIBLE IMPLEMENTATION OF
MAP IN COLOMBIA
- 3 to 4 priority channels
- 19 stations at population centres
FIGURE 3
NETH. ANT.
5,9
Santa Marta
2,6,7
Barranquilla
Cartagena
10
PANAMA
1,4,9
1,4,8,3
VENEZUELA
1,4,8
Riosucio
2
Bucaramanga
7
Arauca
2
Madellin
7
Puerto
Carreño
6
Bogota
2,6,10
Cali
3
COLOMBIA
2
Pasto
2,6
3, 5, 9, 7
Puerto
Leguizamo
10
5,7,9
EQUADOR
3,5,9
BRAZIL
6
Tarapaca
1,4,8
PERU
Larato
2
SCALE 1: 8,000,000
50 0 100 200 300 400 500 550

MAP No. 2


MAP OF COLOMBIA
32 ASSIGNMENTS
NETH. ANT.
Willemstad
2-6-10
2-6-10
Santa Marta
8
Barranquilla
Coro
9
9
Cartagena
Trujillo
5
Panama
2
Chiman
5
Mérida
1-
Barinas
8
Garachine
1
Paya
4
San Cristobal
4
VENEZUELA
Jaque
7
Riosucio
10
Bucaramanga
3-7
Arauca
2-6-10
Medellin
2-6
Puerto Carreño
3-7
Pto. Ayacucho
1-5-9
Bogota
1-5-9
Cali
3-7
COLOMBIA
San Jose
2-6-10
San Carlos
4-8
Pasto
6-10
Esmeraldas
1-5
Tulcan
2
Icana
1-5-9
Puerto Leguizamo
1-5
Quito
4-8
BRAZIL
ECUADOR
Tarqui
3-7
Macas
9
Tarapaca
3-7
Fonte Boa
PERU
Pebas
2-6
Iquitos
4-8
Lareto
1-5-9
Scale 1:8.000.000
50
0
100
200
300
400
500

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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COMMITTEES 4 and 5

Argentine Republic

PROPOSALS FOR THE WORK OF THE CONFERENCE

(Agenda items 2.1.6 and 2.1.7)

RESULTS OF THE THEORETICAL APPLICATION OF ASSIGNMENT PLANNING IN THE GEOGRAPHICAL AREA WHERE CHANNEL ASSIGNMENT PRESENTS THE GREATEST DIFFICULTIES

The Argentine Administration submits herewith some basic findings obtained by applying the assignment planning method in Central America, which it believes to be the most difficult area to plan irrespective of the method adopted.

1. Technical parameters:

Uniform parameters were adopted for the 10 channels in the band 1 605 - 1 705 kHz, in accordance with documents submitted to the recent meeting of CITEL's "Broadcasting" PTC II at Fortaleza (Brazil). They are as follows:

Power: 1 kW for both daytime and night-time operation

Antenna type: omnidirectional, quarter-wave

Conductivity: 10 mS/m

Nominal usable field strength:

daytime: 0.5 mV/m; 50 km

night-time: 2.5 mV/m; 20 km

Protection ratios:

co-channel: 26 dB

first adjacent channel: 0 dB

second adjacent channel: -29.5 dB

Interfering contour (daytime): 25 μV/m

Interfering contour (night-time): 125 μV/m sky wave 50% of the time

Minimum night-time distance of separation, co-channel: 550 km

2. Results

The results produced by the study are summed up in Figure 1. It may be seen that, using the 10 channels concerned, 46 assignments can be made in the geographical area comprising the small Central American countries. Since an attempt was made to strike a certain degree of balance in distributing the assignments, the number 46 is not a maximum; nevertheless, the existence and impact of a certain number of constraints should be borne in mind, as follows:

a) current occupation of the last three channels in the band 535-1605 kHz, as contemplated in the Rio de Janeiro Regional Plan of 1981;

b) the actual location of the urban settlements requiring assignments;

c) the sharing arrangements for these new channels in Colombia and Mexico;

d) the problems of sharing with countries in the Caribbean area, where sea-water conductivity values often have to be used, thus doubling co-channel distances and multiplying adjacent-channel separation by as much as 4.5.

It should also be noted that the study serves merely to illustrate the quantitative effects of assignment planning and makes no suggestions as to actual sites or positions in the area, since the plan will obviously depend on requirements and on the coordination of assignments between the countries concerned.

3. Conclusions

The following conclusions may be drawn from the results obtained.

a) In areas comprising small or medium-sized countries and involving a large number of frontiers, it is essential for the requirements submitted to the Conference to be based on low power values so that the best possible use can be made of the small number of available channels and a more equitable distribution of assignments achieved.

b) If power values considerably below 1 kW were used, particularly for night-time operation, it is clear that the number of possible assignments would be greater than suggested by the findings of this study.

4. Proposals

ARG/24/2

For the above reasons, the Argentine Administration proposes:

1) that planning should be based on low-power station assignments;

2) that the maximum values set should be:

for night-time service: 1 kW

for daytime service: 1 kW in noise zone 1

5 kW in noise zone 2.

Reason

To make more efficient and economical use of the spectrum, in accordance with the letter and the spirit of the Convention and the Radio Regulations.

FIGURE 1

Central America and the Caribbean

figures represent the 10 channels
ilable in the band 1 605 - 1 705 kHz.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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14 April 1986
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STRUCTURE OF THE

FIRST SESSION OF THE REGIONAL ADMINISTRATIVE RADIO CONFERENCE TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1 605 - 1 705 kHz IN REGION 2 - BC-R2(1) (Geneva, 1986)

(as approved at the First Plenary Meeting)

The agenda of the Conference appears in Resolution No. 913 which was adopted by the Administrative Council at its 39th Session (Geneva, 1984).

Bearing in mind Nos. 464 to 479 inclusive of the International Telecommunication Convention, Nairobi, 1982, the following committees with their terms of reference are suggested. These terms of reference have been drawn up within the framework of the Convention, the Conference Agenda and in the light of experience at previous conferences.

Committee 1 - Steering Committee

Terms of Reference :

To coordinate all matters connected with the smooth execution of work and to plan the order and number of meetings, avoiding overlapping wherever possible in view of the limited number of members of some delegations (Nos. 468 and 469 of the International Telecommunication Convention, Nairobi, 1982).

Committee 2 - Credentials Committee

Terms of Reference :

To verify the credentials of delegations and to report on its conclusions to the Plenary Meeting within the time specified by the latter (Nos. 390 and 471 of the International Telecommunication Convention, Nairobi, 1982).

Committee 3 - Budget Control Committee

Terms of Reference :

To determine the organization and the facilities available to the delegates, to examine and approve the accounts of expenditure incurred throughout the duration of the First Session of the Conference and to report to the Plenary Meeting the estimated total expenditure of the First Session as well as the estimated costs entailed by the execution of the decisions of the First Session of the Conference (Nos. 476 to 479 inclusive of the International Telecommunication Convention, Nairobi, 1982 and Nairobi Resolution 48).

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Committee 4 - Technical Criteria Committee

Terms of Reference :

To establish the technical criteria for the basis of the preparation by the Second Session of the Conference of a plan for the broadcasting service in Region 2 in the band 1 605 - 1 705 kHz, taking into account the following non-exhaustive list of items :

- definitions (agenda item 2.1.1);
- propagation data (agenda item 2.1.2);
- modulation standards (agenda item 2.1.3);
- the effect of receiver characteristics upon AM broadcast standards (agenda item 2.1.4);
- protection ratios, required values for the usable field strength and for the nominal usable field strength (agenda item 2.1.5);
- transmitting antenna characteristics and transmitter powers (agenda item 2.1.6), and

taking into account the report of the concerned CCIR Study Groups, prepared in response to Recommendation 504 of the WARC-79.

To establish the technical criteria, as appropriate, for the sharing of the band 1 625 - 1 705 kHz between the broadcasting service and other services in Region 2, taking into account Nos. 419 and 481 of the Radio Regulations (agenda item 2.2).

Committee 5 - Planning Criteria Committee

Terms of Reference :

To establish the planning methods and guidelines for the preparation by the Second Session of the Conference of the Agreement and associated Plan for the broadcasting service in Region 2 in the band 1 605 - 1 705 kHz (agenda item 2.1.7).

If necessary, to establish and identify specific guidelines for preparatory work, including computer software development, to be carried out before the Second Session of the Conference, and to set dates for the completion of this work (agenda item 2.3).

To specify the manner in which broadcasting requirements for inclusion in the Plan should be submitted to the IFRB and to fix the date by which they should be submitted (agenda item 2.4).

Committee 6 - Editorial Committee

Terms of Reference :

To perfect the form of the texts prepared in the various committees of the First Session of the Conference, without altering the sense, for submission to the Plenary Meeting (Nos. 473 and 474 of the International Télecommunication Convention, Nairobi, 1982).

Working Group of the Plenary

Terms of Reference :

To establish a draft agenda for the Second Session of the Conference, relating to the establishment of an agreement and associated plan, to be submitted to the Administrative Council (agenda item 2.5).

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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14 April 1986
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CONFERENCE CHAIRMANSHIPS
(as established by the First Plenary Meeting)

Chairman of the Conference	: Mr. F. Savio C. PINHEIRO (Brasil)
Vice-Chairmen of the Conference	: Mr. J. GUERRA (Argentina) Mr. C.M. MARTINEZ ALBUERNE (Cuba) Mr. J.C. McKINNEY (United States)
Committee 1 (Steering)	: (composed of the Chairman and Vice-Chairmen of the Conference and of the Chairmen and Vice-Chairmen of the other Committees, and of the Working Group of the Plenary)
Committee 2 (Credentials)	: Chairman : Mr. S.E. MONTANARO CANZANO (Paraguay) : Vice-Chairman : Mr. S.H.F. GOODMAN (Guyana)
Committee 3 (Budget Control)	: Chairman : Mr. E.D. DuCHARME (Canada) : Vice-Chairman : Mr. C.R. DENNY (Barbados)
Committee 4 (Technical Criteria)	: Chairman : Mr. M.L. PIZARRO ARAGONES (Chile) : Vice-Chairman : Mr. J. GAMBOA SÁUREZ (Costa Rica)
Committee 5 (Planning Criteria)	: Chairman : Mr. M. FERNANDEZ-QUIROZ (Mexico) Vice-Chairman : Mr. J. LUSSIO (Ecuador)
Committee 6 (Editorial)	: Chairman : Mr. P. PERRICHON (France) Vice-Chairmen : Mr. G.C. STEMP (United Kingdom) Mr. F. CASTRO ROJAS (Colombia)
Working Group of the Plenary	: Chairman : Mr. E.D. DuCHARME (Canada)

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 27-E
14 April 1986
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Spanish

Note by the Secretary-General

SECRETARIAT OF THE CONFERENCE

Secretary of the Conference	Mr. R.E. BUTLER, Secretary-General
Executive Secretary	Mr. R. Macheret
Technical Secretary	Mr. M. Harbi
Administrative Secretary	Mr. J. Escudero
Plenary Meeting and Committee 1 (Steering)	Mr. D. Schuster
Committee 2 (Credentials)	Mr. R. Macheret
Committee 3 (Budget Control Committee)	Mr. R. Prêlaz
Committee 4 (Technical Criteria)	Mr. J. Fonteyne
Committee 5 (Planning Criteria)	Mr. M. Giroux
Working Group of the Plenary	Mr. Ph. Cross
Committee 6 (Editorial)	Mr. P.-A. Traub

These officials will be assisted as necessary by others seconded from ITU Headquarters.

R.E. BUTLER
Secretary-General

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 28-E
14 April 1986

Information paper

GENERAL SCHEDULE OF THE WORK OF THE CONFERENCE
(following consideration in the Steering Committee)

1st week (14 - 18 April)

Organization and commencement of work[1)]

2nd week (21 - 25 April)

Continuation of the work in Working Groups and Committees[1)]

Wednesday 23	- End of the work of Working Groups of Committee 4
Thursday 24	- End of the work of Working Groups of Committee 5
Friday 25	- End of the work of Committee 4

3rd week (28 April - 2 May)

Monday 28	- End of the work of Committee 5
Tuesday	- End of the work of Working Group of the PL - Report of Credentials Committee
Wednesday 30	- End of the first reading of the texts of the Report by PL
Thursday 1	- End of the second reading of the texts of the Report by PL - Report of Budget Control
Friday 2	- Approval of the Report and closing

1) Plenary meetings if necessary.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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15 April 1986
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COMMITTEE 4

Argentine Republic

PROPOSALS FOR THE WORK OF THE CONFERENCE

TECHNICAL CRITERIA FOR THE SHARING OF THE BAND 1 605 - 1 705 kHz
BETWEEN THE BROADCASTING SERVICE AND OTHER SERVICES
(Agenda item 2.2)

1. Introduction

This proposal has been drawn up having regard to the documents submitted to the meetings of CITEL's "Broadcasting" PTC II and the ITU Seminar, as well as CCIR Recommendations and Reports.

2. Analysis

2.1 Under RR 481, the band 1 605 - 1 705 kHz is to be allocated to the fixed, mobile and aeronautical radionavigation services on a primary basis and to the radiolocation service on a secondary basis, until the date decided by the Conference.

In the Frequency Allocation Table, the band 1 605 - 1 625 kHz is allocated exclusively to the broadcasting service.

The band 1 625 - 1 705 kHz is allocated to the broadcasting service on a primary basis, shared with the fixed and mobile services on a permitted basis and shared with the radioloction service on a secondary basis.

2.2 Values for the protection ratio between the broadcasting service and other services referred to in the documents considered (CCIR Technical Bases (BC-R2(1)); PTC II-90/86; Recommendation 560-1; I 302-1 and I 794-1) contain different criteria, giving maximum co-channel values which vary between 26 and 47 dB.

2.3 The protected contours for the broadcasting, telegraph and telephone services vary between 22.5 and 80 dB (Documents CCIR (BC-R1(1)); PTC II-90/86 and PTC II-110).

2.4 The power considered in the planning examples and outlines presented by most of the administrations attending the "Broadcasting" PTC II meeting (Fortaleza, Brazil) is standardized around 1 kW. This standard power, when combined in planning studies with maximum protection ratio values (2.2) and protected contours (2.3), results in long distances between broadcasting transmitters in relation to other services, and vice versa.

2.5 Information supplied by countries currently using the fixed, mobile, aeronautical radionavigation and radiolocation services in the band 1 605 - 1 705 kHz indicates that many such services are in operation and that, due to saturation, some administrations have difficulty in transferring them to other bands.

3. Proposal

ARG/29/3 The Argentine Republic proposes the following.

a) Since the band 1 605 - 1 625 kHz is allocated exclusively to broadcasting (see 2.1), an implementation date should be set by the second session of the Conference.

Reason:

It would thus be possible to begin implementing the extended broadcasting band without displacing many existing services, while allowing the use of receivers in the band 535 - 1 605 kHz (in some cases subject to a slight adjustment), mainly in economically underdeveloped areas.

b) Having regard to the last paragraph of 2.4, it should be regarded as undesirable to set a date for sharing the band 1 625 - 1 705 kHz; an application procedure should be worked out which would allow other services to relocate or withdraw as broadcasting stations are implemented.

Reason:

The aim is to arrange for the stations of existing services to be withdrawn as the need arises, so that an excessive economic burden is not placed on the developing countries in particular.

c) In the light of RR 2700 and the points made in 2.2 and 2.3 above, having regard to existing discrepancies between protection ratios, field strengths and required operating procedures, and in order to avoid difficulties and effect frequency sharing to the satisfaction of all the parties concerned, it should be decided to conduct new studies for Region 2 covering the multifarious factors involved.

Reason:

The purpose would be to supplement the work of CCIR Interim Working Parties and Study Groups (Table 9-I (Appendix)) by establishing a "RADIF" Working Group which would conduct its business between the first and second sessions of the Conference.

INTERNATIONAL TELECOMMUNICATION UNION
BC-R2(1)
RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2
FIRST SESSION GENEVA, APRIL/MAY 1986

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15 avril 1986
Original : anglais
français
espagnol

ATTRIBUTION DES DOCUMENTS / ALLOCATION OF DOCUMENTS
ATRIBUCION DE LOS DOCUMENTOS

(comme approuvée à la première séance plénière /
as approved at the first Plenary Meeting /
como aprobada en la primera Sesión Plenaria)

Séance plénière Plenary Meeting Sesión Plenaria	:	1, 9, 10
C2 - Pouvoirs Credentials Credenciales	:	2
C3 - Budgétaire Budget Presupuesto	:	5, 6, 12, 18
C4 - Technique Technical Técnica	:	3 + Add.1, 4, 7, 8, 11, 14, 16, 21, 22, 24
C5 - Planification Planning Planificación	:	7, 8, 11, 13, 16, 20, 23, 24
GT de la Plénière WG of the Plenary GT de la Plenaria	:	7, 11

R.E. BUTLER
Secrétaire général

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

BC-R2(1) CARR CHARGÉE D'ÉTABLIR UN PLAN POUR LE SERVICE DE RADIODIFFUSION DANS LA BANDE 1605-1705 kHz DANS LA RÉGION 2

PREMIÈRE SESSION GENÈVE, AVRIL/MAI 1986

Corrigendum 1 al
Documento 31-S/F/E
23 de abril de 1986

SESION PLENARIA

ACTA DE LA

PRIMERA SESION PLENARIA

Pägina 5, sustitúyase el punto 13.5 por el siguiente:

"13.5 El Presidente dice que, como ya ha expresado al ocupar la Presidencia, la Conferencia debe tratar de aprovechar la experiencia adquirida en conferencias anteriores, sacando partido de sus aspectos positivos y evitando los errores que hayan podido cometerse. Tiene la impresión de que el delegado de Cuba iba referirse a la planificación; le invita a que se exprese en términos generales, atendiendo a la experiencia y a los aspectos positivos de las conferencias anteriores, sin entrar en detalles que puedan dar lugar a cuestiones de procedimiento; no serían muy propicio comenzar así en la primera sesión plenaria. Ruega a los participantes que tengan en cuenta estas observaciones."

(Ce corrigendum ne concerne pas le texte français)

(This corrigendum does not concern the English text)

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 31-E
21 April 1986
Original: English

PLENARY MEETING

MINUTES

OF THE

FIRST PLENARY MEETING

Monday, 14 April 1986, at 1445 hrs

Chairmen: Mr. M. FERNÁNDEZ-QUIROZ (Mexico)
Dean of the Conference

then: Mr. F. Savio C. PINHEIRO (Brazil)

Subjects discussed:		Documents
1.	Opening of the Conference	
2.	Election of the Chairman of the Conference	
3.	Election of the Vice-Chairmen of the Conference	
4.	Address by the Secretary-General	
5.	Conference structure	DT/1
6.	Election of Chairmen and Vice-Chairmen of Committees	
7.	Composition of the Conference Secretariat	
8.	Allocation of documents to Committees	DT/3(Rev.1)
9.	Participation requests submitted by international organizations	9
10.	Date by which the Credentials Committee must submit its conclusions	
11.	Working hours of the meetings of the Conference	
12.	Financial responsibilities of administrative conferences	12
13.	Considerations relating to planning of medium freqeuncy broadcasting	

1. Opening of the Conference

The Dean of the Conference (Mr. M. Fernández-Quiroz (Mexico)) declared open the Regional Administrative Planning Conference for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2.

2. Election of the Chairman of the Conference

2.1 The Dean of the Conference said that the meeting of Heads of Delegation had put forward the name of Mr. F. Savio C. Pinheiro (Brazil) for the office of Chairman.

2.2 The proposal having been endorsed, Mr. F. Savio C. Pinheiro took the chair.

Mr. F. Savio C. Pinheiro said that the election was an honour for his Delegation and himself personally. If the Conference was to complete its task in the short time available, the participants must exercise the utmost goodwill and seek to benefit from and improve on the experience of previous conferences.

3. Election of the Vice-Chairmen of the Conference

The Secretary-General said that further to preliminary consultations carried out before the Conference, the meeting of Heads of Delegation had unanimously forwarded the names of three Vice-Chairmen, namely Mr. J. Guerra (Argentina), Mr. C.M. Martinez Albuerne (Cuba) and Mr. J.C. McKinney (United States of America).

The Conference endorsed those nominations.

4. Address by the Secretary-General

The Secretary-General delivered the address reproduced in Annex 1.

5. Conference structure (Document DT/1).

The Secretary-General said that the structure outlined in Document DT/1 took account of informal contacts and embodied suggestions made by administrations.

The draft structure of the Conference was approved.

6. Election of Chairmen and Vice-Chairmen of Committees

The Secretary-General said that, at the meeting of Heads of Delegations, the following recommendations had been made for the posts of Committee Chairmen and Vice-Chairmen.

Committee 1 (Steering Committee)	Comprising the Chairman and Vice-Chairmen of the Conference, and the Chairmen and Vice-Chairmen of all the Committees and of the Working Group of the Plenary	
	Chairmen	Vice-Chairmen
Committee 2 (Credentials)	Mr. S.E. Montanaro Canzano (Paraguay)	Mr. S.H.F. Goodman (Guyana)
Committee 3 (Budget Control)	Mr. E.D. DuCharme (Canada)	Mr. C.R. Denny (Barbados)
Committee 4 (Technical Criteria)	Mr. M.L. Pizarro Aragones (Chile)	Mr. J. Gamboa Suárez (Costa Rica)
Committee 5 (Planning Criteria)	Mr. M. Fernández-Quiroz (Mexico)	Mr. J. Lussio (Ecuador)
Committee 6 (Editorial)	Mr. P. Perrichon (France)	Mr. G.C. Stemp (United Kingdom) Mr. F. Castro Rojas (Colombia)
Working Group of the Plenary	Mr. E.D. DuCharme (Canada)	

The Conference endorsed the above recommendations.

7. Composition of the Conference Secretariat

The Conference took note of the Conference Secretariat:

Secretary of the Conference: Mr. R.E. Butler, Secretary-General

Executive Secretary: Mr. R. Macheret

Technical Secretary: Mr. M. Harbi

Administrative Secretary: Mr. J. Escudero

Meeting Secretaries:

Plenaries and Committee 1	Mr. D. Schuster
Committee 2	Mr. R. Macheret
Committee 3	Mr. R. Prelaz
Committee 4	Mr. J. Fonteyne
Committee 5	Mr. M. Giroux
Committee 6	Mr. P.A. Traub

Working Group of the Plenary: Mr. P. Cross

The officials will be assisted as necessary by others seconded from ITU Headquarters.

8. Allocation of documents to Committees (Document DT/3(Rev.1))

Document DT/3(Rev.1), showing the allocation of documents to the various Committees, was approved.

9. Participation requests submitted by international organizations (Document 9)

It was decided to admit the International Amateur Radio Union (IARU) with the status of observer.

10. Date by which the Credentials Committee must submit its conclusions

At the suggestion of the Secretary-General, it was agreed to set the date by which the Credentials Committee must submit its conclusions at 29 April 1986; after that date the Plenary would give guidance on any matters not clarified.

11. Working hours of the meetings of the Conference

It was agreed to adopt the following timetable:

0900-1200 hours and 1400-1700 hours.

12. Financial responsibilities of administrative conferences (Document 12)

The Secretary-General drew attention to the new provisions (mentioned in Document 12) of the International Telecommunication Convention. Although a regional conference was, of course, financed by the members of the region concerned, it was important to bear in mind both the immediate post-Conference financial implications and, more especially, the longer-term consequences which could affect the regular budget.

He suggested, therefore, that Document 12 should be studied by Committee 3, which might wish to give guidance to Committees 4 and 5.

It was so agreed.

13. Considerations relating to planning of MF broadcasting

13.1 The delegate of Cuba said that he shared the expressions of congratulation to the Chairman on his election and assured him of his Administration's full support in his task.

His Administration wished to express some considerations closely linked to the task of the Conference.

Cuba has taken part in the IFRB Seminar-workshop held during the previous week in order to identify mutual interference and establish agreements with fraternal Latin-American and Caribbean countries, but the progress hoped for had not been possible, despite considerable help from the IFRB, because of all the calculations which had to be made by the IFRB for the various administrations, including Cuba, in order to analyze the $E\mu$ values and the mutual interference levels. His Administration reiterated its desire for mutally satisfactory conclusions concerning interference in respect of the various countries in the region. No such conclusion had been possible however with the United States Administration. Cuba wished all the member countries of the region present, as well as the IFRB and the Secretariat, to be aware of the reasons for that situation, which it had also communicated to the Administration of the United States during the aforementioned workshop.

From the time when MF broadcasting had begun - well before the 1959 Revolution - Cuba and the United States had submitted incompatibilities in regard to that service.

13.2 The delegate of the United States, speaking on a point of order, said that, having carefully reviewed the agenda for the Conference and the issues before the meeting, he failed to find the relevance of the matters now being raised by the Cuban Delegation to the agenda. The purpose of the Conference was clearly stated; he quoted paragraph 2.1 of Administrative Council Resolution No. 913, as contained in Document 1, and requested the Chairman to inquire of the Cuban Delegation to which agenda item, if any, its present comments referred.

13.3 The Chairman said that the point raised seemed rather delicate. Before giving the floor again to the delegate of Cuba he invited all administrations present to exercise the utmost goodwill in order to solve the region's radiocommunication problems. Despite the problems prevailing between some administrations, he appealed to all, at the initial moment of the Conference, to exercise understanding in order to avoid fruitless debate.

13.4 The delegate of Cuba said that he was astonished at the point just raised by the delegate of the United States since his remarks were unquestionably linked to the purpose of the Conference. The latter's task related to planning which meant, in the first place, that the current situation in the MF broadcasting band must be taken into account. It was impossible to speak of planning a new segment as if the prevailing one did not exist.

If he were allowed to conclude, the delegate of the United States would appreciate that the question was closely linked to the task of the Conference in all its aspects. He requested the Chairman to apply No. 462 of the Convention which established that the topics for discussion, and full freedom to deliberate them, were to be guaranteed.

13.5 The Chairman said that, as he had said on assuming the Chair, the Conference should seek to take advantage of the experience gained at previous conferences, developing their positive aspects and avoiding the mistakes eventually made. His own impression was that the delegate of Cuba was about to speak in regard to planning; he invited him rather to speak in general terms with a view to developing the experience and positive aspects of previous conferences without entering into details which might give rise to questions of procedure; to begin thus would not be very auspicious at the first Plenary Meeting. He requested the participants to take those observations into account.

13.6 The delegate of Cuba said that it was important for all administrations present, in planning MF bands, to avoid the adoption of any policy under which those bands, so widely used throughout the continent, would be subject to aggression by any other country. The Radio Regulations established that the medium frequency bands were for national broadcasting service: therefore broadcasting from one country to another was illegal and implied an aggression against State sovereignty.

His Delegation would like to see such avoidance established as a general principle.

Cuba had already expressed to the Administration of the United States, with regard to the old bands that, according to that principle, it would not negotiate any form of interference. It took the same position with regard to the new band, since its service was being subjected to interference at the present time and it was not prepared to take it lying down.

In his Delegation's view, the first aim in planning for the band concerned was to avoid using it aggressively against other nations - a principle which all should bear in mind in the agreements.

The meeting rose at 1530 hours

The Secretary-General:

R.E. BUTLER

The Chairman:

F. Savio C. PINHEIRO

Annex: 1

ANNEX 1

FIRST SESSION OF THE REGIONAL ADMINISTRATIVE RADIO CONFERENCE TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605 - 1705 kHz IN REGION 2

Opening Address

Mr. Chairman,
Excellencies,
Ladies and Gentlemen,

It gives me particular pleasure in congratulating you, Mr. Chairman, on your appointment to guide the work of the First Session of this Region 2 Administrative Radio Conference to establish a Plan for the Broadcasting Service in the band 1605-1705 kHz. Those who have known you during the last ITU conference in 1985 will recognize very well your combination of modesty and youth which inspired you to accomplish the task you were given on that occasion. Your tact for open discussion and brilliant spirit for cooperation marked your appearance within the ITU activities. I am convinced that you are about to embark upon a very busy and, I believe, very successful three weeks' work.

Ladies and Gentlemen,

It is a great honour for me to welcome all of you to the Conference, in Geneva, on behalf of my colleagues and myself.

The Region 2 consists of over 30 countries, with geographical areas which vary from very large to very small, having a common border with only one or even ten other countries. Also population density vary from very sparse to highly concentrated. Based on these elements, the planning approaches should be examined in a spirit of mutual understanding and cooperation in the field of medium frequency broadcasting.

The World Administrative Radio Conference, 1979, in its Recommendation 504, gave a new dimension to medium frequency broadcasting service in Region 2 extending the upper frequency band limit from 1605 to 1705 kHz. This portion of 100 kHz partly allocated on exclusive basis and partly on shared basis, will permit accommodation of 10 new frequency channels in order to improve the utilization of the frequency band as well as to achieve a satisfactory broadcasting service in the countries concerned.

The Administrative Council has adopted the agenda for this session, in its Resolution 913, calling on the Conference to establish the technical criteria to be used for the planning of the 1605-1705 kHz band for broadcasting and to develop appropriate criteria for the shared use of band 1625-1705 kHz between the broadcasting services and other services in Region 2.

./..

It will not be the first time, Mr. Chairman, that the Conference will be faced with the difficult issue of sharing, but the ITU experience gained through the VHF-FM Regional Administrative Radio Conference in 1984 for Region 1 and some countries of Region 3 and MM-EMA Regional Administrative Conferences in 1985 for Region 1 showed that in spite of the complexity of the problem the international community in the ITU knows how to increase the efficiency of use of limited natural resources and to reach practical results.

The planning principles and criteria which this Session has to adopt should lead, as far as possible, to the accommodation of the Region 2 countries broadcasting requirements. However, the date from which this portion of the band for broadcasting would become available, as contained in Recommendation 504, indicate two additional aspects of the problem:

- necessary transfer of some of the existing services to another frequency band,

- availability of suitable broadcasting receivers for the band extended to 1705 kHz.

With this understanding, Mr. Chairman, we do recognize the work to be accomplished at this Session of the Conference as a significant point in establishing a Plan for the broadcasting service in the band 1605-1705 kHz in Region 2. It is also for this Session to take sufficient action which would encourage the industry to undertake work in regard to production of receivers.

The Conference has already the benefit of a substantial body of preparatory work completed by the CCIR Study Groups. The necessary studies were carried out by the Joint Working Party 10-3-8/1 as well as by the Interim Working Party 6/4 of Study Group 6. They were able to produce, well beforehand, a complete report which constitutes the documentation required as a basis for your discussions.

The IFRB, on its part, has also contributed by making all possible efforts to reduce incompatibilities resulting from the Rio de Janeiro Plan. Turning specifically to this Conference, in terms of frequency band allocated, IFRB will certainly have to perform important tasks during the intersessional period according to the decisions to be taken during your deliberations.

In this connection, I would like to assure you of the full support of all the staff of the Union, particularly those assigned to this Conference.

Mr. Chairman, Excellencies, Ladies and Gentlemen,

It remains for me to conclude by wishing you every success in your work and a pleasant stay in Geneva.

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

BC-R2(1) CARR CHARGÉE D'ÉTABLIR UN PLAN POUR LE SERVICE DE RADIODIFFUSION DANS LA BANDE 1605-1705 kHz DANS LA RÉGION 2

PREMIÈRE SESSION GENÈVE, AVRIL/MAI 1986

Corrigendum 1 to
Document 32-E/F/S
16 April 1986

COMMITTEE 4

NOTE FROM THE

CHAIRMAN OF COMMITTEE 4

Opposite Chairman of Working Group 4B, read

Mrs T.M. Beiler (Brazil), Box No. 32

(Ce corrigendum ne concerne pas le texte français.)

(Este corrigendum no concierne al texto español.)

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 32-E
15 April 1986
Original: French

COMMITTEE 4

NOTE FROM THE

CHAIRMAN OF COMMITTEE 4

On the basis of the terms of reference of Committee 4 adopted by the first Plenary Meeting (Document 25), two Working Groups were set up with the following terms of reference:

Working Group 4A - Chairman - Mr. J.C. Wang (United States), Box No. 28
Secretary - Mr. H. Koker, Box No. 349

Propagation data (item 2.1.2 of the agenda of the Conference: Document 1).

Documents 3, 4, 7, 8, 14, 16, 22.

Working Group 4B - Chairman - Mrs. T.M. Beiler (Belgium), Box No. 32
Secretary - Mr. J. Fonteyne, Box No. 348

- definitions (agenda item 2.1.1);
- modulation standards (agenda item 2.1.3);
- the effect of receiver characteristics upon AM broadcast standards (agenda item 2.1.4);
- protection ratios, required values for the usable field strength and for the nominal usable field strength (agenda item 2.1.5);
- transmitting antenna characteristics and transmitter powers (agenda item 2.1.6).

Documents 3, 4, 7, 8, 11, 14, 16, 21, 24.

The question of technical criteria for the sharing of the band 1 625 - 1 705 kHz between the broadcasting service and other services in Region 2, taking into account Nos. 419 and 481 of the Radio Regulations (agenda item 2.2) will be considered by Committee 4 at a later stage. A further Working Group 4C may be set up for the purpose.

M.L. PIZARRO
Chairman of Committee 4

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 33-E
15 April 1986
Original: English

Note by the Secretary-General

NOTE BY THE IFRB TO THE RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1 605 - 1 705 kHz IN REGION 2

At the request of the IFRB, I transmit, for the information of the Conference, the attached Note by the IFRB on the status of the primary and permitted services in connection with planning and notifications.

R.E. BUTLER

Secretary-General

Annex: 1

ANNEX

NOTE BY THE IFRB

on the status of the primary and permitted services in connection with planning and notifications

1. Introduction

1.1 In response to a request made by administrations of Region 2, the Board has prepared this document on the interpretation of the provisions of RR419, RR480 and RR481 in relation to the respective status of primary and permitted service.

1.2 On several occasions the Board's views were requested with respect to the interpretation to be given to the relationship between primary and permitted services when planning one of these services. Documents to this effect were prepared for the Region 1 VHF and the Region 1 Maritime Mobile Conferences. None of these conferences objected to the interpretation given by the Board to the respective status of the primary/permitted services.

2. Application of RR419
Considerations applicable to all services and bands

2.1 The part of the documents submitted to the previous conferences which refers to considerations applicable to all services and bands is reproduced below:

2.2 The definition of a permitted service is contained in No. 419 of the Radio Regulations.

"419 (3) Permitted and primary services have equal rights, except that, in the preparation of frequency plans, the primary service, as compared with the permitted service, shall have prior choice of frequencies."

RR419 basically states that "permitted and primary services have equal rights", with one exception, i.e., "in the preparation of frequency plans". However, the use of these words implies that prior to and subsequent to such preparation the two categories of service have equal rights.

2.3 The preparation of a plan by a Conference is carried out during its session. Subsequent additions to, modifications to and deletions from the plan which generally take place after the entry into force of the Final Acts of the Conference, cannot be considered as part of the "preparation". After the Conference, therefore, the two categories of service will have equal rights.

2.4 It may be argued that because No. 419 refes to "frequency plans" the exception to "equal rights", giving prior choice of frequencies to the primary service, only applies if both primary and permitted services are being planned. This argument can be dismissed since it would mean that when the primary service only is being planned, the exception, i.e., "prior choice of frequencies" does not apply. Clearly the term "frequency plans", while in the plural, applies also to the case where only the primary service is planned.

2.5 <u>Conditions Applicable to the bands where the Primary Service is to be Planned and the Permited Service is not Planned</u>

2.5.1 <u>Prior to the Conference</u>, all primary and permitted services have equal rights.

2.5.2 <u>During the conference</u>, (i.e., period of preparation of plans) the primary service has "prior choice of frequencies". This Conference when assigning frequencies to stations of one service should decide on the manner of how to satisfy and protect the requirements of the other service.

2.5.3 <u>After the conference</u>, all primary and permitted services have equal rights

3. <u>Situation prevailing in Region 2 in the Band to be planned</u>

In Region 2 the 1605-1705 kHz band is allocated as follows:

1605-1800 kHz
Allocation to Services

Region 2

1605-1625 BROADCASTING 480 481
1625-1705 BROADCASTING 480 /FIXED / /MOBILE / Radiolocation 481

480 In Region 2, the use of the band 1605-1705 kHz by stations of the broadcasting service shall be subject to a plan to be established by a regional administrative radio conference (see Recommendation 504).

481 In Region 2, until the dates decided by the regional administrative radio conference referred to in No. 480, the band 1605-1705 kHz is allocated to the fixed, mobile and aeronautical radionavigation services on a primary basis and to the radiolocation service on a secondary basis (see Recommendation 504).

4. Application of RR480

The situation of this Conference is unique in a sense that it is a regional conference in which decisions are applicable to the contracting members only and at the same time if it is a conference that has to take decisions in accordance with RR480 which are applicable to all countries of Region 2 (contracting or non contracting members); moreover, the decisions relating to the dates in RR481 may have some impact on the other Regions which will have to protect the Broadcasting Service as from dates on which they have no control. The Board had to consider in which way it will implement RR480. In this respect, the following conclusions were reached.

4.1 Irrespective of their situation with respect to the agreement established by this Conference, no country in Region 2 can use the band for broadcasting, except if it has allotments/assignments in the Plan.

4.2 Countries not present in the Conference shall be consulted on their intention on the use of the band for the Broadcasting Service.

4.3 Any country which has not communicated its requirements will be considered as not intending to use the band for broadcasting.

5. Application of RR481

5.1 The application of RR481 leads to the consideration of the following:

a) RR481 refers to dates to be decided by a regional administrative conference which would mean that the conference may adopt one date for all the band or more than one date for several sub bands;

b) RR481 refers to Recommendation 504 which states that the use of these bands by the Broadcasting Service shall not commence before certain specified dates; it is to be noted that as this Recommendation is cited in a provision of the Radio Regulations it has the same status as a provision of the Radio Regulations. This would mean that the Conference has to adopt dates consistent with dates and sub bands mentioned in the Recommendation;

c) in similar situations the footnotes refer to the "entry into force of the Final Acts" which would mean that any decision relating to a date becomes valid only after the entry into force of the Final Acts of the Conference; it is to be noted that the decision relating to the dates may affect the non contracting members as well as the two Region which will have to protect the BC afte these dates;

d) the agenda of the first session does not contain an item referring to the decisions on these dates; this would mean that this matter is left intentionally to the second session.

5.2 In the Board's view the 1979 Conference wanted to fix up definitively in the framed part of the Table the future and final situation of the allocation of the band 1605-1705 kHz. The 1979 Conference left to this conference to decide only on the dates at which this final situation becomes applicable; consequently RR481 is not titled as a different category of service. For these reasons the Board is of the view that:

a) the dates should be decided by the second session; it is to be noted that Recommendation 504 contains one date which is prior to the planned date for the second session;

b) the conference is supposed to adopt an agreement having provisions which are applicable to the contracting members. Therefore, the Board is obliged to protect the fixed and mobile services of non participating countries on the basis of equal rights with the Broadcasting Service;

c) as the plan is a set of bilateral agreements between participating countries, the Conference may, as indicated in 2.5.2, either decide on the appropriate protection to be applied by all the participating administrations or leave this matter to administrations to decide on bilaterally.

6. Considerations applicable to Region 2 where only one primary service is to be planned and the other primary services become permitted at some date after the RARC

6.1 Prior to the Second Session of the Conference the band 1625-1705 kHz is allocated to only the fixed, mobile and aeronautical radionavigation service on a primary basis.

6.2 During the Second Session of the Conference, under RR481 the band is not yet available for use by the Broadcasting Service and the Fixed, Aeronautical Radionavigation, and Mobile Services are still primary, therefore, the comments contained in 5.2 b) and c) above apply. (N.B. The required extracts from the MIFR can be made available to the Conference.)

6.3 After the Second Session of the Conference:

6.3.1 Period between the second session and the dates at which the allocation is modified.

During this period:

a) the band is allocated on a primary basis to only the fixed, mobile and aeronautical radionavigation services;

b) no broadcasting stations can be brought into service in accordance with Recommendation 504;

c) there is a plan which may require protection from assignments of the fixed, mobile and aeronautical radionavigation service.

6.3.2 After the dates at which the allocation is modified

As the Conference concerns planning in a band allocated to primary and permitted services, the Board will have to develop rules of procedure to be applied after the entry into force of the Final Acts of this Conference when examining notices of frequency assignments in the services concerned, mainly when considering provisions of RR1245 of Article 12 of the Radio Regulations. These rules of procedure should take account of the manner in which the Conference will treat the assignments pertaining to non-planned services and recorded in the Master Register.

6.3.3 Relations between the Plan and the Other Services

This conference should adopt provisions applicable to the parties of the Agreement permitting the protection of assignments in the Plan which have not been brought into use. In the absence of such provisions, a frequency assignment of a permitted service, notified after the conference and capable of causing harmful interference to planned assignments not in use and therefore not in the MIFR will receive a favourable finding. Its recording in the MIFR will give it the right to international protection. Such situations may greatly reduce the efficiency of the Plan. A possible solution to this may consist in adopting provisions in the agreement that will request the Board to examine notices of the other services to which the band is allocated vis-a-vis all entries appearing in the Plan. The Board considers that the second session of the conference should be made competent to deal with this matter.

7. Relations with non-parties to the Agreement in the three Regions

7.1 Irrespective of their category of allocation (primary or permitted), assignments notified by countries non-party to the Agreement in Region 2, and assignments notified by administrations of Regions 1 and 3 will be examined by the Board only with respect to those assignments which are recorded in the Master Register and not with respect to those assignments appearing in the Plan which are not recorded in the Master Register. There exists no possibility for the Board to protect the Plan in such situations except if a world administrative radio conference, with this matter on its agenda, adopts provisions to this effect.

7.2 Similarly, assignments in the Plan, when notified, will be examined with respect to assignments of countries non-party to the Agreement in Region 1, 2 or 3 which are recorded in the MIFR. As they may run the risk of receiving an unfavourable finding, the Board recommends that the planning process take account of assignments already recorded; extracts will be made available to this effect.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document No. 34-E
15 April 1986
Original: English

Note by the Secretary-General

REPORT BY THE IFRB TO THE RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1 605 - 1 705 kHz IN REGION 2

At the request of the IFRB, I transmit herewith for the information of the Conference a Report by the IFRB on IFRB Technical Standards.

R.E. Butler
Secretary-General

Annex: 1

REPORT BY THE

INTERNATIONAL FREQUENCY REGISTRATION BOARD

ON IFRB TECHNICAL STANDARDS

1. Introduction

The Board has carried out studies with a view to revising the IFRB Technical Standards on the basis of the latest available information and modified some of the Standards which are now being applied.

The Technical Standards applicable to the services other than Broadcasting in the band 1605-1705 kHz being considered by the Conference are briefly described below. Those parts of the Standards (TSA-1, TSA-2, TSA-3 and TSA-5) which may be useful to the Conference are reproduced in Annexes 1 to 4 to the present report. These Standards have been developed to cover all services in the band 1605-4000 kHz. At the present time, there is no technical examination with respect to broadcasting in the band 1605-1705 kHz: however, these Standards are now used for broadcasting in the bands

2300-2498 kHz (Region 1, 2300-2495 kHz (Regions 2 and 3),

3200-3410 kHz (all Regions) and 3900-4000 kHz.

2. Tables of Protection Ratios (TSA-1)

Technical Standard A-1 (TSA-1) contains signal-to-interference protection ratio values (PR) for the main types of transmission. These values of protection ratios had been determined from RF steady state protection ratio values by adding allowances for long-term intensity fluctuation and short period fading for a given time percentage corresponding to the performance quality criteria applicable to each type of transmission. For each transmission type two time percentages are used: one (e.g. 99% of the time) which is intended to fully satisfy the required performance quality criteria in the fading signal environment when the wanted signal is at its weakest level at the instant when the interference signal is likely to be at its strongest level so as to reach a favourable finding foreseen in RR1249 and RR1250, and another one (e.g. 75%) which ensures protection during a lesser percentage of time to meet the objectives stipulated in RR1251 (values in brackets in TSA-1 for "qualified favourable" findings). RF steady state S/I protection ratio values had been deduced from CCIR Recommendation 339 (AF signal-to-noise ratio). Values for the required time percentage corresponding to the performance quality criteria are based on CCIR Recommendation 339.

3. Tables of the minimum field strength to be protected (TSA-2)

TSA-2 contains values for the minimum field strength to be protected for the main types of tranmission. These values of the minimum field strength had been determined from the median values (50%) of the noise level (atmospheric, man-made or galactic) and the steady stage signal-to-noise ratio (S/N) by adding appropriate allowances for 90% of the time to take into account the noise level variation and the intensity fluctuation of the wanted signal. Values of the minimum field strength to be protected contained in TSA-2 have been derived from CCIR Report 322 and Recommendation 339.

The aim of calculating the minimum field strength to be protected is to determine the field strength at the receiving point below which the wanted signal is not worth being protected against interfering signals because the wanted signal-to-noise ratio is smaller than that which could satisfy the required performance quality criteria without interference. Values of the minimum field strength to be protected are calculated in two steps. First, the noise grade figures (see Annex 2) are determined, from Tables 1 to 4, for the location of the receiving point and for the season and time concerned. This noise grade figure is then used in order to obtain, from Table 5A or 5B, the minimum field in dB above 1 μV/m, for the type of transmission and frequency concerned.

4. Tables of Receiver Discrimination (TSA-3)

Values of TSA-3 for receiver discrimination are defined as a correction, in decibels, to be applied to the signal-to-interference ratio and expressed as a function of the frequency separation between the wanted and unwanted emissions (Δf).

The values of TSA-3 are determined on the basis of:

- the selectivity of typical receivers assumed to be used for different classes of emission, and
- the necessary bandwidth occupied by the interfering emissions, together with the energy distribution of the power within and outside the bandwidth.

The Board's studies were based on CCIR Recommendations 328 and 332.

5. Tables of field-strength values (TSA-5)

Technical Standard A-5 (TSA-5) contains values of field strength for ground-wave and sky-wave propagation mode in frequency bands between 9 kHz and 3 900 kHz. Field strength values are given in the form of tables as a function of the distance, in median values (exceeded 50% of the time) in decibels relative to 1 μV/m. The power reference to be used is a radiated power of 1 kW (30 dBW) from a loss-free halfwave dipole antenna isolated in space. Allowances had been made (by considering typical antennae: vertical antenna for the band 535 - 1 605 kHz, and an average of horizontal half-wave dipole, inverted L and vertical antenna for the bands 1 605 - 3 900 kHz) mainly to take into account the vertical radiation pattern for ionospheric propagation mode. (Horizontal directivity is to be taken into account separately for directive antennae, if necessary.)

Reference ground conductivity values are:

- propagation over sea : $\sigma = 4$ S/m, $\epsilon = 80$;
- propagation over land : $\sigma = 10^{-2}$ S/m, $\epsilon = 4$.

Values for TSA-5 had been deduced from the following sources:

- ground-wave propagation: CCIR Recommendation 368,

- sky-wave propagation: CCIR Report 264-1
  EBU, OIRT studies
  FCC, Rules of Practice and Procedures.

[For broadcasting in the band 525 - 1 606.5 kHz, separate technical standards have been prepared based mainly on the two Regional Agreements GE75 and RJ81.]

<u>Annexes</u>: 4

ANNEX 1

RF SIGNAL-TO-INTERFERENCE RATIOS

IFRB TECHNICAL STANDARD SERIES A-1

Values are expressed in terms of p.e.p. (For conversion factors see Annex 1A.)

<table>
<tr><th colspan="3">Transmission type</th><th>Frequency band (kHz)

1 606.5 - 4 000</th></tr>
<tr><td colspan="3">Telegraphy, aural reception</td><td>11 (5 - 10)</td></tr>
<tr><td colspan="3">Telegraphy, aural reception
Meteo, Press</td><td>13 (5 - 12)</td></tr>
<tr><td colspan="3">Telegraphy, automatic reception,
without error correction</td><td>17 (10 - 16)</td></tr>
<tr><td colspan="3">Telegraphy, automatic reception,
with error correction</td><td>12 (7 - 11)</td></tr>
<tr><td colspan="3">Phototelegraphy, facsimile</td><td>24 (16 - 23)</td></tr>
<tr><td rowspan="4">Telephony</td><td rowspan="2">not for connection to public network</td><td>DSB and
SSB full carrier (CO)</td><td>21 (17 - 20)</td></tr>
<tr><td>SSB, reduced or suppressed carrier, ISB (CO)</td><td>15 (11 - 14)</td></tr>
<tr><td rowspan="2">for connection to public network</td><td>DSB and
SSB full carrier (CP)</td><td>34 (28 - 33)</td></tr>
<tr><td>SSB, reduced or suppressed carrier, ISB (CP)</td><td>28 (22 - 27)</td></tr>
<tr><td colspan="3">Broadcasting</td><td>38 (32 - 37)</td></tr>
<tr><td colspan="3">Aeronautical mobile service in
the exclusive bands
(telegraphy or telephony)</td><td>15</td></tr>
<tr><td colspan="3">Radiobeacons</td><td>15</td></tr>
</table>

ANNEX 1A

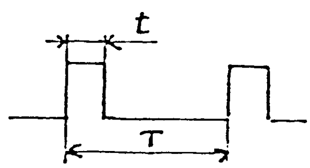
CONVERSION FACTORS FOR DIFFERENT NOTIFIED POWER TYPES

Class of emission	Notified power type	Conversion *) mean to p.e.p.	Conversion *) p.e.p. to mean
NON	Z	0	0
A1A	X	–	-3
A1B	X	–	-3
A1C	X	–	-3
A2A	Y	+4	–
A2B	Y	+4	–
A2N	Y	+4	–
H2A	Y	+3	–
H2B	Y	+3	–
H2N	Y	+3	–
D2A	Y	+3	–
R2B	X	–	-3
J2B	X	–	-3
A3E (BC)	Z	+6	0
A3E	Y	+4 (4-6)	–
H3E	Y	+4 (3-6)	–
R3E	X	–	-4 (4-10)
J3E	X	–	-4 (4-10)
A3C	Y	+4	–
R3C	X	–	0
J3C	X	–	0
A7B	Y	+4	–
H7B	Y	+4	–
R7C	X	–	-4 (3 -6)
J7C	X	–	-4 (3 -6)
B7B	X	–	-4
B8E	X	–	-4 (3-13)
B8C	X	–	0
AXX	Y	+6	–
BXX	X	–	-4 (3-10)
JXX	X	–	-4 (3-10)
B9W	X	–	-4
F,G/1,2, 3,7, X/ B,C,D,X	Y	0	–
P,L,M,X/- any	X	–	$10 \log \frac{t}{T}$ **)
K2B	X	–	$10 \log \frac{t}{T} - 5$
K3E	X	–	$10 \log \frac{t}{T} - 4$

Notes:

*) In the cases where, in brackets, more than one figure is given, these figures refer to different modulating signal conditions (e.g. smoothly read text instead of sinusoidal modulating signal at 100 % carrier modulation) (see CCIR Rec. 326-4).

**) In the case of pulse modulation:

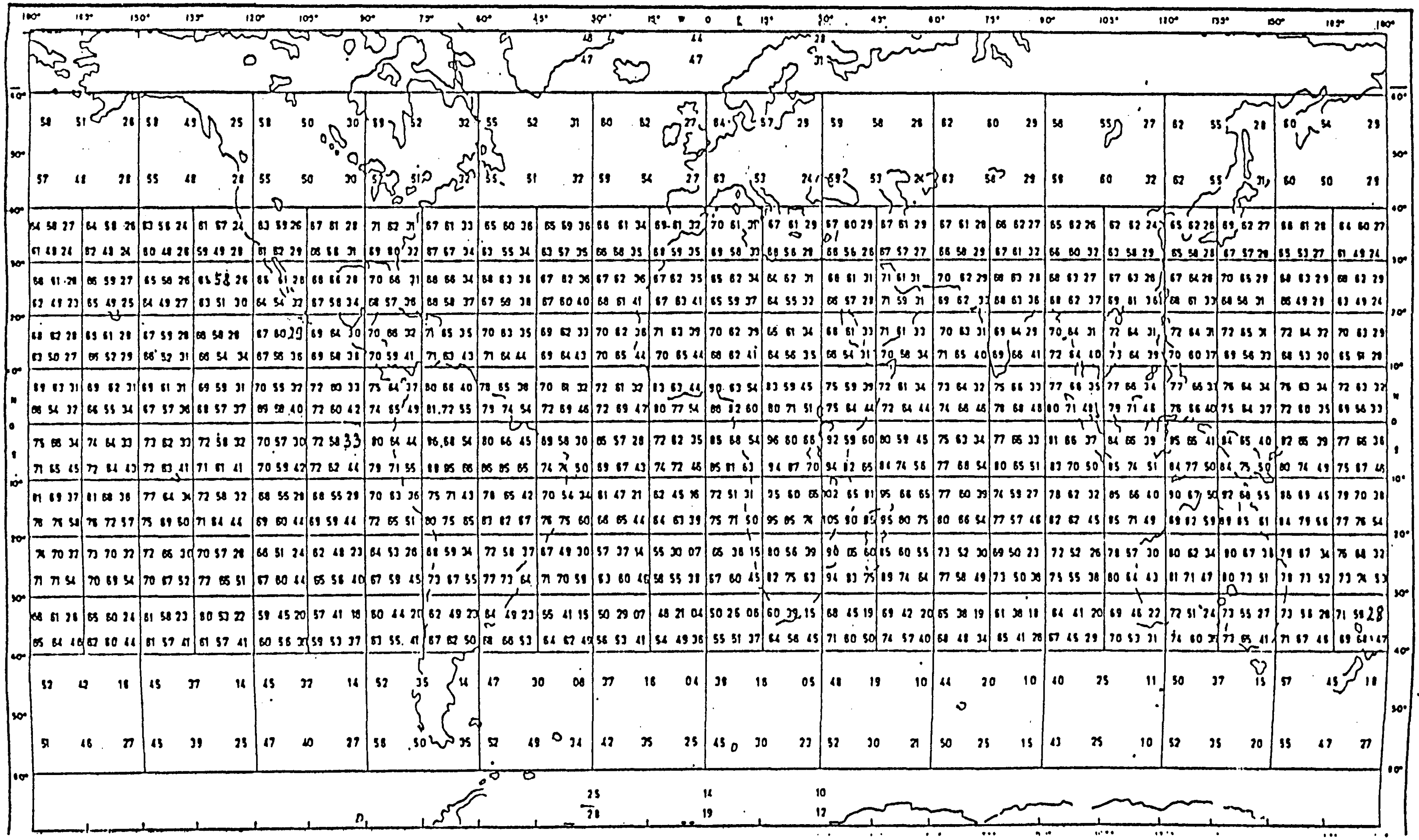


VALEUR DU DEGRE DE BRUIT EN FONCTION DE LA LATITUDE ET DE LA LONGITUDE DU LIEU DE RECEPTION
NOISE GRADE FIGURES ACCORDING TO LATITUDE AND LONGITUDE OF RECEIVING POINT
VALORES DEL GRADO DE RUIDO EN FUNCION DE LA LATITUD Y DE LA LONGITUD DEL LUGAR DE RECEPCION

période : DECEMBRE - JANVIER - FEVRIER
period : DECEMBER - JANUARY - FEBRUARY
periodo : DICIEMBRE - ENERO - FEBRERO
} DC

(1)

DC



ANNEX 2 (cont'd)

TSA-2(1984)

VALEUR DU DEGRE DE BRUIT EN FONCTION DE LA LATITUDE ET DE LA LONGITUDE DU LIEU DE RECEPTION

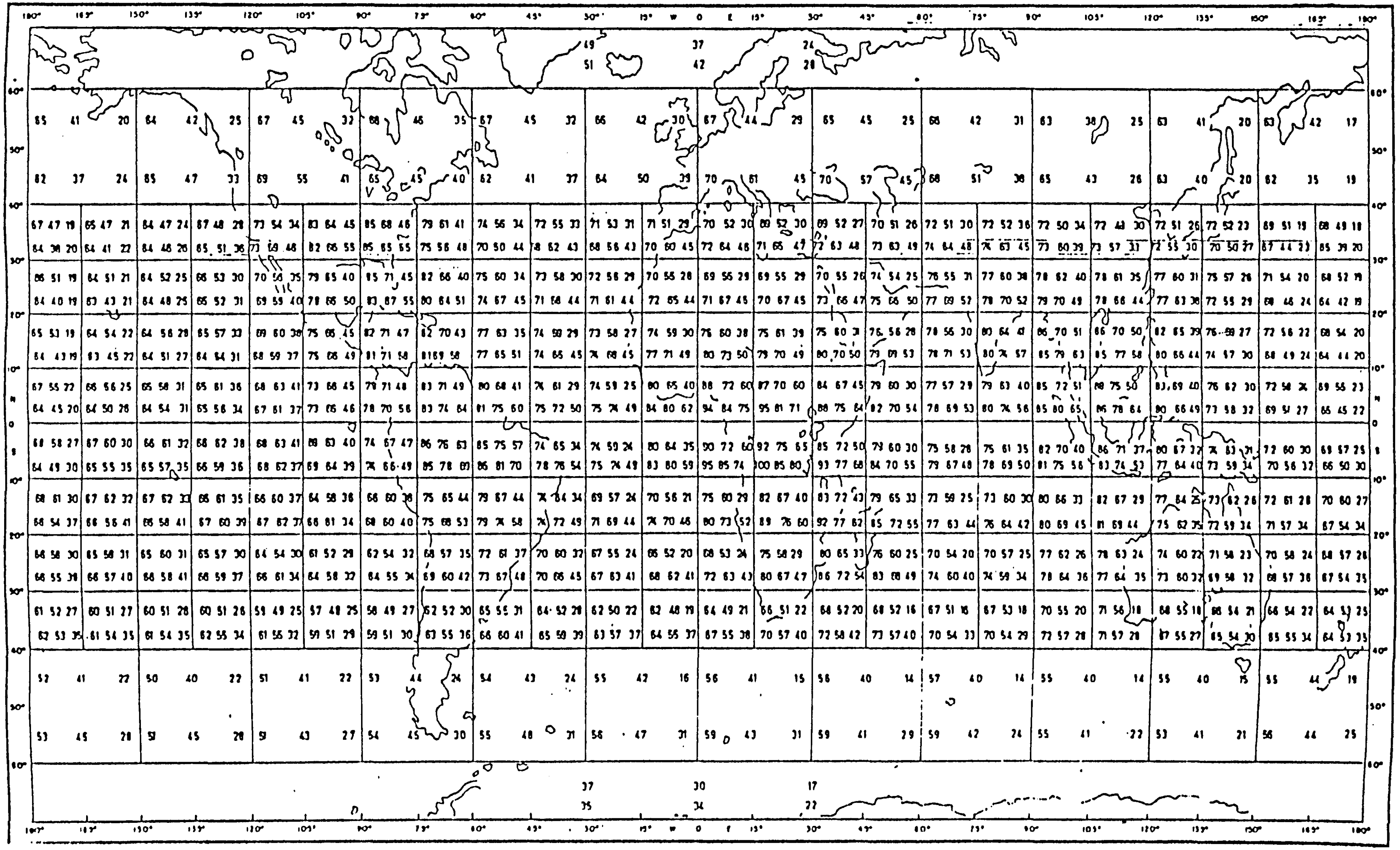
NOISE GRADE FIGURES ACCORDING TO LATITUDE AND LONGITUDE OF RECEIVING POINT

VALORES DEL GRADO DE RUIDO EN FUNCION DE LA LATITUD Y DE LA LONGITUD DEL LUGAR DE RECEPCION

période : MARS - AVRIL - MAI
period : MARCH - APRIL - MAY
periodo : MARZO - ABRIL - MAYO
} MR

(2)

MR



VALEUR DU DEGRE DE BRUIT EN FONCTION DE LA LATITUDE ET DE LA LONGITUDE DU LIEU DE RECEPTION

NOISE GRADE FIGURES ACCORDING TO LATITUDE AND LONGITUDE OF RECEIVING POINT

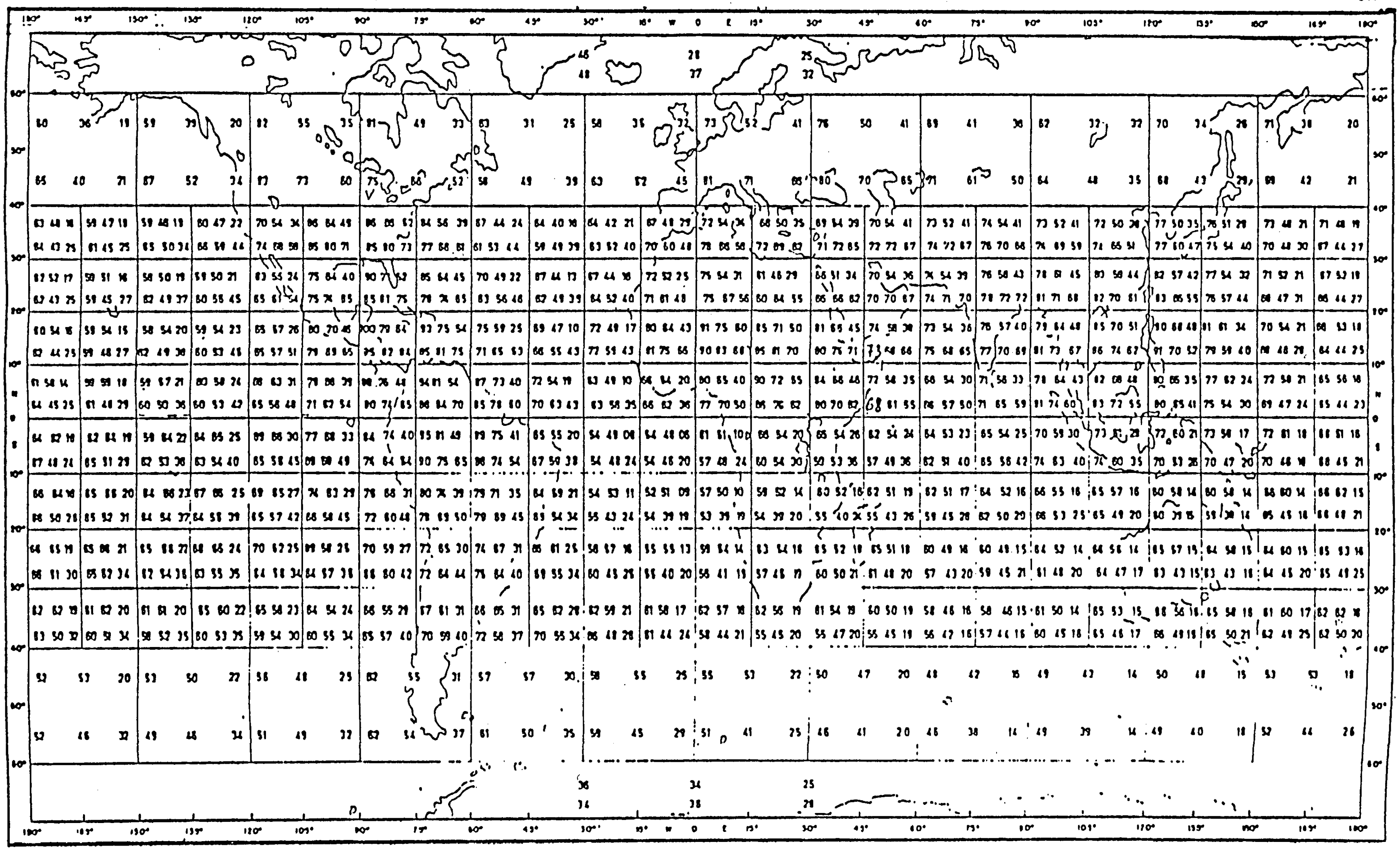
VALORES DEL GRADO DE RUIDO EN FUNCION DE LA LATITUD Y DE LA LONGITUD DEL LUGAR DE RECEPCION

TSA-2(1984)

période : JUIN - JUILLET - AOUT
period : JUNE - JULY - AUGUST
periodo : JUNIO - JULIO - AGOSTO
} JN

③

JN



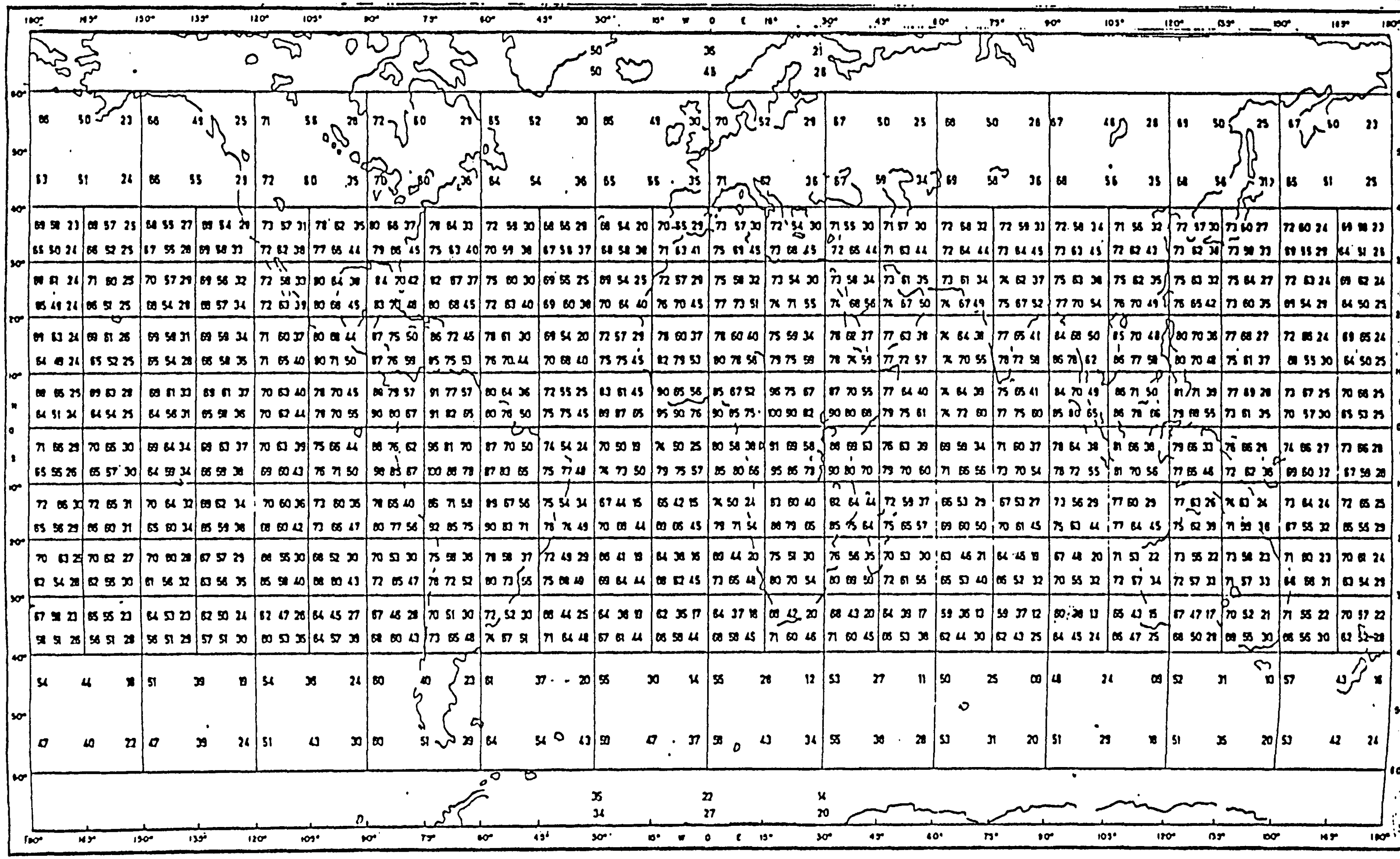
VALEUR DU DEGRE DE BRUIT EN FONCTION DE LA LATITUDE ET DE LA LONGITUDE DU LIEU DE RECEPTION TSA-2(1984)

NOISE GRADE FIGURES ACCORDING TO LATITUDE AND LONGITUDE OF RECEIVING POINT

VALORES DEL GRADO DE RUIDO EN FUNCION DE LA LATITUD Y DE LA LONGITUD DEL LUGAR DE RECEPCION

période : SEPTEMBRE - OCTOBRE - NOVEMBRE
period : SEPTEMBER - OCTOBER - NOVEMBER } SE
periodo : SEPTIEMBRE - OCTUBRE - NOVIEMBRE

(4)
SE



ANNEX 2 (cont'd)

Intensité minimum du champ à protéger (exprimée en dB par rapport à 1 uV/m)
Minimum field strength to be protected (expressed in dB relative to 1 uV/m)
Intensidad de campo mínima a proteger (expresada en dB con relación a 1 uV/m)

Type de transmission: Télégraphie, réception auditive
Type of transmission: Télégraphy, aural reception
Tipo de transmisión: Telegrafía, recepcion auditiva
(B > 0.5 kHz)

5A

DEGRE DE BRUIT NOISE GRADE GRADO DE RUIDO	KHZ 500			MHZ 1			MHZ 1,5			MHZ 2		
	N2 N1	T1 T2	J1 J2	N2 N1	T1 T2	J1 J2	N2 N1	T1 T2	J1 J2	N2 N1	T1 T2	J1 J2
100	57 56	59 63	67 68	52 51	54 55	52 54	47 47	50 49	41 43	44 42	47 45	34 36
90	48 47	50 53	57 57	42 41	44 45	42 44	38 37	40 40	32 33	35 34	38 36	26 28
80	38 37	40 43	46 46	32 31	34 35	32 34	28 28	31 30	23 25	27 26	29 28	18 20
70	28 26	30 32	35 36	22 21	24 25	22 24	19 19	22 22	14 26	18 18	20 20	10 12
60	18 18	21 22	25 26	12 11	14 15	12 14	10 9	12 12	6 7	10 9	12 11	2 4
50	7 7	11 12	15 16	4 4	4 5	4 4	3 3	3 3	3 3	2 2	3 3	2 2
40	7			4			3			2		
30	7			4			3			2		
20	7			4			3			2		
10	7			4			3			2		
0	7			4			3			2		

Constants to be added to obtain other types of emissions			
Narrow band TG (B < 0.5 kHz)			- 5
Telegraphy aut. (B > 0.5 kHz)			4
Phototelegraphy			16
Telephony	CO	J3E R3E B8E	14
		H3E	20
		A3E	23
	CP	J3E R3E B8E	25
		H3E	31
		A3E	34
Broadcast.	LF/MF		49
	BC Trop		46

ANNEX 3

3. TSA-1

Discrimination du récepteur (dB) - Receiver discrimination (dB)
Discriminacion del receptor (dB)

Emission brouilleuse - Interfering emission - Emision interferente

k	Telegraphy 100HA1A	500HA1A 500HA1B	1KOOA1B	A2A, A2B, A2N, H2A, H2B, H2N	Other telegraphy (TG)	Telephony SSB - CP ISB - CO - CP (with privacy device)	Telephony DSB - CP (with privacy device) SSB - CO (without privacy dev)	Telephony DSB - CO (without privacy dev.)
0	0	0	0	0	0	0	0	0
0,1	0	0	0	6	0	0	0	0
0,2	0	0	3	6	0	0	0	0
0,3	0	5	6	6	0	0	0	3
0,4	0	7	9	6	0	0	3	9
0,5	0	9	11	6	0	3	9	15
0,6	0	11	14	6	0	9	15	21
0,7	7	13	16	6	0	13	19	25
0,8	8	14	18	6	3	17	23	29
0,9	9	15	20	6	6	19	25	31
1	10	17	22	6	10	21	27	33
1,2	11	20	26	24	21	23	29	35
1,4	12	23	30	39	30	25	31	37
1,6	13	26	31,5	50	38	26	32	38
1,8	14	29	38	58	44	27	33	39
2	15	32	42	64	50	28	34	40
2,2	16	35	46		57	29	35	41
2,4	17	38	49		60	30	36	42
2,6	18	42	53		63	30,5	36,5	42,5
2,8	19	45	56		66	31	37	43
3	20	48	59		69	32	38	44
4	25	59	64		78	35	41	47
5	30	64				38	44	50
6	34	69				40	46	52
7	39					42	48	54
8	44					44	50	56
9	49					46	52	58
10	55					47	53	59
12	62					49	55	61
15	70							
$k = \frac{\Delta f - 0,5\ Bwa}{0,5\ Bwi}$					$k = \Delta f - (0,5\ Bwa + 0,5\ Bwi) + 1$			

k : Facteur de discrimination du récepteur - Receiver discrimination factor - Factor de discriminacion del receptor.
Bwi : Largeur de bande de l'émission brouilleuse - Bandwidth of interfering emission - Anchura de banda de la emision interferente.
Bwa : Bande passante du récepteur de l'émission désirée - Pass-band of receiver of wanted emission. Banda pasante del receptor de la emision deseada.
Δf : Décalage entre les fréquences assignées - Frequency separation between assigned frequencies - Separación entre las frecuencias asignadas.

ANNEX 4 — TSA-5 (Rev.84)

Intensité de champ (exprimée en dB par rapport à 1 µV/m)
Field strength (expressed in dB relative to 1 µV/m)
Intensidad de campo (expresada en dB con relación a 1 µV/m)

TERRE-LANO-TIERRA

Distance en km / Distance in km / Distancia en km	1605 - 2300 kHz						
	Onde de sol / Ground wave / Onda de superficie	Onde ionospherique — Sky wave — Onda ionosferica					
		midi (activite solaire faible) / noon (low solar activity) / mediodia (actividad solar baja)					nuit / night / noche
		latitude - latitud					
		0°	30°	40°	50°	60°	
10	78						
50	48						46
100	34					30	43
200	17			10	15	21	41
300	5	2	3	4	8	16	41
400	- 8	- 4	- 3	- 2	2	10	41
500		- 7	- 6	- 5	- 1	6	41
600		- 9	- 9	- 8	- 4	2	41
700		-11	-11	-10	- 6	- 1	41
800		-12	-12	-11	- 9	- 3	41
900		-13	-13	-12	-10	- 4	40
1000		-14	-14	-13	-11	- 5	39
1100		-15	-15	-14	-12	- 7	39
1200		-16	-16	-15	-13	- 8	38
1300		-17	-17	-16	-14	- 9	37
1400		-18	-18	-17	-15	-10	36
1500		-20	-20	-19	-16	-12	35
1600		-21	-21	-20	-17	-13	34
1700							33
1800							33
1900							32
2000							32
2200							31
2400							30
2600							29
2800							28
3000							27
3200							26
3400							25
3600							23
3800							21
4000							19
4500							15
5000							10

MOD NOC

Les intensités de champ de l'onde ionosphérique n'ont pas été indiquées dans les cas où elles sont inférieures à celles de l'onde de sol, sauf dans quelques cas où l'interpolation s'en trouve facilitée.
The values for sky wave field strength have not been included when they are less than the ground wave, except when they make the interpolation easier.
No se han indicado las intensidades de campo de la onda ionosférica cuando son inferiores a las de la onda de superficie, salvo en algunos casos en que ello facilita la interpolación.

ANNEX 4 (cont'd) TSA-5 (Rev.84)

Intensité de champ (exprimée en dB par rapport à 1 µV/m)
Field strength (expressed in dB relative to 1 µV/m)
Intensidad de campo (expresada en dB con relación a 1 µV/m)

MER-SEA-MAR

Distance en km Distance in km Distancia en km	1605 - 2300 kHz						
	Onde de sol Ground wave Onda de superficie	Onde ionospherique — Sky wave — Onda ionosferica					
		midi (activite solaire, faible) noon (low solar activity) mediodia (actividad solar baja)					nuit night noche
		latitude - latitud					
		0°	30°	40°	50°	60°	
10	86						
50	72						
100	65						
200	57						
300	50						
400	43						41
500	38						41
600	32						41
700	27						41
800	22						41
900	16						40
1000	11						39
1100	6				-12	- 7	39
1200	0			-15	-13	- 8	38
1300	- 5	-17	-17	-16	-14	- 9	37
1400	-10	-18	-18	-17	-15	-10	36
1500	-15	-20	-20	-19	-16	-12	35
1600		-21	-21	-20	-17	-13	34
1700							33
1800							33
1900							32
2000							32
2200							31
2400							30
2600							29
2800							28
3000							27
3200							26
3400							25
3600							23
3800							21
4000							19
4500							15
5000							10

MOD NOC

Les intensités de champ de l'onde ionosphérique n'ont pas été indiquées dans les cas où elles sont inférieures à celles de l'onde de sol, sauf dans quelques cas où l'interpolation s'en trouve facilitée.
The values for sky wave field strength have not been included when they are less than the ground wave, except when they make the interpolation easier.
No se han indicado las intensidades de campo de la onda ionosférica cuando son inferiores a las de la onda de superficie, salvo en algunos casos en que ello facilita la interpolación.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 35-E
18 April 1986
Original: English

COMMITTEE 4

SUMMARY RECORD

OF THE

FIRST MEETING OF COMMITTEE 4

(TECHNICAL CRITERIA)

Tuesday, 15 April 1986, at 0900 hrs

Chairman: Mr. M.L. PIZARRO (Chile)

Subjects discussed:	Documents
1. Terms of reference of Committee 4	25
2. Organization of work	DT/4, 28
3. Appointment of Working Group Chairmen	

1. Terms of reference of Committee 4 (Document 25)

The Committee noted the terms of reference of Committee 4 as approved by the first Plenary Meeting.

2. Organization of work (Documents DT/4 and 28)

2.1 The Chairman drew attention to the Working Group structure proposed in Document DT/4, which had been drawn up on the basis of the general schedule of work of the Conference as set forth in Document 28 and of the resources available. Since participating countries would be bearing the costs of the Conference, it was particularly important that the teams of interpreters, in particular, should be used as efficiently as possible.

Turning to the terms of reference of the Working Groups, he pointed out that matters relating to technical criteria for the sharing of the band 1 625 - 1 705 kHz in Region 2 would be dealt with, according to the progress made by the Working Groups, either by a third Working Group or by the Committee as a whole.

He drew particular attention to the general schedule of work of the Conference (Document 28) and to the date - Wednesday, 23 April - set for the completion of the work of the Working Groups and that set for completion of the work of the Committee (Friday, 25 April).

The Committee approved the organization of work as proposed.

3. Appointment of Working Group Chairmen

3.1 The Chairman made the following proposals:

Working Group 4-A: Mr. J.C.H. Wang (United States of America)

Working Group 4-B: Mrs. T.M. Beiler (Brazil)

3.2 The delegate of the United States of America said that while he would in principle like to accept the nomination as Chairman of Working Group 4-A, he would also, as one of the few people specializing in propagation, have to introduce and defend certain documents, and participate in the discussions. If he had permission to do that, he would gladly accept the nomination.

3.3 The Chairman replied that there should be no problem with that arrangement. The Committee had every confidence in Mr. Wang's impartial nature and integrity.

3.4 The delegate of Brazil said that his Delegation was happy to be able to provide a Chairman for Working Group 4-B and fully supported the nomination of Mr. Wang for Working Group 4-A.

The proposals were adopted.

The meeting rose at 09.20 hours.

The Secretary: J. FONTEYNE

The Chairman: M.L. PIZARRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Corrigendum No. 1
to Document 36-E
7 May 1986
Original : English/Spanish

COMMITTEE 5

SUMMARY RECORD

OF THE

FIRST MEETING OF COMMITTEE 5

Paragraph 2.2

In the tenth line, replace the words "sharing an allotment area" by "in the border areas".

Paragraph 2.3

Replace the third and fourth sentences as follows :

"Allotment planning had many advantages, not least the fact that prior submission of station location and characteristics were not needed and that it could easily be implemented with microcomputers - an important asset for countries that could call on few software facilities to assist them in their calculations. Brazil considered that the requirements set out in its document were met by the planning method proposed by Canada, subject to a few modifications."

Paragraph 2.7

At the end of the sixth line, replace "small countries" by "countries utilizing small allotments".

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 36-E
17 April 1986
Original: English

COMMITTEE 5

SUMMARY RECORD

OF THE

FIRST MEETING OF COMMITTEE 5

(PLANNING CRITERIA)

Tuesday, 15 April 1986, at 1030 hrs

Chairman: Mr. M. FERNANDEZ-QUIROZ (Mexico)

Subjects discussed:	Documents
1. Terms of reference and organization of work of the Committee	-
2. Planning method	7, 8, 11, 13, 16, 20, 23, 24

1. Terms of reference and organization of work of the Committee (Document 25)

1.1 The Chairman drew attention to Document 25, in which the terms of reference adopted by the Plenary for Committee 5 were set out. With regard to the first paragraph of those terms of reference, the Committee should note that the word "guidelines", as was made plain in § 2.1.7 of the Conference Agenda (Resolution No. 913 (Document 1)), referred to the Agreement to be prepared by the second session and not to the planning procedure to be established by the present one. That point was not clearly made in the wording of the French and Spanish texts of Document 25.

He proposed that the Committee, in organizing its work, should deal separately with the two tasks set out in the first paragraph of its terms of reference, considering first the planning method to be recommended to the Plenary and then going on to prepare the guidelines for the Agreement. The tasks set out in the second and third paragraphs of the terms of reference, the details of which would be conditioned by the planning method decided on, could be dealt with last.

1.2 In response to a question from the delegate of Chile, the Technical Secretary said that although the Committee had no authority to amend the text of Document 25, which had been adopted by the Plenary, it could make clear that, by adopting the organization of work proposed by the Chairman, it was interpreting its terms of reference in accordance with the wording of § 2.1.7 of Resolution No. 913. It would then be appropriate for the Chairman, in his first report to the Plenary, to draw attention to the ambiguity in the French and Spanish texts of Document 25 and request their alignment with the English text and with Resolution No. 913.

The terms of reference were noted and the organization of work proposed by the Chairman adopted.

2. Planning method (Documents 7, 8, 11, 13, 16, 20, 23 and 24)

2.1 The Chairman invited those delegations whose administrations had prepared proposals on the planning method to introduce their texts.

2.2 The delegate of Canada said that his Administration's proposals were contained in section 8 of Document 7. Canada had decided for the reasons set out in sub-section 8.1 that allotment planning was preferable to assignment planning. After experimenting with a number of possible approaches, it had decided that the objectives of simplicity, flexibility, efficiency and equality in border areas would best be met by the Modified Allotment Plan (MAP) approach set on in sub-sections 8.2 and 8.3. A cornerstone of the planning method was the provision of a fixed single standard protection distance applicable throughout Region 2. In addition, provision was made for the equitable allocation of priority channels to countries sharing an allotment area and for the use of non-priority and adjacent channels. Maps had been provided to illustrate the kind of distribution of priority channel entitlements and priority channel allotments (Figures 8.1 and 8.2) that might result from the proposed planning approach. Implementation criteria were dealt with in sub-section 8.4 and Figure 8.3. The details of the proposed planning method were susceptible to variation and adjustment in the course of discussion by the Committee. The basic outline of the approach was one that Canada felt would be simple to develop and fair to all the countries concerned. If adopted it would enable the present session to make considerable progress and have valid Recommendations to make to the second session.

2.3 The delegate of Brazil, introducing Document 8, said that section VI of Document 8 contained his Administration's proposals on planning starting with a list of seven principles to be observed, whatever method was adopted. Brazil's preference for an allotment planning method was stated and a number of standard parameters and planning criteria for such an approach were put forward. Allotment planning had many advantages, not least the fact that prior submission of station location and characteristics were not needed and that it could easily be implemented with the help of microcomputers - an important asset for countries that could call on few software facilities to assist them in their calculations. Brazil considered that the requirements set out in its document were met by the planning method proposed by Canada. That method would facilitate the work of the second session of the Conference and keep the need for coordination between countries to a minimum.

2.4 The delegate of the United States of America, introducing Document 11, said that while his Administration had no specific planning approach to propose, it considered that any planning method to be considered by the Conference should embody the principles of equitable distribution, channel re-use and preservations of future rights. In view of the fact that the band was a new one, allotment planning was to be preferred to assignment planning since it would ease the task of the second session of the Conference. The United States' views on suitable values for transmitting antenna characteristics and station power were also given in the document. It was recognized, however, that departures from such standard values could be allowable in certain circumstances provided that protection equivalent to that provided by the standard values was maintained. Delegates' attention was drawn to part three of the document, which considered sharing criteria in the new band.

2.5 The delegate of Chile, introducing Document 13, said that his Administration also supported an allotment planning approach. It could accept the Canadian proposal provided some adjustments could be made to the suggested parameters to accommodate the particular propagation conditions existing in certain areas of Region 2. Chile was concerned that the implementation procedure contained in the Canadian proposal (Document 7, Figure 8.3) would in the long-term turn the original allotment plan into an assignment plan. He would revert to that point on a later occasion when it could receive more detailed discussion.

2.6 The delegate of Paraguay said that, as indicated in section 8 of Document 16, his Administration was among those which supported allotment planning as the most efficient, effective and flexible approach.

2.7 The delegate of Cuba, introducing Document 20, said that its opening section set out the principles his Administration considered should govern the plan to be adopted for the band concerned. The document then considered a number of constraints affecting such planning in Region 2 and went on to propose a number of parameters to take account of those constraints, among others the need to provide for the use of channels on a strictly local basis by small countries. In that connection, it would make for more equitable planning if administrations could be provided with a diskette that would enable them to carry out their intersessional calculations on microcomputers. Cuba would prefer an allotment planning approach in view of its greater flexibility and simplicity.

2.8 The delegate of Argentina, introducing Documents 23 and 24, said that his Administration had carried out a number of studies on allotment and assignment planning for the new band in Region 2. It had found that in areas comprising small or medium-sized countries and involving a large number of frontiers, assignment planning would result in far more efficient use of the small frequency spectrum available. Argentina therefore favoured an assignment planning approach.

The meeting rose at 1200 hours.

The Secretary:
M. GIROUX

The Chairman:
M. FERNANDEZ-QUIROZ

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 37-E
21 April 1986
Original: English

COMMITTEE 3

SUMMARY RECORD OF THE FIRST MEETING OF COMMITTEE 3 (BUDGET CONTROL)

Tuesday, 15 April 1986, at 0910 hrs

Chairman: Mr. E.D. DuCHARME (Canada)

Subjects discussed:		Documents
1.	Organization of the work of the Committee	-
2.	Terms of reference and facilities made available to delegates	DT/1
3.	Financial responsibilities of administrative conferences	12
4.	Budget of the Conference	5
5.	Contributions of non-exempt recognized private operating agencies and international organizations	6
6.	Attendance at regional administrative conferences of Members not belonging to the region concerned	18

1. Organization of the work of the Committee

1.1 The Chairman opened the meeting by introducing the Vice-Chairman and thanking in advance the Head of the Finance Department who was to act as Secretary of the Committee. He said that he envisaged that the Committee would meet once per week, and complete its work mid-way through the final week by submtting its report to the Plenary.

2. Terms of reference and facilities made available to delegates (DT/1)

2.1 The Chairman said he assumed that the facilities available to delegates would be satisfactory as they have always been in the past.

The Committee took note of the terms of reference as contained in Document DT/1.

3. Financial responsibilities of administrative conferences (Document 12)

3.1 The Chairman referred participants to Document 12 in which the Secretary-General drew attention to the provisions of Article 80 of the Convention and Resolution No. 48 of the Plenipotentiary Conference (1982) concerning the financial responsibilities of conferences. In that respect, he said that he intended to remind the Chairmen of Committees 4 and 5 of those responsibilities, asking them to advise Committee 3 of the budgetary consequences of decisions taken in their respective committees.

Similarly, he might send a note to the Chairman of the IFRB and the Director of the CCIR inviting them to submit their estimates of the financial consequences of decisions as they were taken.

The above information would then be used as a basis for Committee 3's final report to the Plenary.

It was so agreed and the Committee authorized its Chairman to issue the above notes, with an indication of the deadline by which the information should be submitted.

4. Budget of the Conference (Document 5)

4.1 The Secretary of the Committee introduced the budget in Document 5, as approved by the 1985 session of the Administrative Council, from which it was seen that the major expenses were those relating to supernumerary staff and common services, the latter being charged to the conference budget in the case of a regional conference. The total figure of 1,123,000 Swiss francs was to be adjusted to take account of modifications in the common system which had taken place since the budget had been approved.

In reply to questions from the floor, he explained that, under Article 15 of the Convention, all countries in Region 2 would share the cost, regardless of whether they attended or not, and that all the countries listed on page 8 of the document were part of Region 2. The position of the Conference accounts would be reported to the second and third meetings of the Committee: it was to be expected that the final total, and thus the amount per contributory unit, based on actual expenditure, would in fact be less than that indicated. The Conference accounts would, following the normal practice, be closed two months after the end of the Conference.

The Committee took note of Document 5.

5. Contributions of non-exempt recognized private operating agencies (Document 6)

5.1 The Chairman drew attention to Document 6 concerning the conditions for participation in the Conference by non-exempt organizations, pointing out that no application had been received from an organization within that category.

The Committee took note of the document.

6. Attendance at regional administrative conferences of Members not belonging to the region concerned (Document 18)

6.1 The Chairman explained that the provisional rules described in Document 18 had been drafted by the Administrative Council to cover the attendance at regional conferences of Members from other regions who wished to monitor the results without bearing a full share of the costs and without the right to speak or take an active part.

6.2 The Secretary of the Committee added that normally it would be the Administrative Council which set the price for a set of documents, but in the present case it was suggested that the Budget Control Committee should do so, since the session of the Administrative Council was not being held until June. In fact the problem was theoretical only, since there were not Members from other regions present.

The Committee took note of Document 18, on the understanding that a revised version would be issued to clarify the explanation of how the price per set of documents was calculated.

The meeting rose at 0935 hours.

The Secretary: R. PRELAZ

The Chairman: E.D. DuCHARME

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 38-E
22 April 1986
Original: English

SUMMARY RECORD

OF THE

FIRST MEETING OF COMMITTEE 2

(CREDENTIALS)

Tuesday, 15 April 1986, at 1100 hrs

Chairman: Mr. S.E. MONTANARO (Paraguay)

Subjects discussed:	Documents
1. Terms of reference of the Committee	DT/1, 25
2. Organization of the Committee's work	-

1. Terms of reference of Committee 2 (Documents DT/1 and 25)

The Committee took note of the terms of reference contained in Document 25 and of the deadline for submission of its report, set for Tuesday, 29 April 1986.

2. Organization of the Committee's work

2.1 The Chairman suggested the formation of a small Working Group, comprising himself, the Vice-Chairman and a delegate from Canada (Mr. D. Fraser), to examine the credentials for conformity with the Convention.

It was so agreed.

2.2 The Chairman said that the first meeting of the Working Group would probably be held towards the end of the first week of the Conference and members would be convened individually.

The meeting rose at 1110 hours.

The Secretary:	The Chairman:
R. MACHERET	S.E. MONTANARO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 39-E
15 April 1986
Original: French

COMMITTEE 6

SUMMARY RECORD

OF THE

FIRST MEETING OF COMMITTEE 6

(EDITORIAL)

Tuesday, 15 April 1986, at 1000 hrs

Chairman: Mr. P. PERRICHON (France)

Subjects discussed:

1. Terms of reference of the Editorial Committee (Nos. 473 and 474 of the International Telecommunication Convention, Nairobi, 1982)

2. Organization of work

3. Contents and structure of the report to be prepared

1. Terms of reference of the Editorial Committee (Nos. 473 and 474 of the International Telecommunication Convention, Nairobi, 1982)

1.1 The Chairman recalled that the terms of reference of the Editorial Committee were those set out in the Convention.

2. Organization of work

2.1 A number of details were given concerning the measures foreseen for the organization of work. The delegations participating in the Editorial Committee were requested to designate, if possible, several members in case the Committee was obliged to split into several working groups towards the end of the Conference.

3. Contents and structure of the Report to be prepared

3.1 The Chairman said he would need a draft as soon as possible for submission to the first meeting of the Steering Committee. During a discussion involving the delegates of the United States of America and the Vice-Chairman (United Kingdom), it was agreed that various items could be taken into account, including the structure of the Report drawn up by the First Session of the Regional Administrative MF Broadcasting Conference, Region 2 (duly adapted to the requirements of the present Conference) or the structure of the Report prepared by the CCIR.

3.2 The Chairman said he would discuss the matter with the Chairmen of Committees 4 and 5 before preparing the draft.

3.3 The Vice-Chairman (United Kingdom) expressed the wish that for definitions Committees 4 and 5 should as far as possible use those already adopted in the past.

The meeting rose at 1030 hours.

The Secretary: The Chairman:

P.A. TRAUB P. PERRICHON

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 40-E
15 April 1986
Original: Spanish

COMMITTEE 5

Argentine Republic

PROPOSALS FOR THE WORK OF THE CONFERENCE

INTERMEDIATE PLANNING METHOD (IPM), OR METHOD
FOR COORDINATING ASSIGNMENTS IN FRONTIER FRINGE AREAS
(Agenda item 2.1.7)

Since the occupation of this band by the broadcasting service means that operational stations of other services will have to be transferred to other bands, and in most cases will have to change their equipment, the Argentine Republic considers that the greatest care should be taken to develop a regional planning method satisfactory to all the countries concerned, both large and small, developed and developing.

1. Basic conditions

In order to take decisions of continental scope concerning the forward planning of the broadcasting service in the band in question, account must be taken of the conditioning factors arising from existing wide dissimilarities in geography, population, socio-economic situations and development. It must also be borne in mind that the band in question has only 10 channels to be shared, that the related ground-wave propagation conditions are poor and that there will be some cost involved in transferring other services' existing installations to other bands or replacing equipment.

2. Intermediate planning method (IPM)

Essentially, the method described below consists in defining a geographical coordination fringe on both sides of national frontiers - for example, 550 km when planning assignments for 1 kW stations operating at night, or 170 km for 0.25 kW stations (conductivity 10 mS/m) - and coordinating future planned assignments only between sites located inside the fringe.

3. Alternative

In order to make forward planning more flexible, 600 km might be adopted as the distance for 1 kW stations, thus enabling an assignment to be shifted in the future to another town or village within a radius of 50 km, without any need for subsequent coordination.

If, after the Conference, two administrations sharing a channel for planning purposes were each to move their original assignments towards one another along the same straight line, the resulting separation of 500 km could be accepted, since the night-time interfering signal would only increase by about 0.37 dB in relation to the 550 km separation.

4. Merits of the IPM method

a) Only the sites and parameters of requirements inside a frontier fringe would need to be specified at the Conference; the remainder of each country's domestic territory would not be subject to that procedure.

b) Conditions would be optimized for areas comprising small countries and for critical areas with many frontiers belonging to medium-sized or large countries.

c) Any country in any critical area of Region 2, particularly those comprising small countries, would be guaranteed several assignments using omnidirectional antennas.

d) Large countries would be able to dispense with much of the work involved in coordinating future internal assignments.

e) No spectrum capacity would be lost, as happens with the allotment planning method, particularly in critical areas.

5. Planning variants

The use of more than one method for planning the Agreement is not really a new issue. Working with estimates instead of stations and with low or relatively low powers will place the Conference in a far more favourable situation than CARR-81 where, for example, the application of different sky-wave curves (10% of the time for countries in the northern part of America and 50% of the time for the others) obliged some Central American and Caribbean countries to calculate each assignment in their territory twice over.

The application of different planning criteria would be justified in the case of countries with very long frontiers and coordination fringe areas which are sparsely populated in some parts and densely populated or highly urbanized in others.

The same would apply to large countries with many dissimilar neighbours. The application of different planning methods according to the size of the neighbouring country (large, medium or small) could provide a valuable degree of flexibility both at the Conference itself and during future coordination.

6. Conclusion

Never losing sight of the fact that there are only 10 channels to share, that the power values to be agreed will be relatively low and that the band has no broadcasting stations in operation, it is perfectly appropriate to accept the possibility of applying different planning methods geared to the interests of the countries in the various parts of Region 2, rather than to adopt a rigid method which is not satisfactory to all concerned.

7. Proposal

ARG/40/4 In view of the foregoing, the Argentine Republic proposes:

1) that a single planning method should not be adopted for the whole of Region 2, but that the possibility should be accepted of applying different methods;

2) that, for this purpose, account should be taken of the intermediate planning method (IPM), or method of coordinating assignments in frontier fringe areas, set out in this document.

Reason:

To set on foot a planning process and an agreement which, by simplifying coordination and procedures, enables maximum benefit to be derived where necessary from the limited possibilities offered by the extended band.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Corrigendum 1 to
Document 41-E
7 May 1986
Original : Spanish

COMMITTEE 5

SUMMARY RECORD

OF THE

SECOND MEETING OF COMMITTEE 5

Paragraph 1.7

Replace the second sentence by the following :

"Referring to 8.2 and the map on page 39 of Document 7, he said that it would be very difficult for Uruguay to use channels under the allotment method - a disadvantage which would affect other small and medium-sized countries too."

Paragraph 1.11

Replace the second and third sentences by the following :

"If the allotment method were adopted, administrations interested in utilizing other services which shared the band with the broadcasting service could do so in whatever channels were allotted to them."

Paragraph 1.25

Replace the last three sentences by the following :

"The Plan to be established should, therefore, be sufficiently flexible to enable the band to be used for broadcasting services as well as other services for a certain period of time. When the dates were eventually established for the introduction of broadcasting in the band, administrations would be concerned with existing services and would have to find a way of solving the problems of each individual administration."

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 41-E
18 April 1986
Original: English

COMMITTEE 5

SUMMARY RECORD

OF THE

SECOND MEETING OF COMMITTEE 5

(PLANNING CRITERIA)

Tuesday, 15 April 1986, at 1410 hrs

Chairman: Mr. M. FERNANDEZ-QUIROZ (Mexico)

Subjects discussed:	Documents
1. Planning method	7, 8, 11, 13, 16, 19, 20, 23, 24

1. Planning method (Documents 7, 8, 11, 13, 16, 19, 20, 23, 24)

1.1 The Chairman noted that Document 19 transmitted the text of Resolution PTC.II/RES 17 (IV-85) adopted at the fourth meeting of the CITEL Permanent Technical Committee II; the other documents before the Committee had already been introduced at the previous meeting. One administration had favoured the assignment method (Documents 23 and 24), the remaining documents were more or less in agreement on the allotment method. In regard to parameters - for example, the use of 1 kW maximum power, the use of 90° omnidirectional antennas and protection of the groundwave - there was some degree of consensus.

1.2 The delegate of Ecuador said that his Administration was generally in agreement with the method proposed by Canada in Document 7 but had some reservations about parameters, especially with regard to power. His own delegation proposed that 1 kW should be the maximum power for a broadcasting transmitter and the Brazilian Administration (Document 8) stated that administrations wishing to plan for less then 1 kW should be allowed to do so. The use of non-standard parameters on priority channels, however, referred to in 8.4.2 of Document 7, would allow provision for powers above 1 kW in some cases; and in 7.1 of that document the figures of 1 kW station power for night/day and 1/4 wave antenna for night/day were put forward as standard parameters. Although the intention was good, he thought such values might lead to problems in some cases. It would be as well, therefore, to define the service as a very local one and reserve the band for local transmitters only; the possibility of planning for larger areas would still exist.

1.3 The delegate of Mexico said it was of primary importance to plan an equitable system; care must be taken, therefore, to provide adequate planning whilst retaining flexibility. For that purpose, the Committee should focus its efforts on the allotment method, which seemed the more suitable; the Canadian proposals should be taken as a basis for development.

1.4 The delegate of the United Kingdom said that on the basis of preliminary calculations his Administration agreed with the point raised in Document 13 that in some latitudes the groundwave field dominated the skywave - a point of importance to the Eastern Caribbean countries. In determining distance "x" at 550 km in Document 7, it had been assumed that the skywave dominated; if the groundwave dominated there would be implications for the definition of distance "x" and for the assumptions in 8.2.1, 8.4.2 and elsewhere in that document.

In at least two of the documents before Committee 5, mention was made of a characteristic field strength of 300 mV/m. But Committee 4 was currently seeking agreement on propagation curves based on a field strength of 100 mV/m. It was important for the two Committees to unify their approach.

The power of 1 kW mentioned in Document 7 might give rise to problems for Eastern Caribbean nations consisting of scattered islands, especially in view of the difficulty caused by low conductivity. Synchronized networks would be very costly, and the use of directional antennas would not overcome the problems related to programme feeds. Since the matter was too complex to discuss in Committee 5, perhaps his Administration could hold informal consultations with the sponsors of the Modified Allotment Planning proposals.

1.5 The delegate of Colombia felt that the allotment method was the more suitable for a plan which allowed a reasonable degree of independence, particularly with regard to domestic planning. His Administration felt some concern, however, about the determination of distance, which was an important factor for countries having medium-sized territories and therefore requiring a greater number of channels.

1.6 The delegate of Ecuador said that his Administration wished to see a maximum power of 1 kW established and there seemed to be a consensus on that for the band in question. For propagation problems of the sort referred to by the delegate of the United Kingdom, the solution surely lay in measures such as synchronized networks.

1.7 The delegate of Uruguay said that he agreed with the Argentine Administration: the assignment method would allow better use of the spectrum in the band concerned. Referring to 8.2 and the map on page 39 of Document 7, he said that it would be very difficult for Uruguay to establish coordinating channels - a disadvantage which would affect other small and medium-sized countries too. His delegation felt that 1 kW power for Zone 1 and 5 kW for Zone 2, with 90° antennas, would be acceptable values.

1.8 The delegate of Argentina said that the results referred to in § 2 of Document 24 showed that, using the 10 channels concerned, 46 assignments could be made in the geographical area comprising the small Central American countries; the distribution based on the map produced in that document meant a capacity of 3 to 6 assignments per country. Because of additional constraints such as those noted in sub-paragraph 2(d), it would be very difficult to achieve optimum planning for the countries in the area. Therefore, the method suggested must be carefully analyzed with regard to the area concerned and he supported the observations made by the delegate of the United Kingdom in that connection.

1.9 The Chairman noted that two further countries had endorsed the allotment method and one more had endorsed the assignment method. Concern had been expressed about the capacity to deal with a large number of stations should the assignment method be used, and also about conductivity problems.

1.10 The delegate of Canada said that it was important to compare like with like. The allotment method involved much more than the number of assignments. One factor was the flexibility which administrations would have in making assignments; such flexibility could also be an advantage with regard to a neighbouring State's potential requirements when assigning channels to stations close to frontiers. In Document 23, for example, the Argentine Administration had used a figure put forward at CITEL - a figure not included in the Canadian proposals - as an example of how channels could be used. But the Canadian proposals referred to channel allotments within an area. In the case of Colombia, for example, 3 to 4 channels had been mentioned, which could be used to make 19 assignments or even more, without using non-priority channels. The Canadian proposals, therefore, provided great flexibility. He would be pleased to discuss the matter with the delegate of Argentina, particularly in order to show how assignments could be added. His Administration had also offered to discuss with the United Kingdom Delegation the problems associated with sea water conductivity problems which arose regardless of the planning method used.

1.11 The delegate of Brazil said it was important to bear in mind that the band in question would not be allocated to broadcasting alone but shared with other services. If the assignment method were to be adopted, deadlines would of necessity be established beyond which existing services no longer sharing the band would become secondary; they and other permitted services would be able to use only the channels resulting from the Plan. Under the allotment method, however, administrations would have an opportunity to use two or more channels, which could be used by other services, if the latter were protected.

1.12 The delegate of Argentina said that he accepted the Canadian Delegation's invitation. At PTC II/CITEL, the allotment method had been drawn up with 5 channels, not 4; in addition, the distribution figure of 19 had been deemed non-standard, which caused his Administration to question it.

The Brazilian Delegation's remarks about other services were cogent, especially for most developing Latin American nations which must pay close attention to costs and therefore keep in mind the needs of services as a whole.

1.13 The delegate of Brazil said he wished to clarify that he had not been speaking of protection for other services - a matter which did not enter into planning for the broadcasting bands. The point was that, under the allotment method, administrations would retain the option of assigning unoccupied channels to other services at their own discretion.

1.14 The representative of the IFRB said that, in the light of Article 8 of the Radio Regulations and other relevant provisions, the IFRB had prepared a document (subsequently issued as Document 33) setting out its interpretation of the provisions of RR 419, RR 480 and RR 481. Perhaps the Committee could further examine the respective status of the broadcasting and other services when that document was available.

1.15 The Chairman considered that the Committee could make no further progress until it had reached a decision on the planning method to be adopted. Once a decision had been taken, a Working Group could be established to go into details and provide information to assist Committee 4.

It was agreed to suspend the meeting for brief informal consultations on the matters raised.

1.16 The Chairman invited comments from delegates following the informal exchange of views.

1.17 The delegate of Argentina said that his Delegation had clarified certain matters with the Canadian Delegation and considered that the outstanding problems were of form rather than of substance. It might be useful to bear in mind, however, that the countries of the southern cone of South America experienced problems stemming from the distribution of bands below 4 MHz by the Administrative Conference held in 1951. Other areas of the region did not have the same problems. As a result, the costs involved in moving fixed or mobile services to other channels represented a particular burden, especially in view of the high level of foreign debt of countries such as his own. Since only ten low-powered channels were involved, it might be possible to find an alternative solution, such as the use of different curves for night-time, as adopted by the 1981 Rio de Janeiro Conference. A document by the Argentine Delegation was to be distributed the following day. Another doucment might also usefully be prepared for discussion the following day with a view to harmonizing the two basic criteria.

1.18 The delegate of Canada wished to raise a matter which had not yet been discussed, that of cost. That aspect had also been a matter of concern to the Canadian Delegation and had been one of the reasons which had prompted it to work towards the adoption of an allotment planning method. Bearing in mind that the cost of the present Conference, the intersessional work and the second session would be divided among the Members of the Region, a decision in favour of an allotment plan would involve little intersessional work for the IFRB and the CCIR. Furthermore, the second session, currently scheduled to last for four weeks, could probably be reduced to two because no detailed planning operation would be involved. In the case of assignment planning, however, and from experience gained over the years with assignment plans for broadcasting satellites and the existing AM frequency band, the IFRB would need to recruit two or three additional staff members in the intersessional period to develop a computer program and carry out other work for the second session, which would involve several hundred thousand Swiss francs and a second session of at least four weeks. Administrations would also have to submit detailed requirements on the basis of which the Conference would develop a detailed frequency assignment plan. The total package for an allotment plan, on the other hand, would provide flexibility in the use of frequencies in the future and would be far less costly to develop.

1.19 The delegate of Paraguay said that the Conference should consider the statement just made by the delegate of Canada very seriously. The future costs referred to by the delegate of Argentina would be easier to deal with than the cost of establishing the Plan itself. The most appropriate solution, therefore, appeared to be allotment planning.

1.20 The delegate of Chile said that the Committee would have to find a way of achieving a balance between the needs and interests of all countries involved. His country had had sharing problems between broadcasting and other services in the band in question ever since 1979, and considered that the costs involved in making the necessary changes would be offset by the resulting benefits. Moreover the time had come to look beyond the interests of individual countries and seek a solution that would be fair to all. The allotment planning method as submitted by Canada was a viable one which would protect the interests of all conerned, and would help solve the particular difficulties of the subregions.

1.21 The delegate of Cuba said that before making any decisions his Delegation would like to see examples of how the allotment plan would be applied, the values and distances that were involved, and how the Central American and Caribbean areas would be affected.

1.22 The delegate of Canada said that his Delegation would be glad to provide such information at any time, on the understanding that the preliminary work which Canada had done on the different areas of Region 2 was not considered definitive.

1.23 The delegate of Guyana said that his Delegation could accept the allotment planning method on three conditions: that No. 2666 of the Radio Regulations was observed, that the method used was flexible and that equitable distribution was ensured. It further proposed that only one type of antenna and Class C stations only should be included in the Plan. In that connection he drew particular attention to section 4.4.3 of Chapter 4 of the Final Acts of the Radio Administrative MF Broadcasting Conference (Region 2), Rio de Janeiro, 1981, which related to noise Zones 1 and 2, and to Document 19.

1.24 The delegate of Canada said that the resolution contained in Document 19, particularly RECOMMENDS d) and e), might allay the concerns of the Argentine Delegation. The Canadian Delegation had attended the last CITEL meeting and subscribed to the principles set forth in that document. The planning approach described in Document 8 appeared to have omitted those particular points.

1.25 The delegate of Brazil said that Document 8, already introduced, showed his Delegation's concern for services at present occupying the band under consideration. Of the seven planning principles outlined, three indicated the conditions to be established to facilitate the necessary process of transferring existing services to other bands in accordance with the limitations of each administration. Many administrations, including that of Brazil, used the band for other services, particularly the aeronautical radionavigation service, and intended to continue to do so indefinitely. The Plan to be established should, therefore, be sufficiently flexible to enable the band to be used for broadcasting services as well as other services. An allotment plan did not necessarily mean that specific characteristics had to be put forward, which was important for administrations wishing to use the band for broadcasting either immediately or at some future date. Furthermore, when the dates were eventually established for the introduction of broadcasting in the band, administrations would be concerned with existing services and would have to find a way of solving the problems of each individual administration.

1.26 The Chairman said that there appeared to be a majority of countries in favour of the allotment method, although some still appeared to be in favour of the assignment method. He wondered whether Argentina's document, which would be distributed the following day, would provide a compromise solution.

1.27 The delegate of Argentina confirmed that the new document discussed sharing between the broadcasting and existing services. However, perhaps the Secretariat could provide for consideration the following day an alternative solution which at the same time would provide a reasonable degree of flexibility.

He also wondered whether it would be possible for the Canadian Delegation to make the working document earlier referred to available for discussion in the Committee the following day.

1.28 The delegate of Uruguay confirmed that his Delegation still preferred the assignment planning method. It was very difficult for small countries like his own to coordinate with other countries, and the assignment planning method would therefore be of greater benefit.

1.29 The delegate of Canada said that his Delegation would hesitate to turn its working document into one on which a decision would be based, since so many factors were involved. However it was prepared to show the document to any delegations wishing to read it. If the Committee really wanted the document to be circulated, a few days would be needed for adequate preparation.

1.30 The Chairman suggested in that case and bearing in mind Cuba's request, the delegations concerned should meet informally to try to reach some agreement.

It was so decided

The meeting rose at 1630 hours.

The Secretary:
M. GIROUX

The Chairman:
M. FERNANDEZ-QUIROZ

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Corrigendum 1 to
Document 42-E
7 May 1986
Original : English

COMMITTEE 5

SUMMARY RECORD

OF THE

THIRD MEETING OF COMMITTEE 5

Paragraph 1.5

Replace by the following :

"1.5 The delegate of the United Kingdom expressed his preference for the allotment planning approach proposed by Canada, which, subject to its claimed flexibility being proven, would solve many problems in the Caribbean, and especially the east Caribbean, area."

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) **RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2**

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 42-E
18 April 1986
Original: English

COMMITTEE 5

SUMMARY RECORD

OF THE

THIRD MEETING OF COMMITTEE 5

(PLANNING CRITERIA)

Wednesday, 16 April 1986, at 0900 hrs

Chairman: Mr. M. FERNANDEZ-QUIROZ (Mexico)

Subjects discussed:	Document
1. Planning method (continued)	40

1. Planning method (continued) (Document 40)

1.1 The delegate of Argentina said that Document 40 contained his Administration's proposal for an intermediate planning method (IPM) that provided a compromise between the allotment and assignment approaches. Under the IPM, allotment planning would be used throughout Region 2 except in defined geographical fringe areas on both sides of national frontiers, where assignment planning would be used. The IPM would thus ensure that fringe areas would benefit from a greater access to a limited spectrum than the assignment system could provide, while retaining the flexibility and simplicity of operation of the allotment system. It would not entail an excessive workload for the IFRB or the second session of the Conference since notification procedures for the fringe areas could be kept to a minimum and coordination would be required only on a bilateral or at most trilateral basis.

1.2 The delegate of Uruguay supported the Argentine proposal for an IPM.

1.3 The delegate of Canada said that assignment planning in the initial stages would produce many incompatibilities that would take the second session of the Conference much time and effort to resolve. However, provided the initial overall planning and sharing out of channels throughout Region 2 was done on the allotment system, it would be acceptable for individual countries, after the initial allotment of channels, to be given the option, in agreement with their neighbours, of using the assignment system to plan those allotments. In that way, the flexibility of the allotment approach would be preserved.

1.4 The delegate of Brazil did not consider that the IPM would provide the same flexibility and simplicity as the allotment planning approach.

1.5 The delegate of the United Kingdom expressed his preference for the allotment planning approach proposed by Canada, which would solve many problems in the Caribbean, and especially the east Caribbean, area.

1.6 The delegate of the United States of America considered that the IPM would in practice turn into a full assignment plan. The geographical fringe width it called for would necessitate multilateral rather than bilateral or trilateral coordination of the assignments made, resulting in an increased workload for the ITU and the second session of the Conference. Only the full allotment approach proposed by Canada would give administrations the flexibility required to meet their broadcasting requirements in future years.

1.7 The delegate of Cuba said that the Committee should not be precipitate in coming to a decision on a matter of such importance as planning. He suggested that further time for reflection and further data on the subject, including examples of the application of both approaches to the Region, should be provided to delegates to assist them in reaching the right decision.

1.8 The delegate of Argentina said that the flexibility of the allotment approach was more apparent than real in the case of small countries with many neighbours. Such countries would necessarily have to face many constraints when they wished to introduce or change a channel allotment in border areas in the post-Conference period. The necessary negotiations with their neighbours would involve more work and higher costs than assignment planning of fringe areas by the second session of the Conference.

1.9 The delegate of Canada, supported by the delegate of Brazil, said the problem of coordination of adjacent channels in border areas would be less complex under the allotment system than the delegate of Argentina feared. The only cases in which the use of adjacent channels posed a real problem was when there were two cities separated by no more than 50 to 100 km on either side of a border. Such cases were, however, rare and could be handled by post-Conference coordination.

1.10 The delegate of Barbados said that the use of the new band would enhance the service provided by the medium wave band in the Region. It called for a planning method that would be flexible and responsive to the needs of administrations and provide a fair distribution of channels. Preservation of rights to future use of allotments was essential for small countries unable at present to introduce sophisticated equipment. All those reasons were important in view of the propagation conditions specific to his subregion, and Barbados therefore supported the allotment planning approach.

1.11 The delegate of Ecuador supported the allotment planning approach because it would preserve the future rights of administrations and would call for minimum coordination. The few coordination problems at borders resulting from the allotment plan could be solved by consultation between neighouring administrations to adjust power and distance parameters to suit their specific situations.

1.12 The delegate of Argentina reminded the delegate of Barbados that the particular propagation conditions prevailing in the Caribbean area would necessarily restrict the flexibility of station location allowed by the allotment planning method. In reply to the delegate of Ecuador, he noted that the dissimilarity in population densities on either side of some borders would also cause problems, which, under the allotment planning aproach, would have to be solved by post-Conference negotiation. He continued to consider that the proposed IPM would be as simple, flexible, efficient and equitable as the allotment planning approach and make better use of the frequency spectrum available.

1.13 The Chairman suggested that the meeting should be suspended for some informal discussions of the issues on which opinions were divided.

The meeting was suspended at 1025 hours and resumed at 1120 hours.

1.14 The Chairman said the informal discussions had shown that 11 delegations were in favour of an Allotment Plan, two were in favour of an Assignment Plan and one was still undecided pending further information. He suggested that a document should be prepared for the next meeting, crystallizing the main points of concern and setting out the elements of a provisional planning approach, and invited delegations to collaborate in the preparation of such a document.

1.15 The representative of the IFRB said that the planning approach for Region 2 might be based on a Plan containing allotments which could be turned into assignments at or after the second session by administrations wishing to do so, in accordance with the criteria of the Allotment Plan. The Plan would thus become a Frequency Plan for the Region, containing allotments, but also assignments for some administrations. There should be no submission of requirements by administrations, and standard parameters should be used. Moreover, a set of criteria and procedures should be developed during the first session to deal with the situation of border areas.

1.16 The delegate of Argentina asked whether, from the regulatory point of view, decisions on the planning method taken by only 14 of the more than 30 countries of Region 2 could be regarded as valid for the whole Region. To his knowledge, a number of countries of that Region which were not represented at the first session but would probably attend the second were in favour of an Assignment Plan.

1.17 The representative of the IFRB said that the Board had experience of the problem raised by the previous speaker and was aware of the difficulties involved in getting as many countries as possible to accede to agreements concluded during conferences at which they had not been represented.

1.18 Another representative of the IFRB pointed out that the problem was broader than that of limited attendance. When a conference was held in two sessions, each session in fact represented a separate conference and, under the Convention, adopted decisions having an effect only on the participating countries. The legal problem now at issue was that the current Conference had a mandate from WARC-79 to decide on a planning method applicable to all the countries of Region 2; the decisions of the first session of a regional conference normally also applied to the second, irrespective of participation in that session, but the Convention provided that the second session could, if the majority so decided, reopen discussion of topics dealt with at the first session and could even modify the decisions of that session - although no regional conference had so far availed itself of that right.

1.19 The delegate of Argentina observed that a number of countries had failed to send delegations to the first session in Geneva because of budgetary problems. Since Region 2 was largely composed of developing countries, the second session would certainly be better attended, and hence more successful, if it could be held on the American continent.

1.20 The representative of the IFRB said that, under the Convention, a conference could be held in any country, provided an invitation was extended by a government. If such an invitation was forthcoming, the Administrative Council would decide, in connection with the adoption of the agenda of the second session, whether that session should be held in Geneva or in the inviting American country.

The Committee took note of the Argentine suggestion.

The meeting rose at 1140 hours.

The Secretary: M. GIROUX

The Chairman: M. FERNANDEZ-QUIROZ

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 43(Rev.1)-E
23 April 1986
Original: French

COMMITTEES 4 and 5

Information note from the Chairman of Committee 3 to the Chairmen of Committees 4 and 5

1. At its first meeting, Committee 3 took particular note of Article 80 and Resolution 48 of the Convention which are conveniently reproduced in Document 12 by the Secretary-General. The Committee recognized that under these provisions of the Convention, conferences are required, before adopting Resolutions and Recommendations or taking decisions which are likely to result in additional and unforeseen demands upon the budgets of the Union, to:

i) prepare and take into account estimates of the additional demands made on the budgets of the Union;

ii) where two or more proposals are involved, arrange them in an order of priority;

iii) prepare and submit to the Administrative Council a statement of the estimated budgetary impact, together with a summary of the significance and benefit to the Union of financing the implementation of the decisions and an indication of priorities where appropriate.

2. However, Committee 3 realizes that the first session will most likely not take decisions that will have a long-term budgetary impact, and concluded that the main budgetary impact from the first session will most likely be related to the intersessional work of the IFRB, the studies to be undertaken by the CCIR, especially if these studies require an early completion date and cannot be carried out within the regular CCIR study period, and any other intersessional activities.

3. On the basis of this conclusion, Committee 3 recommends that in their work Committees 4 and 5 should:

1) be prudent in their identification of any intersessional activities which will have a budgetary impact;

2) in the event that decisions are taken which may have a budgetary impact, send an information note to Committee 3 at the earliest opportunity describing the nature of the decisions and if possible indicating the estimated cost of implementing them.

To enable Committee 3 to publish its final report on the date set by the Steering Committee, the two Committees' reports should be submitted to Committee 3 by 28 April 1986.

E.D. DuCHARME
Chairman of Committee 3

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 43-E
17 April 1986
Original: French

COMMITTEE 3

Information note to the Chairmen of Committees 4 and 5

1. At its first meeting, Committee 3 took particular note of Article 80 and Resolution 48 of the Convention which are conveniently reproduced in Document 12 by the Secretary-General. The Committee recognized that under these provisions of the Convention, conferences are required, before adopting Resolutions and Recommendations or taking decisions which are likely to result in additional and unforeseen demands upon the budgets of the Union, to:

i) prepare and take into account estimates of the additional demands made on the budgets of the Union;

ii) where two or more proposals are involved, arrange them in an order of priority;

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E.D. DuCHARME
Chairman of Committee 3

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) **RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2**

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 44-E
16 April 1986
Original: English

COMMITTEE 4

FIRST REPORT OF WORKING GROUP 4-A TO COMMITTEE 4

Working Group 4A has examined the proposals on groundwave propagation and has adopted the following chapter.

GROUNDWAVE PROPAGATION

1. Ground conductivity

For groundwave propagation calculations in the band 1605-1705 kHz, the Atlas of Ground Conductivity should be used which contains information communicated to the IFRB in connection with the first and second sessions of the Regional Administrative MF broadcasting conference (Region 2), Buenos Aires (1980) and Rio de Janeiro (1981), and subsequent revisions.

The following provisions should also be included.

a) When an administration notifies to the IFRB data intended to modify the Atlas, the IFRB shall so inform all administrations of Region 2. After 90 days from the date on which this information is communicated by the IFRB, the IFRB shall modify the Atlas and communicate the modifications to all administrations.

b) No /‾assignment_7 /‾allotment_7 in the Plan shall at any time be required to be modified as a result of the incorporation of these data.

c) A proposal to modify the Plan shall be evaluated on the basis of the values in the Atlas on the date the proposal was received by the IFRB.

2. Field strength curves for groundwave propagation

The curves shown on Graph /‾A_7 are to be used for determining groundwave propagation in the frequency range of 1 605 - 1 705 kHz; these curves are computed for 1 655 kHz.

The curves are labelled with ground conductivities in millisiemens/metre. All curves, except the 5000 mS/m (sea water) curve, are derived for a relative dielectric constant of 15. The sea water curve is derived for a dielectric constant of 80.

Annex E to the Report by the First Session of the Regional Administrative MF Broadcasting Conference (Region 2), Buenos Aires, 1980, contains a mathematical discussion relating to the calculation of the groundwave curves. The corresponding computer program is available at the IFRB.

3. Calculation of groundwave field strength

Using the Atlas of Ground Conductivity, the relevant conductivity or conductivities for the chosen path are determined. If only one conductivity is representative, the method for homogeneous paths is used. If several conductivities are involved, the method for non-homogeneous paths is used.

3.1 Homogeneous paths

The vertical component of the field strength for a homogeneous path is represented in Graph [A] as a function of distance, for various values of ground conductivity.

The distance in kilometres is shown on a logarithmic scale on the abscissa. The field strength is shown on a linear scale on the ordinate in decibels above 1 uV/m. The graph is standardized for a characteristic field strength of 100 mV/m corresponding to an effective monopole radiated power (e.m.r.p.) of -9.5 dB relative to 1 kW. The straight line marked "100 mV/m at 1 km" is the field strength on the assumption that the antenna is erected on a surface of perfect conductivity.

For omnidirectional antenna systems having a different characteristic field strength, correction must be made according to the following equations:

$E = E_0 \times \frac{E_c}{100} \times \sqrt{P}$ if field strengths are expressed in mV/m, and

$E = E_0 + E_c - 100 + 10 \log P$ if field strengths are expressed in dB (uV/m)

For directional antenna systems, the correction must be made according to the following equations:

$E = E_0 \times \frac{E_R}{100}$ if field strengths are expressed in mV/m, and

$E = E_0 + E_R - 100$ if field strengths are expressed in dB (uV/m).

Where
- E : resulting field strength
- E_0 : field strength read from Graph [A]
- E_R : actual field strength at a particular azimuth at 1 km
- E_c : characteristic field strength
- P : station power in kW.

Graph /‾B_7 consists of three pairs of scales to be used with graph /‾A_7. Each pair contains one scale labelled in decibels and another in millivolts per metre. Each pair can be cut out and trimmed as a unit to be used as sliding ordinate scales. The scales allow graphical conversion between decibels and millivolts per metre, and are used to make graphical determinations of field strengths. Other methods of making calculations on graph /‾A_7 may be used, including the use of dividers to adjust for values of E_R that differ from 100 mV/m at 1 km. However, any method used will follow steps similar to those discussed below.

For both omnidirectional and directional antenna systems the value of E_R must be found. For omnidirectional systems E_R can be determined by using the following equations:

$E_R = E_c \sqrt{P}$ if field strengths are expressed in mV/m, and

$E_R = E_c + 10 \log P$ if field strengths are expressed in dB (uV/m).

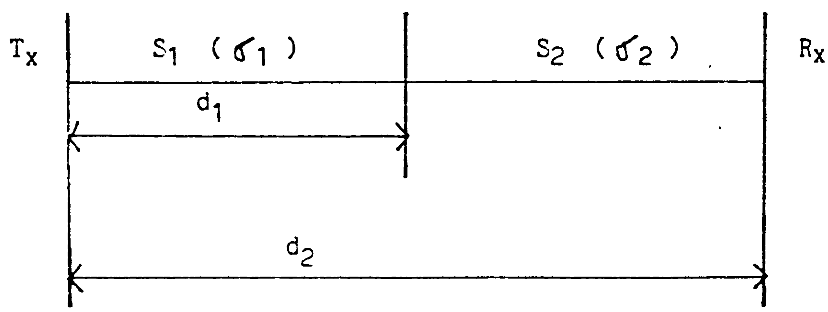
To determine the field strength at a given distance, the scale is placed at the given distance with the 100 dB (uV/m) point of the scale resting on the appropriate conductivity curve. The value of E_R is then found on the scale; the point on the underlying graph (which lies underneath the E_R point of the scale) yields the field strength at the given distance.

To determine the distance at a given field strength, the E_R value is found on the sliding scale and that point is placed directly at the level of the given field strength on the graph. The scale is then moved horizontally until the 100 dB (uV/m) point of the scale coincides with the applicable conductivity curve. The distance may then be read from the abscissa of the underlying graph.

3.2 Non-homogeneous paths

In this case, the equivalent distance or Kirke method is to be used. To apply this method, Graph /‾A_7 can also be used.

Consider a path whose sections S_1 and S_2 have endpoint lengths corresponding to d_1 and $d_2 - d_1$, and conductivities σ_1 and σ_2 respectively, as shown on the following figure:



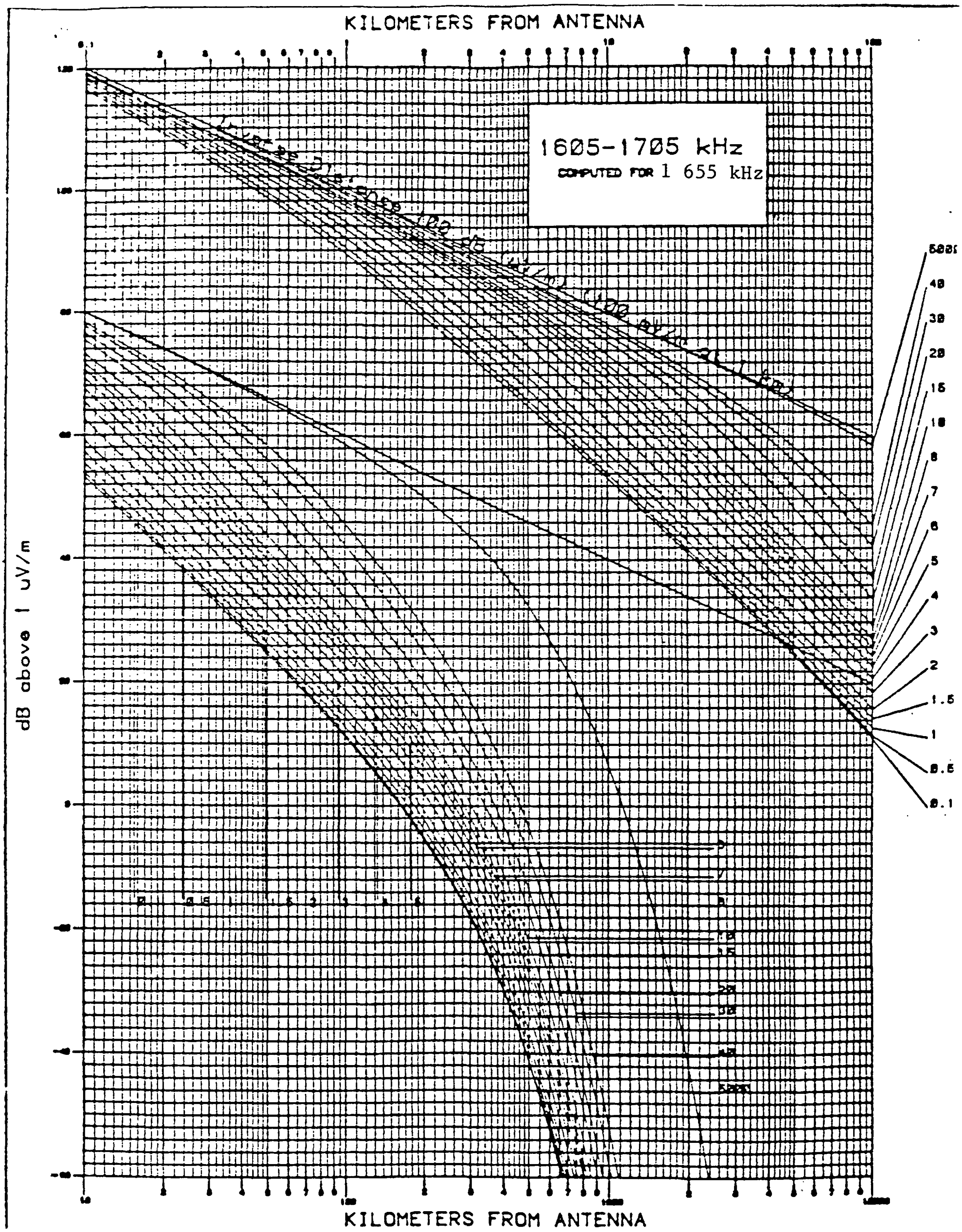
The method is applied as follows:

a) Taking section S_1 first, we read the field strength corresponding to conductivity σ_1 at distance d_1 on the graph.

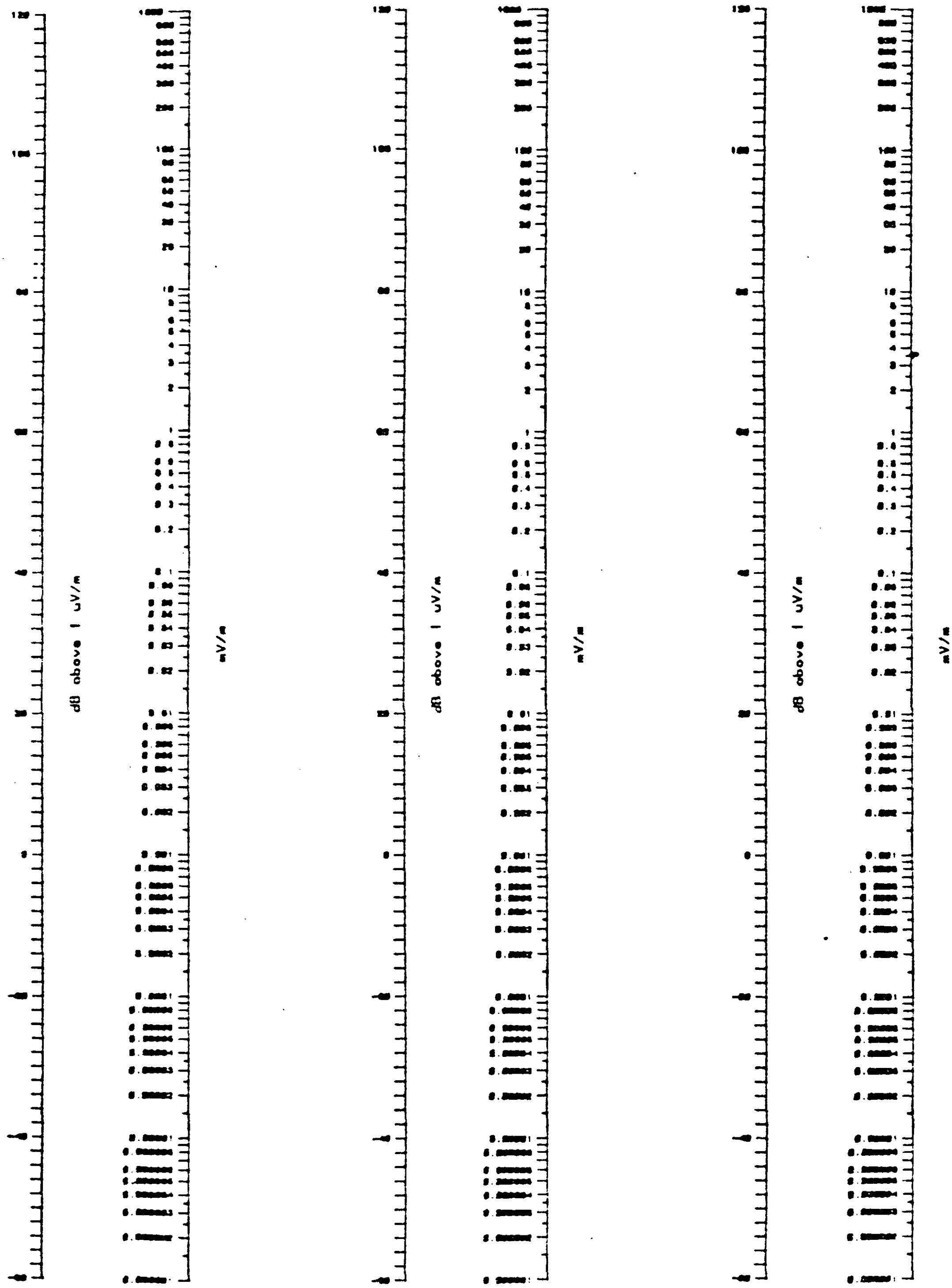
b) As the field strength remains constant at the soil discontinuity, the value immediately after the point of discontinuity must be equal to that obtained in a) above. As the conductivity of the second section is σ_2, the curve corresponding to conductivity σ_2 gives the equivalent distance to that which would be obtained at the same field strength arrived at in a). This equivalent distance is d. Distance d is larger than d_1 when σ_2 is larger than σ_1. Otherwise d is less than d_1.

c) The field strength at the real distance d_2 is determined by taking note of the corresponding curve for conductivity σ_2 similar to that obtained at equivalent distance $d + (d_2 - d_1)$.

d) For successive sections with different conductivities, procedures b) and c) are repeated.



GRAPH /‾A‾7 - Ground-wave field strength versus distance
(for a characteristic field strength of 100 mV/m)



Graph [B] - Scale for use with ground-wave field strength graph [A]

J.C.H. WANG
Chairman of Working Group 4-A

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 45-E
17 April 1986
Original: English

PLENARY MEETING

FIRST REPORT OF COMMITTEE 5 TO THE PLENARY

1. It is the understanding of the Committee 5 that the first paragraph of its Terms of Reference (Conference Document 25) contains two separate tasks, the adoption of a planning method and the establishment of guidelines for the agreement.

2. Committee 5 has considered the following Documents 7, 8, 11, 13, 16, 19, 20, 23, 24 and 40 relating to the planning approach to be used by Region 2 in the band 1 605 - 1 705 kHz. As a result of the discussions on these documents the following approach has been decided on for use in the planning of this band for the Broadcasting Service:

a) the Plan for the Broadcasting Service will contain allotments and may contain assignments;

b) the Plan will not be based on requirements submitted by administrations;

c) the Plan will be based on the use of standardized parameters. However, the possibility should be left open for the case where a group of countries decide to develop at the Conference part of the Plan, consistent with the Regional Plan, subregionally based on a transmitter power less than the standardized parameters;

d) the First Session will develop one or more standardized distance(s) for the separation of the allotment zones;

e) the planning method will consist of two steps:

- firstly, the development of a region wide allotment plan;
- secondly, for those administrations so wishing, they may convert at the Second Session their allotments into assignments using the specified planning criteria and these assignments will also appear in the Plan;

f) the associated procedures will specify, among other things, the details for converting the allotments into assignments in the border areas and shall be contained in the guidelines to the Second Session;

g) administrations may use channels not allotted to them in a specified area under the conditions to be specified in the guidelines to the Second Session.

3. The details of the planning approach and the guidelines for the associated procedures will be prepared in Working Group(s) of Committee 5.

M.M. FERNANDEZ-QUIROZ
Chairman of Committee 5

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 46-E
17 April 1986
Original: English

COMMITTEE 4

SECOND REPORT OF WORKING GROUP 4-A TO COMMITTEE 4

Working Group 4-A has examined the proposals on skywave propagation and has adopted the annexed chapter on skywave propagation.

At the meeting held on 17 April 1986:

1. The Delegate of Cuba indicated that the Cuban Delegation may request further discussion on the inclusion of geomagnetic latitude in Fig. 3 at the meeting of Committee 4.

2. The Delegate from Brazil proposed that, in the initial stage of planning, in determining the coordination distance only, Fig. 4 of the RJ81 Final Acts (Chapter 2 of Annex 2) be used. The method described in the attached chapter on skywave propagation is to be used in all other calculations.

This concludes the work of Working Group 4-A.

J. WANG
Chairman of Working Group 4-A

SKYWAVE PROPAGATION

The calculation of skywave field strength shall be conducted in accordance with the provisions which follow.

1. *List of symbols*

d:	short great-circle path distance (km)
E_c:	characteristic field strength, mV/m at 1 km for 1 kW
$f(\theta)$:	radiation as a fraction of the value $\theta = 0$ (when $\theta = 0, f(\theta) = 1$)
f:	frequency (kHz)
F:	unadjusted annual median skywave field strength, in dB(μV/m)
F_c:	field strength for a characteristic field strength of 100 mV/m at 1 km
$F(50)$:	skywave field strength, 50% of the time, in dB(μV/m)
P:	station power (kW)
θ:	elevation angle from the horizontal (degrees)
a_T:	geographic latitude of the transmitting terminal (degrees)
a_R:	geographic latitude of the receiving terminal (degrees)
b_T:	geographic longitude of the transmitting terminal (degrees)
b_R:	geographic longitude of the receiving terminal (degrees)
ϕ_T:	geomagnetic latitude of the transmitting terminal (degrees)
ϕ_R:	geomagnetic latitude of the receiving terminal (degrees)
ϕ:	average geomagnetic latitude of a path under study (degrees)

Note: North and east are considered positive, south and west negative.

2. *General procedure*

Radiation in the horizontal plane of an omnidirectional antenna fed with 1 kW (characteristic field strength, E_c) is known either from design data or, if the actual design data are not available, from Fig. 1, and Figure 1a.

Elevation angle θ is given by

$$\theta = \text{arc tan}\left(0.00752 \cot \frac{d}{444.54}\right) - \frac{d}{444.54} \qquad \text{degrees} \qquad (1)$$

$$0° \leqslant \theta \leqslant 90°$$

Alternatively, Table 1 or Fig. 2 may be used.

It is assumed that the Earth is a smooth sphere with an effective radius of 6,367.6 km and that reflections occur from an ionospheric height of 96.5 km.

The radiation $f(\theta)$ expressed as a fraction of the value at $\theta = 0$ at a pertinent elevation angle θ can be determined from Fig. 3 or Table II.

The product $E_c f(\theta) \sqrt{P}$ is thus determined for an omnidirectional antenna. For a directional antenna, $E_c f(\theta) \sqrt{P}$ can be determined from the antenna radiation pattern. $E_c f(\theta) \sqrt{P}$ is the field strength at 1 km at the appropriate elevation angle and azimuth.

The unadjusted skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c\ f\ (\theta)\ \sqrt{P}}{100} \quad \text{dB(uV/m)} \qquad (2)$$

F_c is given by:

$$F_c = (95\text{-}20 \log d)-(2\pi + 4.95 \tan^2 \phi)(d/1000)^{1/2} \text{ dB (uV/m)} \qquad (3)$$

Figure 4 and Table III show F_c for selected latitudes. If $|\phi|$ is greater than 60 degrees, equation (3) is evaluated for $|\phi|$ = 60 degrees. If d is less than 200 km, equation (3) is evaluated for d=200 km. However, the actual great-circle distance is to be used in determining elevation angle. See section 4 for calculation of great-circle distance and conversion from geographic latitude to geomagnetic latitude.

Note: Values of F_c are normalized to 100 mV/m at 1 km corresponding to an effective monople radiated power (e.m.r.p.) of -9.54 dB(kW).

3. <u>Skywave field strength, 50% of the time</u>

This is given by:

$$F(50) = F \quad \text{dB(uV/m)} \qquad (4)$$

4. <u>Path parameters</u>

Refer to section 1. The great-circle distance d (km) is given by:

$$d = 111.18 \text{ arc cos}[\sin a_T \sin a_R + \cos a_T \cos a_R \cos (b_R - b_T)] \qquad (5)$$

The geomagnetic latitude of the transmitting terminal, ϕ_T, is given by:

$$\phi_T = \text{arc sin } [\sin a_T \sin 78.5° + \cos a_T \cos 78.5° \cos (69° + b_T)] \qquad (6)$$

ϕ_R can be determined in a similar manner. And,

$$\phi = ½ (\phi_T + \phi_R) \qquad (7)$$

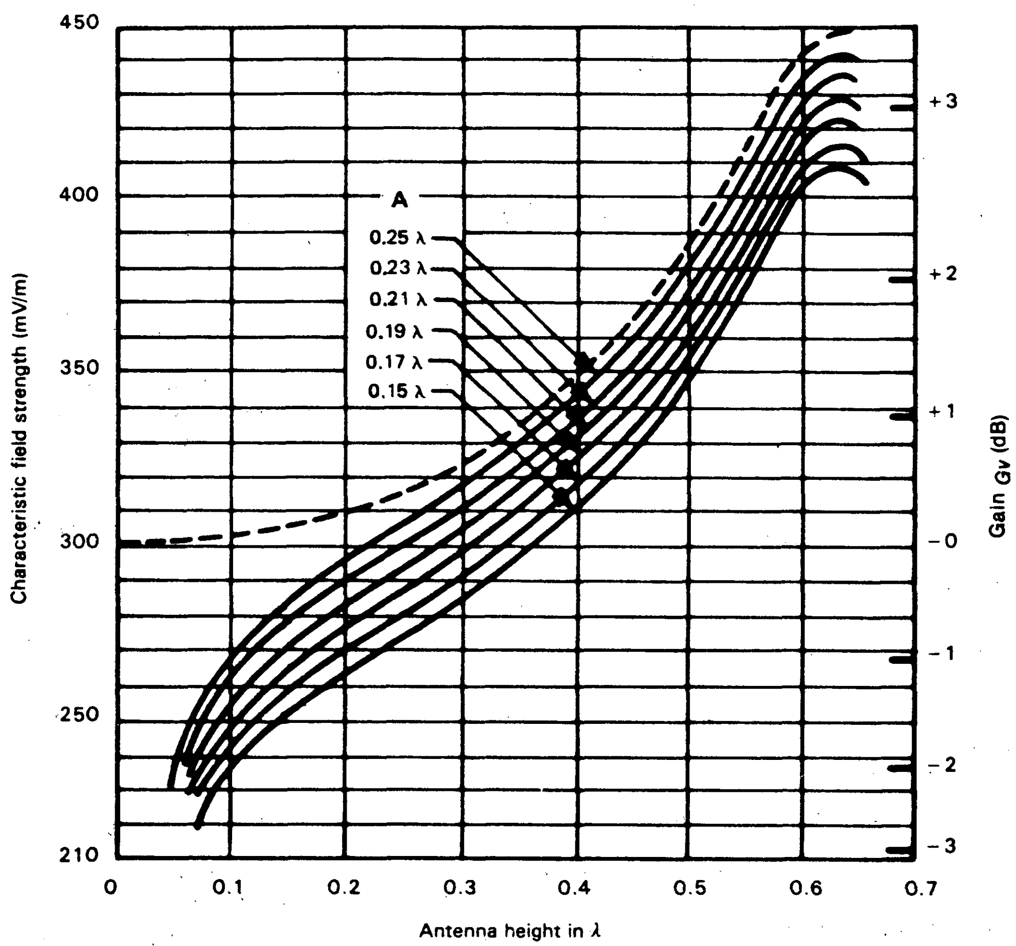
Alternatively, Figure 5 may be used.

5. *Nocturnal variation of skywave field strength*

Hourly median skywave field strengths vary during the night and at sunrise and sunset. Figure 6 shows the average variation referred to the value at 2 hours after sunset at the path midpoint. This variation applies to field strengths occurring for 50% of the nights.

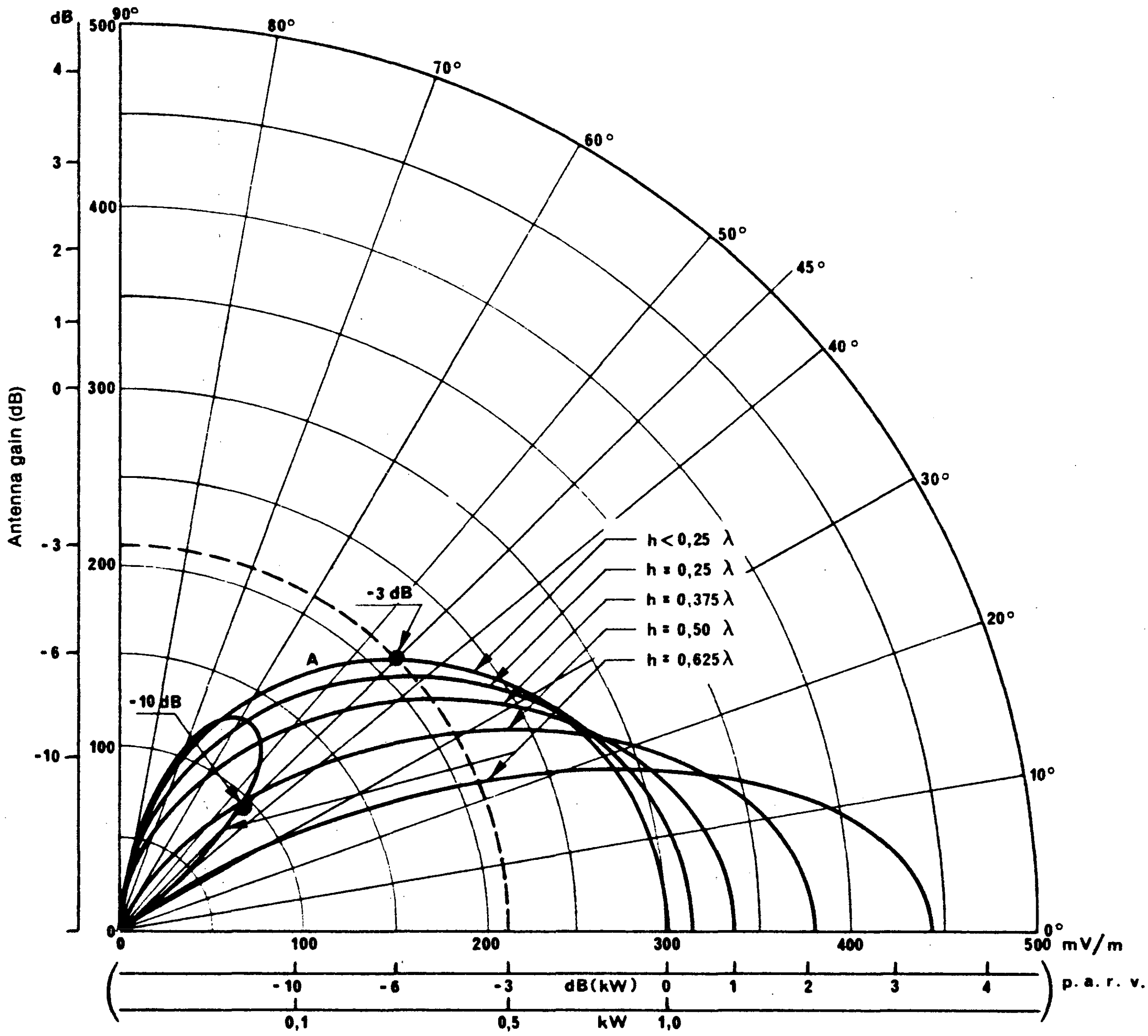
6. *Sunrise and sunset time*

To facilitate the determination of the local time of sunrise and sunset, Fig. 7 gives the times for various geographical latitudes and for each month of the year. The time is the local meridian time at the point concerned and should be converted to the appropriate standard time.



A: Radius of ground system
Full lines: Real antenna correctly designed
Dashed line: Ideal antenna on a perfectly conducting ground

FIGURE 1 – *Characteristic field strengths for simple vertical antennas, using 120-radial ground systems*



A: Short vertical antenna

FIGURE 1*a* – *Effective monopole radiated power (e.m.r.p.) and field strength at a distance of 1 km as a function of elevation angle, for different heights of vertical antennas assuming a transmitter power of 1 kW*

TABLE I – *Elevation angle vs distance*

Distance (km)	Elevation angle (degrees)
50	75.3
100	62.2
150	51.6
200	43.3
250	36.9
300	31.9
350	27.9
400	24.7
450	22.0
500	19.8
550	18.0
600	16.3
650	14.9
700	13.7
750	12.6
800	11.7
850	10.8
900	10.0
950	9.3
1000	8.6
1050	8.0
1100	7.4
1150	6.9
1200	6.4
1250	5.9
1300	5.4
1350	5.0
1400	4.6
1450	4.3
1500	3.9
1550	3.5
1600	3.2
1650	2.9
1700	2.6
1750	2.3
1800	2.0
1850	1.7
1900	1.5
1950	1.2
2000	1.0
2050	0.7
2100	0.5
2150	0.2
2200	0.0
2250	0.0
2300	0.0
2350	0.0
2400	0.0

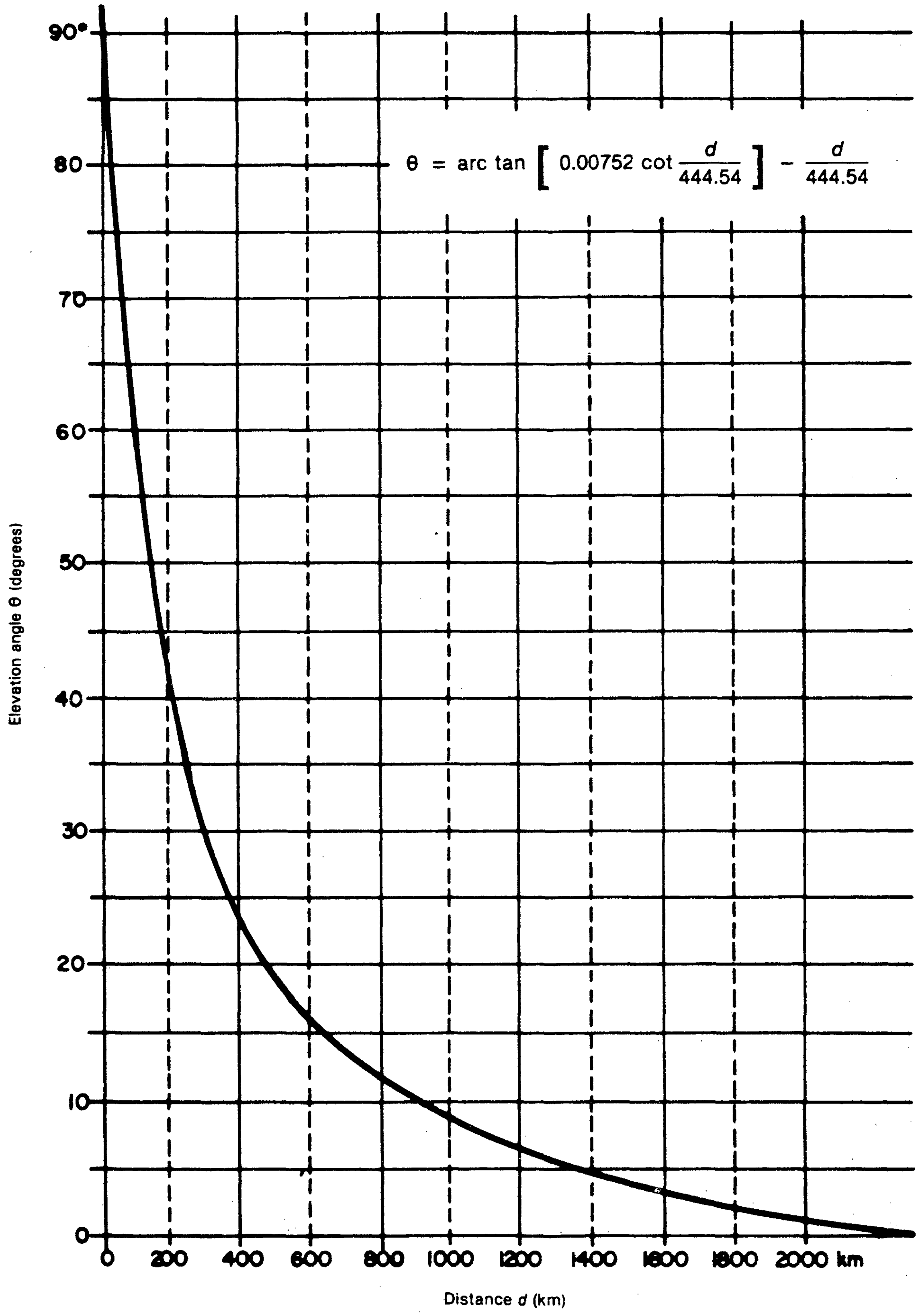


FIGURE 2 – *Elevation angle vs distance*

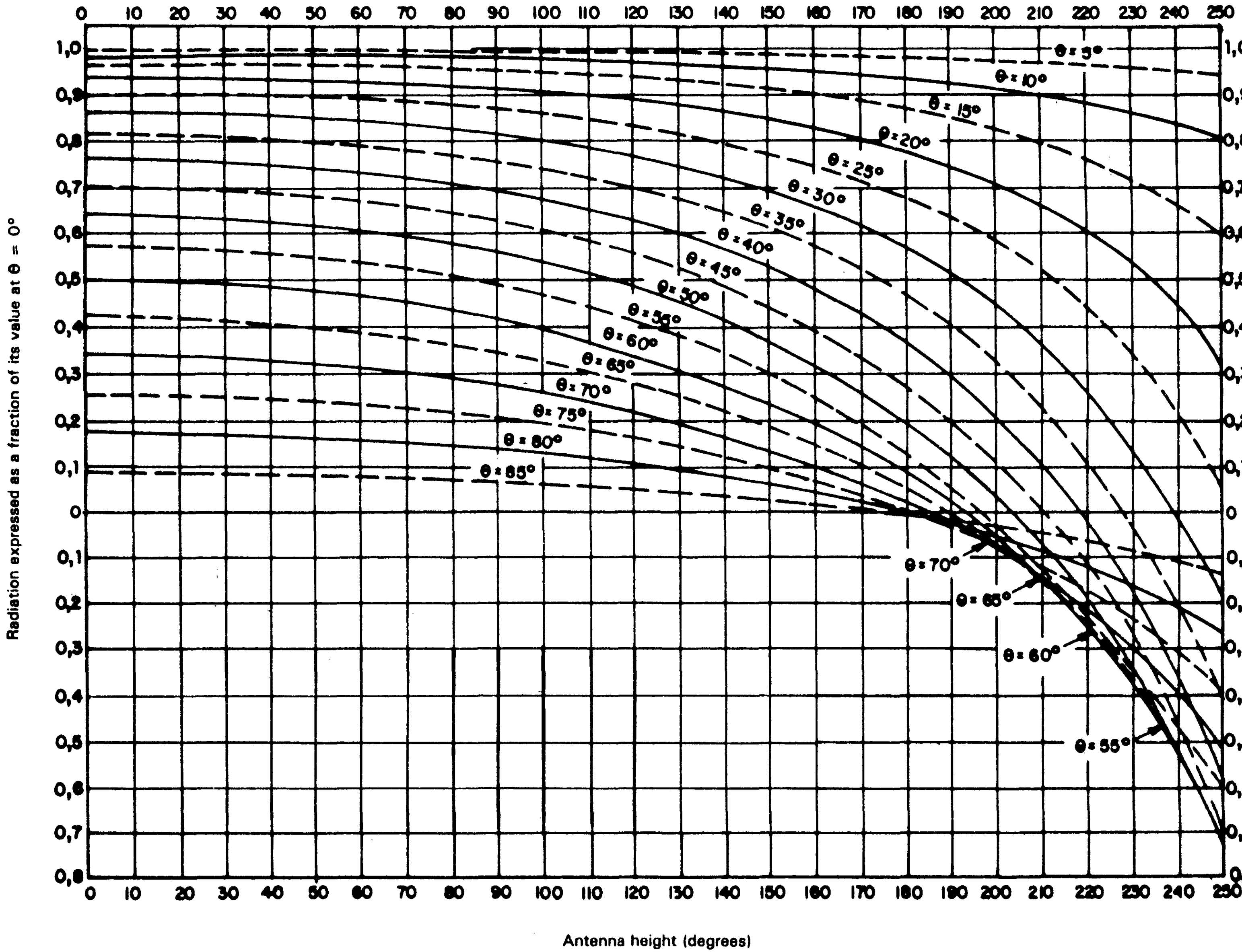


FIGURE 3 – *Vertical plane radiation of simple vertical antennas as a function of electrical tower height for various values of elevation angle (θ)*

TABLE II – *f*(θ) *values for simple vertical antennas*

Elevation angle (degrees)	*f*(θ)					
	0.11 λ	0.13 λ	0.15 λ	0.17 λ	0.19 λ	0.21 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.999	0.998	0.998	0.998	0.998	0.998
4	0.997	0.997	0.997	0.997	0.997	0.997
5	0.996	0.996	0.996	0.995	0.995	0.995
6	0.994	0.994	0.994	0.993	0.993	0.993
7	0.992	0.992	0.991	0.991	0.991	0.990
8	0.989	0.989	0.989	0.988	0.988	0.987
9	0.987	0.986	0.986	0.985	0.985	0.984
10	0.984	0.983	0.983	0.982	0.981	0.980
11	0.980	0.980	0.979	0.978	0.977	0.976
12	0.976	0.976	0.975	0.974	0.973	0.971
13	0.972	0.972	0.971	0.969	0.968	0.967
14	0.968	0.967	0.966	0.965	0.963	0.961
15	0.963	0.962	0.961	0.959	0.958	0.956
16	0.958	0.957	0.956	0.954	0.952	0.950
17	0.953	0.952	0.950	0.948	0.945	0.943
18	0.947	0.946	0.944	0.942	0.940	0.937
19	0.941	0.940	0.938	0.935	0.933	0.930
20	0.935	0.933	0.931	0.929	0.926	0.922
22	0.922	0.920	0.917	0.914	0.911	0.907
24	0.907	0.905	0.902	0.898	0.894	0.890
26	0.892	0.889	0.885	0.882	0.877	0.872
28	0.875	0.872	0.868	0.864	0.858	0.852
30	0.857	0.854	0.849	0.844	0.839	0.832
32	0.838	0.834	0.830	0.824	0.818	0.811
34	0.819	0.814	0.809	0.803	0.795	0.789
36	0.798	0.793	0.788	0.781	0.774	0.766
38	0.776	0.771	0.765	0.758	0.751	0.742
40	0.753	0.748	0.742	0.735	0.725	0.717
42	0.730	0.724	0.718	0.710	0.702	0.692
44	0.705	0.700	0.693	0.685	0.676	0.666
46	0.680	0.674	0.667	0.659	0.650	0.639
48	0.654	0.648	0.641	0.633	0.623	0.612
50	0.628	0.621	0.614	0.606	0.596	0.585
52	0.600	0.594	0.587	0.578	0.568	0.557
54	0.572	0.566	0.559	0.550	0.540	0.529
56	0.544	0.537	0.530	0.521	0.512	0.501
58	0.515	0.508	0.501	0.493	0.483	0.472
60	0.485	0.479	0.472	0.463	0.454	0.443

TABLE II *(continued)*

Elevation angle (degrees)	$f(\theta)$					
	0.23 λ	0.25 λ	0.27 λ	0.29 λ	0.311 λ	0.35 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.998	0.998	0.998	0.998	0.998	0.997
4	0.997	0.996	0.996	0.996	0.996	0.995
5	0.995	0.994	0.994	0.994	0.993	0.992
6	0.992	0.992	0.991	0.991	0.990	0.989
7	0.990	0.989	0.988	0.988	0.987	0.985
8	0.987	0.986	0.985	0.984	0.983	0.980
9	0.983	0.982	0.981	0.980	0.978	0.975
10	0.979	0.978	0.977	0.975	0.973	0.969
11	0.975	0.973	0.972	0.970	0.968	0.963
12	0.970	0.968	0.966	0.964	0.962	0.955
13	0.965	0.963	0.961	0.958	0.955	0.949
14	0.959	0.957	0.955	0.952	0.948	0.941
15	0.953	0.951	0.948	0.945	0.941	0.932
16	0.947	0.944	0.941	0.937	0.933	0.924
17	0.941	0.937	0.934	0.930	0.925	0.914
18	0.934	0.930	0.926	0.921	0.916	0.904
19	0.926	0.922	0.918	0.913	0.907	0.894
20	0.919	0.914	0.909	0.904	0.898	0.883
22	0.902	0.897	0.891	0.885	0.877	0.861
24	0.885	0.879	0.872	0.865	0.856	0.837
26	0.866	0.859	0.852	0.843	0.833	0.811
28	0.846	0.833	0.830	0.820	0.809	0.795
30	0.825	0.816	0.807	0.797	0.784	0.758
32	0.803	0.794	0.784	0.772	0.759	0.729
34	0.780	0.770	0.759	0.747	0.732	0.701
36	0.756	0.746	0.734	0.721	0.705	0.671
38	0.732	0.720	0.708	0.694	0.677	0.642
40	0.706	0.695	0.681	0.667	0.649	0.612
42	0.681	0.668	0.654	0.639	0.621	0.582
44	0.654	0.641	0.627	0.611	0.593	0.552
46	0.628	0.614	0.600	0.583	0.564	0.523
48	0.600	0.587	0.572	0.555	0.536	0.494
50	0.573	0.559	0.544	0.527	0.507	0.465
52	0.545	0.531	0.515	0.498	0.479	0.436
54	0.517	0.503	0.487	0.470	0.451	0.408
56	0.488	0.474	0.459	0.442	0.423	0.381
58	0.460	0.446	0.431	0.414	0.395	0.354
60	0.431	0.418	0.403	0.387	0.368	0.328

TABLE II *(end)*

Elevation angle (degrees)	f(θ)					
	0.40 λ	0.45 λ	0.50 λ	0.528 λ	0.55 λ	0.625 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	0.999	0.999	0.999	0.999
2	0.998	0.998	0.998	0.997	0.997	0.995
3	0.997	0.996	0.995	0.994	0.993	0.989
4	0.994	0.992	0.990	0.989	0.988	0.981
5	0.991	0.988	0.985	0.983	0.981	0.970
6	0.986	0.983	0.979	0.975	0.972	0.957
7	0.982	0.977	0.971	0.967	0.962	0.941
8	0.976	0.970	0.962	0.957	0.951	0.924
9	0.970	0.963	0.953	0.945	0.938	0.904
10	0.963	0.954	0.942	0.933	0.924	0.882
11	0.955	0.945	0.930	0.919	0.909	0.859
12	0.947	0.934	0.917	0.905	0.893	0.834
13	0.938	0.923	0.903	0.889	0.875	0.807
14	0.929	0.912	0.889	0.872	0.857	0.773
15	0.918	0.899	0.873	0.855	0.837	0.748
16	0.908	0.886	0.857	0.836	0.815	0.717
17	0.897	0.873	0.840	0.817	0.795	0.684
18	0.885	0.859	0.823	0.797	0.772	0.651
19	0.873	0.844	0.804	0.776	0.749	0.617
20	0.860	0.828	0.785	0.755	0.726	0.582
22	0.833	0.796	0.746	0.710	0.677	0.510
24	0.805	0.763	0.705	0.665	0.625	0.436
26	0.776	0.728	0.663	0.618	0.574	0.363
28	0.745	0.692	0.621	0.570	0.522	0.290
30	0.714	0.655	0.577	0.522	0.470	0.219
32	0.682	0.619	0.534	0.475	0.419	0.151
34	0.649	0.582	0.492	0.428	0.368	0.085
36	0.617	0.545	0.450	0.383	0.321	0.025
38	0.584	0.509	0.409	0.340	0.275	−0.031
40	0.552	0.473	0.370	0.298	0.231	−0.083
42	0.519	0.438	0.332	0.258	0.190	−0.129
44	0.488	0.405	0.296	0.221	0.152	−0.170
46	0.457	0.372	0.262	0.187	0.117	−0.205
48	0.427	0.341	0.230	0.155	0.085	−0.235
50	0.397	0.311	0.201	0.126	0.056	−0.259
52	0.369	0.283	0.174	0.099	0.031	−0.278
54	0.341	0.257	0.149	0.076	0.009	−0.291
56	0.315	0.232	0.126	0.055	−0.010	−0.300
58	0.289	0.208	0.105	0.037	−0.026	−0.304
60	0.265	0.186	0.087	0.021	−0.039	−0.304
62				0.003	−0.049	−0.300
64				−0.003	−0.056	−0.292
66				−0.011	−0.062	−0.281
68				−0.017	−0.064	−0.267
70				−0.022	−0.065	−0.250
72				−0.025	−0.064	−0.231
74				−0.026	−0.061	−0.210
76				−0.026	−0.056	−0.138
78				−0.024	−0.051	−0.163
80				−0.022	−0.044	−0.138

Note – When the negative sign (−) appears in the Table, it signifies only the existence of a secondary lobe having the opposite phase from the main lobe in the vertical radiation pattern. In order to perform the calculation, ignore the negative (−) and use only the absolute value f(θ) from the Table.

TABLE III - Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m.

DISTANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
0-200	46.17	203.4574	46.01	199.7683	45.43	186.8867	43.96	157.6842	39.53	94.7147
250	43.90	156.6680	43.72	153.4954	43.07	142.4722	41.42	117.8230	36.47	66.6392
300	42.02	126.1266	41.82	123.3314	41.11	113.6631	39.30	92.3093	33.88	49.4450
350	40.40	104.7304	40.19	102.2257	39.43	93.5977	37.47	74.7566	31.62	38.0894
400	38.98	88.9709	38.76	86.6981	37.94	78.8988	35.85	62.0462	29.59	30.1752
450	37.72	76.9207	37.48	74.8381	36.61	67.7174	34.40	52.4825	27.76	24.4320
500	36.58	67.4351	36.33	65.5120	35.41	58.9589	33.08	45.0689	26.08	20.1307
550	35.53	59.7930	35.27	58.0059	34.31	51.9358	31.86	39.1832	24.52	16.8266
600	34.57	53.5183	34.29	51.8487	33.29	46.1953	30.74	34.4183	23.07	14.2352
650	33.68	48.2840	33.39	46.7172	32.35	41.4276	29.69	30.4974	21.70	12.1669
700	32.84	43.8589	32.54	42.3829	31.46	37.4139	28.70	27.2260	20.42	10.4915
750	32.06	40.0746	31.75	38.6794	30.63	33.9955	27.77	24.4640	19.20	9.1169
800	31.32	36.8059	31.00	35.4833	29.84	31.0547	26.89	22.1079	18.04	7.9764
850	30.62	33.9579	30.29	32.7007	29.10	28.5022	26.06	20.0797	16.93	7.0208
900	29.95	31.4572	29.62	30.2595	28.39	26.2696	25.26	18.3198	15.87	6.2133
950	29.32	29.2464	28.98	28.1030	27.71	24.3030	24.50	16.7818	14.85	5.5255
1000	28.72	27.2798	28.36	26.1861	27.07	22.5601	23.77	15.4291	13.87	4.9356
1050	28.14	25.5207	27.77	24.4729	26.45	21.0066	23.07	14.2325	12.92	4.4265
1100	27.58	23.9394	27.21	22.9339	25.85	19.6150	22.39	13.1684	12.01	3.9845
1150	27.05	22.5115	26.67	21.5451	25.28	18.3625	21.74	12.2177	11.12	3.5988
1200	26.53	21.2165	26.14	20.2866	24.73	17.2306	21.11	11.3645	10.27	3.2607
1250	26.04	20.0378	25.64	19.1418	24.19	16.2036	20.50	10.5958	9.43	2.9628
1300	25.56	18.9609	25.15	18.0967	23.68	15.2685	19.91	9.9007	8.63	2.6995
1350	25.09	17.9741	24.68	17.1396	23.18	14.4142	19.34	9.2699	7.84	2.4657

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
1400	24.64	17.0669	24.22	16.2603	22.69	13.6313	18.79	8.6958	7.07	2.2574
1450	24.21	16.2306	23.78	15.4503	22.22	12.9119	18.25	8.1716	6.32	2.0713
1500	23.78	15.4577	23.35	14.7021	21.76	12.2490	17.72	7.6916	5.60	1.9045
1550	23.37	14.7416	22.93	14.0094	21.32	11.6367	17.21	7.2512	4.88	1.7544
1600	22.97	14.0766	22.52	13.3665	20.88	11.0698	16.71	6.8459	4.19	1.6192
1650	22.58	13.4577	22.12	12.7687	20.46	10.5438	16.22	6.4722	3.50	1.4970
1700	22.20	12.8806	21.74	12.2115	20.05	10.0547	15.74	6.1268	2.84	1.3862
1750	21.83	12.3415	21.36	11.6913	19.64	9.5991	15.28	5.8071	2.18	1.2857
1800	21.46	11.8369	20.99	11.2046	19.25	9.1739	14.82	5.5104	1.54	1.1942
1850	21.11	11.3638	20.63	10.7487	18.87	8.7763	14.38	5.2347	0.91	1.1107
1900	20.76	10.9196	20.27	10.3208	18.49	8.4041	13.94	4.9780	0.29	1.0345
1950	20.43	10.5018	19.93	9.9186	18.12	8.0549	13.51	4.7386	-0.31	0.9648
2000	20.09	10.1084	19.59	9.5401	17.76	7.7270	13.09	4.5151	-0.91	0.9008
2050	19.77	9.7373	19.26	9.1832	17.41	7.4185	12.68	4.3060	-1.49	0.8421
2100	19.45	9.3869	18.94	8.8465	17.06	7.1280	12.28	4.1102	-2.07	0.7880
2150	19.14	9.0555	18.62	8.5282	16.72	6.8540	11.88	3.9265	-2.64	0.7382
2200	18.83	8.7419	18.30	8.2271	16.38	6.5953	11.49	3.7541	-3.19	0.6923
2250	18.53	8.4446	18.00	7.9419	16.06	6.3508	11.11	3.5919	-3.74	0.6499
2300	18.24	8.1626	17.70	7.6714	15.73	6.1194	10.73	3.4393	-4.28	0.6106
2350	17.95	7.8947	17.40	7.4147	15.42	5.9002	10.36	3.2955	-4.82	0.5743
2400	17.66	7.6400	17.11	7.1708	15.11	5.6923	9.99	3.1599	-5.34	0.5405
2450	17.38	7.3977	16.83	6.9388	14.80	5.4949	9.63	3.0318	-5.86	0.5092
2500	17.11	7.1669	16.54	6.7179	14.50	5.3075	9.28	2.9107	-6.37	0.4801
2550	16.84	6.9468	16.27	6.5075	14.20	5.1292	8.93	2.7962	-6.88	0.4530

Continued . . .

**TABLE III - Skywave field strength vs distance (200 to 10 000 km)
for a characteristic field strength of 100 mV/m**

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
2600	16.57	6.7369	16.00	6.3068	13.91	4.9594	8.59	2.6877	-7.38	0.4278
2650	16.31	6.5364	15.73	6.1152	13.62	4.7978	8.25	2.5849	-7.87	0.4042
2700	16.05	6.3448	15.46	5.9323	13.34	4.6436	7.91	2.4873	-8.35	0.3823
2750	15.79	6.1616	15.20	5.7574	13.06	4.4966	7.59	2.3948	-8.83	0.3617
2800	15.54	5.9862	14.95	5.5901	12.78	4.3562	7.26	2.3068	-9.31	0.3425
2850	15.30	5.8183	14.70	5.4299	12.51	4.2220	6.94	2.2231	-9.77	0.3246
2900	15.05	5.6573	14.45	5.2765	12.24	4.0937	6.62	2.1435	-10.24	0.3077
2950	14.81	5.5029	14.20	5.1295	11.98	3.9709	6.31	2.0677	-10.69	0.2919
3000	14.57	5.3547	13.96	4.9884	11.72	3.8534	6.00	1.9955	-11.15	0.2771
3050	14.34	5.2125	13.72	4.8530	11.46	3.7408	5.70	1.9267	-11.59	0.2632
3100	14.11	5.0758	13.48	4.7230	11.20	3.6328	5.39	1.8610	-12.04	0.2501
3150	13.88	4.9444	13.25	4.5981	10.95	3.5293	5.10	1.7982	-12.47	0.2379
3200	13.66	4.8180	13.02	4.4779	10.71	3.4299	4.80	1.7383	-12.91	0.2263
3250	13.44	4.6963	12.79	4.3624	10.46	3.3345	4.51	1.6810	-13.34	0.2154
3300	13.22	4.5792	12.57	4.2512	10.22	3.2428	4.22	1.6262	-13.76	0.2051
3350	13.00	4.4663	12.35	4.1441	9.98	3.1546	3.94	1.5738	-14.18	0.1954
3400	12.78	4.3575	12.13	4.0409	9.74	3.0698	3.66	1.5236	-14.60	0.1863
3450	12.57	4.2526	11.91	3.9414	9.51	2.9883	3.38	1.4755	-15.01	0.1776
3500	12.36	4.1514	11.70	3.8455	9.28	2.9097	3.10	1.4294	-15.42	0.1695
3550	12.16	4.0537	11.49	3.7529	9.05	2.8341	2.83	1.3852	-15.82	0.1618
3600	11.95	3.9593	11.28	3.6636	8.82	2.7611	2.56	1.3428	-16.22	0.1545
3650	11.75	3.8682	11.07	3.5773	8.60	2.6909	2.29	1.3021	-16.62	0.1476
3700	11.55	3.7801	10.87	3.4940	8.38	2.6231	2.03	1.2631	-17.01	0.1410
3750	11.35	3.6949	10.66	3.4134	8.16	2.5577	1.77	1.2255	-17.40	0.1348

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
3800	11.16	3.6125	10.46	3.3356	7.94	2.4945	1.51	1.1894	-17.79	0.1289
3850	10.96	3.5328	10.26	3.2602	7.72	2.4335	1.25	1.1547	-18.18	0.1234
3900	10.77	3.4556	10.07	3.1873	7.51	2.3746	0.99	1.1214	-18.56	0.1181
3950	10.58	3.3808	9.87	3.1168	7.30	2.3177	0.74	1.0892	-18.93	0.1131
4000	10.39	3.3084	9.68	3.0485	7.09	2.2627	0.49	1.0583	-19.31	0.1083
4050	10.21	3.2383	9.49	2.9823	6.89	2.2094	0.24	1.0286	-19.68	0.1038
4100	10.02	3.1702	9.30	2.9182	6.68	2.1580	0.00	0.9999	-20.05	0.0995
4150	9.84	3.1043	9.12	2.8560	6.48	2.1081	-0.24	0.9722	-20.41	0.0954
4200	9.66	3.0403	8.93	2.7958	6.28	2.0599	-0.49	0.9456	-20.78	0.0915
4250	9.48	2.9782	8.75	2.7373	6.08	2.0132	-0.73	0.9199	-21.13	0.0878
4300	9.30	2.9179	8.56	2.6806	5.88	1.9679	-0.96	0.8951	-21.49	0.0842
4350	9.13	2.8594	8.38	2.6255	5.68	1.9240	-1.20	0.8711	-21.85	0.0808
4400	8.95	2.8026	8.21	2.5721	5.49	1.8815	-1.43	0.8480	-22.20	0.0776
4450	8.78	2.7474	8.03	2.5202	5.30	1.8403	-1.66	0.8257	-22.55	0.0746
4500	8.61	2.6937	7.85	2.4698	5.11	1.8003	-1.89	0.8041	-22.89	0.0717
4550	8.44	2.6416	7.68	2.4208	4.92	1.7615	-2.12	0.7833	-23.24	0.0689
4600	8.27	2.5909	7.51	2.3732	4.73	1.7239	-2.35	0.7632	-23.58	0.0662
4650	8.10	2.5415	7.34	2.3269	4.54	1.6873	-2.57	0.7437	-23.92	0.0637
4700	7.94	2.4936	7.17	2.2819	4.36	1.6518	-2.79	0.7249	-24.26	0.0613
4750	7.77	2.4469	7.00	2.2381	4.18	1.6174	-3.02	0.7066	-24.59	0.0589
4800	7.61	2.4014	6.83	2.1955	3.99	1.5839	-3.24	0.6890	-24.93	0.0567
4850	7.45	2.3572	6.67	2.1541	3.81	1.5513	-3.45	0.6719	-25.26	0.0546
4900	7.29	2.3141	6.50	2.1137	3.64	1.5197	-3.67	0.6554	-25.58	0.0526
4950	7.13	2.2721	6.34	2.0744	3.46	1.4890	-3.88	0.6394	-25.91	0.0506

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km)
for a characteristic field strength of 100 mV/m

Page 5 of 8

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
5000	6.97	2.2313	6.18	2.0362	3.28	1.4591	-4.10	0.6239	-26.23	0.0488
5050	6.81	2.1914	6.02	1.9989	3.11	1.4300	-4.31	0.6089	-26.56	0.0470
5100	6.66	2.1526	5.86	1.9626	2.93	1.4017	-4.52	0.5943	-26.88	0.0453
5150	6.51	2.1147	5.70	1.9272	2.76	1.3741	-4.73	0.5802	-27.19	0.0437
5200	6.35	2.0778	5.54	1.8927	2.59	1.3473	-4.94	0.5665	-27.51	0.0421
5250	6.20	2.0418	5.39	1.8591	2.42	1.3212	-5.14	0.5532	-27.83	0.0406
5300	6.05	2.0067	5.23	1.8263	2.25	1.2958	-5.35	0.5404	-28.14	0.0392
5350	5.90	1.9724	5.08	1.7943	2.08	1.2711	-5.55	0.5279	-28.45	0.0378
5400	5.75	1.9389	4.93	1.7631	1.92	1.2470	-5.75	0.5157	-28.76	0.0365
5450	5.60	1.9063	4.77	1.7326	1.75	1.2235	-5.95	0.5040	-29.06	0.0352
5500	5.46	1.8744	4.62	1.7029	1.59	1.2006	-6.15	0.4925	-29.37	0.0340
5550	5.31	1.8433	4.47	1.6739	1.42	1.1783	-6.35	0.4814	-29.67	0.0328
5600	5.17	1.8129	4.33	1.6456	1.26	1.1565	-6.55	0.4706	-29.97	0.0317
5650	5.02	1.7832	4.18	1.6180	1.10	1.1353	-6.74	0.4602	-30.27	0.0306
5700	4.88	1.7542	4.03	1.5909	0.94	1.1146	-6.94	0.4500	-30.57	0.0296
5750	4.74	1.7259	3.89	1.5646	0.78	1.0944	-7.13	0.4401	-30.87	0.0286
5800	4.60	1.6982	3.74	1.5388	0.63	1.0747	-7.32	0.4304	-31.16	0.0277
5850	4.46	1.6711	3.60	1.5136	0.47	1.0555	-7.51	0.4211	-31.46	0.0267
5900	4.32	1.6446	3.46	1.4890	0.31	1.0367	-7.70	0.4120	-31.75	0.0259
5950	4.18	1.6187	3.32	1.4649	0.16	1.0184	-7.89	0.4031	-32.04	0.0250
6000	4.05	1.5934	3.18	1.4414	0.00	1.0005	-8.08	0.3945	-32.33	0.0242
6050	3.91	1.5686	3.04	1.4184	-0.15	0.9831	-8.27	0.3861	-32.62	0.0234
6100	3.78	1.5444	2.90	1.3959	-0.30	0.9660	-8.45	0.3780	-32.90	0.0226
6150	3.64	1.5207	2.76	1.3739	-0.45	0.9494	-8.63	0.3700	-33.19	0.0219

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km)
for a characteristic field strength of 100 mV/m

Page 6 of 8

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
6200	3.51	1.4975	2.62	1.3524	-0.60	0.9331	-8.82	0.3623	-33.47	0.0212
6250	3.37	1.4748	2.49	1.3314	-0.75	0.9172	-9.00	0.3548	-33.75	0.0205
6300	3.24	1.4525	2.35	1.3108	-0.90	0.9017	-9.18	0.3475	-34.03	0.0199
6350	3.11	1.4308	2.22	1.2906	-1.05	0.8865	-9.36	0.3403	-34.31	0.0193
6400	2.98	1.4095	2.08	1.2709	-1.19	0.8717	-9.54	0.3334	-34.59	0.0186
6450	2.85	1.3886	1.95	1.2515	-1.34	0.8571	-9.72	0.3266	-34.86	0.0181
6500	2.72	1.3682	1.82	1.2326	-1.48	0.8429	-9.90	0.3200	-35.14	0.0175
6550	2.59	1.3481	1.69	1.2141	-1.63	0.8291	-10.07	0.3135	-35.41	0.0170
6600	2.47	1.3285	1.55	1.1960	-1.77	0.8155	-10.25	0.3073	-35.68	0.0164
6650	2.34	1.3093	1.42	1.1782	-1.91	0.8022	-10.42	0.3012	-35.95	0.0159
6700	2.21	1.2905	1.29	1.1608	-2.06	0.7892	-10.60	0.2952	-36.22	0.0154
6750	2.09	1.2720	1.17	1.1437	-2.20	0.7765	-10.77	0.2894	-36.49	0.0150
6800	1.97	1.2539	1.04	1.1270	-2.34	0.7641	-10.94	0.2837	-36.76	0.0145
6850	1.84	1.2362	0.91	1.1106	-2.48	0.7519	-11.11	0.2782	-37.02	0.0141
6900	1.72	1.2188	0.78	1.0946	-2.62	0.7400	-11.28	0.2728	-37.29	0.0137
6950	1.60	1.2017	0.66	1.0788	-2.75	0.7283	-11.45	0.2675	-37.55	0.0133
7000	1.47	1.1850	0.53	1.0634	-2.89	0.7169	-11.62	0.2624	-37.82	0.0129
7050	1.35	1.1686	0.41	1.0483	-3.03	0.7057	-11.79	0.2573	-38.08	0.0125
7100	1.23	1.1525	0.29	1.0334	-3.16	0.6947	-11.96	0.2524	-38.34	0.0121
7150	1.11	1.1367	0.16	1.0189	-3.30	0.6840	-12.12	0.2477	-38.60	0.0118
7200	0.99	1.1212	0.04	1.0046	-3.43	0.6735	-12.29	0.2430	-38.85	0.0114
7250	0.88	1.1060	-0.08	0.9906	-3.57	0.6632	-12.45	0.2384	-39.11	0.0111
7300	0.76	1.0911	-0.20	0.9769	-3.70	0.6531	-12.62	0.2340	-39.37	0.0108
7350	0.64	1.0765	-0.32	0.9634	-3.83	0.6432	-12.78	0.2296	-39.62	0.0104

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
7400	0.52	1.0621	-0.44	0.9502	-3.97	0.6335	-12.94	0.2254	-39.87	0.0101
7450	0.41	1.0480	-0.56	0.9372	-4.10	0.6240	-13.10	0.2212	-40.13	0.0099
7500	0.29	1.0341	-0.68	0.9245	-4.23	0.6147	-13.26	0.2172	-40.38	0.0096
7550	0.18	1.0205	-0.80	0.9120	-4.36	0.6055	-13.42	0.2132	-40.63	0.0093
7600	0.06	1.0072	-0.92	0.8997	-4.49	0.5966	-13.58	0.2093	-40.88	0.0090
7650	-0.05	0.9941	-1.03	0.8877	-4.62	0.5878	-13.74	0.2055	-41.12	0.0088
7700	-0.16	0.9812	-1.15	0.8759	-4.74	0.5792	-13.90	0.2018	-41.37	0.0085
7750	-0.28	0.9685	-1.27	0.8643	-4.87	0.5707	-14.06	0.1982	-41.62	0.0083
7800	-0.39	0.9561	-1.38	0.8529	-5.00	0.5625	-14.21	0.1947	-41.86	0.0081
7850	-0.50	0.9439	-1.50	0.8417	-5.12	0.5543	-14.37	0.1912	-42.11	0.0078
7900	-0.61	0.9319	-1.61	0.8307	-5.25	0.5464	-14.53	0.1878	-42.35	0.0076
7950	-0.72	0.9201	-1.73	0.8198	-5.38	0.5385	-14.68	0.1845	-42.59	0.0074
8000	-0.83	0.9085	-1.84	0.8092	-5.50	0.5309	-14.83	0.1813	-42.84	0.0072
8050	-0.94	0.8971	-1.95	0.7988	-5.62	0.5233	-14.99	0.1781	-43.08	0.0070
8100	-1.05	0.8859	-2.06	0.7885	-5.75	0.5159	-15.14	0.1750	-43.32	0.0068
8150	-1.16	0.8749	-2.18	0.7785	-5.87	0.5087	-15.29	0.1720	-43.55	0.0066
8200	-1.27	0.8641	-2.29	0.7686	-5.99	0.5016	-15.44	0.1690	-43.79	0.0065
8250	-1.38	0.8535	-2.40	0.7588	-6.12	0.4946	-15.59	0.1661	-44.03	0.0063
8300	-1.48	0.8430	-2.51	0.7493	-6.24	0.4877	-15.74	0.1632	-44.27	0.0061
8350	-1.59	0.8327	-2.62	0.7399	-6.36	0.4810	-15.89	0.1604	-44.50	0.0060
8400	-1.70	0.8226	-2.73	0.7306	-6.48	0.4743	-16.04	0.1577	-44.74	0.0058
8450	-1.80	0.8127	-2.83	0.7215	-6.60	0.4678	-16.19	0.1550	-44.97	0.0056
8500	-1.91	0.8029	-2.94	0.7126	-6.72	0.4615	-16.34	0.1524	-45.20	0.0055
8550	-2.01	0.7933	-3.05	0.7038	-6.84	0.4552	-16.49	0.1499	-45.43	0.0053

Continued . . .

TABLE III - Skywave field strength vs distance (200 to 10 000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
8600	-2.12	0.7838	-3.16	0.6952	-6.95	0.4490	-16.63	0.1474	-45.66	0.0052
8650	-2.22	0.7745	-3.26	0.6867	-7.07	0.4430	-16.78	0.1449	-45.89	0.0051
8700	-2.32	0.7653	-3.37	0.6783	-7.19	0.4370	-16.92	0.1425	-46.12	0.0049
8750	-2.43	0.7563	-3.48	0.6701	-7.31	0.4312	-17.07	0.1401	-46.35	0.0048
8800	-2.53	0.7474	-3.58	0.6620	-7.42	0.4254	-17.21	0.1378	-46.58	0.0047
8850	-2.63	0.7387	-3.69	0.6540	-7.54	0.4198	-17.36	0.1356	-46.81	0.0046
8900	-2.73	0.7301	-3.79	0.6462	-7.65	0.4142	-17.50	0.1334	-47.03	0.0044
8950	-2.83	0.7216	-3.90	0.6385	-7.77	0.4088	-17.64	0.1312	-47.26	0.0043
9000	-2.93	0.7133	-4.00	0.6309	-7.88	0.4034	-17.78	0.1291	-47.48	0.0042
9050	-3.03	0.7051	-4.10	0.6235	-8.00	0.3982	-17.93	0.1270	-47.71	0.0041
9100	-3.13	0.6970	-4.21	0.6161	-8.11	0.3930	-18.07	0.1249	-47.93	0.0040
9150	-3.23	0.6891	-4.31	0.6089	-8.23	0.3879	-18.21	0.1229	-48.15	0.0039
9200	-3.33	0.6813	-4.41	0.6018	-8.34	0.3829	-18.35	0.1210	-48.38	0.0038
9250	-3.43	0.6736	-4.51	0.5948	-8.45	0.3780	-18.49	0.1190	-48.60	0.0037
9300	-3.53	0.6660	-4.61	0.5879	-8.56	0.3731	-18.63	0.1171	-48.82	0.0036
9350	-3.63	0.6585	-4.72	0.5811	-8.67	0.3684	-18.76	0.1153	-49.04	0.0035
9400	-3.73	0.6511	-4.82	0.5744	-8.79	0.3637	-18.90	0.1135	-49.26	0.0034
9450	-3.82	0.6439	-4.92	0.5678	-8.90	0.3591	-19.04	0.1117	-49.47	0.0034
9500	-3.92	0.6368	-5.02	0.5613	-9.01	0.3546	-19.18	0.1099	-49.69	0.0033
9550	-4.02	0.6297	-5.12	0.5549	-9.12	0.3501	-19.31	0.1082	-49.91	0.0032
9600	-4.11	0.6228	-5.21	0.5486	-9.23	0.3457	-19.45	0.1065	-50.12	0.0031
9650	-4.21	0.6160	-5.31	0.5424	-9.33	0.3414	-19.59	0.1049	-50.34	0.0030
9700	-4.30	0.6092	-5.41	0.5363	-9.44	0.3372	-19.72	0.1033	-50.55	0.0030
9750	-4.40	0.6026	-5.51	0.5303	-9.55	0.3330	-19.86	0.1017	-50.77	0.0029
9800	-4.49	0.5961	-5.61	0.5244	-9.66	0.3289	-19.99	0.1001	-50.98	0.0028
9850	-4.59	0.5896	-5.70	0.5186	-9.77	0.3248	-20.12	0.0986	-51.19	0.0028
9900	-4.68	0.5833	-5.80	0.5128	-9.87	0.3209	-20.26	0.0971	-51.41	0.0027
9950	-4.78	0.5770	-5.90	0.5072	-9.98	0.3169	-20.39	0.0956	-51.62	0.0026
10000	-4.87	0.5709	-5.99	0.5016	-10.09	0.3131	-20.52	0.0942	-51.83	0.0026

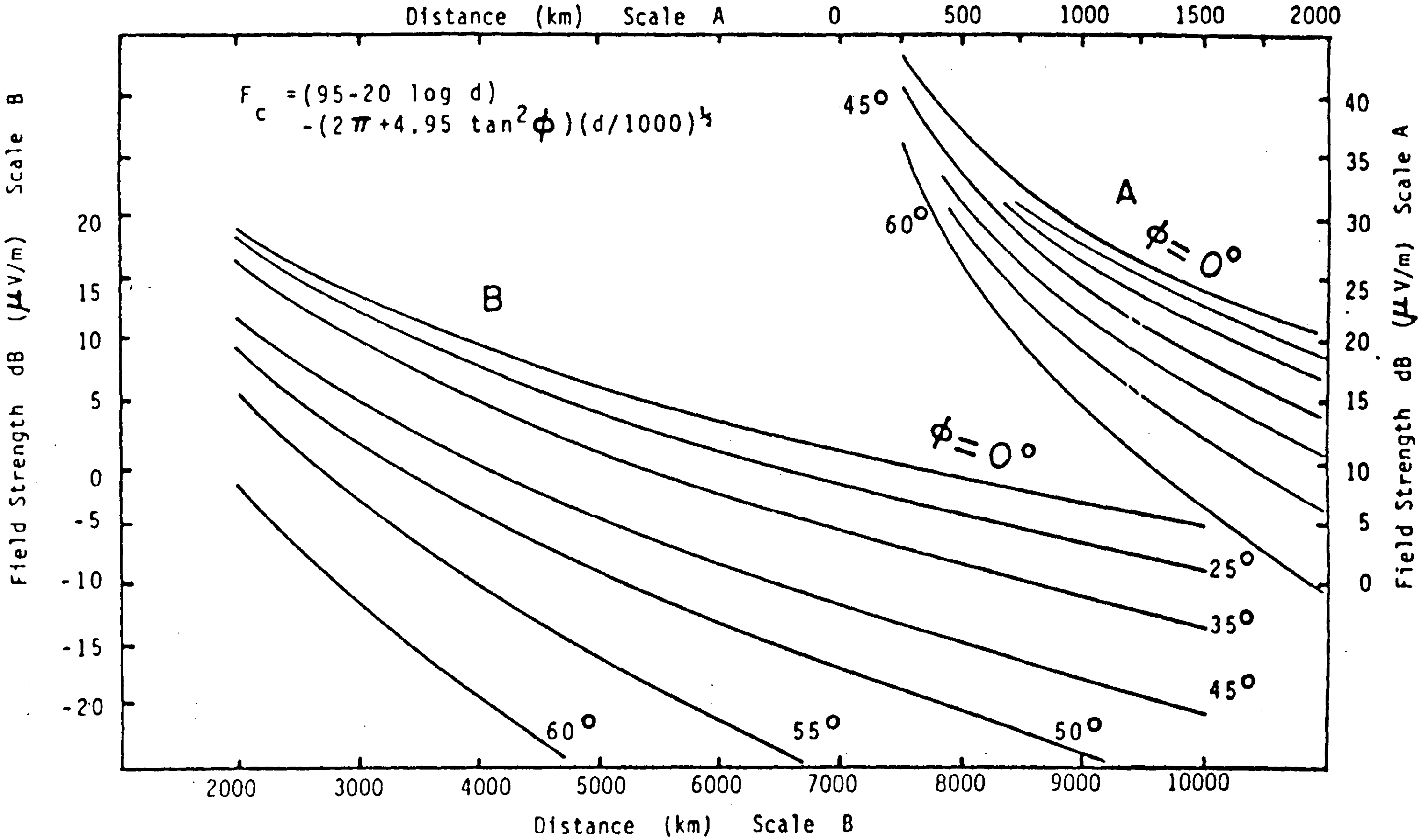


FIGURE 4 - Skywave field strength vs distance (for a characteristic field strength of 100 mV/m at 1 km, 50%, 2 hours after sunset)

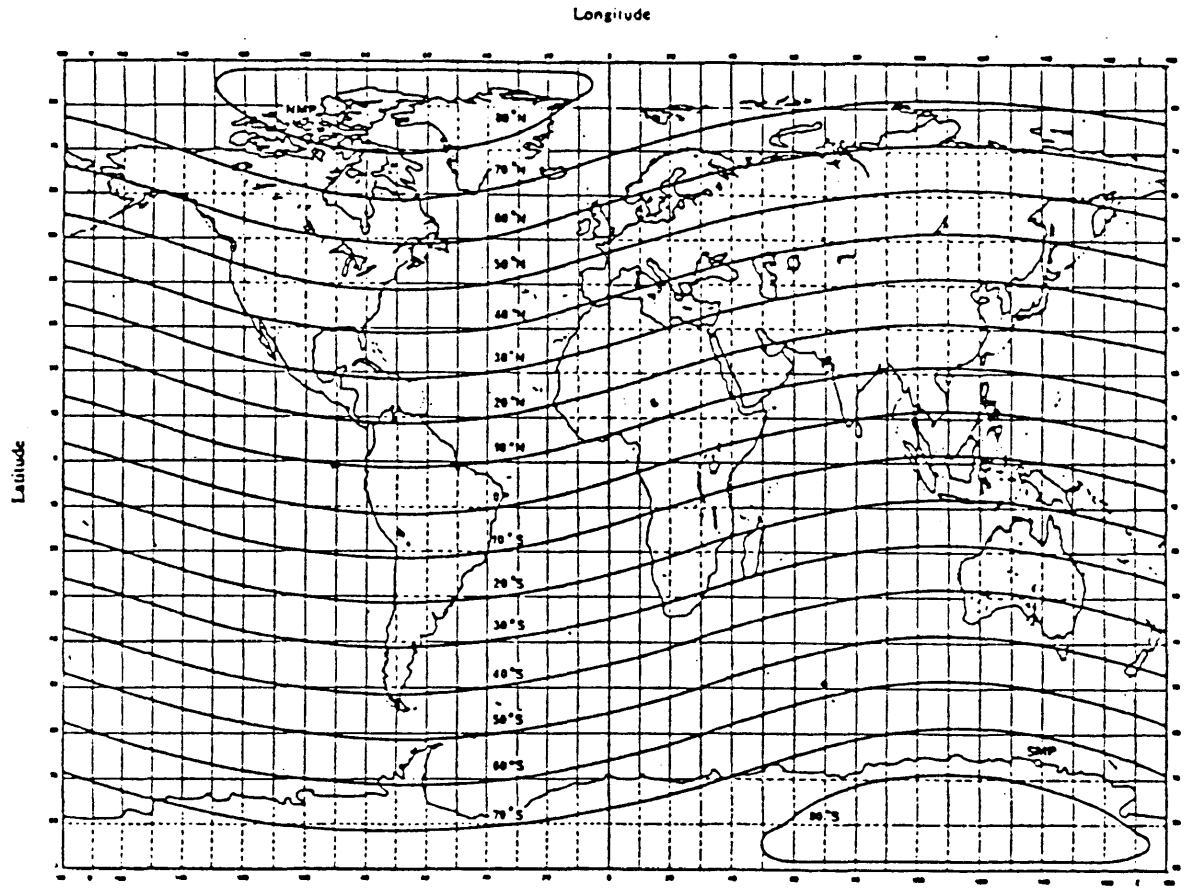


FIGURE 5

Geomagnetic latitudes

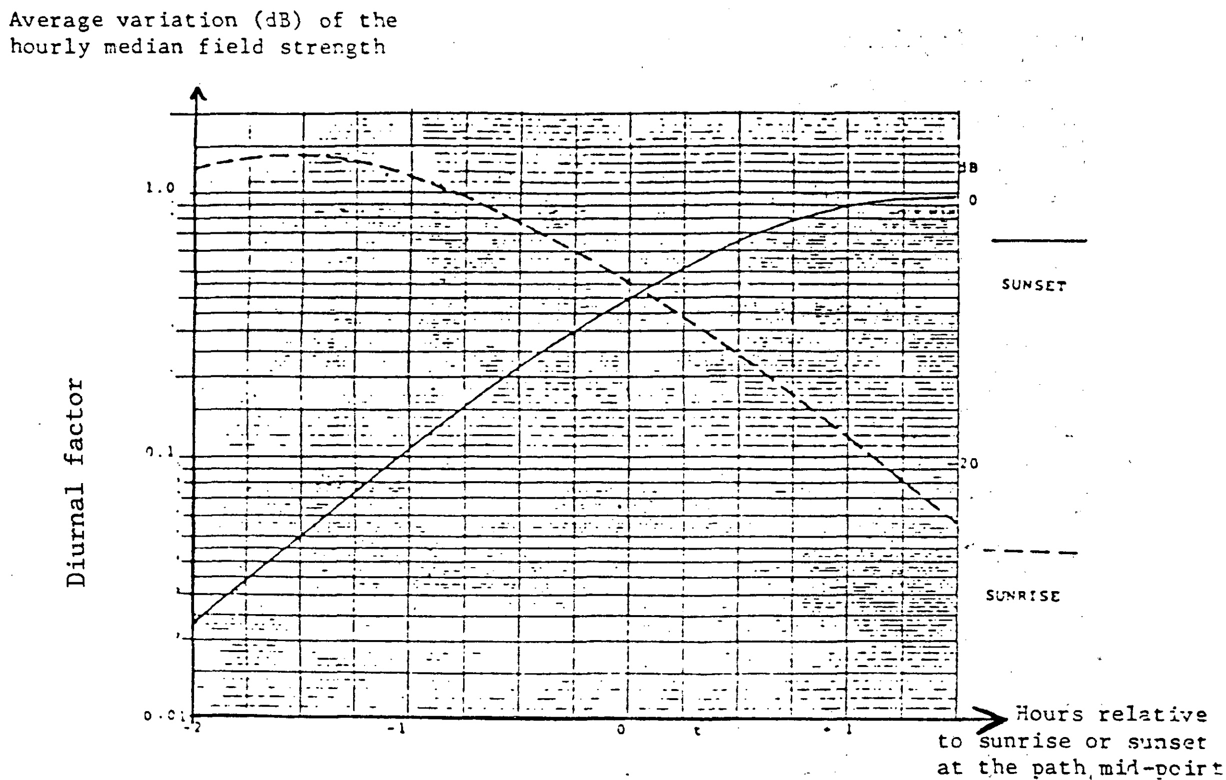


FIGURE 6

Diurnal Curves for the 1605-1705 kHz band

Calculated at 1655 kHz

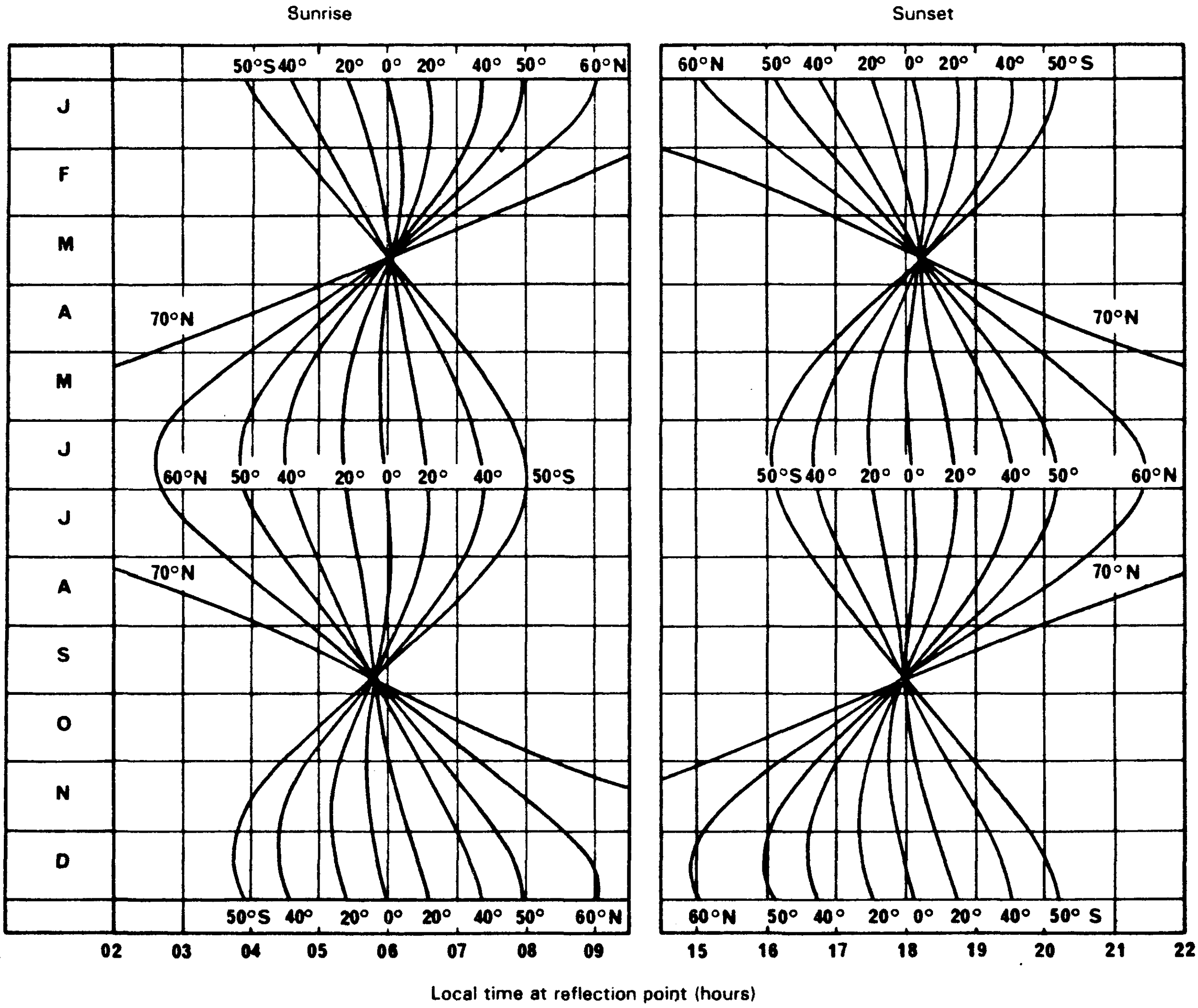


FIGURE 7 - *Times of sunrise and sunset for various months and geographical latitudes*

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 47-E
17 April 1986
Original: French

COMMITTEE 6

Source: Document 44

FIRST SERIES OF TEXTS FROM COMMITTEE 4

TO THE EDITORIAL COMMITTEE

The text set out in Document 44 has been adopted by Committee 4 and is hereby submitted to the Editorial Committee.

M.L. PIZARRO
Chairman of Committee 4

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) **RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2**

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 48-E
24 April 1986
Original: English

COMMITTEE 5

SUMMARY RECORD

OF THE

FOURTH MEETING OF COMMITTEE 5

(PLANNING CRITERIA)

Thursday, 17 April 1986, at 0910 hrs

Chairman: Mr. M. FERNANDEZ-QUIROZ (Mexico)

Subjects discussed:		Documents
1.	Draft first report of Committee 5 to the Plenary	DT/7
2.	Organization of work	-
3.	Consideration of other services	7, 11, 29, 33

1. Draft first report of Committee 5 to the Plenary (Document DT/7)

1.1 The Chairman said that the report was intended to summarize the discussions held in the Committee and would be presented to the Plenary later in the day.

1.2 In reply to the delegate of the United Kingdom who requested a definition by the IFRB of the terms "the Plan" and "assignment", the representative of the IFRB [Mr. Brooks] said that it was for the Conference itself to define what it meant by "the Plan". As he understood the situation the Plan would comprise both allotments and assignments; however, every regional agreement had defined the Plan included in it in its own way. The term "assignment" was defined in Article 1 of the Radio Regulations, and any definition of assignment included in a regional agreement had to be consistent both with the Convention and with those Regulations.

1.3 The representative of the IFRB [Mr. Berrada] added that the definition in the Radio Regulations (No. 19) was in general terms but as far as the Plan referred to in the document was concerned, the difference between allotments and assignments had to be taken into account.

1.4 The representative of the IFRB [Mr. Brooks] added further that if there were fewer parameters in the assignments appearing in the Plan than there were in Appendix 1, the notification would have to include the characteristics in Appendix 1, when the assignment was notified under Article 12 of the Radio Regulations.

1.5 The Chairman invited the Committee to discuss the document paragraph by paragraph.

Paragraphs 1 and 2

Approved.

Sub-paragraph 2 a)

1.6 The delegate of Brazil pointed out that according to the discussions the previous day assignments would be included only if administrations, during the Second Session or post-Conference period, so desired.

1.7 The delegate of the United States proposed that the sub-paragraph should read: "a) the Plan for the broadcasting service will contain allotments and may contain assignments;" which would reflect the Committee's intentions and at the same time be consistent with sub-paragraph 2 e).

It was so agreed.

Sub-paragraph 2 b)

Approved, on the understanding that the word "requerimientos" would be used for "requirements" in the Spanish text.

1.8 The delegate of the United Kingdom raised the question of the procedure to be followed for notifying the conversion of an allotment to an assignment at the Second Session, particularly where the border areas were concerned.

1.9 The representative of the IFRB said that the procedures to be followed at the Second Session were referred to in sub-paragraph 2 f): after that Session, notification would be by mail. The matter would in any case have to be considered further when the guidelines were discussed.

Sub-paragraph 2 c)

On the suggestion of the delegate of Brazil, it was agreed to replace "standard" by "standardized".

1.10 The delegate of the United Kingdom said that as he had understood the discussions, standardized parameters should be defined in terms of allotments but should also apply when an administration wished to have an assignment. It might therefore be better to delete the words "for the allotments".

1.11 The representative of the IFRB [Mr. Berrada] said that the standardized parameters for allotments would be considered as limits not to be exceeded when an administration converted allotments into assignments. If it were stated that the assignments also had standardized parameters, administrations would be obliged to use only those parameters in all parts of their territory.

1.12 The delegates of the United Kingdom and Canada considered that the words "based on" meant a starting point on which the Plan would be built and that administrations could use higher or lower powers so long as they were within the criteria. The latter said that he thought the intention was that an allotment could be used at a higher or lower power than the standard, provided that the standard was not exceeded at the border. Perhaps the words "standard parameters or the equivalent" would cover the situation.

1.13 The suggestion was supported by the delegates of the United States and of Argentina.

1.14 The delegate of Brazil said that if the Plan was to be based on standardized parameters or their equivalent, it would not be possible for countries to set allotments or assignments below the standard. He therefore suggested that sub-paragraph 2 c) might be reworded by adding to it RECOMMENDS d) from Document 19. The sub-paragraph would then read:

> "The Plan will be based on the use of standardized parameters. However, the possibility should be left open for the case where a group of countries decide to develop at the Conference part of the Plan, consistent with the Regional Plan, subregionally based on a transmitter power less than the standardized parameters."

It was so agreed.

Sub-paragraph 2 d)

1.15 The delegate of Brazil proposed that the sub-paragraph be amended to reflect the fact that separation was not between stations but between allotment zones. Where borders were concerned, the coordination distance would determine the necessary separation.

1.16 The delegate of Canada said that he would prefer the term "standard or standardized" distances rather than coordination distances.

1.17 The delegate of the United States said that provision would still have to be made in respect of adjacent channel matters in border areas, but following interventions by the delegate of Brazil recommending the development of a standard procedure for coordination, and by the representative of the IFRB stating that the Plan would be based on co-channel rather than adjacent channel considerations, he said that he would withdraw a proposal for amendment.

1.18 The Chairman put the following text to the Committee:

"d) the First Session will develop one or more standardized distances for the separation of the allotment areas."

The above text was approved.

Sub-paragraph 2 e)

Approved.

Sub-paragraph 2 f)

1.19 The delegate of the United States said that the sub-paragraph as it stood dealt only with the conversion of allotments to assignments; to make it less specific he proposed that the words "among other things" be inserted after the words "will specify".

It was so agreed.

Subparagraph 2 g)

1.20 The delegate of the United Kingdom having asked what was meant by "in a specified area", the representative of the IFRB said that it was intended to cover the point that if an administration had no allotment to a particular area, it could nevertheless use the channel in that area provided that it did not degrade the allotments of a neighbouring country.

1.21 The delegate of Canada suggested, for greater clarity, that the phrase be placed after the words "not allotted to them".

It was so agreed.

Paragraph 3

Approved.

The first Report of Committee 5 to the Plenary as a whole was approved, as amended.

1.22 The representative of the IFRB [Mr. Berrada] drew the Committee's attention to the difficulties that might arise when considering the sharing criteria or other services. What was described in Document DT/7 would probably apply without any major difficulty in the band 1 605 - 1 625 kHz, but in the band 1 625 - 1 705 kHz, allocated to other services, the application of Article 12 of the Radio Regulations would create difficulties if the allotment was not clearly understood and if the characteristics of each allotment were not precisely defined. He therefore suggested that after consultations with the Board, the Chairman might make a statement to the Committee when it considered other services.

2. Organization of work

It was agreed to establish a Working Group, under the chairmanship of Mr. Johnson (Canada), with a view to adopting a planning method; the Working Group 5-A was to begin its task without delay. It was also agreed to establish a Working Group 5-B during the following week to consider the establishment of guidelines.

3. Consideration of other services (Documents 7, 11, 29, 33)

3.1 The delegate of Canada, referring to Document 7, said that at the time of the WARC-1979 decision relating to the allotment of the band 1 605 - 1 705 kHz to the broadcasting service, it had been generally agreed that the band was to be used exclusively for that service. Since it was still being used for other services by some administrations, however, it had been decided that the exclusive use for broadcasting should be deferred to the date shown in the Radio Regulations; the matter had been covered by RR 480 and RR 481. His Administration had felt that the band should be used exclusively for broadcasting; however, it was prepared to take into account the non-broadcasting needs mentioned by the delegate of Argentina and the points relating to sharing raised by the IFRB in Document 33.

3.2 The delegate of the United States referred to Document 11, Part Three, which concluded that if any non-broadcasting services were continued in the band its capacity for broadcasting would correspondingly be reduced in those parts of Region 2 with requirements for non-broadcasting services. It was proposed, therefore, that rather than curtail broadcasting opportunities, administrations did their utmost to reassign their non-broadcasting services to other bands, and that the planning of the new band for use by the broadcasting service should be accomplished without regard for other radio services. In cases where administrations foresaw difficulties in assigning continued non-broadcasting requirements to other bands, one solution might be to allow such administrations the option of bilateral or multilateral arrangements for non-broadcasting services, whilst avoiding constraints on broadcasting opportunities throughout the rest of the Region.

3.3 The delegate of France felt that the proposals expressed by the delegates of Canada and the United States might imply that the non-broadcasting services concerned would become secondary services and he pointed out that the Conference was not empowered to change the status of bands.

3.4 The delegate of Argentina, referring to Document 29, said that the technical criteria for sharing the band were governed by RR 481. His Administration had also taken into account the documents mentioned in paragraph 2.2, as well as RR 480 and RR 481 with regard to protection contours; it had likewise borne in mind administrations' observations concerning the other services in the band.

The proposal in sub-paragraph 3 a), that the Second Session of the Conference should set an implementation date, would make it possible to begin implementation without displacing existing services and to use existing receivers, with technical adjustments, in less developed zones. The proposal contained in sub-paragraph 3 b) would, as mentioned, allow other services to relocate or withdraw as broadcasting stations were implemented. The proposal in sub-paragraph 3 c) was aimed at avoiding difficulties stemming from existing discrepancies between protection ratios, field strengths and operating procedures; bearing in mind the discrepancies referred to in the documentation submitted by the CCIR and various administrations relating to Regions 1 and 3, his Administration proposed that, in order to support CCIR's interim efforts, an intersessional Working Group should be established to consider values for contour protection.

3.5 The representative of the IFRB said that Document 33 had been prepared bearing in mind the differing status of the various services with regard to assignments and assignment plans in the Master Register. The Board had not considered the application of allotment planning; should an allotment plan be established, however, it could be applied on the basis of experience gained with previous allotment plans - but the sharing criteria and allotment areas must be clearly defined. Pursuant to RR 419, primary and permitted services would have equal rights except in the preparation of frequency plans, a task which a conference had to carry out while in session.

With regard to the application of RR 480 it seemed, from what had been said earlier in the meeting, that in general, requirements would not be solicited from administrations. With regard to the application of RR 481, the situation regarding Region 2 was that, prior to the Second Session of the Conference, the band 1 625 - 1 705 kHz was allocated only to the fixed, mobile and aeronautical navigation services and was not available to the broadcasting service; the considerations mentioned in sub-paragraphs b) and c) of paragraph 5.2 were therefore applicable. The Master Register currently contained some 800 entries for other services in the band 1 605 - 1 705 kHz.

The procedures after the Second Session of the Conference and after the dates at which the allocation was modified were outlined in paragraphs 6.3.1 and 6.3.2; the relations between the Plan and the other services were noted in paragraph 6.3.3. Section 7 dealt with relations with non-parties to the Agreement in the three Regions.

The Second Session of the Conference should be made competent to deal with all services in the bands and could produce an agreement on the relationship between the various services, applicable to the parties to the Agreement; that relationship was currently covered under Article 12 of the Radio Regulations. The Conference must clarify what the allotments and the relevant criteria were to be, with regard to planned and other services. Therefore, Committee 5 should request Committee 4 to consider the criteria to be adopted; perhaps it could also request the Working Group of the Plenary to consider drafting a text for the Second Session.

3.6 The delegate of the United Kingdom, referring to Document 33, said that RR 481 applied to the whole of Region 2, not just to the Members, which meant that after a certain date all fixed and mobile services would become permitted services. Therefore, he was puzzled by the statement (sub-paragraph 5.2 b)) that the Board was obliged to protect the fixed and mobile services of non-participating countries. With regard to sub-paragraph 6.3.1. c), he would not have thought that a plan required protection until the date of modification, or indeed at all. With regard to paragraph 6.3.3, requests for the Board to examine notices of the other services were feasible under an assignment plan; in the case of allotment, however, entries would be made over such vast areas that consideration would be impossible until allotments had been converted into assignments. He took paragraph 7.1 to imply that an allotment plan should be converted into an assignment plan and thus recorded in the Master Register as soon as possible after the Conference, in order to secure protection. He would appreciate clarification on the above points.

3.7 The representative of the IFRB said that RR 481 applied to all countries of the region; therefore, primary services would become permitted services at the date agreed upon by the Conference, and their protection would be obligatory. With regard to protection, the Board's interpretation of RR 419 was that, except for the period during which the Plan was protected, the permitted and primary services enjoyed the same status; after that date, the two services would enjoy the same protection under Article 12 of the Radio Regulations. With regard to paragraph 6.3.3, it was up to the Conference to decide what type of protection was to be given between the permitted and planned services; difficulties would doubtless arise, but the matter was one for the contracting parties to deal with. The Board did not suggest that the Plan should go into the Master Register; in the past, only world-wide plans had been so entered.

Assignments, when put into service, were recorded pursuant to Article 12, which provided for deadlines prior to which an assignment could be notified.

3.8 The delegate of the United Kingdom said that for the time being he would accept the explanations given.

3.9 The delegate of the United States said that he shared some of the doubts expressed by the delegate of the United Kingdom, and he thanked the representative of the IFRB for his replies. His Delegation noted that, according to paragraph 4.1 of Document 33, no country in Region 2 could use the band for broadcasting, except if it had allotments/assignments in the Plan. According to sub-paragraph 5.1 b), however, Recommendation 504, stating that the use of the relevant bands by the broadcasting service should not commence before certain specified dates, was cited in a provision of the Radio Regulations and should have the same status as a provision of the latter. According to paragraph 6.1, the band 1 625 - 1 705 kHz was allocated, prior to the Second Session of the Conference, "only" to the fixed, mobile and aeronautical radionavigation services on a primary basis. Those and other concerns raised by Document 33 required careful discussion.

3.10 The delegate of Canada, referring to Document 29, suggested that the third part of the proposal on page 2 relating to shared services should be considered by Committee 4 rather than Committee 5. Referring to Document 33, he said that it had raised a number of difficulties for his Delegation also. The IFRB, instead of providing the guidance it had given to past conferences, seemed rather to be raising obstacles; its interpretation of possibly ambiguous wording in the Radio Regulations seemed unduly restrictive rather than helpful. His Administration could support two of the solutions proposed in the document: in particular he welcomed the Board's interpretation of RR 480 and the suggestion in the last line of 5.2 c) "to leave this matter to administrations to decide on bilaterally". It felt, that on a number points the document was misleading. For example, given the difficulties encountered at previous conferences in determining the period for elaboration of the Plan, it was surprising to see a fixed instant in time implied in paragraph 2.3; in at least two previous conferences, moreover, the Plan had been taken to mean the Plan itself and its associated provisions - in other words, that entries made at the time of the Conference and entries made in the way of modifications after the Conference were accorded the same status and at both Conferences, the equality of those two entries was very important to the delegations present. In addition, it would be wrong in the future to imply, as in paragraph 1.2, that there had been no objections, at previous conferences, to the Board's interpretation of the status of permitted and primary services. It would be necessary to state that at least one administration had objected to the Board's interpretation of permitted services.

With regard to the number of entries in the Master Register, Canada had been carefully reviewing its own assignments and intended to delete at least half of them as soon as possible; measures were also in hand to make the band in question exclusive to the broadcasting service in Canada and to withdraw other services from it. Such action was consistent with the aims of WARC-79 and the RARC Rio de Janeiro, 1981. Until the task was completed, the continued operation of non-broadcasting services in Canada would be no obstacle to the development of the Plan; it was hoped that other administrations would take similar action. His Administration had already shown a willingness to accommodate special needs when the compromise decision on a planning method had been adopted in the Committee, where one administration stated the need for an assignment plan.

3.11 The representative of the IFRB said that the suggestion made by the delegate of Canada that the Plan should be dynamic implied that the non-broadcasting services would remain in uncertainty as to their status indefinitely being downgraded, in effect, to secondary service status. That was not the intention of RR 419. Should it be decided to apply an exclusive allocation in Canada, the Radio Regulations must still be followed in order to give protection to the fixed and mobile services pursuant to international regulations.

He suggested that the other points raised might be discussed at a later meeting or informally.

The meeting rose at 1220 hours.

The Secretary:	The Chairman:
M. GIROUX	M. FERNANDEZ-QUIROZ

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Corrigendum 1 to
Document 49-E
7 May 1986
Original : Spanish

PLENARY MEETING

MINUTES OF THE

SECOND PLENARY MEETING

Paragraph 1.3

In the final sentence, delete the word "terminal" preceding "transmitter power".

Paragraph 2.1

Amend the first and second sentences as follows :

"2.1 The Chairman of Committee 5, introducing the report contained in Document 45, said that the Committee had held four meetings, beginning by clarifying its terms of reference and then proceeding to discuss ten documents relating to the planning approach. At the fourth meeting agreement had been reached on some bases and method of planning, as set out in sub-paragraphs 2) to 2g) of Document 45. ..."

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 49-E
22 April 1986
Original: English

PLENARY MEETING

MINUTES

OF THE

SECOND PLENARY MEETING

Thursday, 17 April 1986, at 1605 hrs

Chairman: Mr. F. Savio C. PINHEIRO (Brazil)

Subjects discussed:	Document
1. Oral reports by Chairmen of Committees	-
2. First report of Committee 5	45

1. Oral reports by Chairmen of Committees

1.1 Report by the Chairman of Committee 2 (Credentials)

The Chairman of Committee 2 said that the Committee had held one meeting, at which it had set up a small Working Group consisting of himself, the Vice-Chairman and a delegate of Canada. A second meeting would be held shortly for the examination of all the credentials submitted to Committee 2.

1.2 Report by the Chairman of Committee 3 (Budget control)

The Chairman of Committee 3 said that his Committee had held one meeting, at which it had reviewed the Conference budget set out in Document 5 and had found that the budget was in good order and that adequate facilities had been provided for the Conference. The Committee had further established the unit value of contributions to be paid by participating non-exempt recognized private operating agencies, but so far no such agencies had expressed their intention to attend. With regard to the financial responsibilities of the Conference under Article 80 of the Convention and Resolution No. 48 of the Nairobi Conference, two documents for the intention of the Chairmen of Committees 4 and 5, the Secretary-General, the Director of the CCIR and the Chairman of the IFRB had been prepared and would be distributed shortly. Finally, the Committee had reviewed the provisions laid down by the Administrative Council on the terms on which Member Administrations from regions other than Region 2 could attend the Conference and was defining the costs that such administrations would have to bear if they chose to attend under those conditions. Committee 3 would hold its second meeting in the course of the following week.

1.3 Report by the Chairman of Committee 4 (Technical criteria)

The Chairman of Committee 4 said that his Committee had held two meetings, at the first of which it had established two Working Groups, 4-A on technical data relating to propagation and 4-B to establish broadcasting standards and transmission characteristics. Working Group 4-A had already submitted a report on groundwave propagation which had been approved by Committee 4 and would be forwarded to the Editorial Committee and its report on skywave propagation was expected in the near future; nevertheless, some administrations might have new proposals to make in connection with Annex I to Document 3 from the CCIR when that document was reviewed at the next meeting of Committee 4. Although Working Group 4-B had made considerable progress, it still had much to do with respect to such matters as terminal transmitter power, antenna characteristics and usable field strength, and it was to be hoped that adequate meeting time would be allocated to that Group.

1.4 Report by the Chairman of Committee 6 (Editorial)

The Chairman of Committee 6 said that the Committee had held one meeting, at which its terms of reference had been recapitulated, the organization of its work had been established with a satisfactory balance between the three working languages of the Conference and an initial approach had been agreed upon for the tentative structure of the report of the first session to the second session: if that structure was approved by the Steering Committee, it could be followed by Committees 4 and 5 in the preparation of their contributions to the report. Finally, owing to the good progress made by Committee 4, Committee 6 would be able to begin its substantive work on the following day.

1.5 The Chairman thanked the Chairmen of Committees 2, 3, 4 and 6 for their encouraging reports.

2. First report of Committee 5 (Planning criteria) (Document 45)

2.1 The Chairman of Committee 5, introducing the report, said that the Committee had held four meetings, beginning by clarifying its terms of reference and then proceeding to discuss 10 documents relating to the planning approach. At the fourth meeting, agreement had been reached on the approach set out in §§ 2 a) to 2 g). The Committee had then set up Working Group 5-A to develop the structure of the Plan and intended to establish Working Group 5-B to prepare guidelines for the Agreement. Finally on completing its work on the planning approach, Committee 5 had begun to discuss sharing criteria in the band under consideration; a very important paper (Document 33) by the IFRB on its interpretation of those criteria had been introduced and had already given rise to divergent opinions.

Document 45 was approved.

2.2 The Chairman thanked the Chairman of Committee 5 for his report, which reflected the excellent work done by his Committee.

The meeting rose at 1630 hours.

The Secretary-General:
R.E. BUTLER

The Chairman:
F. Savio C. PINHEIRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 50-E
21 April 1986
Original : English
French
Spanish

LIST OF DOCUMENTS

(1 to 50)

No.	Origin	Title	Destination
1	SG	Agenda of the Conference	PL
2	SG	Credentials of delegations	C.2
3+Add.1	SG	Note by the Secretary-General	C.4
4	USA	Proposals	C.4
5	SG	Budget of the Conference	C.3
6	SG	Contributions of non-exempt recognized private operating agencies and international organizations	C.3
7+Corr.1	CAN	Proposals	C.4, C.5, WG/PL
8	B	Proposals	C.4, C.5
9	SG	Participation requests submitted by international organizations	PL
10	SG	Loss of the right to vote	PL
11	USA	Additional proposals	C.4, C.5
12	SG	Financial responsabilities of administrative conferences	C.3
13	CHL	Planning method	C.5
14	CHL	Technical bases for planning the broadcasting service in the band 1 605 - 1 705 kHz	C.4
15	SG	Invitations	-
16	PRG	Proposals	C.5
17	PRG	Antenna system for the broadcasting service in the band 1 605 - 1 705 kHz (Information document)	-

No.	Origin	Title	Destination
18(Rev.1) +Corr.1	SG	Provisional rules for attending regional administrative conferences by Members not belonging to the Region concerned	C.3
19	SG	Note by the Secretary-General: text of a Resolution adopted in the fourth meeting of the Permanent Technical Committee of CITEL	-
20	CUB	Planning	C.5
21	CUB	Required field strength	C.4
22	CUB	Sky-wave propagation	C.4
23	ARG	Proposals (Agenta item 2.1.7)	C.5
24	ARG	Proposals (Agenta items 2.1.6 and 2.1.7)	C.4, C.5
25	PL	Structure of the First Session of the RARC BC-R2(1)	-
26	PL	Conference chairmanships	-
27	SG	Secretariat of the Conference	-
28	C.1	General schedule of the work of the Conference	-
29	ARG	Proposals (Agenta item 2.2)	C.4
30	SG	Allocation of documents	-
31	PL	Minutes of the First Plenary Meeting	PL
32+Corr.1	C.4	Note from the Chairman of Committee 4	C.4
33	SG	Note by the IFRB to the Conference: Status of the primary and permitted services	-
34	SG	Report by the IFRB to the Conference	-

No.	Origin	Title	Destination
35	C.4	Summary Record of the First Meeting of Committee 4	C.4
36	C.5	Summary Record of the First Meeting of Committee 5	C.5
37	C.3	Summary Record of the First Meeting of Committee 3	C.3
38	C.2	Summary Record of the First Meeting of Committee 2	C.2
39	C.6	Summary Record of the First Meeting of Committee 6	C.6
40	ARG	Proposals (Agenda item 2.1.7)	C.5
41	C.5	Summary Record of the Second Meeting of Committee 5	C.5
42	C.5	Summary Record of the Third Meeting of Committee 5	C.5
43	C.3	Information note to the Chairmen of Committee 4 and 5	C.4, C.5
44	WG/4A	First Report of Working Group 4A to Committee 4	C.4
45	C.5	First Report of Committee 5 to the Plenary	PL
46	WG/4A	Second Report of Working Group 4A to Committee 4	C.4
47	C.4	First series of texts from Committe 4 to the Editorial Committee	C.6
48	C.5	Summary Record of the Fourth Meeting of Committee 5	C.5
49	PL	Minutes of the Second Plenary Meeting	PL
50	SG	List of Documents (1 to 50)	-

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 51-E
21 April 1986
Original: French

BUDGET CONTROL COMMITTEE

Note by the Secretary-General

POSITION OF THE CONFERENCE ACCOUNTS

at 18 April 1986

I hereby submit an estimate of the Conference expenses at 18 April 1986 for the consideration of the Budget Control Committee.

The statement shows a surplus of 55,000 Swiss francs over the budget approved by the Administrative Council and adjusted to take account of changes in the common system of salaries and allowances.

R.E. BUTLER
Secretary-General

Annex: 1

ANNEX

Position of RARC BC-R2 accounts at 18 April 1986

Items		Budget approved by AC	Budget adjusted at 1.04 1)	Expenditure at 18.4.1986		
				actual	estimated or committed	total
		- Swiss francs (thousands) -				
Subhead I - Preparatory work						
20.611	IFRB preparatory work	200	200	27	173	200
Subhead II - Staff expenditure						
20.621	Sec. staff salaries	365	371	0	376	376
20.622	Com. serv. staff salaries	336	338	10	303	313
20.623	Travel (recruitment)	14	14	2	10	12
20.624	Insurance	46	46	0	32	32
		761	769	12	721	733
Subhead IV - Premises and equipment						
20.641	Premises, furniture, machines	35	35	0	45	45
20.642	Document production	20	20	0	20	20
20.643	Office supplies and overheads	20	20	2	14	16
20.644	PTT	15	15	0	15	15
20.645	Technical installations	5	5	0	3	3
20.646	Sundry and unforeseen	10	10	0	8	8
		105	105	2	105	107
Subhead V - Other expenses						
20.651	Interest	37	37	0	16	16
Subhead VI - Final Acts						
20.661	Report to the 2nd Session	20	20	0	20	20
Total, Section 20.6		1,123	1,131	41	1,035	1,076
Unused credits						55

1) Budget, including additional credits to take account of changes in the United Nations common system.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 52-E
17 April 1986
Original: English

COMMITTEE 4

FIRST REPORT OF WORKING GROUP 4-B TO COMMITTEE 4

Working Group 4-B has examined the proposals relating to definitions:

- transmission standards;
- effects of receiver characteristics;
- protection ratios (Annex I);
- characteristics of transmitting antennas (Annex II).

Concerning the definitions, Working Group 4-B has only adopted those which were independent from the work of other committees. Further definitions will have to be introduced in a forthcoming report and those in square brackets are still pending on the decisions of Committee 5. Concerning the characteristics of transmitting antennas, the points in square brackets are still under consideration in the Working Group.

The texts in Annexes I and II are presented to Committee 4 for consideration.

T.M. BEILER
Chairman of Working Group 4-B

Annexes: 2

ANNEX I

1. DEFINITIONS

In addition to the definitions given in the Radio Regulations, the following definitions and symbols apply.

Broadcasting channel (AM)

A part of the frequency spectrum, equal to the necessary bandwidth of AM sound broadcasting stations, and characterized by the nominal value of the carrier frequency located at its centre.

Objectionable interference

Interference caused by a signal exceeding the maximum permissible field strength within the protected contour, in accordance with the values derived from this [ ].

Protected contour

Continuous line that delimits the service area which is protected from objectionable interference.

Service area

The area delimited by the contour within which the calculated level of the ground-wave field strength is protected from objectionable interference in accordance with the provisions of Chapter [4].

Nominal usable field strength (E_{nom})

Agreed minimum value of the field strength required to provide satisfactory reception, under specified conditions, in the presence of atmospheric noise, man-made noise and interference from other transmitters. The value of nominal usable field strength has been employed as the reference for planning.

Usable field strength (E_u)

Minimum value of the field strength required to provide satisfactory reception under specified conditions in the presence of atmospheric noise, man-made noise, and interference in a real situation (or resulting from a frequency [assignment] [allotment] plan).

Audio-frequency (AF) signal-to-interference ratio (Recommendation 447-2)

The ratio (expressed in decibels) between the values of the voltage of the wanted signal and the voltage of the interfering signal, measured under specified conditions, at the audio-frequency output of the receiver. These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission characteristics (type and percentage modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

Audio-frequency (AF) protection ratio

Agreed minimum value of the audio-frequency signal-to-interference ratio corresponding to a subjectively defined reception quality. [This ratio may have different values according to the type of service desired.]

Radio-frequency (RF) wanted-to-interfering signal ratio (Recommendation 447-2)

The ratio (expressed in decibels) between the values of the radio-frequency voltage of the wanted signal and the interfering signal, measured at the input of the receiver under specified conditions. These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission characteristics (type and percentage modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

Radio-frequency (RF) protection ratio

The desired radio-frequency signal-to-interference ratio which, in well-defined conditions, makes it possible to obtain the audio-frequency protection ratio at the output of a receiver. These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission characteristics (type and percent modulation, etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

Relative radio-frequency protection ratio

This ratio is the difference, expressed in decibels, between the protection ratio when the carriers of the wanted and unwanted transmitters have a frequency difference of Δf (Hz or kHz) and the protection ratio when the carriers of these transmitters have the same frequency.

Class B station

A station intended to provide coverage over one or more population centres and the contiguous rural areas located in its service area and which is protected against objectionable interference, accordingly.

Class C station

A station intended to provide coverage over a city or town and the contiguous suburban areas located in its service area and which is protected against objectionable interference, accordingly.

Daytime operation

Operation between the times of sunrise and sunset at the transmitter site.

Night-time operation

Operation between the times of sunset and sunrise at the transmitter site.

Synchronized network

Two or more broadcasting stations whose nominal carrier frequencies are identical and which broadcast the same programme simultaneously. In such a synchronized network the difference in carrier frequency between any two transmitters in the network shall not exceed 0.1 Hz. The modulation delay between any two transmitters in the network shall not exceed 100 us, when measured at either transmitter site.

Station power

Unmodulated carrier power supplied to the antenna.

Ground-wave

Electromagnetic wave which is propagated along or near the surface of the Earth and which has not been reflected by the ionosphere.

Sky wave

Electromagnetic wave which has been reflected by the ionosphere.

BROADCASTING STANDARDS

3.1 Channel spacing

The Plan shall be based on a channel spacing of 10 kHz and carrier frequencies which are integral multiples of 10 kHz, beginning at 1 610 kHz.

3.2 Class of emission

The Plan shall be based on double-sideband amplitude modulation with full carrier A3E.

Classes of emission other than A3E could also be used on condition that the energy level outside the necessary bandwidth does not exceed that normally expected in A3E emission, for instance to accommodate stereophonic systems.

3.3 Bandwidth of emission

The Plan shall be based on a necessary bandwidth of 10 kHz for which only 5 kHz audio bandwidth can be obtained. While this might be an appropriate value within some administrations, others may wish to employ wider bandwidth systems with necessary bandwidths of the order of 20 kHz. However, the protection ratios selected allow operation with 20 kHz occupied bandwidth without an appreciable increase in interference. Stations operating on frequency 1 700 kHz shall take into account what is set out in Article 6 of the Radio Regulations.

3.4 Frequency tolerance

As indicated in the Radio Regulations, the frequency tolerance shall be 20 parts in 10^6 for powers of 10 kW or less, and 10 Hz for powers greater than 10 kW.

The effect of receiver characteristics upon AM broadcast standards

It is expected that receiver characteristics for this band will be similar to those of existing receivers in the 535 - 1 605 kHz band. Therefore, they should not impact on broadcast standards.

3.7 Protection ratios

3.7.1 Co-channel protection ratio

The co-channel protection ratio shall be 26 dB.

3.7.2 Adjacent channel protection ratio

- protection ratio for the first adjacent channel: 0 dB

- protection ratio for the second adjacent channel: -29.5 dB

3.7.3 Synchronized networks

In addition to the standards specified in this Report, the following standard shall apply to synchronized networks.

For the purpose of determining interference caused by synchronized networks, the following procedure shall be applied. If any two transmitters are less than 400 km apart, the network shall be treated as a single entity, the value of the composite signal being determined by the quadratic addition of the interfering signals from all the individual transmitters in the network. If the distances between all the transmitters are equal to or greater than 400 km, the network shall be treated as a set of individual transmitters.

For the purpose of determining sky-wave interference received by any one member of a network, the value of the interference caused by the other elements of the network shall be determined by the quadratic addition of the interfering signals from all of those elements. In any case, where ground-wave interference is a factor it shall be taken into account.

The co-channel protection ratio between stations belonging to a synchronized network shall be 8 dB.

ANNEX II

[CHAPTER 4]

Radiation characteristics of transmitting antennas

In carrying out the calculations indicated in [Chapters 2 and 3,] the following shall be taken into account.

[4.1] Omnidirectional antennas

[Figure 1 of Chapter 3] shows the characteristic field of a simple vertical antenna as a function of its length and of the radius of the ground system.

It is clear that the characteristic field strength increases as the loss in the ground system is reduced to zero and as the antenna height is increased up to 0.625 wavelengths.

The increased characteristic field strength for antenna lengths up to 0.625 wavelengths is obtained at the expense of radiation at high angles as shown graphically in Figure 1a and numerically in [Table II of Chapter 3.]

[4.2] Considerations of the radiation patterns of directional antennas

The procedures for calculating theoretical, expanded and augmented (modified expanded) directional antenna patterns are given in [Appendix 2.]

[4.3] Top-loaded and sectionalized antennas

[4.3.1] Calculation procedures are given in [Appendix 3.]

[4.3.2] Many stations employ top-loaded or sectionalized towers, either because of space limitations or to vary the radiation characteristics from those of a simple vertical antenna. This is done to achieve desired coverage or to reduce interference.

[4.3.3] An administration using top-loaded or sectionalized antennas shall supply information concerning the tower structure of the antennas. Normally, one of the equations in [Appendix 3] shall be employed to determine the vertical radiation characteristics of the antennas. Other equations may also be proposed by an administration and shall be used in determining the vertical radiation characteristics of the antennas of that administration, subject to the agreement of the other administration.

4.4 Use of electrical height in field strength calculations

The electrical height of each antenna radiator is used in the calculation of field strengths produced by an omindirectional or directional antenna.

This electrical height is given in Figure [7.1] hereafter taking the velocity of propagation in the radiator into consideration. The conversion curve given in Figure [7.1] applies to typical triangular cross-section towers that are base fed and base insulated but not top-loaded.

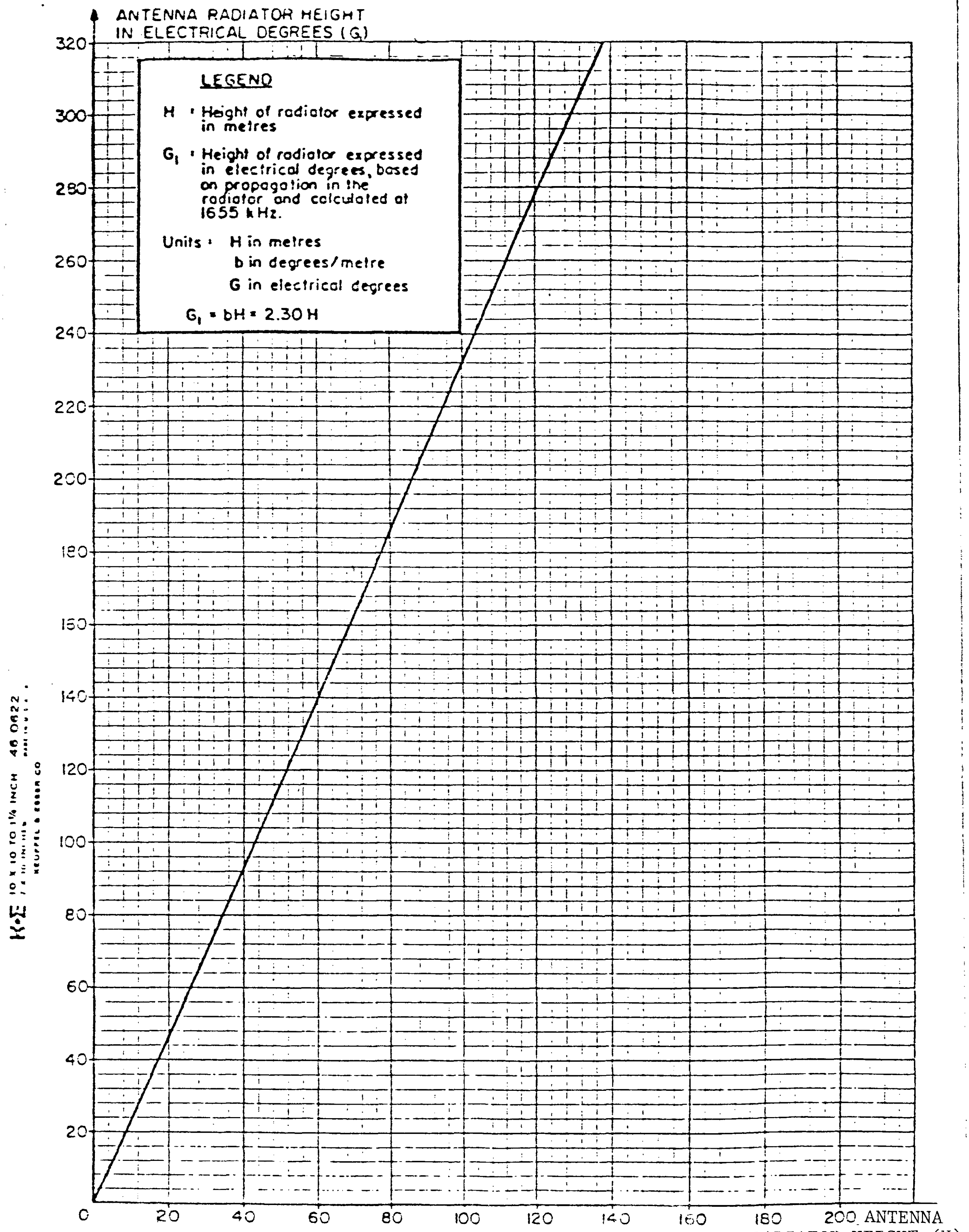


FIGURE [7.1]

Conversion of antenna radiator physical height into electrical degrees

[APPENDIX 2]

Calculation of directional antenna patterns

Introduction

This Appendix describes methods to be employed in calculating the field strength produced by a directional antenna at a given point.

1. *General equations*

The theoretical directional antenna radiation pattern is calculated by means of the following equation, which sums the field strength from each element (tower) in the array.

$$E_T(\varphi, \theta) = \left| K_L \sum_{i=1}^{n} F_i f_i(\theta) \underline{/\psi_i + S_i \cos\theta \cos(\varphi_i - \varphi)} \right| \quad (1)$$

where:

$$f_i(\theta) = \frac{\cos(G_i \sin\theta) - \cos G_i}{(1 - \cos G_i)\cos\theta} \quad (2)$$

where:

$E_T(\varphi, \theta)$: theoretical inverse distance field strength at one kilometre in mV/m for the given azimuth and elevation;

K_L : multiplying constant in mV/m which determines the pattern size (see paragraph 2.5 below for derivation of K_L);

n : number of elements in the directional array;

i : denotes the ith element in the array;

F_i : ratio of the theoretical field strength due to the ith element in the array relative to the theoretical field strength due to the reference element;

θ : vertical elevation angle, in degrees, measured from the horizontal plane;

$f_i(\theta)$: ratio of vertical to horizontal plane field strength radiated by the ith element at elevation angle θ;

G_i : electrical height of the ith element, in degrees;

S_i : electrical spacing of the ith element from the reference point in degrees;

φ_i : orientation of the ith element from the reference element (with respect to True North), in degrees;

φ : azimuth with respect to True North, in degrees;

ψ_i : electrical phase angle of field strength due to the ith element (with respect to the reference element), in degrees.

Equations (1) and (2) assume that:

- the current distribution in the elements is sinusoidal,
- there are no losses in the elements or in the ground,
- the antenna elements are base-fed, and
- the distance to the computation point is large in relation to the size of the array.

2. *Determination of values and constants*

2.1 *Determination of the multiplying constant K for an array*

The multiplying constant K for the loss-free case may be computed by integrating the power flow over the hemisphere, deriving an r.m.s. field strength and comparing the result with the case where the power is radiated uniformly in all directions over the hemisphere.

Thus:

$$K = \frac{E_r\sqrt{P}}{e_h} \quad \text{mV/m}$$

where:

- K: no-loss multiplying constant (mV/m at 1 km);
- E_r: reference level for uniform radiation over a hemisphere, equal to 244.95 mV/m at 1 km for 1 kW;
- P: antenna input power (kW);
- e_h: root mean square radiation pattern over the hemisphere which may be obtained by integrating $e(\theta)$ at each elevation angle over the hemisphere. The integration can be made using the trapezoidal method of approximation, as follows:

$$e_h = \left[\frac{\pi\Delta}{180}\left\{\tfrac{1}{2}[e(\theta)]^2 + \sum_{m=1}^{N}[e(m\Delta)]^2 \cos m\Delta\right\}\right]^{\frac{1}{2}} \qquad (3)$$

where:

- Δ: interval, in degrees, between equally-spaced sampling points at different elevation angles θ;
- m: an integer from 1 to N, which gives the elevation angle θ in degrees when multiplied by Δ, i.e. $\theta = m\Delta$;
- N: one less than the number of intervals $\left(N = \frac{90}{\Delta} - 1\right)$;
- $e(\theta)$: root mean square radiation pattern given by equation (1) with K equal to 1 at the specified elevation angle θ (the value of θ is 0 in the first term of equation (3) and $m\Delta$ in the second term); $e(\theta)$ is computed using equation (4).

$$e(\theta) = \left[\sum_{i=1}^{n}\sum_{j=1}^{n} F_i f_i(\theta) F_j f_j(\theta) \cos \psi_{ij} J_0(S_{ij} \cos \theta)\right]^{\frac{1}{2}} \qquad (4)$$

where:

- i: denotes the ith element;
- j: denotes the jth element;
- n: number of elements in the array;
- ψ_{ij}: difference in phase angles of the field strengths from the ith and jth elements in the array;
- S_{ij}: angular spacing between the ith and jth elements in the array;
- $J_0(S_{ij} \cos \theta)$: the Bessel function of the first kind and zero order of the apparent spacing between the ith and jth elements. In equation (4), S_{ij} is in radians. However when special tables of Bessel functions giving the argument in degrees are used, the values of S_{ij} should then be in degrees.

2.2 *Relationship between field strength and antenna current*

The field strength resulting from a current flowing in a vertical antenna element is:

$$E = \frac{R_c I [\cos (G \sin \theta) - \cos G]}{2\pi r \cos \theta} \times 10^3 \quad \text{mV/m} \qquad (5)$$

where:

- E: field strength in mV/m;
- R_c: resistivity of free space ($R_c = 120\pi$ ohms);
- I: current at the current maximum, in amperes [1];
- G: electrical height of the element, in degrees;
- r: distance from the antenna, in metres;
- θ: vertical elevation angle, in degrees.

---

[1] I is the current at the maximum of the sinusoidal distribution. If the electrical height of the element is less than 90°, the base current will be less than I.

At one kilometre and in the horizontal plane ($\theta = 0°$):

$$E = \frac{120\pi I(1-\cos G) \times 10^3}{2\pi(1000)} \qquad \text{mV/m} \qquad (6)$$

hence:

$$E = 60\, I(1 - \cos G) \qquad \text{mV/m} \qquad (7)$$

2.3 *Determination of no-loss current at current maximum*

For a tower of uniform cross-section or for a similar type of directional array element, the no-loss current at the current maximum is:

$$I_i = \frac{KF_i}{60(1-\cos G_i)} \qquad (8)$$

where:

I_i: current at current maximum in amperes in the ith element;

K: no-loss multiplying constant computed as shown in paragraph 2.1 above.

The base current is given by $I_i \sin G_i$.

2.4 *Array power loss*

Power losses in a directional antenna system are of various types, including ground losses, antenna coupling losses, etc. The loss resistance for the array may be assumed to be inserted at the current maximum to allow for all losses. The power loss is:

$$P_L = \frac{1}{1000}\sum_{i=1}^{n} R_i I_i^2 \qquad (9)$$

where:

P_L: total power loss, in kW;

R_i: assumed loss resistance, in ohms (one ohm, unless otherwise indicated) for the ith tower [1];

I_i: current at current maximum (or base current if the element is less than 90 degrees in electrical height) for the ith tower.

2.5 *Determination of a corrected multiplying constant*

To allow for power loss in the antenna system, the multiplying constant K can be modified, as follows:

$$K_L = K\left(\frac{P}{P + P_L}\right)^{\frac{1}{2}} \qquad (10)$$

where:

K_L: multiplying constant after correction for the assumed loss resistance;

K: no-loss multiplying constant computed in paragraph 2.1 above;

P: array input power (kW);

P_L: total power loss (kW).

---

[1] The loss resistance shall in no way exceed a value such that the value of K_L (see paragraph 2.5) differs by more than ten percent from that calculated for a resistance of one ohm.

2.6 *r.m.s. value of radiation to be notified for directional antennas*

The radiation E_r for directional antennas is determined as follows:

$$E_r = K_L\, e(\theta) \qquad \text{mV/m at 1 km}$$

2.7 *Determination of expanded pattern values*

The expanded pattern is determined as follows:

$$E_{EXP}(\varphi, \theta) = 1.05 \left\{ [E_T(\varphi, \theta)]^2 + Q^2 \right\}^{\frac{1}{2}} \tag{11}$$

where:

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

$E_T(\varphi, \theta)$: theoretical pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

Q : quadrature factor, computed as:

$$Q = Q_0\, g(\theta)$$

where:

Q_0 is the Q on the horizontal plane, and is normally the greatest of the following three quantities:

$$10.0 \quad ; \quad 10\sqrt{P} \quad \text{or} \quad 0.025 K_L \left[\sum_{i=1}^{n} F_i^2 \right]^{\frac{1}{2}}$$

$g(\theta)$ is computed as follows:

If the electrical height of the shortest tower is less than or equal to 180 degrees, then:

$g(\theta) = f(\theta)$ for the shortest tower.

If the electrical height of the shortest tower is greater than 180 degrees, then:

$$g(\theta) = \frac{\{[f(\theta)]^2 + 0.0625\}^{\frac{1}{2}}}{1.030776}$$

where $f(\theta)$ for the shortest tower is used.

Note: In comparing the electrical heights of the antenna towers to determine the shortest tower, the total apparent height (as determined by current distribution) is used for top-loaded and sectionalized towers.

2.8 *Determination of augmented (modified expanded) pattern values*

The purpose of the augmented (modified expanded) pattern is to put one or more "patches" on an expanded pattern. Each "patch" is referred to as an "augmentation". The augmentation may be positive (resulting in more radiation than that of the expanded pattern) or negative (resulting in less radiation than that of the expanded pattern). In no case shall the augmentation be so negative that the augmented (modified expanded) pattern radiation is below the theoretical radiation pattern.

Spans of augmentation may overlap. That is, an augmentation may itself be augmented by a subsequent augmentation. To ensure that the calculations are properly made, the augmentations are handled in increasing order of central azimuth of augmentation, starting at True North. If several augmentations have the same central azimuth, then they are considered in order of decreasing span (i.e. the one with the largest span is handled first). If more than one augmentation has the same central azimuth and the same span, then they are considered in ascending order of their effect.

$$E_{MOD}(\varphi, \theta) = \left\{[E_{EXP}(\varphi, \theta)]^2 + g^2(\theta) \sum_{i=1}^{a} A_i \cos^2 (180\,\Delta_i/\alpha_i)\right\}^{\frac{1}{2}} \tag{12}$$

where:

$E_{MOD}(\varphi, \theta)$: augmented (modified expanded) pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$g(\theta)$: same parameter as described for the expanded pattern (see paragraph 2.7);

a: number of augmentations;

Δ_i: difference between the azimuth at which the radiation is desired φ, and the central azimuth of augmentation of the ith augmentation. It will be noted that Δ_i must be less than or equal to one-half of α_i;

α_i: total span of the ith augmentation;

A_i: is the value of the augmentation given by the expression [1]:

$$A_i = [E_{MOD}(\varphi_i, \theta)]^2 - [E_{INT}(\varphi_i, \theta)]^2 \tag{13}$$

where:

φ_i: central azimuth of the ith augmentation;

$E_{MOD}(\varphi_i, \theta)$: augmented (modified expanded) horizontal plane radiation at the central azimuth of the ith augmentation, after applying the ith augmentation, but before applying subsequent augmentations;

$E_{INT}(\varphi_i, \theta)$: an interim value of radiation in the horizontal plane at the central azimuth of the ith augmentation. The interim value is the radiation obtained from applying previous augmentations (if any) to the expanded pattern, but before applying the ith augmentation.

[APPENDIX 3]

Equations for the calculation of the normalized vertical radiation from top-loaded and typical sectionalized antennas

Basically, the equation is:

$$f(\theta) = \frac{E_\theta}{E_0}$$

where:

E_θ: radiation at a desired elevation angle, θ;

E_0: radiation in the horizontal plane.

Specific equations for top-loaded and typical sectionalized antennas are given below.

These equations use one or more of four variables A, B, C and D, the values of which are given in columns 6, 7, 8 and 9 respectively, of [Part II-C of Annex 1.]

---

[1] When A_i is negative, there is negative augmentation; when A_i is positive, there is positive augmentation. A_i must not be so negative that $E_{MOD}(\varphi, \theta)$ falls below $E_T(\varphi, \theta)$ of any azimuth, φ, or elevation angle, θ.

1. *Top-loaded antenna* [(when column 12 of Part II-A of Annex 1 is 1)]

$$f(\theta) = \frac{\cos B \cos (A \sin \theta) - \sin \theta \sin B \sin (A \sin \theta) - \cos (A + B)}{\cos \theta [\cos B - \cos (A + B)]}$$

where:

A: electrical height of the antenna tower;

B: difference between the apparent electrical height (based on current distribution) and the actual height (A);

θ: the elevation angle with respect to the horizontal plane.

Note: When B is zero (i.e., when there is no top-loading), the equation reduces to that of a simple vertical antenna.

2. *Sectionalized tower* [(when column 12 of Part II-A of Annex 1 is 2)]

$$f(\theta) = \frac{[\cos B \cos (A \sin \theta) - \cos (A + B)] \sin (C + D - A) + \sin B [\cos D \cos (C \sin \theta) [- \sin \theta)] - \sin \theta \sin D \sin (C \sin \theta) - \cos (C + D - A) \cos (A \sin \theta)]}{\cos \theta ([\cos B - \cos (A + B)] \sin (C + D - A) + \sin B [\cos D - \cos (C + D - A)])}$$

where:

A: actual height of the lower section;

B: difference between the apparent electrical height (based on current distribution) of the lower section and the actual height of the lower section (A);

C: actual total height of the antenna;

D: difference between the apparent electrical height (based on current distribution) of the total tower and the actual height of the total tower (C);

θ: vertical angle with respect to the horizontal plane.

3. Administrations proposing to use other types of antenna should furnish details of their characteristics together with a radiation pattern.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 53-E
22 April 1986
Original: English

COMMITTEE 4

SUMMARY RECORD

OF THE

SECOND MEETING OF COMMITTEE 4

(TECHNICAL CRITERIA)

Thursday, 17 April 1986, at 1400 hrs

Chairman: Mr. M.L. PIZARRO ARAGONES (Chile)

Subjects discussed:	Document
1. Reports by the Chairman of Working Group 4-A	44
2. Oral report by the Chairman of Working Group 4-B	-

1. Reports by the Chairman of Working Group 4-A (Document 44)

1.1 The Chairman of Working Group 4-A, introducing the Group's first report (Document 44), said it was based on input data provided by Documents 3, 4, 7, 8, 14 and 16, all of which advocated the use of a single set of curves, calculated for the frequency 1 655 kHz, for the entire new band. That procedure had been followed. The material presented in Document 44 followed the same general structure as that contained in the ground wave chapter of the 1981 Rio Final Acts, apart from some minor editorial changes. In section 1, sub-paragraph b), of the document, square brackets had been placed around the words "allotment" and "assignment" pending the decision on planning methods to be made by Committee 5.

Document 44 was approved.

1.2 The Chairman of Working Group 4-A said that the second topic to be considered by the Group was sky wave propagation. A contribution on the subject had been received from Cuba (Document 22) in addition to the proposals contained in Documents 3, 4, 7, 8, 14 and 16. The majority preference was for the sky wave model discussed in Annex V of the CCIR Technical Bases (Document 3), which included a latitude dependent term. However, the Cuban Administration proposed the use of the method in current use, that described in the 1981 Rio Final Acts. After a lengthy discussion in which most of the Group appeared to be in favour of the method containing a latitude dependent term, he had made a ruling which would appear in the second report of Working Group 4-A, to be submitted to the next meeting of Committee 4. The Cuban Delegation had indicated that it would require further discussion of the sky wave model when the subject was considered by Committee 4. In addition, the Brazilian Delegation expressed the opinion that the sky wave curve in the 1981 Rio Final Acts should be used for the initial stage of planning for determining coordination distance, but that for all subsequent calculations the new model described in Annex V of the CCIR Technical Bases should be used.

The Working Group had now completed its work.

The oral report by the Chairman of Working Group 4-A was noted.

2. Oral report by the Chairman of Working Group 4-B

2.1 The Chairman of Working Group 4-B said that the Group had held two meetings and had reached agreement on protection ratios, the effect of receiver characteristics upon AM broadcast standards, modulation standards, and transmission antenna characteristics.

In its discussion on modulation standards, the Group had also approved a number of proposed standards, such as for frequency tolerances and channel spacing, which were not strictly speaking modulation standards, although they were also concerned with transmission. She asked whether the Group's terms of reference could be extended to cover those items, which it had termed broadcasting standards.

On the subject of transmitter antenna characteristics, the Group had set up a Sub-Working Group to decide the one remaining point appearing in the Canadian proposals as an addition to the Rio Final Acts. Committee 4 should have a document on that subject before it at its next meeting.

Agreement had been reached on all definitions apart from those dependent on decisions by Committee 5, which had been left for discussion at a later stage.

A Sub-Working Group had been set up to consider the subject of nominal usable field strength.

The Working Group had decided to await decisions from Committee 5 before proceeding with its discussion of class of station and transmitter powers.

At the previous meeting of the Group the delegate of Cuba had asked for its Document 20 to be included in the texts allocated to the Group since it included a proposal with regard to transmitter powers.

The oral report by the Chairman of Working Group 4-B was noted and it was decided to extend the terms of reference of the Working Group to include the items referred to as broadcasting standards and to include Document 20 in the texts allocated to the Group.

The meeting rose at 1425 hours.

The Secretary:
J. FONTEYNE

The Chairman:
M.L. PIZARRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 54-E
18 April 1986
Original: French

PLENARY MEETING

Note by the Chairman

DRAFT STRUCTURE OF THE REPORT OF THE FIRST SESSION OF THE CONFERENCE

On the basis of a proposal by the Chairman of Committee 6, the Steering Committee at its last meeting discussed a tentative general structure for the Report of the first session of the Conference.

The outcome of these preliminary discussions is hereby submitted to the Plenary Meeting for consideration and approval, subject to any modifications that may result from subsequent decisions taken by the Conference.

F. Savio C. PINHEIRO
Chairman

Annex: 1

ANNEX

Draft structure of the Report of the first session of the Conference

	COM 4	COM 5
Introduction		
CHAPTER 1 - DEFINITIONS AND SYMBOLS		
1.1 Definitions		
1.2 Symbols		
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* Non-exhaustive list.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 55-E
21 April 1986
Original: Spanish

COMMITTEE 2

First Report by Working Group C2-A to Committee 2

1. The Working Group of Committee 2 (Credentials) met on 18 April 1986. It examined the credentials of the following delegations :

(In French alphabetical order)

Argentine Republic
Brazil (Federative Republic of)
Canada
Chile
Colombia (Republic of) *
Costa Rica
Cuba
Ecuador
Guyana
Honduras (Republic of)
Mexico
Paraguay (Republic of)
United Kingdom of Great Britain and Northern Ireland
Uruguay (Eastern Republic of) *

(a total of 14 delegations)

These credentials are all in order.

2. The Working Group noted that some delegations present at the Conference have not yet deposited their credentials. These delegations will be contacted by the Committee Secretariat.

S.E. MONTANARO CANZANO
Chairman of Working Group C2-A

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*Provisional credentials

BLUE PAGES

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 56-E
18 April 1986

B.1

PLENARY MEETING

1st SERIES OF TEXTS SUBMITTED BY THE EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Document	Title
COM.4	44	Groundwave propagation (Chapter 2)

P. PERRICHON
Chairman of Committee 6

Annex: 6 pages

CHAPTER 2 - PROPAGATION

2.1 Groundwave propagation

2.1.1 Ground conductivity

For groundwave propagation calculations in the band 1 605 - 1 705 kHz, use should be made of the Atlas of Ground Conductivity, which contains information communicated to the IFRB in connection with the first and second sessions of the Regional Administrative MF Broadcasting Conference (Region 2), (Buenos Aires, 1980 and Rio de Janeiro, 1981), and subsequent revisions.

The following provisions should also be included:

a) When an administration notifies to the IFRB data intended to modify the Atlas, the IFRB shall so inform all administrations of Region 2. After 90 days from the date on which this information is communicated by the IFRB, the IFRB shall modify the Atlas and communicate the modifications to all administrations.

b) No [assignment] [allotment] in the Plan shall at any time require modification as a result of the incorporation of these new data.

c) Any proposal to modify the Plan shall be considered on the basis of the values appearing in the Atlas on the date the proposal was received by the IFRB.

2.1.2 Field strength curves for groundwave propagation

The curves shown on Figure 2.1 are to be used for determining groundwave propagation in the frequency range 1 605 - 1 705 kHz; these curves are computed for 1 655 kHz.

The curves are labelled with ground conductivities in millisiemens/metre. All curves, except the 5000 mS/m (sea water) curve, are derived for a relative dielectric constant of 15. The sea water curve is derived for a dielectric constant of 80.

Annex E to the Report by the first session of the Regional Administrative MF Broadcasting Conference (Region 2) (Buenos Aires, 1980) contains a mathematical discussion relating to the calculation of the groundwave curves. The corresponding computer program is available at the IFRB.

2.1.3 Calculation of groundwave field strength

Using the Atlas of Ground Conductivity, the relevant conductivity or conductivities for the chosen path are determined. If only one conductivity is representative, the method for homogeneous paths is used. If several conductivities are involved, the method for non-homogeneous paths is used.

2.1.3.1 Homogeneous paths

The vertical component of the field strength for a homogeneous path is represented in Figure 2.1 as a function of distance, for various values of ground conductivity.

The distance in kilometres is shown on a logarithmic scale on the abscissa. The field strength is shown on a linear scale on the ordinate in decibels above 1 V/m. The graph is standardized for a characteristic field strength of 100 mV/m corresponding to an effective monopole radiated power (e.m.r.p.) of -9.5 dB relative to 1 kW. The straight line marked "100 mV/m at 1 km" is the field strength on the assumption that the antenna is erected on a surface of perfect conductivity.

For omnidirectional antenna systems having a different characteristic field strength, correction must be made according to either of the following equations:

$$E = E_0 \times \frac{E_c}{100} \times P$$

if field strengths are expressed in mV/m, or:

$$E = E_0 + E_c - 100 + 10 \log P$$

if field strengths are expressed in dB (V/m)

For directional antenna systems, correction must be made according to either of the following equations:

$$E = E_0 \times \frac{E_R}{100}$$

if field strengths are expressed in mV/m, or:

$$E = E_0 + E_R - 100$$

if field strengths are expressed in dB (V/m),

where:

E : resulting field strengh

E_0: field strength read from Figure 2.1

E_R: actual field strength at a particular azimuth at 1 km

E_c: characteristic field strength

P : station power in kW.

Figure 2.2 consists of three pairs of scales to be used with Figure 2.1. Each pair contains one scale labelled in decibels and another in millivolts per metre. Each pair can be cut out and trimmed as a unit to be used as sliding ordinate scales. The scales allow graphical conversion between decibels and millivolts per metre, and are used to make graphical determinations of field strengths. Other methods of making calculations on Figure 2.1 may be used, including the use of dividers to adjust for values of E_R that differ from 100 mV/m at 1 km. However, any method used will follow steps similar to those described below.

For both omnidirectional and directional antenna systems the value of E_R must be found. For omnidirectional systems E_R can be determined by using either of the following equations:

$$E_R = E_c \sqrt{P}$$

if field strengths are expressed in mV/m, or:

$$E_R = E_c + 10 \log P$$

if field strengths are expressed in dB (µV/m)

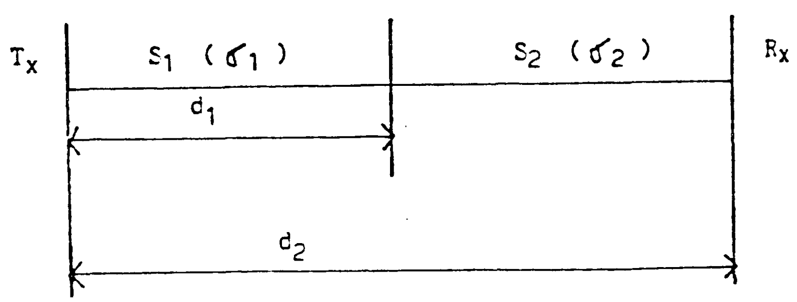
To determine the field strength at a given distance, the scale is placed at that distance with 100 dB (µV/m) point of the scale resting on the appropriate conductivity curve. The value of E_R is then found on the scale; the point on the underlying graph (which lies underneath the E_R point of the scale) yields the field strength at the given distance.

To determine the distance at a given field strength, the E_R value is found on the sliding scale and that point is placed directly at the level of the given field strength on the graph. The scale is then moved horizontally until the 100 dB (µV/m) point of the scale coincides with the applicable conductivity curve. The distance may then be read from the abscissa of the graph.

2.1.3.2 <u>Non-homogeneous paths</u>

In this case, the equivalent distance or Kirke method is to be used. To apply this method, Figure 2.1 can also be used.

Consider a path whose sections S_1 and S_2 have lengths corresponding to d_1 and $d_2 - d_1$, and conductivities σ_1 and σ_2 respectively, as shown on the following figure:



The method is applied as follows.

a) Taking section S_1 first, we read the field strength corresponding to conductivity σ_1 at distance d_1 on Figure 2.1.

b) As the field strength remains constant at the point of discontinuity, the value immediately after the discontinuity must be equal to that obtained in a) above. As the conductivity of the second section is σ_2, the curve corresponding to conductivity σ_2 gives the equivalent distance to that which would be obtained at the same field strength arrived at in a). This equivalent distance is d. Distance d is larger than d_1 when σ_2 is larger than σ_1. Otherwise d is less than d_1.

c) The field strength at the real distance d_2 is determined by taking the corresponding curve for conductivity σ_2 and reading off the field strength obtained at equivalent distance $d + (d_2 - d_1)$.

d) For successive sections with different conductivities, procedures b) and c) are repeated.

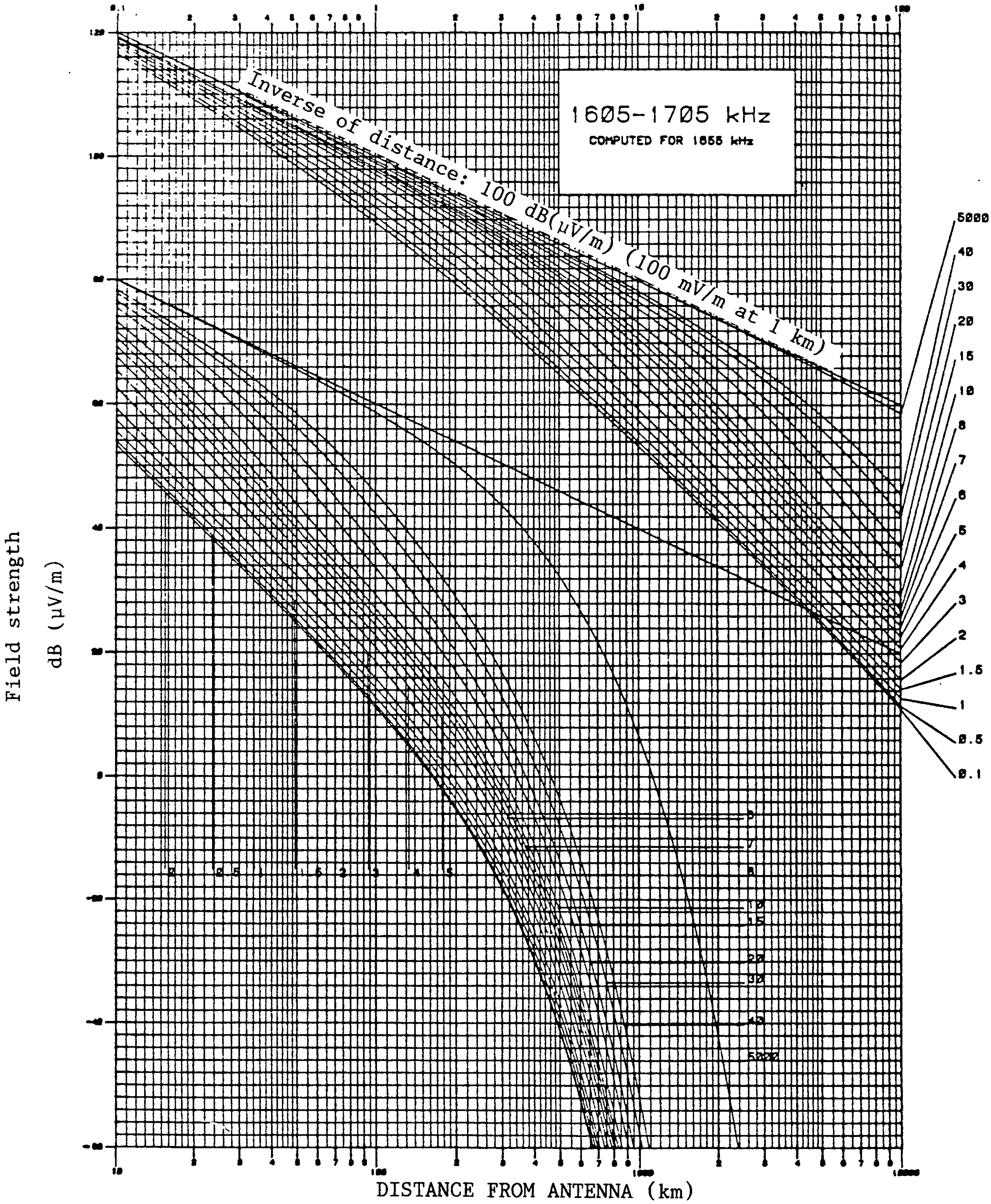


FIGURE 2.1

<u>Groundwave field strength versus distance</u>

(for a characteristic field strength of 100 mV/m)

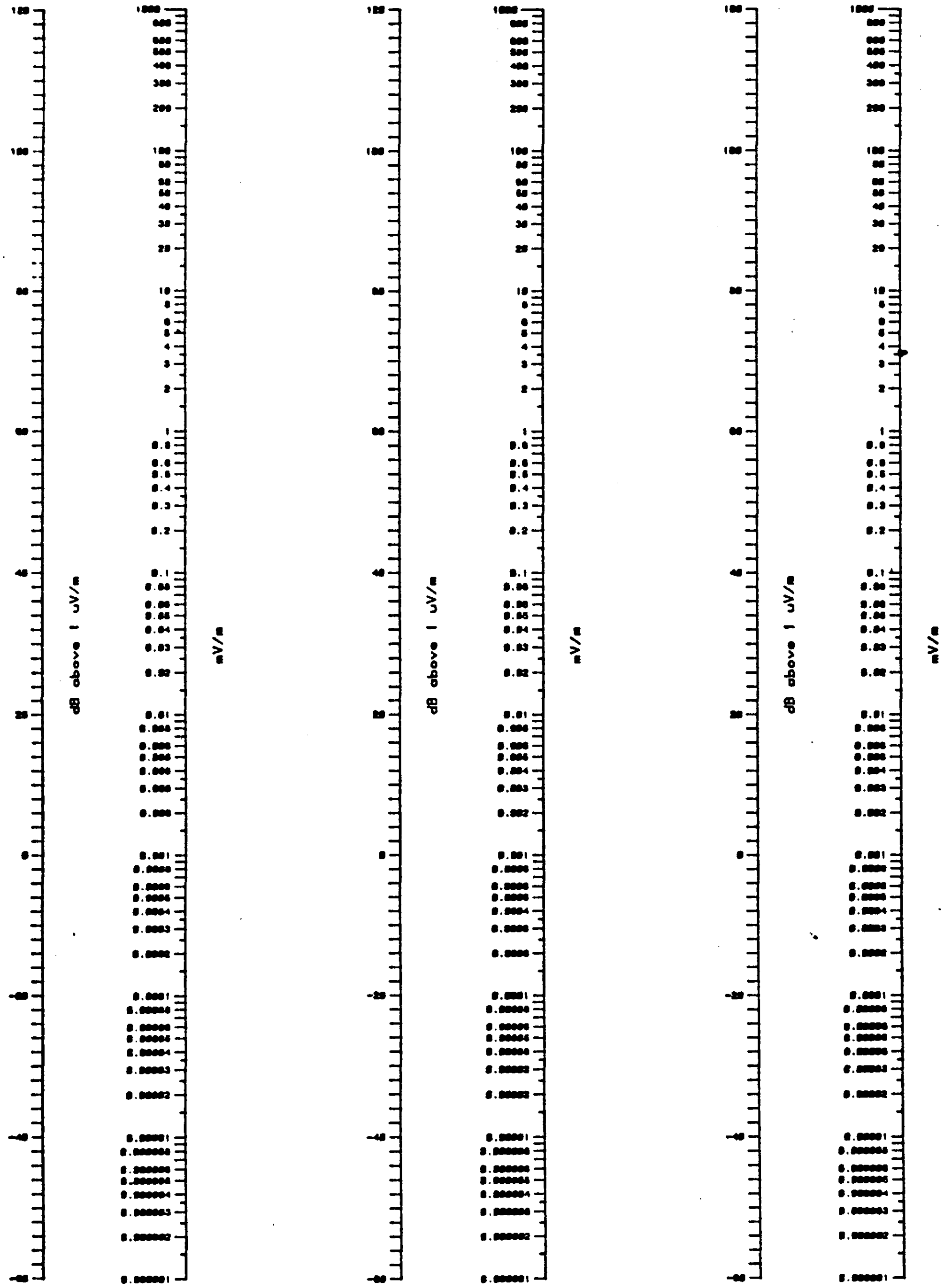


FIGURE 2.2

Scales for use with Figure 2.1

INTERNATIONAL TELECOMMUNICATION UNION

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WORKING GROUP 5-B

United States of America

PROPOSED DRAFT OF FINAL ACTS OF THE SECOND SESSION

of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1605 - 1705 kHz in Region 2

(Geneva, 1988)

PREAMBLE

The delegates of the following Members of the International Telecommunication Union, having participated in the present Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1605-1705 kHz in Region 2;

[Signatory Countries, in French alphabetical order]

acting pursuant to No. 480 of the Radio Regulations, which provides:

> "In Region 2, the use of the band 1605 - 1705 kHz by stations of the broadcasting service shall be subject to a plan to be established by a regional administrative radio conference...";

fully respecting the sovereign right of each country to regulate within its territory the broadcasting service in the medium frequency band 1605 - 1705 kHz, and to reach special arrangements regarding such service with such countries as it may consider appropriate, without prejudice to other administrations;

seeking to facilitate mutual understanding and cooperation among the Members of Region 2 in achieving a satisfactory broadcasting service in the medium-frequency band 1605-1705 kHz;

recognizing that all countries have equal rights, and that, in the application of the Plan and its Provisions, the needs of each country, in particular those of developing countries, shall be fulfilled as far as possible, and

acknowledging that the protection of each other's broadcasting service is a major objective for all countries, in order to bring about better coordination and the use of more efficient facilities;

have adopted the Plan and Associated Provisions hereinafter set forth to effectuate No. 480 of the Radio Regulations.

PLAN

FOR THE USE OF THE 1605 - 1705 kHz BAND FOR THE BROADCASTING SERVICE IN REGION 2 AND ASSOCIATED PROVISIONS

Article 1

Definitions

For the purposes of the Plan and these Provisions, the following terms shall have the meanings defined below.

Union: The International Telecommunication Union;

Secretary General: The Secretary-General of the Union;

IFRB: The International Frequency Registration Board;

CCIR: The International Radio Consultative Committee;

Convention: The International Telecommunication Convention;

Radio Regulations: The Radio Regulations supplementing the provisions of the Convention;

Region 2: The geographical area defined in No. 394 of the Radio Regulations, Geneva, 1979;

Master Register: The Master International Frequency Register;

Provisions: The Provisions adopted herein that are associated with the Plan;

Plan: The Plan comprising Article 6 and these Provisions;

Administration: Any governmental department or service responsible for discharging the obligations undertaken in the Convention. Unless the context indicates otherwise, the term "administration" as used herein refers to the administration of a Member of the Union responsible for its broadcasting assignments in Region 2.

Member: A Member of the Union as indicated in Article 1 of the Convention.

Conformity with the Plan: An assignment on an allotment and which meets all applicable technical criteria.

Affected Administration: An administration within whose territory the signal of a proposed assignment of another administration exceeds that prescribed in Annex [A].

Broadcasting Station: A station having an assigned frequency in the band 1605 - 1705 kHz;

Assignment: A frequency assignment by an administration to a broadcasting station;

Allotment: [Text to be supplied.]

Allotment Area: [An area appearing in the Plan within which an administration may make an assignment on a designated frequency in the Plan].

Article 2

Use of the Frequency Band 1605 - 1705 kHz for the Broadcasting Service in Region 2

2.1 As prescribed by No. 480 of the Radio Regulations, in Region 2 the use of the band 1605 - 1705 kHz by stations in the broadcasting service shall be subject to the Plan.

2.2 Accordingly, administrations in Region 2 shall not bring into use broadcasting assignments not in conformity with these Provisions.

Article 3

The Plan for the Broadcasting Service in the Frequency Band 1605 - 1705 kHz in Region 2

3.1 The Plan is as set forth in Article 6.

3.2 An administration may at any time make assignments on any of its allotments, at one or more locations within each allotment area, without the need for consultation with another administration, provided that the assignment is in conformity with the Plan and is outside the coordination zone defined in Annex [B].

3.3 An administration at any time may make an assignment on a channel not allotted to it at that location, without the need for consultation with another administration, provided that each such assignment meets the technical criteria set forth in Annex [A] with respect to any other administration's allotment or any station previously recorded in the Master Register with a favorable finding.

Article 4

Notification of Frequency Assignments

4.1 If an administration wishes to bring an assignment into use:

a) the basic characteristics thereof shall be notified not earlier than three years nor later than two months before coming into use to the International Frequency Registration Board in the manner specified by Article 12 of the Radio Regulations.

b) Only complete notices shall be considered by the Board.

c) Notices shall be considered in the order of receipt.

d) Each notice shall first be examined with respect to the provisions of the Convention and Radio Regulations.

e) Notices shall be examined for conformity with the Plan contained herein as well as these Provisions.

4.2 Each assignment on an allotment found upon examination to be in conformity with the Convention, the Radio Regulations and these Provisions shall be recorded in the Master Register.

4.3 Each assignment not on an allotment but found upon examination to be in conformity with the Convention, the Radio Regulations and these Provisions shall be recorded in the Master Register.

4.4 Assignments other than those receiving favorable findings pursuant to 4.2 or 4.3 shall be recorded in the Master Register if they have been successfully coordinated with all affected administrations.

4.5 Assignments recorded in the Master Register pursuant to 4.4 shall be treated by the Board as in conformity with the Plan.

Article 5

Special Arrangements

In order to supplement the procedures provided for under these Provisions, or to facilitate the coordination envisioned by Article 4, Administrations may conclude or continue special arrangements in conformity with the applicable provisions of the Convention and the Radio Regulations.

Article 6

Plan

Column 1	Column 2	Column 3
Allotted Frequency (channel number)	Area	Observation
1610 kHz (1)	ARG BLZ CAN USA	(Geographical restriction determined by RARC)
1620 kHz (2)	CAN	(Geographical restriction determined by RARC)
	DOM USA VEN	

Article 7

Entry into Force and Duration of the Plan and These Provisions

The Plan and these Provisions shall enter into force on [ ] and shall remain in force until revised by a competent administrative radio conference.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

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COMMITTEE 6

SECOND SERIES OF TEXTS FROM COMMITTEE 4 TO THE EDITORIAL COMMITTEE

The texts in Annexes I and II have been adopted by Committee 4 and are submitted to the Editorial Committee.

M.L. PIZARRO
Chairman of Committee 4

Annexes: 2

ANNEX I

CHAPTER 1

Definitions

In addition to the definitions given in the Radio Regulations, the following definitions and symbols apply.

Broadcasting channel (AM)

A part of the frequency spectrum, equal to the necessary bandwidth of AM sound broadcasting stations, and characterized by the nominal value of the carrier frequency located at its centre.

Objectionable interference

Interference caused by a signal exceeding the maximum permissible field strength within the [protected contour], in accordance with the values derived from this [ ].

Service area

The area delimited by the contour within which the calculated level of the ground-wave field strength is protected from objectionable interference in accordance with the provisions of Chapter [ ].

Audio-frequency (AF) signal-to-interference ratio

The ratio (expressed in decibels) between the values of the voltage of the wanted signal and the voltage of the interfering signal, measured under specified conditions, at the audio-frequency output of the receiver. These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission characteristics (type and percentage modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

Audio-frequency (AF) protection ratio

Agreed minimum value of the audio-frequency signal-to-interference ratio corresponding to a subjectively defined reception quality. [This ratio may have different values according to the type of service desired.]

Radio-frequency (RF) wanted-to-interfering signal ratio

The ratio (expressed in decibels) between the values of the radio-frequency voltage of the wanted signal and the interfering signal, measured at the input of the receiver under specified conditions. These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission characteristics (type and percentage modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

Radio-frequency (RF) protection ratio

The desired radio-frequency signal-to-interference ratio which, in well-defined conditions, makes it possible to obtain the audio-frequency protection ratio at the output of a receiver. These specified conditions include various parameters such as the frequency separation between the desired carrier and the interfering carrier, the emission characteristics (type and percent modulation, etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

Relative radio-frequency protection ratio

This ratio is the difference, expressed in decibels, between the protection ratio when the carriers of the wanted and unwanted transmitters have a frequency difference of f (Hz or kHz) and the protection ratio when the carriers of these transmitters have the same frequency.

Daytime operation

Operation between the times of sunrise and sunset at the transmitter site.

Night-time operation

Operation between the times of sunset and sunrise at the transmitter site.

Synchronized network

Two or more broadcasting stations whose nominal carrier frequencies are identical and which broadcast the same programme simultaneously. In such a synchronized network the difference in carrier frequency between any two transmitters in the network shall not exceed 0.1 Hz. The modulation delay between any two transmitters in the network shall not exceed 100 us, when measured at either transmitter site.

Station power

Unmodulated carrier power supplied to the antenna.

Ground-wave

Electromagnetic wave which is propagated along or near the surface of the Earth and which has not been reflected by the ionosphere.

Sky wave

Electromagnetic wave which has been reflected by the ionosphere.

CHAPTER 3

Broadcasting standards* and transmission characteristics

3.1 Channel spacing

The Plan shall be based on a channel spacing of 10 kHz and carrier frequencies which are integral multiples of 10 kHz, beginning at 1 610 kHz.

---

* Note - The effect of receiver characteristics upon AM broadcast standards

It is expected that receiver characteristics for this band will be similar to those of existing receivers in the 535 - 1 605 kHz band. Therefore, they should not impact on broadcast standards.

3.2 Class of emission

The Plan shall be based on double-sideband amplitude modulation with full carrier A3E.

Classes of emission other than A3E could also be used on condition that the energy level outside the necessary bandwidth does not exceed that normally expected in A3E emission, for instance to accommodate stereophonic systems.

3.3 Bandwidth of emission

The Plan shall be based on a necessary bandwidth of 10 kHz for which only 5 kHz audio bandwidth can be obtained. While this might be an appropriate value within some administrations, others may wish to employ wider bandwidth systems with necessary bandwidths of the order of 20 kHz. However, the protection ratios selected allow operation with 20 kHz occupied bandwidth without an appreciable increase in interference. Stations operating on frequency 1 700 kHz shall take into account what is set out in provision 343 of the Radio Regulations.

3.4 Frequency tolerance

As indicated in Appendix 7 to the Radio Regulations, the frequency tolerance shall be 20 parts in 10^6 for powers of 10 kW or less, and 10 Hz for powers greater than 10 kW.

3.7 Protection ratios

3.7.1 Co-channel protection ratio

The co-channel protection ratio shall be 26 dB.

3.7.2 Adjacent channel protection ratio

- protection ratio for the first adjacent channel: 0 dB

- protection ratio for the second adjacent channel: -29.5 dB

3.7.3 Synchronized networks

In addition to the standards specified in this Report, the following standard shall apply to synchronized networks.

The co-channel protection ratio between stations belonging to a synchronized network shall be 8 dB.

ANNEX II

CHAPTER 4

Radiation characteristics of transmitting antennas

In carrying out the calculations indicated in [Chapter 2] the following shall be taken into account.

4.1 Omnidirectional antennas

[Figure 1 of Chapter 2] shows the characteristic field of a simple vertical antenna as a function of its length and of the radius of the ground system.

It is clear that the characteristic field strength increases as the loss in the ground system is reduced to zero and as the antenna height is increased up to 0.625 wavelengths.

The increased characteristic field strength for antenna lengths up to 0.625 wavelengths is obtained at the expense of radiation at high angles as shown graphically in [Figure 1a] and numerically in [Table II of Chapter 2.]

4.2 Considerations of the radiation patterns of directional antennas

The procedures for calculating theoretical, expanded and augmented (modified expanded) directional antenna patterns are given in [Appendix 2.]

4.3 Top-loaded and sectionalized antennas

4.3.1 Calculation procedures are given in [Appendix 3.]

4.3.2 Many stations employ top-loaded or sectionalized towers, either because of space limitations or to vary the radiation characteristics from those of a simple vertical antenna. This is done to achieve desired coverage or to reduce interference.

4.3.3 An administration using top-loaded or sectionalized antennas shall supply information concerning the tower structure of the antennas. Normally, one of the equations in [Appendix 3] shall be employed to determine the vertical radiation characteristics of the antennas. Other equations may also be proposed by an administration and shall be used in determining the vertical radiation characteristics of the antennas of that administration, subject to the agreement of the other administration.

[APPENDIX 2]

Calculation of directional antenna patterns

Introduction

This Appendix describes methods to be employed in calculating the field strength produced by a directional antenna at a given point.

1. *General equations*

The theoretical directional antenna radiation pattern is calculated by means of the following equation, which sums the field strength from each element (tower) in the array.

$$E_T(\varphi, \theta) = \left| K_L \sum_{i=1}^{n} F_i f_i(\theta) \underline{/ \psi_i + S_i \cos \theta \cos (\varphi_i - \varphi)} \right| \quad (1)$$

where:

$$f_i(\theta) = \frac{\cos (G_i \sin \theta) - \cos G_i}{(1 - \cos G_i) \cos \theta} \quad (2)$$

where:

- $E_T(\varphi, \theta)$: theoretical inverse distance field strength at one kilometre in mV/m for the given azimuth and elevation;
- K_L : multiplying constant in mV/m which determines the pattern size (see paragraph 2.5 below for derivation of K_L);
- n : number of elements in the directional array;
- i : denotes the ith element in the array;
- F_i : ratio of the theoretical field strength due to the ith element in the array relative to the theoretical field strength due to the reference element;
- θ : vertical elevation angle, in degrees, measured from the horizontal plane;
- $f_i(\theta)$: ratio of vertical to horizontal plane field strength radiated by the ith element at elevation angle θ;
- G_i : electrical height of the ith element, in degrees;
- S_i : electrical spacing of the ith element from the reference point in degrees;
- φ_i : orientation of the ith element from the reference element (with respect to True North), in degrees;
- φ : azimuth with respect to True North, in degrees;
- ψ_i : electrical phase angle of field strength due to the ith element (with respect to the reference element), in degrees.

Equations (1) and (2) assume that:

- the current distribution in the elements is sinusoidal,
- there are no losses in the elements or in the ground,
- the antenna elements are base-fed, and
- the distance to the computation point is large in relation to the size of the array.

2. *Determination of values and constants*

2.1 *Determination of the multiplying constant K for an array*

The multiplying constant K for the loss-free case may be computed by integrating the power flow over the hemisphere, deriving an r.m.s. field strength and comparing the result with the case where the power is radiated uniformly in all directions over the hemisphere.

Thus:

$$K = \frac{E_r\sqrt{P}}{e_h} \quad \text{mV/m}$$

where:

K: no-loss multiplying constant (mV/m at 1 km);

E_r: reference level for uniform radiation over a hemisphere, equal to 244.95 mV/m at 1 km for 1 kW;

P: antenna input power (kW);

e_h: root mean square radiation pattern over the hemisphere which may be obtained by integrating $e(\theta)$ at each elevation angle over the hemisphere. The integration can be made using the trapezoidal method of approximation, as follows:

$$e_h = \left[\frac{\pi\Delta}{180}\left\{\tfrac{1}{2}[e(\theta)]^2 + \sum_{m=1}^{N}[e(m\Delta)]^2 \cos m\Delta\right\}\right]^{\frac{1}{2}} \qquad (3)$$

where:

Δ: interval, in degrees, between equally-spaced sampling points at different elevation angles θ;

m: an integer from 1 to N, which gives the elevation angle θ in degrees when multiplied by Δ, i.e. $\theta = m\Delta$;

N: one less than the number of intervals $\left(N = \frac{90}{\Delta} - 1\right)$;

$e(\theta)$: root mean square radiation pattern given by equation (1) with K equal to 1 at the specified elevation angle θ (the value of θ is 0 in the first term of equation (3) and $m\Delta$ in the second term); $e(\theta)$ is computed using equation (4).

$$e(\theta) = \left[\sum_{i=1}^{n}\sum_{j=1}^{n} F_i f_i(\theta) F_j f_j(\theta) \cos \psi_{ij} J_0(S_{ij} \cos \theta)\right]^{\frac{1}{2}} \qquad (4)$$

where:

i: denotes the ith element;

j: denotes the jth element;

n: number of elements in the array;

ψ_{ij}: difference in phase angles of the field strengths from the ith and jth elements in the array;

S_{ij}: angular spacing between the ith and jth elements in the array;

$J_0(S_{ij} \cos \theta)$: the Bessel function of the first kind and zero order of the apparent spacing between the ith and jth elements. In equation (4), S_{ij} is in radians. However when special tables of Bessel functions giving the argument in degrees are used, the values of S_{ij} should then be in degrees.

2.2 *Relationship between field strength and antenna current*

The field strength resulting from a current flowing in a vertical antenna element is:

$$E = \frac{R_c I\left[\cos(G \sin\theta) - \cos G\right]}{2\pi r \cos\theta} \times 10^3 \quad \text{mV/m} \qquad (5)$$

where:

E: field strength in mV/m;

R_c: resistivity of free space ($R_c = 120\pi$ ohms);

I: current at the current maximum, in amperes [1];

G: electrical height of the element, in degrees;

r: distance from the antenna, in metres;

θ: vertical elevation angle, in degrees.

---

[1] I is the current at the maximum of the sinusoidal distribution. If the electrical height of the element is less than 90°, the base current will be less than I.

At one kilometre and in the horizontal plane ($\theta = 0°$):

$$E = \frac{120\pi I(1-\cos G) \times 10^3}{2\pi(1000)} \qquad \text{mV/m} \tag{6}$$

hence:

$$E = 60\, I(1 - \cos G) \qquad \text{mV/m} \tag{7}$$

2.3 *Determination of no-loss current at current maximum*

For a tower of uniform cross-section or for a similar type of directional array element, the no-loss current at the current maximum is:

$$I_i = \frac{KF_i}{60(1-\cos G_i)} \tag{8}$$

where:

I_i: current at current maximum in amperes in the ith element;

K: no-loss multiplying constant computed as shown in paragraph 2.1 above.

The base current is given by $I_i \sin G_i$.

2.4 *Array power loss*

Power losses in a directional antenna system are of various types, including ground losses, antenna coupling losses, etc. The loss resistance for the array may be assumed to be inserted at the current maximum to allow for all losses. The power loss is:

$$P_L = \frac{1}{1000}\sum_{i=1}^{n} R_i I_i^2 \tag{9}$$

where:

P_L: total power loss, in kW;

R_i: assumed loss resistance, in ohms (one ohm, unless otherwise indicated) for the ith tower [1];

I_i: current at current maximum (or base current if the element is less than 90 degrees in electrical height) for the ith tower.

2.5 *Determination of a corrected multiplying constant*

To allow for power loss in the antenna system, the multiplying constant K can be modified, as follows:

$$K_L = K\left(\frac{P}{P + P_L}\right)^{\frac{1}{2}} \tag{10}$$

where:

K_L: multiplying constant after correction for the assumed loss resistance;

K: no-loss multiplying constant computed in paragraph 2.1 above;

P: array input power (kW);

P_L: total power loss (kW).

---

[1] The loss resistance shall in no way exceed a value such that the value of K_L (see paragraph 2.5) differs by more than ten percent from that calculated for a resistance of one ohm.

2.6 *r.m.s. value of radiation to be notified for directional antennas*

The radiation E_r for directional antennas is determined as follows:

$$E_r = K_L \, e(\theta) \qquad \text{mV/m at 1 km}$$

2.7 *Determination of expanded pattern values*

The expanded pattern is determined as follows:

$$E_{EXP}(\varphi, \theta) = 1.05 \left\{ [E_T(\varphi, \theta)]^2 + Q^2 \right\}^{\frac{1}{2}} \qquad (11)$$

where:

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

$E_T(\varphi, \theta)$: theoretical pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

Q : quadrature factor, computed as:

$$Q = Q_0 \, g(\theta)$$

where:

Q_0 is the Q on the horizontal plane, and is normally the greatest of the following three quantities:

$$10.0 \quad ; \quad 10\sqrt{P} \quad \text{or} \quad 0.025 K_L \left[\sum_{i=1}^{n} F_i^2 \right]^{\frac{1}{2}}$$

$g(\theta)$ is computed as follows:

If the electrical height of the shortest tower is less than or equal to 180 degrees, then:

$$g(\theta) = f(\theta) \text{ for the shortest tower.}$$

If the electrical height of the shortest tower is greater than 180 degrees, then:

$$g(\theta) = \frac{\{[f(\theta)]^2 + 0.0625\}^{\frac{1}{2}}}{1.030776}$$

where $f(\theta)$ for the shortest tower is used.

Note: In comparing the electrical heights of the antenna towers to determine the shortest tower, the total apparent height (as determined by current distribution) is used for top-loaded and sectionalized towers.

2.8 *Determination of augmented (modified expanded) pattern values*

The purpose of the augmented (modified expanded) pattern is to put one or more "patches" on an expanded pattern. Each "patch" is referred to as an "augmentation". The augmentation may be positive (resulting in more radiation than that of the expanded pattern) or negative (resulting in less radiation than that of the expanded pattern). In no case shall the augmentation be so negative that the augmented (modified expanded) pattern radiation is below the theoretical radiation pattern.

Spans of augmentation may overlap. That is, an augmentation may itself be augmented by a subsequent augmentation. To ensure that the calculations are properly made, the augmentations are handled in increasing order of central azimuth of augmentation, starting at True North. If several augmentations have the same central azimuth, then they are considered in order of decreasing span (i.e. the one with the largest span is handled first). If more than one augmentation has the same central azimuth and the same span, then they are considered in ascending order of their effect.

$$E_{MOD}(\varphi,\theta) = \left\{[E_{EXP}(\varphi,\theta)]^2 + g^2(\theta)\sum_{i=1}^{a} A_i \cos^2(180\,\Delta_i/\alpha_i)\right\}^{\frac{1}{2}} \tag{12}$$

where:

$E_{MOD}(\varphi, \theta)$: augmented (modified expanded) pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$g(\theta)$: same parameter as described for the expanded pattern (see paragraph 2.7);

a : number of augmentations;

Δ_i : difference between the azimuth at which the radiation is desired φ, and the central azimuth of augmentation of the ith augmentation. It will be noted that Δ_i must be less than or equal to one-half of α_i;

α_i : total span of the ith augmentation;

A_i : is the value of the augmentation given by the expression [1]:

$$A_i = [E_{MOD}(\varphi_i, \theta)]^2 - [E_{INT}(\varphi_i, \theta)]^2 \tag{13}$$

where:

φ_i : central azimuth of the ith augmentation;

$E_{MOD}(\varphi_i, \theta)$: augmented (modified expanded) horizontal plane radiation at the central azimuth of the ith augmentation, after applying the ith augmentation, but before applying subsequent augmentations;

$E_{INT}(\varphi_i, \theta)$: an interim value of radiation in the horizontal plane at the central azimuth of the ith augmentation. The interim value is the radiation obtained from applying previous augmentations (if any) to the expanded pattern, but before applying the ith augmentation.

[APPENDIX 3]

Equations for the calculation of the normalized vertical radiation from top-loaded and typical sectionalized antennas

Basically, the equation is:

$$f(\theta) = \frac{E_\theta}{E_0}$$

where:

E_θ : radiation at a desired elevation angle, θ;

E_0 : radiation in the horizontal plane.

Specific equations for top-loaded and typical sectionalized antennas are given below.

These equations use one or more of four variables A, B, C and D, the values of which are given in columns 6, 7, 8 and 9 respectively, of [Part II-C of Annex 1.]

---

[1] When A_i is negative, there is negative augmentation; when A_i is positive, there is positive augmentation. A_i must not be so negative that $E_{MOD}(\varphi, \theta)$ falls below $E_T(\varphi, \theta)$ of any azimuth, φ, or elevation angle, θ.

1. *Top-loaded antenna* [(when column 12 of Part II-A of Annex 1 is 1)]

$$f(\theta) = \frac{\cos B \cos (A \sin \theta) - \sin \theta \sin B \sin (A \sin \theta) - \cos (A + B)}{\cos \theta [\cos B - \cos (A + B)]}$$

where:

A : electrical height of the antenna tower;

B : difference between the apparent electrical height (based on current distribution) and the actual height (A);

θ : the elevation angle with respect to the horizontal plane.

Note: When *B* is zero (i.e., when there is no top-loading), the equation reduces to that of a simple vertical antenna.

2. *Sectionalized tower* [(when column 12 of Part II-A of Annex 1 is 2)]

$$f(\theta) = \frac{\begin{array}{l}[\cos B \cos (A \sin \theta) - \cos (A + B)] \sin (C + D - A) + \sin B [\cos D \cos (C \sin \theta) [- \sin \theta)] \\ - \sin \theta \sin D \sin (C \sin \theta) - \cos (C + D - A) \cos (A \sin \theta)]\end{array}}{\cos \theta ([\cos B - \cos (A + B)] \sin (C + D - A) + \sin B [\cos D - \cos (C + D - A)])}$$

where:

A : actual height of the lower section;

B : difference between the apparent electrical height (based on current distribution) of the lower section and the actual height of the lower section (*A*);

C : actual total height of the antenna;

D : difference between the apparent electrical height (based on current distribution) of the total tower and the actual height of the total tower (*C*);

θ : vertical angle with respect to the horizontal plane.

3. Administrations proposing to use other types of antenna should furnish details of their characteristics together with a radiation pattern.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) **RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2**

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 59-E
24 April 1986
Original: English

COMMITTEE 5

SUMMARY RECORD

OF THE

FIFTH MEETING OF COMMITTEE 5

(PLANNING CRITERIA)

Friday, 18 April 1986, at 1410 hrs

Chairman: Mr. M. FERNANDEZ-QUIROZ (Mexico)

Subjects discussed:	Documents
1. Consideration of other services (continued)	7, 11, 29, 33
2. Establishment of Working Group 5-B	

1. Consideration of other services (continued) (Documents 7, 11, 29, 33)

1.1 The Chairman invited the Committee to resume its discussion of Document 33.

1.2 The delegate of Argentina said that he had gathered from the previous discussion of the document that under an allotment plan, broadcasting services in Region 2 would not be protected from fixed, mobile and other services operating in the region or in Regions 1 and 3 closest to Region 2. He therefore requested that the Board or Secretariat should make available the list of 800 entries in the Master Register referred to by the representative of the IFRB at the previous meeting, so that the situation could properly be analyzed. He feared that with the undoubtedly large number of unregistered mobile and other types of stations, as many as 2,000 stations might be operating in the band to be planned, and that the region was therefore facing a major problem.

1.3 The representative of the IFRB said that the 800 entries were those taken into account prior to the CITEL meeting in Fortaleza, and presumably the number had not changed. If the Committee wanted a total picture of the region, a certain amount of summarizing might be necessary, but extracts could easily be provided for individual countries.

The position regarding protection might be clarified by considering the situation in which a Plan was developed containing provisions relating only to broadcasting services. On receiving a notification submitted under Article 12 of the Radio Regulations from a country party to the Agreement for a fixed or mobile station, (which was possible since the band was still allocated to such services under Article 8), the Board would examine the probability of harmful interference only in respect of those stations recorded in the Master Register. As the Region 2 Allotment Plan would not be in the Master Register, no examination would be made in respect of the entries in the Plan. One way of solving the problem would be to make the Second Session of the Conference competent to include in the Agreement the necessary provisions relating to all services in the band. Such a provision might be to request the Board, on receipt of a notification of a fixed or mobile service, to undertake an examination in respect of the entries in the Plan, details of which would be covered in the Agreement. Notices from other regions would be examined only with respect to what was in the Master Register for Region 2. A Region 2 assignment in the Plan would still not be protected, however, from a notified assignment in Regions 1 or 3, but once the assignments were brought into use, they would be recorded in the Master Register and would be protected under Article 12.

1.4 The delegate of the United States wondered whether any administrations in Region 2 had in fact requested the submission of Document 33 as stated in 1.1. Turning to section 2.3, he asked whether there were any allotment plans in existence which had been elaborated after a Conference, and whether they had the same weight as those entered during the Conference.

1.5 The representative of the IFRB replied that two countries in Region 2 had indicated that the relevant provisions of the Radio Regulations were being interpreted differently. In view of those communications and of the need for the Board to advise the Conference on the status of allocations, since non-participants in the Conference or other regions might be affected, the Board had been obliged to give the Conference its views.

Replying to the second point, he said that there was a maritime allotment plan which could be modified under Article 16 of the Radio Regulations, and there were also frequency plans with a modification procedure which had been adopted in the early 1960s and were still in force and being modified, but they did not involve any permitted services.

1.6 The delegate of the United States said that if there was a process that allowed allotments to be added to a plan, there should be some procedure whereby those allotments had the same weight as any other allotment in the Plan, irrespective of any sharing condition.

Another problem area concerned the lack of consistency between sub-paragraph 5.1 b) of the document, which stated that Recommendation 504 had the same status as a provision of the Radio Regulations, and section 6.1. Considering c) of Recommendation 504 stated that in Region 2 the band 1 625 - 1 705 kHz was allocated to the broadcasting service on a shared basis with other services. Clearly, therefore, WARC-79 was of the opinion that there was an allocation to the broadcasting service in the upper 80 kHz of the band in question which conflicted with the statement in section 6.1.

1.7 The representative of the IFRB observed that when Document 33 had been drafted the Board had not known what planning approach the Conference would adopt. Now that that approach had been established, he would submit that from the practical point of view it was impossible for any conference to draw up an Allotment Plan without knowing the location of stations and at the same time to protect stations already in operation. The practical steps that the Conference could take in the circumstances might be summed up as follows.

In the first place, the Conference might establish an Allotment Plan which of necessity could not be examined with respect to the stations to which the band was allocated; the Conference would therefore adopt the Plan disregarding the existing stations of the services other than the broadcasting service to which the band was allocated. Secondly, the First Session might include in the draft agenda of the Second Session an item which would permit that session to adopt provisions governing the relationship between the broadcasting service and other services when an administration proposed to assign frequencies in relation to the allotment it had in the Plan; it should be stressed that that would take place only at the stage of implementation of the allotment, when the respective locations of stations in the broadcasting and other services would be known. Thirdly, if the participants in the First Session so agreed, the Conference might indicate, in a Recommendation or Resolution or in the Report to the Second Session, the intention of all the administrations represented to no longer notify assignments for services other than the broadcasting service in the band; the IFRB for its part undertook to apply such a measure literally.

Even if those steps were taken, however, there would remain two major categories of problems for which the Board unfortunately could suggest no solutions. First of all, the assignments of other regions had to be protected, but those regions might at any time notify assignments to the fixed and mobile services in the band; in such cases, protection could be afforded only to assignments recorded in the Master Register. Secondly, countries in Region 2 which were not parties to the Agreement but had allotments in the Plan could not be obliged to protect the Plan since the decisions of the Conference were binding only on the parties to the Agreement.

1.8 The representative of the IFRB [Mr. Berrada] suggested that the Conference might also wish the IFRB to review the Master Register with respect to the relevant entries of each of the administrations concerned. That would require authorization in the form of a Recommendation or Resolution.

1.9 The delegate of the United States said it would have been useful to include in Document 33 something along the lines of Recommendation No. 2 of the Rio de Janeiro Conference, providing that administrations should avoid making assignments in the band for stations in services other than the broadcasting service. Moreover, his Administration was not yet convinced that it would be impossible to draw up an Allotment Plan, independent of the Frequency Allocation Table in the Radio Regulations, after the Second Session of the Conference on an ongoing and evolutionary basis.

With regard to the suggested review of the Master Register, he did not think that any Resolution or Recommendation was required, since the IFRB had on previous occasions taken the initiative in such matters. In any case, his Administration had already taken action by having all its entries for services other than the broadcasting service in the band in question deleted from column 4 b of the Master Register.

1.10 The delegate of Canada agreed that it would have been desirable to insert in Document 33 a passage along the lines of Recommendation No. 2 of the Rio Conference. In addition, it would be helpful if the IFRB, when sending out notices of entries recorded in the Master Register, could attach a note indicating the intention of administrations to remove their entries.

1.11 The representative of the IFRB said that the Second Session might well adopt a Recommendation similar to that of the Rio Conference, but that it would nevertheless be useful for the Board to have some guidance in the procedures on how to deal with cases where administrations might decide to notify the assignments concerned in spite of a Recommendation to the contrary: it was to be hoped that such cases would be rare, but some provision must be made for them. Furthermore, reviews of the Master Register were normally conducted by means of circular-letters to the administrations concerned, to which copies of their entries were attached, rather than through declarations of intent on the part of administrations. The Board therefore needed a Conference decision to which it could refer specifically in such a circular-letter.

1.12 The delegate of Argentina asked whether the Board would be able to protect a South American broadcasting station brought into use after the adoption of the Plan from other services operating in Region 1, notified and agreed by the Board after adoption of the Region 2 Plan but prior to the entry into use of the South American broadcasting station in question.

1.13 The representative of the IFRB replied that the question related to one of the outstanding problems for which the Board could provide no solution. The only way in which such problems could be dealt with was on a world-wide basis - in other words, a world administrative conference would have to give regional agreements a status whereby the assignments of other regions could be examined with respect to those of the region concerned.

1.14 The Chairman proposed that an ad hoc Group, presided over by Mr. DuCharme (Canada) and composed of delegates of interested administrations, should be set up to prepare a document along the lines suggested by the representatives of the IFRB.

It was so decided.

2. Establishment of Working Group 5-B

The Chairman proposed that Working Group 5-B, presided over by Mr. J. Lussio (Ecuador), Vice-Chairman, should be set up to define procedures for the Agreement.

It was so decided.

The meeting rose at 15.15 hours.

The Secretary

M. GIROUX

The Chairman

M. FERNANDEZ-QUIROZ

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

BC-R2(1) CARR CHARGÉE D'ÉTABLIR UN PLAN POUR LE SERVICE DE RADIODIFFUSION DANS LA BANDE 1605-1705 kHz DANS LA RÉGION 2

PREMIÈRE SESSION GENÈVE, AVRIL/MAI 1986

Corrigendum 1 al
Documento 60-S/F/E
22 de abril de 1986
Original : inglés

COMISION 4

Brasil

PROPOSICIONES PARA LOS TRABAJOS DE LA CONFERENCIA

Página 2, punto 6, segunda línea, léase "... predicción de propagación..."

(Ce corrigendum ne concerne pas le texte français)

(This corrigendum does not concern the English text)

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 60-E
21 April 1986
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COMMITTEE 4

Brazil

PROPOSALS FOR THE WORK OF THE CONFERENCE

1. Introduction

Further to a request made in Committee 4, Brazil is pleased to submit in a written form some of its ideas concerning the skywave propagation prediction method and implications it may have upon planning process.

Brazil understands that a number of important subjects are closely linked together and possibly a decision on these subjects should be taken as a package.

2. Skywave propagation prediction method

Brazil notes that two methods are considered for use by the Conference:

- the modified FCC, and
- the Rio method (the one adopted in RARC-81).

The propagation method is meant to be used in:

- the elaboration of the allotment Plan,
- interregional sharing, and
- implementation of stations (e.g. conversion of allotments into assignments).

In the following we examine the impact of the method on each of these three situations.

3. Elaboration of the allotment Plan

For the elaboration of the allotment Plan it is foreseen that two closely related parameters have to be chosen:

- standard (coordination) distance, and
- Enom

If the modified FCC method is used for these purposes, one of the following two things will happen:

either
- the coordination distance will vary with geomagnetic latitude,

or
- the Enom will vary with geomagnetic latitude.

In both cases a considerable degree of complexity will be introduced in the allotment planning method, thereby jeopardizing one of its best qualities: simplicity.

Brazil understands that it is absolutely necessary to maintain the plan and associated regulatory procedures simple enough, so that every administration would be able to manage the whole system in a microcomputer.

For these reasons the modified FCC method, which has a geomagnetic latitude-dependent term, should not be used for the elaboration of the allotment Plan.

Brazil proposes, therefore, that for establishing the allotment Plan the Rio method should be used.

4. Interregional sharing

As the Conference is not competent to decide on what method should be used for interregional sharing, Brazil thinks it would be advisable for the Conference to adopt a Recommendation to that effect, mentioning that the modified FCC method should be used. Simplicity is not the more relevant item in this particular.

5. Implementation of stations

The following discussion deals with the case where the station to be implemented has parameters different from the standard parameters.

If the Rio method is used, at the moment of implementing a station, it would be necessary to perform one calculation of field strength and compare with Enom.

If the modified FCC method is used it would be necessary to calculate the field strength twice at several points originating from two different points and compare them.

The selection of the method would depend on the relative importance of simplicity and accuracy.

6. Conclusion

Brazil understands that different propagation prediction methods may be used for different purposes, as follows:

- elaboration of the allotment Plan: Rio method,
- interregional sharing: modified FCC method,
- implementation of stations: depends on the relative importance of precision (modified FCC) and simplicity (Rio).

It should be emphasized that the simplicity referred herein concerns the simplicity of the elaboration of the allotment Plan and its future management rather than the calculation of the field strength itself.

BLUE PAGES

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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21 April 1986

B.2

PLENARY MEETING

2nd SERIES OF TEXTS SUBMITTED BY THE EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Document	Title
COM.4	58	Chapter 1 - section 1.1 Chapter 3 - sections 3.1, 3.2, 3.3, 3.4, 3.8 Chapter 4 - sections 4.1, 4.2, 4.3 Annex 1 Annex 2

P. PERRICHON
Chairman of Committee 6

Annex: 11 pages

CHAPTER 1 - DEFINITIONS AND SYMBOLS

1.1 Definitions

In addition to the definitions given in the Radio Regulations, the following definitions and symbols apply.

1.1.1 Broadcasting channel (AM)

A part of the frequency spectrum, equal to the necessary bandwidth of AM sound broadcasting stations, and characterized by the nominal value of the carrier frequency located at its centre.

1.1.2 Objectionable interference

Interference caused by a signal exceeding the maximum permissible field strength within the [protected contour], in accordance with the values derived from [ ].

1.1.3 Service area

The area delimited by the contour within which the calculated level of the groundwave field strength is protected from objectionable interference in accordance with the provisions of Chapter [3].

1.1.4 Audio-frequency (AF) signal-to-interference ratio

The ratio (expressed in decibels) between the values of the voltage of the wanted signal and the voltage of the interfering signal, measured under specified conditions, at the audio-frequency output of the receiver. These specified conditions include various parameters such as the frequency separation between the wanted carrier and the interfering carrier, the emission characteristics (type and percentage of modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

1.1.5 Audio-frequency (AF) protection ratio

Agreed minimum value of the audio-frequency signal-to-interference ratio corresponding to a subjectively defined reception quality. [This ratio may have different values according to the type of service.]

1.1.6 Radio-frequency (RF) signal-to-interference ratio

The ratio (expressed in decibels) between the values of the radio-frequency voltage of the wanted signal and of the interfering signal, measured at the input of the receiver under specified conditions. These specified conditions include various parameters such as the frequency separation between the wanted carrier and the interfering carrier, the emission characteristics (type and percentage of modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

1.1.7 Radio-frequency (RF) protection ratio

The radio-frequency signal-to-interference ratio which, in well-defined conditions, makes it possible to obtain the audio-frequency protection ratio at the output of a receiver. These specified conditions include various parameters such as the frequency separation between the wanted carrier and the interfering carrier, the emission characteristics (type and percentage of modulation, etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

1.1.8 Relative radio-frequency protection ratio

This ratio is the difference (expressed in decibels) between the protection ratio when the carriers of the wanted and unwanted transmitters have a frequency difference of Δf (Hz or kHz) and the protection ratio when the carriers of these transmitters have the same frequency.

1.1.9 Daytime operation

Operation between the times of sunrise and sunset at the transmitter site.

1.1.10 Night-time operation

Operation between the times of sunset and sunrise at the transmitter site.

1.1.11 Synchronized network

Two or more broadcasting stations whose nominal carrier frequencies are identical and which broadcast the same programme simultaneously. In such a synchronized network the difference in carrier frequency between any two transmitters in the network shall not exceed 0.1 Hz. The modulation delay between any two transmitters in the network shall not exceed 100 microseconds, when measured at either transmitter site.

1.1.12 Station power

Unmodulated carrier power supplied to the antenna.

1.1.13 Groundwave

Electromagnetic wave which is propagated along or near the surface of the Earth and which has not been reflected by the ionosphere.

1.1.14 Skywave

Electromagnetic wave which has been reflected by the ionosphere.

[1.2 Symbols]

CHAPTER 3 - BROADCASTING STANDARDS* AND TRANSMISSION CHARACTERISTICS

3.1 Channel spacing

The Plan shall be based on a channel spacing of 10 kHz and carrier frequencies which are integral multiples of 10 kHz, beginning at 1 610 kHz.

3.2 Class of emission

The Plan shall be based on double-sideband amplitude modulation with full carrier A3E.

Classes of emission other than A3E could also be used on condition that the energy level outside the necessary bandwidth does not exceed that normally expected in A3E emission, for instance to accommodate stereophonic systems.

3.3 Bandwidth of emission

The Plan shall be based on a necessary bandwidth of 10 kHz for which only 5 kHz audio bandwidth can be obtained. While this might be an appropriate value within some administrations, others may wish to employ wider bandwidth systems with necessary bandwidths of the order of 20 kHz. However, the protection ratios selected allow operation with 20 kHz occupied bandwidth without an appreciable increase in interference. Stations operating on frequency 1 700 kHz shall take into account No. 343 of the Radio Regulations.

3.4 Frequency tolerance

As indicated in Appendix 7 to the Radio Regulations, the frequency tolerance shall be 20 parts in 10^{-6} (0.002%) for powers of 10 kW or less, and 10 Hz for powers greater than 10 kW.

[3.5 Station power]

[3.6 Nominal usable field strength]

[3.7 Definition of noise zones]

---

* Note - The effect of receiver characteristics upon AM broadcasting standards

It is expected that receiver characteristics for this band will be similar to those of existing receivers in the 535 - 1 605 kHz band. Therefore, they should not affect broadcast standards.

3.8 Protection ratios

3.8.1 Co-channel protection ratio

The co-channel protection ratio shall be 26 dB.

3.8.2 Adjacent channel protection ratio

- the protection ratio for the first adjacent channel shall be 0 dB
- the protection ratio for the second adjacent channel shall be -29.5 dB

3.8.3 Synchronized networks

In addition to the standards specified in this report, the following standard shall apply to synchronized networks:

the co-channel protection ratio between stations belonging to a synchronized network shall be 8 dB.

CHAPTER 4 - RADIATION CHARACTERISTICS OF TRANSMITTING ANTENNAS

In carrying out the calculations indicated in Chapter 2 the following shall be taken into account.

4.1 Omnidirectional antennas

[Figure 1 of section 2.2] shows the characteristic field of a simple vertical antenna as a function of its height in wavelength and of the radius of the ground system.

It is clear that the characteristic field strength increases as the loss in the ground system is reduced to zero and as the antenna height is increased up to 0.625 wavelengths.

The increased characteristic field strength for antenna heights up to 0.625 wavelengths is obtained at the expense of radiation at high angles as shown in [Figure 1a] and [Table II of section 2.2.]

4.2 Considerations of the radiation patterns of directional antennas

The procedures for calculating theoretical, expanded and augmented (modified expanded) directional antenna patterns are given in [Annex 1.]

4.3 Top-loaded or sectionalized antennas

4.3.1 Calculation procedures are given in [Annex 2.]

4.3.2 Many stations employ top-loaded or sectionalized towers, either because of space limitations or to vary the radiation characteristics from those of a simple vertical antenna. This is done to achieve desired coverage or to reduce interference.

4.3.3 An administration using top-loaded or sectionalized antennas shall supply information concerning the tower structure of the antennas. Normally, one of the equations in [Annex 2] shall be employed to determine the vertical radiation characteristics of the antennas. Other equations may also be proposed by an administration and shall be used in determining the vertical radiation characteristics of the antennas of that administration, subject to the agreement of the other administration(s) concerned.

[ANNEX 1]

Calculation of directional antenna patterns

Introduction

This Appendix describes methods to be employed in calculating the field strength produced by a directional antenna at a given point.

1. *General equations*

The theoretical directional antenna radiation pattern is calculated by means of the following equation, which sums the field strength from each element (tower) in the array.

$$E_T(\varphi, \theta) = \left| K_L \sum_{i=1}^{n} F_i f_i(\theta) \underline{/ \psi_i + S_i \cos\theta \cos(\varphi_i - \varphi)} \right| \quad (1)$$

where:

$$f_i(\theta) = \frac{\cos(G_i \sin\theta) - \cos G_i}{(1 - \cos G_i)\cos\theta} \quad (2)$$

where:

$E_T(\varphi, \theta)$: theoretical inverse distance field strength at one kilometre in mV/m for the given azimuth and elevation;

K_L : multiplying constant in mV/m which determines the pattern size (see paragraph 2.5 below for derivation of K_L);

n : number of elements in the directional array;

i : denotes the ith element in the array;

F_i : ratio of the theoretical field strength due to the ith element in the array relative to the theoretical field strength due to the reference element;

θ : vertical elevation angle, in degrees, measured from the horizontal plane;

$f_i(\theta)$: ratio of vertical to horizontal plane field strength radiated by the ith element at elevation angle θ;

G_i : electrical height of the ith element, in degrees;

S_i : electrical spacing of the ith element from the reference point in degrees;

φ_i : orientation of the ith element from the reference element (with respect to True North), in degrees;

φ : azimuth with respect to True North, in degrees;

ψ_i : electrical phase angle of field strength due to the ith element (with respect to the reference element), in degrees.

Equations (1) and (2) assume that:

- the current distribution in the elements is sinusoidal,
- there are no losses in the elements or in the ground,
- the antenna elements are base-fed, and
- the distance to the computation point is large in relation to the size of the array.

2. *Determination of values and constants*

2.1 *Determination of the multiplying constant K for an array*

The multiplying constant K for the loss-free case may be computed by integrating the power flow over the hemisphere, deriving an r.m.s. field strength and comparing the result with the case where the power is radiated uniformly in all directions over the hemisphere.

Thus:

$$K = \frac{E_r\sqrt{P}}{e_h} \quad \text{mV/m}$$

where:

- K: no-loss multiplying constant (mV/m at 1 km);
- E_r: reference level for uniform radiation over a hemisphere, equal to 244.95 mV/m at 1 km for 1 kW;
- P: antenna input power (kW);
- e_h: root mean square radiation pattern over the hemisphere which may be obtained by integrating $e(\theta)$ at each elevation angle over the hemisphere. The integration can be made using the trapezoidal method of approximation, as follows:

$$e_h = \left[\frac{\pi\Delta}{180}\left\{\tfrac{1}{2}[e(\theta)]^2 + \sum_{m=1}^{N}[e(m\Delta)]^2 \cos m\Delta\right\}\right]^{\frac{1}{2}} \quad (3)$$

where:

- Δ: interval, in degrees, between equally-spaced sampling points at different elevation angles θ;
- m: an integer from 1 to N, which gives the elevation angle θ in degrees when multiplied by Δ, i.e. $\theta = m\Delta$;
- N: one less than the number of intervals $\left(N = \frac{90}{\Delta} - 1\right)$;
- $e(\theta)$: root mean square radiation pattern given by equation (1) with K equal to 1 at the specified elevation angle θ (the value of θ is 0 in the first term of equation (3) and $m\Delta$ in the second term); $e(\theta)$ is computed using equation (4).

$$e(\theta) = \left[\sum_{i=1}^{n}\sum_{j=1}^{n} F_i f_i(\theta) F_j f_j(\theta) \cos \psi_{ij} J_0(S_{ij} \cos \theta)\right]^{\frac{1}{2}} \quad (4)$$

where:

- i: denotes the ith element;
- j: denotes the jth element;
- n: number of elements in the array;
- ψ_{ij}: difference in phase angles of the field strengths from the ith and jth elements in the array;
- S_{ij}: angular spacing between the ith and jth elements in the array;
- $J_0(S_{ij} \cos \theta)$: the Bessel function of the first kind and zero order of the apparent spacing between the ith and jth elements. In equation (4), S_{ij} is in radians. However when special tables of Bessel functions giving the argument in degrees are used, the values of S_{ij} should then be in degrees.

2.2 *Relationship between field strength and antenna current*

The field strength resulting from a current flowing in a vertical antenna element is:

$$E = \frac{R_c I\left[\cos(G \sin\theta) - \cos G\right]}{2\pi r \cos\theta} \times 10^3 \quad \text{mV/m} \quad (5)$$

where:

- E: field strength in mV/m;
- R_c: resistivity of free space ($R_c = 120\pi$ ohms);
- I: current at the current maximum, in amperes [1];
- G: electrical height of the element, in degrees;
- r: distance from the antenna, in metres;
- θ: vertical elevation angle, in degrees.

---

[1] I is the current at the maximum of the sinusoidal distribution. If the electrical height of the element is less than 90°, the base current will be less than I.

At one kilometre and in the horizontal plane ($\theta = 0°$):

$$E = \frac{120\pi I(1-\cos G) \times 10^3}{2\pi(1000)} \quad \text{mV/m} \tag{6}$$

hence:

$$E = 60\, I(1 - \cos G) \quad \text{mV/m} \tag{7}$$

2.3 *Determination of no-loss current at current maximum*

For a tower of uniform cross-section or for a similar type of directional array element, the no-loss current at the current maximum is:

$$I_i = \frac{KF_i}{60(1-\cos G_i)} \tag{8}$$

where:

I_i: current at current maximum in amperes in the ith element;

K: no-loss multiplying constant computed as shown in paragraph 2.1 above.

The base current is given by $I_i \sin G_i$.

2.4 *Array power loss*

Power losses in a directional antenna system are of various types, including ground losses, antenna coupling losses, etc. The loss resistance for the array may be assumed to be inserted at the current maximum to allow for all losses. The power loss is:

$$P_L = \frac{1}{1000} \sum_{i=1}^{n} R_i I_i^2 \tag{9}$$

where:

P_L: total power loss, in kW;

R_i: assumed loss resistance, in ohms (one ohm, unless otherwise indicated) for the ith tower [1];

I_i: current at current maximum (or base current if the element is less than 90 degrees in electrical height) for the ith tower.

2.5 *Determination of a corrected multiplying constant*

To allow for power loss in the antenna system, the multiplying constant K can be modified, as follows:

$$K_L = K\left(\frac{P}{P + P_L}\right)^{\frac{1}{2}} \tag{10}$$

where:

K_L: multiplying constant after correction for the assumed loss resistance;

K: no-loss multiplying constant computed in paragraph 2.1 above;

P: array input power (kW);

P_L: total power loss (kW).

[1] The loss resistance shall in no way exceed a value such that the value of K_L (see paragraph 2.5) differs by more than ten percent from that calculated for a resistance of one ohm.

2.6 *r.m.s. value of radiation to be notified for directional antennas*

The radiation E_r for directional antennas is determined as follows:

$$E_r = K_L \, e(\theta) \qquad \text{mV/m at 1 km}$$

2.7 *Determination of expanded pattern values*

The expanded pattern is determined as follows:

$$E_{EXP}(\varphi, \theta) = 1.05 \left\{ [E_T(\varphi, \theta)]^2 + Q^2 \right\}^{\frac{1}{2}} \tag{11}$$

where:

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

$E_T(\varphi, \theta)$: theoretical pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

Q : quadrature factor, computed as:

$$Q = Q_0 \, g(\theta)$$

where:

Q_0 is the Q on the horizontal plane, and is normally the greatest of the following three quantities:

$$10.0 \quad ; \quad 10\sqrt{P} \quad \text{or} \quad 0.025 K_L \left[\sum_{i=1}^{n} F_i^2 \right]^{\frac{1}{2}}$$

$g(\theta)$ is computed as follows:

If the electrical height of the shortest tower is less than or equal to 180 degrees, then:

$$g(\theta) = f(\theta) \text{ for the shortest tower.}$$

If the electrical height of the shortest tower is greater than 180 degrees, then:

$$g(\theta) = \frac{\{[f(\theta)]^2 + 0.0625\}^{\frac{1}{2}}}{1.030776}$$

where $f(\theta)$ for the shortest tower is used.

Note: In comparing the electrical heights of the antenna towers to determine the shortest tower, the total apparent height (as determined by current distribution) is used for top-loaded and sectionalized towers.

2.8 *Determination of augmented (modified expanded) pattern values*

The purpose of the augmented (modified expanded) pattern is to put one or more "patches" on an expanded pattern. Each "patch" is referred to as an "augmentation". The augmentation may be positive (resulting in more radiation than that of the expanded pattern) or negative (resulting in less radiation than that of the expanded pattern). In no case shall the augmentation be so negative that the augmented (modified expanded) pattern radiation is below the theoretical radiation pattern.

Spans of augmentation may overlap. That is, an augmentation may itself be augmented by a subsequent augmentation. To ensure that the calculations are properly made, the augmentations are handled in increasing order of central azimuth of augmentation, starting at True North. If several augmentations have the same central azimuth, then they are considered in order of decreasing span (i.e. the one with the largest span is handled first). If more than one augmentation has the same central azimuth and the same span, then they are considered in ascending order of their effect.

$$E_{MOD}(\varphi,\theta) = \left\{[E_{EXP}(\varphi,\theta)]^2 + g^2(\theta)\sum_{i=1}^{a} A_i \cos^2(180\,\Delta_i/\alpha_i)\right\}^{\frac{1}{2}} \tag{12}$$

where:

$E_{MOD}(\varphi, \theta)$: augmented (modified expanded) pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$g(\theta)$: same parameter as described for the expanded pattern (see paragraph 2.7);

a : number of augmentations;

Δ_i : difference between the azimuth at which the radiation is desired φ, and the central azimuth of augmentation of the ith augmentation. It will be noted that Δ_i must be less than or equal to one-half of α_i;

α_i : total span of the ith augmentation;

A_i : is the value of the augmentation given by the expression [1]:

$$A_i = [E_{MOD}(\varphi_i, \theta)]^2 - [E_{INT}(\varphi_i, \theta)]^2 \tag{13}$$

where:

φ_i : central azimuth of the ith augmentation;

$E_{MOD}(\varphi_i, \theta)$: augmented (modified expanded) horizontal plane radiation at the central azimuth of the ith augmentation, after applying the ith augmentation, but before applying subsequent augmentations;

$E_{INT}(\varphi_i, \theta)$: an interim value of radiation in the horizontal plane at the central azimuth of the ith augmentation. The interim value is the radiation obtained from applying previous augmentations (if any) to the expanded pattern, but before applying the ith augmentation.

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[1] When A_i is negative, there is negative augmentation; when A_i is positive, there is positive augmentation. A_i must not be so negative that $E_{MOD}(\varphi, \theta)$ falls below $E_T(\varphi, \theta)$ of any azimuth, φ, or elevation angle, θ.

[ANNEX 2]

Equations for the calculation of the normalized vertical radiation from top-loaded and typical sectionalized antennas

Basically, the equation is:

$$f(\theta) = \frac{E_\theta}{E_0}$$

where:

E_θ : radiation at a desired elevation angle, θ;

E_0 : radiation in the horizontal plane.

Specific equations for top-loaded and typical sectionalized antennas are given below.

These equations use one or more of four variables A, B, C and D, the values of which are given in columns 6, 7, 8 and 9 respectively, of Part II-C of Annex 1*.

1. *Top-loaded antenna* (when column 12 of Part II-A of Annex 1* is 1)

$$f(\theta) = \frac{\cos B \cos(A \sin\theta) - \sin\theta \sin B \sin(A\sin\theta) - \cos(A+B)}{\cos\theta[\cos B - \cos(A+B)]}$$

where:

A : electrical height of the antenna tower;

B : difference between the apparent electrical height (based on current distribution) and the actual height (A);

θ : the elevation angle with respect to the horizontal plane.

Note: When *B* is zero (i.e., when there is no top-loading), the equation reduces to that of a simple vertical antenna.

2. *Sectionalized tower* (when column 12 of Part II-A of Annex 1* is 2)

$$f(\theta) = \frac{[\cos B\cos(A\sin\theta) - \cos(A+B)]\sin(C+D-A) + \sin B[\cos D\cos(C\sin\theta) - \sin\theta\sin D\sin(C\sin\theta) - \cos(C+D-A)\cos(A\sin\theta)]}{\cos\theta([\cos B - \cos(A+B)]\sin(C+D-A) + \sin B[\cos D - \cos(C+D-A)])}$$

where:

A : actual height of the lower section;

B : difference between the apparent electrical height (based on current distribution) of the lower section and the actual height of the lower section (*A*);

C : actual total height of the antenna;

D : difference between the apparent electrical height (based on current distribution) of the total tower and the actual height of the total tower (*C*);

θ : vertical angle with respect to the horizontal plane.

3. Administrations proposing to use other types of antenna should furnish details of their characteristics together with a radiation pattern.

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* Final Acts of the Regional Administrative MF Broadcasting Conference (Region 2) (Rio de Janeiro, 1981)

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) **RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2**

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 62-E
25 April 1986
Original: English

COMMITTEE 4

SUMMARY RECORD

OF THE

THIRD MEETING OF COMMITTEE 4

(TECHNICAL CRITERIA)

Friday, 18 April 1986, at 0910 hrs

Chairman: Mr. M.L. PIZARRO (Chile)

Subjects discussed:		Documents
1.	First report of Working Group 4-B	52
2.	Second report of Working Group 4-A	46
3.	Technical criteria for the sharing of the band 1 625 - 1 705 kHz between the broadcasting service and other services in Region 2	3 + Add.1, 7, 29, 34

1. First report of Working Group 4-B (Document 52)

1.1 The Chairman of Working Group 4-B, introducing Document 52, drew attention to cases where the text contained square brackets and indicated a number of editorial changes.

ANNEX I

1. DEFINITIONS

Objectional interference, Protected contour.

Following observations made by the delegates of Argentina, the United States, Mexico and Brazil, it was agreed to retain the square brackets in the above two entries, pending a decision on the planning method adopted.

Nominal usable field strength (E_{nom}), Usable field strength (E_u).

It was agreed to leave consideration of the above two definitions in abeyance pending further information from Working Group 4-B.

Audio-frequency (AF) protection ratio

The square brackets were retained around the second sentence pending a decision on the class of station.

Radio-frequency (RF) wanted-to-interfering signal ratio
(Recommendation 447-2)

Approved, with deletion of "(Recommendation 447-2)".

Class B station, Class C station

It was agreed to defer a decision on the above two definitions, and to retain the square brackets, pending a decision by Committee 5.

BROADCASTING STANDARDS

3.3: Bandwidth of emission

It was agreed, on a proposal by the delegate of Canada, to request the Secretariat to verify whether in the final sentence a reference to No. 343 could replace the reference to Article 6 of the Radio Regulations, since the Article as a whole was too broad in scope. On that understanding, the section was approved.

3.4: Frequency tolerance

1.2 The Technical Secretary said that the relevant appendix to the Radio Regulations should be indicated precisely in the text. Referring to the sub-paragraph headed "The effect of receiver characteristics upon AM broadcast standards", he suggested that the Secretariat might add a note to clarify the distinction between broadcasting characteristics and receiver characteristics.

1.3 The Chairman said that the Secretariat would take the matter into account; in any case, the paragraph would have to be renumbered in order to align the text with the Plenary document.

On that understanding, 3.4 was approved.

3.7.3: Synchronized networks

1.4 The Chairman of Working Group 4-B said that the second and third sub-paragraphs were in square brackets not only because the text depended on Committee 5's decision but because some delegates doubted whether the text should appear in that part of the report of this session; the Working Group was to consider the matter further.

Pending a decision on the text within square brackets, 3.7.3 was approved.

ANNEX II [CHAPTER 4] - Radiation characteristics of transmitting antennas

Approved.

4.1: Omnidirectional antennas

1.5 The delegate of Mexico said that in all the Spanish texts the word omnidireccional should be used to translate the English omnidirectional.

It was so agreed.

He said that he saw no need for detailed information on differing antenna heights and characteristic field strengths, which would only serve to confuse matters.

1.6 The Chairman said that although the idea of standardized parameters had been accepted, some flexiblity would still be allowed, provided that the effect on service or border areas was unchanged.

1.7 The delegate of Canada agreed that an allotment plan would allow some flexibility, which meant that information of the sort mentioned would be required.

4.1 was approved, with the square brackets being retained and also added around the term "Figure la" in the last paragraph for editorial purposes.

4.4 and Figure [7.1]

It was agreed to leave the entire text and graph within square brackets and defer a decision pending consideration of the matter by Sub-Working Group 4-B-3, which was expected to report before the next meeting of Committee 4.

APPENDIX 2

1.8 The Chairman said that the text had remained unchanged since the RABC, Rio de Janeiro, 1981; he therefore invited the Committee to approve it as a whole.

Appendix 2 was approved.

APPENDIX 3

1.9 The Chairman of Working Group 4-B said that the term "- sin θ" at the end of the first line of the equation relating to 2. Sectionalized tower, was in square brackets because of doubts expressed about its retention; the Working Group was looking into the matter.

Subject to that reservation and to the Editorial Committee's attention to the square brackets elsewhere in the text, Appendix 3 was approved.

The first report of Working Group 4-B was approved as a whole, subject to the above amendments and comments.

1.10 The Chairman expressed the Committee's thanks to the Chairman and members of Working Group 4-B.

2. Second report of Working Group 4-A (Document 46)

2.1 The Chairman of Working Group 4-A drew attention to an editorial correction to the introductory part of Document 46.

Working Group 4-A, in its consideration of skywave propagation, had examined the proposals contained in Documents 3, 4, 7, 8, 14 and 22. All, with the exception of Document 22 contributed by Cuba, favoured the inclusion of a geomagnetic latitude dependent term in the calculation method to be adopted by the Conference. During The Group's consideration of the subject, the delegate of Mexico had reported that the findings of recent research in Mexico supported the inclusion of such a term. The Group had discussed the issue at great length and ultimately the Chairman had been compelled to make a ruling in favour of the method supported by the majority, which was that contained in the document. As mentioned in the introductory part of the document, Cuba had reserved its right to reopen the discussion in Committee 4 and Brazil had submitted a compromise proposal.

2.2 The delegate of Brazil acknowledged that the modified FCC method for the determination of skywave propagation, which included a geomagnetic latitude dependent term, was more accurate than the method currently employed in Region 2. His Administration therefore had no difficulty in supporting it. However, the use of the modified FCC method during the initial stage of allotment planning might create serious problems for administrations in view of the fact that it would prevent the application throughout the Region of fixed standard values for coordination distance and nominal usable field strength; one or other would have to vary with geomagnetic latitude. He therefore proposed, as stated in the introductory part of Document 46, that in the initial stage of allotment planning, in determining the coordination distance only, the Region 2 method should be used. In reply to a question from the delegate of Canada, he confirmed that the words "in the initial stage of allotment planning" meant "during the development of the allotment plan".

2.3 The delegate of Chile supported the Brazilian proposal.

2.4 The delegate of Argentina said that, as stated in Working Group 4-A, his Administration favoured the method adopted in the 1981 Rio Final Acts.

2.5 The delegate of Cuba said that, as explained in Document 22, calculations made by his Administration showed that use of a skywave propagation model that included a geomagnetic latitude dependent term would result in very large coordination distances for countries in low latitudes. If the nominal usable field strength were held constant, that coordination distance would decrease considerably towards the higher latitudes. Conversely, if the coordination distance were held constant throughout the Region, the nominal usable field strength would be far greater in higher than in lower latitudes. Use of the CCIR or modified FCC methods would thus be disadvantageous to the small and medium-sized countries of the Region, most of which were in the low latitudes. He therefore maintained his proposal. The present system had given satisfactory use for many years; his Administration considered it would not be feasible to change it.

2.6 The delegate of Uruguay supported the Cuban proposal.

2.7 The delegate of Mexico agreed that the present system had operated harmoniously in the Region for a large number of years. However, account now had to be taken of the fact that more recent measurements indicated the need to consider other factors, such as geomagnetic latitude, in determining skywave propagation. The refusal to use the more accurate methods thus developed might allow closer station spacing but the higher interference levels that would result would make such gains worthless.

2.8 The delegate of the United States endorsed those remarks, as did the delegate of Canada, who also pointed out the serious implications for broadcasting in the band that non-inclusion of a geomagnetic latitude dependent factor would introduce with regard to sharing with other services within and outside the Region.

2.9 The delegate of Brazil said that he too was very concerned about the effect that failure to take account of geomagnetic latitude would have on interference levels. He would therefore accept the use of the modified FCC method for determining skywave interference levels within and outside the Region. He considered, however, with the support of the delegate of Paraguay, that it was important when preparing the allotment plan to use fixed standard values of both coordination distance and nominal usable field strength throughout the Region. The only allowable variation should be between the two noise zones and between day and night operation. That was why he was proposing use of the Region 2 method for determination of the coordination distance.

2.10 The delegate of the United States supported by the delegate of Canada, said that consideration of the values of coordination distance and nominal usable field strength to be used in the allotment plan was the province of Committee 5 and outside the terms of reference of Committee 4. What Committee 4 had to consider was the skywave propagation model that would most accurately define the real interference situation existing within and outside the Region.

2.11 The delegate of Brazil said he could prepare a written text to clarify the terms of his proposal.

2.12 The Chairman proposed that that suggestion be adopted and further discussion of the subject suspended until the Brazilian text was available.

It was so agreed.

3. Technical criteria for the sharing of the band 1 625 - 1 705 kHz between the broadcasting service and other services in Region 2 (Documents 3 + Add.1, 7, 29 and 34)

3.1 The Chairman said that the CCIR's technical bases for sharing criteria were outlined in Document 3, Chapter 9, and its Addendum 1.

Following the introduction by the delegates of Canada and Argentina and the representative of the IFRB of Documents 7, 29 and 34 respectively, he said that it would be preferable to initiate discussion of the issue in a more restricted Group and proposed that a small Working Group be set up for the purpose with facilities for consultation with the IFRB and the CCIR. He suggested that the Group should be composed of Canada, Argentina and any other delegation that wished to participate, under the chairmanship of Canada.

It was so agreed.

3.2 The delegates of Brazil and the United States indicated their wish to join the Working Group.

The meeting rose at 1200 hours.

The Secretary	The Chairman
J. FONTEYNE	M.L. PIZARRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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COMMITTEE 4

SECOND REPORT OF WORKING GROUP 4-B
TO COMMITTEE 4

Working Group 4-B has agreed on the following:

Application of the protection criteria

The interference calculations shall be made on a one to one basis; the effect of each interfering signal shall be evaluated separately.

3.6 Nominal usable field strength

Table of nominal usable field strength

	Noise zone 1	Noise zone 2
Daytime	0.5 mV/m	1.25 mV/m
Night-time	3.3 mV/m	6 mV/m

3.7 *Definition of noise zones*

Noise zone 1

Comprises the whole of Region 2 with the exception of noise zone 2.

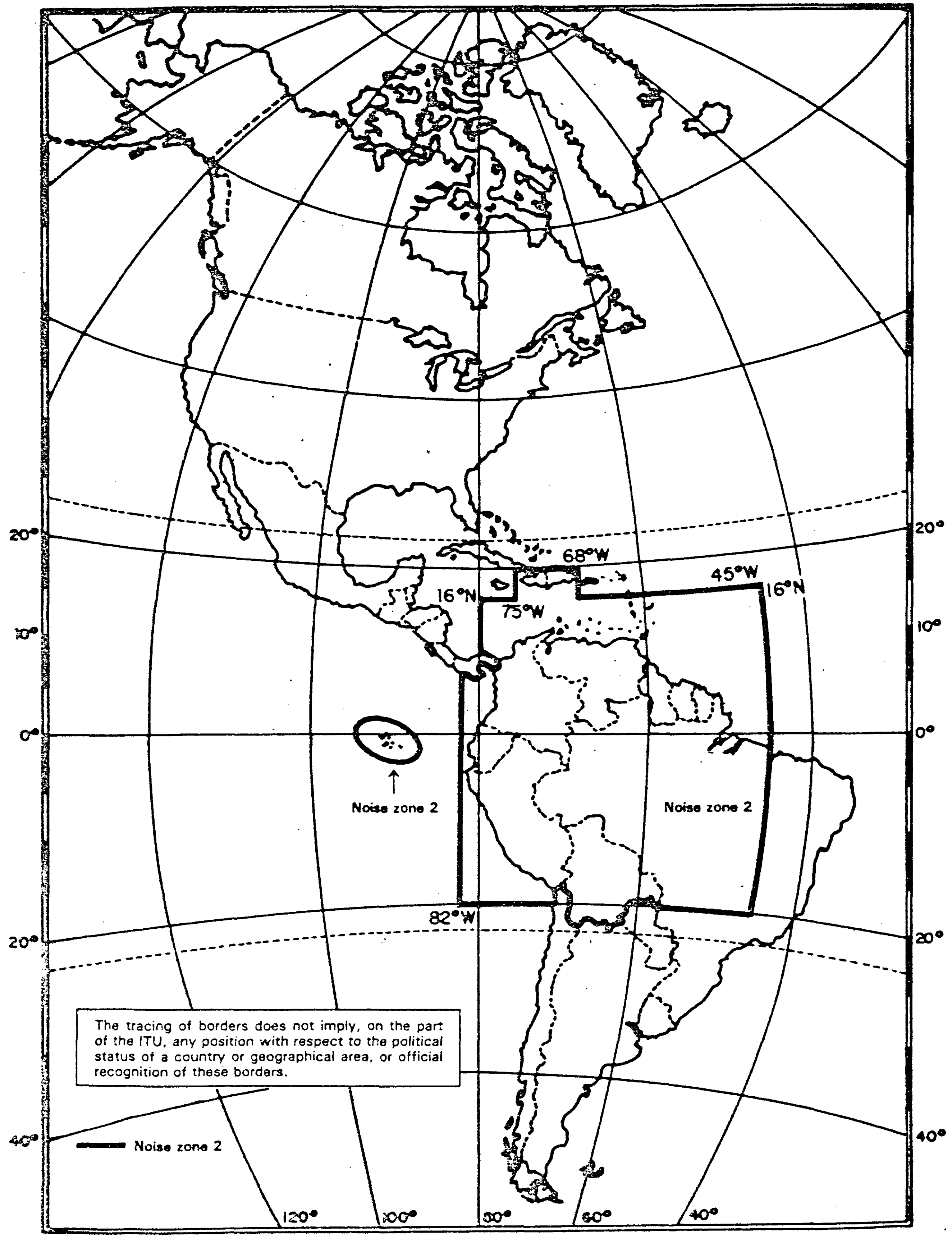
Noise zone 2

Comprises the area within the line defined by the coordinates 20° S-45° W, the meridian 45° W to the coordinates 16° N-45° W, the parallel 16° N to the coordinates 16° N-68° W, the meridian 68° W to the coordinates 20° N-68° W, the parallel 20° N to the coordinates 20° N-75° W, the meridian 75° W to the coordinates 16° N-75° W, the parallel 16° N to the coordinates 16° N-80° W, the meridian 80° W to the northeast coast of Panama, the frontier between Panama and Colombia, the southeast coast of Panama and the meridian 82° W to the parallel 20° S, and the parallel 20° S, with the exception of Chile and Paraguay, until the frontier between Paraguay and Brazil until 45° W. Bolivia is entirely included in noise zone 2 as are the archipelago of San Andrés y Providencia and the islands belonging to Colombia and the Colon archipelago or the Galapagos Islands (Ecuador).

Note 1. – Grenada is included in noise zone 1 night-time and noise zone 2 daytime.

Note 2. – See the maps of noise zones on the following page.

NOISE ZONES



T.M. BEILER
Chairman of Working Group 4-B

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

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COMMITTEE 4

SUMMARY RECORD

OF THE

FOURTH MEETING OF COMMITTEE 4

(TECHNICAL CRITERIA)

Tuesday, 22 April 1986 at 1030 hrs

Chairman: Mr. M.L. PIZARRO (Chile)

Subjects discussed		Documents
1.	Summary record of the first meeting of Committee 4	35
2.	Oral report of Working Group 4-C	-
3.	Second report of Working Group 4-A: sky-wave propagation	46, 60
4.	First and second reports of Working Group 4-B	52, 63

1. Summary record of the first meeting of Committee 4 (Document 35)

The Committee approved the summary record of the first meeting.

2. Oral report of Working Group 4-C

2.1 The Chairman of Working Group 4-C reported that the Working Group had considered the proposals in Documents 3, 7, 29 and 34 relating to the technical criteria for inter-service sharing and approved a draft Chapter VI on that subject to be submitted to Committee 4 at its next meeting. It had also approved two draft Recommendations. The first was on the further refining of sharing criteria for Region 2; in that connection it would be asking administrations to pursue studies and submit their findings through the CCIR for submission at the second session for final decision. The second Recommendation related to the question of interregional sharing on which it was opportune to give some guidelines concerning the protection afforded in Region 2 and indicating ways of calculating field intensities.

The Committee took note of the report.

3. Second report of Working Group 4-A: sky wave propagation (Documents 46 and 60)

3.1 The delegate of Brazil, introducing Document 60, stressed that the purpose had been to achieve greater simplicity in the sky wave propagation prediction method and in elaboration of the allotment plan. Two methods were under consideration, first the modified FCC method and secondly the Rio Method adopted at RARC-81. He stressed the importance of keeping the plan and associated regulatory procedures sufficiently simple.

In reply to a request for clarification from the delegate of Argentina, he explained that the purpose of the explanatory figure distributed to delegates was to demonstrate that the field strength value of a station to be implemented was not greater than that of a station with standard parameters and that, with regard to the question of various geomagnetic latitudes, the aim was to simplify work by avoiding a large number of calculations.

3.2 The delegate of the United States, referring to the explanatory diagram, pointed out that, if the Rio Method were used it was indeed true that only one calculation was needed to determine the acceptability of a non-directional type of operation, but for a directional one a second point would have to be examined.

Secondly, referring to the part of the diagram concerning the modified FCC method, he thought that if a station was located at 0 with a standard configuration of 1 kW with a 90 degrees non-directional tower, only one calculation would be required to determine acceptability.

3.3 The delegate of Brazil said that the diagram had been kept as simple as possible and therefore related only to omnidirectional antennas. It was correct that more calculations would be necessary for non-directional antennas.

In the second example given by the previous speaker, a country would have to carry out its own calculations to check acceptability of the location.

3.4 The delegate of Canada, referring to the point made by the delegate of Argentina, said that over the range of distances where calculations would take place generally variation in using the modified FCC method was so slight that one calculation at mid-latitude of that path would suffice, since error at the end points would be negligible. Therefore there was little to choose in simplicity between the two methods. Although he agreed that it would be impractical to use distances varying with latitude in the elaboration of the allotment plan, he considered that the modified FCC method was more appropriate for interregional sharing and implementation of stations.

3.5 The representative of the United States agreed that differences due to latitude variation were quite small and he could therefore accept use of a medium value applied to calculations, thereby simplifying use. He also supported the sky wave propagation curves as set out in the report of Working Group 4-A to Committee 4.

3.6 The delegate of Cuba could accept use of the Rio Method for elaboration of the allotment plan and of the modified FCC method for interregional sharing purposes, and advocated use of the present Rio Method for implementation of stations as the use of the modified FCC would present difficulties.

3.7 The delegates of Mexico, Colombia, the United Kingdom, Argentina, Uruguay and Brazil said that they could accept use of the Rio Method for elaboration of the allotment plan and implementation of stations and the modified FCC method for interregional sharing purposes.

3.8 The Chairman requested that the Secretary of Committee 4 should produce a preliminary report for consideration by Committee 4 containing the description of the Rio Method as set out in the Final Acts of the second session of the Regional Administrative MF Broadcasting Conference held in Rio de Janeiro, 1981. That text could then be considered with Document 46, which at present contained description of the FCC method only. The text could then be produced as a report of Committee 4 to Committee 6 and later to the Plenary.

It was so agreed.

4. First and second reports of Working Group 4-B (Documents 52 and 63)

First report (Document 52)

4.1 The Chairman of Working Group 4-B said that the Working Group had decided to delete section 4.4. and Figure 7.1 which were both placed in square brackets in Annex II. It had agreed that the administration should make further studies to establish the relationship between physical and electrical heights of antennas and that the CCIR should be invited to prepare a report on those studies as well as carrying out studies within the normal framework of its activities. The Working Group had prepared an appropriate Recommendation for submission to the next meeting of Committee 4.

Referring to the term "F(θ)" in the second line on page 13, the Working Group, after consultations with members of the IFRB and experts from delegations, had confirmed that the expression "- sin θ" should be deleted.

The Committee took note of these amendments.

ANNEX I

1. DEFINITIONS

Protected contour

It was agreed to retain the square brackets in the above entry.

Nominal usable field strength (E_{nom})

Since the values had now been adopted it was agreed that the square brackets could be deleted.

Usable field strength (Eu)

It was agreed that the definition should be deleted.

Audio-frequency (AF) protection ratio

It was agreed that the last sentence placed in square brackets should be deleted.

Class B station, Class C station

It was agreed that the definitions be deleted as no classes were defined.

BROADCASTING STANDARDS, section 3.7.3

It was decided to defer a decision on the section pending discussion of Document 63.

Second report (Document 63)

The Chairman of Working Group 4-B introduced Document 63.

Application of the protection criteria

Approved.

Section 3.6 Nominal usable field strength

4.2 The delegate of the United Kingdom withdrew the reservation made previously.

4.3 The delegate of Cuba pointed out that he wished to retain the reservation made on that section by his Delegation.

The Committee approved section 3.6 and noted the reservation made by Cuba which would appear in the report to the Plenary.

Section 3.7 Definition of noise zones and the associate figure on page 2

The definition of noise zones was maintained.

First report (resumed)

Section 3.7.3 Synchronized networks

4.4 At the suggestion of the delegate of Canada, it was agreed to delete the entire section 3.7.3 as well as the relevant definition of "Synchronized networks" at the top of page 4.

4.5 The Chairman pointed out that the Plenary would have to be informed of that decision since the definition was included in the blue document for submission to the Plenary. Although Committee 5 had not yet laid down guidelines for evaluation of powers of stations in the band, Working Group 4-B should decide on values, to be placed within square brackets, and should study distances for coordination pending the relevant Decisions from Committee 5.

4.6 The Chairman of Working Group 4-B, in reply to a question from the representative of CCIR, said that some definitions were still under consideration and would be included for discussion as appropriate.

The meeting rose at 1215 hours.

The Secretary: J.M. FONTEYNE

The Chairman: M.L. PIZARRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 65-E
25 April 1986
Original: English

COMMITTEE 5

SUMMARY RECORD

OF THE

SIXTH MEETING OF COMMITTEE 5

(PLANNING CRITERIA)

Tuesday, 22 April 1986, at 1400 hours

Chairman: Mr. M. FERNANDEZ-QUIROZ (Mexico)

Subjects discussed:		Documents
1.	Summary records of the first, second and third meetings of Committee 5	36, 41, 42
2.	Oral reports by the Chairmen of Working Groups 5-A and 5-B	-
3.	Draft report of the ad hoc Group of Committee 5	DT/11
4.	Intersessional activities	7, 8

1. Summary records of the first, second and third meetings of Committee 5 (Documents 36, 41 and 42)

The summary records of the first, second and third meetings of Committee 5 were approved as amended (see the Corrigenda to Documents 36, 41 and 42).

2. Oral reports by the Chairmen of Working Groups 5-A and 5-B

2.1 The Chairman of Working Group 5-A said that the Group had completed most of its work on the text setting out the principles to be used in planning (termed the Basis for Planning), the only part outstanding being the case of administrations wishing to turn the allotment plan into assignments at the Second Session. However, some areas of the agreed text remained in square brackets pending a final decision on the text or tables to be inserted at those points. The issues involved included determination of the standard parameters for day and night-time operation, a decision as to whether the distance (x) should have one or more values, the related decisions concerning nominal usable field strengths and propagation curves, and development of the procedures to be followed in border areas. The Group therefore had a large amount of work ahead of it, which it would endeavour to complete in the limited time available.

The Committee took note of the oral report by the Chairman of Working Group 5-A.

2.2 The Chairman of Working Group 5-B said that the Group's discussions had focussed on the proposals in Documents DT/12 and 57. Consideration had been given to the interpretation to be given to RR 480 and 481 and to the nature of the instrument required to regulate the operation of the broadcasting service in the 1 605 - 1 705 kHz band. As a result, two currents of opinion had emerged: one favouring the adoption of provisions associated with the Plan and the other the adoption of a regional agreement.

The Group had also completed its examination of the Preamble and two Articles of the draft Final Acts proposed by the United States of America in Document 57. In that connection, a representative of the IFRB had suggested that the Secretary-General be consulted with regard to the contents of the Preamble. That suggestion was placed before the Committee.

2.3 The Chairman said he would look into the matter of consultation with the Secretary-General and report back to the Working Group.

The Committee took note of that action and of the oral report by the Chairman of Working Group 5-B.

3. Draft report of the ad hoc Group of Committee 5 on the relation between the broadcasting service in Region 2 and the other services to which the band 1 605 - 1 705 kHz is allocated (Document DT/11)

3.1 The Chairman of the ad hoc Group said that Document DT/11 contained the text proposed by his Drafting Group, prepared in the light of the discussion that had taken place at the fifth meeting of the Committee and of certain elements of the CITEL Recommendation (Document 19).

In reply to a request by the representative of the IFRB (Mr. Brooks) for clarification of the meaning of the term "designated non-broadcasting stations" used in paragraph 2, he said that the sentence concerned had been taken in its entirety from the CITEL Recommendation. It had been considered to mean that existing non-broadcasting services would be permitted to continue to operate provided that they caused no interference to the broadcasting service in the band. It was by no means intended to imply that new non-broadcasting services could be added in the band.

3.2 The representative of the IFRB said that in that case it might be well to remove the word "designated" from the term.

It was agreed, following suggestions from the Chairman and the delegate of Brazil, to refer paragraph 1 for action to Working Group 5-A, and to refer paragraph 2 for action, taking into account the comments made in discussion, to the Working Group of the Plenary, which was preparing the draft agenda for the Second Session of the Conference. The points covered in both paragraphs should be included in the Plan document.

3.3 In reply to a question from the delegate of Argentina, the Chairman of the ad hoc Group said that the intention in paragraph 3 was merely, as in Recommendation No. 2 of the Rio Conference (which could moreover be used as the model for the proposed Recommendation), to urge administrations not to make new assignments to other services and to remove existing assignments to them but without setting any final date for the latter process.

In reply to a question from the delegate of Brazil, he said that the reference in the last line of paragraph 3 to the date of adoption of the Recommendation was simply intended as a reminder of the usual rule whereby Recommendations of a conference became applicable as soon as they were adopted without waiting until the Final Acts of the Second Session to be adopted.

3.4 The delegate of Brazil, supported by the delegate of Cuba, proposed that the last part of the first sentence of paragraph 3 following the word "allocated" should be deleted since the action concerned would be covered by the Resolution referred to in paragraph 4.

3.5 The Chairman of the ad hoc Group concurred with that proposal. In reply to a further question from the delegate of Brazil, he said that the "stations of other services" in paragraph 4 referred not only to stations no longer in use but also to those administrations who were being urged to discontinue service as soon as possible.

3.6 The Chairman proposed that a Drafting Group, consisting of the delegations that had taken part in the discussion and under the chairmanship of the delegate of Brazil, should be set up to prepare the texts of the Recommendation and Resolution referred to in paragraphs 3 and 4 respectively, due attention being paid to the points that had been raised in discussion.

It was so agreed.

4. Intersessional activities (Documents 7 and 8)

4.1 The delegate of Canada, introducing proposal CAN/7/60 (Document 7), said that the adoption of the allotment planning method meant that little intersessional work would be required. However, a suggestion had been made during the Conference that the definition of allotment areas could be computerized, and the IFRB could perhaps be asked to provide such computer programs.

4.2 The delegate of Brazil endorsed those remarks and drew attention to the computer software proposals contained in Document 8, section VII.

4.3 Following a discussion on the feasibility and possible financial implications of computerization, in which the representatives of the IFRB (Mr. Brooks and Mr. Berrada) and the delegates of the United States of America, the United Kingdom and Canada took part, the Chairman said that it was clear that further discussion was necessary to clarify the situation before any specific request could be formulated on the subject by Committee 5. He proposed that such discussion take place informally outside the Committee.

It was so agreed.

The meeeting rose at 1530 hours

The Secretary:	The Chairman:
M. GIROUX	M. FERNANDEZ-QUIROZ

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Corrigendum 1 to
Document 66-E
7 May 1986
Original : Spanish/English

PLENARY MEETING

MINUTES OF THE

THIRD PLENARY MEETING

Paragraph 2.3

1. In the Spanish version only, replace "nocturna y diurna" by "diurna y nocturna" and delete the words "capacidad de" in the seventh and eleventh lines respectively.

2. In all versions, replace "signals" in the eleventh line by "interference".

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 66-E
25 April 1986
Original: English

PLENARY MEETING

MINUTES

OF THE

THIRD PLENARY MEETING

Tuesday, 22 April 1986, at 1545 hrs

Chairman: Mr. F. Savio C. PINHEIRO (Brazil)

Subjects discussed:	Documents
1. Approval of the minutes of the first Plenary Meeting	31
2. Reports by Chairmen of Committees	55
3. First series of texts submitted by the Editorial Committee for first reading (Series B.1)	56
4. Second series of texts submitted by the Editorial Committee for first reading (Series B.2)	61

1. Approval of the minutes of the first Plenary Meeting (Document 31)

The minutes of the first Plenary Meeting were approved.

2. Reports by Chairmen of Committees

2.1 Report by the Chairman of Committee 2 (Credentials) (Document 55)

The Plenary Meeting took note of Document 55.

2.2 Oral report by the Chairman of Committee 3 (Budget Control)

The Chairman of Committee 3 said that the Committee had not met since the previous Plenary Meeting; its second meeting was planned for the following morning.

2.3 Oral report by the Chairman of Committee 4 (Technical Criteria)

The Chairman of Committee 4 said that Working Group 4-A had completed its work relating to parameters for ground-wave and sky-wave propagation. Working Group 4-B had made progress in establishing values for E_{nom} and the two noise areas to be established for that purpose, pursuant to the Final Acts of the RARC, Rio de Janeiro, 1981. For Noise Zone 1, values of 0.5 mV/m and 3.3 mV/m had been established for daytime and night-time respectively; for Noise Zone 2, the respective values established were 1.25 mV/m and 6 mV/m. The Delegation of Cuba had recorded a reservation in respect of the daytime value relating to Noise Zone 1. It had also been determined that, for the purpose of interference calculations, the value of each signal capacity would be taken instead of applying the RSS for multiple signals. Several parameters, such as that relating to station power, had still to be determined, and some new definitions would have to be formulated in the light of the Plan adopted. A Working Group 4-C had been established to deal with matters relating to sharing criteria in the 1 625 - 1 705 kHz band; it had already concluded its task and was to submit its report to the next meeting of Committee 4, which hoped to complete its work by the deadline of 25 April.

2.4 Oral report by the Chairman of Committee 5 (Planning Criteria)

The Chairman of Commitee 5 said that Working Group 5-A had held four meetings so far and had begun work on the establishment of technical bases and procedures; it would be meeting again that evening. Working Group 5-B had so far held two meetings. Some problems had arisen at the outset, including uncertainty about the reaction of the IFRB and the interpretation reflected in the latter's document. Nevertheless, work was proceeding on the basis of a document submitted by the United States. In view of certain doubts about the preamble to that document, a further document was to be prepared for submission to the Secretary-General for his views. An ad hoc Group formed by Committee 5 had made a number of Recommendations contained in Document DT/11. Paragraph 1 of that document would be studied by Working Group 5-A; paragraph 2 would be submitted to WG/PLEN, and the last two paragraphs would be sent to a Drafting Group of Committee 5.

2.5 Oral report by the Chairman of the Working Group of the Plenary

The Chairman of the Working Group of the Plenary said that the timetables of other meetings had hitherto prevented the Working Group from meeting; however, it would hold its first meeting the following day at 1400 hours.

3. First series of texts submitted by the Editorial Committee to the Plenary Meeting for first reading (Series B.1) (Document 56)

3.1 The Chairman of the Editorial Committee drew attention to a number of editorial corrections in the first series of texts submitted for first reading relating to Chapter 2.

Section 2.1: Ground-wave propagation

Approved, with the following amendments:

2.1.1: first paragraph, replace "should" by "shall", and, in the last line, "revisions" by "modifications".

2.1.1 b): reworded as follows:
"No allotment or assignment in the Plan ...". and delete square brackets.

2.1.3.1: in the second paragraph of the English text, correct the symbol "1 V/m" to read "1 μV/m"; in the third paragraph, add square root before symbol P at the end of the first equation.

2.1.3.2.b): third line of French text, "session" should read "section".

Figures 2.1 and 2.2

Approved, subject to minor editorial amendments to the English texts and correction of "1 565 kHz" to "1 655 kHz" in the Spanish text.

3.2 The delegate of the United States of America, in response to observations by the delegate of Brazil and the Chairman of the Editorial Committee, said that his Administration was forwarding to the Conference, for use during the current Session, the requisite documents to provide clearer presentation of the data in Figures 2.1 and 2.2, which would doubtless be used by administrations for calculations prior to the Second Session.

The first series of texts (B.1) submitted by the Editorial Committee was approved, as amended, on first reading.

4. Second series of texts submitted by the Editorial Committee for first reading (Series B.2) (Document 61)

4.1 The Chairman of the Editorial Committee introduced the second series of texts, containing parts of Chapters 1, 3 and 4 and Annexes 1 and 2.

Chapter 1

1.1.1: retained without change, following a discussion on the suggestion to include a particular value for necessary bandwith;

1.1.5: deletion of the entire last sentence;

1.1.8: the symbol "f" should read "Δf";

1.1.11: deletion of the entire paragraph;

1.1.12: the Chairman of the Editorial Committee said that the title "Station power" should be changed to "Transmitter power".

4.2 A representative of the IFRB suggested that the definition should read "Unmodulated carrier power supplied to the antenna transmission line"; the delegates of the United States and the United Kingdom disagreed with that proposal and the latter considered that the original term "Station power" should be retained. That view was endorsed by the Chairman of Committee 4.

4.3 The representative of the IFRB said that the text of 1.1.12 as it stood did not conform to Nos. 58 and 153 of the Radio Regulations.

4.4 The Chairman of Committee 4 said it was the definition of station power that his Committee had considered and the purpose was to apply definitions and symbols additional to those in the Radio Regulations.

4.5 The delegate of Canada added that generally speaking the definitions should be those used in the Rio de Janeiro Plan.

It was finally agreed to retain 1.1.12, heading "Station power", and the text as it stood.

Chapter 3

4.6 The Chairman of Committee 4 reiterated Committee 4's proposal that paragraph 3.8.3 should be deleted and it was agreed that that Committee should be asked to reconsider the matter in the light of observations made; in the meantime the paragraph was to be retained in square brackets.

Chapter 4

Approved.

Annex 1

Approved, subject to deletion of the square brackets throughout the Annex and use of the French term "en section fractionnée" wherever the English version used "sectionalized".

Annex 2

Approved, subject to those same modifications and the amendments below:

- in the final sentence of the introductory paragraph, the text after the words "variables A, B, C and D" were to be replaced by "which are defined after each equation";

- the text after the words "Top-loaded antenna" to be replaced by "Antenna type 1" in the heading of paragraph 1;

- in the heading of paragraph 2, the text in parentheses to be replaced by "Antenna type 2" and the term ["-sin Θ "] at the end of the first line of the equation to be deleted.

The second series of texts (Series B.2) submitted for first reading was thus approved, as amended.

The meeting rose at 1730 hours.

The Secretary-General:
R.E. BUTLER

The Chairman:
F. Savio C. PINHEIRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 67-E
22 April 1986
Original: English

COMMITTEE 4

FINAL REPORT OF WORKING GROUP 4-C
TO COMMITTEE 4

1. Working Group 4-C has considered the proposals in Documents 3, 7, 29 and 34 relating to the technical criteria for interservice sharing (item 2.2 of the agenda). As a result of the discussions on these documents:

DRAFT CHAPTER ON TECHNICAL CRITERIA FOR INTERSERVICE SHARING

is proposed in Annex 1.

2. It is the opinion of Working Group 4-C that the administrations of Region 2 should be invited to carry out studies and make measurements, within the limits of their possibilities, to define, on the basis of the principle of an equivalent service quality between the broadcasting and the other services sharing the same band, the steady state protection ratio values as requested. These studies should be carried out within the normal framework of the CCIR Study Group activity. The concerned administrations are therefore invited to submit their findings to the relevant CCIR Study Group at its interim meeting. In this connection, a draft Recommendation [COM4/2] is proposed in Annex 2.

3. In addition, Working Group 4-C touched on the question of interregional sharing, being aware that it is opportune to give some guidelines concerning this issue. An appropriate draft Recommendation [COM4/3] is proposed in Annex 3.

4. Some parts of the text in Annexes 1 and 3 are within square brackets pending decisions from Committee 5.

J.M. BOILARD
Chairman of Working Group 4-C

Annexes: 3

ANNEX 1

Draft

CHAPTER 6 - TECHNICAL CRITERIA FOR INTERSERVICE SHARING

In accordance with Article 8, of the Radio Regulations, the fixed and mobile services become permitted services at a time to be established by the Conference. The intention was to facilitate the preparation of the broadcasting Plan without restrictions from other services. Thus in drawing up the Plan, broadcasting will have prior choice of frequency and does not have to protect the other services. The sharing criteria developed in this section are designed to apply to the permitted services in order to protect broadcasting services in the Plan and give protection to these permitted services. According to the specific cases the protection ratio value is given for co-channel interference (CO) or for off-channel interference (OC).

[6.1] Protection of the broadcasting service

The broadcasting service in Region 2 may be subject to potential interservice interference from services sharing the sub-band 1 625 - 1 705 kHz such as the fixed, mobile and radiolocation services.

[Protection in accordance with the criteria in [§ 6.1.1] is to be given within the national boundary and/or sub-national zone for priority channels and within the service contours for non-priority channels.]

A value of 26 dB has been indicated in [3.8.X] for co-channel protection ratio between broadcasting emissions, hence allowing a given quality of service, and the same quality criteria has been applied to derive the figures given in the case where interfering services other than broadcasting are considered.

[6.1.1] Protection ratio criteria

As noted in the CCIR Report to the Conference, "Compatibility problems and sharing criteria between the broadcasting service and the other services are not fully investigated ...". Additional limited information has been developed since that document was prepared. However, it is recognized that further information is necessary before administrations are in a position to agree on the values to be used in establishing protection criteria for use in sharing of the extended band. As a result, administrations are encouraged to make further studies of this subject during the intersessional period. In addition, it would be desirable for the CCIR to assist in the final preparation of a responsive document to be submitted to the Second Session. (See Recommendation COM4/2.)

The latest available information from the CCIR is presented in Table 6.1.

New results of measurements, performed in one administration from Region 2, indicate that, at least for J3E and F1B interference cases, new radio-frequency protection ratio values can be proposed, namely: 28 dB for J3E off-channel interference case (about 1.4 kHz assigned frequency spacing and zero frequency carrier spacing) and 45 dB for F1B off-channel (1 kHz) interference case. The radio-frequency protection curves (median values) appearing in Figures [6.1] and [6.2] can be used to determine protection for various carrier spacings.

6.2 Protection of the permitted services

The protection ratio values to protect the permitted services when implementing the Plan are also given in Table [6.1].

In the wanted fixed service case, values are indicated for just usable (JU), marginally commercial (MC) and good commercial (GC) quality and in the telegraph communication case they should be specified for a character error ratio, P_E of 10^{-2}, 10^{-3} and 10^{-4}, but since the protection ratios do not significantly vary for P_E values up to 10^{-6}, a single figure is suggested by the CCIR.

TABLE 6.1

Steady-state protection ratios (dB)*

Interfering signal / Wanted signal		A3E (BC)		A3E (fixed)		A2A/A2B		F1B		J2B		J3E		H2A/H2B		Class of emission
		CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	Interfering condition[1)]
A3E (BC)		26		26		31		47	45		43		38		37	
A3E (fixed)[2)]	JU MC GC	-7 5 26														
A2A/A2B	$P_E<10^{-6}$	5														
F1B	$P_E<10^{-6}$	-3														
J2B	$P_E<10^{-6}$		5													
J3E	JU MC GC		-19 -7 14													
H2A/H2B	$P_E<10^{-6}$		-1													
Class of emission	Service grade															

* Ratio of wanted-to-interfering signals whose powers are expressed in terms of p.e.p. (PX) (see Recommendation 240-3 (MOD I)).

1) CO (co-channel interference) and OC (off-channel interference) are the cases when the frequency separation between the assigned frequency of the wanted signal and that of the interfering signal is approximately zero and about 1.4 kHz respectively.

2) Administrations are urged to discontinue, in the fixed service, the use of double-sideband radiotelephone (class A3E) transmissions (see RR 2700).

Wanted[1]	A3E	(Broadcasting)
Unwanted	J3E	(Radiotelephony)
LPF[2] at Rx	10 kHz	
Grade of impairment.....	4	(as per CCIR Rec. 562-1)

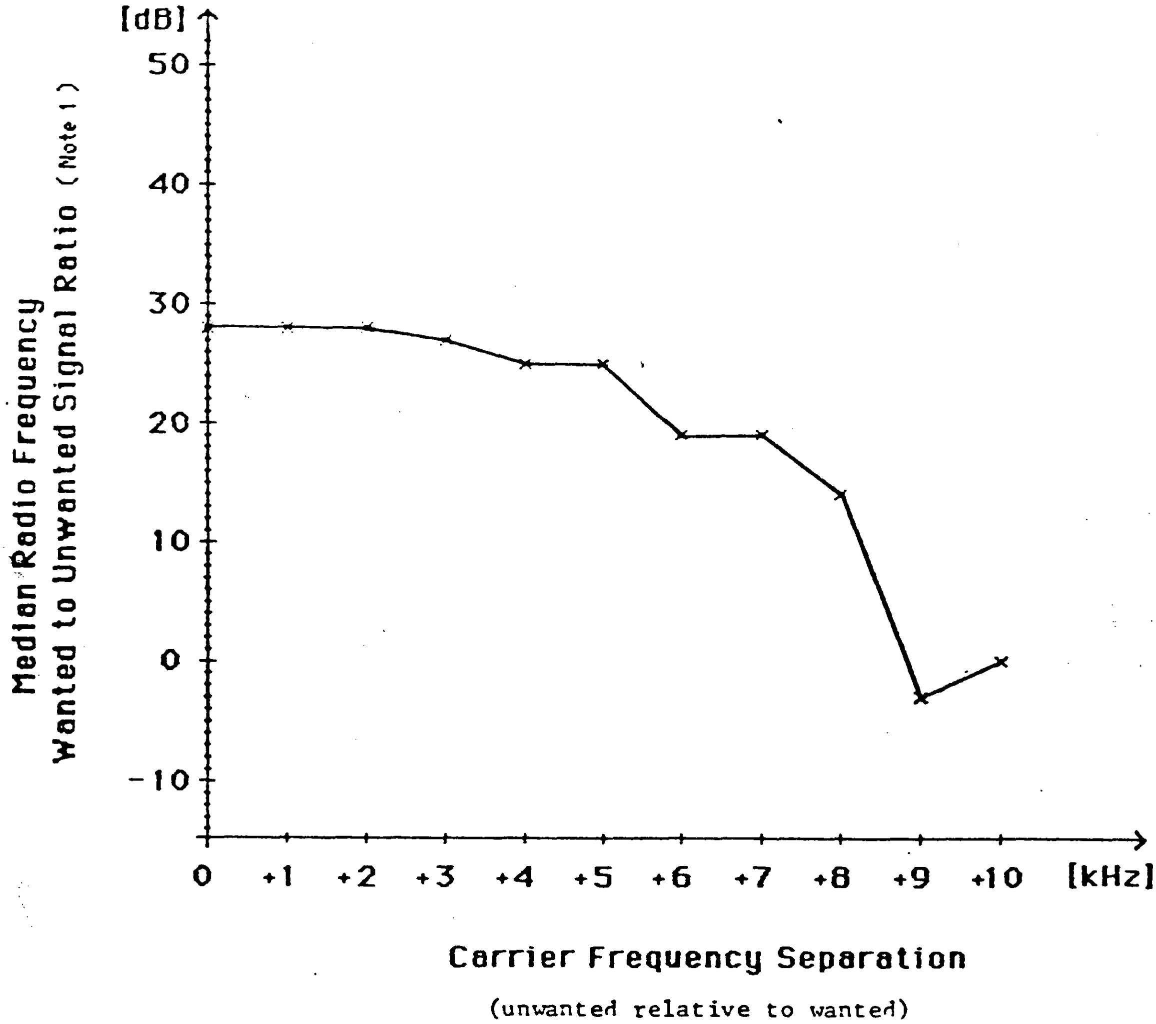


Figure 6.1- Median value of the radio frequency wanted (A3E) to unwanted (J3E) signal ratio as a function of the carrier frequency separation.

Note 1 - The signal ratio is defined as the ratio of the peak envelope power of the wanted signal to the peak envelope power of the unwanted signal.

Note 2 - LPF means low pass filter.

Wanted[1]........................	A3E	(Broadcasting)
Unwanted........................	F1B	(Narrow-band direct printing telegraphy or selective digital calling)
LPF[2] at Rx........................	10 kHz	
Grade of impairment.....	4	(as per CCIR Rec. 562-1)

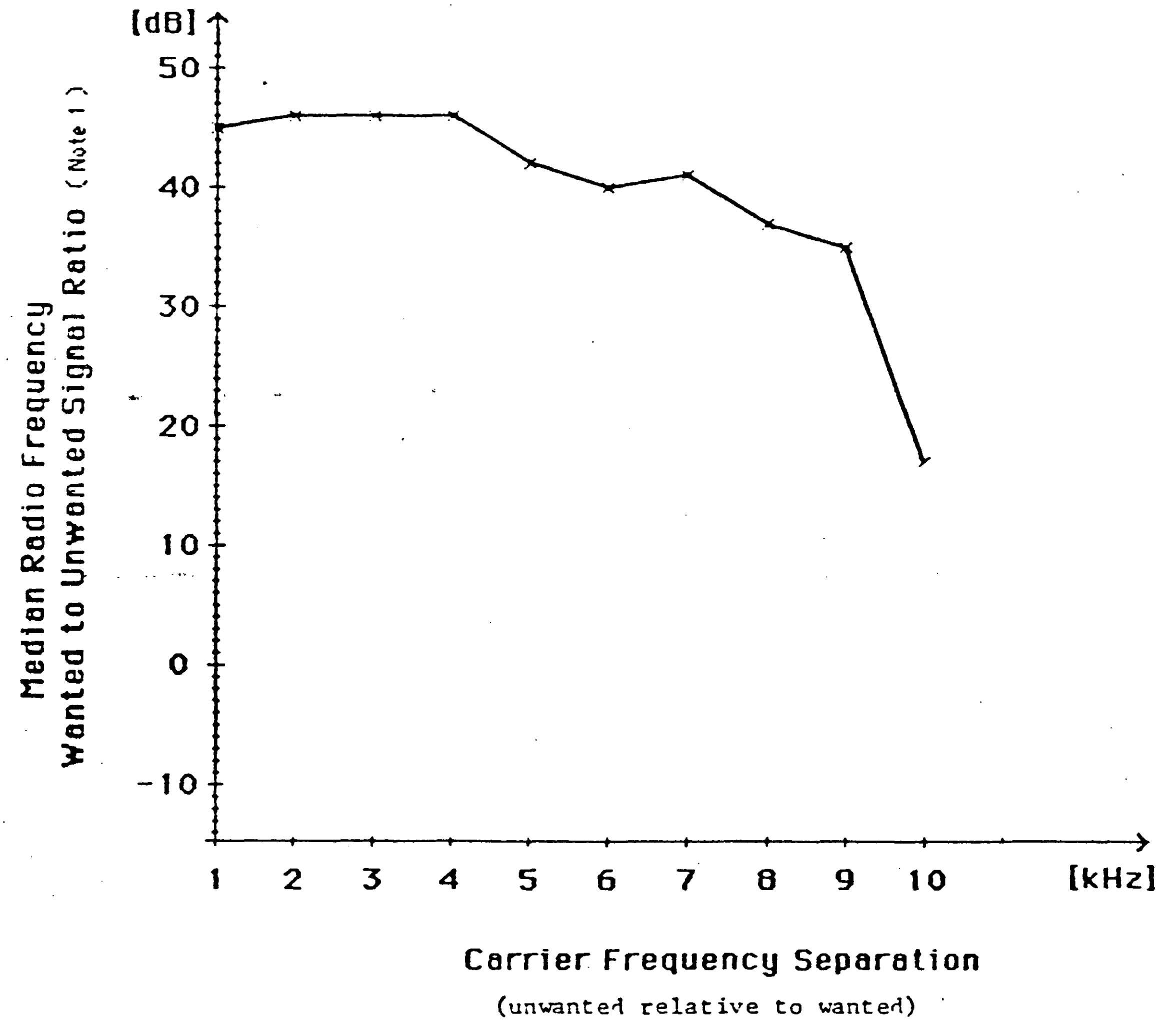


Figure 6.2 Median value of the radio frequency wanted (A3E) to unwanted (F1B) signal ratio as a function of the carrier frequency separation.

Note 1 - The signal ratio is defined as the ratio of the peak envelope power of the wanted signal to the mean power of the unwanted signal.

Note 2 - LPF means low-pass filter.

6.3 Principles used for the application of interregional sharing criteria (see Recommendation COM4/3)

6.3.1 Application of RR 346

In the application of the interregional sharing criteria, the basic principle is the equality of rights between the regions as contained in RR 346.

6.3.2 Application of the IFRB technical standards

The relevant IFRB technical standards govern the matter concerning the interregional sharing.

ANNEX 2

Draft

RECOMMENDATION COM4/2

Continuation of studies concerning sharing criteria for services using the band 1 625 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

considering

a) that the World Administrative Radio Conference (Geneva, 1979), in its Recommendation No. 504, invited the CCIR to perform the necessary technical studies related to convening a conference for Region 2;

b) that the Administrative Council, in its Resolution No. 913 establishing the agenda for this Conference, invited the CCIR to prepare a report on the necessary technical bases;

c) that the CCIR, in response to those requests, has drawn up a report on the technical bases, which includes a chapter on compatibility with other services, while recognizing that the problem of criteria for sharing between the broadcasting service and the other services has not yet been fully investigated;

d) that more varied and more detailed data are required for a better understanding of the subject and for confirmation of the values provisionally proposed in Chapter 6 of this report;

recommends that administrations cooperate urgently and to the fullest extent possible with the CCIR, by sending the latter contributions on the above-mentioned subject, taking account of the CCIR working schedule;

requests the CCIR

1. to continue its studies on sharing criteria for services using the band 1 625 - 1 705 kHz in Region 2;

2. to prepare a new report for the Second Session of the Conference on the basis of those studies;

and invites the Second Session of the Conference to reconsider the relevant parts of Chapter 6 of the Report of the First Session in the light of data developed by the administrations and the CCIR's new report and, if necessary, to modify the values proposed in that chapter.

ANNEX 3

Draft

RECOMMENDATION No. [COM4/3]

Technical criteria for interregional sharing

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

considering

a) that under the terms of the agenda contained in Resolution No. 913 of the Administrative Council, this Conference proposed provisional technical criteria for inter-service sharing between the broadcasting service and other services in Region 2, in the band 1 625 - 1 705 kHz;

b) that, in accordance with numbers 1001 and 1454 of the Radio Regulations, the IFRB develops Technical Standards and Rules of Procedure for internal use by the Board in the exercise of its functions, based inter alia upon the relevant provisions of the Radio Regulations and the Appendices thereto, the decisions of administrative radio conferences, as appropriate, and the Recommendations of the CCIR;

considering further

that compatibility problems and sharing criteria between the broadcasting service and other services are not fully investigated, although a comprehensive study is being carried out in the CCIR;

noting

a) that, in conformity with the provisions of number 56 of the Convention, the decisions of a regional administrative conference must in all circumstances be in conformity with the provisions of the Radio Regulations and that such a conference may give instructions to the IFRB, provided that such instructions do not conflict with the interests of the two other Regions;

b) that the Regional Administrative Radio Conference for the Maritime Mobile Service and Aeronautical Radionavigation Service in certain parts of the MF band in Region 1 (RARC MM-R1, Geneva, 1985) adopted technical criteria for the protection of the maritime mobile service in the bands 1 606.5 - 1 625 kHz and 1 635 - 1 800 kHz;

recommends

that the IFRB should take account of the guidelines set out in the Annex to this Recommendation when adopting its technical standards for the purpose of calculations of interregional interference.

Annex

(to Recommendation No. [COM4/3])

Calculation of field strengths in the case of interregional interference

1) In calculating interregional interference, the field strengths shall be determined by taking the arithmetic mean of the signal strengths, expressed in dB(uV/m) for a specified e.m.r.p., calculated both by the method described in Annex 1 to CCIR Recommendation 435-3 and by the method proposed by Region 2. Signal strengths calculated by the Region 2 method should be increased by 2.5 dB to allow for the different reference hours of the two methods. The value determined in accordance with the above shall be applied when it is midnight at the mid-point of the interregional path, provided that the entire path is in darkness. Signal strengths at other times are unlikely to exceed this value.

2) Protection in accordance with the criteria defined in Chapter 6 should be given within [the national boundary and/or sub-national zone for priority channels and within the service contours for non-priority channels.]

Document 68-E
22 April 1986
Original: English/French/Spanish

COMMITTEE 4

/ CHAPTER 2 - PROPAGATION /

2.2 Skywave propagation

The calculation of skywave field strength shall be conducted in accordance with the provisions which follow. (No account is taken in the Agreement of sea gain or of excess polarization coupling loss.)

2.2.1 *List of symbols*

- d: short great-circle path distance (km)
- E_c: characteristic field strength, mV/m at 1 km for 1 kW
- $f(\theta)$: radiation as a fraction of the value $\theta = 0$ (when $\theta = 0$, $f(\theta) = 1$)
- f: frequency (kHz)
- F: unadjusted annual median skywave field strength, in dB(μV/m)
- F_c: field strength read from Fig. 4 or Table III for a characteristic field strength of 100 mV/m
- $F(50)$: skywave field strength, 50% of the time, in dB(μV/m)
- P: station power (kW)
- θ: elevation angle from the horizontal (degrees)

2.2.2 *General procedure*

Radiation in the horizontal plane of an omnidirectional antenna fed with 1 kW (characteristic field strength, E_c) is known either from design data or, if the actual design data are not available, from Fig. 1.

Elevation angle θ is given by

$$\theta = \arctan\left(0.00752 \cot \frac{d}{444.54}\right) - \frac{d}{444.54} \qquad \text{degrees} \qquad (1)$$

$$0° \leq \theta \leq 90°$$

Alternatively, Table 1 or Fig. 2 may be used.

It is assumed that the Earth is a smooth sphere with an effective radius of 6,367.6 km and that reflections occur from an ionospheric height of 96.5 km.

The radiation $f(\theta)$ expressed as a fraction of the value at $\theta = 0$ at a pertinent elevation angle θ can be determined from Fig. 3 or Table II.

The product $E_c f(\theta)\sqrt{P}$ is thus determined for an omnidirectional antenna. For a directional antenna, $E_c f(\theta)\sqrt{P}$ can be determined from the antenna radiation pattern. $E_c f(\theta)\sqrt{P}$ is the field strength at 1 km at the appropriate elevation angle and azimuth.

The unadjusted skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c f(\theta) \sqrt{P}}{100} \quad \text{dB}(\mu\text{V/m}) \qquad (2)$$

where F_c is the direct reading from the field strength curve in Fig. 4 or Table III.

Note: Values of F_c in Fig. 4 and Table III are normalized to 100 mV/m at 1 km corresponding to an effective monopole radiated power (e.m.r.p.) or − 9.5 dB(kW).

For distances greater than 4250 km, it should be noted that F_c can be expressed by:

$$F_c = \frac{231}{3 + d/1000} - 35.5 \quad \text{dB}(\mu\text{V/m}) \qquad (3)$$

2.2.3 *Skywave field strength, 50% of the time*

This is given by:

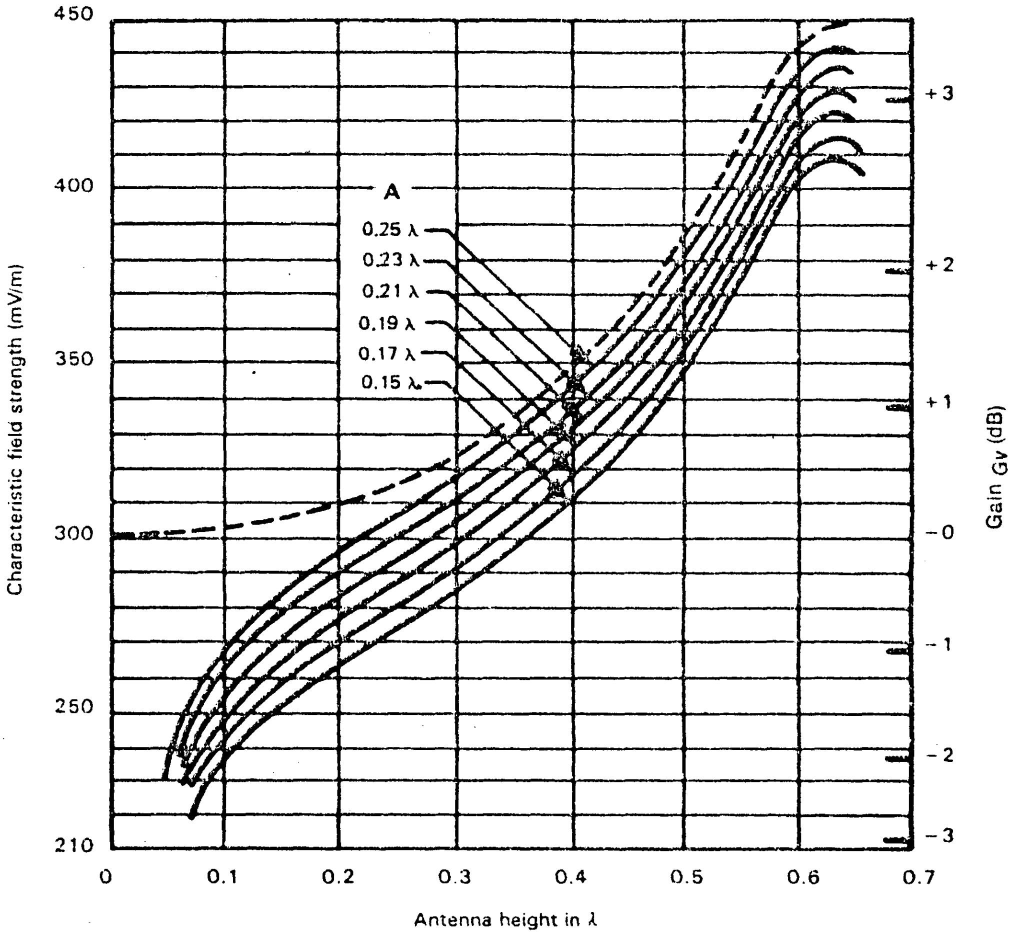
$$F(50) = F \quad \text{dB}(\mu\text{V/m}) \qquad (4)$$

2.2.4 *Nocturnal variation of skywave field strength*

Hourly median skywave field strengths vary during the night and at sunrise and sunset. Figure 5 shows the average variation referred to the value at 2 hours after sunset at the path midpoint. This variation applies to field strengths occurring for 50% of the nights.

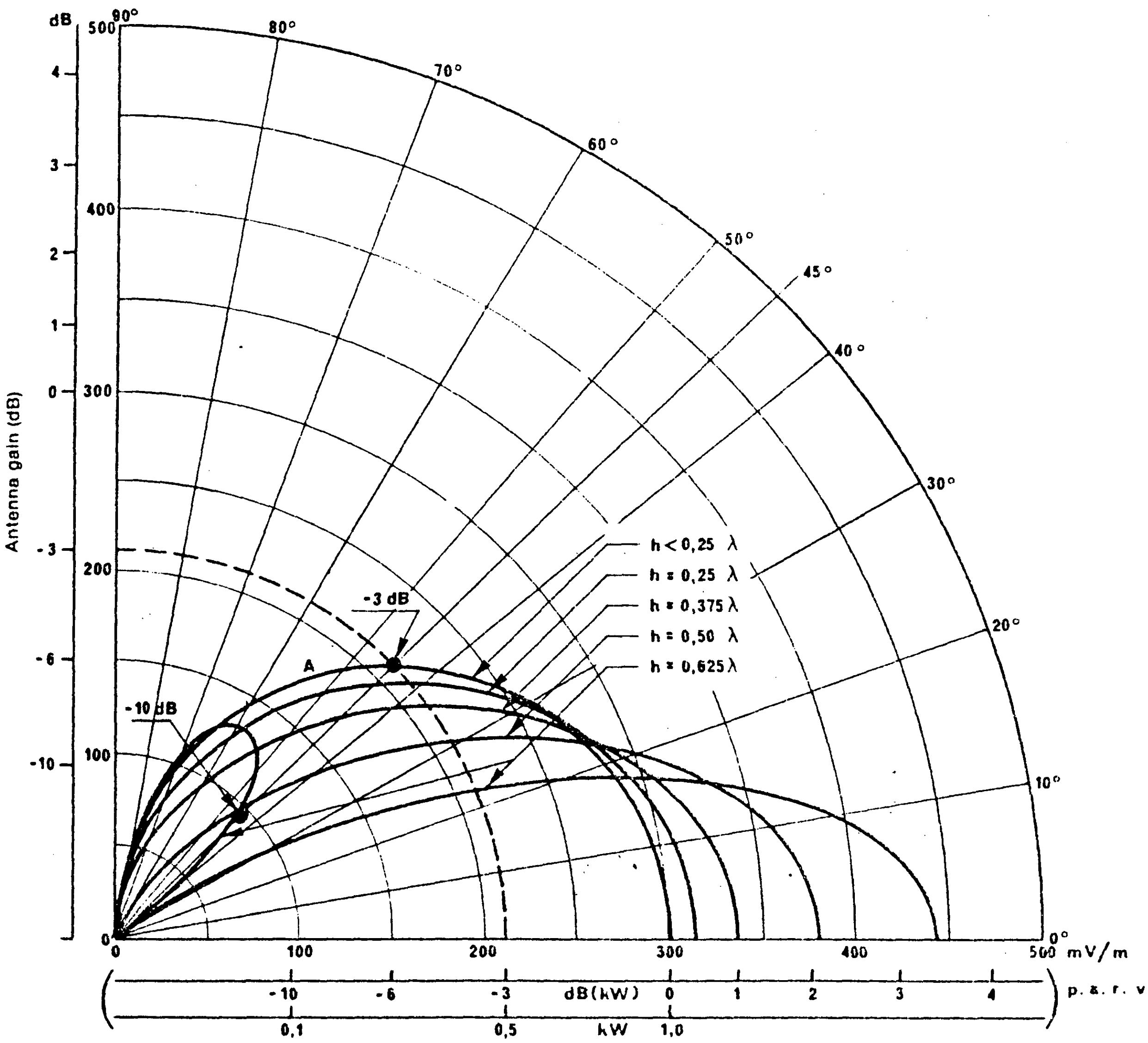
2.2.5 *Sunrise and sunset time*

To facilitate the determination of the local time of sunrise and sunset, Fig. 6 gives the times for various geographical latitudes and for each month of the year. The time is the local meridian time at the point concerned and should be converted to the appropriate standard time.



A: Radius of ground system
Full lines: Real antenna correctly designed
Dashed line: Ideal antenna on a perfectly conducting ground

FIGURE 1 – *Characteristic field strengths for simple vertical antennas, using 120-radial ground systems*



A: Short vertical antenna

FIGURE 1a – *Effective monopole radiated power (e.m.r.p.) and field strength at a distance of 1 km as a function of elevation angle, for different heights of vertical antennas assuming a transmitter power of 1 kW*

TABLE I – *Elevation angle vs distance*

Distance (km)	Elevation angle (degrees)
50	75.3
100	62.2
150	51.6
200	43.3
250	36.9
300	31.9
350	27.9
400	24.7
450	22.0
500	19.8
550	18.0
600	16.3
650	14.9
700	13.7
750	12.6
800	11.7
850	10.8
900	10.0
950	9.3
1000	8.6
1050	8.0
1100	7.4
1150	6.9
1200	6.4
1250	5.9
1300	5.4
1350	5.0
1400	4.6
1450	4.3
1500	3.9
1550	3.5
1600	3.2
1650	2.9
1700	2.6
1750	2.3
1800	2.0
1850	1.7
1900	1.5
1950	1.2
2000	1.0
2050	0.7
2100	0.5
2150	0.2
2200	0.0
2250	0.0
2300	0.0
2350	0.0
2400	0.0

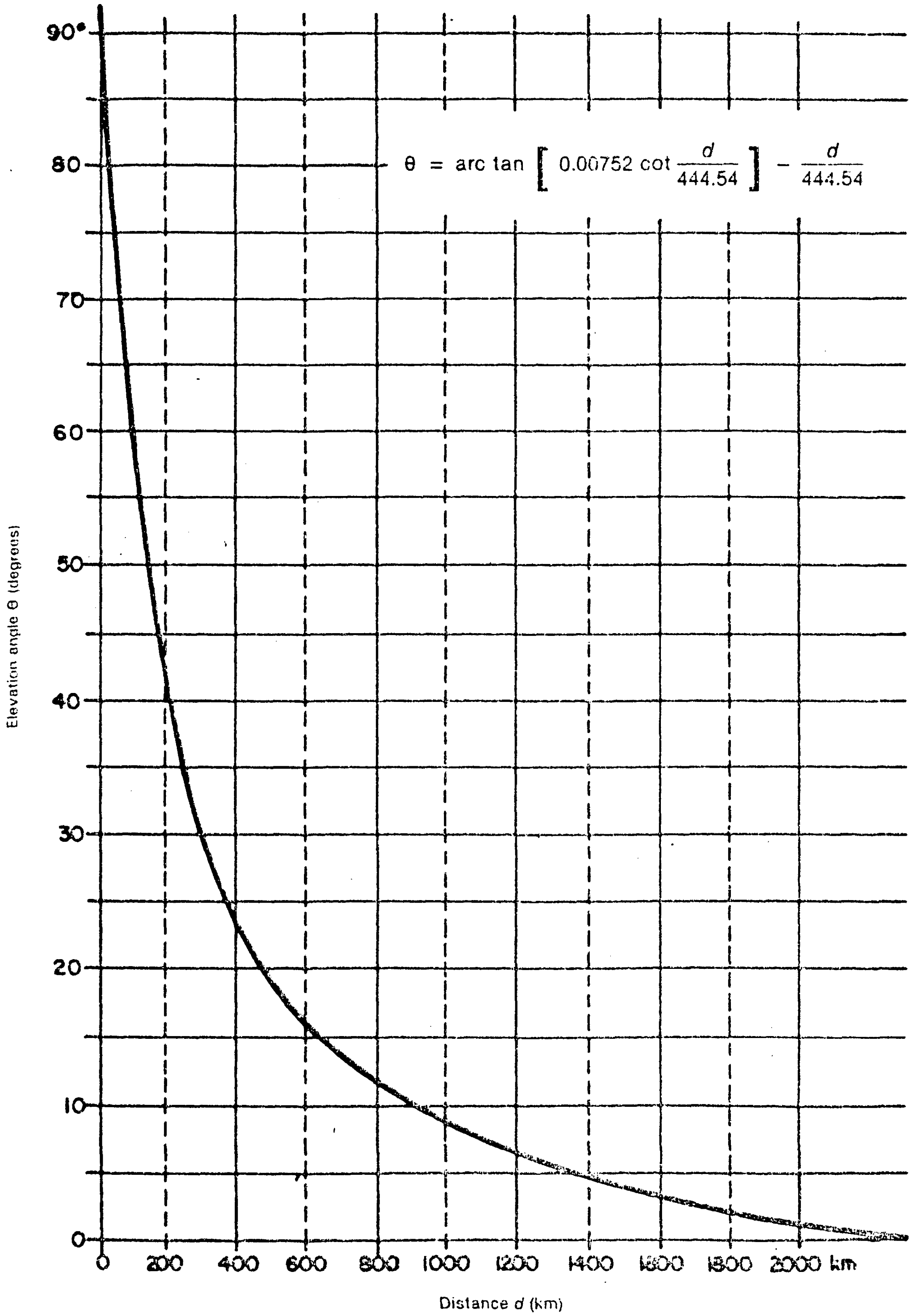


FIGURE 2 - *Elevation angle vs distance*

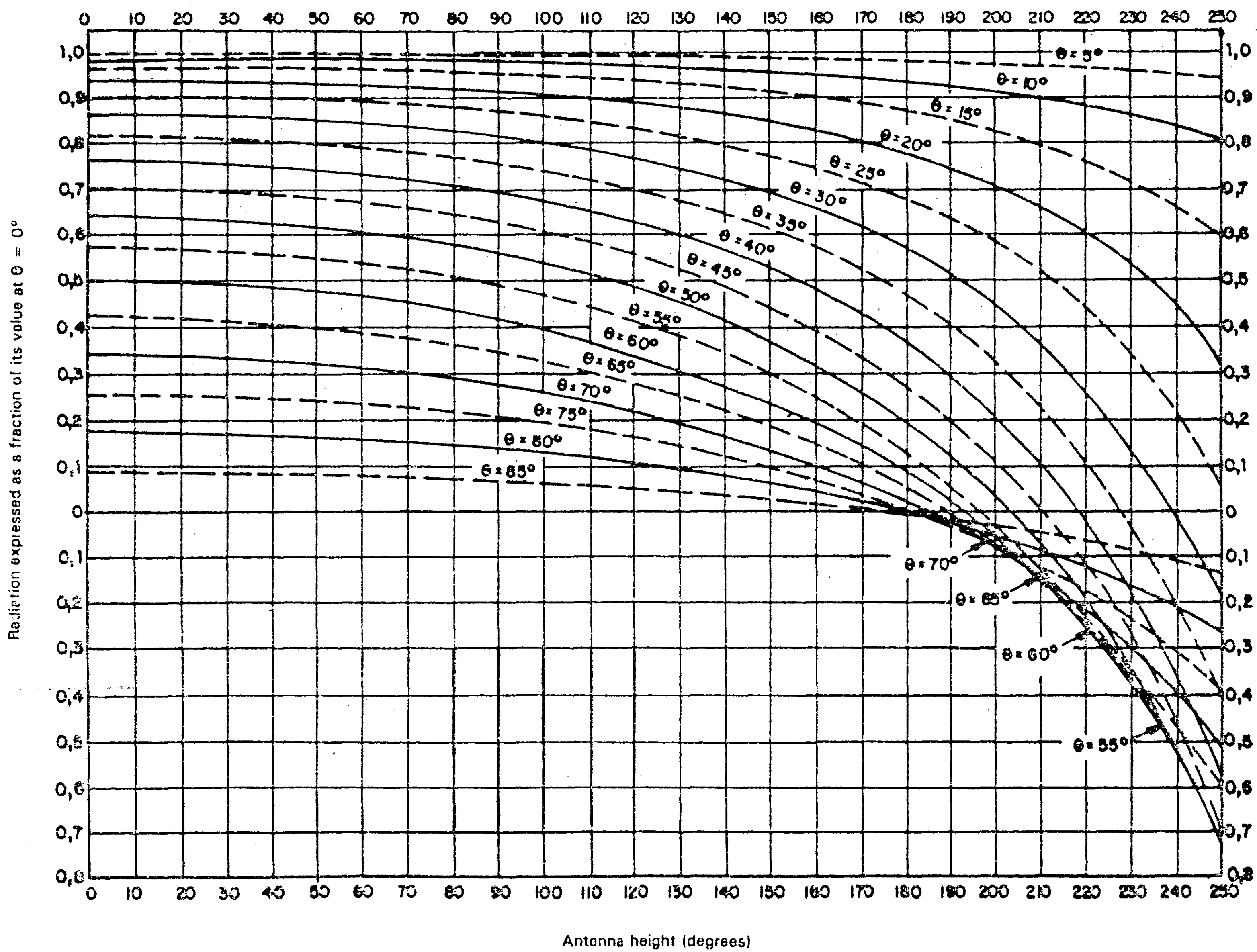


FIGURE 3 – *Vertical plane radiation of simple vertical antennas as a function of electrical tower height for various values of elevation angle (θ)*

TABLE II – *f*(θ) *values for simple vertical antennas*

Elevation angle (degrees)	*f*(θ)					
	0.11 λ	0.13 λ	0.15 λ	0.17 λ	0.19 λ	0.21 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.999	0.998	0.998	0.998	0.998	0.998
4	0.997	0.997	0.997	0.997	0.997	0.997
5	0.996	0.996	0.996	0.995	0.995	0.995
6	0.994	0.994	0.994	0.993	0.993	0.993
7	0.992	0.992	0.991	0.991	0.991	0.990
8	0.989	0.989	0.989	0.988	0.988	0.987
9	0.987	0.986	0.986	0.985	0.985	0.984
10	0.984	0.983	0.983	0.982	0.981	0.980
11	0.980	0.980	0.979	0.978	0.977	0.976
12	0.976	0.976	0.975	0.974	0.973	0.971
13	0.972	0.972	0.971	0.969	0.968	0.967
14	0.968	0.967	0.966	0.965	0.963	0.961
15	0.963	0.962	0.961	0.959	0.958	0.956
16	0.958	0.957	0.956	0.954	0.952	0.950
17	0.953	0.952	0.950	0.948	0.945	0.943
18	0.947	0.946	0.944	0.942	0.940	0.937
19	0.941	0.940	0.938	0.935	0.933	0.930
20	0.935	0.933	0.931	0.929	0.926	0.922
22	0.922	0.920	0.917	0.914	0.911	0.907
24	0.907	0.905	0.902	0.898	0.894	0.890
26	0.892	0.889	0.885	0.882	0.877	0.872
28	0.875	0.872	0.868	0.864	0.858	0.852
30	0.857	0.854	0.849	0.844	0.839	0.832
32	0.838	0.834	0.830	0.824	0.818	0.811
34	0.819	0.814	0.809	0.803	0.795	0.789
36	0.798	0.793	0.788	0.781	0.774	0.766
38	0.776	0.771	0.765	0.758	0.751	0.742
40	0.753	0.748	0.742	0.735	0.725	0.717
42	0.730	0.724	0.718	0.710	0.702	0.692
44	0.705	0.700	0.693	0.685	0.676	0.666
46	0.680	0.674	0.667	0.659	0.650	0.639
48	0.654	0.648	0.641	0.633	0.623	0.612
50	0.628	0.621	0.614	0.606	0.596	0.585
52	0.600	0.594	0.587	0.578	0.568	0.557
54	0.572	0.566	0.559	0.550	0.540	0.529
56	0.544	0.537	0.530	0.521	0.512	0.501
58	0.515	0.508	0.501	0.493	0.483	0.472
60	0.485	0.479	0.472	0.463	0.454	0.443

TABLE II *(continued)*

Elevation angle (degrees)	f(ϑ)					
	0.23 λ	0.25 λ	0.27 λ	0.29 λ	0.311 λ	0.35 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.998	0.998	0.998	0.998	0.998	0.997
4	0.997	0.996	0.996	0.996	0.996	0.995
5	0.995	0.994	0.994	0.994	0.993	0.992
6	0.992	0.992	0.991	0.991	0.990	0.989
7	0.990	0.989	0.988	0.988	0.987	0.985
8	0.987	0.986	0.985	0.984	0.983	0.980
9	0.983	0.982	0.981	0.980	0.978	0.975
10	0.979	0.978	0.977	0.975	0.973	0.969
11	0.975	0.973	0.972	0.970	0.968	0.963
12	0.970	0.968	0.966	0.964	0.962	0.955
13	0.965	0.963	0.961	0.958	0.955	0.949
14	0.959	0.957	0.955	0.952	0.948	0.941
15	0.953	0.951	0.948	0.945	0.941	0.932
16	0.947	0.944	0.941	0.937	0.933	0.924
17	0.941	0.937	0.934	0.930	0.925	0.914
18	0.934	0.930	0.926	0.921	0.916	0.904
19	0.926	0.922	0.918	0.913	0.907	0.894
20	0.919	0.914	0.909	0.904	0.898	0.883
22	0.902	0.897	0.891	0.885	0.877	0.861
24	0.885	0.879	0.872	0.865	0.856	0.837
26	0.866	0.859	0.852	0.843	0.833	0.811
28	0.846	0.833	0.830	0.820	0.809	0.795
30	0.825	0.816	0.807	0.797	0.784	0.758
32	0.803	0.794	0.784	0.772	0.759	0.729
34	0.780	0.770	0.759	0.747	0.732	0.701
36	0.756	0.746	0.734	0.721	0.705	0.671
38	0.732	0.720	0.708	0.694	0.677	0.642
40	0.706	0.695	0.681	0.667	0.649	0.612
42	0.681	0.668	0.654	0.639	0.621	0.582
44	0.654	0.641	0.627	0.611	0.593	0.552
46	0.628	0.614	0.600	0.583	0.564	0.523
48	0.600	0.587	0.572	0.555	0.536	0.494
50	0.573	0.559	0.544	0.527	0.507	0.465
52	0.545	0.531	0.515	0.498	0.479	0.436
54	0.517	0.503	0.487	0.470	0.451	0.408
56	0.488	0.474	0.459	0.442	0.423	0.381
58	0.460	0.446	0.431	0.414	0.395	0.354
60	0.431	0.418	0.403	0.387	0.368	0.328

TABLE II *(end)*

Elevation angle (degrees)	$f(\theta)$					
	0.40 λ	0.45 λ	0.50 λ	0.528 λ	0.55 λ	0.625 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	0.999	0.999	0.999	0.999
2	0.998	0.998	0.998	0.997	0.997	0.995
3	0.997	0.996	0.995	0.994	0.993	0.989
4	0.994	0.992	0.990	0.989	0.988	0.981
5	0.991	0.988	0.985	0.983	0.981	0.970
6	0.986	0.983	0.979	0.975	0.972	0.957
7	0.982	0.977	0.971	0.967	0.962	0.941
8	0.976	0.970	0.962	0.957	0.951	0.924
9	0.970	0.963	0.953	0.945	0.938	0.904
10	0.963	0.954	0.942	0.933	0.924	0.882
11	0.955	0.945	0.930	0.919	0.909	0.859
12	0.947	0.934	0.917	0.905	0.893	0.834
13	0.938	0.923	0.903	0.889	0.875	0.807
14	0.929	0.912	0.889	0.872	0.857	0.773
15	0.918	0.899	0.873	0.855	0.837	0.748
16	0.908	0.886	0.857	0.836	0.815	0.717
17	0.897	0.873	0.840	0.817	0.795	0.684
18	0.885	0.859	0.823	0.797	0.772	0.651
19	0.873	0.844	0.804	0.776	0.749	0.617
20	0.860	0.828	0.785	0.755	0.726	0.582
22	0.833	0.796	0.746	0.710	0.677	0.510
24	0.805	0.763	0.705	0.665	0.625	0.436
26	0.776	0.728	0.663	0.618	0.574	0.363
28	0.745	0.692	0.621	0.570	0.522	0.290
30	0.714	0.655	0.577	0.522	0.470	0.219
32	0.682	0.619	0.534	0.475	0.419	0.151
34	0.649	0.582	0.492	0.428	0.368	0.085
36	0.617	0.545	0.450	0.383	0.321	0.025
38	0.584	0.509	0.409	0.340	0.275	−0.031
40	0.552	0.473	0.370	0.298	0.231	−0.083
42	0.519	0.438	0.332	0.258	0.190	−0.129
44	0.488	0.405	0.296	0.221	0.152	−0.170
46	0.457	0.372	0.262	0.187	0.117	−0.205
48	0.427	0.341	0.230	0.155	0.085	−0.235
50	0.397	0.311	0.201	0.126	0.056	−0.259
52	0.369	0.283	0.174	0.099	0.031	−0.278
54	0.341	0.257	0.149	0.076	0.009	−0.291
56	0.315	0.232	0.126	0.055	−0.010	−0.300
58	0.289	0.208	0.105	0.037	−0.026	−0.304
60	0.265	0.186	0.087	0.021	−0.039	−0.304
62				0.003	−0.049	−0.300
64				−0.003	−0.056	−0.292
66				−0.011	−0.062	−0.281
68				−0.017	−0.064	−0.267
70				−0.022	−0.065	−0.250
72				−0.025	−0.064	−0.231
74				−0.026	−0.061	−0.210
76				−0.026	−0.056	−0.138
78				−0.024	−0.051	−0.163
80				−0.022	−0.044	−0.138

Note **– When the negative sign (–) appears in the Table, it signifies only the existence of a secondary lobe having the opposite phase from the main lobe in the vertical radiation pattern. In order to perform the calculation, ignore the negative (–) and use only the absolute value $f(\theta)$ from the Table.**

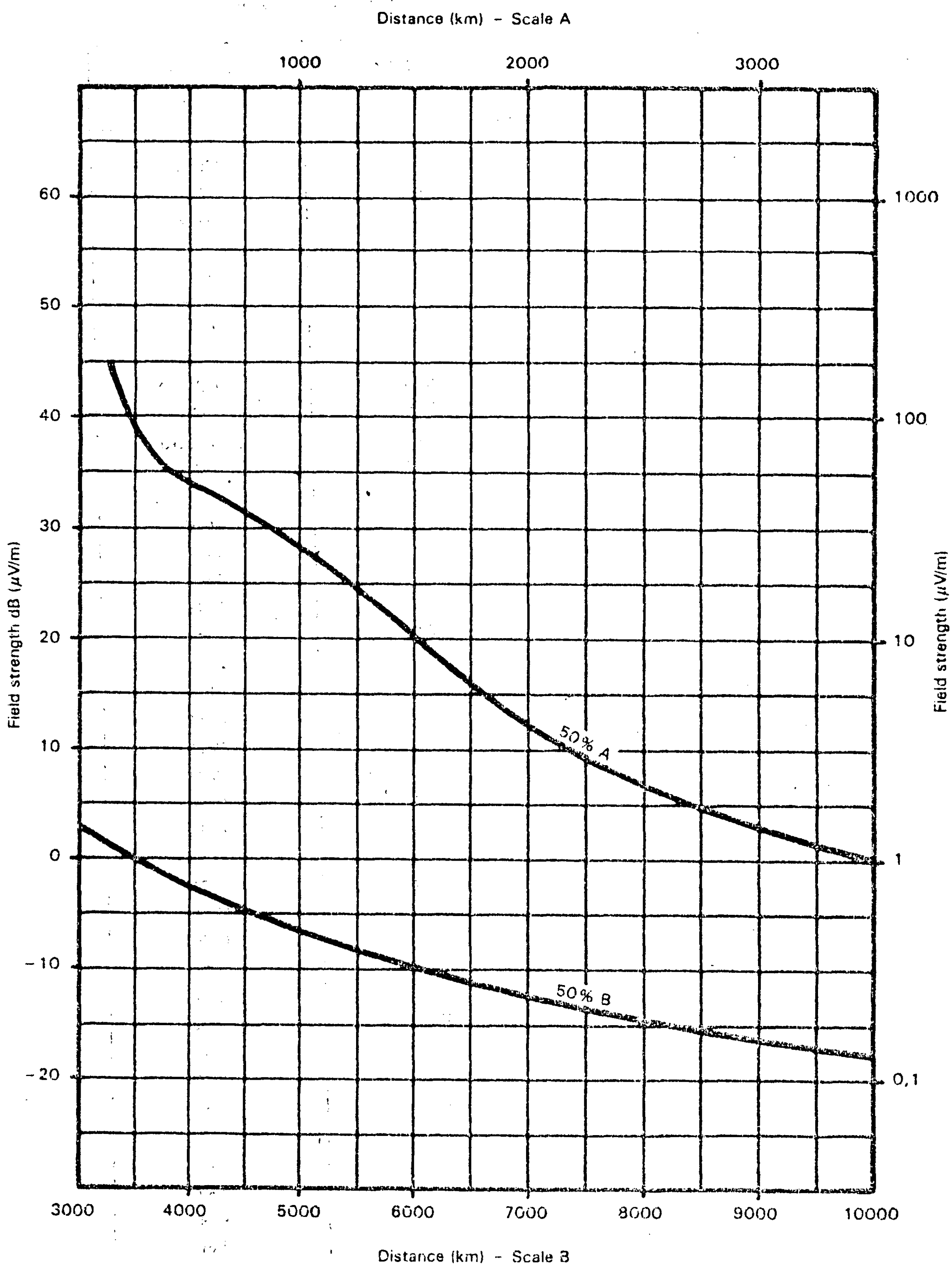


FIGURE 4 – *Skywave field strength vs distance for a characteristic field strength of 100 mV/m*

TABLE III – *Skywave field strength vs distance (100 to 10 000 km) for a characteristic field strength of 100 mV/m*

d (km)	F_c (dB (μV/m)) 50%	F_c (μV/m) 50%
100	45.06	179.11
150	41.38	117.18
200	39.28	92.06
250	37.79	77.54
300	36.75	68.82
350	35.86	62.06
400	35.13	57.08
450	34.46	52.86
500	33.92	49.65
550	33.40	46.78
600	32.94	44.36
650	32.45	41.95
700	31.94	39.54
750	31.32	36.81
800	30.73	34.40
850	30.18	32.30
900	29.51	29.89
950	28.83	27.63
1000	28.14	25.54
1050	27.44	23.56
1100	26.79	21.84
1150	25.98	19.91
1200	25.25	18.30
1250	24.50	16.78
1300	23.71	15.32
1350	22.90	13.97
1400	22.08	12.71
1450	21.25	11.55
1500	20.42	10.50
1550	19.59	9.53
1600	18.66	8.57
1650	17.75	7.72
1700	16.87	6.98
1750	16.04	6.34
1800	15.28	5.80
1850	14.52	5.32
1900	13.78	4.89
1950	13.05	4.49
2000	12.34	4.14
2100	11.15	3.61
2200	10.05	3.18
2300	8,92	2.79
2400	8.13	2.55
2500	7.09	2.26
2600	6.16	2.03
2700	5.32	1.85
2800	4.58	1.69
2900	3.81	1.55

TABLE III *(end)*

d (km)	F_c (dB (μV/m)) 50%	F_c (μV/m) 50%
3000	3.11	1.43
3100	2.45	1.33
3200	1.78	1.23
3300	1.18	1.15
3400	0.57	1.07
3500	0.02	1.00
3600	−0.53	0.94
3700	−1.08	0.88
3800	−1.59	0.83
3900	−2.08	0.79
4000	−2.52	0.75
4100	−3.01	0.71
4200	−3.46	0.67
4300	−3.90	0.64
4400	−4.33	0.61
4500	−4.74	0.58
4600	−5.15	0.55
4700	−5.54	0.53
4800	−5.93	0.51
4900	−6.30	0.48
5000	−6.67	0.46
5100	−7.02	0.45
5200	−7.37	0.43
5300	−7.71	0.41
5400	−8.04	0.40
5500	−8.37	0.38
5600	−8.68	0.37
5700	−8.99	0.36
5800	−9.29	0.34
5900	−9.59	0.33
6000	−9.88	0.32
6200	−10.43	0.30
6400	−10.97	0.28
6600	−11.48	0.27
6800	−11.97	0.25
7000	−12.44	0.24
7200	−12.90	0.23
7400	−13.33	0.22
7600	−13.75	0.21
7800	−14.15	0.20
8000	−14.54	0.19
8200	−14.92	0.18
8400	−15.28	0.17
8600	−15.63	0.17
8800	−15.97	0.16
9000	−16.29	0.15
9200	−16.61	0.15
9400	−16.91	0.14
9600	−17.21	0.14
9800	−17.50	0.13
10000	−17.77	0.13

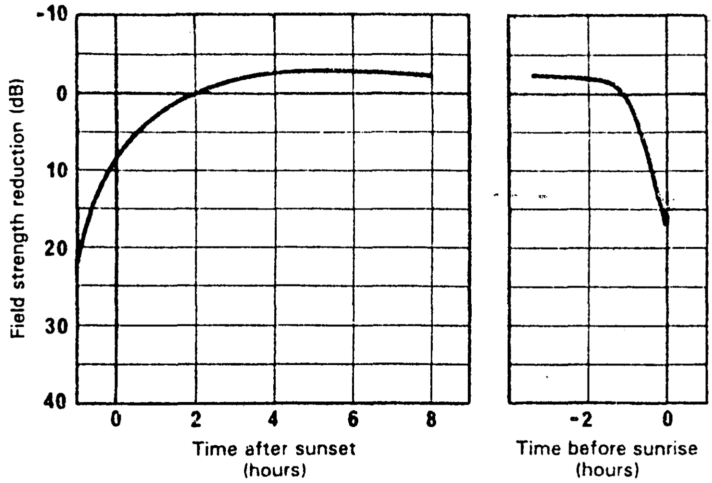


FIGURE 5 – *Field strength variation during the night*

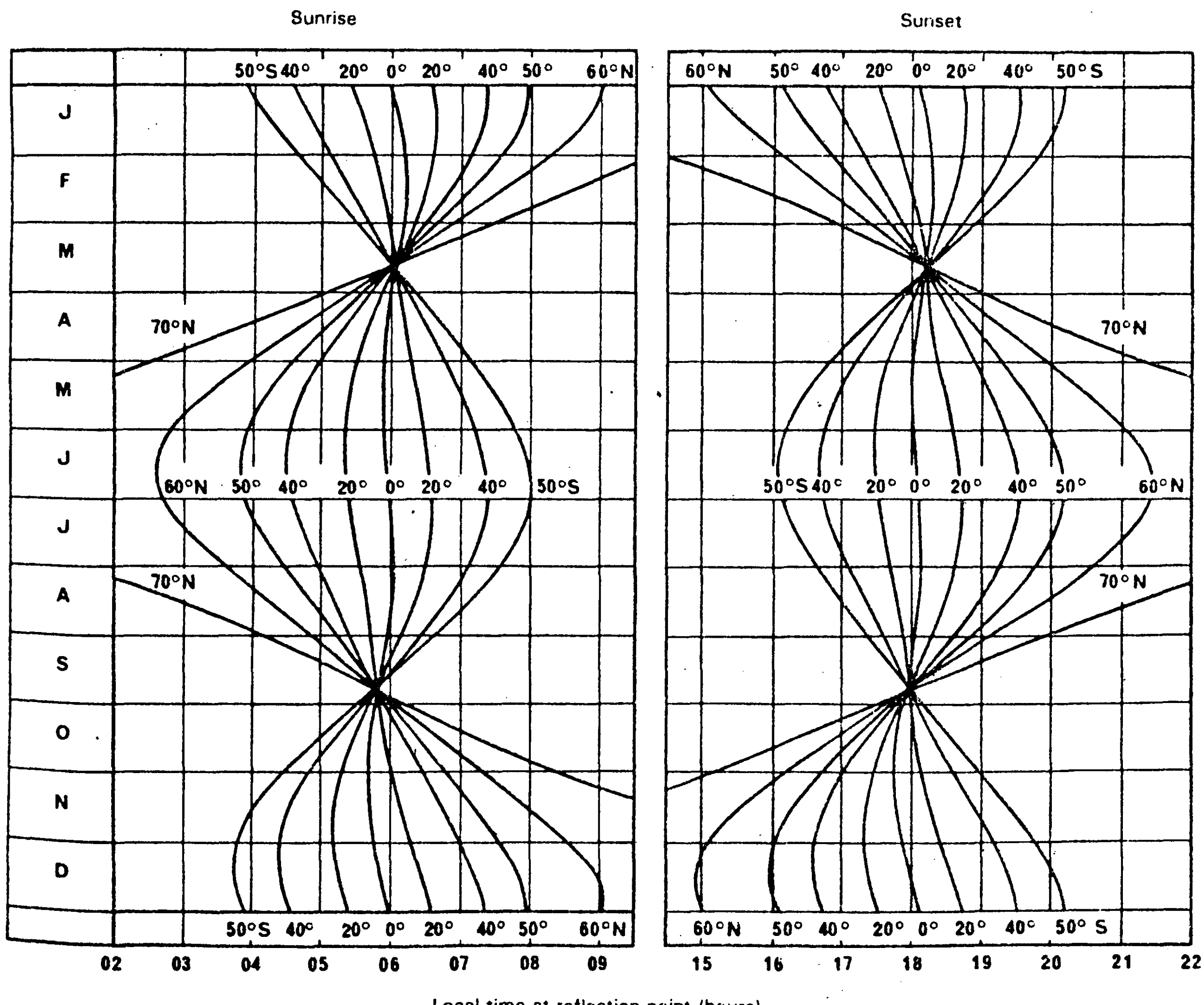


FIGURE 6 – *Times of sunrise and sunset for various months and geographical latitudes*

M.L. PIZARRO
Chairman of Committee 4

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 69-E
22 April 1986
Original: English/ French

COMMITTEE 4

RECOMMENDATION No. [COM4/4]

Calculation of the skywave field strength to evaluate interregional interference

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

noting

a) that the recording and examination process provided in Article 12 of the Radio Regulations is the only procedure making it possible to avoid harmful interference between stations operating in Region 2, on the one hand, and those operating in Regions 1 and 3, on the other hand, and that the IFRB will therefore adopt appropriate technical standards;

b) that, under No. 56 of the Convention, the decisions of a regional administrative conference must in all circumstances be in conformity with the provisions of the Administrative Regulations and that such a conference may give instructions to the IFRB provided that they do not conflict with the interests of other Regions;

considering that, under Nos. 1001 and 1454 of the Radio Regulations, the IFRB develops, for the performance of its functions, Technical Standards and Rules of Procedure based in particular on the relevant provisions of the Radio Regulations and the Appendices thereto and, as appropriate, on the decisions of administrative conferences of the Union and the Recommendations of the CCIR;

recommends that the IFRB should take account of the method of calculating the skywave field strength described in the Annex to this Recommendation when adopting its Technical Standards relating to the examination of frequency assignment notices for broadcasting stations of Region 2 operating in the band 1 605 - 1 705 kHz from the standpoint of the probability of harmful interference to stations in Regions 1 and 3, and vice versa.

M.L. PIZARRO
Chairman of Committee 4

Annex: 1

Annex 1

(to Recommendation No. /¯COM4/4_7)

Calculation of skywave field strength for interregional sharing applications.

1. List of symbols (see also Chapter 3)

a_T: geographical latitude of the transmitting terminal (degrees)

a_R: geographical latitude of the receiving terminal (degrees)

b_T: geographical longitude of the transmitting terminal (degrees)

b_R: geographical longitude of the receiving terminal (degrees)

ϕ_T: geomagnetic latitude of the transmitting terminal (degrees)

ϕ_R: geomagnetic latitude of the receiving terminal (degrees)

ϕ: average geomagnetic latitude of a path under study (degrees)

Note - North and east are considered positive, south and west negative.

2. General procedure

The general procedure for calculation of skywave field strength for interregional sharing applications is similar to that described in Chapter 3 with the following exception.

The unadjusted skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c \, f(\theta) \sqrt{P}}{100} \quad dB(uV/m) \qquad (1)$$

F_c is given by:

$$F_c = (95 - 20 \log d) - (2\pi + 4.95 \tan^2 \phi)(d/1000)^{1/2} \ dB\,(uV/m) \qquad (2)$$

Figure 1 and Table I show F_c for selected latitudes. If $|\phi|$ is greater than 60 degrees, equation (2) is evaluated for $|\phi|$ = 60 degrees. If d is less than 200 km, equation (2) is evaluated for d=200 km. However, the actual great-circle distance is to be used in determining elevation angle. See section 4 for calculation of great-circle distance and conversion from geographic latitude to geomagnetic latitude.

Note: Values of F_c are normalized to 100 mV/m at 1 km corresponding to an effective monople radiated power (e.m.r.p.) of -9.54 dB(kW).

3. Skywave field strength, 50% of the time

This is given by:

$$F(50) = F \quad dB(uV/m) \qquad (3)$$

4. Path parameters

Refer to section 1. The great-circle distance d (km) is given by:

$$d = 111.18 \text{ arc cos}[\sin a_T \sin a_R + \cos a_T \cos a_R \cos (b_R - b_T)] \qquad (4)$$

The geomagnetic latitude of the transmitting terminal, ϕ_T, is given by:

$$\phi_T = \text{arc sin } [\sin a_T \sin 78.5° + \cos a_T \cos 78.5° \cos (69° + b_T)] \qquad (5)$$

ϕ_R can be determined in a similar manner. And,

$$\phi = \tfrac{1}{2}(\phi_T + \phi_R) \qquad (6)$$

Alternatively, Figure 2 may be used.

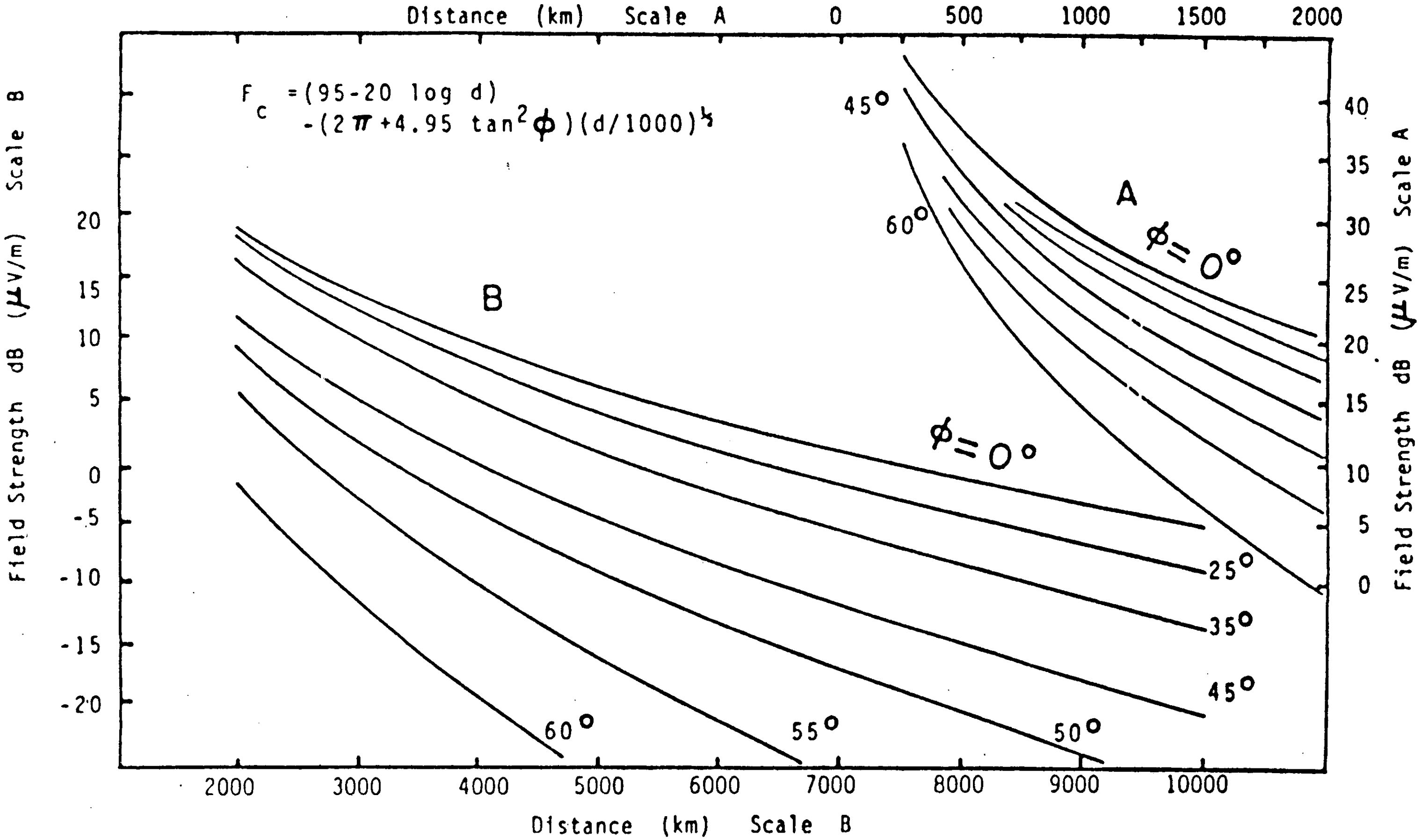


FIGURE 1 - Skywave field strength vs distance (for a characteristic field strength of 100 mV/m at 1 km, 50%, 2 hours after sunset)

TABLE I - **Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m.**

Page 1 of 8

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
0-200	46.17	203.4574	46.01	199.7683	45.43	186.8867	43.96	157.6842	39.53	94.7147
250	43.90	156.6680	43.72	153.4954	43.07	142.4722	41.42	117.8230	36.47	66.6392
300	42.02	126.1266	41.82	123.3314	41.11	113.6631	39.30	92.3093	33.88	49.4450
350	40.40	104.7304	40.19	102.2257	39.43	93.5977	37.47	74.7566	31.62	38.0894
400	38.98	88.9709	38.76	86.6981	37.94	78.8988	35.85	62.0462	29.59	30.1752
450	37.72	76.9207	37.48	74.8381	36.61	67.7174	34.40	52.4825	27.76	24.4320
500	36.58	67.4351	36.33	65.5120	35.41	58.9589	33.08	45.0689	26.08	20.1307
550	35.53	59.7930	35.27	58.0059	34.31	51.9358	31.86	39.1832	24.52	16.8266
600	34.57	53.5183	34.29	51.8487	33.29	46.1953	30.74	34.4183	23.07	14.2352
650	33.68	48.2840	33.39	46.7172	32.35	41.4276	29.69	30.4974	21.70	12.1669
700	32.84	43.8589	32.54	42.3829	31.46	37.4139	28.70	27.2260	20.42	10.4915
750	32.06	40.0746	31.75	38.6794	30.63	33.9955	27.77	24.4640	19.20	9.1169
800	31.32	36.8059	31.00	35.4833	29.84	31.0547	26.89	22.1079	18.04	7.9764
850	30.62	33.9579	30.29	32.7007	29.10	28.5022	26.06	20.0797	16.93	7.0208
900	29.95	31.4572	29.62	30.2595	28.39	26.2696	25.26	18.3198	15.87	6.2133
950	29.32	29.2464	28.98	28.1030	27.71	24.3030	24.50	16.7818	14.85	5.5255
1000	28.72	27.2798	28.36	26.1861	27.07	22.5601	23.77	15.4291	13.87	4.9356
1050	28.14	25.5207	27.77	24.4729	26.45	21.0066	23.07	14.2325	12.92	4.4265
1100	27.58	23.9394	27.21	22.9339	25.85	19.6150	22.39	13.1684	12.01	3.9845
1150	27.05	22.5115	26.67	21.5451	25.28	18.3625	21.74	12.2177	11.12	3.5988
1200	26.53	21.2165	26.14	20.2866	24.73	17.2306	21.11	11.3645	10.27	3.2607
1250	26.04	20.0378	25.64	19.1418	24.19	16.2036	20.50	10.5958	9.43	2.9628
1300	25.56	18.9609	25.15	18.0967	23.68	15.2685	19.91	9.9007	8.63	2.6995
1350	25.09	17.9741	24.68	17.1396	23.18	14.4142	19.34	9.2699	7.84	2.4657

Continued . . .

TABLE I - **Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m**

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
1400	24.64	17.0669	24.22	16.2603	22.69	13.6313	18.79	8.6958	7.07	2.2574
1450	24.21	16.2306	23.78	15.4503	22.22	12.9119	18.25	8.1716	6.32	2.0713
1500	23.78	15.4577	23.35	14.7021	21.76	12.2490	17.72	7.6916	5.60	1.9045
1550	23.37	14.7416	22.93	14.0094	21.32	11.6367	17.21	7.2512	4.88	1.7544
1600	22.97	14.0766	22.52	13.3665	20.88	11.0698	16.71	6.8459	4.19	1.6192
1650	22.58	13.4577	22.12	12.7687	20.46	10.5438	16.22	6.4722	3.50	1.4970
1700	22.20	12.8806	21.74	12.2115	20.05	10.0547	15.74	6.1268	2.84	1.3862
1750	21.83	12.3415	21.36	11.6913	19.64	9.5991	15.28	5.8071	2.18	1.2857
1800	21.46	11.8369	20.99	11.2046	19.25	9.1739	14.82	5.5104	1.54	1.1942
1850	21.11	11.3638	20.63	10.7487	18.87	8.7763	14.38	5.2347	0.91	1.1107
1900	20.76	10.9196	20.27	10.3208	18.49	8.4041	13.94	4.9780	0.29	1.0345
1950	20.43	10.5018	19.93	9.9186	18.12	8.0549	13.51	4.7386	-0.31	0.9648
2000	20.09	10.1084	19.59	9.5401	17.76	7.7270	13.09	4.5151	-0.91	0.9008
2050	19.77	9.7373	19.26	9.1832	17.41	7.4185	12.68	4.3060	-1.49	0.8421
2100	19.45	9.3869	18.94	8.8465	17.06	7.1280	12.28	4.1102	-2.07	0.7880
2150	19.14	9.0555	18.62	8.5282	16.72	6.8540	11.88	3.9265	-2.64	0.7382
2200	18.83	8.7419	18.30	8.2271	16.38	6.5953	11.49	3.7541	-3.19	0.6923
2250	18.53	8.4446	18.00	7.9419	16.06	6.3508	11.11	3.5919	-3.74	0.6499
2300	18.24	8.1626	17.70	7.6714	15.73	6.1194	10.73	3.4393	-4.28	0.6106
2350	17.95	7.8947	17.40	7.4147	15.42	5.9002	10.36	3.2955	-4.82	0.5743
2400	17.66	7.6400	17.11	7.1708	15.11	5.6923	9.99	3.1599	-5.34	0.5405
2450	17.38	7.3977	16.83	6.9388	14.80	5.4949	9.63	3.0318	-5.86	0.5092
2500	17.11	7.1669	16.54	6.7179	14.50	5.3075	9.28	2.9107	-6.37	0.4801
2550	16.84	6.9468	16.27	6.5075	14.20	5.1292	8.93	2.7962	-6.88	0.4530

Continued . . .

TABLE I - **Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m**

Page 3 of 8

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
2600	16.57	6.7369	16.00	6.3068	13.91	4.9594	8.59	2.6877	-7.38	0.4278
2650	16.31	6.5364	15.73	6.1152	13.62	4.7978	8.25	2.5849	-7.87	0.4042
2700	16.05	6.3448	15.46	5.9323	13.34	4.6436	7.91	2.4873	-8.35	0.3823
2750	15.79	6.1616	15.20	5.7574	13.06	4.4966	7.59	2.3948	-8.83	0.3617
2800	15.54	5.9862	14.95	5.5901	12.78	4.3562	7.26	2.3068	-9.31	0.3425
2850	15.30	5.8183	14.70	5.4299	12.51	4.2220	6.94	2.2231	-9.77	0.3246
2900	15.05	5.6573	14.45	5.2765	12.24	4.0937	6.62	2.1435	-10.24	0.3077
2950	14.81	5.5029	14.20	5.1295	11.98	3.9709	6.31	2.0677	-10.69	0.2919
3000	14.57	5.3547	13.96	4.9884	11.72	3.8534	6.00	1.9955	-11.15	0.2771
3050	14.34	5.2125	13.72	4.8530	11.46	3.7408	5.70	1.9267	-11.59	0.2632
3100	14.11	5.0758	13.48	4.7230	11.20	3.6328	5.39	1.8610	-12.04	0.2501
3150	13.88	4.9444	13.25	4.5981	10.95	3.5293	5.10	1.7982	-12.47	0.2379
3200	13.66	4.8180	13.02	4.4779	10.71	3.4299	4.80	1.7383	-12.91	0.2263
3250	13.44	4.6963	12.79	4.3624	10.46	3.3345	4.51	1.6810	-13.34	0.2154
3300	13.22	4.5792	12.57	4.2512	10.22	3.2428	4.22	1.6262	-13.76	0.2051
3350	13.00	4.4663	12.35	4.1441	9.98	3.1546	3.94	1.5738	-14.18	0.1954
3400	12.78	4.3575	12.13	4.0409	9.74	3.0698	3.66	1.5236	-14.60	0.1863
3450	12.57	4.2526	11.91	3.9414	9.51	2.9883	3.38	1.4755	-15.01	0.1776
3500	12.36	4.1514	11.70	3.8455	9.28	2.9097	3.10	1.4294	-15.42	0.1695
3550	12.16	4.0537	11.49	3.7529	9.05	2.8341	2.83	1.3852	-15.82	0.1618
3600	11.95	3.9593	11.28	3.6636	8.82	2.7611	2.56	1.3428	-16.22	0.1545
3650	11.75	3.8682	11.07	3.5773	8.60	2.6909	2.29	1.3021	-16.62	0.1476
3700	11.55	3.7801	10.87	3.4940	8.38	2.6231	2.03	1.2631	-17.01	0.1410
3750	11.35	3.6949	10.66	3.4134	8.16	2.5577	1.77	1.2255	-17.40	0.1348

Continued . . .

TABLE I - **Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m**

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
3800	11.16	3.6125	10.46	3.3356	7.94	2.4945	1.51	1.1894	-17.79	0.1289
3850	10.96	3.5328	10.26	3.2602	7.72	2.4335	1.25	1.1547	-18.18	0.1234
3900	10.77	3.4556	10.07	3.1873	7.51	2.3746	0.99	1.1214	-18.56	0.1181
3950	10.58	3.3808	9.87	3.1168	7.30	2.3177	0.74	1.0892	-18.93	0.1131
4000	10.39	3.3084	9.68	3.0485	7.09	2.2627	0.49	1.0583	-19.31	0.1083
4050	10.21	3.2383	9.49	2.9823	6.89	2.2094	0.24	1.0286	-19.68	0.1038
4100	10.02	3.1702	9.30	2.9182	6.68	2.1580	0.00	0.9999	-20.05	0.0995
4150	9.84	3.1043	9.12	2.8560	6.48	2.1081	-0.24	0.9722	-20.41	0.0954
4200	9.66	3.0403	8.93	2.7958	6.28	2.0599	-0.49	0.9456	-20.78	0.0915
4250	9.48	2.9782	8.75	2.7373	6.08	2.0132	-0.73	0.9199	-21.13	0.0878
4300	9.30	2.9179	8.56	2.6806	5.88	1.9679	-0.96	0.8951	-21.49	0.0842
4350	9.13	2.8594	8.38	2.6255	5.68	1.9240	-1.20	0.8711	-21.85	0.0808
4400	8.95	2.8026	8.21	2.5721	5.49	1.8815	-1.43	0.8480	-22.20	0.0776
4450	8.78	2.7474	8.03	2.5202	5.30	1.8403	-1.66	0.8257	-22.55	0.0746
4500	8.61	2.6937	7.85	2.4698	5.11	1.8003	-1.89	0.8041	-22.89	0.0717
4550	8.44	2.6416	7.68	2.4208	4.92	1.7615	-2.12	0.7833	-23.24	0.0689
4600	8.27	2.5909	7.51	2.3732	4.73	1.7239	-2.35	0.7632	-23.58	0.0662
4650	8.10	2.5415	7.34	2.3269	4.54	1.6873	-2.57	0.7437	-23.92	0.0637
4700	7.94	2.4936	7.17	2.2819	4.36	1.6518	-2.79	0.7249	-24.26	0.0613
4750	7.77	2.4469	7.00	2.2381	4.18	1.6174	-3.02	0.7066	-24.59	0.0589
4800	7.61	2.4014	6.83	2.1955	3.99	1.5839	-3.24	0.6890	-24.93	0.0567
4850	7.45	2.3572	6.67	2.1541	3.81	1.5513	-3.45	0.6719	-25.26	0.0546
4900	7.29	2.3141	6.50	2.1137	3.64	1.5197	-3.67	0.6554	-25.58	0.0526
4950	7.13	2.2721	6.34	2.0744	3.46	1.4890	-3.88	0.6394	-25.91	0.0506

Continued . . .

TABLE I - **Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m**

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
5000	6.97	2.2313	6.18	2.0362	3.28	1.4591	-4.10	0.6239	-26.23	0.0488
5050	6.81	2.1914	6.02	1.9989	3.11	1.4300	-4.31	0.6089	-26.56	0.0470
5100	6.66	2.1526	5.86	1.9626	2.93	1.4017	-4.52	0.5943	-26.88	0.0453
5150	6.51	2.1147	5.70	1.9272	2.76	1.3741	-4.73	0.5802	-27.19	0.0437
5200	6.35	2.0778	5.54	1.8927	2.59	1.3473	-4.94	0.5665	-27.51	0.0421
5250	6.20	2.0418	5.39	1.8591	2.42	1.3212	-5.14	0.5532	-27.83	0.0406
5300	6.05	2.0067	5.23	1.8263	2.25	1.2958	-5.35	0.5404	-28.14	0.0392
5350	5.90	1.9724	5.08	1.7943	2.08	1.2711	-5.55	0.5279	-28.45	0.0378
5400	5.75	1.9389	4.93	1.7631	1.92	1.2470	-5.75	0.5157	-28.76	0.0365
5450	5.60	1.9063	4.77	1.7326	1.75	1.2235	-5.95	0.5040	-29.06	0.0352
5500	5.46	1.8744	4.62	1.7029	1.59	1.2006	-6.15	0.4925	-29.37	0.0340
5550	5.31	1.8433	4.47	1.6739	1.42	1.1783	-6.35	0.4814	-29.67	0.0328
5600	5.17	1.8129	4.33	1.6456	1.26	1.1565	-6.55	0.4706	-29.97	0.0317
5650	5.02	1.7832	4.18	1.6180	1.10	1.1353	-6.74	0.4602	-30.27	0.0306
5700	4.88	1.7542	4.03	1.5909	0.94	1.1146	-6.94	0.4500	-30.57	0.0296
5750	4.74	1.7259	3.89	1.5646	0.78	1.0944	-7.13	0.4401	-30.87	0.0286
5800	4.60	1.6982	3.74	1.5388	0.63	1.0747	-7.32	0.4304	-31.16	0.0277
5850	4.46	1.6711	3.60	1.5136	0.47	1.0555	-7.51	0.4211	-31.46	0.0267
5900	4.32	1.6446	3.46	1.4890	0.31	1.0367	-7.70	0.4120	-31.75	0.0259
5950	4.18	1.6187	3.32	1.4649	0.16	1.0184	-7.89	0.4031	-32.04	0.0250
6000	4.05	1.5934	3.18	1.4414	0.00	1.0005	-8.08	0.3945	-32.33	0.0242
6050	3.91	1.5686	3.04	1.4184	-0.15	0.9831	-8.27	0.3861	-32.62	0.0234
6100	3.78	1.5444	2.90	1.3959	-0.30	0.9660	-8.45	0.3780	-32.90	0.0226
6150	3.64	1.5207	2.76	1.3739	-0.45	0.9494	-8.63	0.3700	-33.19	0.0219

Continued . . .

TABLE I - **Skywave field strength vs distance (200 to 10 000 km)**
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
6200	3.51	1.4975	2.62	1.3524	-0.60	0.9331	-8.82	0.3623	-33.47	0.0212
6250	3.37	1.4748	2.49	1.3314	-0.75	0.9172	-9.00	0.3548	-33.75	0.0205
6300	3.24	1.4525	2.35	1.3108	-0.90	0.9017	-9.18	0.3475	-34.03	0.0199
6350	3.11	1.4308	2.22	1.2906	-1.05	0.8865	-9.36	0.3403	-34.31	0.0193
6400	2.98	1.4095	2.08	1.2709	-1.19	0.8717	-9.54	0.3334	-34.59	0.0186
6450	2.85	1.3886	1.95	1.2515	-1.34	0.8571	-9.72	0.3266	-34.86	0.0181
6500	2.72	1.3682	1.82	1.2326	-1.48	0.8429	-9.90	0.3200	-35.14	0.0175
6550	2.59	1.3481	1.69	1.2141	-1.63	0.8291	-10.07	0.3135	-35.41	0.0170
6600	2.47	1.3285	1.55	1.1960	-1.77	0.8155	-10.25	0.3073	-35.68	0.0164
6650	2.34	1.3093	1.42	1.1782	-1.91	0.8022	-10.42	0.3012	-35.95	0.0159
6700	2.21	1.2905	1.29	1.1608	-2.06	0.7892	-10.60	0.2952	-36.22	0.0154
6750	2.09	1.2720	1.17	1.1437	-2.20	0.7765	-10.77	0.2894	-36.49	0.0150
6800	1.97	1.2539	1.04	1.1270	-2.34	0.7641	-10.94	0.2837	-36.76	0.0145
6850	1.84	1.2362	0.91	1.1106	-2.48	0.7519	-11.11	0.2782	-37.02	0.0141
6900	1.72	1.2188	0.78	1.0946	-2.62	0.7400	-11.28	0.2728	-37.29	0.0137
6950	1.60	1.2017	0.66	1.0788	-2.75	0.7283	-11.45	0.2675	-37.55	0.0133
7000	1.47	1.1850	0.53	1.0634	-2.89	0.7169	-11.62	0.2624	-37.82	0.0129
7050	1.35	1.1686	0.41	1.0483	-3.03	0.7057	-11.79	0.2573	-38.08	0.0125
7100	1.23	1.1525	0.29	1.0334	-3.16	0.6947	-11.96	0.2524	-38.34	0.0121
7150	1.11	1.1367	0.16	1.0189	-3.30	0.6840	-12.12	0.2477	-38.60	0.0118
7200	0.99	1.1212	0.04	1.0046	-3.43	0.6735	-12.29	0.2430	-38.85	0.0114
7250	0.88	1.1060	-0.08	0.9906	-3.57	0.6632	-12.45	0.2384	-39.11	0.0111
7300	0.76	1.0911	-0.20	0.9769	-3.70	0.6531	-12.62	0.2340	-39.37	0.0108
7350	0.64	1.0765	-0.32	0.9634	-3.83	0.6432	-12.78	0.2296	-39.62	0.0104

Continued . . .

TABLE I - **Skywave field strength vs distance (200 to 10 000 km)**
for a characteristic field strength of 100 mV/m

DISTANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
7400	0.52	1.0621	-0.44	0.9502	-3.97	0.6335	-12.94	0.2254	-39.87	0.0101
7450	0.41	1.0480	-0.56	0.9372	-4.10	0.6240	-13.10	0.2212	-40.13	0.0099
7500	0.29	1.0341	-0.68	0.9245	-4.23	0.6147	-13.26	0.2172	-40.38	0.0096
7550	0.18	1.0205	-0.80	0.9120	-4.36	0.6055	-13.42	0.2132	-40.63	0.0093
7600	0.06	1.0072	-0.92	0.8997	-4.49	0.5966	-13.58	0.2093	-40.88	0.0090
7650	-0.05	0.9941	-1.03	0.8877	-4.62	0.5878	-13.74	0.2055	-41.12	0.0088
7700	-0.16	0.9812	-1.15	0.8759	-4.74	0.5792	-13.90	0.2018	-41.37	0.0085
7750	-0.28	0.9685	-1.27	0.8643	-4.87	0.5707	-14.06	0.1982	-41.62	0.0083
7800	-0.39	0.9561	-1.38	0.8529	-5.00	0.5625	-14.21	0.1947	-41.86	0.0081
7850	-0.50	0.9439	-1.50	0.8417	-5.12	0.5543	-14.37	0.1912	-42.11	0.0078
7900	-0.61	0.9319	-1.61	0.8307	-5.25	0.5464	-14.53	0.1878	-42.35	0.0076
7950	-0.72	0.9201	-1.73	0.8198	-5.38	0.5385	-14.68	0.1845	-42.59	0.0074
8000	-0.83	0.9085	-1.84	0.8092	-5.50	0.5309	-14.83	0.1813	-42.84	0.0072
8050	-0.94	0.8971	-1.95	0.7988	-5.62	0.5233	-14.99	0.1781	-43.08	0.0070
8100	-1.05	0.8859	-2.06	0.7885	-5.75	0.5159	-15.14	0.1750	-43.32	0.0068
8150	-1.16	0.8749	-2.18	0.7785	-5.87	0.5087	-15.29	0.1720	-43.55	0.0066
8200	-1.27	0.8641	-2.29	0.7686	-5.99	0.5016	-15.44	0.1690	-43.79	0.0065
8250	-1.38	0.8535	-2.40	0.7588	-6.12	0.4946	-15.59	0.1661	-44.03	0.0063
8300	-1.48	0.8430	-2.51	0.7493	-6.24	0.4877	-15.74	0.1632	-44.27	0.0061
8350	-1.59	0.8327	-2.62	0.7399	-6.36	0.4810	-15.89	0.1604	-44.50	0.0060
8400	-1.70	0.8226	-2.73	0.7306	-6.48	0.4743	-16.04	0.1577	-44.74	0.0058
8450	-1.80	0.8127	-2.83	0.7215	-6.60	0.4678	-16.19	0.1550	-44.97	0.0056
8500	-1.91	0.8029	-2.94	0.7126	-6.72	0.4615	-16.34	0.1524	-45.20	0.0055
8550	-2.01	0.7933	-3.05	0.7038	-6.84	0.4552	-16.49	0.1499	-45.43	0.0053

Continued . . .

TABLE I - **Skywave field strength vs distance (200 to 10 000 km) for a characteristic field strength of 100 mV/m**

Page 8 of 8

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
8600	-2.12	0.7838	-3.16	0.6952	-6.95	0.4490	-16.63	0.1474	-45.66	0.0052
8650	-2.22	0.7745	-3.26	0.6867	-7.07	0.4430	-16.78	0.1449	-45.89	0.0051
8700	-2.32	0.7653	-3.37	0.6783	-7.19	0.4370	-16.92	0.1425	-46.12	0.0049
8750	-2.43	0.7563	-3.48	0.6701	-7.31	0.4312	-17.07	0.1401	-46.35	0.0048
8800	-2.53	0.7474	-3.58	0.6620	-7.42	0.4254	-17.21	0.1378	-46.58	0.0047
8850	-2.63	0.7387	-3.69	0.6540	-7.54	0.4198	-17.36	0.1356	-46.81	0.0046
8900	-2.73	0.7301	-3.79	0.6462	-7.65	0.4142	-17.50	0.1334	-47.03	0.0044
8950	-2.83	0.7216	-3.90	0.6385	-7.77	0.4088	-17.64	0.1312	-47.26	0.0043
9000	-2.93	0.7133	-4.00	0.6309	-7.88	0.4034	-17.78	0.1291	-47.48	0.0042
9050	-3.03	0.7051	-4.10	0.6235	-8.00	0.3982	-17.93	0.1270	-47.71	0.0041
9100	-3.13	0.6970	-4.21	0.6161	-8.11	0.3930	-18.07	0.1249	-47.93	0.0040
9150	-3.23	0.6891	-4.31	0.6089	-8.23	0.3879	-18.21	0.1229	-48.15	0.0039
9200	-3.33	0.6813	-4.41	0.6018	-8.34	0.3829	-18.35	0.1210	-48.38	0.0038
9250	-3.43	0.6736	-4.51	0.5948	-8.45	0.3780	-18.49	0.1190	-48.60	0.0037
9300	-3.53	0.6660	-4.61	0.5879	-8.56	0.3731	-18.63	0.1171	-48.82	0.0036
9350	-3.63	0.6585	-4.72	0.5811	-8.67	0.3684	-18.76	0.1153	-49.04	0.0035
9400	-3.73	0.6511	-4.82	0.5744	-8.79	0.3637	-18.90	0.1135	-49.26	0.0034
9450	-3.82	0.6439	-4.92	0.5678	-8.90	0.3591	-19.04	0.1117	-49.47	0.0034
9500	-3.92	0.6368	-5.02	0.5613	-9.01	0.3546	-19.18	0.1099	-49.69	0.0033
9550	-4.02	0.6297	-5.12	0.5549	-9.12	0.3501	-19.31	0.1082	-49.91	0.0032
9600	-4.11	0.6228	-5.21	0.5486	-9.23	0.3457	-19.45	0.1065	-50.12	0.0031
9650	-4.21	0.6160	-5.31	0.5424	-9.33	0.3414	-19.59	0.1049	-50.34	0.0030
9700	-4.30	0.6092	-5.41	0.5363	-9.44	0.3372	-19.72	0.1033	-50.55	0.0030
9750	-4.40	0.6026	-5.51	0.5303	-9.55	0.3330	-19.86	0.1017	-50.77	0.0029
9800	-4.49	0.5961	-5.61	0.5244	-9.66	0.3289	-19.99	0.1001	-50.98	0.0028
9850	-4.59	0.5896	-5.70	0.5186	-9.77	0.3248	-20.12	0.0986	-51.19	0.0028
9900	-4.68	0.5833	-5.80	0.5128	-9.87	0.3209	-20.26	0.0971	-51.41	0.0027
9950	-4.78	0.5770	-5.90	0.5072	-9.98	0.3169	-20.39	0.0956	-51.62	0.0026
10000	-4.87	0.5709	-5.99	0.5016	-10.09	0.3131	-20.52	0.0942	-51.83	0.0026

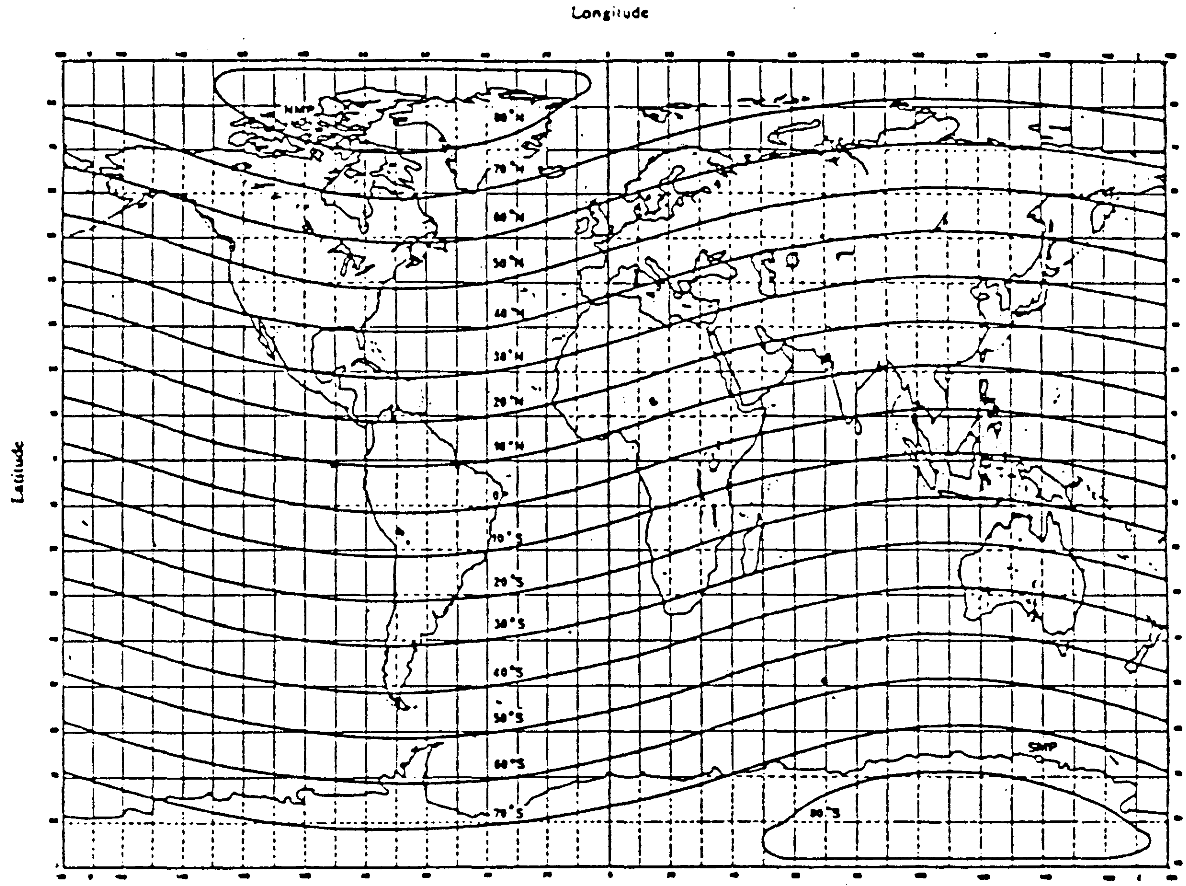


FIGURE 2

Geomagnetic latitudes

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 70-E
22 April 1986
Original: English

WORKING GROUP OF THE PLENARY

NOTE FROM THE CHAIRMAN OF COMMITTEE 5

TO THE CHAIRMAN OF THE WORKING GROUP OF THE PLENARY

The following text has been adopted by Committee 5 and is submitted for your consideration.

The draft agenda of the Second Session should contain an item that permits it to adopt a procedure to be applied by administrations wishing to implement their allotments with respect to non-broadcasting stations of the other contracting members. Such procedures will provide for the continued operation of designated non-broadcasting stations provided it does not have an adverse effect upon the implementation of the Plan.

M.M. FERNANDEZ-QUIROZ
Chairman of Committee 5

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 71-E
29 April 1986
Original: English

COMMITTEE 4

SUMMARY RECORD

OF THE

FIFTH MEETING OF COMMITTEE 4

(TECHNICAL CRITERIA)

Wednesday, 23 April 1986, at 0900 hrs

Chairman: Mr. M.L. PIZARRO (Chile)

Subjects discussed:	Documents
1. Skywave propagation	68, 69
2. Final report of Working Group 4-C	67

1. Skywave propagation (Documents 68, 69)

Document 68

1.1 The Chairman pointed out that the text had been taken verbatim from the Rio Final Acts in accordance with the Committee's decision at its fourth meeting. That fact accounted for any divergence from Document 46, discussed previously.

Section 2.2 - Skywave propagation

It was agreed that the final sentence placed in brackets should be deleted, since it was valid in the Rio Final Acts but not in the present document.

Section 2.2.1 - List of symbols

1.2 The delegate of Brazil suggested moving the list from Chapter 2 to the Chapter on Definitions.

1.3 The Chairman pointed out that section 2.2.1 contained symbols relating only to Chapter 2 whereas the Chapter on Definitions contained symbols applicable to the document as a whole.

At the suggestion of the delegate of Canada, it was agreed to maintain section 2.2.1 in Chapter 2.

Section 2.2.2 - General procedure

1.4 The delegate of Brazil pointed out that in calculation of characteristic field strength, the IFRB used a curve which was not reflected in Figure 1 and he proposed insertion in the present text of such a curve.

1.5 The Technical Secretary pointed out that Figure 1 was included because Committee 4 had decided on the previous day to use the whole of the text from the Rio Final Acts on propagation method.

1.6 The delegate of Brazil said that the last paragraph of the Spanish text on page 1 should be aligned on the English text to contain the word "determinado".

Section 2.2.4

1.7 The delegate of Brazil queried the usefulness of the section and Figure 4 and suggested that they be deleted.

1.8 The delegate of the United States of America said that the skywave curve given in the Rio Final Acts did not take account of the fact that, when the great circle distance was sufficiently small, the so-called "slant distance" was virtually constant; hence for a path shorter than 200 or 300 km, the skywave field strength should be more or less constant. He therefore proposed that the Rio method as described in the CCIR report (Document 3), with a value of around 40 dB for 200 km, be adopted.

1.9 After a discussion in which the delegates of Canada, Brazil, Cuba and Mexico participated, it was agreed to adopt that proposal.

It was agreed to retain the distances under 200 km in accordance with Document 3 from the CCIR in Table I.

Figure 4

It was agreed that the figure would contain the correction indicated previously, showing a constant value for distances between 0 and 200 km, and that the part of the curve above 40 dB would be removed.

Table III

It was agreed to delete the values for 100 and 150 km.

Figures 5 and 6

Approved, with the inclusion of the correction factors of field strength variation.

Document 68 as a whole was approved, as amended.

Document 69 - Recommendation [COM4/4]

1.10 The delegate of Brazil proposed the addition of a new text after the "considering" paragraph, to consist of two sub-paragraphs "recognizing a)" and "recognizing b)" explaining why the method had been adopted.

The substance of that addition was approved and it was decided that the Secretary of the Committee would meet with the delegates of Brazil, Canada and other interested delegations to draft those two sub-paragraphs.

The text would then be submitted directly to the Editorial Committee in order to avoid delay in dealing with the document and delegations would be free to make appropriate corrections in the Plenary Meeting.

1.11 The delegate of Brazil proposed an additional sentence at the end of the text under "recommends" to read:

> "The intensity of the signal thus calculated will be increased by 2.5 dB to take into account the different reference hours between Region 2 and Regions 1 and 3."

The addition was approved.

Annex 1

1.12 The Chairman pointed out that the text was taken directly from the report of Working Group 4-A.

1.13 The delegate of the United Kingdom suggested that in equation (2) "2π" should be amended to read "6.28"; the same amendment should also be made in Figure 1.

It was so agreed.

Document 69 was approved, as amended.

2. Final report of Working Group 4-C (Document 67)

2.1 The Chairman of Working Group 4-C introduced the report and drew attention to a number of editorial amendments.

Chapter 6

Introductory paragraph

At the suggestion of the delegate of Paraguay, it was agreed to amend the word "previstos" in the eighth line of the Spanish text to read "contenidos" in order to avoid any implication of their being assignments.

Paragraph 6.2

Editorial changes to the French version only to be communicated directly to the Editorial Committee.

Table 6.1

The entries under column FIB to be corrected in the French and English versions.

Figures 6.1 and 6.2

"Filtre passe-bas à la réception" should read "Filtre passe-bas au récepteur".

Draft Recommendation COM4/2

The number of the Recommendation should be enclosed in square brackets.

Following discussion between the delegates of Guyana, the United States and the Secretary, it was agreed that the Secretariat should align the wording of "considering a)" to that used in the original document.

It was agreed, on a proposal by the delegate of Canada, to reword "requests the CCIR" as follows:

"2. to prepare a new report on this topic ... basis of these studies;

3. these studies should be carried out within the normal framework of the CCIR study activities."

Draft Recommendation [COM4/3]

2.2 The representative of the IFRB requested clarification on the relationship between Recommendations COM4/3 and COM4/4, since they contained many common elements.

2.3 The Chairman of Working Group 4-C explained that Recommendation [COM4/3] showed how field intensities should be calculated and their protection afforded. Recommendation [COM4/4] gave a full description of the modified FCC method with latitude-dependent parameters. Care should be taken to ensure that the two Recommendations did not overlap.

2.4 The Chairman of Working Group 4-A added that Recommendation COM4/3 dealt with the philosophy of sharing criteria while Recommendation COM4/4 dealt with specific procedures.

It was agreed to align the Spanish text of the Recommendation to the English where necessary.

It was also agreed to add the words "allocated to the 1 605 - 1 705 band" after "other services" in "considering further" and to delete the final sentence of paragraph 1) of the Annex to the Recommendation.

Document 67 was approved, with the above amendments.

The meeting rose at 1110 hours.

The Secretary: The Chairman:

J.M. FONTEYNE M.L. PIZARRO

PINK PAGES

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 72-E
23 April 1986

R.1

PLENARY MEETING

1st SERIES OF TEXTS SUBMITTED BY THE
EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for second reading:

Source	Document	Title
COM.6	61	Chapter 1 - section 1.1
	56	Chapter 2 - section 2.1
		Chapter 3 - sections 3.1, 3.2, 3.3, 3.4, 3.8
		Chapter 4
		Annex 1
		Annex 2

P. PERRICHON
Chairman of Committee 6

Annex: 17 pages

CHAPTER 1 - DEFINITIONS AND SYMBOLS

1.1 Definitions

In addition to the definitions given in the Radio Regulations, the following definitions and symbols apply.

1.1.1 Broadcasting channel (AM)

A part of the frequency spectrum, equal to the necessary bandwidth of AM sound broadcasting stations, and characterized by the nominal value of the carrier frequency located at its centre.

*[1.1.2 Objectionable interference

Interference caused by a signal exceeding the maximum permissible field strength within the [protected contour], in accordance with the values derived from [ ].]

1.1.3 Service area

The area delimited by the contour within which the calculated level of the groundwave field strength is protected from objectionable interference in accordance with the provisions of Chapter 3.

1.1.4 Audio-frequency (AF) signal-to-interference ratio

The ratio (expressed in decibels) between the values of the voltage of the wanted signal and the voltage of the interfering signal, measured under specified conditions, at the audio-frequency output of the receiver. These specified conditions include various parameters such as the frequency separation between the wanted carrier and the interfering carrier, the emission characteristics (type and percentage of modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

1.1.5 Audio-frequency (AF) protection ratio

Agreed minimum value of the audio-frequency signal-to-interference ratio corresponding to a subjectively defined reception quality.

1.1.6 Radio-frequency (RF) signal-to-interference ratio

The ratio (expressed in decibels) between the values of the radio-frequency voltage of the wanted signal and of the interfering signal, measured at the input of the receiver under specified conditions. These specified conditions include various parameters such as the frequency separation between the wanted carrier and the interfering carrier, the emission characteristics (type and percentage of modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

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* To be re-examined in the light of the work of Committee 5.

1.1.7 Radio-frequency (RF) protection ratio

The radio-frequency signal-to-interference ratio which, in well-defined conditions, makes it possible to obtain the audio-frequency protection ratio at the output of a receiver. These specified conditions include various parameters such as the frequency separation between the wanted carrier and the interfering carrier, the emission characteristics (type and percentage of modulation, etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

1.1.8 Relative radio-frequency protection ratio

This ratio is the difference (expressed in decibels) between the protection ratio when the carriers of the wanted and unwanted transmitters have a frequency difference of Δf (Hz or kHz) and the protection ratio when the carriers of these transmitters have the same frequency.

1.1.9 Daytime operation

Operation between the times of sunrise and sunset at the transmitter site.

1.1.10 Night-time operation

Operation between the times of sunset and sunrise at the transmitter site.

1.1.11 Station power

Unmodulated carrier power supplied to the antenna.

1.1.12 Groundwave

Electromagnetic wave which is propagated along or near the surface of the Earth and which has not been reflected by the ionosphere.

1.1.13 Skywave

Electromagnetic wave which has been reflected by the ionosphere.

[1.2 Symbols]

CHAPTER 2 - PROPAGATION

2.1 Groundwave propagation

2.1.1 Ground conductivity

For groundwave propagation calculations in the band 1 605 - 1 705 kHz, use shall be made of the Atlas of Ground Conductivity, which contains information communicated to the IFRB in connection with the first and second sessions of the Regional Administrative MF Broadcasting Conference (Region 2), (Buenos Aires, 1980 and Rio de Janeiro, 1981), and subsequent modifications.

The following provisions should also be included:

a) When an administration notifies to the IFRB data intended to modify the Atlas, the IFRB shall so inform all administrations of Region 2. After 90 days from the date on which this information is communicated by the IFRB, the IFRB shall modify the Atlas and communicate the modifications to all administrations.

b) No assignment or allotment in the Plan shall at any time require modification as a result of the incorporation of these new data.

c) Any proposal to modify the Plan shall be considered on the basis of the values appearing in the Atlas on the date the proposal was received by the IFRB.

2.1.2 Field strength curves for groundwave propagation

The curves shown in Figure 2.1 shall be used for determining groundwave propagation in the frequency range 1 605 - 1 705 kHz; these curves are computed for 1 655 kHz.

The curves are labelled with ground conductivities in millisiemens/metre. All curves, except the 5000 mS/m (sea water) curve, are derived for a relative dielectric constant of 15. The sea water curve is derived for a relative dielectric constant of 80.

Annex E to the Report by the first session of the Regional Administrative MF Broadcasting Conference (Region 2) (Buenos Aires, 1980) contains a mathematical discussion relating to the calculation of the groundwave curves. The corresponding computer program is available at the IFRB.

2.1.3 Calculation of groundwave field strength

Using the Atlas of Ground Conductivity, the relevant conductivity or conductivities for the chosen path are determined. If only one conductivity is representative, the method for homogeneous paths is used. If several conductivities are involved, the method for non-homogeneous paths is used.

2.1.3.1 Homogeneous paths

The vertical component of the field strength for a homogeneous path is represented in Figure 2.1 as a function of distance, for various values of ground conductivity.

The distance in kilometres is shown on a logarithmic scale on the abscissa. The field strength is shown on a linear scale on the ordinate in decibels above 1 µV/m. The graph is standardized for a characteristic field strength of 100 mV/m corresponding to an effective monopole radiated power (e.m.r.p.) of -9.5 dB relative to 1 kW. The straight line marked "100 mV/m at 1 km" is the field strength on the assumption that the antenna is erected on a surface of perfect conductivity.

For omnidirectional antenna systems having a different characteristic field strength, correction must be made according to either of the following equations:

$$E = E_0 \times \frac{E_c}{100} \times \sqrt{P}$$

if field strengths are expressed in mV/m, or:

$$E = E_0 + E_c - 100 + 10 \log P$$

if field strengths are expressed in dB (µV/m)

For directional antenna systems, correction must be made according to either of the following equations:

$$E = E_0 \times \frac{E_R}{100}$$

if field strengths are expressed in mV/m, or:

$$E = E_0 + E_R - 100$$

if field strengths are expressed in dB (µV/m),

where:

E : resulting field strength

E_0: field strength read from Figure 2.1

E_R: actual field strength at a particular azimuth at 1 km

E_c: characteristic field strength

P : station power in kW.

Figure 2.2 consists of three pairs of scales to be used with Figure 2.1. Each pair contains one scale labelled in decibels and another in millivolts per metre. Each pair can be cut out and trimmed as a unit to be used as sliding ordinate scales. The scales allow graphical conversion between decibels and millivolts per metre, and are used to make graphical determinations of field strengths. Other methods of making calculations on Figure 2.1 may be used, including the use of dividers to adjust for values of E_R that differ from 100 mV/m at 1 km. However, any method used will follow steps similar to those described below.

For both omnidirectional and directional antenna systems the value of E_R must be found. For omnidirectional systems E_R can be determined by using either of the following equations:

$$E_R = E_c \sqrt{P}$$

if field strengths are expressed in mV/m, or:

$$E_R = E_c + 10 \log P$$

if field strengths are expressed in dB (μV/m)

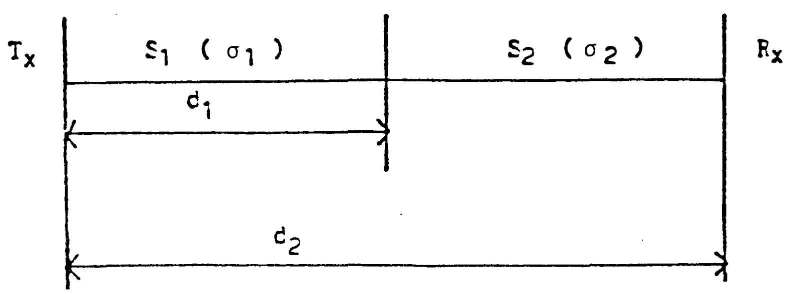
To determine the field strength at a given distance, the scale is placed at that distance with the 100 dB (μV/m) point of the scale resting on the appropriate conductivity curve. The value of E_R is then found on the scale; the point on the underlying graph (which lies underneath the E_R point of the scale) yields the field strength at the given distance.

To determine the distance at a given field strength, the E_R value is found on the sliding scale and that point is placed directly at the level of the given field strength on the graph. The scale is then moved horizontally until the 100 dB (μV/m) point of the scale coincides with the applicable conductivity curve. The distance may then be read from the abscissa of the graph.

2.1.3.2 Non-homogeneous paths

In this case, the equivalent distance or Kirke method is to be used. To apply this method, Figure 2.1 can also be used.

Consider a path whose sections S_1 and S_2 have lengths corresponding to d_1 and $d_2 - d_1$, and conductivities σ_1 and σ_2 respectively, as shown on the following figure:



The method is applied as follows:

a) Taking section S_1 first, we read the field strength corresponding to conductivity σ_1 at distance d_1 on Figure 2.1.

b) As the field strength remains constant at the point of discontinuity, the value immediately after the discontinuity must be equal to that obtained in a) above. As the conductivity of the second section is σ_2, the curve corresponding to conductivity σ_2 gives the equivalent distance to that which would be obtained at the same field strength arrived at in a). This equivalent distance is d. Distance d is larger than d_1 when σ_2 is larger than σ_1. Otherwise d is less than d_1.

c) The field strength at the real distance d_2 is determined by taking the corresponding curve for conductivity σ_2 and reading off the field strength obtained at the equivalent distance $d + (d_2 - d_1)$.

d) For successive sections with different conductivities, procedures b) and c) are repeated.

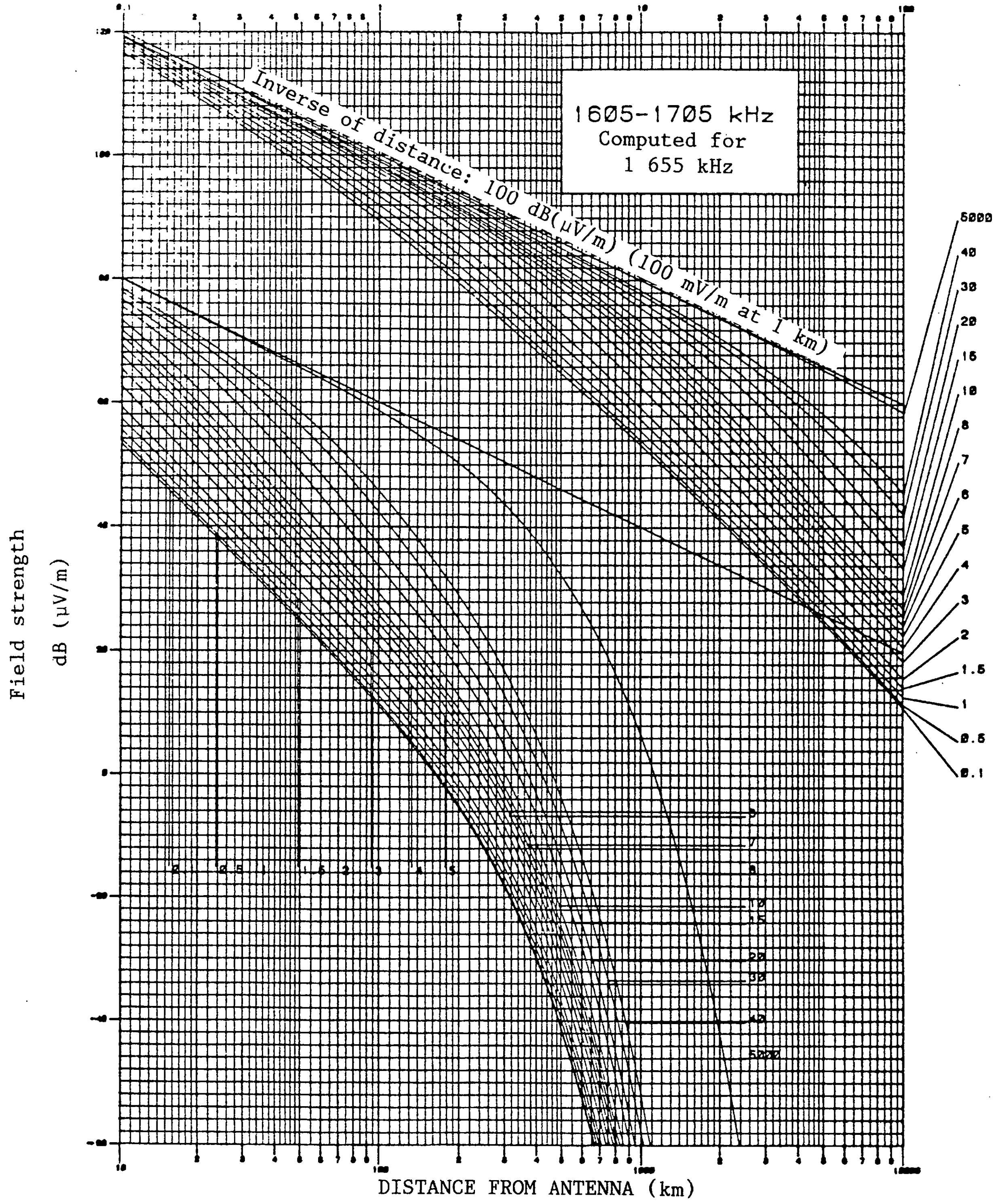


FIGURE 2.1

Groundwave field strength versus distance

(for a characteristic field strength of 100 mV/m)

[Note by the Editorial Committee - In the final version, Figures 2.1 and 2.2 will be improved by using the originals, when received.]

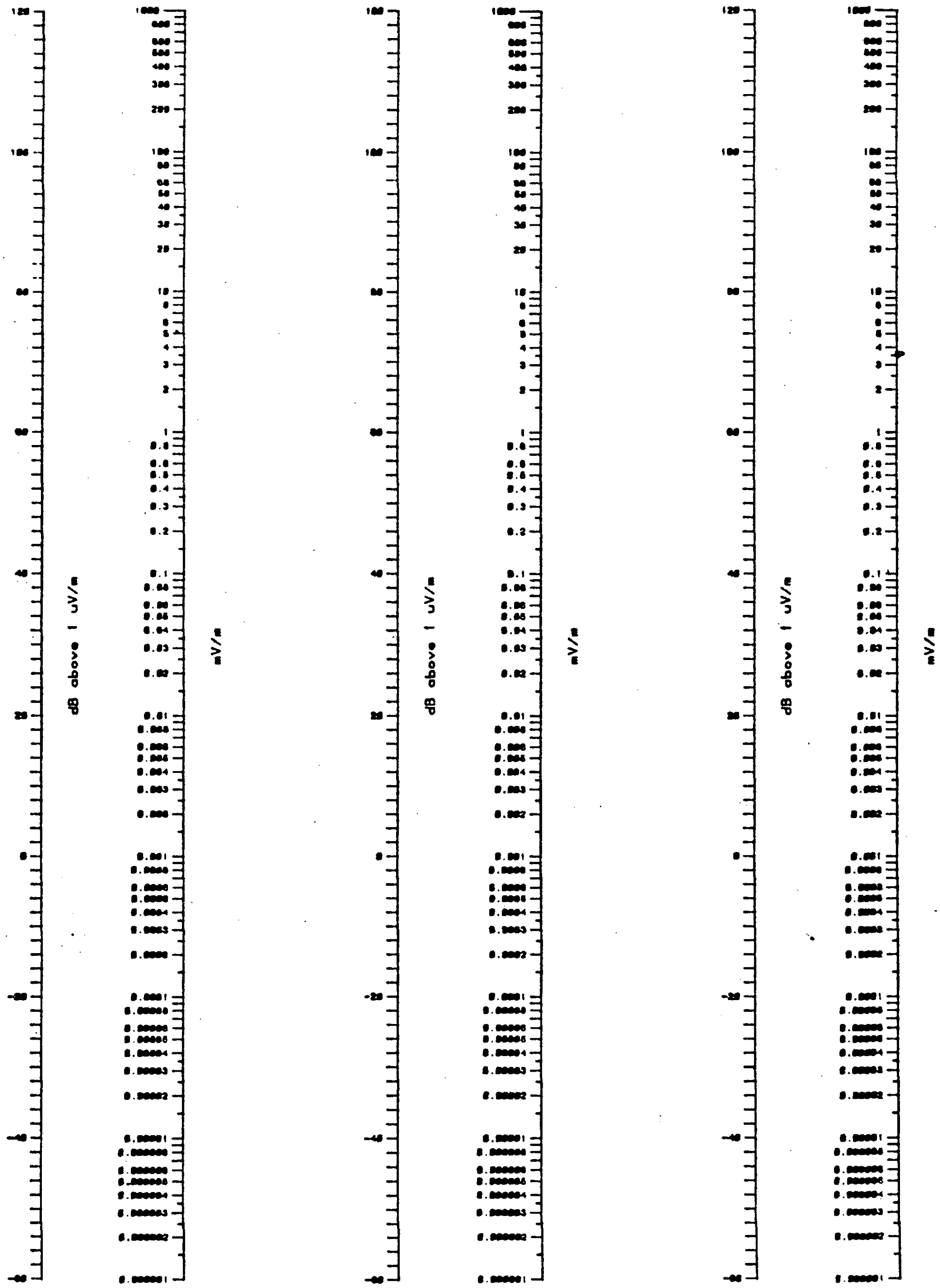


FIGURE 2.2

Scales for use with Figure 2.1

CHAPTER 3 - BROADCASTING STANDARDS* AND TRANSMISSION CHARACTERISTICS

3.1 Channel spacing

The Plan shall be based on a channel spacing of 10 kHz and carrier frequencies which are integral multiples of 10 kHz, beginning at 1 610 kHz.

3.2 Class of emission

The Plan shall be based on double-sideband amplitude modulation with full carrier A3E.

Classes of emission other than A3E could also be used on condition that the energy level outside the necessary bandwidth does not exceed that normally expected in A3E emission, for instance to accommodate stereophonic systems.

3.3 Bandwidth of emission

The Plan shall be based on a necessary bandwidth of 10 kHz for which only 5 kHz audio bandwidth can be obtained. While this might be an appropriate value within some administrations, others may wish to employ wider bandwidth systems with necessary bandwidths of the order of 20 kHz. However, the protection ratios selected allow operation with 20 kHz occupied bandwidth without an appreciable increase in interference. Stations operating on frequency 1 700 kHz shall take into account No. 343 of the Radio Regulations.

3.4 Frequency tolerance

As indicated in Appendix 7 to the Radio Regulations, the frequency tolerance shall be 20 parts in 10^6 (0.002%) for powers of 10 kW or less, and 10 Hz for powers greater than 10 kW.

[3.5 Station power]

[3.6 Nominal usable field strength]

[3.7 Definition of noise zones]

---

* Note - The effect of receiver characteristics upon AM broadcasting standards

It is expected that receiver characteristics for this band will be similar to those of existing receivers in the 535 - 1 605 kHz band. Therefore, they should not affect broadcasting standards.

3.8 Protection ratios

3.8.1 Co-channel protection ratio

The co-channel protection ratio shall be 26 dB.

3.8.2 Adjacent channel protection ratio

- the protection ratio for the first adjacent channel shall be 0 dB

- the protection ratio for the second adjacent channel shall be minus 29.5 dB.

CHAPTER 4 - RADIATION CHARACTERISTICS OF TRANSMITTING ANTENNAS

In carrying out the calculations indicated in Chapter 2 the following shall be taken into account.

4.1 Omnidirectional antennas

Figure 1 of section 2.2 shows the characteristic field of a simple vertical antenna as a function of its height in wavelength and of the radius of the ground system.

It is clear that the characteristic field strength increases as the loss in the ground system is reduced to zero and as the antenna height is increased up to 0.625 wavelengths.

The increased characteristic field strength for antenna heights up to 0.625 wavelengths is obtained at the expense of radiation at high angles as shown in Figure 1a and Table II of section 2.2.

4.2 Considerations of the radiation patterns of directional antennas

The procedures for calculating theoretical, expanded and augmented (modified expanded) directional antenna patterns are given in Annex 1.

4.3 Top-loaded or sectionalized antennas

4.3.1 Calculation procedures are given in Annex 2.

4.3.2 Many stations employ top-loaded or sectionalized towers, either because of space limitations or to vary the radiation characteristics from those of a simple vertical antenna. This is done to achieve desired coverage or to reduce interference.

4.3.3 An administration using top-loaded or sectionalized antennas shall supply information concerning the tower structure of the antennas. Normally, one of the equations in Annex 2 shall be employed to determine the vertical radiation characteristics of the antennas. Other equations may also be proposed by an administration for determining the vertical radiation characteristics of the antennas of that administration, subject to the agreement of the other administration(s) concerned.

ANNEX 1

Calculation of directional antenna patterns

Introduction

This annex describes methods to be employed in calculating the field strength produced by a directional antenna at a given point.

1. *General equations*

The theoretical directional antenna radiation pattern is calculated by means of the following equation, which sums the field strength from each element (tower) in the array.

$$E_T(\varphi, \theta) = \left| K_L \sum_{i=1}^{n} F_i f_i(\theta) \underline{/ \psi_i + S_i \cos\theta \cos(\varphi_i - \varphi)} \right| \quad (1)$$

where:

$$f_i(\theta) = \frac{\cos(G_i \sin\theta) - \cos G_i}{(1 - \cos G_i) \cos\theta} \quad (2)$$

where:

$E_T(\varphi, \theta)$: theoretical inverse distance field strength at one kilometre in mV/m for the given azimuth and elevation;

K_L : multiplying constant in mV/m which determines the pattern size (see paragraph 2.5 below for derivation of K_L);

n : number of elements in the directional array;

i : denotes the ith element in the array;

F_i : ratio of the theoretical field strength due to the ith element in the array relative to the theoretical field strength due to the reference element;

θ : vertical elevation angle, in degrees, measured from the horizontal plane;

$f_i(\theta)$: ratio of vertical to horizontal plane field strength radiated by the ith element at elevation angle θ;

G_i : electrical height of the ith element, in degrees;

S_i : electrical spacing of the ith element from the reference point in degrees;

φ_i : orientation of the ith element from the reference element (with respect to True North), in degrees;

φ : azimuth with respect to True North, in degrees;

ψ_i : electrical phase angle of field strength due to the ith element (with respect to the reference element), in degrees.

Equations (1) and (2) assume that:

- the current distribution in the elements is sinusoidal,
- there are no losses in the elements or in the ground,
- the antenna elements are base-fed, and
- the distance to the computation point is large in relation to the size of the array.

2. *Determination of values and constants*

2.1 *Determination of the multiplying constant K for an array*

The multiplying constant K for the loss-free case may be computed by integrating the power flow over the hemisphere, deriving an r.m.s. field strength and comparing the result with the case where the power is radiated uniformly in all directions over the hemisphere.

Thus:

$$K = \frac{E_r \sqrt{P}}{e_h} \quad \text{mV/m}$$

where:

- K: no-loss multiplying constant (mV/m at 1 km);
- E_r: reference level for uniform radiation over a hemisphere, equal to 244.95 mV/m at 1 km for 1 kW;
- P: antenna input power (kW);
- e_h: root mean square radiation pattern over the hemisphere which may be obtained by integrating $e(\theta)$ at each elevation angle over the hemisphere. The integration can be made using the trapezoidal method of approximation, as follows:

$$e_h = \left[\frac{\pi\Delta}{180}\left\{\tfrac{1}{2}[e(0)]^2 + \sum_{m=1}^{N}[e(m\Delta)]^2 \cos m\Delta\right\}\right]^{\frac{1}{2}} \qquad (3)$$

where:

- Δ: interval, in degrees, between equally-spaced sampling points at different elevation angles θ;
- m: an integer from 1 to N, which gives the elevation angle θ in degrees when multiplied by Δ, i.e. $\theta = m\Delta$;
- N: one less than the number of intervals $\left(N = \frac{90}{\Delta} - 1\right)$;
- $e(\theta)$: root mean square radiation pattern given by equation (1) with K equal to 1 at the specified elevation angle θ (the value of θ is 0 in the first term of equation (3) and $m\Delta$ in the second term); $e(\theta)$ is computed using equation (4).

$$e(\theta) = \left[\sum_{i=1}^{n}\sum_{j=1}^{n} F_i f_i(\theta) F_j f_j(\theta) \cos \psi_{ij} J_0(S_{ij} \cos \theta)\right]^{\frac{1}{2}} \qquad (4)$$

where:

- i: denotes the ith element;
- j: denotes the jth element;
- n: number of elements in the array;
- ψ_{ij}: difference in phase angles of the field strengths from the ith and jth elements in the array;
- S_{ij}: angular spacing between the ith and jth elements in the array;
- $J_0(S_{ij} \cos \theta)$: the Bessel function of the first kind and zero order of the apparent spacing between the ith and jth elements. In equation (4), S_{ij} is in radians. However when special tables of Bessel functions giving the argument in degrees are used, the values of S_{ij} should then be in degrees.

2.2 *Relationship between field strength and antenna current*

The field strength resulting from a current flowing in a vertical antenna element is:

$$E = \frac{R_c I\left[\cos(G \sin\theta) - \cos G\right]}{2\pi r \cos\theta} \times 10^3 \quad \text{mV/m} \qquad (5)$$

where:

- E: field strength in mV/m;
- R_c: resistivity of free space ($R_c = 120\pi$ ohms);
- I: current at the current maximum, in amperes [1];
- G: electrical height of the element, in degrees;
- r: distance from the antenna, in metres;
- θ: vertical elevation angle, in degrees.

---

[1] I is the current at the maximum of the sinusoidal distribution. If the electrical height of the element is less than 90°, the base current will be less than I.

At one kilometre and in the horizontal plane ($\theta = 0°$):

$$E = \frac{120\pi I(1-\cos G) \times 10^3}{2\pi(1000)} \qquad \text{mV/m} \tag{6}$$

hence:

$$E = 60\, I(1 - \cos G) \qquad \text{mV/m} \tag{7}$$

2.3 *Determination of no-loss current at current maximum*

For a tower of uniform cross-section or for a similar type of directional array element, the no-loss current at the current maximum is:

$$I_i = \frac{KF_i}{60(1-\cos G_i)} \tag{8}$$

where:

I_i: current at current maximum in amperes in the *i*th element;

K: no-loss multiplying constant computed as shown in paragraph 2.1 above.

The base current is given by $I_i \sin G_i$.

2.4 *Array power loss*

Power losses in a directional antenna system are of various types, including ground losses, antenna coupling losses, etc. The loss resistance for the array may be assumed to be inserted at the current maximum to allow for all losses. The power loss is:

$$P_L = \frac{1}{1000} \sum_{i=1}^{n} R_i I_i^2 \tag{9}$$

where:

P_L: total power loss, in kW;

R_i: assumed loss resistance, in ohms (one ohm, unless otherwise indicated) for the *i*th tower [1];

I_i: current at current maximum (or base current if the element is less than 90 degrees in electrical height) for the *i*th tower.

2.5 *Determination of a corrected multiplying constant*

To allow for power loss in the antenna system, the multiplying constant K can be modified, as follows:

$$K_L = K\left(\frac{P}{P + P_L}\right)^{\frac{1}{2}} \tag{10}$$

where:

K_L: multiplying constant after correction for the assumed loss resistance;

K: no-loss multiplying constant computed in paragraph 2.1 above;

P: array input power (kW);

P_L: total power loss (kW).

---

[1] The loss resistance shall in no way exceed a value such that the value of K_L (see paragraph 2.5) differs by more than ten percent from that calculated for a resistance of one ohm.

2.6 *r.m.s. value of radiation to be notified for directional antennas*

The radiation E_r for directional antennas is determined as follows:

$$E_r = K_L\, e(\theta) \qquad \text{mV/m at 1 km}$$

2.7 *Determination of expanded pattern values*

The expanded pattern is determined as follows:

$$E_{EXP}(\varphi, \theta) = 1.05 \left\{ [E_T(\varphi, \theta)]^2 + Q^2 \right\}^{\frac{1}{2}} \tag{11}$$

where:

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

$E_T(\varphi, \theta)$: theoretical pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

Q : quadrature factor, computed as:

$$Q = Q_0\, g(\theta)$$

where:

Q_0 is the Q on the horizontal plane, and is normally the greatest of the following three quantities:

$$10.0 \quad ; \quad 10\sqrt{P} \quad \text{or} \quad 0.025 K_L \left[\sum_{i=1}^{n} F_i^2 \right]^{\frac{1}{2}}$$

$g(\theta)$ is computed as follows:

If the electrical height of the shortest tower is less than or equal to 180 degrees, then:

$g(\theta) = f(\theta)$ for the shortest tower.

If the electrical height of the shortest tower is greater than 180 degrees, then:

$$g(\theta) = \frac{\{[f(\theta)]^2 + 0.0625\}^{\frac{1}{2}}}{1.030776}$$

where $f(\theta)$ for the shortest tower is used.

Note: In comparing the electrical heights of the antenna towers to determine the shortest tower, the total apparent height (as determined by current distribution) is used for top-loaded and sectionalized towers.

2.8 *Determination of augmented (modified expanded) pattern values*

The purpose of the augmented (modified expanded) pattern is to put one or more "patches" on an expanded pattern. Each "patch" is referred to as an "augmentation". The augmentation may be positive (resulting in more radiation than that of the expanded pattern) or negative (resulting in less radiation than that of the expanded pattern). In no case shall the augmentation be so negative that the augmented (modified expanded) pattern radiation is below the theoretical radiation pattern.

Spans of augmentation may overlap. That is, an augmentation may itself be augmented by a subsequent augmentation. To ensure that the calculations are properly made, the augmentations are handled in increasing order of central azimuth of augmentation, starting at True North. If several augmentations have the same central azimuth, then they are considered in order of decreasing span (i.e. the one with the largest span is handled first). If more than one augmentation has the same central azimuth and the same span, then they are considered in ascending order of their effect.

$$E_{MOD}(\varphi, \theta) = \left\{ [E_{EXP}(\varphi, \theta)]^2 + g^2(\theta) \sum_{i=1}^{a} A_i \cos^2 (180\, \Delta_i / \alpha_i) \right\}^{\frac{1}{2}} \quad (12)$$

where:

$E_{MOD}(\varphi, \theta)$: augmented (modified expanded) pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$g(\theta)$: same parameter as described for the expanded pattern (see paragraph 2.7);

a: number of augmentations;

Δ_i: difference between the azimuth at which the radiation is desired φ, and the central azimuth of augmentation of the ith augmentation. It will be noted that Δ_i must be less than or equal to one-half of α_i;

α_i: total span of the ith augmentation;

A_i: is the value of the augmentation given by the expression [1]:

$$A_i = [E_{MOD}(\varphi_i, \theta)]^2 - [E_{INT}(\varphi_i, \theta)]^2 \quad (13)$$

where:

φ_i: central azimuth of the ith augmentation;

$E_{MOD}(\varphi_i, \theta)$: augmented (modified expanded) horizontal plane radiation at the central azimuth of the ith augmentation, after applying the ith augmentation, but before applying subsequent augmentations;

$E_{INT}(\varphi_i, \theta)$: an interim value of radiation in the horizontal plane at the central azimuth of the ith augmentation. The interim value is the radiation obtained from applying previous augmentations (if any) to the expanded pattern, but before applying the ith augmentation.

---

1 When A_i is negative, there is negative augmentation; when A_i is positive, there is positive augmentation. A_i must not be so negative that $E_{MOD}(\varphi, \theta)$ falls below $E_T(\varphi, \theta)$ of any azimuth, φ, or elevation angle, θ.

ANNEX 2

Equations for the calculation of the normalized vertical radiation from top-loaded and typical sectionalized antennas

Basically, the equation is:

$$f(\theta) = \frac{E_\theta}{E_0}$$

where:

E_θ: radiation at a desired elevation angle, θ;

E_0: radiation in the horizontal plane.

Specific equations for top-loaded and typical sectionalized antennas are given below.

These equations use one or more of four variables A, B, C and D, which are defined after each equation.

1. Top-loaded antenna (Type 1 antennas)

$$f(\theta) = \frac{\cos B \cos (A \sin \theta) - \sin \theta \sin B \sin (A \sin \theta) - \cos (A + B)}{\cos \theta[\cos B - \cos (A + B)]}$$

where:

A: electrical height of the antenna tower;

B: difference between the apparent electrical height (based on current distribution) and the actual height (A);

θ: the elevation angle with respect to the horizontal plane.

Note: When B is zero (i.e., when there is no top-loading), the equation reduces to that of a simple vertical antenna.

2. *Sectionalized tower* (Type 2 antennas)

$$f(\theta) = \frac{[\cos B \cos (A \sin \theta) - \cos (A + B)] \sin (C + D - A) + \sin B[\cos D \cos (C \sin \theta) - \sin \theta \sin D \sin (C \sin \theta) - \cos (C + D - A) \cos (A \sin \theta)]}{\cos \theta([\cos B - \cos (A + B)] \sin (C + D - A) + \sin B[\cos D - \cos (C + D - A)])}$$

where:

A: actual height of the lower section;

B: difference between the apparent electrical height (based on current distribution) of the lower section and the actual height of the lower section (A);

C: actual total height of the antenna;

D: difference between the apparent electrical height (based on current distribution) of the total tower and the actual height of the total tower (C);

θ: vertical angle with respect to the horizontal plane.

3. Administrations proposing to use other types of antenna should furnish details of their characteristics together with a radiation pattern.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 73-E
23 April 1986
Original: English

COMMITTEE 6

Source: Documents 67, 68, 69

THIRD SERIES OF TEXTS FROM COMMITTEE 4

TO THE EDITORIAL COMMITTEE

The texts of the Annexes of Document 67 and the texts of Documents 68 and 69 have been adopted by Committee 4 and are submitted to the Editorial Committee with the appropriate modifications.

The delegate of Cuba reserved his position concerning the sky-wave propagation curve (Chapter 2, para. 2.2) for distances less than 200 km.

M.L. PIZARRO
Chairman of Committee 4

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 74-E
23 April 1986

B.3

PLENARY MEETING

3rd SERIES OF TEXTS SUBMITTED BY THE
EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Document	Title
COM.4	68 (+73)	Chapter 2 - section 2.2
	67 (+73)	Chapter 6 - Technical criteria for interservice sharing

Note by the Chairman of Committee 4 - The delegate of Cuba reserved his position concerning the sky-wave propagation curve (Chapter 2, section 2.2) for distances less than 200 km.

P. PERRICHON
Chairman of Committee 6

Annex: 20 pages

/‾CHAPTER 2 - PROPAGATION_7

2.2 **Skywave propagation**

The calculation of skywave field strength shall be conducted in accordance with the provisions which follow.

2.2.1 *List of symbols*

- d: short great-circle path distance (km)
- E_c: characteristic field strength, mV/m at 1 km for 1 kW
- $f(\theta)$: radiation as a fraction of the value $\theta = 0$ (when $\theta = 0$, $f(\theta) = 1$)
- f: frequency (kHz)
- F: unadjusted annual median skywave field strength, in dB(μV/m)
- F_c: field strength read from Fig. 2.6 or Table 2.III for a characteristic field strength of 100 mV/m
- $F(50)$: skywave field strength, 50% of the time, in dB(μV/m)
- P: station power (kW)
- θ: elevation angle from the horizontal (degrees)

2.2.2 *General procedure*

Radiation in the horizontal plane of an omnidirectional antenna fed with 1 kW (characteristic field strength, E_c) is known either from design data or, if the actual design data are not available, from Fig. 2.3.

Elevation angle θ is given by

$$\theta = \arc \tan \left(0.00752 \cot \frac{d}{444.54}\right) - \frac{d}{444.54} \qquad \text{degrees} \qquad (1)$$

$$0° \leq \theta \leq 90°$$

Alternatively, Fig. 2.4 or Table 2.I may be used.

It is assumed that the Earth is a smooth sphere with an effective radius of 6,367.6 km and that reflections occur from an ionospheric height of 96.5 km.

The radiation $f(\theta)$ expressed as a fraction of the value at $\theta = 0$ at a pertinent elevation angle θ can be determined from Fig. 2.5 or Table 2.II.

The product $E_c f(\theta)\sqrt{P}$ is thus determined for an omnidirectional antenna. For a directional antenna, $E_c f(\theta)\sqrt{P}$ can be determined from the antenna radiation pattern. $E_c f(\theta)\sqrt{P}$ is the field strength at 1 km at the appropriate elevation angle and azimuth.

The unadjusted annual median skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c f(\theta) \sqrt{P}}{100} \qquad \text{dB}(\mu\text{V/m}) \qquad (2)$$

where F_c is the direct reading from the field strength curve in Fig. 2.6 or Table 2.III.

Note: Values of F_c in Fig. 2.6 and Table 2.III are normalized to 100 mV/m at 1 km corresponding to an effective monopole radiated power (e.m.r.p.) of −9.5 dB(kW).

For distances greater than 4250 km, it should be noted that F_c can be expressed by:

$$F_c = \frac{231}{3 + d/1000} - 35.5 \qquad \text{dB}(\mu\text{V/m}) \qquad (3)$$

2.2.3 *Skywave field strength, 50% of the time*

This is given by:

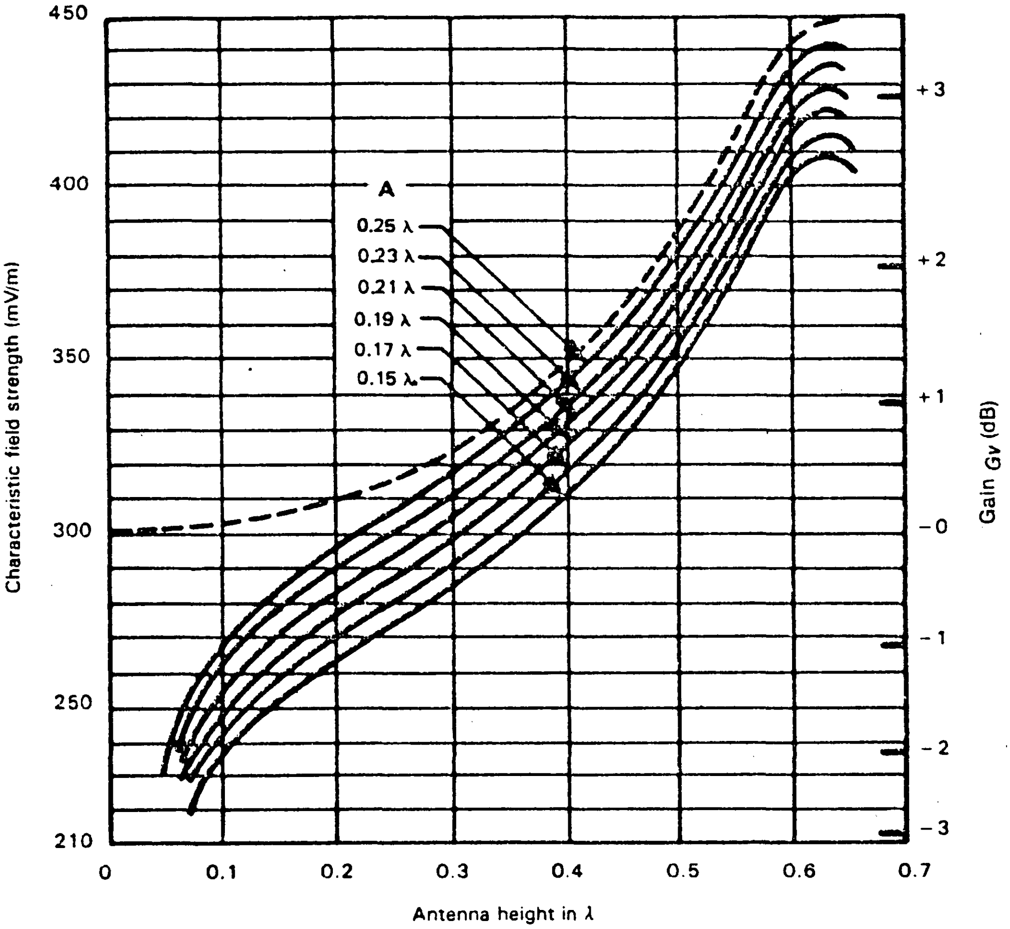
$$F(50) = F \qquad \text{dB}(\mu\text{V/m}) \qquad (4)$$

2.2.4 *Nocturnal variation of skywave field strength*

Hourly median skywave field strengths vary during the night and at sunrise and sunset. Figure 2.7 shows the average variation referred to the value at 2 hours after sunset at the path midpoint. This variation applies to field strengths occurring for 50% of the nights.

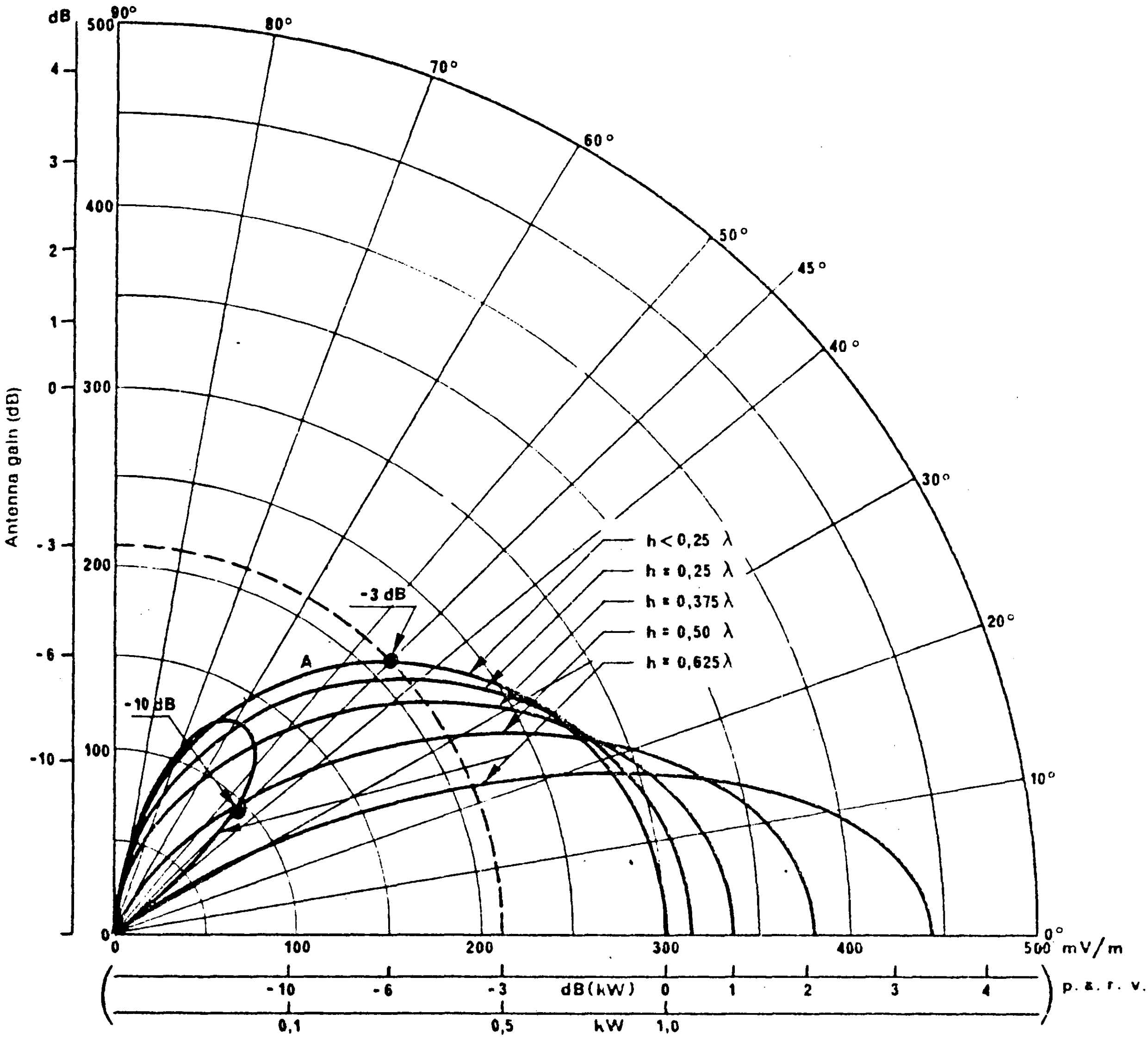
2.2.5 *Sunrise and sunset time*

To facilitate the determination of the local time of sunrise and sunset, Fig. 2.8 gives the times for various geographical latitudes and for each month of the year. The time is the local meridian time at the point concerned and should be converted to the appropriate standard time.



A: Radius of ground system
Full lines: Real antenna correctly designed
Dashed line: Ideal antenna on a perfectly conducting ground

FIGURE 2.3 - *Characteristic field strengths for simple vertical antennas, using 120-radial ground systems*



A: Short vertical antenna

FIGURE 2.3a - *Effective monopole radiated power (e.m.r.p.) and field strength at a distance of 1 km as a function of elevation angle, for different heights of vertical antennas assuming a transmitter power of 1 kW*

TABLE 2.I - *Elevation angle vs distance*

Distance (km)	Elevation angle (degrees)
50	75.3
100	62.2
150	51.6
200	43.3
250	36.9
300	31.9
350	27.9
400	24.7
450	22.0
500	19.8
550	18.0
600	16.3
650	14.9
700	13.7
750	12.6
800	11.7
850	10.8
900	10.0
950	9.3
1000	8.6
1050	8.0
1100	7.4
1150	6.9
1200	6.4
1250	5.9
1300	5.4
1350	5.0
1400	4.6
1450	4.3
1500	3.9
1550	3.5
1600	3.2
1650	2.9
1700	2.6
1750	2.3
1800	2.0
1850	1.7
1900	1.5
1950	1.2
2000	1.0
2050	0.7
2100	0.5
2150	0.2
2200	0.0
2250	0.0
2300	0.0
2350	0.0
2400	0.0

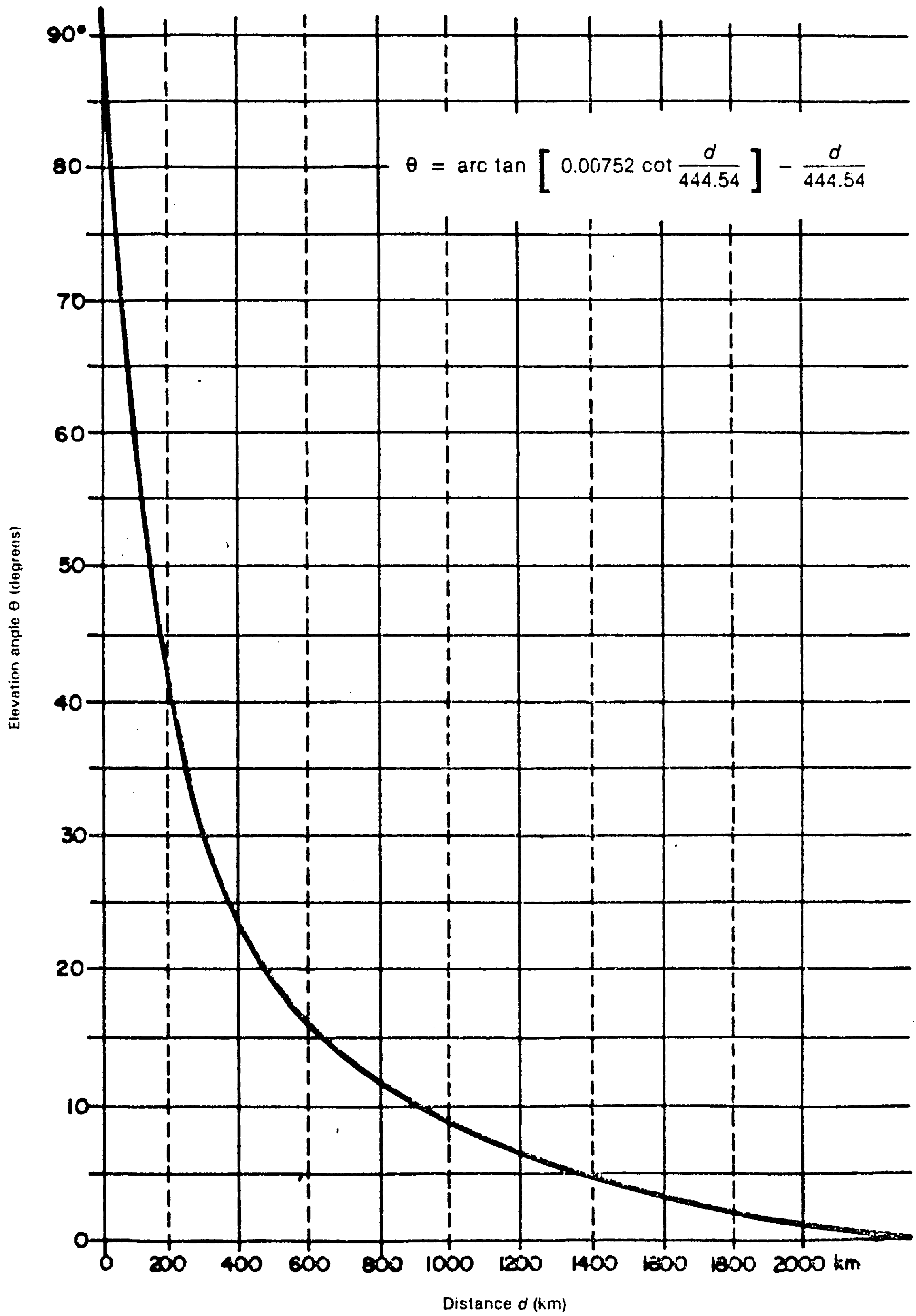


FIGURE 2.4 - *Elevation angle vs distance*

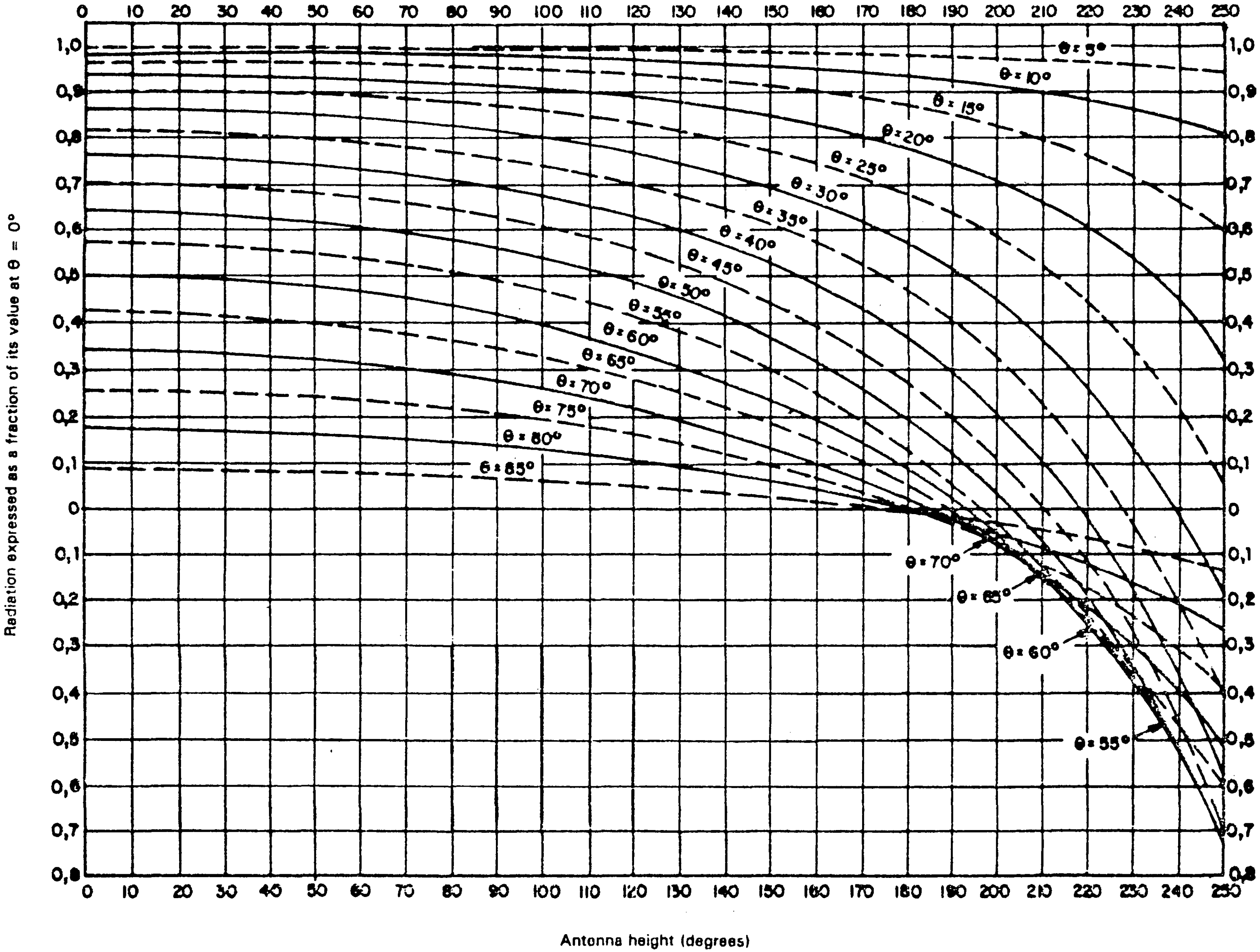


FIGURE 2.5 – *Vertical plane radiation of simple vertical antennas as a function of electrical tower height for various values of elevation angle (θ)*

TABLE 2.II – *f(θ) values for simple vertical antennas*

Elevation angle (degrees)	f(θ)					
	0.11 λ	0.13 λ	0.15 λ	0.17 λ	0.19 λ	0.21 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.999	0.998	0.998	0.998	0.998	0.998
4	0.997	0.997	0.997	0.997	0.997	0.997
5	0.996	0.996	0.996	0.995	0.995	0.995
6	0.994	0.994	0.994	0.993	0.993	0.993
7	0.992	0.992	0.991	0.991	0.991	0.990
8	0.989	0.989	0.989	0.988	0.988	0.987
9	0.987	0.986	0.986	0.985	0.985	0.984
10	0.984	0.983	0.983	0.982	0.981	0.980
11	0.980	0.980	0.979	0.978	0.977	0.976
12	0.976	0.976	0.975	0.974	0.973	0.971
13	0.972	0.972	0.971	0.969	0.968	0.967
14	0.968	0.967	0.966	0.965	0.963	0.961
15	0.963	0.962	0.961	0.959	0.958	0.956
16	0.958	0.957	0.956	0.954	0.952	0.950
17	0.953	0.952	0.950	0.948	0.945	0.943
18	0.947	0.946	0.944	0.942	0.940	0.937
19	0.941	0.940	0.938	0.935	0.933	0.930
20	0.935	0.933	0.931	0.929	0.926	0.922
22	0.922	0.920	0.917	0.914	0.911	0.907
24	0.907	0.905	0.902	0.898	0.894	0.890
26	0.892	0.889	0.885	0.882	0.877	0.872
28	0.875	0.872	0.868	0.864	0.858	0.852
30	0.857	0.854	0.849	0.844	0.839	0.832
32	0.838	0.834	0.830	0.824	0.818	0.811
34	0.819	0.814	0.809	0.803	0.795	0.789
36	0.798	0.793	0.788	0.781	0.774	0.766
38	0.776	0.771	0.765	0.758	0.751	0.742
40	0.753	0.748	0.742	0.735	0.725	0.717
42	0.730	0.724	0.718	0.710	0.702	0.692
44	0.705	0.700	0.693	0.685	0.676	0.666
46	0.680	0.674	0.667	0.659	0.650	0.639
48	0.654	0.648	0.641	0.633	0.623	0.612
50	0.628	0.621	0.614	0.606	0.596	0.585
52	0.600	0.594	0.587	0.578	0.568	0.557
54	0.572	0.566	0.559	0.550	0.540	0.529
56	0.544	0.537	0.530	0.521	0.512	0.501
58	0.515	0.508	0.501	0.493	0.483	0.472
60	0.485	0.479	0.472	0.463	0.454	0.443

TABLE 2.II *(continued)*

Elevation angle (degrees)	$f(\theta)$					
	0.23 λ	0.25 λ	0.27 λ	0.29 λ	0.311 λ	0.35 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.998	0.998	0.998	0.998	0.998	0.997
4	0.997	0.996	0.996	0.996	0.996	0.995
5	0.995	0.994	0.994	0.994	0.993	0.992
6	0.992	0.992	0.991	0.991	0.990	0.989
7	0.990	0.989	0.988	0.988	0.987	0.985
8	0.987	0.986	0.985	0.984	0.983	0.980
9	0.983	0.982	0.981	0.980	0.978	0.975
10	0.979	0.978	0.977	0.975	0.973	0.969
11	0.975	0.973	0.972	0.970	0.968	0.963
12	0.970	0.968	0.966	0.964	0.962	0.955
13	0.965	0.963	0.961	0.958	0.955	0.949
14	0.959	0.957	0.955	0.952	0.948	0.941
15	0.953	0.951	0.948	0.945	0.941	0.932
16	0.947	0.944	0.941	0.937	0.933	0.924
17	0.941	0.937	0.934	0.930	0.925	0.914
18	0.934	0.930	0.926	0.921	0.916	0.904
19	0.926	0.922	0.918	0.913	0.907	0.894
20	0.919	0.914	0.909	0.904	0.898	0.883
22	0.902	0.897	0.891	0.885	0.877	0.861
24	0.885	0.879	0.872	0.865	0.856	0.837
26	0.866	0.859	0.852	0.843	0.833	0.811
28	0.846	0.838	0.830	0.820	0.809	0.795
30	0.825	0.816	0.807	0.797	0.784	0.758
32	0.803	0.794	0.784	0.772	0.759	0.729
34	0.780	0.770	0.759	0.747	0.732	0.701
36	0.756	0.746	0.734	0.721	0.705	0.671
38	0.732	0.720	0.708	0.694	0.677	0.642
40	0.706	0.695	0.681	0.667	0.649	0.612
42	0.681	0.668	0.654	0.639	0.621	0.582
44	0.654	0.641	0.627	0.611	0.593	0.552
46	0.628	0.614	0.600	0.583	0.564	0.523
48	0.600	0.587	0.572	0.555	0.536	0.494
50	0.573	0.559	0.544	0.527	0.507	0.465
52	0.545	0.531	0.515	0.498	0.479	0.436
54	0.517	0.503	0.487	0.470	0.451	0.408
56	0.488	0.474	0.459	0.442	0.423	0.381
58	0.460	0.446	0.431	0.414	0.395	0.354
60	0.431	0.418	0.403	0.387	0.368	0.328

TABLE 2.II *(end)*

Elevation angle (degrees)	f(θ)					
	0.40 λ	0.45 λ	0.50 λ	0.528 λ	0.55 λ	0.625 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	0.999	0.999	0.999	0.999
2	0.998	0.998	0.998	0.997	0.997	0.995
3	0.997	0.996	0.995	0.994	0.993	0.989
4	0.994	0.992	0.990	0.989	0.988	0.981
5	0.991	0.988	0.985	0.983	0.981	0.970
6	0.986	0.983	0.979	0.975	0.972	0.957
7	0.982	0.977	0.971	0.967	0.962	0.941
8	0.976	0.970	0.962	0.957	0.951	0.924
9	0.970	0.963	0.953	0.945	0.938	0.904
10	0.963	0.954	0.942	0.933	0.924	0.882
11	0.955	0.945	0.930	0.919	0.909	0.859
12	0.947	0.934	0.917	0.905	0.893	0.834
13	0.938	0.923	0.903	0.889	0.875	0.807
14	0.929	0.912	0.889	0.872	0.857	0.773
15	0.918	0.899	0.873	0.855	0.837	0.748
16	0.908	0.886	0.857	0.836	0.815	0.717
17	0.897	0.873	0.840	0.817	0.795	0.684
18	0.885	0.859	0.823	0.797	0.772	0.651
19	0.873	0.844	0.804	0.776	0.749	0.617
20	0.860	0.828	0.785	0.755	0.726	0.582
22	0.833	0.796	0.746	0.710	0.677	0.510
24	0.805	0.763	0.705	0.665	0.625	0.436
26	0.776	0.728	0.663	0.618	0.574	0.363
28	0.745	0.692	0.621	0.570	0.522	0.290
30	0.714	0.655	0.577	0.522	0.470	0.219
32	0.682	0.619	0.534	0.475	0.419	0.151
34	0.649	0.582	0.492	0.428	0.368	0.085
36	0.617	0.545	0.450	0.383	0.321	0.025
38	0.584	0.509	0.409	0.340	0.275	– 0.031
40	0.552	0.473	0.370	0.298	0.231	– 0.083
42	0.519	0.438	0.332	0.258	0.190	– 0.129
44	0.488	0.405	0.296	0.221	0.152	– 0.170
46	0.457	0.372	0.262	0.187	0.117	– 0.205
48	0.427	0.341	0.230	0.155	0.085	– 0.235
50	0.397	0.311	0.201	0.126	0.056	– 0.259
52	0.369	0.283	0.174	0.099	0.031	– 0.278
54	0.341	0.257	0.149	0.076	0.009	– 0.291
56	0.315	0.232	0.126	0.055	– 0.010	– 0.300
58	0.289	0.208	0.105	0.037	– 0.026	– 0.304
60	0.265	0.186	0.087	0.021	– 0.039	– 0.304
62				0.003	– 0.049	– 0.300
64				– 0.003	– 0.056	– 0.292
66				– 0.011	– 0.062	– 0.281
68				– 0.017	– 0.064	– 0.267
70				– 0.022	– 0.065	– 0.250
72				– 0.025	– 0.064	– 0.231
74				– 0.026	– 0.061	– 0.210
76				– 0.026	– 0.056	– 0.138
78				– 0.024	– 0.051	– 0.163
80				– 0.022	– 0.044	– 0.138

Note – When the negative sign (–) appears in the Table, it signifies only the existence of a secondary lobe having the opposite phase from the main lobe in the vertical radiation pattern. In order to perform the calculation, ignore the negative (–) and use only the absolute value f(θ) from the Table.

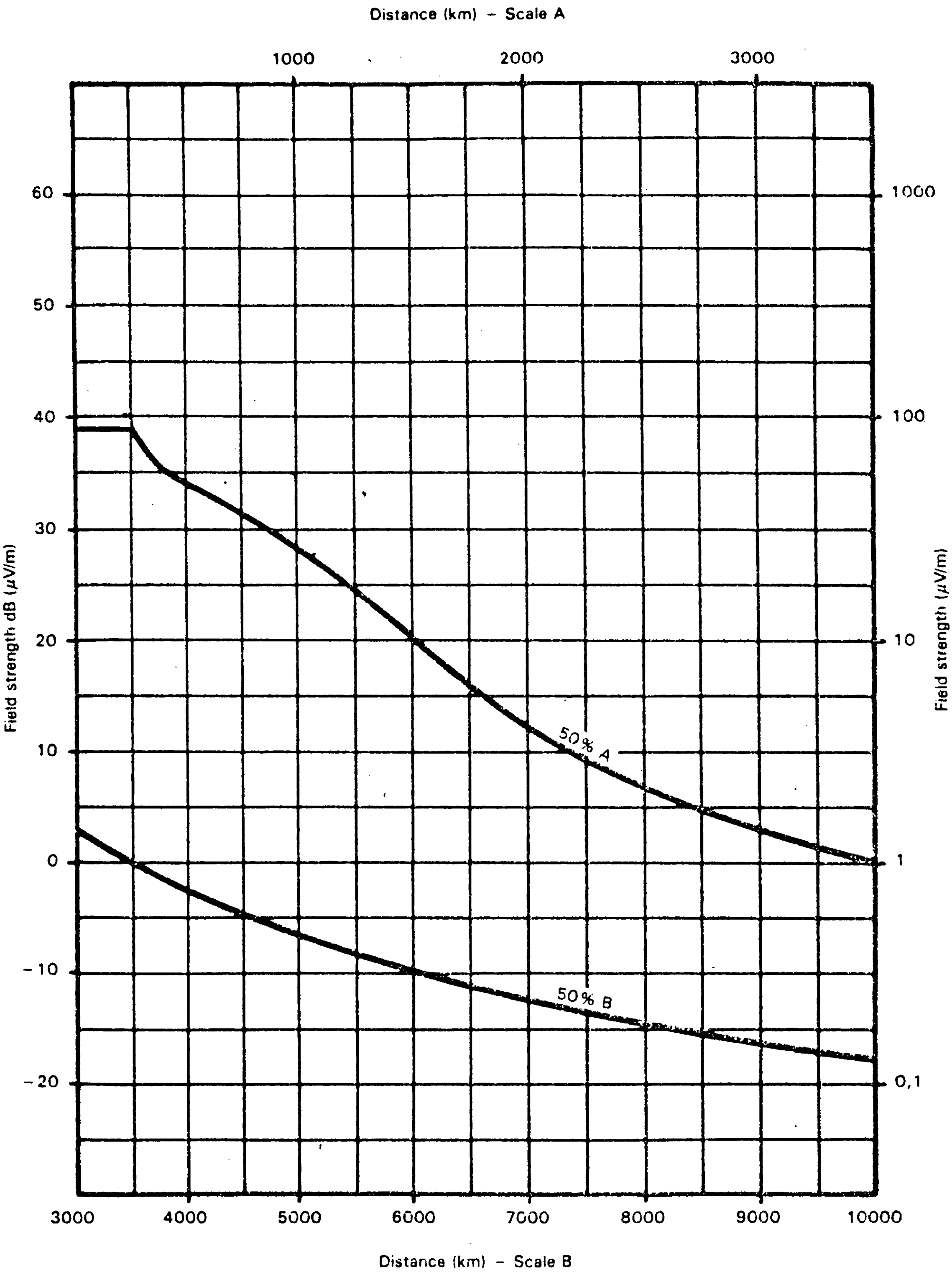


FIGURE 2.6 – *Skywave field strength vs distance for a characteristic field strength of 100 mV/m*

TABLE 2.III – *Skywave field strength vs distance* (0 to *10 000 km) for a characteristic field strength of 100 mV/m*

d (km)	F_c (dB (μV/m)) 50%	F_c (μV/m) 50%
0-200	39.28	92.06
250	37.79	77.54
300	36.75	68.82
350	35.86	62.06
400	35.13	57.08
450	34.46	52.86
500	33.92	49.65
550	33.40	46.78
600	32.94	44.36
650	32.45	41.95
700	31.94	39.54
750	31.32	36.81
800	30.73	34.40
850	30.18	32.30
900	29.51	29.89
950	28.83	27.63
1000	28.14	25.54
1050	27.44	23.56
1100	26.79	21.84
1150	25.98	19.91
1200	25.25	18.30
1250	24.50	16.78
1300	23.71	15.32
1350	22.90	13.97
1400	22.08	12.71
1450	21.25	11.55
1500	20.42	10.50
1550	19.59	9.53
1600	18.66	8.57
1650	17.75	7.72
1700	16.87	6.98
1750	16.04	6.34
1800	15.28	5.80
1850	14.52	5.32
1900	13.78	4.89
1950	13.05	4.49
2000	12.34	4.14
2100	11.15	3.61
2200	10.05	3.18
2300	8.92	2.79
2400	8.13	2.55
2500	7.09	2.26
2600	6.16	2.03
2700	5.32	1.85
2800	4.58	1.69
2900	3.81	1.55

TABLE 2.III *(end)*

d (km)	F_c (dB (μV/m)) 50%	F_c (μV/m) 50%
3000	3.11	1.43
3100	2.45	1.33
3200	1.78	1.23
3300	1.18	1.15
3400	0.57	1.07
3500	0.02	1.00
3600	−0.53	0.94
3700	−1.08	0.88
3800	−1.59	0.83
3900	−2.08	0.79
4000	−2.52	0.75
4100	−3.01	0.71
4200	−3.46	0.67
4300	−3.90	0.64
4400	−4.33	0.61
4500	−4.74	0.58
4600	−5.15	0.55
4700	−5.54	0.53
4800	−5.93	0.51
4900	−6.30	0.48
5000	−6.67	0.46
5100	−7.02	0.45
5200	−7.37	0.43
5300	−7.71	0.41
5400	−8.04	0.40
5500	−8.37	0.38
5600	−8.68	0.37
5700	−8.99	0.36
5800	−9.29	0.34
5900	−9.59	0.33
6000	−9.88	0.32
6200	−10.43	0.30
6400	−10.97	0.28
6600	−11.48	0.27
6800	−11.97	0.25
7000	−12.44	0.24
7200	−12.90	0.23
7400	−13.33	0.22
7600	−13.75	0.21
7800	−14.15	0.20
8000	−14.54	0.19
8200	−14.92	0.18
8400	−15.28	0.17
8600	−15.63	0.17
8800	−15.97	0.16
9000	−16.29	0.15
9200	−16.61	0.15
9400	−16.91	0.14
9600	−17.21	0.14
9800	−17.50	0.13
10000	−17.77	0.13

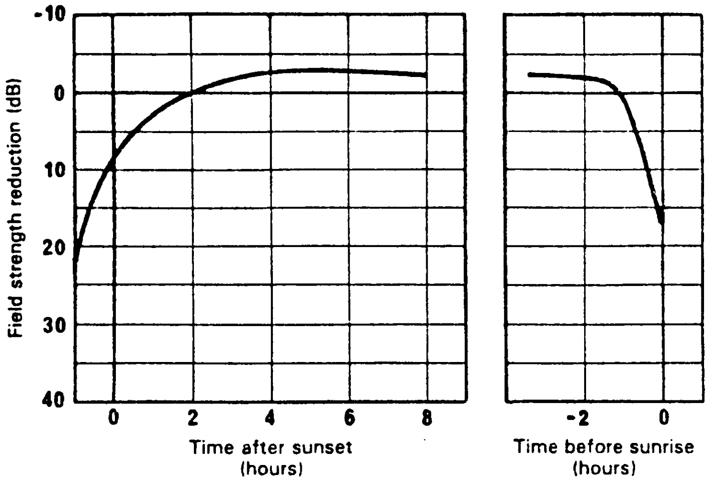


FIGURE 2.7 – *Field strength variation during the night*

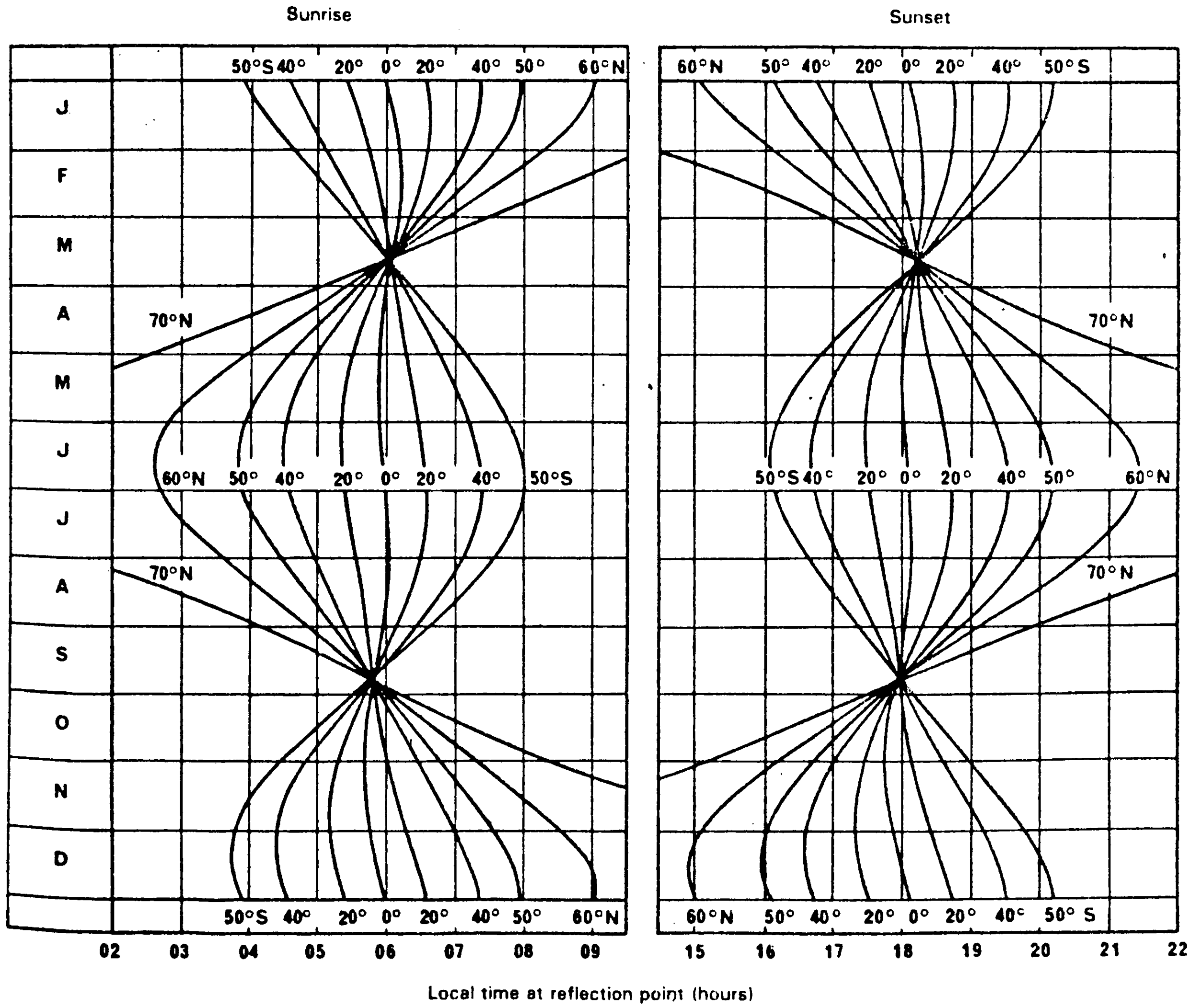


FIGURE 2.8 – *Times of sunrise and sunset for various months and geographical latitudes*

CHAPTER 6 - TECHNICAL CRITERIA FOR INTERSERVICE SHARING

[In accordance with Article 8 of the Radio Regulations, the fixed and mobile services become permitted services at a time to be established by the Conference. The intention is to facilitate the preparation of the broadcasting Plan without restrictions from other services. Thus in drawing up the Plan, the broadcasting service will have prior choice of frequency and does not have to protect the other services. The sharing criteria developed in this chapter are designed to apply to the permitted services in order to protect broadcasting services in the Plan and give protection to these permitted services. According to the specific cases the protection ratio value is given for co-channel interference (CO) or for off-channel interference (OC).]

6.1 Protection of the broadcasting service

The broadcasting service in Region 2 may be subject to interservice interference from services sharing the sub-band 1 625 - 1 705 kHz such as the fixed, mobile and radiolocation services.

[Protection in accordance with the criteria in section 6.1.1 is to be given within the national boundary and/or sub-national zone for priority channels and within the service contours for non-priority channels.]

A value of 26 dB has been indicated in section 3.8.1 for co-channel protection ratio between broadcasting emissions, hence allowing a given quality of service, and the same quality criteria have been applied to derive the figures given for interfering services other than broadcasting.

6.1.1 Protection ratio criteria

As noted in the CCIR Report to the Conference, "Compatibility problems and sharing criteria between the broadcasting service and the other services are not fully investigated ...". Some additional information has been developed since that document was prepared. However, it is recognized that further information will be necessary before administrations are in a position to agree on the values to be used in establishing protection criteria for use in sharing of the extended band. As a result, administrations are encouraged to study this subject further during the intersessional period. In addition, it would be desirable for the CCIR to assist in the final preparation of a document to be submitted to the second session. (See Recommendation COM4/B.)

The latest available information from the CCIR is presented in Table 6.I.

New results of measurements carried out by a Region 2 administration, indicate that, at least for J3E and F1B interference cases, new radio-frequency protection ratio values can be proposed, namely: 28 dB for J3E off-channel interference (about 1.4 kHz assigned frequency spacing and zero carrier frequency spacing) and 45 dB for F1B off-channel (1 kHz) interference. The radio-frequency protection ratio curves (median values) appearing in Figures 6.1 and 6.2 can be used to determine the required protection for various carrier spacings.

6.2 Protection of the permitted services

The protection ratio values to protect the permitted services when implementing the Plan are also given in Table 6.I.

To protect reception of the fixed service, values are indicated for just usable (JU), marginally commercial (MC) and good commercial (GC) quality; for telegraph communication they should be specified for a character error ratio P_E of 10^{-2}, 10^{-3} and 10^{-4}, but since the protection ratios do not significantly vary for values of P_E up to 10^{-6}, a single value is suggested by the CCIR.

TABLE 6.I

Steady-state protection ratios (dB)*

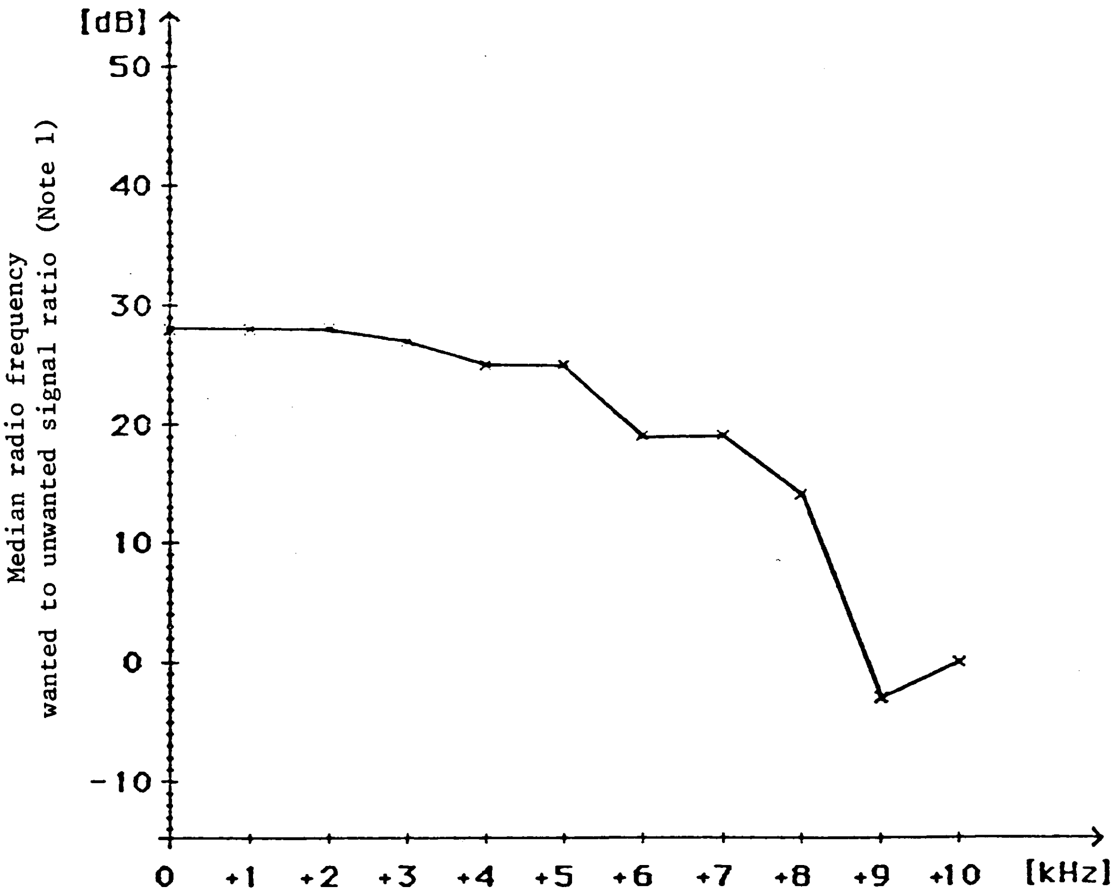
Interfering signal / Wanted signal		A3E (BC)		A3E (fixed)		A2A/A2B		F1B		J2B		J3E		H2A/H2B		Class of emission
		CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	Interfering condition 1)
A3E (BC)		26		26		31		47			43		38		37	
A3E (fixed) 2)	JU MC GC	-7 5 26														
A2A/A2B	$P_E<10^{-6}$	5														
F1B	$P_E<10^{-6}$	-3														
J2B	$P_E<10^{-6}$		5													
J3E	JU MC GC		-19 -7 14													
H2A/H2B	$P_E<10^{-6}$		-1													
Class of emission	Quality of service															

* Ratio of wanted-to-interfering signals whose powers are expressed in terms of p.e.p. (PX) (see Recommendation 240-3 (MOD I)).

1) CO (co-channel interference) and OC (off-channel interference) are the cases when the frequency separation between the assigned frequency of the wanted signal and that of the interfering signal is about zero and about 1.4 kHz respectively.

2) Administrations are urged to discontinue, in the fixed service, the use of double-sideband radiotelephone (class A3E) transmissions (see RR 2700).

Wanted .... A3E (Broadcasting)
Unwanted .... J3E (Radiotelephony)
Low pass filter
at receiver output .... 10 kHz
Grade of quality .... 4 (CCIR Recommendation 562-1)



Carrier frequency separation

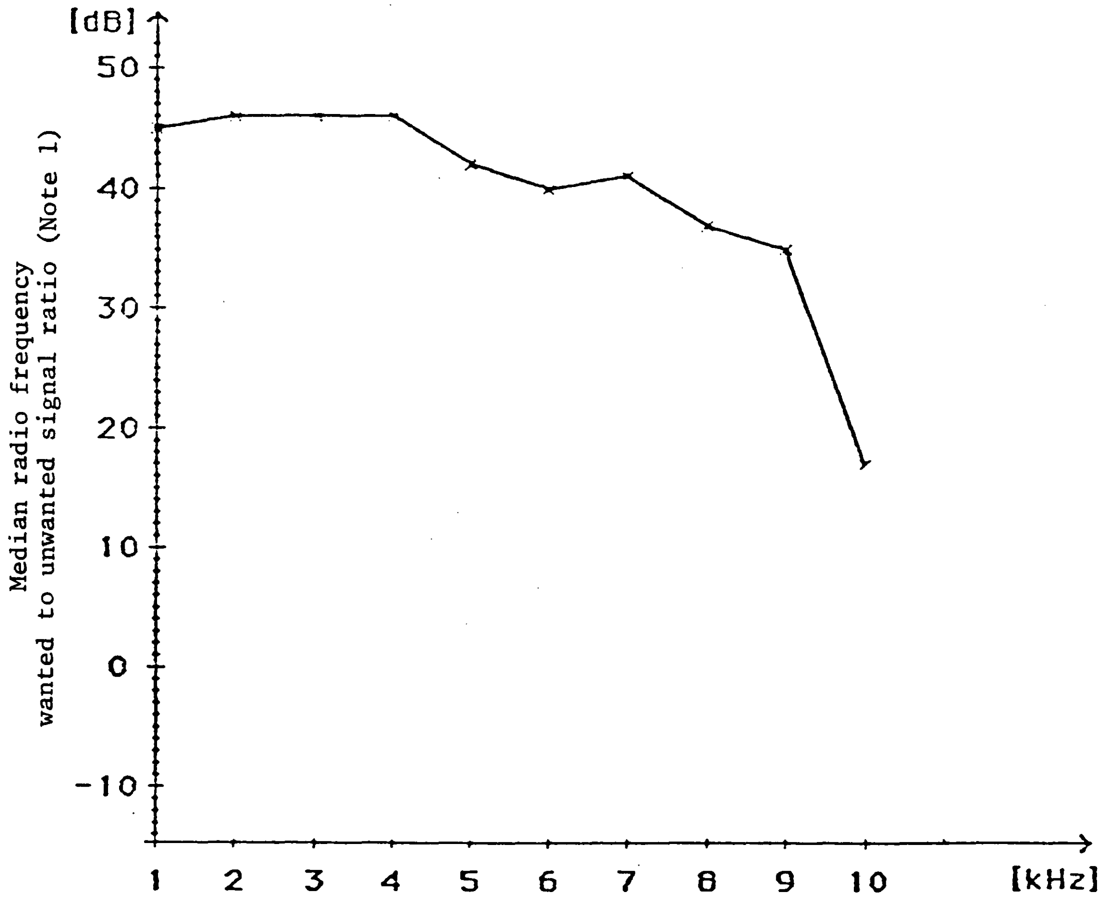
(unwanted to wanted)

FIGURE 6.1

Median value of the radio frequency wanted (A3E) to unwanted (J3E) signal ratio as a function of the carrier frequency separation

Note 1 - The signal ratio is defined as the ratio of the peak envelope power of the wanted signal to the peak envelope power of the unwanted signal.

Wanted .... A3E (Broadcasting)
Unwanted..................... F1B (Narrow-band direct printing telegraphy or selective digital calling)
Low pass filter
at receiver output............. 10 kHz
Grade of quality ....4 (CCIR Recommendation 562-1)



Carrier frequency separation
(unwanted to wanted)

FIGURE 6.2

Median value of the radio frequency wanted (A3E) to unwanted (F1B) signal ratio as a function of the carrier frequency separation

Note 1 - The signal ratio is defined as the ratio of the peak envelope power of the wanted signal to the mean power of the unwanted signal.

6.3 Principles used for the application of interregional sharing criteria (see Recommendation COM4/C)

6.3.1 Application of RR 346

In the application of the interregional sharing criteria, the basic principle is the equality of rights between the regions as provided in RR 346.

6.3.2 Application of the IFRB Technical Standards

The relevant IFRB Technical Standards govern interregional sharing.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 75-E
23 April 1986
Original: English

COMMITTEE 5

FIRST REPORT FROM THE CHAIRMAN OF WORKING GROUP 5-A

TO COMMITTEE 5

1.1 Definitions

An allotment is an entry in the plan of a designated broadcasting channel for use by an administration for the broadcasting service in an allotment area under the conditions specified in the [Plan and/or Agreement]. Each allotment included in the Plan may be used for one or more assignments using the technical criteria specified in [A].

An allotment area is a specifically defined geographical area within a country to which one or more channels are allotted.

6.1 Basis for planning

The plan for the broadcasting service in Region 2 in the band 1 605 - 1 705 kHz is based on the following:

a) the Plan for the broadcasting service will contain allotments and may contain assignments;

b) the Plan will not be based on requirements submitted by administrations;

c) an allotment plan shall be established without taking into account the stations of other services;

d) an allotment area is determined on the basis of the standardized distance(s) specified in Table [B];

e) where the separation distance between the allotment area of one administration and those of a number of other administrations is less than the standardized distance(s), the minimum number of channels allotted to that area will depend on the number of administrations involved as indicated in Table [C];

f) where the separation distance between the allotment area of one administration and those allotment areas of all other administrations is greater than the standardized distance(s), all ten channels are allotted to that area;

g) the Plan will be based on the use of standardized parameters. However, the possibility should be left open for the case where a group of countries decide subregionally to develop at the Conference part of the Plan, consistent with the Regional Plan, based on a transmitter power less than the standardized parameters;

h) an administration may make assignments on channels not allotted to it in a particular allotment area provided that it protects the allotments and assignments of other countries in accordance with Annex [1]. Such assignments shall not restrict standardized parameter use of allotments;

i) in cases where neighbouring countries have allotments on adjacent channels, procedures to be followed before bringing into use assignments from allotments in border areas are specified in Chapter [D];

j) administrations may bring into use assignments with parameters different from the standardized parameters provided the conditions given in [E] are met;

k) for those administrations so wishing, they may convert at the second session their allotments into assignments using the specified planning criteria and these assignments will also appear in the Plan;

l) for the case mentioned in k) above, where neighbouring countries have allotments in adjacent channels, the procedures mentioned in i) must be followed.

D. JOHNSON
Chairman of Working Group 5-A

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INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 76-E
23 April 1986

B.4

PLENARY MEETING

4th SERIES OF TEXTS SUBMITTED BY THE
EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Document	Title
COM.4	67 (+73)	Recommendation B
	69 (+73)	Recommendation C
		Recommendation D

P. PERRICHON
Chairman of Committee 6

Annex: 17 pages

RECOMMENDATION COM4/B

Continuation of studies on sharing criteria for services using the band 1 625 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

considering

a) that the World Administrative Radio Conference (Geneva, 1979), in its Recommendation No. 504, invited the CCIR to carry out the necessary technical studies related to convening a conference for Region 2;

b) that the Administrative Council, in its Resolution No. 913 establishing the agenda for this Conference, invited the CCIR to prepare a report on the necessary technical bases;

c) that the CCIR, in response to those requests, has drawn up a report on the technical bases, which includes a chapter on compatibility with other services, and has recognized that the problem of criteria for sharing between the broadcasting service and the other services had not yet been fully studied;

d) that more varied and more detailed data are required for a better understanding of the subject and for confirmation of the values provisionally proposed in Chapter 6 of this report;

recommends that administrations

cooperate urgently and to the fullest extent possible with the CCIR by sending it contributions on the above-mentioned subject, taking account of the CCIR working schedule;

requests the CCIR

1. to continue its studies on sharing criteria for services using the band 1 625 - 1 705 kHz in Region 2;

2. to prepare a new report on this subject for the Second Session of the Conference on the basis of those studies;

3. to carry out these studies as part of the normal work of the CCIR Study Groups;

and requests the Second Session of the Conference

to reconsider the relevant parts of Chapter 6 of the Report of the First Session in the light of data provided by administrations and the CCIR's new report and, if necessary, to consider modifying the values proposed in that Chapter.

RECOMMENDATION COM4/C

Technical criteria for interregional sharing

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

considering

a) that according to the agenda contained in Administrative Council Resolution No. 913, this Conference proposed provisional technical criteria for inter-service sharing of the band 1 625 - 1 705 kHz between the broadcasting service and other services in Region 2;

b) that, in accordance with numbers 1001 and 1454 of the Radio Regulations, the IFRB develops Technical Standards and Rules of Procedure for internal use by the Board in the exercise of its functions, based inter alia upon the relevant provisions of the Radio Regulations and the Appendices thereto, the decisions of administrative radio conferences, as appropriate, and the Recommendations of the CCIR;

considering further

that compatibility problems and criteria for sharing between the broadcasting service and other services to which the band 1 605 - 1 705 kHz is allocated have not yet been fully studied, although a comprehensive study is being carried out in the CCIR;

noting

a) that, under number 56 of the Convention, the decisions of a regional administrative conference must in all circumstances be in conformity with the provisions of the Radio Regulations and that such a conference may give instructions to the IFRB, provided that such instructions do not conflict with the interests of the two other Regions;

b) that the Regional Administrative Radio Conference for the Maritime Mobile Service and Aeronautical Radionavigation Service in certain parts of the MF band in Region 1 (RARC MM-R1, Geneva, 1985) adopted technical criteria for the protection of the maritime mobile service in the bands 1 606.5 - 1 625 kHz and 1 635 - 1 800 kHz;

recommends

that the IFRB should take account of the guidelines set out in the Annex to this Recommendation when adopting its Technical Standards for the purpose of calculating interregional interference.

Annex: 1

Annex

(to Recommendation COM4/C)

Calculation of field strengths in the case of interregional interference

1) In calculating interregional interference, the field strengths shall be determined by taking the arithmetic mean of the signal strengths, expressed in dB(uV/m) for a specified e.m.r.p., calculated both by the method described in Annex 1 to CCIR Recommendation 435-3 and by the method proposed by the Region 2 administrations. The value thus calculated shall be applied when it is midnight at the mid-point of the interregional path, provided that the entire path is in darkness. Signal strengths at other times are unlikely to exceed this value.

2) Protection in accordance with the criteria defined in Chapter 6 should be given within [the national boundary and/or sub-national zone for priority channels and within the service contours for non-priority channels.]

RECOMMENDATION COM4/D

Calculation of the skywave field strength to evaluate interregional interference

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

noting

a) that the recording and examination process provided in Article 12 of the Radio Regulations is the only procedure making it possible to avoid harmful interference between stations operating in Region 2, on the one hand, and those operating in Regions 1 and 3, on the other hand, and that the IFRB will therefore adopt appropriate Technical Standards;

b) that, under No. 56 of the Convention, the decisions of a regional administrative conference must in all circumstances be in conformity with the provisions of the Radio Regulations and that such a conference may give instructions to the IFRB provided that they do not conflict with the interests of other Regions;

considering

that, under Nos. 1001 and 1454 of the Radio Regulations, the IFRB develops, for the performance of its functions, Technical Standards and Rules of Procedure based in particular on the relevant provisions of the Radio Regulations and the Appendices thereto and, as appropriate, on the decisions of administrative conferences of the Union and the Recommendations of the CCIR;

recognizing

a) that the method set out in the Annex was proposed for use in the planning of the 1 605 - 1 705 kHz band because it offered greater precision than the method used for the 525 - 1 605 kHz band in Region 2, and that the latter was chosen only because it simplified the planning process;

b) that simplicity is not a major factor in the calculation of field strength over interregional paths for individual assignments;

recommends

that the IFRB should take account of the method of calculating the skywave field strength described in the Annex to this Recommendation when adopting its Technical Standards relating to the examination of frequency assignment notices for broadcasting stations of Region 2 operating in the band 1 605 - 1 705 kHz from the standpoint of the probability of harmful interference to stations in Regions 1 and 3, and vice versa. The signal strengths thus calculated will be increased by 2.5 dB to take into account the different reference hours in Region 2 and Regions 1 and 3.

Annex: 1

Annex

(to Recommendation COM4/D)

Calculation of the skywave field strength to evaluate interregional interference

1. List of symbols (see also Chapter 2)

a_T: geographical latitude of the transmitting terminal (degrees)

a_R: geographical latitude of the receiving terminal (degrees)

b_T: geographical longitude of the transmitting terminal (degrees)

b_R: geographical longitude of the receiving terminal (degrees)

ϕ_T: geomagnetic latitude of the transmitting terminal (degrees)

ϕ_R: geomagnetic latitude of the receiving terminal (degrees)

ϕ: average geomagnetic latitude of a path under study (degrees)

Note - North and east are considered positive, south and west negative.

2. General procedure

The general procedure for calculation of skywave field strength to evaluate interregional interference is similar to that described in Chapter 2 with the following exception.

The unadjusted skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c \, f(\theta) \sqrt{P}}{100} \quad dB(uV/m) \qquad (1)$$

F_c is given by:

$$F_c = (95-20 \log d)-(6.28+4.95 \tan^2 \phi)(d/1000)^{1/2} \; dB\,(uV/m) \qquad (2)$$

Figure 1 and Table I show F_c for selected latitudes. If $|\phi|$ is greater than 60 degrees, equation (2) is evaluated for $|\phi|$ = 60 degrees. If d is less than 200 km, equation (2) is evaluated for d=200 km. However, the actual great-circle distance is to be used in determining elevation angle. See section 4 for calculation of great-circle distance and conversion from geographical latitude to geomagnetic latitude.

Note: Values of F_c are normalized to 100 mV/m at 1 km corresponding to an effective monopole radiated power (e.m.r.p.) of -9.54 dB(kW).

3. Skywave field strength, 50% of the time

This is given by:

$$F(50) = F \quad dB(uV/m) \qquad (3)$$

4. Path parameters

Refer to section 1. The great-circle distance d (km) is given by:

$$d = 111.18 \text{ arc cos}[\sin a_T \sin a_R + \cos a_T \cos a_R \cos (b_R - b_T)] \quad (4)$$

The geomagnetic latitude of the transmitting terminal, ϕ_T, is given by:

$$\phi_T = \text{arc sin } [\sin a_T \sin 78.5° + \cos a_T \cos 78.5° \cos (69° + b_T)] \quad (5)$$

ϕ_R can be determined in a similar manner. And,

$$\phi = 1/2 (\phi_T + \phi_R) \quad (6)$$

Alternatively, Figure 2 may be used.

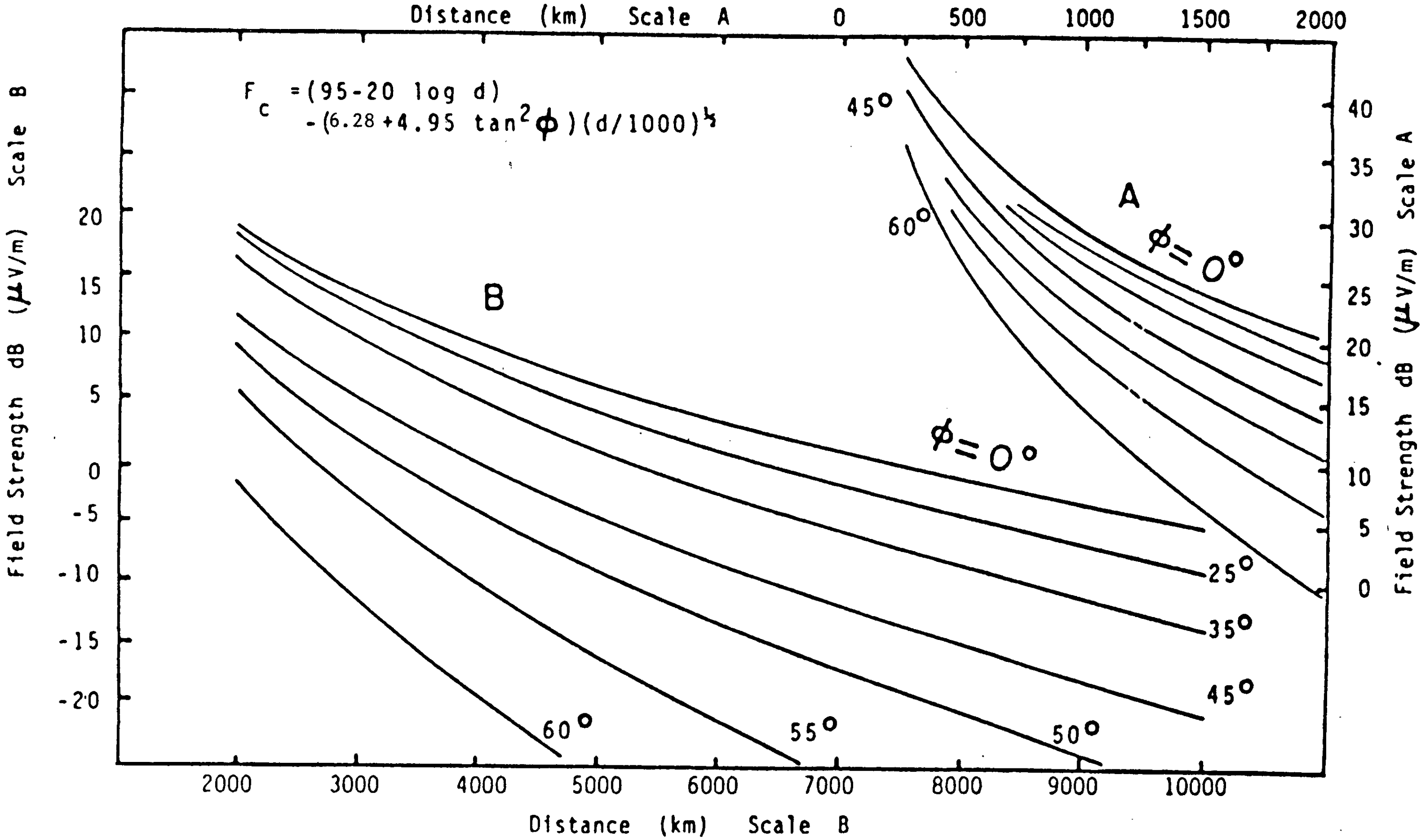

FIGURE 1

Skywave field strength versus distance (for a characteristic field strength of 100 mV/m at 1 km, 50%, 2 hours after sunset)

TABLE I

Skywave field strength versus distance (200 to 10,000 km)
for a characteristic field strength of 100 mV/m

Page 1 of 8

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
0-200	46.17	203.4574	46.01	199.7683	45.43	186.8867	43.96	157.6842	39.53	94.7147
250	43.90	156.6680	43.72	153.4954	43.07	142.4722	41.42	117.8230	36.47	66.6392
300	42.02	126.1266	41.82	123.3314	41.11	113.6631	39.30	92.3093	33.88	49.4450
350	40.40	104.7304	40.19	102.2257	39.43	93.5977	37.47	74.7566	31.62	38.0894
400	38.98	88.9709	38.76	86.6981	37.94	78.8988	35.85	62.0462	29.59	30.1752
450	37.72	76.9207	37.48	74.8381	36.61	67.7174	34.40	52.4825	27.76	24.4320
500	36.58	67.4351	36.33	65.5120	35.41	58.9589	33.08	45.0689	26.08	20.1307
550	35.53	59.7930	35.27	58.0059	34.31	51.9358	31.86	39.1832	24.52	16.8266
600	34.57	53.5183	34.29	51.8487	33.29	46.1953	30.74	34.4183	23.07	14.2352
650	33.68	48.2840	33.39	46.7172	32.35	41.4276	29.69	30.4974	21.70	12.1669
700	32.84	43.8589	32.54	42.3829	31.46	37.4139	28.70	27.2260	20.42	10.4915
750	32.06	40.0746	31.75	38.6794	30.63	33.9955	27.77	24.4640	19.20	9.1169
800	31.32	36.8059	31.00	35.4833	29.84	31.0547	26.89	22.1079	18.04	7.9764
850	30.62	33.9579	30.29	32.7007	29.10	28.5022	26.06	20.0797	16.93	7.0208
900	29.95	31.4572	29.62	30.2595	28.39	26.2696	25.26	18.3198	15.87	6.2133
950	29.32	29.2464	28.98	28.1030	27.71	24.3030	24.50	16.7818	14.85	5.5255
1000	28.72	27.2798	28.36	26.1861	27.07	22.5601	23.77	15.4291	13.87	4.9356
1050	28.14	25.5207	27.77	24.4729	26.45	21.0066	23.07	14.2325	12.92	4.4265
1100	27.58	23.9394	27.21	22.9339	25.85	19.6150	22.39	13.1684	12.01	3.9845
1150	27.05	22.5115	26.67	21.5451	25.28	18.3625	21.74	12.2177	11.12	3.5988
1200	26.53	21.2165	26.14	20.2866	24.73	17.2306	21.11	11.3645	10.27	3.2607
1250	26.04	20.0378	25.64	19.1418	24.19	16.2036	20.50	10.5958	9.43	2.9628
1300	25.56	18.9609	25.15	18.0967	23.68	15.2685	19.91	9.9007	8.63	2.6995
1350	25.09	17.9741	24.68	17.1396	23.18	14.4142	19.34	9.2699	7.84	2.4657

Continued . . .

TABLE I

Skywave field strength versus distance (200 to 10,000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
1400	24.64	17.0669	24.22	16.2603	22.69	13.6313	18.79	8.6958	7.07	2.2574
1450	24.21	16.2306	23.78	15.4503	22.22	12.9119	18.25	8.1716	6.32	2.0713
1500	23.78	15.4577	23.35	14.7021	21.76	12.2490	17.72	7.6916	5.60	1.9045
1550	23.37	14.7416	22.93	14.0094	21.32	11.6367	17.21	7.2512	4.88	1.7544
1600	22.97	14.0766	22.52	13.3665	20.88	11.0698	16.71	6.8459	4.19	1.6192
1650	22.58	13.4577	22.12	12.7687	20.46	10.5438	16.22	6.4722	3.50	1.4970
1700	22.20	12.8806	21.74	12.2115	20.05	10.0547	15.74	6.1268	2.84	1.3862
1750	21.83	12.3415	21.36	11.6913	19.64	9.5991	15.28	5.8071	2.18	1.2857
1800	21.46	11.8369	20.99	11.2046	19.25	9.1739	14.82	5.5104	1.54	1.1942
1850	21.11	11.3638	20.63	10.7487	18.87	8.7763	14.38	5.2347	0.91	1.1107
1900	20.76	10.9196	20.27	10.3208	18.49	8.4041	13.94	4.9780	0.29	1.0345
1950	20.43	10.5018	19.93	9.9186	18.12	8.0549	13.51	4.7386	-0.31	0.9648
2000	20.09	10.1084	19.59	9.5401	17.76	7.7270	13.09	4.5151	-0.91	0.9008
2050	19.77	9.7373	19.26	9.1832	17.41	7.4185	12.68	4.3060	-1.49	0.8421
2100	19.45	9.3869	18.94	8.8465	17.06	7.1280	12.28	4.1102	-2.07	0.7880
2150	19.14	9.0555	18.62	8.5282	16.72	6.8540	11.88	3.9265	-2.64	0.7382
2200	18.83	8.7419	18.30	8.2271	16.38	6.5953	11.49	3.7541	-3.19	0.6923
2250	18.53	8.4446	18.00	7.9419	16.06	6.3508	11.11	3.5919	-3.74	0.6499
2300	18.24	8.1626	17.70	7.6714	15.73	6.1194	10.73	3.4393	-4.28	0.6106
2350	17.95	7.8947	17.40	7.4147	15.42	5.9002	10.36	3.2955	-4.82	0.5743
2400	17.66	7.6400	17.11	7.1708	15.11	5.6923	9.99	3.1599	-5.34	0.5405
2450	17.38	7.3977	16.83	6.9388	14.80	5.4949	9.63	3.0318	-5.86	0.5092
2500	17.11	7.1669	16.54	6.7179	14.50	5.3075	9.28	2.9107	-6.37	0.4801
2550	16.84	6.9468	16.27	6.5075	14.20	5.1292	8.93	2.7962	-6.88	0.4530

Continued . . .

TABLE I

Skywave field strength versus distance (200 to 10,000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
2600	16.57	6.7369	16.00	6.3068	13.91	4.9594	8.59	2.6877	-7.38	0.4278
2650	16.31	6.5364	15.73	6.1152	13.62	4.7978	8.25	2.5849	-7.87	0.4042
2700	16.05	6.3448	15.46	5.9323	13.34	4.6436	7.91	2.4873	-8.35	0.3823
2750	15.79	6.1616	15.20	5.7574	13.06	4.4966	7.59	2.3948	-8.83	0.3617
2800	15.54	5.9862	14.95	5.5901	12.78	4.3562	7.26	2.3068	-9.31	0.3425
2850	15.30	5.8183	14.70	5.4299	12.51	4.2220	6.94	2.2231	-9.77	0.3246
2900	15.05	5.6573	14.45	5.2765	12.24	4.0937	6.62	2.1435	-10.24	0.3077
2950	14.81	5.5029	14.20	5.1295	11.98	3.9709	6.31	2.0677	-10.69	0.2919
3000	14.57	5.3547	13.96	4.9884	11.72	3.8534	6.00	1.9955	-11.15	0.2771
3050	14.34	5.2125	13.72	4.8530	11.46	3.7408	5.70	1.9267	-11.59	0.2632
3100	14.11	5.0758	13.48	4.7230	11.20	3.6328	5.39	1.8610	-12.04	0.2501
3150	13.88	4.9444	13.25	4.5981	10.95	3.5293	5.10	1.7982	-12.47	0.2379
3200	13.66	4.8180	13.02	4.4779	10.71	3.4299	4.80	1.7383	-12.91	0.2263
3250	13.44	4.6963	12.79	4.3624	10.46	3.3345	4.51	1.6810	-13.34	0.2154
3300	13.22	4.5792	12.57	4.2512	10.22	3.2428	4.22	1.6262	-13.76	0.2051
3350	13.00	4.4663	12.35	4.1441	9.98	3.1546	3.94	1.5738	-14.18	0.1954
3400	12.78	4.3575	12.13	4.0409	9.74	3.0698	3.66	1.5236	-14.60	0.1863
3450	12.57	4.2526	11.91	3.9414	9.51	2.9883	3.38	1.4755	-15.01	0.1776
3500	12.36	4.1514	11.70	3.8455	9.28	2.9097	3.10	1.4294	-15.42	0.1695
3550	12.16	4.0537	11.49	3.7529	9.05	2.8341	2.83	1.3852	-15.82	0.1618
3600	11.95	3.9593	11.28	3.6636	8.82	2.7611	2.56	1.3428	-16.22	0.1545
3650	11.75	3.8682	11.07	3.5773	8.60	2.6909	2.29	1.3021	-16.62	0.1476
3700	11.55	3.7801	10.87	3.4940	8.38	2.6231	2.03	1.2631	-17.01	0.1410
3750	11.35	3.6949	10.66	3.4134	8.16	2.5577	1.77	1.2255	-17.40	0.1348

Continued . . .

TABLE I

Skywave field strength versus distance (200 to 10,000 km) for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
3800	11.16	3.6125	10.46	3.3356	7.94	2.4945	1.51	1.1894	-17.79	0.1289
3850	10.96	3.5328	10.26	3.2602	7.72	2.4335	1.25	1.1547	-18.18	0.1234
3900	10.77	3.4556	10.07	3.1873	7.51	2.3746	0.99	1.1214	-18.56	0.1181
3950	10.58	3.3808	9.87	3.1168	7.30	2.3177	0.74	1.0892	-18.93	0.1131
4000	10.39	3.3084	9.68	3.0485	7.09	2.2627	0.49	1.0583	-19.31	0.1083
4050	10.21	3.2383	9.49	2.9823	6.89	2.2094	0.24	1.0286	-19.68	0.1038
4100	10.02	3.1702	9.30	2.9182	6.68	2.1580	0.00	0.9999	-20.05	0.0995
4150	9.84	3.1043	9.12	2.8560	6.48	2.1081	-0.24	0.9722	-20.41	0.0954
4200	9.66	3.0403	8.93	2.7958	6.28	2.0599	-0.49	0.9456	-20.78	0.0915
4250	9.48	2.9782	8.75	2.7373	6.08	2.0132	-0.73	0.9199	-21.13	0.0878
4300	9.30	2.9179	8.56	2.6806	5.88	1.9679	-0.96	0.8951	-21.49	0.0842
4350	9.13	2.8594	8.38	2.6255	5.68	1.9240	-1.20	0.8711	-21.85	0.0808
4400	8.95	2.8026	8.21	2.5721	5.49	1.8815	-1.43	0.8480	-22.20	0.0776
4450	8.78	2.7474	8.03	2.5202	5.30	1.8403	-1.66	0.8257	-22.55	0.0746
4500	8.61	2.6937	7.85	2.4698	5.11	1.8003	-1.89	0.8041	-22.89	0.0717
4550	8.44	2.6416	7.68	2.4208	4.92	1.7615	-2.12	0.7833	-23.24	0.0689
4600	8.27	2.5909	7.51	2.3732	4.73	1.7239	-2.35	0.7632	-23.58	0.0662
4650	8.10	2.5415	7.34	2.3269	4.54	1.6873	-2.57	0.7437	-23.92	0.0637
4700	7.94	2.4936	7.17	2.2819	4.36	1.6518	-2.79	0.7249	-24.26	0.0613
4750	7.77	2.4469	7.00	2.2381	4.18	1.6174	-3.02	0.7066	-24.59	0.0589
4800	7.61	2.4014	6.83	2.1955	3.99	1.5839	-3.24	0.6890	-24.93	0.0567
4850	7.45	2.3572	6.67	2.1541	3.81	1.5513	-3.45	0.6719	-25.26	0.0546
4900	7.29	2.3141	6.50	2.1137	3.64	1.5197	-3.67	0.6554	-25.58	0.0526
4950	7.13	2.2721	6.34	2.0744	3.46	1.4890	-3.88	0.6394	-25.91	0.0506

Continued . . .

TABLE I

Skywave field strength versus distance (200 to 10,000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
5000	6.97	2.2313	6.18	2.0362	3.28	1.4591	-4.10	0.6239	-26.23	0.0488
5050	6.81	2.1914	6.02	1.9989	3.11	1.4300	-4.31	0.6089	-26.56	0.0470
5100	6.66	2.1526	5.86	1.9626	2.93	1.4017	-4.52	0.5943	-26.88	0.0453
5150	6.51	2.1147	5.70	1.9272	2.76	1.3741	-4.73	0.5802	-27.19	0.0437
5200	6.35	2.0778	5.54	1.8927	2.59	1.3473	-4.94	0.5665	-27.51	0.0421
5250	6.20	2.0418	5.39	1.8591	2.42	1.3212	-5.14	0.5532	-27.83	0.0406
5300	6.05	2.0067	5.23	1.8263	2.25	1.2958	-5.35	0.5404	-28.14	0.0392
5350	5.90	1.9724	5.08	1.7943	2.08	1.2711	-5.55	0.5279	-28.45	0.0378
5400	5.75	1.9389	4.93	1.7631	1.92	1.2470	-5.75	0.5157	-28.76	0.0365
5450	5.60	1.9063	4.77	1.7326	1.75	1.2235	-5.95	0.5040	-29.06	0.0352
5500	5.46	1.8744	4.62	1.7029	1.59	1.2006	-6.15	0.4925	-29.37	0.0340
5550	5.31	1.8433	4.47	1.6739	1.42	1.1783	-6.35	0.4814	-29.67	0.0328
5600	5.17	1.8129	4.33	1.6456	1.26	1.1565	-6.55	0.4706	-29.97	0.0317
5650	5.02	1.7832	4.18	1.6180	1.10	1.1353	-6.74	0.4602	-30.27	0.0306
5700	4.88	1.7542	4.03	1.5909	0.94	1.1146	-6.94	0.4500	-30.57	0.0296
5750	4.74	1.7259	3.89	1.5646	0.78	1.0944	-7.13	0.4401	-30.87	0.0286
5800	4.60	1.6982	3.74	1.5388	0.63	1.0747	-7.32	0.4304	-31.16	0.0277
5850	4.46	1.6711	3.60	1.5136	0.47	1.0555	-7.51	0.4211	-31.46	0.0267
5900	4.32	1.6446	3.46	1.4890	0.31	1.0367	-7.70	0.4120	-31.75	0.0259
5950	4.18	1.6187	3.32	1.4649	0.16	1.0184	-7.89	0.4031	-32.04	0.0250
6000	4.05	1.5934	3.18	1.4414	0.00	1.0005	-8.08	0.3945	-32.33	0.0242
6050	3.91	1.5686	3.04	1.4184	-0.15	0.9831	-8.27	0.3861	-32.62	0.0234
6100	3.78	1.5444	2.90	1.3959	-0.30	0.9660	-8.45	0.3780	-32.90	0.0226
6150	3.64	1.5207	2.76	1.3739	-0.45	0.9494	-8.63	0.3700	-33.19	0.0219

Continued . . .

TABLE I

Skywave field strength versus distance (200 to 10,000 km)
for a characteristic field strength of 100 mV/m

Page 6 of 8

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
6200	3.51	1.4975	2.62	1.3524	-0.60	0.9331	-8.82	0.3623	-33.47	0.0212
6250	3.37	1.4748	2.49	1.3314	-0.75	0.9172	-9.00	0.3548	-33.75	0.0205
6300	3.24	1.4525	2.35	1.3108	-0.90	0.9017	-9.18	0.3475	-34.03	0.0199
6350	3.11	1.4308	2.22	1.2906	-1.05	0.8865	-9.36	0.3403	-34.31	0.0193
6400	2.98	1.4095	2.08	1.2709	-1.19	0.8717	-9.54	0.3334	-34.59	0.0186
6450	2.85	1.3886	1.95	1.2515	-1.34	0.8571	-9.72	0.3266	-34.86	0.0181
6500	2.72	1.3682	1.82	1.2326	-1.48	0.8429	-9.90	0.3200	-35.14	0.0175
6550	2.59	1.3481	1.69	1.2141	-1.63	0.8291	-10.07	0.3135	-35.41	0.0170
6600	2.47	1.3285	1.55	1.1960	-1.77	0.8155	-10.25	0.3073	-35.68	0.0164
6650	2.34	1.3093	1.42	1.1782	-1.91	0.8022	-10.42	0.3012	-35.95	0.0159
6700	2.21	1.2905	1.29	1.1608	-2.06	0.7892	-10.60	0.2952	-36.22	0.0154
6750	2.09	1.2720	1.17	1.1437	-2.20	0.7765	-10.77	0.2894	-36.49	0.0150
6800	1.97	1.2539	1.04	1.1270	-2.34	0.7641	-10.94	0.2837	-36.76	0.0145
6850	1.84	1.2362	0.91	1.1106	-2.48	0.7519	-11.11	0.2782	-37.02	0.0141
6900	1.72	1.2188	0.78	1.0946	-2.62	0.7400	-11.28	0.2728	-37.29	0.0137
6950	1.60	1.2017	0.66	1.0788	-2.75	0.7283	-11.45	0.2675	-37.55	0.0133
7000	1.47	1.1850	0.53	1.0634	-2.89	0.7169	-11.62	0.2624	-37.82	0.0129
7050	1.35	1.1686	0.41	1.0483	-3.03	0.7057	-11.79	0.2573	-38.08	0.0125
7100	1.23	1.1525	0.29	1.0334	-3.16	0.6947	-11.96	0.2524	-38.34	0.0121
7150	1.11	1.1367	0.16	1.0189	-3.30	0.6840	-12.12	0.2477	-38.60	0.0118
7200	0.99	1.1212	0.04	1.0046	-3.43	0.6735	-12.29	0.2430	-38.85	0.0114
7250	0.88	1.1060	-0.08	0.9906	-3.57	0.6632	-12.45	0.2384	-39.11	0.0111
7300	0.76	1.0911	-0.20	0.9769	-3.70	0.6531	-12.62	0.2340	-39.37	0.0108
7350	0.64	1.0765	-0.32	0.9634	-3.83	0.6432	-12.78	0.2296	-39.62	0.0104

Continued . . .

TABLE I

Skywave field strength versus distance (200 to 10,000 km)
for a characteristic field strength of 100 mV/m

Page 7 of 8

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
7400	0.52	1.0621	-0.44	0.9502	-3.97	0.6335	-12.94	0.2254	-39.87	0.0101
7450	0.41	1.0480	-0.56	0.9372	-4.10	0.6240	-13.10	0.2212	-40.13	0.0099
7500	0.29	1.0341	-0.68	0.9245	-4.23	0.6147	-13.26	0.2172	-40.38	0.0096
7550	0.18	1.0205	-0.80	0.9120	-4.36	0.6055	-13.42	0.2132	-40.63	0.0093
7600	0.06	1.0072	-0.92	0.8997	-4.49	0.5966	-13.58	0.2093	-40.88	0.0090
7650	-0.05	0.9941	-1.03	0.8877	-4.62	0.5878	-13.74	0.2055	-41.12	0.0088
7700	-0.16	0.9812	-1.15	0.8759	-4.74	0.5792	-13.90	0.2018	-41.37	0.0085
7750	-0.28	0.9685	-1.27	0.8643	-4.87	0.5707	-14.06	0.1982	-41.62	0.0083
7800	-0.39	0.9561	-1.38	0.8529	-5.00	0.5625	-14.21	0.1947	-41.86	0.0081
7850	-0.50	0.9439	-1.50	0.8417	-5.12	0.5543	-14.37	0.1912	-42.11	0.0078
7900	-0.61	0.9319	-1.61	0.8307	-5.25	0.5464	-14.53	0.1878	-42.35	0.0076
7950	-0.72	0.9201	-1.73	0.8198	-5.38	0.5385	-14.68	0.1845	-42.59	0.0074
8000	-0.83	0.9085	-1.84	0.8092	-5.50	0.5309	-14.83	0.1813	-42.84	0.0072
8050	-0.94	0.8971	-1.95	0.7988	-5.62	0.5233	-14.99	0.1781	-43.08	0.0070
8100	-1.05	0.8859	-2.06	0.7885	-5.75	0.5159	-15.14	0.1750	-43.32	0.0068
8150	-1.16	0.8749	-2.18	0.7785	-5.87	0.5087	-15.29	0.1720	-43.55	0.0066
8200	-1.27	0.8641	-2.29	0.7686	-5.99	0.5016	-15.44	0.1690	-43.79	0.0065
8250	-1.38	0.8535	-2.40	0.7588	-6.12	0.4946	-15.59	0.1661	-44.03	0.0063
8300	-1.48	0.8430	-2.51	0.7493	-6.24	0.4877	-15.74	0.1632	-44.27	0.0061
8350	-1.59	0.8327	-2.62	0.7399	-6.36	0.4810	-15.89	0.1604	-44.50	0.0060
8400	-1.70	0.8226	-2.73	0.7306	-6.48	0.4743	-16.04	0.1577	-44.74	0.0058
8450	-1.80	0.8127	-2.83	0.7215	-6.60	0.4678	-16.19	0.1550	-44.97	0.0056
8500	-1.91	0.8029	-2.94	0.7126	-6.72	0.4615	-16.34	0.1524	-45.20	0.0055
8550	-2.01	0.7933	-3.05	0.7038	-6.84	0.4552	-16.49	0.1499	-45.43	0.0053

Continued . . .

TABLE I

Skywave field strength versus distance (200 to 10,000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
8600	-2.12	0.7838	-3.16	0.6952	-6.95	0.4490	-16.63	0.1474	-45.66	0.0052
8650	-2.22	0.7745	-3.26	0.6867	-7.07	0.4430	-16.78	0.1449	-45.89	0.0051
8700	-2.32	0.7653	-3.37	0.6783	-7.19	0.4370	-16.92	0.1425	-46.12	0.0049
8750	-2.43	0.7563	-3.48	0.6701	-7.31	0.4312	-17.07	0.1401	-46.35	0.0048
8800	-2.53	0.7474	-3.58	0.6620	-7.42	0.4254	-17.21	0.1378	-46.58	0.0047
8850	-2.63	0.7387	-3.69	0.6540	-7.54	0.4198	-17.36	0.1356	-46.81	0.0046
8900	-2.73	0.7301	-3.79	0.6462	-7.65	0.4142	-17.50	0.1334	-47.03	0.0044
8950	-2.83	0.7216	-3.90	0.6385	-7.77	0.4088	-17.64	0.1312	-47.26	0.0043
9000	-2.93	0.7133	-4.00	0.6309	-7.88	0.4034	-17.78	0.1291	-47.48	0.0042
9050	-3.03	0.7051	-4.10	0.6235	-8.00	0.3982	-17.93	0.1270	-47.71	0.0041
9100	-3.13	0.6970	-4.21	0.6161	-8.11	0.3930	-18.07	0.1249	-47.93	0.0040
9150	-3.23	0.6891	-4.31	0.6089	-8.23	0.3879	-18.21	0.1229	-48.15	0.0039
9200	-3.33	0.6813	-4.41	0.6018	-8.34	0.3829	-18.35	0.1210	-48.38	0.0038
9250	-3.43	0.6736	-4.51	0.5948	-8.45	0.3780	-18.49	0.1190	-48.60	0.0037
9300	-3.53	0.6660	-4.61	0.5879	-8.56	0.3731	-18.63	0.1171	-48.82	0.0036
9350	-3.63	0.6585	-4.72	0.5811	-8.67	0.3684	-18.76	0.1153	-49.04	0.0035
9400	-3.73	0.6511	-4.82	0.5744	-8.79	0.3637	-18.90	0.1135	-49.26	0.0034
9450	-3.82	0.6439	-4.92	0.5678	-8.90	0.3591	-19.04	0.1117	-49.47	0.0034
9500	-3.92	0.6368	-5.02	0.5613	-9.01	0.3546	-19.18	0.1099	-49.69	0.0033
9550	-4.02	0.6297	-5.12	0.5549	-9.12	0.3501	-19.31	0.1082	-49.91	0.0032
9600	-4.11	0.6228	-5.21	0.5486	-9.23	0.3457	-19.45	0.1065	-50.12	0.0031
9650	-4.21	0.6160	-5.31	0.5424	-9.33	0.3414	-19.59	0.1049	-50.34	0.0030
9700	-4.30	0.6092	-5.41	0.5363	-9.44	0.3372	-19.72	0.1033	-50.55	0.0030
9750	-4.40	0.6026	-5.51	0.5303	-9.55	0.3330	-19.86	0.1017	-50.77	0.0029
9800	-4.49	0.5961	-5.61	0.5244	-9.66	0.3289	-19.99	0.1001	-50.98	0.0028
9850	-4.59	0.5896	-5.70	0.5186	-9.77	0.3248	-20.12	0.0986	-51.19	0.0028
9900	-4.68	0.5833	-5.80	0.5128	-9.87	0.3209	-20.26	0.0971	-51.41	0.0027
9950	-4.78	0.5770	-5.90	0.5072	-9.98	0.3169	-20.39	0.0956	-51.62	0.0026
10000	-4.87	0.5709	-5.99	0.5016	-10.09	0.3131	-20.52	0.0942	-51.83	0.0026

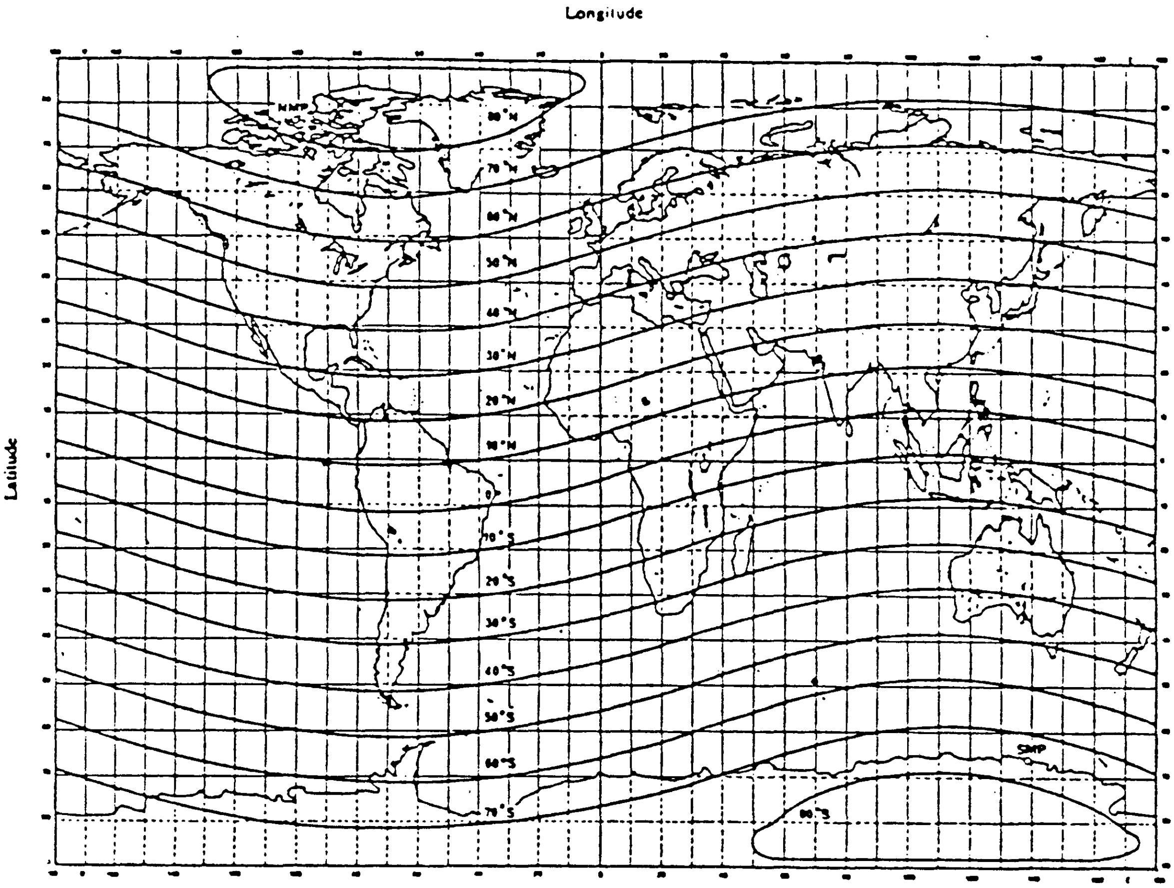

FIGURE 2

Geomagnetic latitudes

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) **RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2**

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 77-E
23 April 1986
Original: English

COMMITTEE 4

THIRD REPORT OF WORKING GROUP 4-B

TO COMMITTEE 4

Working Group 4-B has adopted the texts presented in Annexes 1 and 2.

Concerning the standardized power for daytime in Noise Zone 2, two administrations thought that a higher power could be necessary, and one administration was in favour of 1 kW.

Concerning the maximum station power, three administrations were in favour of 5 kW and five administrations were in favour of 10 kW.

T.M. BEILER
Chairman of Working Group 4-B

Annexes: 2

ANNEX 1

1.1.15 Sky-wave field strength, 50% of the time

The sky-wave field strength during the reference hour which is exceeded for 50% of the nights of the year. The reference hour is the period of one hour beginning one and a half hours after sunset and ending two and a half hours after sunset at the midpoint of the short great-circle path.

1.1.16 Characteristic field strength (E_c)

The field strength, at a reference distance of 1 km in a horizontal direction, of the ground-wave signal propagated along perfectly conducting ground for 1 kW station power, taking into account losses in a real antenna.

Note 1 - The gain (G) of the transmitting antenna relative to an ideal short vertical antenna is given in dB by the following equation:

$$G = 20 \log \frac{E_c}{300} \qquad (1)$$

where:

E_c: units of mV/m.

Note 2 - The effective monopole radiated power (e.m.r.p.) is given in dB (kW) by the following equation:

$$\text{e.m.r.p.} = 10 \log P_t + G \qquad (2)$$

where:

P_t: station power (kW).

1.2 Symbols

Hz:	hertz
kHz:	kilohertz
W:	watt
kW:	kilowatt
mV/m:	millivolt/metre
μV/m:	microvolt/metre
dB:	decibel
dB(μV/m):	decibels with respect to 1 μV/m
dB(kW):	decibels with respect to 1 kW
mS/m:	millisiemens/metre

3.5 Standardized transmitter parameters

The allotment plan shall be based on a standard according to Table [ ] below, and a standard omnidirectional antenna with 90° electrical antenna height.

Table of standard powers

	Noise zone 1	Noise zone 2
Daytime	1 kW	[5 kW]
Night-time	1 kW	1 kW

3.5 a) Station power

In no case the power shall be greater than [5 kW/10 kW].

3.8 a) Co-channel standardized distance

The standardized distance shall be 330 km. However, administrations in areas involving sea-paths shall consider greater distances*.

* Ground-wave propagation over sea-paths would involve distances of 450 km to protect a nominal usable field strength of 3.3 mV/m and 360 km to protect a nominal field strength of 6 mV/m.

[3.9] Application of protection criteria

[3.9.1] Protection to allotments

The signal strengths to be protected are the appropriate values of nominal usable field strength as shown in paragraph 3.6. The area to be protected is the border of an allotment area.

The maximum permitted interfering field strength within the area is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the interfering signal is considered to be the greater of the groundwave or skywave signal. In all other cases, only groundwave interference is considered.

The effect of each interfering signal should be evaluated separately, and the presence of interference from other stations in excess of this permissible level should not reduce the necessity to limit interference which would result from proposed modifications or assignments.

[3.9.1] Protection to non-allotments

Assignments on non-alloted channels are not specifically provided protection from assignments using allotments. The amount of interference from the latter is limited by restricting them to standard parameters or the equivalent as defined in [ ]. However, assignments on non-alloted channels are protected from subsequent non-allotments. The protected contour encompasses the area where the groundwave field strength is equal to or greater than the appropriate value of E_{nom} found in paragraph [3.6].

The maximum permitted interfering field strength within the area is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the interfering signal is considered to be the greater of the groundwave or skywave signal. In all other cases, only groundwave interference is considered.

The effect of each interfering signal should be evaluated separately and the presence of interference from other stations in excess of this permissible level should not reduce the necessity to limit interference which would result from proposed modifications or assignments.

Where the protected contour would extend beyond the boundary of the country in which the station is located, the maximum permissible interfering groundwave field strength at the boundary is the calculated field strength of the protected assignment along the boundary divided by the protection ratio.

[[3.9.3] Skywave interference calculations

The field strength of skywave interfering signals shall be calculated on the basis of 50% of the time, either at the boundary of the allotment or at the site of a non-allotment.]

ANNEX 2

RECOMMENDATION [COM4/1]

Relationship between physical and electrical antenna height

The Regional Administrative Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

that information relating to the relationship between physical antenna height and electrical antenna height would be useful to every administration when establishing assignments in the 1 605 - 1 705 kHz band;

recommends administrations in Region 2

within the limits of their possibilities, to carry out measurements to define this relationship and submit the relevant data to the concerned CCIR Study Group taking into account the CCIR Working schedule;

requests the CCIR

a) to prepare, on the basis of the contributions submitted a Report to the Second Session of the Conference;

b) to carry out these studies within the normal framework of the CCIR Study Groups' activity.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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23 April 1986
Original: English

COMMITTEE 6

Source: Document 63

FOURTH SERIES OF TEXTS FROM COMMITTEE 4

TO THE EDITORIAL COMMITTEE

The text of Document 63 has been adopted by Committee 4 and is submitted to the Editorial Committee.

The delegate of Cuba reserved his position concerning the nominal usable field strength daytime in Noise Zone 1.

M.L. PIZARRO
Chairman of Committee 4

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

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23 April 1986
Original: English

COMMITTEE 4

FINAL REPORT OF WORKING GROUP 4-B

Working Group 4-B presents the following information on adjacent channel and protection outside national boundaries, which might be useful for Committee 5.

1. Comments on adjacent channel assignments

The following table shows the groundwave distance (in km) in which the Enom value is obtained.

It was considered Enom = 0.5 mV/m for Noise Zone 1 and Enom = 1.25 mV/m for Noise Zone 2, a protection ratio of 0 dB and a standard omnidirectional antenna with 90° height.

Ground conductivity (mS/m)	Noise Zone 1 (1 kW)	Noise Zone 2	
		1 kW	5 kW
Poor (2)	24	15	23
Fair (5)	36	20	35
Good (10)	53	35	52
Very good (30)	100	65	98
Sea (5000)	310	160	280

Furthermore, the following criteria were considered adequate to be adopted in the cases of adjacent channel assignments.

2. Protection outside national boundaries

No station has the right to be protected beyond the boundary of the country in which the station is established, except when otherwise specified in a bilateral or multilateral arrangement.

No broadcasting station shall be assigned a nominal frequency with a separation of 10 kHz from that of a station in another country if the 2500 uV/m contours overlap.

No broadcasting station shall be assigned a nominal frequency with a separation of 20 kHz from that of a station in another country if the 10,000 uV/m contours overlap.

No broadcasting station shall be assigned a nominal frequency with a separation of 30 kHz from that of a station in another country if the 25,000 uV/m contours overlap.

In addition to the conditions described in 4.10.4.2, when the protected contour would extend beyond the boundary of the country in which the station is located, its assignment shall be protected in accordance with 4.10.2 and 4.10.3.

For protection purposes, the boundary of a country shall be deemed to encompass only its land area, including islands.

T.M. BEILER
Chairman of Working Group 4-B

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 80-E
29 April 1986
Original: English

PLENARY MEETING

MINUTES

OF THE

FOURTH PLENARY MEETING

Thursday, 24 April 1986, at 1530 hrs

Chairman: Mr. F. Savio C. PINHEIRO (Brazil)

Subjects discussed:		Documents
1.	Approval of the minutes of the second Plenary Meeting	49
2.	Draft structure of the Report to the Second Session	54
3.	Third Series of texts submitted by the Editorial Committee for first reading (Series B.3)	74
4.	Fourth Series of texts submitted by the Editorial Committee for first reading (Series B.4)	76
5.	First Series of texts submitted by the Editorial Committee for second reading (Series R.1)	72
6.	Venue of the Second Session of the Conference	-

1. Approval of the minutes of the second Plenary Meeting (Document 49)

The minutes of the second Plenary Meeting were approved as amended (see Corrigendum 1 to Document 49).

2. Draft structure of the Report to the Second Session (Document 54)

2.1 The Chairman of Committee 6 explained that the basis for the structure proposed was the text adopted at Buenos Aires with some changes to take specific points into account. The text had been divided but it was acknowledged that there might be some changes in the order within chapters in the light of discussion.

2.2 The delegate of the United Kingdom noted that Chapter 5 was placed in square brackets and wondered whether they, or the chapter, could be deleted. The Chairman of Committee 4 explained that the chapter was no longer necessary and could be deleted; the following chapters would be renumbered accordingly.

2.3 The Chairman suggested that the Working Group of the Plenary should prepare a draft introduction and a draft Resolution to convey the report of the First Session to the Second Session of the Conference.

It was so agreed.

Document 54, as amended, was approved.

3. Third Series of texts submitted by the Editorial Committee to the Plenary Meeting for first reading (Series B.3) (Document 74)

3.1 In response to a request for clarification from the delegate of Paraguay, the Chairman of the Editorial Committee stated that the square brackets around the title were a purely editorial matter.

Chapter 2, section 2.2

It was agreed to retain Figure 2.3 for information and that the IFRB would make available the curve it used to calculate compatibility.

Figure 2.6

3.2 The delegate of Cuba withdrew his reservation concerning the skywave propagation curve for distances less than 200 km.

Table 2.III

3.3 The Chairman of the Editorial Committee drew attention to an error in the Spanish version where the heading should read "(de 0 a 10,000 km)".

Chapter 6 - Technical Criteria for inter-service sharing

Introductory paragraph

3.4 The Chairman of Committee 4 explained that the square brackets around the paragraph were necessary pending the results of Committee 5's work.

Following a discussion in which the delegates of Canada, Mexico, Brazil, France, Cuba and the representative of the IFRB drew attention to a number of issues inherent in the paragraph, it was agreed to retain the square brackets pending consultations with all administrations and the results of Committee 5's deliberations.

The Third Series of texts (B.3) submitted by the Editorial Committee was approved, as amended, on first reading.

4. Fourth Series of texts submitted by the Editorial Committee for first reading (Series B.4) (Document 76)

Recommendation COM4/B

Approved.

Recommendations COM4/C and COM4/D

4.1 The representative of the IFRB requested clarification on the inter-relationship between the two Recommendations which appeared to overlap.

4.2 The Chairman of Committee 4 said that both were necessary; the annex to COM4/C related to calculation of field strengths while that to COM4/D was concerned with skywave field strength.

The representative of the IFRB suggested that the two annexes be merged into a single annex. Together with the Chairman of Committee 4 a representative of the IFRB would draft an appropriate new text retaining the substance.

It was so agreed.

The Fourth Series of texts (B.4) submitted by the Editorial Committee was approved on that understanding.

5. First Series of texts submitted by the Editorial Committee to the Plenary Meeting for second reading (Series R.1) (Document 72)

Chapter 1

Approved.

5.1 The delegate of France withdrew his objection to the deletion of the definition of "synchronized network" which the Plenary had decided at its previous meeting.

Chapter 2

Approved.

5.2 The Chairman of the Editorial Committee thanked the United States Delegation for providing the originals for Figures 2.1 and 2.2; improved figures would be produced shortly.

Chapter 3, Chapter 4, Annex 1 and Annex 2

Approved.

The First Series of texts (R.1) submitted by the Editorial Committee was approved, on second reading, subject to minor drafting amendments indicated by the Chairman of the Editorial Committee (paragraph 2.1.3.2).

6. Venue of the Second Session of the Conference

6.1 The delegate of Costa Rica proposed that the possibility of holding the Second Session in Region 2, in order to facilitate participation by members of the Region, should be studied.

6.2 The delegate of Cuba, supported by the delegate of Colombia, requested the Secretary-General to convey that proposal to the Administrative Council.

6.3 The Secretary-General said that the Council, in deciding on the agenda, date and place for the Second Session, would need to consult the members of the Region but, clearly, could only take action if a Member Administration issued an invitation to the Second Session.

The Secretariat would be ready to prepare the financial implications of holding a conference in Region 2.

6.4 The delegate of Barbados reminded the meeting that a Caribbean administration might be a likely candidate for hosting the Second Session.

At the request of the Chairman, the Working Group of the Plenary agreed to prepare a Recommendation urging administrations in Region 2 to consider the possibility of holding the Second Session of the Conference in that Region.

The meeting rose at 1705 hours.

The Secretary-General: R.E. BUTLER

The Chairman: F. Savio C. PINHEIRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Corrigendum 1 to
Document 81-E
7 May 1986
Original : Spanish

COMMITTEE 4

SUMMARY RECORD

OF THE

SIXTH AND LAST MEETING OF COMMITTEE 4

Paragraph 2.4

Replace by the following :

The delegate of Colombia, supported by the delegates of Brazil and Ecuador, proposed that, since the noise zones had been defined, coordination distances should be determined for each noise zone. Therefore, she proposed, for noise zone 2, a standardized co-channel distance of 120 km, which corresponded to standardized parameters for that zone, but the delegate of the United States said that different distances for respective noise zones would complicate allotment procedures.

After further discussion, it was agreed to amend the sub-paragraph as follows :

"3.8 a) Co-channel standardized distance

The standard distance shall be 330 km for noise zone 1 and 120 km for noise zone 2. However, administrations in areas involving sea paths may consider greater distances. For information, groundwave propagation over sea paths would involve distances of 450 km to protect a nominal usable field strength of 3.3 mV/m and 360 km to protect a nominal field strength of 6 mV/m."

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 81-E
29 April 1986
Original: English

COMMITTEE 4

SUMMARY RECORD

OF THE

SIXTH AND LAST MEETING OF COMMITTEE 4

(TECHNICAL CRITERIA)

Thursday, 24 April 1986, at 0915 hrs

Chairman: Mr. M.L. PIZARRO (Chile)

Subjects discussed:		Documents
1.	Summary record of the second meeting of Committee 4	53
2.	Third report of Working Group 4-B	77
3.	Final report of Working Group 4-B	79
4.	Completion of the work of the Committee	-

1. Summary record of the second meeting of Committee 4 (Document 53)

The summary record of the second meeting was approved.

2. Third report of Working Group 4-B (Document 77)

2.1 The Chairman of Working Group 4-B introduced Document 77.

Following a brief discussion involving the Chairman and the delegates of Canada, Brazil, the United Kingdom, the United States, Cuba and Mexico, it was decided that the text, when approved by Committee 4, would be submitted through the Editorial Committee to the Plenary, on the understanding that Committee 5 would be duly informed of all matters having a bearing on the latter's task; wherever it was felt necessary, items could appear in square brackets for the time being.

ANNEX 1

1.2 Symbols

It was agreed to add the symbol σ for conductivity.

3.5 Standardized transmitter parameters

It was agreed to amend the title to "Standardized station parameters".

It was also agreed that in the table of standard powers the figure for both noise zones would be shown as 1 kW for daytime and night-time alike but would appear within square brackets in respect of daytime in the noise zone 2 column, to take account of reservations expressed by the delegates of the United Kingdom and France.

3.5 a) Station power

2.2 The delegates of Brazil and Cuba thought that 5 kW should be the maximum power whereas the delegates of Canada, the United Kingdom and the United States felt that a maximum of 10 kW should be permitted.

Following brief informal consultations it was agreed to insert a new first sentence based on a proposal by the delegate of Mexico, further amended by the delegate of Brazil, as follows:

> "Powers greater than the standardized power may be utilized provided that interference caused to other countries by allotted and non-allotted channels does not exceed that produced by a station using standardized parameters.".

The existing text would become the second sentence, the term"[5 kW/10 kW]" being replaced by "[10 kW]".

3.8 a) Co-channel standardized distance

2.3 The delegate of Cuba, supported by the delegate of France, proposed that the text of the note should form part of the sub-paragraph itself.

2.4 The delegates of Colombia, Brazil and Ecuador proposed that a separate distance of 120 km be indicated for noise zone 2, but the delegate of the United States said that different distances for respective noise zones would complicate allotment procedures.

After further discussion, it was agreed to amend the sub-paragraph as follows:

"3.8 a) The standardized distance shall be 330 km. However, administrations in areas involving sea-paths may consider greater distances. By way of information, ground-wave propagation over sea paths .... strength of 6 mV/m.".

2.5 The delegate of Cuba said he wished to enter a reservation with respect to that wording.

3.9.1 Protection to non-allotments

It was agreed to place the title of 3.9.1. in square brackets for editorial reasons.

Document 77 was approved, as amended.

3. Final report of Working Group 4-B (Document 79)

3.1 The Chairman of Working Group 4-B, introducing Document 79, said that the Working Group's final report would be forwarded to Committee 5.

1. Comments on adjacent channel assignments

It was agreed to insert the word "first" before "adjacent" in the title.

Minor editorial changes noted by the delegates of France and Brazil were also agreed.

2. Protection outside national boundaries

3.2 The Chairman said that the paragraphs under that heading should be numbered consecutively from 2.1.

3.3 The Chairman of Working Group 4-B, referring to paragraph 2.5, said that the reference to 4.10.4.2 would become 2.2 under the new numbering; the references 4.10.2 and 4.10.3, however, would have to be placed within square brackets for the time being.

Document 79, as amended, was approved.

4. Completion of the work of the Committee

4.1 The Chairman announced that the Committee had now completed its work. He expressed his warmest thanks to all delegations for their cooperation and great efforts, particularly the Chairmen of the Working Groups whose contribution had been so valuable.

4.2 The delegates of the United States, Canada and Brazil expressed sincere appreciation for the work of the Chairman.

4.3 The Chairman then declared the work of the Committee completed.

The meeting rose at 1215 hours.

The Secretary: The Chairman:

J. FONTEYNE M.L. PIZARRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 82-E
30 April 1986
Original: English

COMMITTEE 5

SUMMARY RECORD

OF THE

SEVENTH MEETING OF COMMITTEE 5

(PLANNING CRITERIA)

Thursday, 24 April 1986, at 1400 hrs

Chairman: Mr. M. FERNANDEZ-QUIROZ (Mexico)

Subjects discussed:	Document
1. Legal aspects of a number of questions relating to Document 57	-
2. First report from the Chairman of Working Group 5-A	75

1. Legal aspects of a number of questions relating to Document 57

1.1 The Chairman recalled that some uncertainty had emerged in Working Group 5-B's discussions as to the interpretation to be given to RR 480 and the precise legal standing of the procedures envisaged in the proposed draft Final Acts of the second session of the Conference (Document 57). At the Committee's request, he had asked the Secretary-General to advise them on the legal aspects of the matter.

1.2 The Secretary-General said that he had been posed two questions by the Chairman of Committee 5. Firstly, could the present Conference adopt provisions and instructions to the IFRB that were not part of a regional agreement or not intended to be included in the Radio Regulations i.e. with the appropriate process. Secondly, could the Conference adopt a plan and provisions applicable to all countries of the Region without giving the countries not present at the Conference the opportunity to communicate their requirements and without those provisions being included in the Radio Regulations.

In order to provide some guidance on the matter, and speaking as the person responsible for the legal advice given to the organs of the Union, including the present Conference, but without going into the details, he made the general legal comments contained in the statement appearing at Annex 1, which had resulted from a close examination of the matter with the Legal Adviser.

From that statement, it was apparent that the answer to the two questions was no. However, from a procedural point of view there was always the Administrative Council and the second session of the Conference, which was scheduled for late 1988. There were indications that a conference of a regional character previously foreseen for Region 3 in early 1988 would be postponed. If it were appropriate, a chain of events could be envisaged leading from the forthcoming session of the Administrative Council in order to have the question put on the agenda in a practical way for the second session and at the same time on the agenda for the WARC for the Geostationary Orbit (ORB-2) in mid-1988, by which time, if there had been a revision in the programme, the second session would have already taken place and identified the particular provisions that would be appropriate for modification of RR 480. At the same time, perhaps, it would have identified the detailed provisions of the technical characteristics to be used in the use of the band for inclusion in some form of Appendix. Those, however, were matters of mechanics and could be looked at. Clearly, from the legal point of view the application of a decision for all Members, parties or non-parties to an agreement, would have to find its way through appropriate provisions in the Radio Regulations.

1.3 The representative of the IFRB (Mr. Berrada), speaking in explanation of the Board's position with regard to implementation of the two options, recalled the suggestion made in Working Group 5-B that procedures should be envisaged to reword RR 480 on the lines of RR 584, in other words that the use of the band in question should be established and operated in accordance with an agreement and associated plan. He drew the Committee's attention to the fact that the Region 1 plan covered by RR 584 had been based on the submission of requirements by administrations (the IFRB being authorized to prepare and submit the requirements of administrations not attending the relevant conference). That fact encouraged countries that had not attended the conference to accede to the plan, since such accession was a prerequisite for any alteration or addition to their assignments under the plan.

The proposed Region 2 plan was different in that it was not to be based on requirements submitted by administrations but on objective criteria applicable to all countries of the Region whether or not they had attended the Conference. It had been suggested that those criteria should be embodied in a limited number of provisions to cover the planning steps not dealt with by the Conference. In the event that the Conference decided to adopt an allotment plan with such associated provisions and submitted them through the Administrative Council to a WARC for inclusion in the Radio Regulations in order to make them mandatory for all countries of the Region, the IFRB would consider itself entitled, even before the final formalities were completed by the relevant WARC, to apply the plan and provisions to all the countries of the Region.

With regard to the suggestion that the procedures for more detailed coordination of the allotment plan should be set out in a regional agreement, he pointed out that such an agreement, as with the Region 1 agreement, could be applied by IFRB only to the countries of the Region that had acceded to the agreement.

1.4 The Secretary-General noted that accession to an agreement by all the countries of a region was frequently a lengthy procedure and an agreement could not be legally binding on the members of a Region until all had acceded to it. While there was certainly a need for a regional agreement in the present instance, there was also a case for considering the preparation of provisions intended to complement that agreement for submission to a WARC for inclusion in the Radio Regulations in some form of Appendix, in order to bind all members of the Region to basic provisions which could be supplemented by the procedures detailed in any separate agreement.

1.5 The delegate of the United States of America said that in the light of the legal advice given and the other comments made, he considered that the correct procedure to make sure of the legal standing of the Conference's decisions would be to prepare a regional agreement. In addition, the Conference should make provision for the relevant change to RR 480, and for action to have the terms and provisions of the agreement embodied in the Radio Regulations, by requesting the Administrative Council to have the matter placed on the agenda of a forthcoming WARC. The present session of the Conference should further recommend to the Administrative Council that the agenda of the second session should be amended to allow the Conference to deal not only with broadcasting but also with non-broadcasting issues concerned with the 1 605 - 1 705 kHz band in order to facilitate steps to deal with the matter at a WARC, since all parties to the use of the band would have been covered.

1.6 The Secretary-General said that, in the light of that approach, thought would need to be given to which forthcoming WARC the relevant requests should be submitted. He noted that it would be advantageous to have any revision of the Radio Regulations approved by a WARC held before the next Plenipotentiary Conference. That would accelerate ratification or approval of the relevant provisions since, under No. 174 of the Convention, accession to the new Convention to be developed by the Plenipotentiary Conference would necessarily entail approval of the Radio Regulations as revised at that date. The last suitable WARC before the Plenipotentiary was the ORB-2 Conference.

1.7 The representative of the IFRB (Mr. Brooks), noting that under the present conference schedule the ORB-2 Conference preceded the second session of the present Conference, said that the proposal to amend RR 480 could be carried out by a WARC that preceded the second session. However, insertion into the Radio Regulations of the provisions associated with the regional agreement would have to be dealt with by a WARC following the second session.

1.8 The Secretary-General said that the ORB-2 Conference was a particularly suitable WARC to deal with any revision of the Radio Regulations proposed by the present Conference since the Administrative Council would be considering the ORB-2 agenda at its next session and it would be relatively easy to include on that agenda any additional items proposed by the present Conference. There was a possibility that by exchanging dates with the proposed Region 3 conference for early 1988 the second session of the Conference could be brought forward to a date in 1988 before ORB-2 and that action might well be suggested to the Administrative Council.

1.9 The representative of the IFRB (Mr. Berrada) noted that a sufficient time lag would have to be left between the second session of the Conference and ORB-2 in order to allow communication of the decisions of the former to all administrations for consideration.

1.10 The Chairman of the Drafting Group said that his Group's forthcoming work in drafting the relevant Recommendations to be sent to the Administrative Council would take into account all the advice given and points raised in discussion.

2. First report from the Chairman of Working Group 5-A (Document 75)

2.1 The Chairman of Working Group 5-A said that the first part of Document 75 proposed texts for the definition of the two important concepts of "allotment" and "allotment area". The second part set out the proposed basis for planning, which contained 12 specific provisions. The capital letters enclosed in square brackets throughout the text referred to texts and tables that were currently being developed by the Working Group for submission in a further report.

Definitions

2.2 In reply to the delegate of Chile, who questioned the appropriateness of the term defined being used for explanatory purposes in the body of the definition, the Chairman proposed that the matter be referred to the Chairman of Working Group 5-A and further discussion of the definitions deferred to a later meeting of Committee 5.

It was so agreed.

Basis for planning

The introductory phrase and subsections (a) to (f) were approved subject to the replacement of the word "interesadas" by "involucrados" in the Spanish text only of subsection (e) and subject to the insertion of the word "appropriate" before "standardized" in subsection (f), with removal of the "(s)" after "distance".

The meeting rose at 1525 hours.

The Secretary:	The Chairman:
M. GIROUX	M. FERNANDEZ-QUIROZ

Annex: 1

ANNEX 1

Legal aspects of a number of questions related to Document 57

(Statement by the Secretary-General)

1. First of all, it is recalled that this session of the Conference is, according to its agenda contained in AC Resolution No. 913, mandated "to establish", inter alia, "guidelines for the agreement" (see sub-paragraph 2.1.7 of the agenda). According to § 2.5 of the agenda, "the second session of the Conference" is referred to as "relating to the establishment of an agreement and an associated plan". As this is a RARC of Region 2, it has to be thus concluded that the result of this Conference, according to its mandate as presently reflected in AC Resolution No. 913, is expected to be a regional agreement and an associated plan on the subject.

2. Document 57 gives the impression that the work of this Conference - to be accomplished at its second session - should be only a plan with associated provisions adopted by this Conference, but both not being embodied in a regional agreement. Such a result would be a novelty and in contradiction with the legislative practice followed up to now by the Union in RARCs and would furthermore have no legally binding force.

3. In similar cases treated before in the Union by RARCs, regional agreements were indeed adopted containing the necessary provisions and an associated plan or plans, including, in particular, provisions related to approval/ratification, accession and denunciation procedures. The latter provisions are of utmost importance with regard to the legally binding force of any instrument adopted upon any Member of the Union. Any such Member has to become a Party to any such instrument, before the latter is applicable to it, becoming a Party being materialized by way of either "approval", "ratification" or "accession" as specified in the agreement, more generally speaking: by an expression of consent to be bound thereby. Without this consent, the agreement is not legally binding upon a Member and cannot be applied to it.

4. Such an expression of consent to be bound is not foreseen at all in Document 57 which, in its "Preamble", does not even contain the usual standard clause "subject to the approval of the competent authorities of their respective countries" (cf., for example, the Preamble to the "Regional Agreement Relating to the Use of the Band 87.5 - 108 MHz for FM Sound Broadcasting (Region 1 and Part of Region 3)", Geneva, 1984). In this context, it is, in passing, also noted that, in the Union's legislating practice through conferences, delegations are usually not empowered to bind, by their simple signature of any instrument adopted, their respective administrations, without the latter's subsequent approval (cf. Nos. 172 and 582 of the Convention).

5. If, for whatever reason, the present session of this Conference comes to the conclusion that the adoption of a regional agreement would not be possible, appropriate or desirable, there appears to be only one other course of action, from the legal point of view, to make the result of this Conference applicable to all Members of the Union in Region 2. This course of action would consist in a resolution to be addressed to the AC - in relation with § 2.5 of the agenda - inviting the latter to put the incorporation of the provisions and the associated plan adopted by the second session of this Conference into the Radio Regulations (RR) themselves on the agenda of a forthcoming World Administrative Radio Conference (WARC), which would then be competent to act accordingly with the effects described in the provisions of Article 42 of the Convention.

6. Apart from the adoption of a regional agreement and the course of action just outlined in the preceding paragraph, there is no other, third legally sound way to make the provisions and the associated Plan applicable to the Members of the Union in Region 2.

7. In the latter context, reference has indeed to be made to No. 480 of the RR, the text of which is quoted in the "Preamble" of Document 57 and does therefore not need to be repeated.

8. To consider that the wording of No. 480 of the RR would imply any direct or indirect "delegation" of authority by a WARC, i.e. the WARC 1979, which indeed incorporated this provision in the RR and also adopted its Recommendation No. 504 on the subject (but not quoted in Document 57), to the present RARC to amend by partially revising the RR themselves, would be legally erroneous and in contradiction with the pertinent provisions of Article 7 of the Convention (the Nairobi Convention currently in force having not modified in any way these provisions as to their contents as compared with the previous Malaga-Torremolinos Convention).

9. Nos. 52 and 53 of the Convention stipulate very clearly that <u>only</u> "the agenda of a <u>World Administrative Conference</u> may include: a) the <u>partial revision of the Administrative Regulations</u> mentioned in No. 643". This means, in the present context, that only a WARC could partially revise the RR by incorporating therein the provisions and associated "Plan" (see No. 480 of the RR) adopted by this RARC. Nowhere in the Convention has any such authority, which rests with a competent WARC (see § 7 above), been entrusted to a RARC. No. 56 of the Convention stipulates what a RARC may deal with; therein, no mention is made that a RARC may, even upon delegation by a WARC, partially revise the RR. Furthermore, in the case of any RARC - like, by the way, in the case of any WARC - the third sentence of No. 51 of the Convention applies, according to which "the decisions of such conferences must in all circumstances be in conformity with the provisions of the Convention".

10. If ever WARC 1979 had had the intention of giving such an authority to the present RARC by way of "delegation" (see § 8 above) - for which there is no evidence available, as far as known - through adopting the text of No. 480 of the RR, such a decision itself would have been taken by that Conference <u>not</u> in conformity with the pertinent provisions of Nos. 52 and 53 of the Convention and would thus be in contradiction with the provision of No. 51 quoted in § 11 above. If the present RARC itself would try to revise and amend the RR themselves, it would act <u>ultra vires</u> and violate the same provisions of the Convention.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 83-E
28 April 1986
Original: English

COMMITTEE 3

SUMMARY RECORD

OF THE

SECOND MEETING OF COMMITTEE 3

(BUDGET CONTROL)

Wednesday, 23 April 1986, at 0905 hrs

Chairman: Mr. E.D. DuCHARME (Canada)

Subjects discussed:	Documents
1. Approval of the summary record of the first meeting	37
2. Attendance at regional administrative conferences of Members not belonging to the region concerned	18(Rev.1) + Corr.1
3. Position of the Conference accounts as at 18 April 1986	51

1. Summary record of the first meeting of Committee 3 (Document 37)

The summary record of the first meeting was approved.

1.1 The Chairman informed the Committee that the Note he had been asked to transmit to the Chairmen of Committees 4 and 5 had been distributed as Conference Document 43; and at the same time he had sent a Note to the Chairman of the IFRB, the Director of the CCIR and the Secretary-General asking them to provide similar information. Upon receipt of the replies later that week or early the following week the Committee would then prepare a report to the Administrative Council on the budgetary consequences of decisions taken by the Conference.

2. Attendance at regional administrative conferences of Members not belonging to the region concerned (Document 18(Rev.1) + Corr.1)

2.1 At the Chairman's invitation, the Secretary of the Committee introduced the above document in which the erroneous method of calculating the price for a set of conference documents had been reviewed and corrected, resulting in a figure of 300 Swiss francs per set.

2.2 The Chairman thanked the Secretary for clarifying the situation and said that he now understood that henceforth administrations outside the region which requested copies of documents, without attending the Conference at all, would also be charged that price.

2.3 The Secretary pointed out that it would be for the Administrative Council to discuss the matter but in principle that was the case.

The Committee took note of Document 18 as revised and corrected.

3. Position of the Conference accounts as at 18 April 1986 (Document 51)

3.1 The Secretary said that very little expenditure had occurred to date and estimated expenditure up to the end of the Conference could not yet be established very precisely. It appeared, however, that so far there were unused credits of about 5%.

In reply to the delegate of the United Kingdom who asked whether any provision had been made for evening or Saturday morning meetings, he said that it was hoped that three teams of interpreters would suffice, but additional interpreters would have to be recruited if there were numerous extra meetings. That latter situation was not covered by the figures given in the document.

The Committee took note of the position of the accounts reflected in Document 51.

The meeting rose at 0920 hours.

The Secretary:	The Chairman:
R. PRELAZ	E.D. DuCHARME

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 84-E
28 April 1986
Original: French

COMMITTEE 3

Note by the Secretary-General

POSITION OF THE CONFERENCE ACCOUNTS

at 28 April 1986

I hereby submit an estimate of the Conference expenses at 28 April 1986 for the consideration of the Budget Control Committee.

The statement shows a surplus of 80,000 Swiss francs over the budget approved by the Administrative Council and adjusted to take account of changes in the common system of salaries and allowances.

R.E. BUTLER
Secretary-General

Annex: 1

ANNEX

Position of RARC BC-R2 accounts at 28 April 1986

Items		Budget approved by AC	Budget adjusted at 1.04 1)	Expenditure at 28.4.1986		
				actual	estimated or committed	total
		- Swiss francs (thousands) -				
Subhead I - Preparatory work						
20.611	IFRB preparatory work	200	200	27	173	200
Subhead II - Staff expenditure						
20.621	Sec. staff salaries	365	371	0	365	365
20.622	Com. serv. staff salaries	336	338	57	265	322
20.623	Travel (recruitment)	14	14	5	6	11
20.624	Insurance	46	46	0	32	32
		761	769	62	668	730
Subhead IV - Premises and equipment						
20.641	Premises, furniture, machines	35	35	0	42	42
20.642	Document production	20	20	0	12	12
20.643	Office supplies and overheads	20	20	4	12	16
20.644	PTT	15	15	0	15	15
20.645	Technical installations	5	5	0	3	3
20.646	Sundry and unforeseen	10	10	1	7	8
		105	105	5	91	96
Subhead V - Other expenses						
20.651	Interest	37	37	0	15	15
Subhead VI - Final Acts						
20.661	Report to the 2nd Session	20	20	0	10	10
Total, Section 20.6		1123	1131	94	957	1051
Unused credits						80

1) Budget, including additional credits to take account of changes in the United Nations common system.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 85-E
29 April 1986
Original: English

COMMITTEE 3

Note by the Secretary-General

CCIR INTERSESSIONAL ACTIVITY

At the request of the Director of the CCIR, I hereby transmit a note from the CCIR concerning the intersessional period.

R.E. BUTLER
Secretary-General

Annex: 1

ANNEX

CCIR Intersessional activity

Recommendations 4/A and 4/B respectively contained in Document 93 and Document 76 request the CCIR to carry out specific studies during the intersessional period.

According to the above-mentioned documents, these studies will be carried out as a part of the normal CCIR Study Group(s) activities.

The results of these studies will be contained in a report (CCIR report to the second session of the Conference) which will be submitted as a Conference document.

The cost for the dissemination of the report as a Conference document (translation, typing, printing and postage) is estimated to be 10,000 Swiss francs chargeable to the Conference budget.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 86-E
1 May 1986
Original: English

COMMITTEE 5

SUMMARY RECORD OF THE EIGHTH MEETING OF COMMITTEE 5 (PLANNING CRITERIA)

Friday, 25 April 1986, at 0910 hrs

Chairman: Mr. M. FERNANDEZ-QUIROZ (Mexico)

Subjects discussed:	Documents
1. First report from the Chairman of Working Group 5-A (continued)	75
2. Oral report by the Chairman of Working Group 5-B	-
3. Oral report by the Chairman of the ad hoc Group on the Resolution/Recommendation foreseen in DT/11	DT/22, DT/23

1. First report from the Chairman of Working Group 5-A (continued) (Document 75)

1.1 The Chairman invited the Committee to complete its consideration of Document 75, from 6.1 g) onwards.

1.2 The representative of the IFRB (Mr. Berrada) said that, since Committee 4 had adopted two noise zones for which powers had been considered there was an urgent need to define standardized distance and consider the conditions of its application. In addition, Working Group 5-A should perhaps consider adopting a phrase to replace the words "border area" in 6.1 i).

1.3 The Chairman said that at a meeting with the Chairman of the Conference it had been proposed that documents adopted in Committee 4 would be taken as a reference and that any amendments found necessary as the work progressed could be considered in a later Plenary Meeting. In the meantime, he suggested that Working Group 5-A should prepare a draft definition.

1.4 The Chairman of Working Group 5-A, in response to an observation by the delegate of the United States of America, suggested that the definition should be approached on the basis of the E_{nom} value.

It was agreed that the Chairman of Working Group 5-A, the delegate of the United States and the representative of the IFRB would begin work on the basis of a draft definition to be prepared by Working Group 5-A that afternoon.

1.5 The Chairman expressed the Committee's thanks to the Chairman of Working Group 5-A, who was relinquishing his task because of ill-health, and thanked Mr. Zeitoun (Canada) for taking over the post.

2. Oral report by the Chairman of Working Group 5-B

2.1 The Chairman of Working Group 5-B said that the Drafting Group was currently preparing a document for consideration. It was hoped to report to Committee 5 after the Working Group's next meeting. Committee 5 had already been informed of the consensus approach established in the Working Group along the lines outlined by the United States Delegation.

The Committee took note of the oral report.

3. Oral report by the Chairman of the ad hoc Group on the Resolution/Recommendation foreseen in DT/11 (Documents DT/22, DT/23)

3.1 The Chairman of the ad hoc Group introduced the draft Resolution and draft Recommendation.

Draft Resolution [COM5/1] (Document DT/22)

considerings a) and b)

It was agreed, following proposals made by the delegate of the United States and the representative of the IFRB, to replace "by RR 481 in Article 8" and "by RR 480 in the Articles" in a) and b) respectively by "RR 481 and the Table of Frequency Allocations in Article 8", to delete the square brackets and to replace the text within them by "a date to be decided upon by the second session".

considering c)

3.2 The Chairman of the ad hoc Group, in response to an observation by the delegate of the United Kingdom, said that the fact that the Plan for the broadcasting service might contain assignments did not mean that all countries would have their assignments by the end of the second session; considering c), therefore, should be retained.

It was so agreed.

considering d)

The words "in the Plan" to be added after the word "allotments".

considering e), considering f) and resolves 1

The square brackets to be deleted.

resolves 2

The word "broadcasting" to be inserted before "Plan".

resolves 3

It was agreed to retain the square brackets and delete the word "estimated".

3.3 The delegate of Canada felt that the square brackets should be around the paragraph number only and should not enclose the word "paragraph" itself, lest the impression were given that some question remained about the paragraph's substance.

3.4 The delegate of Brazil felt it important to retain the reference to § 2 of Document DT/11 because of the provision contained in its second sentence; perhaps a reference to that provision could be ensured by means of suitable indication in the report to the second session.

Following a brief discussion, it was agreed to draw the matter to the attention of the Working Group of the Plenary with a view to inserting an appropriate reference.

resolves 4

At the end, add "including the dates referred to in resolves 3".

urges administrations 1

Insert the words "as far as they could" after "to take all necessary measures".

requests the IFRB

It was agreed to add a sentence requested by the representative of the IFRB and re-arrange the paragraph as follows:

"requests the IFRB 1

to send Recommendation COM5/1 to administrations of Region 2 not present at the first session of the Conference and to request them to apply the procedure contained in this Resolution".

"requests the IFRB 2

to provide administrations with all the necessary assistance in the implementation of the provisions of this Resolution."

The draft Resolution was approved, as amended.

Draft Recommendation [COM5/1]

considerings a) and b)

The text within square brackets to be amended in line with draft Resolution [COM5/1] just approved.

recommends a)

Following a brief discussion involving the delegates of Brazil, the United Kingdom, Canada and Paraguay, it was agreed that the words "shall refrain from using" would be replaced by "should no longer assign frequencies in"; in the Spanish text the words "se abstengan, con efecto inmediato, de utilizar" would be replaced by "deberían abstenerse en adelante de asignar frecuencias en".

recommends b)

It was agreed that, in the English text, the word "shall" would be replaced by "should" and in the Spanish text the word "tomen" would be replaced by "deberían tomar".

Recommendation COM5/1 was approved, as amended.

The meeting rose at 1040 hours.

The Secretary:
M. GIROUX

The Chairman:
M. FERNANDEZ-QUIROZ

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 87-E
25 April 1986
Original: English

COMMITTEE 5

NOTE FROM COMMITTEE 4 TO COMMITTEE 5

Committee 4 presents the following information on adjacent channel and protection outside national boundaries, which might be useful for Committee 5.

1. Comments on adjacent channel assignments

The following table shows the distance (in km) at which the groundwave field strength is equal to the nominal field strength.

It was considered Enom = 0.5 mV/m for Noise Zone 1 and Enom = 1.25 mV/m for Noise Zone 2, a protection ratio of 0 dB and a standard omnidirectional antenna with 90° electrical height.

Ground conductivity (mS/m)	Noise Zone 1 (1 kW)	Noise Zone 2	
		1 kW	5 kW
Poor (2)	24	15	23
Fair (5)	36	20	35
Good (10)	53	35	52
Very good (30)	100	65	98
Sea (5000)	310	160	280

2. Protection outside national boundaries

2.1 No station has the right to be protected beyond the boundary of the country in which the station is established, except when otherwise specified in a bilateral or multilateral arrangement.

2.2 No broadcasting station shall be assigned a nominal frequency with a separation of 10 kHz from that of a station in another country if the 2500 uV/m contours overlap.

2.3 No broadcasting station shall be assigned a nominal frequency with a separation of 20 kHz from that of a station in another country if the 10,000 uV/m contours overlap.

2.4 No broadcasting station shall be assigned a nominal frequency with a separation of 30 kHz from that of a station in another country if the 25,000 uV/m contours overlap.

2.5 In addition to the conditions described in §§ 2.2 to 2.4 of this document when the protected contour would extend beyond the boundary of the country in which the station is located, its assignment shall be protected in accordance with § 3.9 of the Report to the second session.

2.6 For protection purposes, the boundary of a country shall be deemed to encompass only its land area, including islands.

M.L. PIZARRO
Chairman of Committee 4

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 88-E
25 April 1986
Original: English/ Spanish

COMMITTEE 6

Source: Documents 52, 77

FIFTH AND LAST SERIES OF TEXTS SUBMITTED BY COMMITTEE 4 TO THE EDITORIAL COMMITTEE

Committee 4 has adopted the texts in annex and submits them to the Editorial Committee.

Committee 4 could not reach a consensus on the standardized power for Noise zone 2 daytime (section 3.5) and on the maximum station power (section 3.5a).

The values in square brackets reflect the views expressed by the majority.

The first section from the Fourth Series of texts from Committee 4 to Committee 6 (Application of protection criteria) will be deleted since it is contained in section 3.9 of the annex.

M.L. PIZARRO
Chairman of Committee 4

Annex: 1

ANNEX

[CHAPTER 1: DEFINITIONS AND SYMBOLS]

[1.1.2a Protected contour

Continuous line that delimits the service area which is protected from objectionable interference.]

1.1.3a Nominal usable field strength (E_{nom})

Agreed minimum value of the field strength required to provide satisfactory reception, under specified conditions, in the presence of atmospheric noise, man-made noise and interference from other transmitters. The value of nominal usable field strength has been employed as the reference for planning.

1.1.15 Skywave field strength, 50% of the time

The skywave field strength during the reference hour which is exceeded for 50% of the nights of the year. The reference hour is the period of one hour beginning one and a half hours after sunset and ending two and a half hours after sunset at the midpoint of the short great-circle path.

1.1.16 Characteristic field strength (E_c)

The field strength, at a reference distance of 1 km in a horizontal direction, of the groundwave signal propagated along perfectly conducting ground for 1 kW station power, taking into account losses in a real antenna.

Note 1 - The gain (G) of the transmitting antenna relative to an ideal short vertical antenna is given in dB by the following equation:

$$G = 20 \log \frac{E_c}{300} \qquad (1)$$

where E_c is expressed in mV/m.

Note 2 - The effective monopole radiated power (e.m.r.p.) is given in dB (kW) by the following equation:

$$\text{e.m.r.p.} = 10 \log P_t + G \qquad (2)$$

where P_t is the station power (kW).

1.2 Symbols

Hz:	hertz
kHz	kilohertz
W:	watt
kW:	kilowatt
mV/m	millivolt/metre
μV/m	microvolt/metre
dB	decibel
dB(μV/M):	decibels with respect to 1 μV/m
dB(kW):	decibels with respect to 1 kW
mS/m:	millisiemens/metre
σ :	ground conductivity

[CHAPTER 3]

3.5 Standardized station parameters

The allotment plan shall be based on a standard power according to the table below, and a standard omnidirectional antenna with 90° electrical antenna height.

Table of standard powers

	Noise zone 1	Noise zone 2 (see section 3.7)
Daytime	1 kW	[1 kW]
Night-time	1 kW	1 kW

3.5a Station power

Higher powers than the standard power may be used on condition that the interference caused to other countries by allotted and non-allotted channels does not exceed the interference produced by a station using the standardized parameters.

In no case shall the power be greater than [10 kW].

[3.8a Co-channel standardized distance

The standard distance shall be 330 km for noise zone 1 and 120 km for noise zone 2. However, administrations in areas involving sea paths may consider greater distances. For information, groundwave propagation over sea paths would involve distances of 450 km to protect a nominal usable field strength of 3.3 mV/m and 360 km to protect a nominal field strength of 6 mV/m.]

3.9 Application of protection criteria

3.9.1 Protection of allotments[1]

The signal strengths to be protected are the appropriate values of nominal usable field strength shown in section 3.6. The area to be protected is the border of an allotment area.

The maximum permitted interfering field strength within the area is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the interfering signal considered is the greater of the groundwave or skywave signal. In all other cases, only groundwave interference is considered.

The effect of each interfering signal should be evaluated separately, and the presence of interference from other stations in excess of this permissible level should not reduce the necessity to limit the interference which would result from proposed modifications or assignments.

3.9.2 Protection of non-allotments

Assignments on non-allotted channels are not specifically protected from assignments using allotments. The amount of interference from the latter is limited by restricting them to standard parameters or the equivalent as defined in sections 3.5 and 3.5a. However, assignments on non-allotted channels are protected from subsequent non-allotments. The protected contour encompasses the area in which the groundwave field strength is equal to or greater than the appropriate value of E_{nom} according to section 3.6.

The maximum permitted interfering field strength within the area is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the interfering signal considered is the greater of the groundwave or skywave signal. In all other cases, only groundwave interference is considered.

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1 Committee 6 might change these titles in view of the terminology adopted by Committee 5.

The effect of each interfering signal should be evaluated separately and the presence of interference from other stations in excess of this permissible level should not reduce the necessity to limit the interference which would result from proposed modifications or assignments.

Where the protected contour would extend beyond the boundary of the country in which the station is located, the maximum permissible interfering groundwave field strength at the boundary is the calculated field strength of the protected station along the boundary divided by the protection ratio.

3.9.3 Skywave interference calculations

The field strength of skywave interfering signals shall be calculated on the basis of 50% of the time, either at the boundary of the allotment area or at the site of a non-allotment.

RECOMMENDATION [COM4/1]

Relationship Between Physical and Electrical Antenna Height

The Regional Administrative Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

that information relating to the relationship between physical antenna height and electrical antenna height would be useful to all administrations when establishing assignments in the 1 605 - 1 705 kHz band;

recommends administrations in Region 2

within the limits of their possibilities, to carry out measurements to define this relationship and submit the relevant data to the CCIR Study Group concerned taking into account the CCIR work schedule;

requests the CCIR

a) to prepare, on the basis of the contributions submitted, a report to the second session of the Conference;

b) to carry out these studies as part of the normal work of the CCIR Study Groups.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 89-E
25 April 1986
Original: English

COMMITTEE 6

Source: Documents 75, DT/22, DT/23

FIRST SERIES OF TEXTS FROM COMMITTEE 5

TO THE EDITORIAL COMMITTEE

The texts set out in Documents 75, DT/22 and DT/23 have been modified and adopted by Committee 5 and are submitted to the Editorial Committee.

M.M. FERNANDEZ-QUIROZ
Chairman of Committee 5

PINK PAGES

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 90-E
25 April 1986

R.2

PLENARY MEETING

2nd SERIES OF TEXTS SUBMITTED BY THE
EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for second reading:

Source	Document	Title
COM.4	B.3/74	Chapter 5 - Technical criteria for interservice sharing
	B.4/76	Recommendaitons COM4/B, COM4/C*

*Note by the Editorial Committee - The text of Recommendation COM4/C requires two readings.

P. PERRICHON
Chairman of Committee 6

Annex: 22 pages

CHAPTER 5 - TECHNICAL CRITERIA FOR INTERSERVICE SHARING

[In accordance with Article 8 of the Radio Regulations, the fixed and mobile services become permitted services at a time to be established by the Conference. The intention is to facilitate the preparation of the broadcasting Plan without restrictions from other services. Thus in drawing up the Plan, the broadcasting service will have prior choice of frequency and does not have to protect the other services. The sharing criteria developed in this chapter are designed to apply to the permitted services in order to protect broadcasting services in the Plan and give protection to these permitted services. According to the specific cases the protection ratio value is given for co-channel interference (CO) or for off-channel interference (OC).]

5.1 Protection of the broadcasting service

The broadcasting service in Region 2 may be subject to interservice interference from services sharing the sub-band 1 625 - 1 705 kHz such as the fixed, mobile and radiolocation services.

[Protection in accordance with the criteria in section 5.1.1 is to be given within the national boundary and/or sub-national zone for priority channels and within the service contours for non-priority channels.]

A value of 26 dB has been indicated in section 3.8.1 for co-channel protection ratio between broadcasting emissions, hence allowing a given quality of service, and the same quality criteria have been applied to derive the figures given for interfering services other than broadcasting.

5.1.1 Protection ratio criteria

As noted in the CCIR Report to the Conference, "Compatibility problems and sharing criteria between the broadcasting service and the other services are not fully investigated ...". Some additional information has been developed since that document was prepared. However, it is recognized that further information will be necessary before administrations are in a position to agree on the values to be used in establishing protection criteria for use in sharing of the extended band. As a result, administrations are encouraged to study this subject further during the intersessional period. In addition, it would be desirable for the CCIR to assist in the final preparation of a document to be submitted to the second session. (See Recommendation COM4/B.)

The latest available information from the CCIR is presented in Table 5.I.

New results of measurements carried out by a Region 2 administration, indicate that, at least for J3E and F1B interference cases, new radio-frequency protection ratio values can be proposed, namely: 28 dB for J3E off-channel interference (about 1.4 kHz assigned frequency spacing and zero carrier frequency spacing) and 45 dB for F1B off-channel (1 kHz) interference. The radio-frequency protection ratio curves (median values) appearing in Figures 5.1 and 5.2 can be used to determine the required protection for various carrier spacings.

5.2 Protection of the permitted services

The protection ratio values to protect the permitted services when implementing the Plan are also given in Table 5.I.

To protect reception of the fixed service, values for speech communications are indicated for just usable (JU), marginally commercial (MC) and good commercial (GC) quality; for telegraph communication they should be specified for a character error ratio P_E of 10^{-2}, 10^{-3} and 10^{-4}, but since the protection ratios do not significantly vary for values of P_E up to 10^{-6}, a single value is suggested by the CCIR.

TABLE 5.I

Steady-state protection ratios (dB)*

Wanted signal \ Interfering signal		A3E (BC)		A3E (fixed)		A2A/A2B		F1B		J2B		J3E		H2A/H2B		Class of emission
		CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	Interfering condition 1)
A3E (BC)		26		26		31		47			43		38		37	
A3E (fixed) 2)	JU MC GC	-7 5 26														
A2A/A2B	$P_e<10^{-6}$	5														
F1B	$P_e<10^{-6}$	-3														
J2B	$P_e<10^{-6}$		5													
J3E	JU MC GC		-19 -7 14													
H2A/H2B	$P_e<10^{-6}$		-1													
Class of emission	Quality of service															

* Ratio of wanted-to-interfering signals whose powers are expressed in terms of p.e.p. (PX) (see Recommendation 240-3 (MOD I)).

1) CO (co-channel interference) and OC (off-channel interference) are the cases when the frequency separation between the assigned frequency of the wanted signal and that of the interfering signal is about zero and about 1.4 kHz respectively.

2) Administrations are urged to discontinue, in the fixed service, the use of double-sideband radiotelephone (class A3E) transmissions (see RR 2700).

Wanted .... A3E (Broadcasting)
Unwanted..................... J3E (Radiotelephony)
Low pass filter
at receiver output............. 10 kHz
Grade of quality ....4 (CCIR Recommendation 562-1)

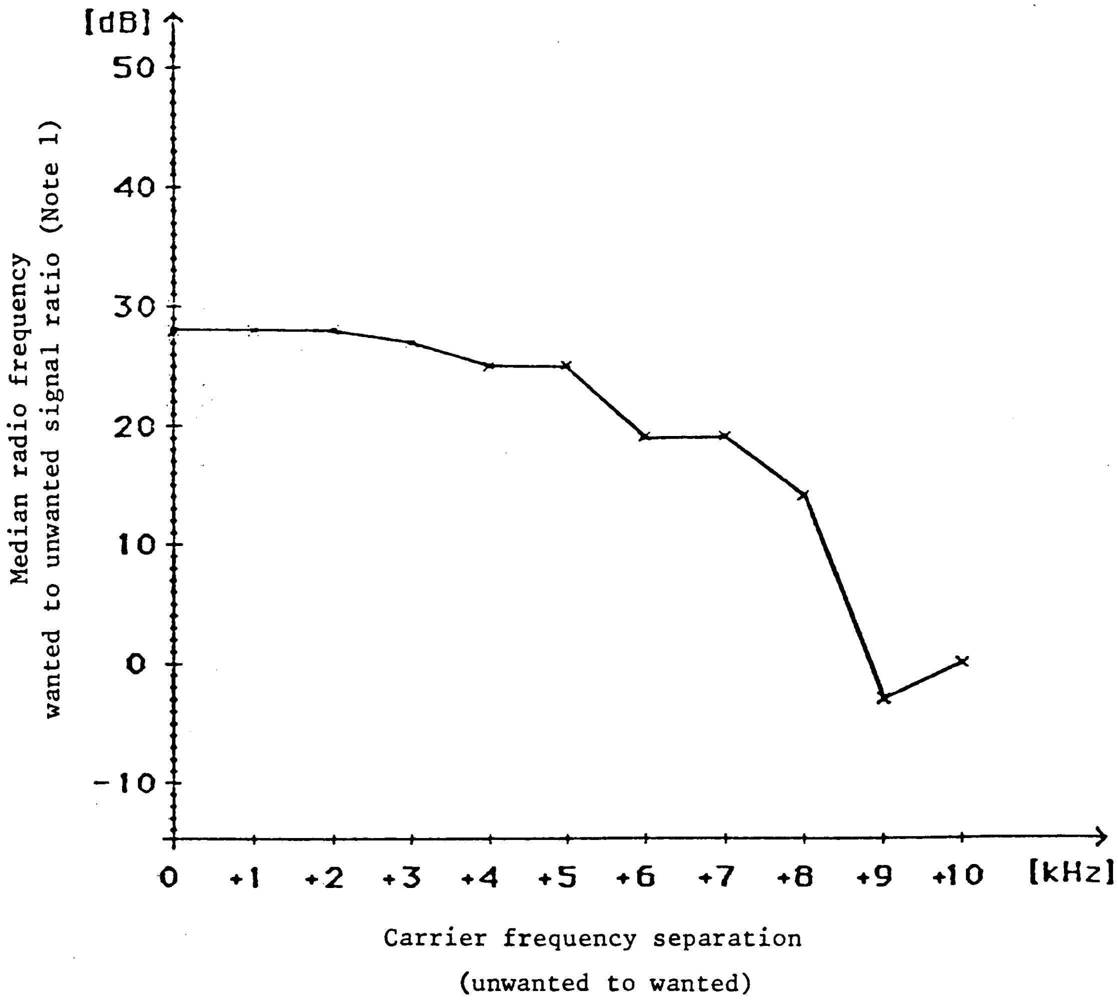


FIGURE 5.1

Median value of the radio frequency wanted (A3E) to unwanted (J3E) signal ratio as a function of the carrier frequency separation

Note 1 - The signal ratio is defined as the ratio of the peak envelope power of the wanted signal to the peak envelope power of the unwanted signal.

Wanted	.... A3E	(Broadcasting)
Unwanted	.... F1B	(Narrow-band direct printing telegraphy or digital selective calling)
Low pass filter at receiver output	.... 10 kHz	
Grade of quality	4	(CCIR Recommendation 562-1)

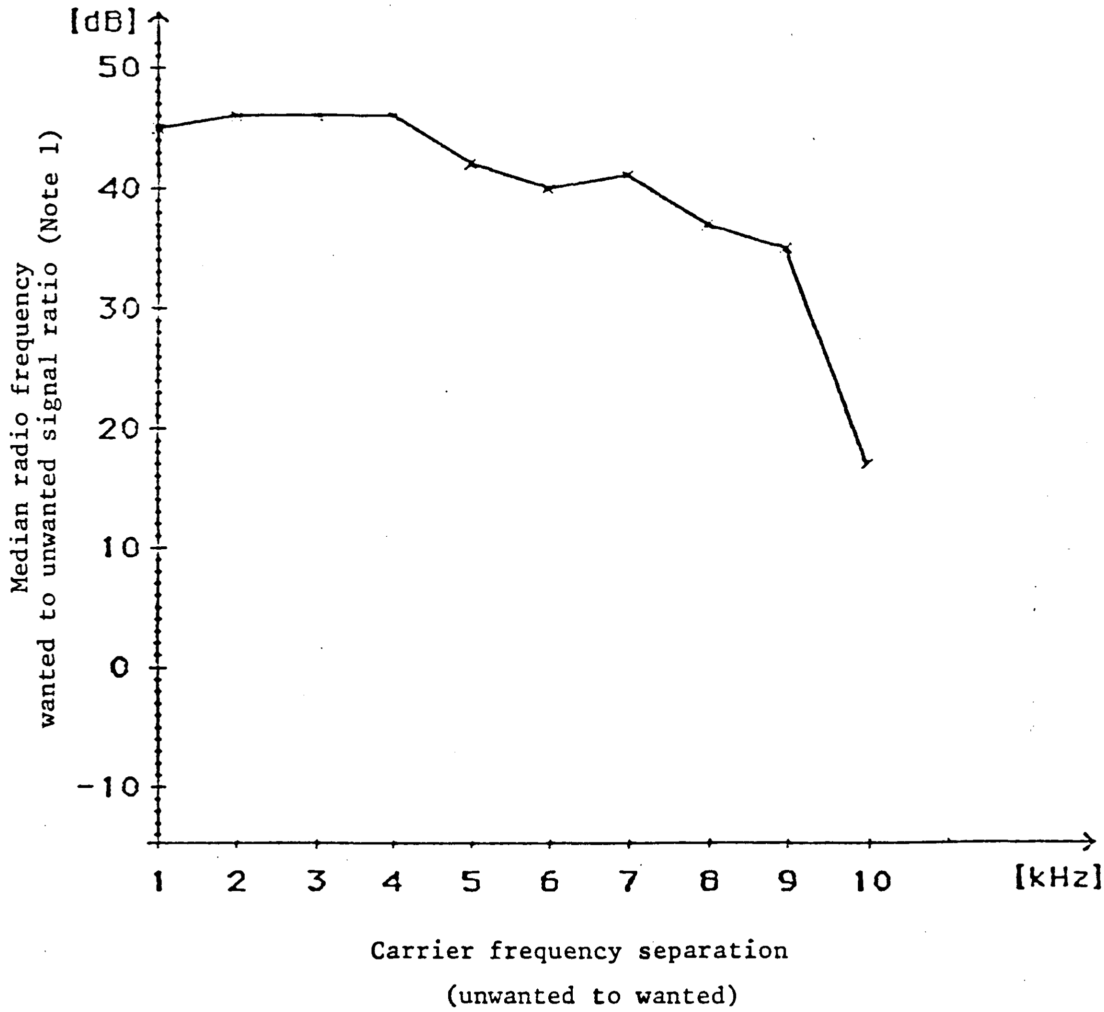


FIGURE 5.2

Median value of the radio frequency wanted (A3E) to unwanted (F1B) signal ratio as a function of the carrier frequency separation

Note 1 - The signal ratio is defined as the ratio of the peak envelope power of the wanted signal to the mean power of the unwanted signal.

5.3 Principles used for the application of interregional sharing criteria (see Recommendation COM4/C)

5.3.1 Application of RR 346

In the application of the interregional sharing criteria, the basic principle is the equality of rights between the regions as provided in RR 346.

5.3.2 Application of the IFRB Technical Standards

The relevant IFRB Technical Standards govern interregional sharing.

RECOMMENDATION COM4/B

Continuation of Studies on Sharing Criteria for Services Using the Band 1 625 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

considering

a) that the World Administrative Radio Conference (Geneva, 1979), in its Recommendation No. 504, invited the CCIR to carry out the necessary technical studies related to convening a conference for Region 2;

b) that the Administrative Council, in its Resolution No. 913 establishing the agenda for this Conference, invited the CCIR to prepare a report on the necessary technical bases;

c) that the CCIR, in response to those requests, has drawn up a report on the technical bases, which includes a chapter on compatibility with other services, and has recognized that the problem of criteria for sharing between the broadcasting service and the other services had not yet been fully studied;

d) that more varied and more detailed data are required for a better understanding of the subject and for confirmation of the values provisionally proposed in Chapter 5 of this report;

recommends that administrations

cooperate urgently and to the fullest extent possible with the CCIR by sending it contributions on the above-mentioned subject, taking account of the CCIR working schedule;

requests the CCIR

1. to continue its studies on sharing criteria for services using the band 1 625 - 1 705 kHz in Region 2;

2. to prepare a new report on this subject for the Second Session of the Conference on the basis of those studies;

3. to carry out these studies as part of the normal work of the CCIR Study Groups;

and requests the Second Session of the Conference

to reconsider the relevant parts of Chapter 5 of the Report of the First Session in the light of data provided by administrations and the CCIR's new report and, if necessary, to consider modifying the values proposed in that Chapter.

RECOMMENDATION COM4/C

Technical Criteria for Interregional Sharing

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

considering

a) that according to the agenda contained in Administrative Council Resolution No. 913, this Conference proposed provisional technical criteria for inter-service sharing of the band 1 625 - 1 705 kHz between the broadcasting service and other services in Region 2;

b) that, in accordance with numbers 1001 and 1454 of the Radio Regulations, the IFRB develops Technical Standards and Rules of Procedure for internal use by the Board in the exercise of its functions, based inter alia upon the relevant provisions of the Radio Regulations and the Appendices thereto, the decisions of administrative radio conferences, as appropriate, and the Recommendations of the CCIR;

considering further

that compatibility problems and criteria for sharing between the broadcasting service and other services to which the band 1 605 - 1 705 kHz is allocated have not yet been fully studied, although a comprehensive study is being carried out in the CCIR;

noting

a) that the recording and examination process provided in Article 12 of the Radio Regulations is the only procedure making it possible to avoid harmful interference between stations operating in Region 2, on the one hand, and those operating in Regions 1 and 3, on the other hand, and that the IFRB will therefore adopt appropriate Technical Standards;

b) that, under number 56 of the Convention, the decisions of a regional administrative conference must in all circumstances be in conformity with the provisions of the Radio Regulations and that such a conference may give instructions to the IFRB, provided that such instructions do not conflict with the interests of the two other Regions;

c) that the Regional Administrative Radio Conference for the Maritime Mobile Service and Aeronautical Radionavigation Service in certain parts of the MF band in Region 1 (RARC MM-R1, Geneva, 1985) adopted technical criteria for the protection of the maritime mobile service in the bands 1 606.5 - 1 625 kHz and 1 635 - 1 800 kHz;

recognizing

a) that the method set out in the Annex to this Recommendation was proposed for use in the planning of the 1 605 - 1 705 kHz band because it offered greater precision than the method used for the 525 - 1 605 kHz band in Region 2, and that the latter was chosen only because it simplified the planning process;

b) that simplicity is not a major factor in the calculation of field strength over interregional paths for individual assignments;

recommends

1. that the IFRB should take account of the method of calculating the skywave field strength described in the Annex to this Recommendation when adopting its Technical Standards relating to the examination of frequency assignment notices for broadcasting stations of Region 2 operating in the band 1 605 - 1 705 kHz from the standpoint of the probability of harmful interference to stations in Regions 1 and 3, and vice versa. The signal strengths thus calculated will be increased by 2.5 dB to take into account the different reference hours in Region 2 and Regions 1 and 3;

2. that, in calculating interregional interference, the field strengths shall be determined by taking the arithmetic mean of the signal strengths, expressed in dB(uV/m) for a specified e.m.r.p., calculated both by the method described in Annex 1 to CCIR Recommendation 435-3 and by the method referred to in recommends 1 above. The value thus calculated shall be applied when it is midnight at the mid-point of the interregional path, provided that the entire path is in darkness. Signal strengths at other times are unlikely to exceed this value;

3. that, protection in accordance with the criteria defined in Chapter 5 should be given within [the national boundary and/or sub-national zone for priority channels and within the service contours for non-priority channels.]*

Annex: 1

*Note by the Editorial Committee - The text in square brackets will be aligned in due course with the terminology adopted by Committee 5.

Annex

(to Recommendation COM4/C)

Calculation of the skywave field strength to evaluate interregional interference

1. List of symbols (see also Chapter 2)

a_T: geographical latitude of the transmitting terminal (degrees)

a_R: geographical latitude of the receiving terminal (degrees)

b_T: geographical longitude of the transmitting terminal (degrees)

b_R: geographical longitude of the receiving terminal (degrees)

ϕ_T: geomagnetic latitude of the transmitting terminal (degrees)

ϕ_R: geomagnetic latitude of the receiving terminal (degrees)

ϕ: average geomagnetic latitude of a path under study (degrees)

Note - North and east are considered positive, south and west negative.

2. General procedure

The general procedure for calculation of skywave field strength to evaluate interregional interference is similar to that described in Chapter 2 with the following exception.

The unadjusted skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c \, f\,(\theta) \sqrt{P}}{100} \quad \text{dB(uV/m)} \qquad (1)$$

F_c is given by:

$$F_c = (95-20 \log d) - (6.28 + 4.95 \tan^2 \phi)\,(d/1000)^{1/2}\ \text{dB(uV/m)} \qquad (2)$$

Figure 1 and Table I show F_c for selected latitudes. If $|\phi|$ is greater than 60 degrees, equation (2) is evaluated for $|\phi|$ = 60 degrees. If d is less than 200 km, equation (2) is evaluated for d = 200 km. However, the actual great-circle distance is to be used in determining elevation angle. See section 4 for calculation of great-circle distance and conversion from geographical latitude to geomagnetic latitude.

Note - Values of F_c are normalized to 100 mV/m at 1 km corresponding to an effective monopole radiated power (e.m.r.p.) of -9.54 dB(kW).

3. Skywave field strength, 50% of the time

This is given by:

$$F(50) = F \quad \text{dB(uV/m)} \qquad (3)$$

4. Path parameters

Refer to section 1. The great-circle distance d (km) is given by:

$$d = 111.18 \text{ arc cos } [\sin a_T \sin a_R + \cos a_T \cos a_R \cos (b_R - b_T)] \quad (4)$$

The geomagnetic latitude of the transmitting terminal, ϕ_T, is given by:

$$\phi_T = \text{arc sin } [\sin a_T \sin 78.5^\circ + \cos a_T \cos 78.5^\circ \cos (69^\circ + b_T)] \quad (5)$$

ϕ_R can be determined in a similar manner. And,

$$\phi = {}^1/_2 (\phi_T + \phi_R) \quad (6)$$

Alternatively, Figure 2 may be used.

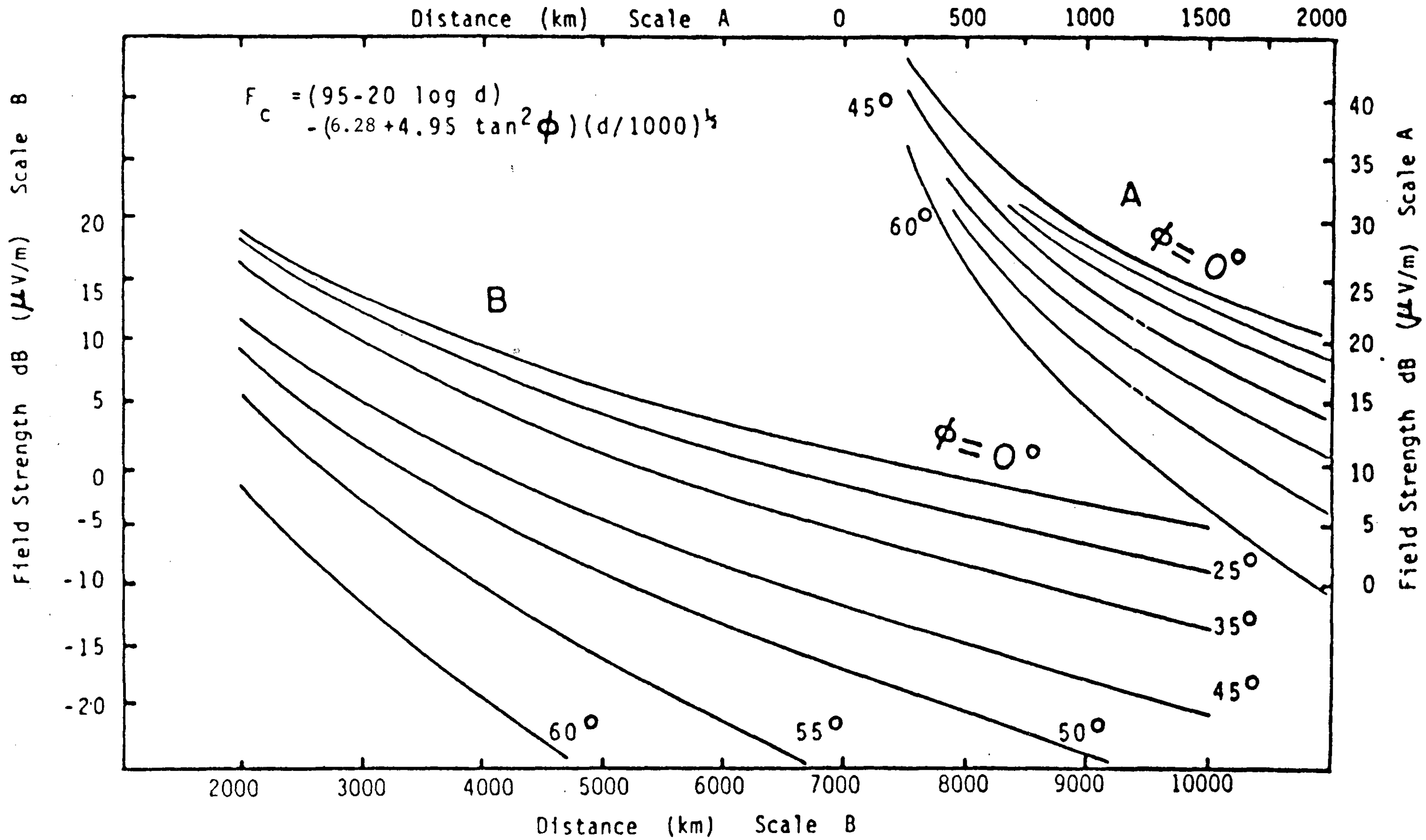


FIGURE 1

Skywave field strength versus distance (for a characteristic field strength of 100 mV/m at 1 km, 50%, 2 hours after sunset)

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
0-200	46.17	203.4574	46.01	199.7683	45.43	186.8867	43.96	157.6842	39.53	94.7147
250	43.90	156.6680	43.72	153.4954	43.07	142.4722	41.42	117.8230	36.47	66.6392
300	42.02	126.1266	41.82	123.3314	41.11	113.6631	39.30	92.3093	33.88	49.4450
350	40.40	104.7304	40.19	102.2257	39.43	93.5977	37.47	74.7566	31.62	38.0894
400	38.98	88.9709	38.76	86.6981	37.94	78.8988	35.85	62.0462	29.59	30.1752
450	37.72	76.9207	37.48	74.8381	36.61	67.7174	34.40	52.4825	27.76	24.4320
500	36.58	67.4351	36.33	65.5120	35.41	58.9589	33.08	45.0689	26.08	20.1307
550	35.53	59.7930	35.27	58.0059	34.31	51.9358	31.86	39.1832	24.52	16.8266
600	34.57	53.5183	34.29	51.8487	33.29	46.1953	30.74	34.4183	23.07	14.2352
650	33.68	48.2840	33.39	46.7172	32.35	41.4276	29.69	30.4974	21.70	12.1669
700	32.84	43.8589	32.54	42.3829	31.46	37.4139	28.70	27.2260	20.42	10.4915
750	32.06	40.0746	31.75	38.6794	30.63	33.9955	27.77	24.4640	19.20	9.1169
800	31.32	36.8059	31.00	35.4833	29.84	31.0547	26.89	22.1079	18.04	7.9764
850	30.62	33.9579	30.29	32.7007	29.10	28.5022	26.06	20.0797	16.93	7.0208
900	29.95	31.4572	29.62	30.2595	28.39	26.2696	25.26	18.3198	15.87	6.2133
950	29.32	29.2464	28.98	28.1030	27.71	24.3030	24.50	16.7818	14.85	5.5255
1000	28.72	27.2798	28.36	26.1861	27.07	22.5601	23.77	15.4291	13.87	4.9356
1050	28.14	25.5207	27.77	24.4729	26.45	21.0066	23.07	14.2325	12.92	4.4265
1100	27.58	23.9394	27.21	22.9339	25.85	19.6150	22.39	13.1684	12.01	3.9845
1150	27.05	22.5115	26.67	21.5451	25.28	18.3625	21.74	12.2177	11.12	3.5988
1200	26.53	21.2165	26.14	20.2866	24.73	17.2306	21.11	11.3645	10.27	3.2607
1250	26.04	20.0378	25.64	19.1418	24.19	16.2036	20.50	10.5958	9.43	2.9628
1300	25.56	18.9609	25.15	18.0967	23.68	15.2685	19.91	9.9007	8.63	2.6995
1350	25.09	17.9741	24.68	17.1396	23.18	14.4142	19.34	9.2699	7.84	2.4657

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km) for a characteristic field strength of 100 mV/m

Page 2 of 8

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
1400	24.64	17.0669	24.22	16.2603	22.69	13.6313	18.79	8.6958	7.07	2.2574
1450	24.21	16.2306	23.78	15.4503	22.22	12.9119	18.25	8.1716	6.32	2.0713
1500	23.78	15.4577	23.35	14.7021	21.76	12.2490	17.72	7.6916	5.60	1.9045
1550	23.37	14.7416	22.93	14.0094	21.32	11.6367	17.21	7.2512	4.88	1.7544
1600	22.97	14.0766	22.52	13.3665	20.88	11.0698	16.71	6.8459	4.19	1.6192
1650	22.58	13.4577	22.12	12.7687	20.46	10.5438	16.22	6.4722	3.50	1.4970
1700	22.20	12.8806	21.74	12.2115	20.05	10.0547	15.74	6.1268	2.84	1.3862
1750	21.83	12.3415	21.36	11.6913	19.64	9.5991	15.28	5.8071	2.18	1.2857
1800	21.46	11.8369	20.99	11.2046	19.25	9.1739	14.82	5.5104	1.54	1.1942
1850	21.11	11.3638	20.63	10.7487	18.87	8.7763	14.38	5.2347	0.91	1.1107
1900	20.76	10.9196	20.27	10.3208	18.49	8.4041	13.94	4.9780	0.29	1.0345
1950	20.43	10.5018	19.93	9.9186	18.12	8.0549	13.51	4.7386	-0.31	0.9648
2000	20.09	10.1084	19.59	9.5401	17.76	7.7270	13.09	4.5151	-0.91	0.9008
2050	19.77	9.7373	19.26	9.1832	17.41	7.4185	12.68	4.3060	-1.49	0.8421
2100	19.45	9.3869	18.94	8.8465	17.06	7.1280	12.28	4.1102	-2.07	0.7880
2150	19.14	9.0555	18.62	8.5282	16.72	6.8540	11.88	3.9265	-2.64	0.7382
2200	18.83	8.7419	18.30	8.2271	16.38	6.5953	11.49	3.7541	-3.19	0.6923
2250	18.53	8.4446	18.00	7.9419	16.06	6.3508	11.11	3.5919	-3.74	0.6499
2300	18.24	8.1626	17.70	7.6714	15.73	6.1194	10.73	3.4393	-4.28	0.6106
2350	17.95	7.8947	17.40	7.4147	15.42	5.9002	10.36	3.2955	-4.82	0.5743
2400	17.66	7.6400	17.11	7.1708	15.11	5.6923	9.99	3.1599	-5.34	0.5405
2450	17.38	7.3977	16.83	6.9388	14.80	5.4949	9.63	3.0318	-5.86	0.5092
2500	17.11	7.1669	16.54	6.7179	14.50	5.3075	9.28	2.9107	-6.37	0.4801
2550	16.84	6.9468	16.27	6.5075	14.20	5.1292	8.93	2.7962	-6.88	0.4530

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km) for a characteristic field strength of 100 mV/m

DISTANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
2600	16.57	6.7369	16.00	6.3068	13.91	4.9594	8.59	2.6877	-7.38	0.4278
2650	16.31	6.5364	15.73	6.1152	13.62	4.7978	8.25	2.5849	-7.87	0.4042
2700	16.05	6.3448	15.46	5.9323	13.34	4.6436	7.91	2.4873	-8.35	0.3823
2750	15.79	6.1616	15.20	5.7574	13.06	4.4966	7.59	2.3948	-8.83	0.3617
2800	15.54	5.9862	14.95	5.5901	12.78	4.3562	7.26	2.3068	-9.31	0.3425
2850	15.30	5.8183	14.70	5.4299	12.51	4.2220	6.94	2.2231	-9.77	0.3246
2900	15.05	5.6573	14.45	5.2765	12.24	4.0937	6.62	2.1435	-10.24	0.3077
2950	14.81	5.5029	14.20	5.1295	11.98	3.9709	6.31	2.0677	-10.69	0.2919
3000	14.57	5.3547	13.96	4.9884	11.72	3.8534	6.00	1.9955	-11.15	0.2771
3050	14.34	5.2125	13.72	4.8530	11.46	3.7408	5.70	1.9267	-11.59	0.2632
3100	14.11	5.0758	13.48	4.7230	11.20	3.6328	5.39	1.8610	-12.04	0.2501
3150	13.88	4.9444	13.25	4.5981	10.95	3.5293	5.10	1.7982	-12.47	0.2379
3200	13.66	4.8180	13.02	4.4779	10.71	3.4299	4.80	1.7383	-12.91	0.2263
3250	13.44	4.6963	12.79	4.3624	10.46	3.3345	4.51	1.6810	-13.34	0.2154
3300	13.22	4.5792	12.57	4.2512	10.22	3.2428	4.22	1.6262	-13.76	0.2051
3350	13.00	4.4663	12.35	4.1441	9.98	3.1546	3.94	1.5738	-14.18	0.1954
3400	12.78	4.3575	12.13	4.0409	9.74	3.0698	3.66	1.5236	-14.60	0.1863
3450	12.57	4.2526	11.91	3.9414	9.51	2.9883	3.38	1.4755	-15.01	0.1776
3500	12.36	4.1514	11.70	3.8455	9.28	2.9097	3.10	1.4294	-15.42	0.1695
3550	12.16	4.0537	11.49	3.7529	9.05	2.8341	2.83	1.3852	-15.82	0.1618
3600	11.95	3.9593	11.28	3.6636	8.82	2.7611	2.56	1.3428	-16.22	0.1545
3650	11.75	3.8682	11.07	3.5773	8.60	2.6909	2.29	1.3021	-16.62	0.1476
3700	11.55	3.7801	10.87	3.4940	8.38	2.6231	2.03	1.2631	-17.01	0.1410
3750	11.35	3.6949	10.66	3.4134	8.16	2.5577	1.77	1.2255	-17.40	0.1348

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
3800	11.16	3.6125	10.46	3.3356	7.94	2.4945	1.51	1.1894	-17.79	0.1289
3850	10.96	3.5328	10.26	3.2602	7.72	2.4335	1.25	1.1547	-18.18	0.1234
3900	10.77	3.4556	10.07	3.1873	7.51	2.3746	0.99	1.1214	-18.56	0.1181
3950	10.58	3.3808	9.87	3.1168	7.30	2.3177	0.74	1.0892	-18.93	0.1131
4000	10.39	3.3084	9.68	3.0485	7.09	2.2627	0.49	1.0583	-19.31	0.1083
4050	10.21	3.2383	9.49	2.9823	6.89	2.2094	0.24	1.0286	-19.68	0.1038
4100	10.02	3.1702	9.30	2.9182	6.68	2.1580	0.00	0.9999	-20.05	0.0995
4150	9.84	3.1043	9.12	2.8560	6.48	2.1081	-0.24	0.9722	-20.41	0.0954
4200	9.66	3.0403	8.93	2.7958	6.28	2.0599	-0.49	0.9456	-20.78	0.0915
4250	9.48	2.9782	8.75	2.7373	6.08	2.0132	-0.73	0.9199	-21.13	0.0878
4300	9.30	2.9179	8.56	2.6806	5.88	1.9679	-0.96	0.8951	-21.49	0.0842
4350	9.13	2.8594	8.38	2.6255	5.68	1.9240	-1.20	0.8711	-21.85	0.0808
4400	8.95	2.8026	8.21	2.5721	5.49	1.8815	-1.43	0.8480	-22.20	0.0776
4450	8.78	2.7474	8.03	2.5202	5.30	1.8403	-1.66	0.8257	-22.55	0.0746
4500	8.61	2.6937	7.85	2.4698	5.11	1.8003	-1.89	0.8041	-22.89	0.0717
4550	8.44	2.6416	7.68	2.4208	4.92	1.7615	-2.12	0.7833	-23.24	0.0689
4600	8.27	2.5909	7.51	2.3732	4.73	1.7239	-2.35	0.7632	-23.58	0.0662
4650	8.10	2.5415	7.34	2.3269	4.54	1.6873	-2.57	0.7437	-23.92	0.0637
4700	7.94	2.4936	7.17	2.2819	4.36	1.6518	-2.79	0.7249	-24.26	0.0613
4750	7.77	2.4469	7.00	2.2381	4.18	1.6174	-3.02	0.7066	-24.59	0.0589
4800	7.61	2.4014	6.83	2.1955	3.99	1.5839	-3.24	0.6890	-24.93	0.0567
4850	7.45	2.3572	6.67	2.1541	3.81	1.5513	-3.45	0.6719	-25.26	0.0546
4900	7.29	2.3141	6.50	2.1137	3.64	1.5197	-3.67	0.6554	-25.58	0.0526
4950	7.13	2.2721	6.34	2.0744	3.46	1.4890	-3.88	0.6394	-25.91	0.0506

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km) for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
5000	6.97	2.2313	6.18	2.0362	3.28	1.4591	-4.10	0.6239	-26.23	0.0488
5050	6.81	2.1914	6.02	1.9989	3.11	1.4300	-4.31	0.6089	-26.56	0.0470
5100	6.66	2.1526	5.86	1.9626	2.93	1.4017	-4.52	0.5943	-26.88	0.0453
5150	6.51	2.1147	5.70	1.9272	2.76	1.3741	-4.73	0.5802	-27.19	0.0437
5200	6.35	2.0778	5.54	1.8927	2.59	1.3473	-4.94	0.5665	-27.51	0.0421
5250	6.20	2.0418	5.39	1.8591	2.42	1.3212	-5.14	0.5532	-27.83	0.0406
5300	6.05	2.0067	5.23	1.8263	2.25	1.2958	-5.35	0.5404	-28.14	0.0392
5350	5.90	1.9724	5.08	1.7943	2.08	1.2711	-5.55	0.5279	-28.45	0.0378
5400	5.75	1.9389	4.93	1.7631	1.92	1.2470	-5.75	0.5157	-28.76	0.0365
5450	5.60	1.9063	4.77	1.7326	1.75	1.2235	-5.95	0.5040	-29.06	0.0352
5500	5.46	1.8744	4.62	1.7029	1.59	1.2006	-6.15	0.4925	-29.37	0.0340
5550	5.31	1.8433	4.47	1.6739	1.42	1.1783	-6.35	0.4814	-29.67	0.0328
5600	5.17	1.8129	4.33	1.6456	1.26	1.1565	-6.55	0.4706	-29.97	0.0317
5650	5.02	1.7832	4.18	1.6180	1.10	1.1353	-6.74	0.4602	-30.27	0.0306
5700	4.88	1.7542	4.03	1.5909	0.94	1.1146	-6.94	0.4500	-30.57	0.0296
5750	4.74	1.7259	3.89	1.5646	0.78	1.0944	-7.13	0.4401	-30.87	0.0286
5800	4.60	1.6982	3.74	1.5388	0.63	1.0747	-7.32	0.4304	-31.16	0.0277
5850	4.46	1.6711	3.60	1.5136	0.47	1.0555	-7.51	0.4211	-31.46	0.0267
5900	4.32	1.6446	3.46	1.4890	0.31	1.0367	-7.70	0.4120	-31.75	0.0259
5950	4.18	1.6187	3.32	1.4649	0.16	1.0184	-7.89	0.4031	-32.04	0.0250
6000	4.05	1.5934	3.18	1.4414	0.00	1.0005	-8.08	0.3945	-32.33	0.0242
6050	3.91	1.5686	3.04	1.4184	-0.15	0.9831	-8.27	0.3861	-32.62	0.0234
6100	3.78	1.5444	2.90	1.3959	-0.30	0.9660	-8.45	0.3780	-32.90	0.0226
6150	3.64	1.5207	2.76	1.3739	-0.45	0.9494	-8.63	0.3700	-33.19	0.0219

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
6200	3.51	1.4975	2.62	1.3524	-0.60	0.9331	-8.82	0.3623	-33.47	0.0212
6250	3.37	1.4748	2.49	1.3314	-0.75	0.9172	-9.00	0.3548	-33.75	0.0205
6300	3.24	1.4525	2.35	1.3108	-0.90	0.9017	-9.18	0.3475	-34.03	0.0199
6350	3.11	1.4308	2.22	1.2906	-1.05	0.8865	-9.36	0.3403	-34.31	0.0193
6400	2.98	1.4095	2.08	1.2709	-1.19	0.8717	-9.54	0.3334	-34.59	0.0186
6450	2.85	1.3886	1.95	1.2515	-1.34	0.8571	-9.72	0.3266	-34.86	0.0181
6500	2.72	1.3682	1.82	1.2326	-1.48	0.8429	-9.90	0.3200	-35.14	0.0175
6550	2.59	1.3481	1.69	1.2141	-1.63	0.8291	-10.07	0.3135	-35.41	0.0170
6600	2.47	1.3285	1.55	1.1960	-1.77	0.8155	-10.25	0.3073	-35.68	0.0164
6650	2.34	1.3093	1.42	1.1782	-1.91	0.8022	-10.42	0.3012	-35.95	0.0159
6700	2.21	1.2905	1.29	1.1608	-2.06	0.7892	-10.60	0.2952	-36.22	0.0154
6750	2.09	1.2720	1.17	1.1437	-2.20	0.7765	-10.77	0.2894	-36.49	0.0150
6800	1.97	1.2539	1.04	1.1270	-2.34	0.7641	-10.94	0.2837	-36.76	0.0145
6850	1.84	1.2362	0.91	1.1106	-2.48	0.7519	-11.11	0.2782	-37.02	0.0141
6900	1.72	1.2188	0.78	1.0946	-2.62	0.7400	-11.28	0.2728	-37.29	0.0137
6950	1.60	1.2017	0.66	1.0788	-2.75	0.7283	-11.45	0.2675	-37.55	0.0133
7000	1.47	1.1850	0.53	1.0634	-2.89	0.7169	-11.62	0.2624	-37.82	0.0129
7050	1.35	1.1686	0.41	1.0483	-3.03	0.7057	-11.79	0.2573	-38.08	0.0125
7100	1.23	1.1525	0.29	1.0334	-3.16	0.6947	-11.96	0.2524	-38.34	0.0121
7150	1.11	1.1367	0.16	1.0189	-3.30	0.6840	-12.12	0.2477	-38.60	0.0118
7200	0.99	1.1212	0.04	1.0046	-3.43	0.6735	-12.29	0.2430	-38.85	0.0114
7250	0.88	1.1060	-0.08	0.9906	-3.57	0.6632	-12.45	0.2384	-39.11	0.0111
7300	0.76	1.0911	-0.20	0.9769	-3.70	0.6531	-12.62	0.2340	-39.37	0.0108
7350	0.64	1.0765	-0.32	0.9634	-3.83	0.6432	-12.78	0.2296	-39.62	0.0104

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

Page 7 of 8

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
7400	0.52	1.0621	-0.44	0.9502	-3.97	0.6335	-12.94	0.2254	-39.87	0.0101
7450	0.41	1.0480	-0.56	0.9372	-4.10	0.6240	-13.10	0.2212	-40.13	0.0099
7500	0.29	1.0341	-0.68	0.9245	-4.23	0.6147	-13.26	0.2172	-40.38	0.0096
7550	0.18	1.0205	-0.80	0.9120	-4.36	0.6055	-13.42	0.2132	-40.63	0.0093
7600	0.06	1.0072	-0.92	0.8997	-4.49	0.5966	-13.58	0.2093	-40.88	0.0090
7650	-0.05	0.9941	-1.03	0.8877	-4.62	0.5878	-13.74	0.2055	-41.12	0.0088
7700	-0.16	0.9812	-1.15	0.8759	-4.74	0.5792	-13.90	0.2018	-41.37	0.0085
7750	-0.28	0.9685	-1.27	0.8643	-4.87	0.5707	-14.06	0.1982	-41.62	0.0083
7800	-0.39	0.9561	-1.38	0.8529	-5.00	0.5625	-14.21	0.1947	-41.86	0.0081
7850	-0.50	0.9439	-1.50	0.8417	-5.12	0.5543	-14.37	0.1912	-42.11	0.0078
7900	-0.61	0.9319	-1.61	0.8307	-5.25	0.5464	-14.53	0.1878	-42.35	0.0076
7950	-0.72	0.9201	-1.73	0.8198	-5.38	0.5385	-14.68	0.1845	-42.59	0.0074
8000	-0.83	0.9085	-1.84	0.8092	-5.50	0.5309	-14.83	0.1813	-42.84	0.0072
8050	-0.94	0.8971	-1.95	0.7988	-5.62	0.5233	-14.99	0.1781	-43.08	0.0070
8100	-1.05	0.8859	-2.06	0.7885	-5.75	0.5159	-15.14	0.1750	-43.32	0.0068
8150	-1.16	0.8749	-2.18	0.7785	-5.87	0.5087	-15.29	0.1720	-43.55	0.0066
8200	-1.27	0.8641	-2.29	0.7686	-5.99	0.5016	-15.44	0.1690	-43.79	0.0065
8250	-1.38	0.8535	-2.40	0.7588	-6.12	0.4946	-15.59	0.1661	-44.03	0.0063
8300	-1.48	0.8430	-2.51	0.7493	-6.24	0.4877	-15.74	0.1632	-44.27	0.0061
8350	-1.59	0.8327	-2.62	0.7399	-6.36	0.4810	-15.89	0.1604	-44.50	0.0060
8400	-1.70	0.8226	-2.73	0.7306	-6.48	0.4743	-16.04	0.1577	-44.74	0.0058
8450	-1.80	0.8127	-2.83	0.7215	-6.60	0.4678	-16.19	0.1550	-44.97	0.0056
8500	-1.91	0.8029	-2.94	0.7126	-6.72	0.4615	-16.34	0.1524	-45.20	0.0055
8550	-2.01	0.7933	-3.05	0.7038	-6.84	0.4552	-16.49	0.1499	-45.43	0.0053

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

DIST-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
8600	-2.12	0.7838	-3.16	0.6952	-6.95	0.4490	-16.63	0.1474	-45.66	0.0052
8650	-2.22	0.7745	-3.26	0.6867	-7.07	0.4430	-16.78	0.1449	-45.89	0.0051
8700	-2.32	0.7653	-3.37	0.6783	-7.19	0.4370	-16.92	0.1425	-46.12	0.0049
8750	-2.43	0.7563	-3.48	0.6701	-7.31	0.4312	-17.07	0.1401	-46.35	0.0048
8800	-2.53	0.7474	-3.58	0.6620	-7.42	0.4254	-17.21	0.1378	-46.58	0.0047
8850	-2.63	0.7387	-3.69	0.6540	-7.54	0.4198	-17.36	0.1356	-46.81	0.0046
8900	-2.73	0.7301	-3.79	0.6462	-7.65	0.4142	-17.50	0.1334	-47.03	0.0044
8950	-2.83	0.7216	-3.90	0.6385	-7.77	0.4088	-17.64	0.1312	-47.26	0.0043
9000	-2.93	0.7133	-4.00	0.6309	-7.88	0.4034	-17.78	0.1291	-47.48	0.0042
9050	-3.03	0.7051	-4.10	0.6235	-8.00	0.3982	-17.93	0.1270	-47.71	0.0041
9100	-3.13	0.6970	-4.21	0.6161	-8.11	0.3930	-18.07	0.1249	-47.93	0.0040
9150	-3.23	0.6891	-4.31	0.6089	-8.23	0.3879	-18.21	0.1229	-48.15	0.0039
9200	-3.33	0.6813	-4.41	0.6018	-8.34	0.3829	-18.35	0.1210	-48.38	0.0038
9250	-3.43	0.6736	-4.51	0.5948	-8.45	0.3780	-18.49	0.1190	-48.60	0.0037
9300	-3.53	0.6660	-4.61	0.5879	-8.56	0.3731	-18.63	0.1171	-48.82	0.0036
9350	-3.63	0.6585	-4.72	0.5811	-8.67	0.3684	-18.76	0.1153	-49.04	0.0035
9400	-3.73	0.6511	-4.82	0.5744	-8.79	0.3637	-18.90	0.1135	-49.26	0.0034
9450	-3.82	0.6439	-4.92	0.5678	-8.90	0.3591	-19.04	0.1117	-49.47	0.0034
9500	-3.92	0.6368	-5.02	0.5613	-9.01	0.3546	-19.18	0.1099	-49.69	0.0033
9550	-4.02	0.6297	-5.12	0.5549	-9.12	0.3501	-19.31	0.1082	-49.91	0.0032
9600	-4.11	0.6228	-5.21	0.5486	-9.23	0.3457	-19.45	0.1065	-50.12	0.0031
9650	-4.21	0.6160	-5.31	0.5424	-9.33	0.3414	-19.59	0.1049	-50.34	0.0030
9700	-4.30	0.6092	-5.41	0.5363	-9.44	0.3372	-19.72	0.1033	-50.55	0.0030
9750	-4.40	0.6026	-5.51	0.5303	-9.55	0.3330	-19.86	0.1017	-50.77	0.0029
9800	-4.49	0.5961	-5.61	0.5244	-9.66	0.3289	-19.99	0.1001	-50.98	0.0028
9850	-4.59	0.5896	-5.70	0.5186	-9.77	0.3248	-20.12	0.0986	-51.19	0.0028
9900	-4.68	0.5833	-5.80	0.5128	-9.87	0.3209	-20.26	0.0971	-51.41	0.0027
9950	-4.78	0.5770	-5.90	0.5072	-9.98	0.3169	-20.39	0.0956	-51.62	0.0026
10000	-4.87	0.5709	-5.99	0.5016	-10.09	0.3131	-20.52	0.0942	-51.83	0.0026

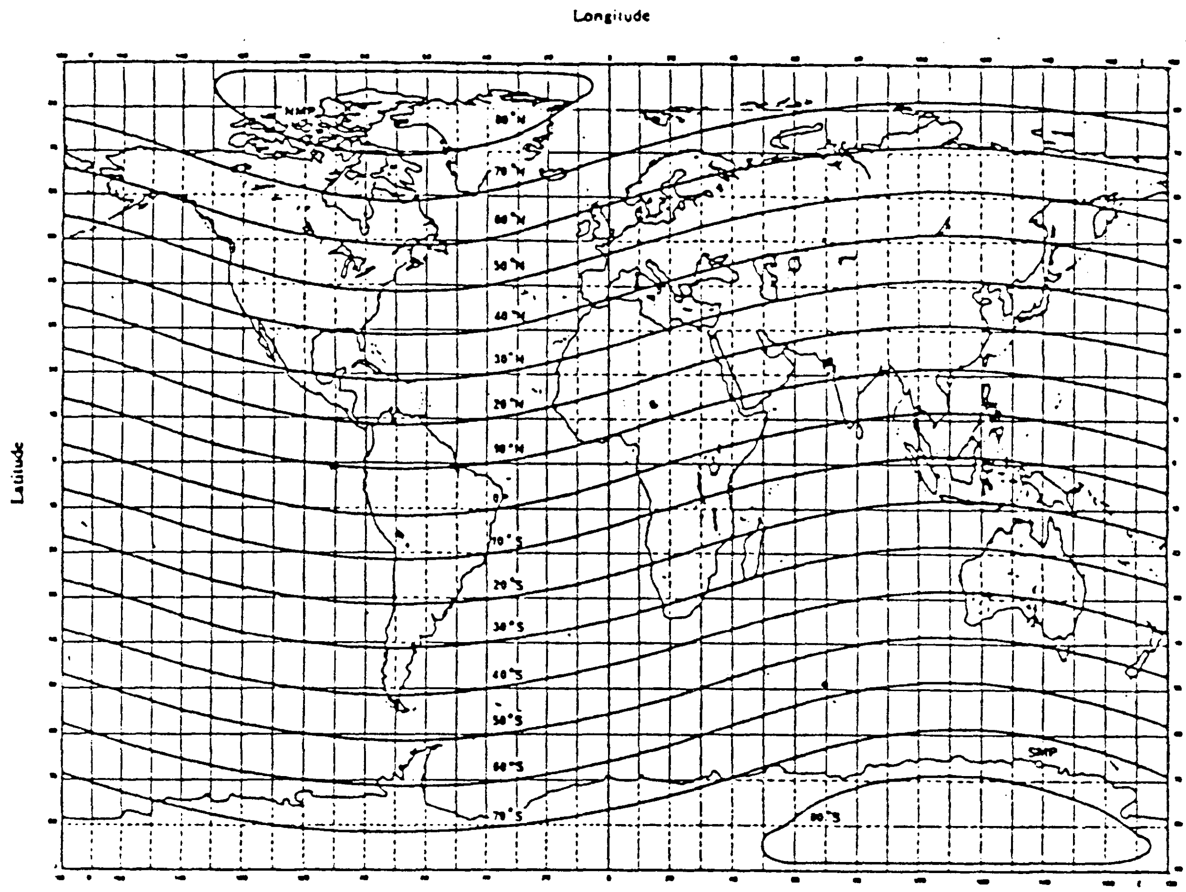


FIGURE 2

Geomagnetic latitudes

Pro. Mem.

Text left pending in Document 72, page R.1/1 until the results of the work of Committee 5 are known.

[1.1.2 Objectionable interference

Interference caused by a signal exceeding the maximum permissible field strength within the [protected contour], in accordance with the values derived from [ ].]

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 91-E
25 April 1986
Original: Spanish

COMMITTEE 3

NOTE FROM COMMITTEE 4 TO COMMITTEE 3

Committee 4 having completed its work, it has not planned any further activities with any effect on the budget of the Union.

M.L. PIZARRO
Chairman of Committee 4

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 92-E
25 April 1986
Original: Spanish

COMMITTEE 2

SECOND REPORT OF THE WORKING GROUP OF COMMITTEE 2 (CREDENTIALS)

The Working Group of Committee 2 met on 25 April 1986. It examined the credentials of the following delegations :

(In French alphabetical order)

United States of America
France
Trinidad and Tobago

The credentials of these delegations were all found to be in order.

S.E. MONTANARO CANZANO
Chairman of Working Group C2-A

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 93-E
25 April 1986

B.5

PLENARY MEETING

5th SERIES OF TEXTS SUBMITTED BY THE EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Document	Title
COM.4	77	Chapter 1 - Sections 1.1.14 to 1.1.17, 1.2
	63	Chapter 3 - Sections 3.6 and 3.7
COM.5	75	Chapter 6 - Section 6.1
COM.4	77	Recommendation COM4/A
COM.5	DT/23	Recommendation COM5/A
COM.5	DT/22	Resolution COM5/1

P. PERRICHON
Chairman of Committee 6

Annex: 8 pages

Note by the Chairman of Committee 4 - The delegate of Cuba reserved his position concerning the nominal usable field strength daytime in Noise Zone 1 (section 3.6).

[CHAPTER 1]

1.1.14 Skywave field strength, 50% of the time

The skywave field strength during the reference hour which is exceeded for 50% of the nights of the year. The reference hour is the period of one hour beginning one and a half hours after sunset and ending two and a half hours after sunset at the midpoint of the short great-circle path.

1.1.15 Characteristic field strength (E_c)

The field strength, at a reference distance of 1 km in a horizontal direction, of the groundwave propagated along perfectly conducting ground for 1 kW station power, taking into account losses in a real antenna.

Note 1 - The gain (G) of the transmitting antenna relative to an ideal short vertical antenna is given in dB by the equation:

$$G = 20 \log \frac{E_c}{300} \qquad (1)$$

where:

E_c is expressed in mV/m.

Note 2 The effective monopole radiated power (e.m.r.p.) is given in dB (kW) by the following equation:

$$e.m.r.p. = 10 \log P_t + G \qquad (2)$$

where:

P_t: station power (kW).

1.1.16 Allotment

Entry in the Plan of a designated broadcasting channel for use by an administration for the broadcasting service in an allotment area under the conditions specified in the [Plan and/or Agreement]. Each allotment included in the Plan may be used for one or more assignments using the technical criteria specified in [A].

1.1.17 Allotment area

Specifically defined geographical area within a country to which one or more channels are allotted.

1.2 Symbols and units

Hz:	hertz
kHz:	kilohertz
W:	watt
kW:	kilowatt
mV/m:	millivolt/metre
μV/m:	microvolt/metre
dB:	decibel
dB(μV/m):	decibels with respect to 1 μV/m
dB(kW):	decibels with respect to 1 kW
mS/m:	millisiemens/metre

/ CHAPTER 3 /

3.6 Nominal usable field strength

Table of nominal usable field strength

	Noise zone 1	Noise zone 2
Daytime	0.5 mV/m	1.25 mV/m
Night-time	3.3 mV/m	6 mV/m

3.7 *Definition of noise zones*

Noise zone 1

Comprises the whole of Region 2 with the exception of noise zone 2.

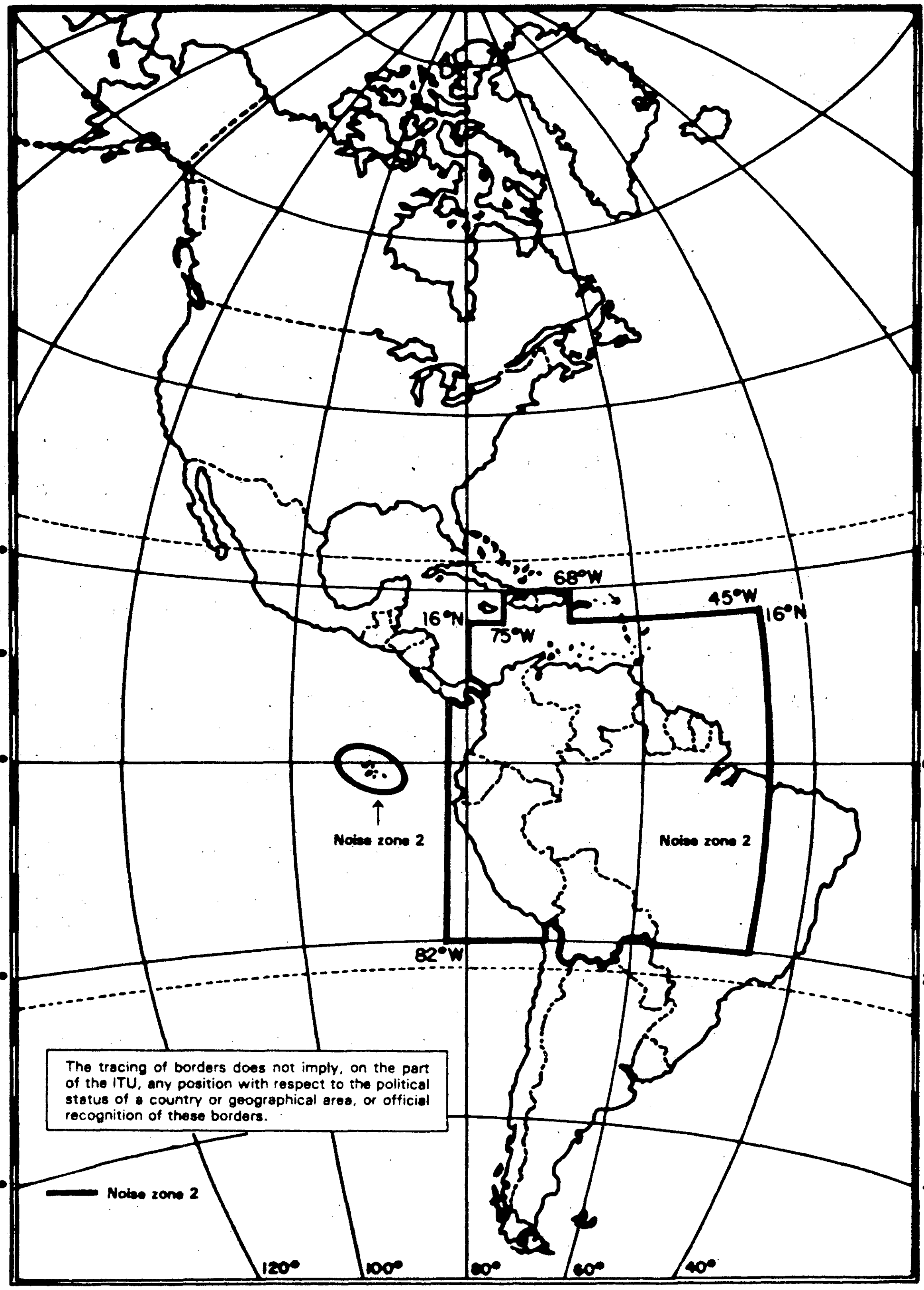
Noise zone 2

Comprises the area within the line defined by the coordinates 20° S-45° W, the meridian 45° W to the coordinates 16° N-45° W, the parallel 16° N to the coordinates 16° N-68° W, the meridian 68° W to the coordinates 20° N-68° W, the parallel 20° N to the coordinates 20° N-75° W, the meridian 75° W to the coordinates 16° N-75° W, the parallel 16° N to the coordinates 16° N-80° W, the meridian 80° W to the northeast coast of Panama, the frontier between Panama and Colombia, the southeast coast of Panama and the meridian 82° W to the parallel 20° S, and the parallel 20° S, with the exception of Chile and Paraguay, until the frontier between Paraguay and Brazil until 45° W. Bolivia is entirely included in noise zone 2 as are the archipelago of San Andrés y Providencia and the islands belonging to Colombia and the Colon archipelago or the Galapagos Islands (Ecuador).

Note 1. – Grenada is included in noise zone 1 night-time and noise zone 2 daytime.

Note 2. – See the maps of noise zones on the following page.

NOISE ZONES



20°
10°
0°
20°
40°
68°W
45°W
16°N
16°N
75°W
82°W
Noise zone 2
Noise zone 2
The tracing of borders does not imply, on the part of the ITU, any position with respect to the political status of a country or geographical area, or official recognition of these borders.
Noise zone 2
120°
100°
80°
60°
40°

CHAPTER 6 - PLANNING

6.1 Basis for planning

The Plan for the broadcasting service in Region 2 in the band 1 605 - 1 705 kHz is based on the following principles:

a) the Plan for the broadcasting service shall contain allotments and may contain assignments;

b) the Plan shall not be based on requirements submitted by administrations;

c) the Allotment Plan shall be established without taking into account the stations of other services;

d) an allotment area is determined on the basis of the standardized distance(s) specified in Table [B];

e) where the separation distance between an allotment area of one administration and those of a number of other administrations is less than the standardized distance(s), the minimum number of channels allotted to that area will depend on the number of administrations involved as indicated in Table [C];

f) where the separation distance between an allotment area of one administration and those of all other administrations is greater than the appropriate standardized distance, all ten channels are allotted to that area;

g) the Plan will be based on the use of standardized parameters. However, the possibility should be left open for a group of countries to decide subregionally to develop, at the Conference, part of the Plan, consistent with the Regional Plan, based on a transmitter power less than the standardized parameter;

h) an administration may make assignments on channels not allotted to it in a given allotment area provided that it protects the allotments and assignments of other countries in accordance with Annex [ ]. Such assignments shall not restrict use of allotments which complies with standardized parameters;

i) where neighbouring countries have allotments on adjacent channels, the procedures to be followed before bringing into use assignments from allotments in border areas are specified in [Chapter D];

j) administrations may bring into use assignments with parameters different from the standardized parameters provided the conditions given in [E] are met;

k) administrations so wishing may convert their allotments into assignments at the Second Session using the specified planning criteria; these assignments will also appear in the Plan;

l) for the case mentioned in k) above, where neighbouring countries have allotments in adjacent channels, the procedures referred to in i) must be followed.

RECOMMENDATION COM4/A

Relationship Between Physical and Electrical Antenna Height

The Regional Administrative Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

that information relating to the relationship between physical antenna height and electrical antenna height would be useful to all administrations when establishing assignments in the 1 605 - 1 705 kHz band;

recommends administrations in Region 2

within the limits of their possibilities, to carry out measurements to define this relationship and submit the relevant data to the CCIR Study Group concerned taking into account the CCIR work schedule;

requests the CCIR

a) to prepare, on the basis of the contributions submitted, a report to the second session of the Conference;

b) to carry out these studies as part of the normal work of the CCIR Study Groups.

RECOMMENDATION COM5/A

Use of the Band 1 605 - 1 705 kHz in Region 2 by the Non-Broadcasting Services and the Development and Implementation of the Region 2 Broadcasting Plan

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva 1986),

<u>considering</u>

a) that under No. 481, and the Table of Frequency Allocations in Article 8 of the Radio Regulations and until a date to be decided by the second session, the band 1 605 - 1 705 kHz is allocated to the fixed, mobile and aeronautical radionavigation services on a primary basis and to the radiolocation service on a secondary basis.

b) that under No. 481, and the Table of Frequency Allocations in Article 8 of the Radio Regulations and from a date to be decided by the second session, the band 1 605 - 1 625 kHz is allocated exclusively to the broadcasting service, and the band 1 625 - 1 705 kHz is allocated to the broadcasting service on a primary basis, to the fixed and mobile services on a permitted basis, and to the radiolocation service on a secondary basis

c) that the operation of non-broadcasting services in this band by the Region 2 administrations might hinder the implementation of the Plan for the broadcasting service in the band 1 605 - 1 705 kHz;

<u>recommends</u>

a) that the Region 2 administrations shall henceforth refrain from assigning frequencies in the band 1 625 - 1 705 kHz to their stations in the non-broadcasting service when this might inhibit the implementation of the Plan;

b) that, when using frequencies in the band 1 605 - 1 705 kHz for stations in the non-broadcasting services, administrations shall take all necessary steps to ensure that the full implementation of the Plan adopted by the Conference is not compromised.

RESOLUTION COM5/1

Updating of the Master International Frequency Register with Regard to Assignments to Stations of the Fixed, Mobile, Aeronautical Radionavigation and Radiolocation Services in the Frequency Band 1 605 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva 1986),

considering

a) that under No. 481 and the Table of Frequency Allocations in Article 8 of the Radio Regulations and until a date to be decided by the second session, the band 1 605 - 1 705 kHz is allocated to the fixed, mobile and aeronautical radionavigation services on a primary basis and to the radiolocation service on a secondary basis;

b) that under No. 481 and the Table of Frequency Allocations in Article 8 of the Radio Regulations and from a date to be decided by the second session, the band 1 605 - 1 625 kHz is allocated exclusively to the broadcasting service, and the band 1 625 - 1 705 kHz is allocated to the broadcasting service on a primary basis, to the fixed and mobile services on a permitted basis, and to the radiolocation service on a secondary basis;

c) that the planning of the band shall be based upon allotment and that the exact location and characteristics of broadcasting stations are not known;

d) that it is impractical to assess compatibility between the allotments in the Plan and assignments to the other services to which the band is also allocated;

e) that, in view of the difficulties involved in evaluating compatibility between allotments in the Plan and assignments to other services, the Conference established a Plan without taking into account existing stations of the non-broadcasting services;

f) Recommendation COM5/A;

resolves

1. that, within 90 days of the end of the first session of this Conference, the IFRB shall send to each administration of Region 2 the list of assignments to its stations of the fixed, mobile, aeronautical radionavigation and radiolocation services recorded in the Master Register in the bands concerned, requesting them to review these assignments with a view to cancelling those which are no longer in use;

2. that administrations shall, within a period of 90 days following the receipt of the list referred to in paragraph 1 above, return the copy of the list indicating the assignments to be deleted from the Master Register as well as such modifications to other assignments as will assist in implementing the Broadcasting Plan;

3. that administrations wishing to maintain in operation non-broadcasting stations in application of [paragraph*] shall indicate the estimated date on which the station in question will cease operation.

4. that the IFRB shall submit a report to the second session of the Conference on all deletions (including the deletion date referred to in paragraph 3 above) of and modifications to assignments to non-broadcasting stations in the band 1 605 - 1 705 kHz recorded in the Master Register on behalf of Region 2 administrations.

urges administrations

1. having assignments in the fixed, mobile, aeronautical radionavigation and/or radiolocation services which are potentially incompatible with the Plan to take all necessary steps to eliminate the potential incompatibility in view of the fact that, in general, the non-broadcasting services have more flexibility to modify their characteristics, including the frequency;

2. to take all possible action with a view to achieving the objectives of this Resolution;

requests the IFRB

1. to send Recommendation COM5/A to Region 2 administrations not present at the first session of the Conference and to request them to apply the procedures included in it;

2. to provide all administrations with all the necessary assistance in the implementation of the provisions of this Resolution.

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* Note by Committee 5 - The reference to the part of the report which will contain the text currently set out in section 2 of Document DT/11 (see also Document 70) must be added at a later stage.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 94-E
25 April 1986
Original: English

COMMITTEE 6

Source: Documents DT/25 and DT/26

FIRST SERIES OF TEXTS FROM THE WORKING GROUP OF THE PLENARY TO THE EDITORIAL COMMITTEE

The texts set out in Documents DT/25 and DT/26 have been modified and adopted by the Working Group of the Plenary and are submitted to the Editorial Committee.

E.D. DuCHARME
Chairman of the Working Group
of the Plenary

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 95-E
26 April 1986
Original: English

COMMITTEE 5

REPORT OF THE WORKING GROUP 5-B

The Group held five meetings and the results of its deliberations are attached as:

- a draft Regional Agreement for the use of the band 1 605 - 1 705 kHz in Region 2;
- a Recommendation relating to the incorporation into the Radio Regulations of the allotment plan and the associated provisions for the broadcasting service in the band 1 605 - 1 705 kHz in Region 2.

The delegate of Cuba reserved the right to raise the issue, at Committee 5 or Plenary level, of the competence of the Conference to deal with matters other than the broadcasting service in the band 1 605 - 1 705 kHz.

With this report, the Group has concluded the work entrusted to it by Committee 5. I wish to take this opportunity to specially thank Mr. J. David, the Chairman of Sub-Working Group 5-B-Drafting and those who participated with him in the drafting work.

J. LUSSIO
Chairman of Working Group 5-B

Attachments

In considering the guidelines for the Agreement, it was concluded these could best be represented by a possible draft Regional Agreement which would be included in the report.

REGIONAL AGREEMENT FOR THE USE OF THE
BAND 1 605 - 1 705 kHz IN REGION 2

PREAMBLE

Noting No. 480 of the Radio Regulations, which provides:

"In Region 2, the use of the band 1 605 - 1 705 kHz by stations of the broadcasting service shall be subject to a plan to be established by a regional administrative radio conference ...";

fully respecting the sovereign right of each country to regulate within its territory the use of the frequency band 1 605 - 1 705 kHz, and to reach special arrangements regarding such service with such countries as it may consider appropriate, without prejudice to other administrations;

seeking to facilitate mutual understanding and cooperation among the Members of Region 2 in achieving a satisfactory broadcasting service in the medium-frequency band 1 605 - 1 705 kHz;

recognizing that all countries have equal rights, and that, in the application of the Plan and its Provisions, the needs of each country, in particular those of developing countries, shall be fulfilled as far as possible, and

acknowledging that the protection of each other's broadcasting service is a major objective for all countries, in order to bring about better coordination and the use of more efficient facilities;

the delegates of the Members of the International Telecomunication Union meeting in [Geneva] at a regional administrative conference convened under the provisions of the International Telecommunication Convention (Nairobi 1982), have adopted, subject to approval by the competent authorities of their respective countries, the following provisions relating to the broadcasting service in Region 2 for the frequency band between 1 605 and 1 705 kHz.

ARTICLE 1

Definitions

For the purposes of the Agreement, the following terms shall have the meanings defined below.

Union: The International Telecommunication Union.

Secretary-General: The Secretary-General of the Union.

IFRB: The International Frequency Registration Board.

CCIR: The International Radio Consultative Committee.

Convention: The International Telecommunication Convention.

Radio Regulations: The Radio Regulations supplementing the provisions of the Convention.

Region 2: The geographical area defined in No. 394 of the Radio Regulations, Geneva, 1979.

Master Register: The Master International Frequency Register.

Provisions: The Provisions adopted herein that are associated with the Plan.

Agreement: This Agreement and its Annexes.

Plan: The Allotment Plan in [Annex] and the associated provisions[1].

Administration: Any governmental department or service responsible for discharging the obligations undertaken in the Convention and the RR.

Contracting Member: Any member of the Union which has approved the Agreement or acceded to it.

Affected Administration: An administration within whose territory the signal of a proposed assignment of another administration exceeds that prescribed in [ ].

An allotment is an entry in the plan of a designated broadcasting channel for use by an administration for the broadcasting service in an allotment area under the conditions specified in the Agreement. Each allotment included in the Plan may be used for one or more assignments using the technical criteria specified in [A].

An allotment area is a specifically defined geographical area within a country to which one or more channels are allotted.

---

1 The allotments may be converted into assignments and this will appear as Part B of the Plan.

ARTICLE 2

Frequency Band

The provisions of the Agreement shall apply to the frequency band 1 605 - 1 705 kHz as allocated to Region 2 under Article 8 of the Radio Regulations.

ARTICLE 3

Execution of the Agreement

3.1 The Contracting Members shall adopt for their stations in Region 2 in the frequency band which is the subject of the Agreement the technical characteristics and standards which are in conformity with the Agreement.

3.2 The Contracting Members shall not bring into use frequency assignments, except under the conditions set out in Article 4 of the Agreement.

[3.3 The Contracting Members undertake to study and, in common agreement and to the extent possible, to put into practice the measures necessary to avoid or to reduce any harmful or objectionable interference that might result from the application of the Agreement.]

[3.3 The Contracting Members undertake, to the extent possible, to avoid or to reduce any harmful or objectionable interference.]

ARTICLE 4

Implementation of the Plan and Notification of Frequency Assignments in the Broadcasting Service

4.1 Assignments corresponding to an allotted channel*

4.1.1. An administration may at any time, without the need for coordination, make assignments corresponding to any of its allotments, at one or more locations within the respective allotment area, provided that:

4.1.1.1 - its characteristics are within the standardized parameters given in Annex [A];

4.1.1.2 - where necessary, the coordination required for protection of adjacent channels has been successfully concluded (Annex [B]); and

* Depending on separation distances used in preparing the allotment plan, there may be a need for coordination procedures involved in bringing into use of an assignment corresponding to an allotment.

4.1.1.3 - the criteria of [ ] are met in cases where its characteristics exceed the values of the standardized parameters.

4.2 <u>Assignments corresponding to channels not allotted to the area</u>

4.2.1 An administration may at any time, without the need for coordination, make an assignment on a channel not allotted to it provided its characteristics satisfy the criteria set forth in Annex [A] with respect to:

4.2.1.1 - the use of the channel or channels by the administration(s) to which it is allotted in the Plan; and

4.2.1.2 - any broadcasting station of another administration of Region 2 previously recorded in the Master Register with a favourable finding.

4.2.2 An administration may make an assignment on a channel not allotted to it or with the characteristics which do not satisfy the conditions set forth in 4.2.1.1 and 4.2.1.2 provided such use has been successfully coordinated with the affected administration(s).

4.3 When an administration proposes to bring into use an assignment in conformity with the Agreement, it shall notify it to the IFRB in accordance with the provisions of Article 12 of the Radio Regulations. Any such assignment recorded in the Master Register as a result of application of the provisions of Article 12 of the Radio Regulations shall bear a special symbol under the Remarks Column and a date in Column 2a or in Column 2b.

4.4 Whenever the IFRB receives an assignment notice which is not in conformity with the Agreement, it shall return the notice to the notifying administration.

4.5 If the notifying administration resubmits the notice with or without modification and insists on its reconsideration and if the Board's finding remains unfavourable, the notice is returned to the notifying administration.

ARTICLE 5

Special Arrangements

In order to supplement the procedures provided for under these Provisions, or to facilitate the coordination foreseen by Article 4, administrations may conclude or continue special arrangements in conformity with the applicable provisions of the Convention and the Radio Regulations.

ARTICLE 6

<u>Part A</u>: consists of the allotments in the Region-wide allotment plan.

<u>Part B</u>: consists of the assignments to be developed at the Second Session by administrations seeking to convert their allotments to assignments.

ARTICLE 7

Scope of Application of the Agreement

7.1 The Agreement is binding upon the Contracting Members in their mutual relations, but not in their relations with non-contracting countries.

7.2 Should a Contracting Member make reservations on the application of any provision of the Agreement, the other Contracting Members shall be free to disregard that provision in their relations with the Member that has made the reservations.

ARTICLE 8

Approval of the Agreement

The signatory Members shall notify the Secretary-General of their approval of this Agreement as soon as possible by depositing an instrument of approval; the Secretary-General shall immediately inform the other Members of the Union.

ARTICLE 9

Accession to the Agreement

9.1 Any Member of the Union in Region 2 which has not signed the Agreement may at any time deposit an instrument of accession with the Secretary-General, who shall immediately inform the other Members of the Union. Accession shall apply to the Plan as it stands at the time of accession and shall be made without reservations.

9.2 Accession to the Agreement shall become effective on the date on which the instrument of accession is received by the Secretary-General.

ARTICLE 10

Denunciation of the Agreement

10.1 Any Contracting Member may denounce the Agreement at any time by a notification sent to the Secretary-General, who shall inform the other Members of the Union.

10.2 Denunciation shall become effective one year after the date on which the Secretary-General receives the notification of denunciation.

ARTICLE 11

Entry into Force of the Agreement

The Agreement shall enter into force on [ ] at 0800 hours UTC.

ARTICLE 12

Duration of the Agreement

The Agreement shall remain in force until revised by a competent administrative radio conference.

RECOMMENDATION COM5/B

Relating to the Incorporation into the Radio Regulations of the Allotment Plan and the Associated Provisions for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

a) that, on the basis of RR480 of the Radio Regulations, the Conference was empowered to establish a plan for all the Region;

b) that the Conference decided to prepare such a plan on the basis of objective criteria equally applied to all the countries of the Region;

c) that the plan will be an allotment plan limited to a channelling arrangement, the delimitation of the allotment areas and standardized parameters;

d) that the standardized parameters adopted for the establishment of the plan should not lead to any inter-regional difficulties between the services to which the band is allocated;

e) Recommendation No. PLEN/... relating to the agenda of the Second Session of this Conference;

recommends the Administrative Council place on the agenda of an appropriate World Administrative Radio Conference, preferably the Second Session of the WARC-ORB in 1988;

1.1 the consideration of consequential changes to RR480 and RR481 of Article 8 of the Radio Regulations in this frequency band in Region 2;

1.2 the consideration of the question of incorporation into the Radio Regulations in the appropriate form the Allotment Plan and the associated provisions to be prepared for the Broadcasting Service in the band 1 605 - 1 705 kHz in Region 2.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Addendum 2 to
Document 96-E
28 April 1986
Original: English

COMMITTEE 5

NOTE FROM THE CHAIRMAN OF WORKING GROUP 5-A

3.9 Application of protection criteria from assignments on non-allotted channels

3.9.1 Protection of allotments

The signal strengths to be protected are the appropriate values of nominal usable field strength shown in section 3.6. [The area to be protected is the border of an allotment area.]

The maximum permitted interfering field strength within the area is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the interfering signal considered is the greater of the groundwave or skywave signal. In all other cases, only groundwave interference is considered.

The effect of each interfering signal should be evaluated separately, and the presence of interference from other stations in excess of this permissible level should not reduce the necessity to limit the interference which would result from proposed modifications or assignments.

3.9.2 Protection of assignments on non-allotted channels

Assignments on non-allotted channels are protected from subsequent assignments on non-allotted channels. The protected contour encompasses the area in which the groundwave field strength is equal to or greater than the appropriate value of E_{nom} according to section 3.6.

The maximum permitted interfering field strength within the area is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the interfering signal considered is the greater of the groundwave or skywave signal. In all other cases, only groundwave interference is considered.

The effect of each interfering signal should be evaluated separately and the presence of interference from other stations in excess of this permissible level should not reduce the necessity to limit the interference which would result from proposed modifications or assignments.

Where the protected contour would extend beyond the boundary of the country in which the station is located, the maximum permissible interfering groundwave field strength at the boundary is the calculated field strength of the protected station along the boundary divided by the protection ratio.

7.4 Protection considerations

[7.4.1 Protecting allotments from assignments on allotted channels

Assignments on co-channel allotments are considered to be compatible one with the other when they are brought into use in accordance with 7.3.]

7.4.2 Protecting allotments from assignments on non-allotted channels

The criteria set out in 3.9.1 apply in this case.

7.4.3 Protecting assignments on unallotted channels from assignments on allotted channels

Assignments on unallotted channels receive protection from assignments on allotted channels only to the extent that the latter must operate within the criteria set out in 7.3.

7.4.4 Protecting assignments on unallotted channels from other assignments on unallotted channels

The criteria set out in 3.9.2 apply in this case.

R. ZEITOUN
Chairman of Working Group 5-A

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Addendum 1 to
Document 96-E
28 April 1986
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COMMITTEE 5

NOTE FROM CHAIRMAN OF WORKING GROUP 5-A

[NEW 7.3.3.- Assignments on non-allotted channels may use higher radiated power than that produced by a standardized parameter station, provided that the field strength within a neighbouring country not having a co-channel or an adjacent channel allotted to it does not exceed the field strength produced by a standardized parameter station situated at the most critical point at the border of the originating country.]

R. ZEITOUN
Chairman of Working Group 5A

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 96-E
28 April 1985
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COMMITTEE 5

SECOND REPORT FROM THE CHAIRMAN OF WORKING GROUP 5-A
TO COMMITTEE 5

7.2 Planning method

The following is a general description of the steps to be taken in developing the Plan based on the planning method that has been adopted.

7.2.1 Step 1 consists of using the appropriate co-channel standardized distance and identifying within each country the areas to which a minimum number of channels will be allotted. A possible method to be used is as follows.

7.2.1.1 Taking a geographical map covered with a sufficiently small grid and using a template having a circle with a radius equal to the appropriate standardized distance, determine for any point of the grid the number of countries within this circle; write the number on the map.

7.2.1.2 Move to another point on the grid and repeat § 7.2.1.1.

7.2.1.3 Having processed all the points on the grid, draw the boundaries around all the numbers with the same value. (See Figures [1] and [2].)

7.2.1.4 Taking into account the borders between countries, describe each area using these borders and/or geographical coordinates from the boundaries defined in § 7.2.1.3.

7.2.1.5 Identify each area with a unique code based on the geographical area symbols contained in Table [ ] of the Preface to the IFL.

7.2.2 Step 2 consists of identifying the minimum number of channels to be allotted to each of the areas identified in Step 1.

1. To each of the areas identified in Step 1 is associated a number corresponding to the number of countries within a distance [X].

2. Using Table [1] determine the minimum number of channels to be allotted to each area.

TABLE [1]

Minimum number of allotted channels

Total number of administrations	Minimum number of allotted channels	Remaining channels
1	10	0
2	5	0
3	3	1
4	2	2
5	2	0
6-10	1	4-0

7.2.3 Step 3 consists of allotting in each case the channels that constitute the minimum number of channels taking account of the need to minimize adjacent channel interference.

At this stage the minimum number of allotments to neighbouring allotment areas shall be made with a view to minimizing adjacent channel problems as much as possible, particularly in the case of allotment areas with only one or two channels.

7.2.4 Step 4 consists of allotting the remaining channels.

The remaining channels may be used during the Second Session to increase the number of allotments to neighbouring countries, on the basis of conditions to be adopted at that Session.

7.2.5 Step 5 consists of neighbouring countries carrying out bilateral or multilateral negotiations if they so desire.

The Second Session should adopt any rule that may be needed during the Second Session for these negotiations concerning:

- alternative arrangements of the channels and areas allotted to them;
- the determination of the limits of allotment areas on the basis of tolerances to be defined;

7.2.6 At this stage for those administrations so wishing, they may use the allotments resulting from steps 3 and 4 above and specify the locations and parameters of assignments which are to be included in the Plan that will appear in the Regional Agreement. These assignments will be examined using the criteria of [ ] to ensure that the allotments of other administrations are not affected.

As an illustration of the method, the following example is given:

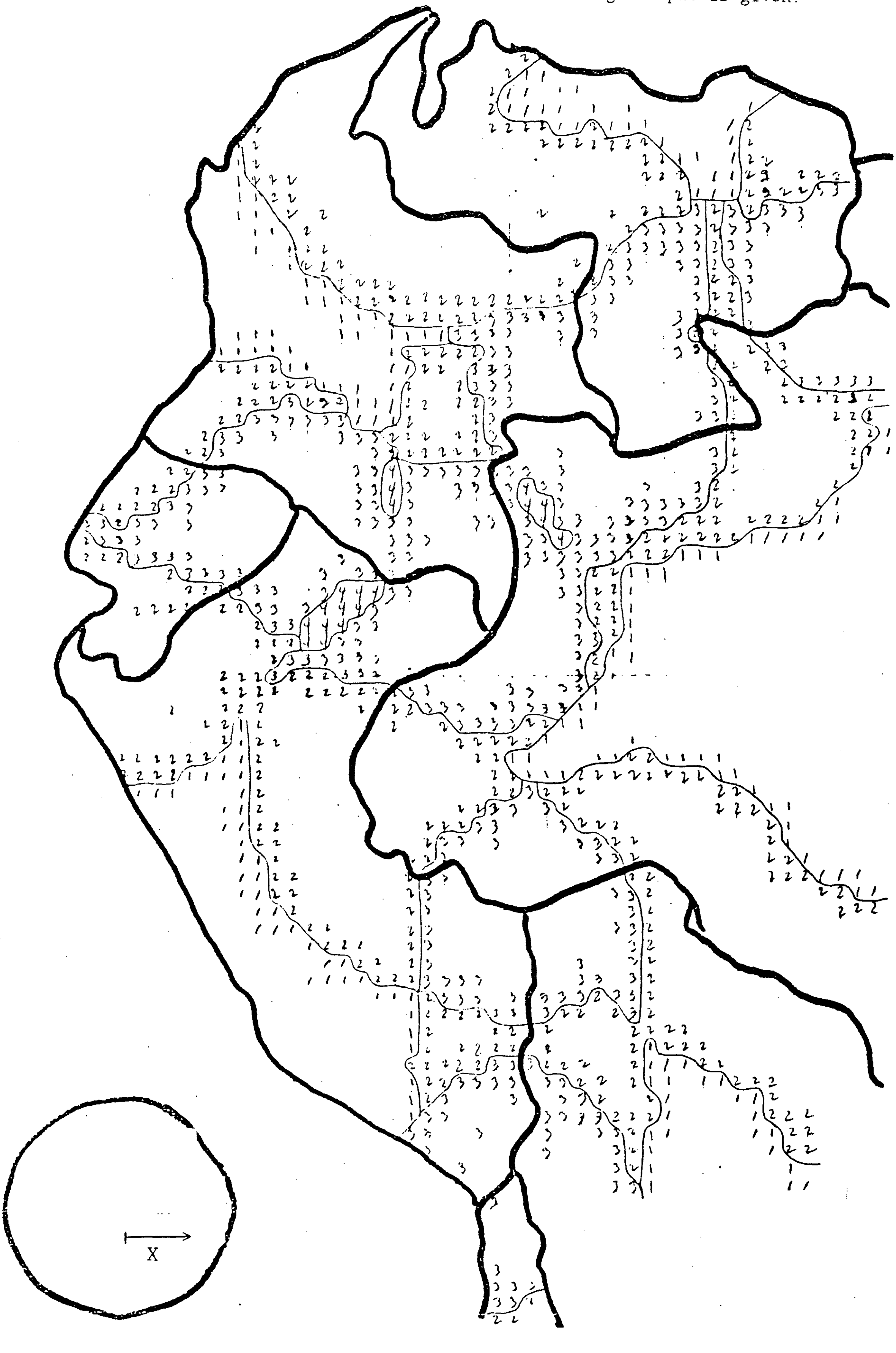

FIGURE [1]

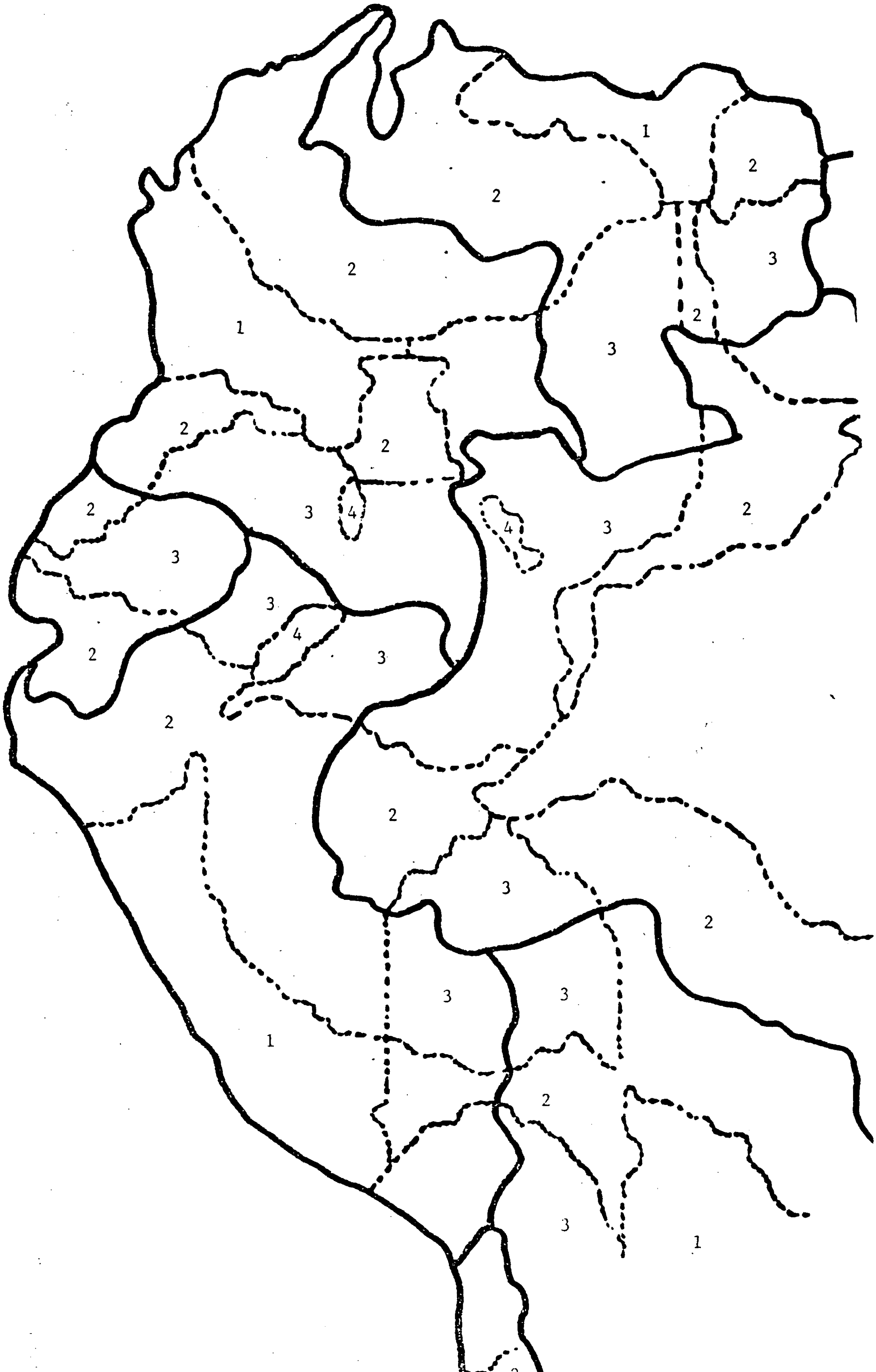

FIGURE [2]

Number of countries within a distance [X]

7.3 Planning criteria

7.3.1 Standardized parameters

The allotment plan shall be based on the following standard parameters for day and night and for noise zones 1 and 2.

Station power: 1 kW

Antenna: omnidirectional with 90° electrical height

7.3.2 Co-channel standardized distance

The standardized distance shall be:

- for noise zone 1 land path: 330 km;
- for noise zone 2 land path: 120 km;
- for noise zone 1 sea path: [ ];
- for noise zone 2 sea path: [ ];
- for mixed path: (to be developed if required).

7.3.3 Use of different parameters

7.3.3.1 Higher radiated power than that produced by the standardized parameters in paragraph 7.3.1 may be used by an administration provided that the field strength produced by a standard parameters station situated at the most critical point of the border of the original allotment area is not exceeded:

- in any co-channel allotment area of another administration, at the appropriate standardized distance from the border of the originating administration's allotment area;
- at any point in the allotment area of another administration to which an adjacent channel is allotted.

7.3.3.2 In recognition of the special problems caused by the low ground conductivity of the Caribbean islands situated in noise zone 2, the concept described in paragraph 7.3.3.1 is extended as follows.

a) A reference situation is established in which a station with standardized parameters is located at the limit of the allotment area of such an island. The resulting field strength to the allotment areas of other administrations is calculated assuming an all-sea path.

b) Before an island administration may bring into use an assignment with higher radiated power than that associated with a standardized station, the resulting field strength to the allotment areas of other administrations is calculated taking into account the actual ground traversed over the island, the path otherwise being sea.

c) Such field strengths referred to in b) must not exceed those in a).

This special provision applies only to the daytime situation.

7.3.3.3 In no case shall the station power be greater than 10 kW.

7.3.4 Border area considerations for first adjacent channels

For an efficient use of the band to be planned, the first adjacent channel interference should be evaluated at the stage of assigning frequencies to stations; in some cases, this will require coordination among the administrations concerned. In order to limit the need for such coordination, the following steps should be taken.

7.3.4.1 The guidelines for the procedure to be followed before bringing into use assignments from allotments in border areas should contain the following.

a) An administration proposing to assign a frequency to a station shall coordinate this assignment with any other administration if the field strength produced by the proposed assignment in the neighbouring adjacent allotment area of that administration exceeds the nominal field strength.

b) In order to easily identify the administrations with which the above coordination is required, the following distances shall be used:

- ground path in noise zone 1: 53 km
- sea path in noise zone 1: 310 km
- ground path in noise zone 2: 35 km
- sea path in noise zone 2: 160 km

Beyond the above appropriate distance, coordination is not required.

7.3.4.2 The procedures to be applied for such coordination should be adopted at the Second Session. The following may be considered in developing such procedures:

a) provisions to resolve cases where despite the cooperative effort in the search for a solution, coordination is not reached;

b) the need to address the question of overlapping the appropriate contours for nominal frequency separation of 10 kHz, 20 kHz and 30 kHz;

c) the concept that, for protection purposes, the boundary of a country should be deemed to encompass only its land area, including islands.

R. ZEITOUN
Chairman of Working Group 5-A

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 97-E
28 April 1986
Original: English

COMMITTEE 6

Source: Documents DT/21(Rev.), DL/14, DL/15

SECOND AND LAST SERIES OF TEXTS FROM THE WORKING GROUP OF THE PLENARY TO THE EDITORIAL COMMITTEE

The texts set out in Documents DT/21(Rev.1), DL/14 and DL/15 have been modified and adopted by the Working Group of the Plenary and are submitted to the Editorial Committee.

E.D. DuCHARME
Chairman of the Working Group
of the Plenary

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 98-E
29 April 1986
Original: English

COMMITTEE 2

SUMMARY RECORD

OF THE

SECOND AND LAST MEETING OF COMMITTEE 2

(CREDENTIALS)

Monday, 28 April 1986, at 1115 hrs

Chairman: Mr. S.E. MONTANARO (Republic of Paraguay)

Subjects discussed:		Documents
1.	Summary record of the first meeting	38
2.	First and second reports of Working Group 2-A	55, 92
3.	Third (oral) report by the Chairman of Working Group 2-A	-
4.	Draft report to the Plenary Meeting	DT/31

1. Summary record of the first meeting (Document 38)

The summary record of the first meeting (Document 38) was approved.

2. First and second reports of Working Group 2-A (Documents 55, 92)

The first and second reports of Working Group 2-A were approved.

3. Third (oral) report by the Chairman of Working Group 2-A

3.1 The Chairman, speaking as Chairman of Working Group 2-A, said that the Group had met to examine the credentials deposited by the Delegation of the Republic of Suriname and had found them to be in order.

4. Draft report to the Plenary Meeting (Document DT/31)

4.1 The Chairman, introducing the Committee's draft report to the Plenary Meeting (Document DT/31), said that as a result of Working Group 2-A's third report, the Republic of Suriname should be added to the countries whose credentials had been found to be in order (Annex, List 1) and deleted from those which had not deposited credentials (Annex, List 4).

Document DT/31, as orally revised, was approved.

The meeting rose at 1140 hours.

The Secretary:	The Chairman:
R. MACHERET	S.E. MONTANARO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Corrigendum 1 to Document 99-E
30 April 1986
Original: French

AMENDMENTS TO THE

REPORT OF COMMITTEE 2 TO THE PLENARY MEETING

Following the oral report by the Chairman of Committee 2 to the sixth Plenary Meeting the following changes should be made in the annex to Document 99:

Section 2

Insert Peru

Section 4

Delete Peru

S.E. MONTANARO CANZANO
Chairman of Committee 2

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 99-E
28 April 1986
Original : French

PLENARY MEETING

REPORT OF COMMITTEE 2 TO THE PLENARY MEETING
(CREDENTIALS)

1. Terms of reference of the Committee

The terms of reference of the Committee are set out in Document 25.

2. Meetings

The Committee met twice, on 15 and 28 April 1986.

At its first meeting, it set up a Working Group consisting of the Chairman and Vice-Chairman of the Committee and one delegate from Canada to verify delegations' credentials in accordance with Article 67 of the International Telecommunication Convention, Nairobi (1982).

3. Conclusions

The conclusions reached by the Committee are reproduced in the Annex attached hereto and submitted to the Plenary Meeting for approval.

4. Final remark

The Committee recommends that the Plenary Meeting authorize the Chairman and the other members of the Working Group to verify the credentials received after the date of the present Report and to submit their conclusions to the Plenary Meeting on the matter.

S.E. MONTANARO CANZANO

Chairman of Committee 2

Annex : 1

ANNEX

1. Credentials found to be in order, deposited by the delegations of countries having the right to vote

(In French alphabetical order)

Canada
Chile
Cuba
United States of America
France
Mexico
Paraguay (Republic of)
United Kingdom of Great Britain and Northern Ireland
Suriname (Republic of)
Trinidad and Tobago

Conclusion : The delegations of these countries are entitled to vote.

2. Provisional credentials found to be in order, deposited by the delegations of countries having the right to vote (see No. 383 of the Convention)

Colombia (Republic of)
Uruguay (Eastern Republic of)

Conclusion : The delegations of these countries are entitled to vote.

3. Credentials found to be in order, deposited by the delegations of countries which do not have the right to vote (see Document 10)

Argentine Republic
Brazil (Federative Republic of)
Costa Rica
Ecuador
Guyana
Honduras (Republic of)

Conclusion : The delegations of these countries are not entitled to vote.

4. Delegations attending the Conference which have not deposited credentials

* Barbados
Peru

Conclusion : The delegations of these countries are not entitled to vote.

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* Appears in the list of countries which have lost their right to vote (see Document 10)

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 100-E
30 April 1986
Original : English
French
Spanish

LIST OF DOCUMENTS

(51 to 100)

No.	Origin	Title	Destination
51	SG	Position of the Conference accounts at 18 April 1986	C.3
52	WG/4B	First Report of Working Group 4-B to Committee 4	C.4
53	C.4	Summary record of the second meeting of Committee 4	C.4
54	Conference Chairman	Draft Structure of the Report of the First Session of the Conference	PL
55	WG/2A	First Report by Working Group C2-A to Committee 2	C.2
56	C.6	B.1	PL
57	USA	Proposed Draft of Final Acts of the Second Session	WG/5B
58	C.4	Second series of texts from Committee 4 to the Editorial Committee	C.6
59	C.5	Summary record of the fifth meeting of Committee 5	C.5
60 +Corr.1	B	Proposals	C.4
61	C.6	B.2	PL
62	C.4	Summary record of the third meeting of Committee 4	C.4
63	GT/4B	Second Report of Working Group 4-B to Committee 4	C.4
64	C.4	Summary record of the fourth meeting of Committee 4	C.4
65	C.5	Summary record of the sixth meeting of Committee 5	C.5
66	PL	Minutes of the third Plenary Meeting	PL

No.	Origin	Title	Destination
67	WG/4C	Final report of Working Group 4-C to Committee 4	C.4
68	C.4	Committe 4 (Chapter 2 - Propagation)	C.4
69	C.4	Recommandation No. [Com4/4]	C.4
70	C.5	Note from the Chairman of Committee 5 to the Chairman of the Working Group of the Plenary	WG/PL
71	C.4	Summary record of the fifth meeting of Committee 4	C.4
72	C.6	R.1	PL
73	C.4	Third series of texts from Committee 4 to the Editorial Committee	C.6
74	C.6	B.3	PL
75	WG/5A	First report from the Chairman of Working Group 5-A to Committee 5	C.5
76	C.6	B.4	PL
77	WG/4B	Third report of Working Group 4-B to Committee 4	C.4
78	C.4	Fourth series of texts from Committee 4 to the Editorial Committee	C.6
79	WG/4B	Final Report of Working Group 4-B	C.4
80	PL	Minutes of the fourth Plenary Meeting	PL
81	C.4	Summary record of the sixth and last meeting of Committee 4	C.4
82	C.5	Summary record of the seventh meeting of Committee 5	C.5
83	C.3	Summary record of the second meeting of Committee 3	C.3

No.	Origin	Title	Destination
84	SG	Position of the Conference accounts at 28 April 1986	C.3
85	SG	CCIR Intersessional Activity	C.3
86	C.5	Summary record of the eighth meeting of Committee 5	C.5
87	C.4	Note from Committee 4 to Committee 5	C.5
88	C.4	Fifth and last series of texts submitted by Committee 4 to the Editorial Committee	C.6
89	C.5	First series of texts from Committee 5 to the Editorial Committee	C.6
90	C.6	R.2	PL
91	C.4	Note from Committee 4 to Committee 3	C.3
92	WG/2A	Second report of the Working Group of Committee 2 (Credentials)	C.2
93	C.6	B.5	PL
94	WG/PL	First series of texts from the Working Group of the Plenary to the Editorial Committee	C.6
95	WG/5B	Report of the Working Group 5-B	C.5
96 +Add.1,2	WG/5A	Second report from the Chairman of Working Group 5-A to Committee 5	C.5
97	WG/PL	Second and last series of texts from the Working Group of the Plenary to the Editorial Committee	C.6
98	C.2	Summary record of the second and last meeting of Committee 2	C.2
99	C.2	Report of Committee 2 to the Plenary Meeting (Credentials)	PL
100	SG	List of documents (51 to 100)	

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 101-E
20 May 1986
Original: English

PLENARY MEETING

MINUTES

OF THE

FIFTH PLENARY MEETING

Tuesday, 29 April 1986, at 1000 hrs

Chairman: Mr. F. Savio C. PINHEIRO (Brazil)

Subjects discussed:	Documents
1. Minutes of the third Plenary Meeting	66
2. Report by the Chairman of Committee 2	99
3. Second series of texts submitted by the Editorial Committee for second reading (Series R.2)	90
4. Third series of texts submitted by the Editorial Committee for second reading (Series R.3)	103
5. Fifth series of texts submitted by the Editorial Committee for first reading (Series B.5)	93
6. Sixth series of texts submitted by the Editorial Committee for first reading (Series B.6)	102
7. Report from Committee 5 ad hoc 2	DT/34
8. Seventh series of texts submitted by the Editorial Committee for first reading (Series B.7)	104
9. Eighth series of texts submitted by the Editorial Committee for first reading (Series B.8)	107

1. Minutes of the third Plenary Meeting (Document 66)

The minutes of the third Plenary Meeting were approved as amended (see the Corrigendum to Document 66).

2. Report by the Chairman of Committee 2 (Document 99)

The Plenary took note of the report of Committee 2 (Document 99) and endorsed the procedure set out in its paragraph 4.

3. Second series of texts submitted by the Editorial Committee for second reading (Series R.2) (Document 90)

Chapter 5 - Technical criteria for interservice sharing

Introductory paragraph

Approved, subject to deletion of the second and third sentences, removal of the square brackets and alignment of the Spanish text of the final phrase of the penultimate sentence with the English, which read "and as well give protection to these permitted services".

Section 5.1: Protection of the broadcasting service

Approved with amendment of the second paragraph to read:

"Protection in accordance with the criteria in section 5.1.1 is to be given within the national boundary and/or allotment area for allotted channels and within the service contours for assignments on non-allotted channels."

and removal of the square brackets.

3.1 In reply to a question from the representative of the IFRB (Mr. Brooks), the delegate of the United States of America confirmed that the purpose of the changes made was to align the text with the terminology adopted in Committee 5 and was in no way intended to imply the provision of protection outside national boundaries.

Chapter 5, as amended, and Recommendation COM4/B were approved on second reading.

Recommendation COM4/C

3.2 The Chairman pointed out that that Recommendation was in fact being submitted for first reading.

It was agreed to make the following amendments:

- recommends 2: correct in the English version the term "dB(uV/m)" to read "(dB(μVm)", delete the underlining in the fifth line;

- recommends 3: deleted as incompatible with the Radio Regulations.

Recommendation COM4/C was approved, as amended, on first and second readings.

Section 1.1.2 to be deleted, on the understanding that the words "or objectionable" would be removed from paragraph 3.3 of Chapter 7 thus obviating the need for a definition.

4. Third series of texts submitted by the Editorial Committee for second reading (Series R.3) (Document 103)

Chapter 2 - Section 2.2

4.1 The Chairman said that the IFRB had now produced a curve reproduced in Figure 2.3a of characteristic field strength as a function of antenna height, which meant that the square brackets could be removed from the second sentence of 2.2.2.

The text and figure were accordingly being submitted for first reading.

4.2 The delegate of Canada proposed that the two subparagraphs should be more closely linked, as follows:

2.2.2 "... If the actual design data are not available, Figure 2.3 can be used as useful information on the matter. However, Figure 2.3a shows the characteristic field strength ...".

It was so agreed.

Section 2.2 of Chapter 2 was approved, as amended, on first and second reading.

5. Fifth series of texts submitted by the Editorial Committee for first reading (Series B.5) (Document 93)

5.1 The Chairman of the Editorial Committee drew attention to editorial corrections relating to sections 1.2, 3.6 and Resolution COM5/1 and said that the table and paragraph numbers in square brackets would be revised for the second reading.

Section 1.16

It was agreed to delete the square brackets and the words "and/or Agreement".

Section 3.6

5.2 The delegate of Cuba said that his Delegation maintained its reservation concerning the nominal usable field strength daytime in Noise Zone 1, (section 3.6) which posed a serious problem for the countries of small land area in Region 2 and took little account of the actual state of affairs in that Region.

5.3 The delegate of Costa Rica said he shared those concerns and would also reserve his Delegation's position on the matter.

Section 3.7

It was agreed to delete Note 1.

Recommendation COM5/A

The word "shall" to be replaced by "should" in recommends a) and b) and "when this" by "which".

Resolution COM5/1

The following amendments were agreed:

- considering e): replace "the Conference established" by "the Conference will establish";

- resolves 3 in the Spanish text replace "prevista" by "aproximada";

- requests the IFRB 1. delete " ... and to request them to apply it."

The fifth series of texts (B.5) submitted by the Editorial Committee was approved, as amended, on first reading.

6. Sixth series of texts submitted by the Editorial Committee for first reading (Series B.6) (Document 102)

Introduction

Approved with the following amendments:

- first indent: replace "shall be" by "was";

- second indent and new third indent: reworded as follows on a suggestion by the representative of the IFRB:

  "- the Allotment Plan for the broadcasting service shall contain one or more allotments for all countries of Region 2 for possible inclusion in the Radio Regulations by a competent WARC;

  - the Plan to be annexed to the Regional Agreement shall contain allotments and may contain assignments;";

- last indent: deleted and replaced by the following:

  "- and adopted the Resolutions and Recommendations annexed to the present Report.";

- final paragraph: the square brackets were deleted.

Chapter 1

It was agreed to delete the definition in 1.1.2a.

Chapter 3

It was agreed to delete all sections (3.5, 3.5a, 3.8a, 3.9.1, 3.9.2, 3.9.3) since Committee 5 would be submitting its findings on the same parameters to the Plenary later in connection with analysis of the planning method.

Recommendation PLEN/A

It was agreed:

- to delete the second sentence in recommends to the Administrative Council, point 1.5, on the understanding that it would appear elsewhere in the body of the report;

- to amend paragraph 2 of the same section by:

"to consider a duration of three to four weeks for the Second Session of the Conference in 1988.";

- and to review the figure in square brackets in paragraph 3.

6.1 The Secretary-General said that it was necessary to consider further the question of the date to be selected for the Second Session of the Conference in view of the various restricting factors pertaining to it.

Recommendation PLEN/B

6.2 The Secretary-General, referring to an observation by the delegate of the United States, said that the additional cost of hosting the Second Session would obviously vary according to the location; in response to a specific request from one administration in the Caribbean area, a rough estimate of 1.4-1.5 million Swiss francs had been indicated in respect of expenditure over and above the costs relating to the physical facilities which must be made available.

The sixth series of texts (B.6) (comprising parts of Chapters 1 and 3, Resolution PLEN/1 and Recommendations PLEN/A and B) submitted by the Editorial Committee was approved, as amended, on first reading.

7. Report from Committee 5 ad hoc 2 (Document DT/34)

7.1 The Chairman of Committee 5 ad hoc 2, introducing Document DT/34, thanked the IFRB for the assistance given in preparing the report on draft Chapter 9. He pointed out that the text of 9.1.1b) remained within square brackets because, although the task would require considerable funds and additional work by the Board, it was felt that, even if Committee 5 ad hoc 1 decided on a fixed separation distance for sea and mixed paths, the work should be done nevertheless to cover any contingencies prior to the Second Session. The budget report shortly to be made available would take such work into account. In 9.2, the information was to be supplied by Committee 5 ad hoc 1, not Committee 4; perhaps that section should describe also the studies which would be carried out by the CCIR.

It was agreed that a text would be sent to the Editorial Committee, that the square brackets around 9.1.1b) would be retained and the remaining square brackets be deleted from the report.

On that understanding, Document DT/34 was approved.

8. Seventh series of texts submitted by the Editorial Committee for first reading (Series B.7) (Document 104)

Chapter 7

It was agreed to insert the words "of the Administrative Council" after "Resolution No. 913".

It was agreed that, in the definition of Allotment, the square brackets and the words "and/or Agreement" would be deleted, and that Committee 5 would provide the Editorial Committee with the appropriate references so that the square brackets elsewhere in Article 1, could also be deleted.

It was also agreed that in the definition "Affected Administrations", the word "Agreement" is replaced by "REPORT" and square brackets deleted.

Footnote 1 on the bottom of the page is suppressed.

Article 3

It was agreed to delete the words "or objectionable" from 3.3.

Article 4

It was agreed to delete the asterisk and footnote in respect of 4.1 and, following an observation by the Chairman of Committee 5, to retain the square brackets appearing elsewhere in Article 4, until the appropriate reference is made by the Editorial Committee.

Recommendation COM5/B

8.1 The delegate of Cuba said that his Delegation had difficulty in accepting the substance of Recommendation COM5/B at the current stage of the Conference. The purpose might be to oblige all the countries of the Region to comply with the Agreement; there were alternative methods, however, not necessarily involving the Radio Regulations, which would ensure that Members of the Union complied with it. One method could simply be to draw up an equitable Plan which would secure that aim whilst recognizing the interests of all administrations. It seemed to him that to have recourse to the Radio Regulations, which were already quite complex, would complicate matters exceedingly, especially if that method were adopted in respect of other services and regions. In his view, the Regional Agreement should remain precisely that. The IFRB had to be relied upon, of course, for assistance and implementation, but to embody an Agreement in the Radio Regulations was to invite serious problems. He wondered, moreover, how the Union would play its part under a Plan based on standardized requirements rather than on the needs of administrations - especially in view of the scant attendance at the current Session. The problem was serious, and it seemed rather hasty to adopt a Recommendation of that sort.

8.2 The representative of the IFRB, referring to considering d), said that checks had revealed only two cases of possible incompatibility between regions; the subject could perhaps be considered in further detail during the Second Session.

The seventh series of texts (B.7) submitted by the Editorial Committee was approved, as amended, on first reading.

9. Eighth series of texts submitted by the Editorial Committee for first reading (Series B.8) (Document 107)

Section 6.2

It was agreed to replace the second sentence of section 6.2.1 by "A method which may be used is as follows".

Section 6.3

9.1 The Chairman of Working Group 5 ad hoc 1, referring to the conclusions reached by his Group with respect to the standardized sea path distance as now set out in section 6.3.2, said that the Group had been unable to agree on a single distance and had decided to put forward two distances for both noise zones, on the understanding that one distance would be selected by the Second Session on the basis of a planning exercise carried out by the IFRB during the intersessional period for the Caribbean area.

With regard to mixed paths, no specific distance had been decided upon, but a criterion had been established for defining that distance on the basis of a percentage of the ground portion of the path.

9.2 The delegate of Canada said that his Delegation had devised a method of calculating the mixed path distance by means of curves which might be simpler and more accurate than the criterion suggested after the rather inconclusive discussion in the ad hoc Group. The delegates of Colombia, Chile, France and Mexico said they supported the Canadian solution in principle. The representative of the IFRB said that, at first sight, the method proposed by Canada would not in fact be simpler, since it could not be applied manually, but would require an iterative approach in each case to determine the exact percentages.

9.3 The Chairman suggested that a small ad hoc Group, presided over by the delegate of Canada and composed of the delegates of Brazil, France, Guyana, Honduras and the United States, should study the question and submit the results directly to the Editorial Committee.

It was so agreed.

The following amendments were agreed:

- in 6.3.2, add the final sentence to the text of the fourth indent, changing the reference to 2.1 instead of 6.2.1;
- in 6.3.4, replace "Frontier" in the English title by "Border"; add a new section 6.3.5 to read as follows:

"Considerations for the use of non-broadcasting stations

The Second Session should consider the adoption of a procedure to be applied by administrations wishing to implement their allotments with respect to non-broadcasting stations of the other contracting Members. Such procedures will provide for the continued operation of designated non-broadcasting stations provided it does not have an adverse effect upon the implementation of the Plan (see Recommendation COM5/A and Resolution COM5/1)."

The eighth series of texts (B.8) submitted by the Editorial Committee was approved, as amended, on first reading.

9.4 The representative of the IFRB said that, in view of the decision taken on the sea path distance in section 6.3.2, a new paragraph should be inserted in section 8.1.1, reading as follows:

"c) prepare planning exercises for two standardized distances (in accordance with section 6.3.2 for the Caribbean area);"

It was so agreed.

9.5 The Secretary-General drew the attention of the meeting to Document 106, setting out the arrangements for the final days of the Conference. The time limits for the deposit of declarations and additional declarations would be announced by the Steering Committee the following morning.

The meeting rose at 1810 hours.

The Secretary-General	The Chairman
R.E. BUTLER	F. Savio C. PINHEIRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 102-E
28 April 1986

B.6

PLENARY MEETING

6th SERIES OF TEXTS SUBMITTED BY THE EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Documents	Title
WG/PLEN	DT/25 + 94	Introduction
COM.4	88	Chapter 1 - 1.1.2a, 1.1.3a Chapter 3 - 3.5, 3.5a 3.8a 3.9
WG/PLEN	DT/26 + 94	Resolution PLEN 1
WG/PLEN	DT/21(Rev.) + 97 DL/15	Recommendation PLEN A
WG/PLEN	DL/14 + 97	Recommendation PLEN B

P. PERRICHON
Chairman of Committee 6

Annex: 9 pages

INTRODUCTION

When allocating the band 1 605 - 1 705 kHz to the broadcasting service in Region 2, the World Administrative Radio Conference Geneva, 1979 (WARC-79), stated in its Recommendation 504 that the use of the band by the new service was subject to a broadcasting plan to be established by a regional administrative radio conference and recommended that such a conference be convened for Region 2.

The Plenipotentiary Conference (Nairobi, 1982) decided in its Resolution 1 that the Conference for Region 2 would be held in two sessions.

Pursuant to that Resolution, the Administrative Council, at its 39th session in 1984, after consulting the Region 2 members, adopted Resolution 913 establishing the agenda, date and duration of the First Session of the Conference.

Consequently, the First Session of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 was held in Geneva from 14 April to [2 May] 1986.

Under its terms of reference, the First Session decided inter alia as follows:

- this Report shall be adopted for submission to the Second Session;
- the Plan for the broadcasting service shall contain allotments and may contain assignments;
- the Plan shall not be based on requirements submitted by administrations;
- the Plan shall be based on the use of standardized parameters;
- all Resolutions and Recommendations annexed to the present Report shall be adopted.

Apart from the technical criteria specific to the broadcasting service (such as propagation, technical standards, etc.), the First Session, under item 2.2 of its agenda, considered the problems of compatibility with the other services in the same band [and provisionally defined sharing criteria].

[CHAPTER 1]

1.1.2a Protected contour

Continuous line that delimits the service area which is protected from objectionable interference.

1.1.3a Nominal usable field strength (E_{nom})

Agreed minimum value of the field strength required to provide satisfactory reception, under specified conditions, in the presence of atmospheric noise, man-made noise and interference from other transmitters. The value of nominal usable field strength has been employed as the reference for planning.

[CHAPTER 3]

3.5 Standardized station parameters

The Allotment Plan shall be based on a standard power according to the table below, and a standard omnidirectional antenna with 90° electrical antenna height.

Table of standard powers

	Noise zone 1	Noise zone 2 (see section 3.7)
Daytime	1 kW	[1 kW]
Night-time	1 kW	1 kW

3.5a Station power

Higher than standard powers may be used on condition that the interference caused to other countries by allotted and non-allotted channels does not exceed the interference produced by a station using the standardized parameters.

In no case shall the power be greater than [10 kW].

[3.8a Co-channel standardized distance

The standard distance shall be 330 km for noise zone 1 and 120 km for noise zone 2. However, administrations in areas involving sea paths may consider adopting greater distances. It should be noted for information that groundwave propagation over sea paths would require distances of 450 km to protect a nominal usable field strength of 3.3 mV/m and 360 km to protect a nominal field strength of 6 mV/m.]

3.9 Application of protection criteria

3.9.1 Protection of allotments[1]

The signal strengths to be protected are the appropriate values of nominal usable field strength shown in section 3.6. [The area to be protected is the border of an allotment area]. [*Protection shall be provided throughout the allotment area].

The maximum permissible interfering field strength within this area is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the greater of the groundwave or skywave signal is considered to be the interfering signal. In all other cases, only groundwave interference is taken into account.

[The effect of each interfering transmitter shall be evaluated separately, and the presence of interference from other stations in excess of the permissible level shall not affect the need to limit the interference which would result from proposed modifications or new assignments.] *[the effect of each interfering transmitter shall be evaluated separately, and interference from other transmitters shall not be taken into account in determining the maximum signal strength permitted from each transmitter.]

3.9.2 Protection of non-allotments

Assignments on non-allotted channels are not specifically protected from assignments based on allotments. The amount of interference from the latter is limited by reducing them to standard parameters or the equivalent as defined in sections 3.5 and 3.5a. However, assignments on non-allotted channels are protected from subsequent assignments on non-allotted channels. The protected contour thus encompasses the area in which the groundwave field strength is equal to or greater than the appropriate value of E_{nom} given in section 3.6.

The maximum permissible interfering field strength within this area is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the greater of the groundwave or skywave signal is considered to be the interfering signal. In all other cases, only groundwave interference is taken into account.

1 Committee 5 might change these titles in view of the terminology adopted.

* Alternative version proposed by Committee 6.

[The effect of each interfering transmitter shall be evaluated separately and the presence of interference from other stations in excess of the permissible level shall not affect the need to limit the interference which would result from proposed modifications or new assignments]. *[The effect of each interfering transmitter shall be evaluated separately, and interference from other transmitters shall not be taken into account in determining the maximum signal strength permitted from each transmitter].

Where the protected contour would extend beyond the frontier of the country in which the station is located, the maximum permissible interfering groundwave field strength at the frontier is the field strength of the protected station along the frontier divided by the protection ratio.

3.9.3 Skywave interference calculations

The field strength of skywave interfering signals shall be calculated on the basis of 50% of the time, either at the boundary of the allotment area or at the site of a non-allotment, as the case may be.

* Alternative version proposed by Committee 6.

RESOLUTION PLEN/1

Report of the First Session

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

considering

the terms of reference assigned to it by Resolution 913 of the Administrative Council;

resolves

to approve the Report of this session of the Conference;

instructs

1. the Chairman of this session of the Conference to transmit under his signature the Report of the First Session to the Second Session of the Conference;

2. the Secretary-General to transmit this Report to all Members of the Union.

RECOMMENDATION PLEN/A

Draft Agenda and Duration of the Second Session of the Conference

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

considering

a) Resolution 1 of the Plenipotentiary Conference, Nairobi, 1982, relating to Future Conferences of the Union;

b) Recommendation 504 of the 1979 WARC, relating to the Preparation of a Broadcasting Plan in the Band 1 605 - 1 705 kHz in Region 2;

c) that, in accordance with RR 480 of the Radio Regulations, the use of the band 1 605 - 1 705 kHz by stations of the broadcasting service shall be subject to a plan to be established by a regional administrative radio conference;

d) that the effective implementation of the Plan in the Region will be facilitated by the incorporation of the Regional Agreement in the Radio Regulations;

e) that the Table of Frequency Allocations provides for other services in the frequency band 1 625 - 1 705 kHz;

f) that the agenda for the First Session contained in Resolution No. 913 of the Administrative Council, 1984, provides for the First Session to establish a draft agenda for the Second Session of the Conference, relating to the establishment of an agreement and an associated plan, to be submitted to the Administrative Council;

g) the Report of the First Session;

h) that the Second Session will need to consider the report of the IFRB on the work carried out during the intersessional period based on the decision of the First Session;

i) that the Second Session will need to consider technical information made available by the CCIR as a result of studies carried out;

j) that administrations will submit proposals to the Second Session;

recognizing

that the frequency band 1 605 - 1 705 kHz is shared with other services;

recommends to the Administrative Council

1. the following draft agenda for the Second Session on the basis of the Report of the First Session and taking account of considerings h, i and j:

1.1 to draw up an agreement which includes regulatory procedures, appropriate technical standards, an associated frequency allotment plan and possibly assignments derived therefrom for the use of the band 1 605 - 1 705 kHz by the broadcasting service in Region 2;

1.2 to establish regulatory procedures governing the use of the band 1 625 - 1 705 kHz by other services in Region 2;

1.3 to establish a date (or dates) in accordance with RR 481, and a schedule for the introduction of the broadcasting service in the band 1 605 - 1 705 kHz;

1.4 to review and revise the relevant Resolutions and Recommendations;

1.5 to adopt a procedure to be applied by administrations wishing to implement their allotments in relation to non-broadcasting stations of the other contracting members. This procedure shall permit the continued operation of designated non-broadcasting stations provided it does not have an adverse effect upon the implementation of the Plan.

2. to consider the time four weeks allotted for the Second Session of the Conference in 1988 with a view to its reduction.

3. to select a date at least [4] months before WARC ORB-2 when deciding on the date of the Second Session of this Conference.

RECOMMENDATION PLEN/B

Concerning the Venue for the Second Session

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

a) Resolution 3 of the Plenipotentiary Conference (Nairobi, 1982) concerning invitations to hold conferences or meetings away from Geneva;

b) that there are considerable advantages in holding the Second Session in the Region;

c) the importance of ensuring the active participation of all the countries of the Region:

recommends to the administrations

that an administration in the Region should extend an invitation to hold the Second Session in its country;

requests the Secretary-General

to distribute this Recommendation to the administrations in Region 2 as soon as possible with a view to obtaining their replies before the 41st session of the Administrative Council.

PINK PAGES

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 103-E
28 April 1986

R.3

PLENARY MEETING

3rd SERIES OF TEXTS SUBMITTED BY THE EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for second reading:

Source	Document	Title
COM.6	B.3/74	Chapter 2 - section 2.2

P. PERRICHON
Chairman of Committee 6

Annex: 15 pages

Note by the Chairman of the Conference

At its fourth meeting, the Plenary of the Conference requested the IFRB to produce the curve of characteristic field strength as a function of antenna height, as currently used by the IFRB in the framework of the Rio de Janeiro Agreement, 1981.

This curve is given in Figure 2.3a) (page R.2/4).

It is proposed that an introductory sentence should be added at the end of the first paragraph 2.2.2.

It is therefore proposed that actual Figure 2.3a) should be renumbered 2.3b).

2.2 **Skywave propagation**

The calculation of skywave field strength shall be conducted in accordance with the provisions which follow.

2.2.1 *List of symbols*

- d : short great-circle path distance (km)
- E_c : characteristic field strength, mV/m at 1 km for 1 kW
- $f(\theta)$: radiation as a fraction of the value $\theta = 0$ (when $\theta = 0, f(\theta) = 1$)
- f : frequency (kHz)
- F : unadjusted annual median skywave field strength, in dB(μV/m)
- F_c : field strength read from Fig. 2.6 or Table 2.III for a characteristic field strength of 100 mV/m
- $F(50)$: skywave field strength, 50% of the time, in dB(μV/m)
- P : station power (kW)
- θ : elevation angle from the horizontal (degrees)

2.2.2 *General procedure*

Radiation in the horizontal plane of an omnidirectional antenna fed with 1 kW (characteristic field strength, E_c) is known either from design data or, if the actual design data are not available, from Fig. 2.3.

[Figure 2.3a) shows the characteristic field strength of an antenna based on a 1 ohm resistance loss, as currently used by the IFRB in the framework of the Rio de Janeiro Agreement, 1981. This figure shall be used for compatibility calculations.] *

Elevation angle θ is given by

$$\theta = \arctan\left(0.00752 \cot \frac{d}{444.54}\right) - \frac{d}{444.54} \qquad \text{degrees} \tag{1}$$

$$0° \leqslant \theta \leqslant 90°$$

Alternatively, Fig. 2.4 or Table 2.I may be used.

It is assumed that the Earth is a smooth sphere with an effective radius of 6,367.6 km and that reflections occur from an ionospheric height of 96.5 km.

The radiation $f(\theta)$ expressed as a fraction of the value at $\theta = 0$ at a pertinent elevation angle θ can be determined from Fig. 2.5 or Table 2.II.

The product $E_c f(\theta)\sqrt{P}$ is thus determined for an omnidirectional antenna. For a directional antenna, $E_c f(\theta)\sqrt{P}$ can be determined from the antenna radiation pattern. $E_c f(\theta)\sqrt{P}$ is the field strength at 1 km at the appropriate elevation angle and azimuth.

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* Note by the Editorial Committee - This text requires two readings.

The unadjusted annual median skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c f(\theta) \sqrt{P}}{100} \quad \text{dB}(\mu\text{V/m}) \qquad (2)$$

where F_c is the direct reading from the field strength curve in Fig. 2.6 or Table 2.III.

Note: Values of F_c in Fig. 2.6 and Table 2.III are normalized to 100 mV/m at 1 km corresponding to an effective monopole radiated power (e.m.r.p.) of −9.5 dB(kW).

For distances greater than 4250 km, it should be noted that F_c can be expressed by:

$$F_c = \frac{231}{3 + d/1000} - 35.5 \quad \text{dB}(\mu\text{V/m}) \qquad (3)$$

2.2.3 *Skywave field strength, 50% of the time*

This is given by:

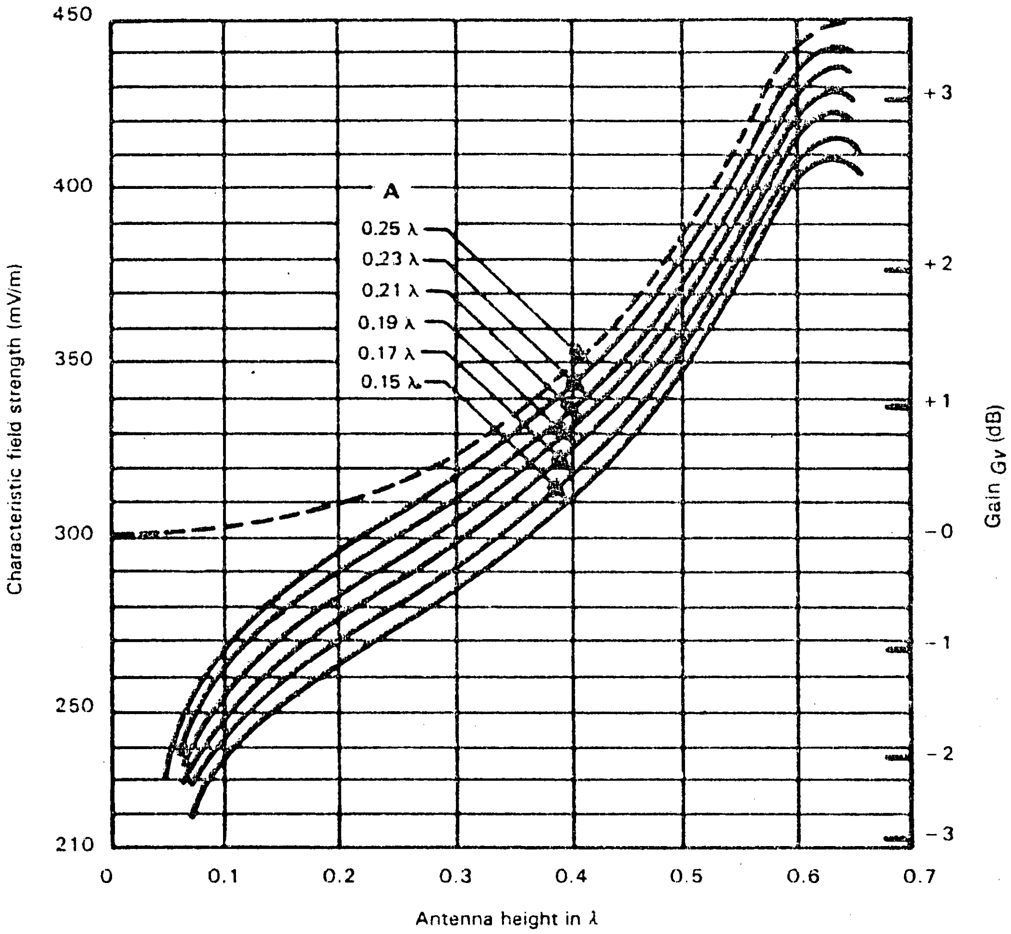
$$F(50) = F \quad \text{dB}(\mu\text{V/m}) \qquad (4)$$

2.2.4 *Nocturnal variation of skywave field strength*

Hourly median skywave field strengths vary during the night and at sunrise and sunset. Figure 2.7 shows the average variation referred to the value at 2 hours after sunset at the path midpoint. This variation applies to field strengths occurring for 50% of the nights.

2.2.5 *Sunrise and sunset time*

To facilitate the determination of the local time of sunrise and sunset, Fig. 2.8 gives the times for various geographical latitudes and for each month of the year. The time is the local meridian time at the point concerned and should be converted to the appropriate standard time.



A: Radius of ground system
Full lines: Real antenna correctly designed
Dashed line: Ideal antenna on a perfectly conducting ground

FIGURE 2.3 - *Characteristic field strengths for simple vertical antennas, using 120-radial ground systems*

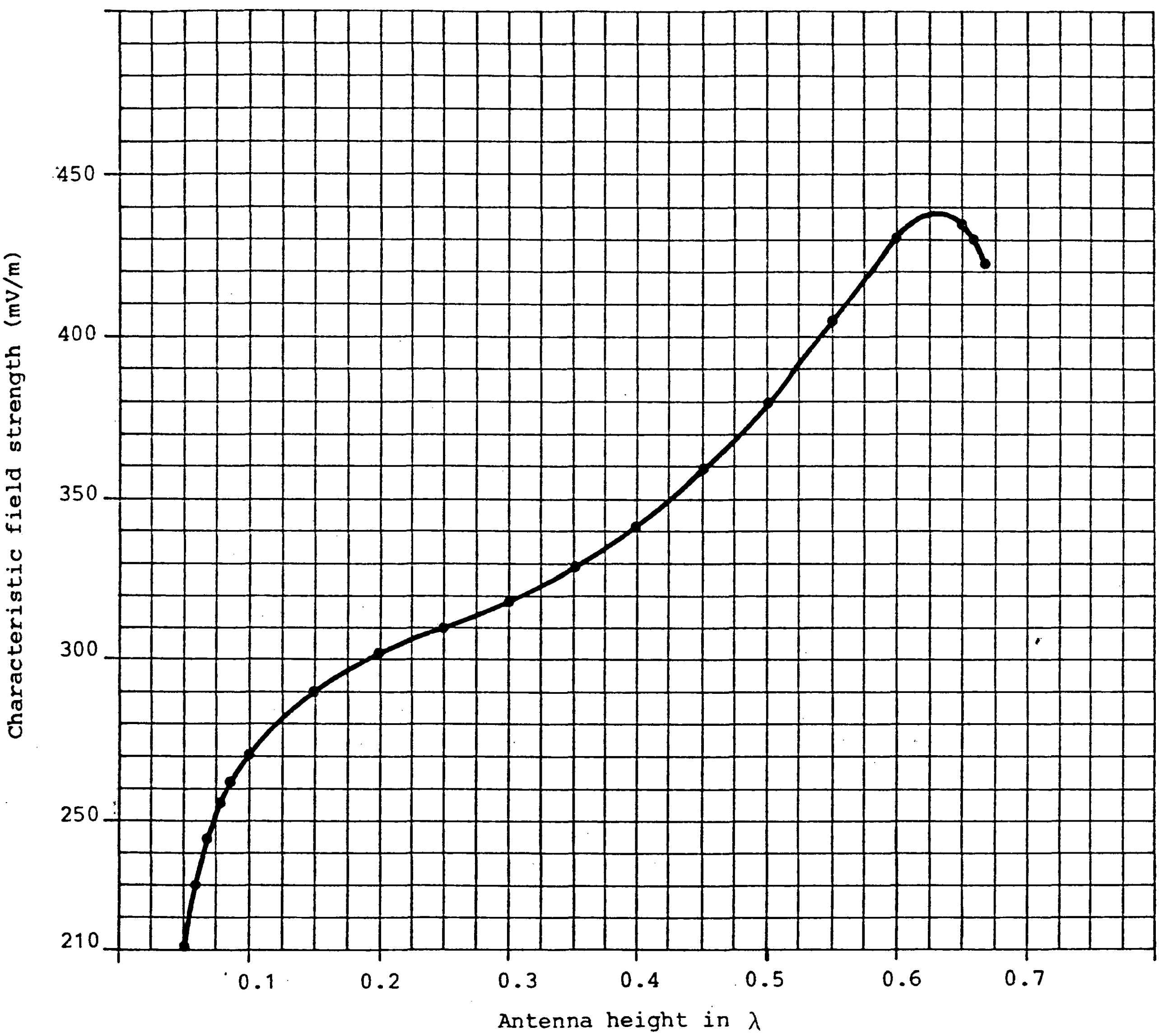
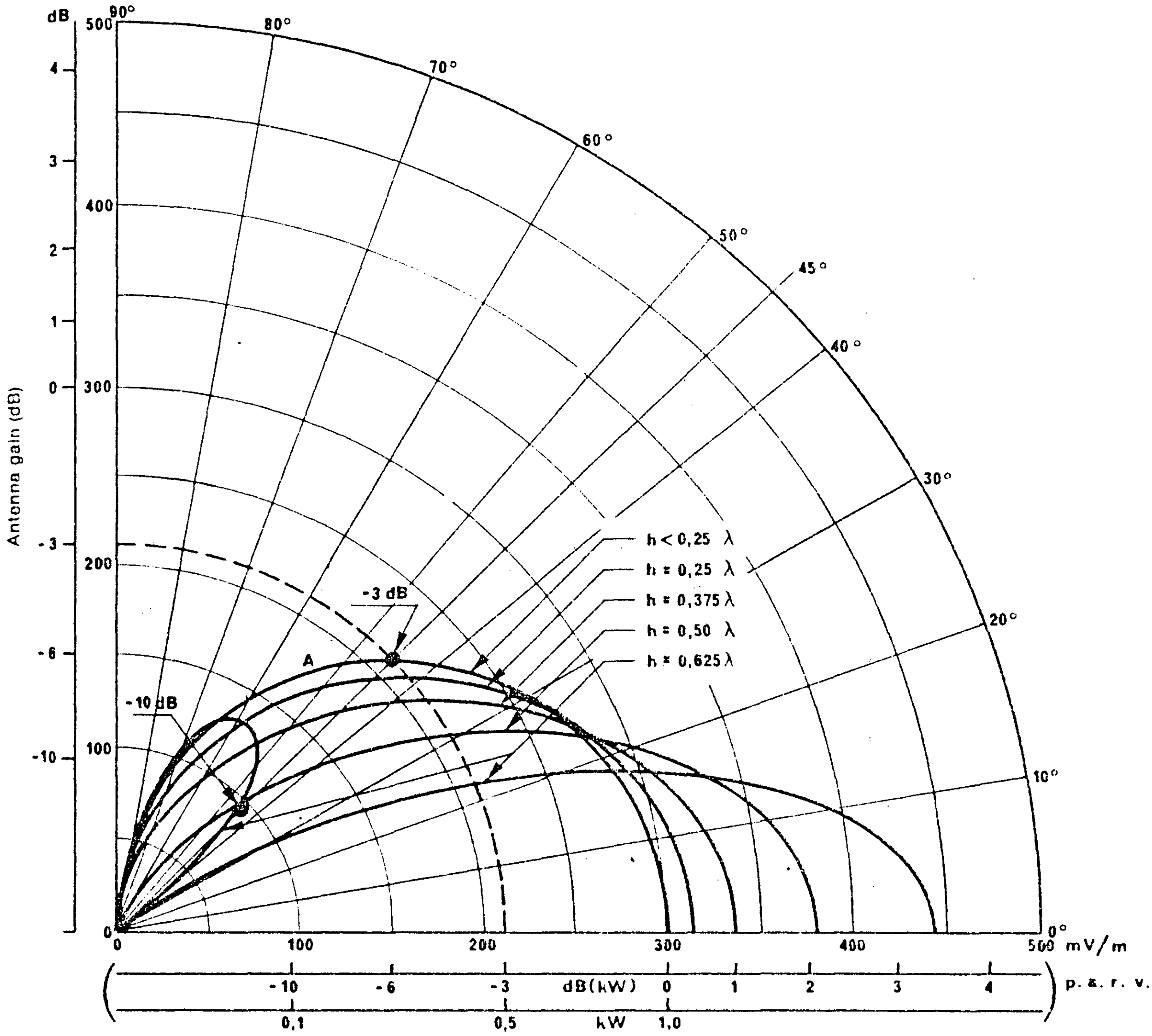


FIGURE 2.3a

Characteristic field strength of an antenna, based on a 1 ohm resistance loss

[Note by the Editorial Committee - This text requires two readings.]

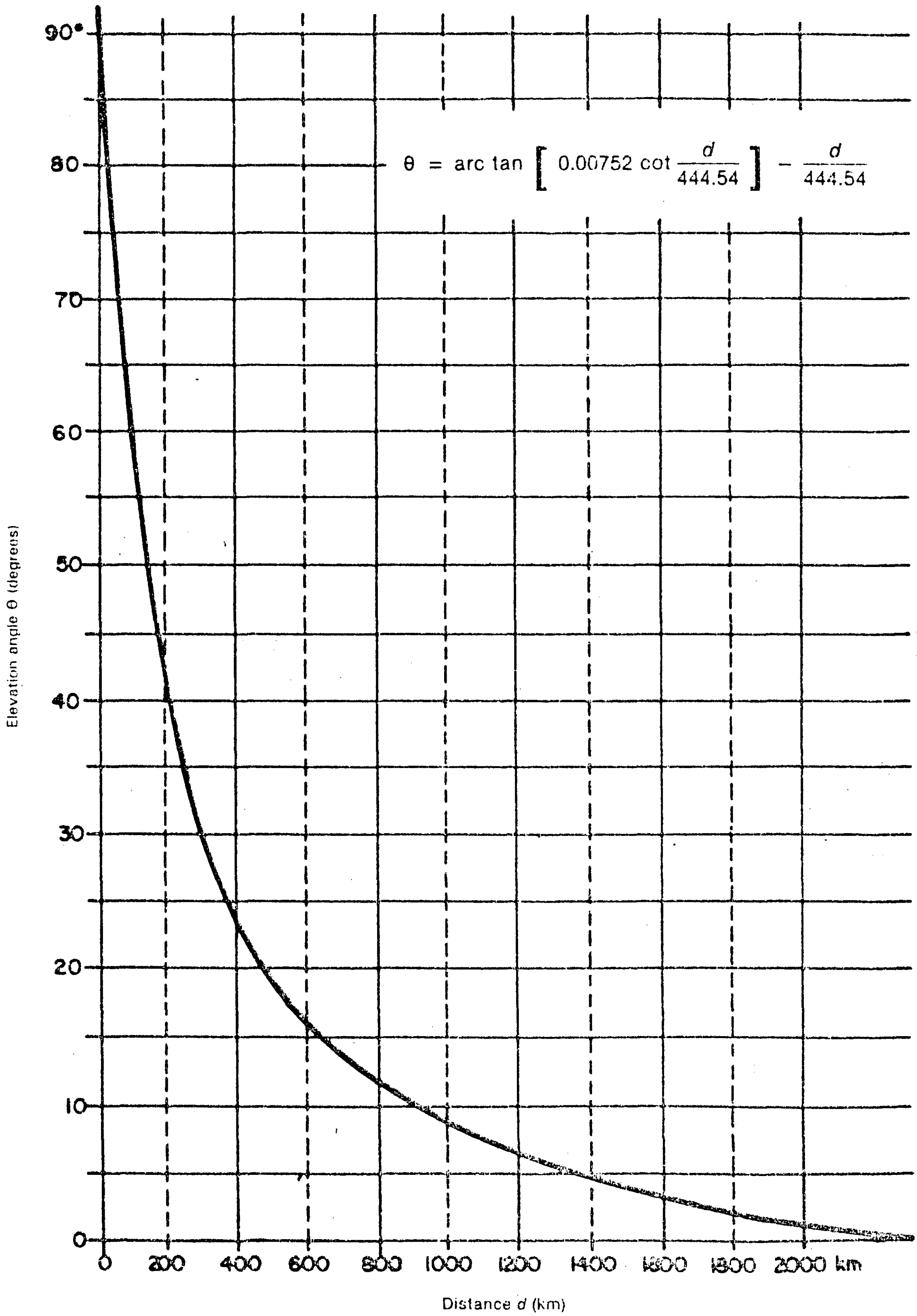


A: Short vertical antenna

FIGURE 2.3b - *Effective monopole radiated power (e.m.r.p.) and field strength at a distance of 1 km as a function of elevation angle, for different heights of vertical antennas assuming a transmitter power of 1 kW*

TABLE 2.I - *Elevation angle vs distance*

Distance (km)	Elevation angle (degrees)
50	75.3
100	62.2
150	51.6
200	43.3
250	36.9
300	31.9
350	27.9
400	24.7
450	22.0
500	19.8
550	18.0
600	16.3
650	14.9
700	13.7
750	12.6
800	11.7
850	10.8
900	10.0
950	9.3
1000	8.6
1050	8.0
1100	7.4
1150	6.9
1200	6.4
1250	5.9
1300	5.4
1350	5.0
1400	4.6
1450	4.3
1500	3.9
1550	3.5
1600	3.2
1650	2.9
1700	2.6
1750	2.3
1800	2.0
1850	1.7
1900	1.5
1950	1.2
2000	1.0
2050	0.7
2100	0.5
2150	0.2
2200	0.0
2250	0.0
2300	0.0
2350	0.0
2400	0.0



$$\theta = \arctan\left[0.00752 \cot \frac{d}{444.54}\right] - \frac{d}{444.54}$$

FIGURE 2.4 - *Elevation angle vs distance*

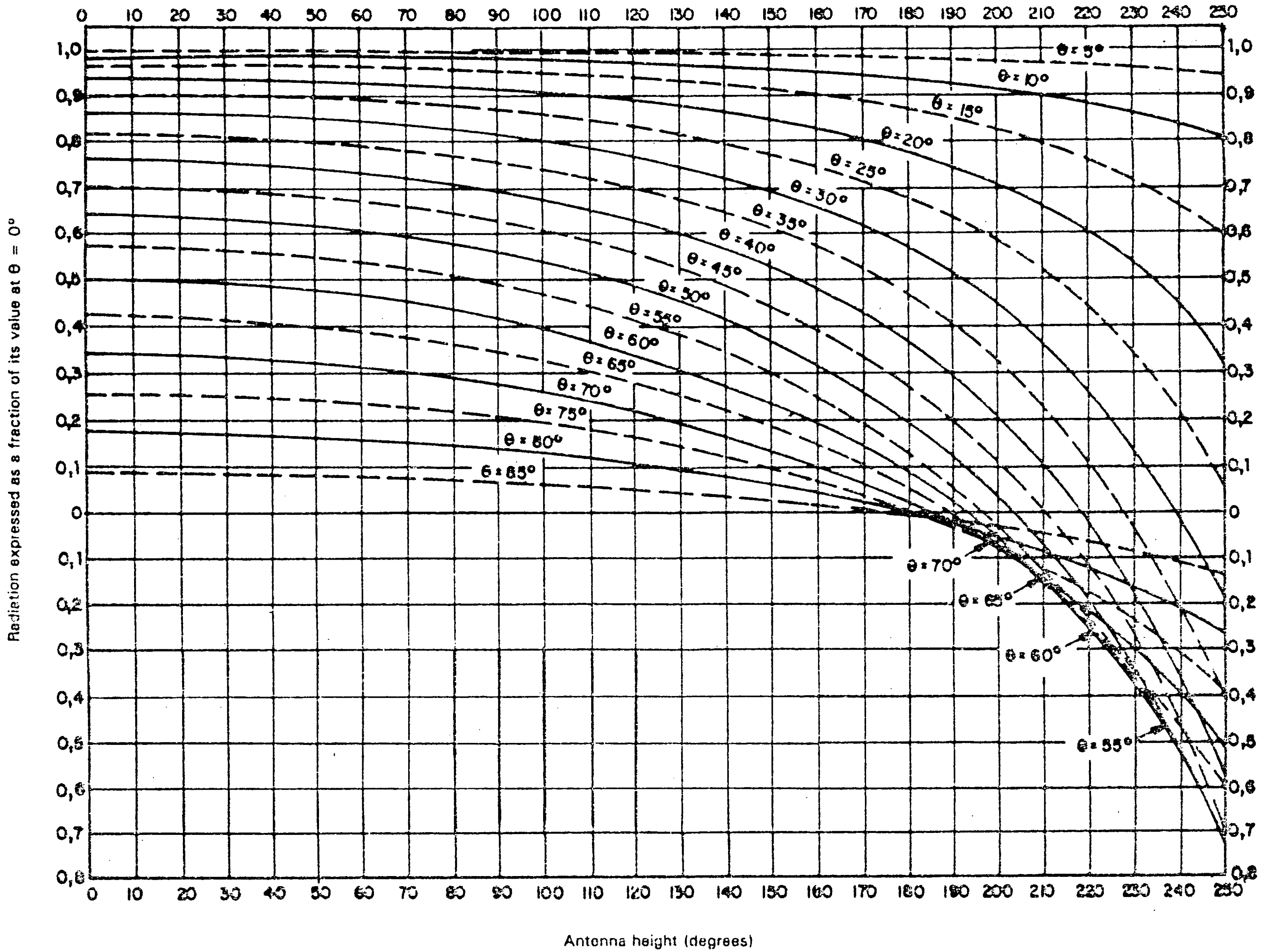


FIGURE 2.5 - *Vertical plane radiation of simple vertical antennas as a function of electrical tower height for various values of elevation angle (θ)*

TABLE 2.II – *f*(θ) *values for simple vertical antennas*

Elevation angle (degrees)	*f*(θ)					
	0.11 λ	0.13 λ	0.15 λ	0.17 λ	0.19 λ	0.21 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.999	0.998	0.998	0.998	0.998	0.998
4	0.997	0.997	0.997	0.997	0.997	0.997
5	0.996	0.996	0.996	0.995	0.995	0.995
6	0.994	0.994	0.994	0.993	0.993	0.993
7	0.992	0.992	0.991	0.991	0.991	0.990
8	0.989	0.989	0.989	0.988	0.988	0.987
9	0.987	0.986	0.986	0.985	0.985	0.984
10	0.984	0.983	0.983	0.982	0.981	0.980
11	0.980	0.980	0.979	0.978	0.977	0.976
12	0.976	0.976	0.975	0.974	0.973	0.971
13	0.972	0.972	0.971	0.969	0.968	0.967
14	0.968	0.967	0.966	0.965	0.963	0.961
15	0.963	0.962	0.961	0.959	0.958	0.956
16	0.958	0.957	0.956	0.954	0.952	0.950
17	0.953	0.952	0.950	0.948	0.945	0.943
18	0.947	0.946	0.944	0.942	0.940	0.937
19	0.941	0.940	0.938	0.935	0.933	0.930
20	0.935	0.933	0.931	0.929	0.926	0.922
22	0.922	0.920	0.917	0.914	0.911	0.907
24	0.907	0.905	0.902	0.898	0.894	0.890
26	0.892	0.889	0.885	0.882	0.877	0.872
28	0.875	0.872	0.868	0.864	0.858	0.852
30	0.857	0.854	0.849	0.844	0.839	0.832
32	0.838	0.834	0.830	0.824	0.818	0.811
34	0.819	0.814	0.809	0.803	0.795	0.789
36	0.798	0.793	0.788	0.781	0.774	0.766
38	0.776	0.771	0.765	0.758	0.751	0.742
40	0.753	0.748	0.742	0.735	0.725	0.717
42	0.730	0.724	0.718	0.710	0.702	0.692
44	0.705	0.700	0.693	0.685	0.676	0.666
46	0.680	0.674	0.667	0.659	0.650	0.639
48	0.654	0.648	0.641	0.633	0.623	0.612
50	0.628	0.621	0.614	0.606	0.596	0.585
52	0.600	0.594	0.587	0.578	0.568	0.557
54	0.572	0.566	0.559	0.550	0.540	0.529
56	0.544	0.537	0.530	0.521	0.512	0.501
58	0.515	0.508	0.501	0.493	0.483	0.472
60	0.485	0.479	0.472	0.463	0.454	0.443

TABLE 2.II *(continued)*

Elevation angle (degrees)	f(ϑ)					
	0.23 λ	0.25 λ	0.27 λ	0.29 λ	0.311 λ	0.35 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.998	0.998	0.998	0.998	0.998	0.997
4	0.997	0.996	0.996	0.996	0.996	0.995
5	0.995	0.994	0.994	0.994	0.993	0.992
6	0.992	0.992	0.991	0.991	0.990	0.989
7	0.990	0.989	0.988	0.988	0.987	0.985
8	0.987	0.986	0.985	0.984	0.983	0.980
9	0.983	0.982	0.981	0.980	0.978	0.975
10	0.979	0.978	0.977	0.975	0.973	0.969
11	0.975	0.973	0.972	0.970	0.968	0.963
12	0.970	0.968	0.966	0.964	0.962	0.955
13	0.965	0.963	0.961	0.958	0.955	0.949
14	0.959	0.957	0.955	0.952	0.948	0.941
15	0.953	0.951	0.948	0.945	0.941	0.932
16	0.947	0.944	0.941	0.937	0.933	0.924
17	0.941	0.937	0.934	0.930	0.925	0.914
18	0.934	0.930	0.926	0.921	0.916	0.904
19	0.926	0.922	0.918	0.913	0.907	0.894
20	0.919	0.914	0.909	0.904	0.898	0.883
22	0.902	0.897	0.891	0.885	0.877	0.861
24	0.885	0.879	0.872	0.865	0.856	0.837
26	0.866	0.859	0.852	0.843	0.833	0.811
28	0.846	0.838	0.830	0.820	0.809	0.795
30	0.825	0.816	0.807	0.797	0.784	0.758
32	0.803	0.794	0.784	0.772	0.759	0.729
34	0.780	0.770	0.759	0.747	0.732	0.701
36	0.756	0.746	0.734	0.721	0.705	0.671
38	0.732	0.720	0.708	0.694	0.677	0.642
40	0.706	0.695	0.681	0.667	0.649	0.612
42	0.681	0.668	0.654	0.639	0.621	0.582
44	0.654	0.641	0.627	0.611	0.593	0.552
46	0.628	0.614	0.600	0.583	0.564	0.523
48	0.600	0.587	0.572	0.555	0.536	0.494
50	0.573	0.559	0.544	0.527	0.507	0.465
52	0.545	0.531	0.515	0.498	0.479	0.436
54	0.517	0.503	0.487	0.470	0.451	0.408
56	0.488	0.474	0.459	0.442	0.423	0.381
58	0.460	0.446	0.431	0.414	0.395	0.354
60	0.431	0.418	0.403	0.387	0.368	0.328

TABLE 2.II *(end)*

Elevation angle (degrees)	$f(\theta)$					
	0.40 λ	0.45 λ	0.50 λ	0.528 λ	0.55 λ	0.625 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	0.999	0.999	0.999	0.999
2	0.998	0.998	0.998	0.997	0.997	0.995
3	0.997	0.996	0.995	0.994	0.993	0.989
4	0.994	0.992	0.990	0.989	0.988	0.981
5	0.991	0.988	0.985	0.983	0.981	0.970
6	0.986	0.983	0.979	0.975	0.972	0.957
7	0.982	0.977	0.971	0.967	0.962	0.941
8	0.976	0.970	0.962	0.957	0.951	0.924
9	0.970	0.963	0.953	0.945	0.938	0.904
10	0.963	0.954	0.942	0.933	0.924	0.882
11	0.955	0.945	0.930	0.919	0.909	0.859
12	0.947	0.934	0.917	0.905	0.893	0.834
13	0.938	0.923	0.903	0.889	0.875	0.807
14	0.929	0.912	0.889	0.872	0.857	0.773
15	0.918	0.899	0.873	0.855	0.837	0.748
16	0.908	0.886	0.857	0.836	0.815	0.717
17	0.897	0.873	0.840	0.817	0.795	0.684
18	0.885	0.859	0.823	0.797	0.772	0.651
19	0.873	0.844	0.804	0.776	0.749	0.617
20	0.860	0.828	0.785	0.755	0.726	0.582
22	0.833	0.796	0.746	0.710	0.677	0.510
24	0.805	0.763	0.705	0.665	0.625	0.436
26	0.776	0.728	0.663	0.618	0.574	0.363
28	0.745	0.692	0.621	0.570	0.522	0.290
30	0.714	0.655	0.577	0.522	0.470	0.219
32	0.682	0.619	0.534	0.475	0.419	0.151
34	0.649	0.582	0.492	0.428	0.368	0.085
36	0.617	0.545	0.450	0.383	0.321	0.025
38	0.584	0.509	0.409	0.340	0.275	−0.031
40	0.552	0.473	0.370	0.298	0.231	−0.083
42	0.519	0.438	0.332	0.258	0.190	−0.129
44	0.488	0.405	0.296	0.221	0.152	−0.170
46	0.457	0.372	0.262	0.187	0.117	−0.205
48	0.427	0.341	0.230	0.155	0.085	−0.235
50	0.397	0.311	0.201	0.126	0.056	−0.259
52	0.369	0.283	0.174	0.099	0.031	−0.278
54	0.341	0.257	0.149	0.076	0.009	−0.291
56	0.315	0.232	0.126	0.055	−0.010	−0.300
58	0.289	0.208	0.105	0.037	−0.026	−0.304
60	0.265	0.186	0.087	0.021	−0.039	−0.304
62				0.003	−0.049	−0.300
64				−0.003	−0.056	−0.292
66				−0.011	−0.062	−0.281
68				−0.017	−0.064	−0.267
70				−0.022	−0.065	−0.250
72				−0.025	−0.064	−0.231
74				−0.026	−0.061	−0.210
76				−0.026	−0.056	−0.138
78				−0.024	−0.051	−0.163
80				−0.022	−0.044	−0.138

Note – When the negative sign (−) appears in the Table, it signifies only the existence of a secondary lobe having the opposite phase from the main lobe in the vertical radiation pattern. In order to perform the calculation, ignore the negative (−) and use only the absolute value $f(\theta)$ from the Table.

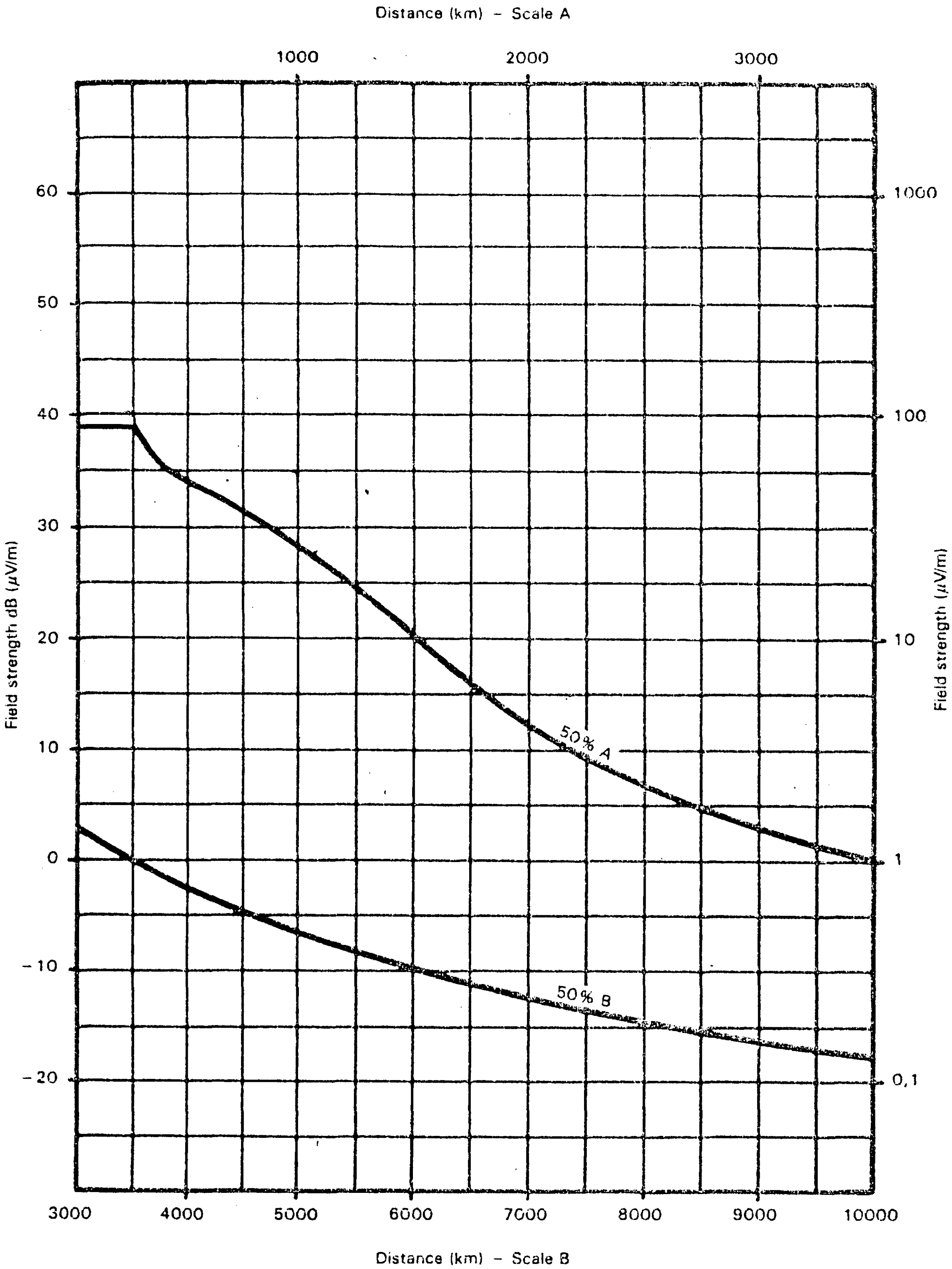


FIGURE 2.6 – *Skywave field strength vs distance for a characteristic field strength of 100 mV/m*

TABLE 2.III – *Skywave field strength vs distance* (0 to *1000 km*) *for a characteristic field strength of 100 mV/m*

d (km)	F_c (dB(μV/m)) 50%	F_c (μV/m) 50%
0-200	39.28	92.06
250	37.79	77.54
300	36.75	68.82
350	35.86	62.06
400	35.13	57.08
450	34.46	52.86
500	33.92	49.65
550	33.40	46.78
600	32.94	44.36
650	32.45	41.95
700	31.94	39.54
750	31.32	36.81
800	30.73	34.40
850	30.18	32.30
900	29.51	29.89
950	28.83	27.63
1000	28.14	25.54
1050	27.44	23.56
1100	26.79	21.84
1150	25.98	19.91
1200	25.25	18.30
1250	24.50	16.78
1300	23.71	15.32
1350	22.90	13.97
1400	22.08	12.71
1450	21.25	11.55
1500	20.42	10.50
1550	19.59	9.53
1600	18.66	8.57
1650	17.75	7.72
1700	16.87	6.98
1750	16.04	6.34
1800	15.28	5.80
1850	14.52	5.32
1900	13.78	4.89
1950	13.05	4.49
2000	12.34	4.14
2100	11.15	3.61
2200	10.05	3.18
2300	8.92	2.79
2400	8.13	2.55
2500	7.09	2.26
2600	6.16	2.03
2700	5.32	1.85
2800	4.58	1.69
2900	3.81	1.55

TABLE 2.III *(end)*

d (km)	F_c (dB (μV/m)) 50%	F_c (μV/m) 50%
3000	3.11	1.43
3100	2.45	1.33
3200	1.78	1.23
3300	1.18	1.15
3400	0.57	1.07
3500	0.02	1.00
3600	−0.53	0.94
3700	−1.08	0.88
3800	−1.59	0.83
3900	−2.08	0.79
4000	−2.52	0.75
4100	−3.01	0.71
4200	−3.46	0.67
4300	−3.90	0.64
4400	−4.33	0.61
4500	−4.74	0.58
4600	−5.15	0.55
4700	−5.54	0.53
4800	−5.93	0.51
4900	−6.30	0.48
5000	−6.67	0.46
5100	−7.02	0.45
5200	−7.37	0.43
5300	−7.71	0.41
5400	−8.04	0.40
5500	−8.37	0.38
5600	−8.68	0.37
5700	−8.99	0.36
5800	−9.29	0.34
5900	−9.59	0.33
6000	−9.88	0.32
6200	−10.43	0.30
6400	−10.97	0.28
6600	−11.48	0.27
6800	−11.97	0.25
7000	−12.44	0.24
7200	−12.90	0.23
7400	−13.33	0.22
7600	−13.75	0.21
7800	−14.15	0.20
8000	−14.54	0.19
8200	−14.92	0.18
8400	−15.28	0.17
8600	−15.63	0.17
8800	−15.97	0.16
9000	−16.29	0.15
9200	−16.61	0.15
9400	−16.91	0.14
9600	−17.21	0.14
9800	−17.50	0.13
10000	−17.77	0.13

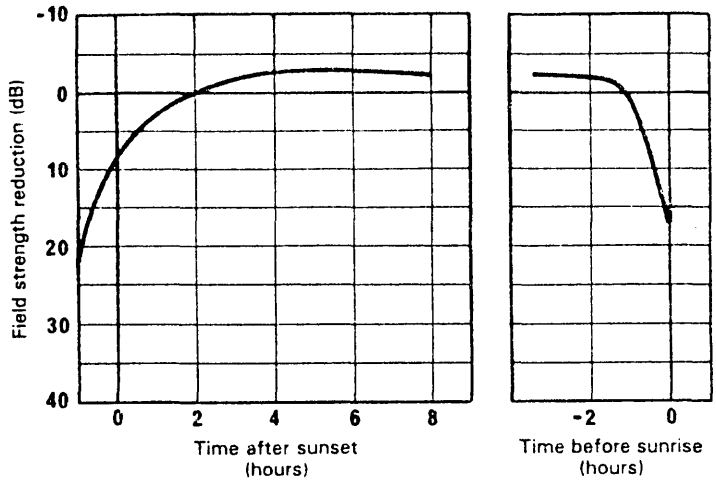


FIGURE 2.7 – *Field strength variation during the night*

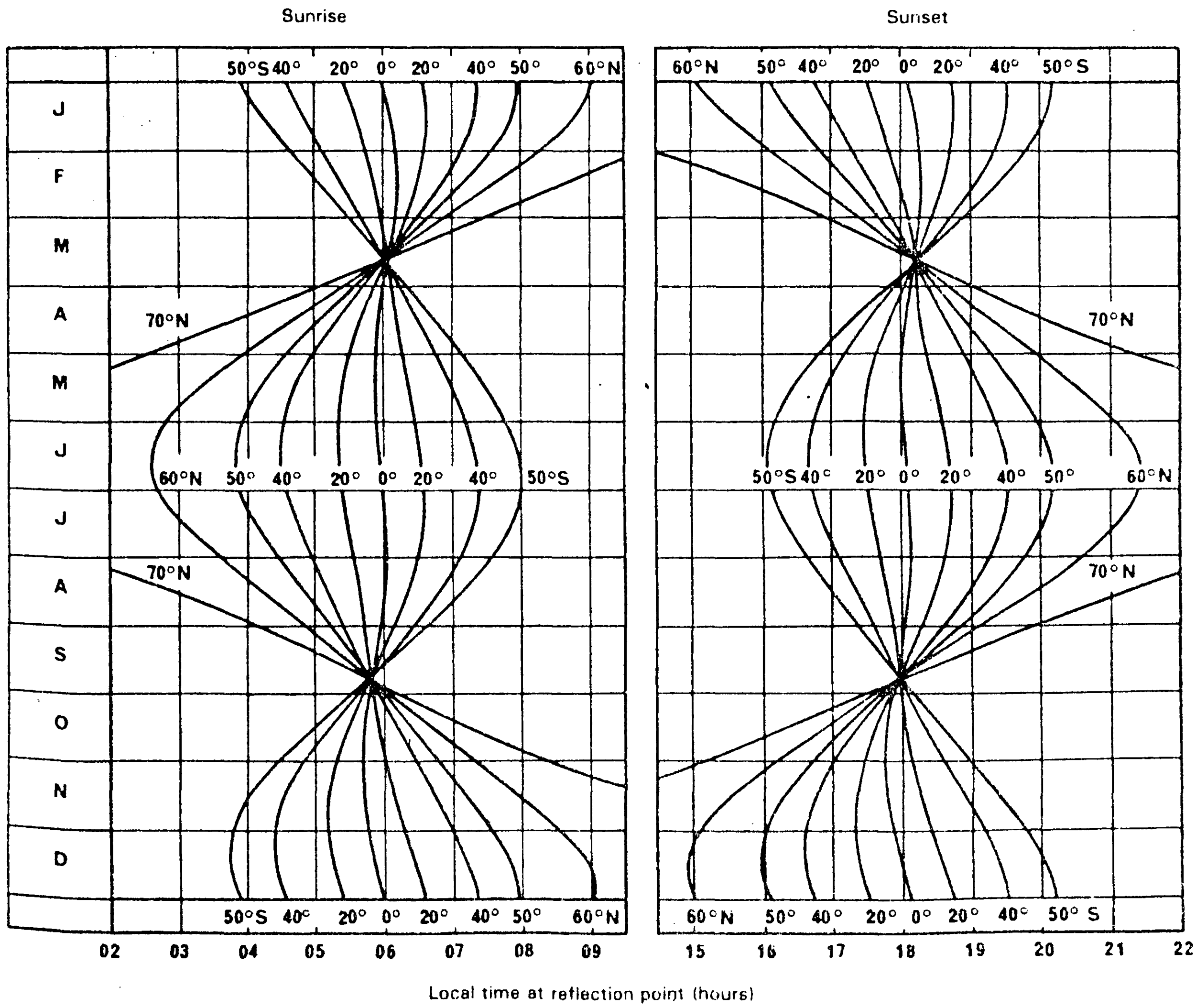


FIGURE 2.8 – *Times of sunrise and sunset for various months and geographical latitudes*

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 104-E
28 April 1986

B.7

PLENARY MEETING

7th SERIES OF TEXTS SUBMITTED BY THE EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Document	Title
COM.5	95	Chapter 7 - Guidelines for the Agreement
		Recommendation COM5/B

P. PERRICHON
Chairman of Committee 6

Annex: 7 pages

CHAPTER 7 - GUIDELINES FOR THE AGREEMENT

In compliance with item 2.1.7 of the agenda in Resolution No. 913 relating to the establishment of guidelines for the agreement, a draft agreement was prepared by the first session of the Conference to assist the second session, as follows:

DRAFT REGIONAL AGREEMENT FOR THE USE BY THE BROADCASTING SERVICE OF THE BAND 1 605 - 1 705 kHz IN REGION 2

PREAMBLE

Noting No. 480 of the Radio Regulations, which provides:

"In Region 2, the use of the band 1 605 - 1 705 kHz by stations of the broadcasting service shall be subject to a plan to be established by a regional administrative radio conference ...";

fully respecting the sovereign right of each country to regulate within its territory the use of the frequency band 1 605 - 1 705 kHz by the broadcasting service, and to reach special arrangements regarding this service with such countries as it may consider appropriate, without prejudice to other administrations;

seeking to facilitate mutual understanding and cooperation among the Members of Region 2 in achieving a satisfactory broadcasting service in the MF band 1 605 - 1 705 kHz;

recognizing that all countries have equal rights, and that, in the application of the Plan and its provisions, the needs of each country, and in particular those of developing countries, shall be met as far as possible, and

acknowledging that mutual protection of their broadcasting service is a major objective for all countries, in order to ensure better coordination and the use of more efficient facilities;

the delegates of the Members of the International Telecomunication Union assembled in [ ] at a regional administrative conference convened pursuant to the International Telecommunication Convention (Nairobi 1982), have adopted, subject to approval by the competent authorities of their respective countries, the following provisions relating to the broadcasting service in Region 2 for the frequency band between 1 605 and 1 705 kHz.

ARTICLE 1

Definitions

For the purposes of the Agreement, the following terms shall have the meanings defined below.

Union: The International Telecommunication Union.

Secretary-General: The Secretary-General of the Union.

IFRB: The International Frequency Registration Board.

CCIR: The International Radio Consultative Committee.

Convention: The International Telecommunication Convention.

Radio Regulations: The Radio Regulations supplementing the provisions of the Convention.

Region 2: The geographical area defined in No. 394 of the Radio Regulations, Geneva, 1979.

Master Register: The Master International Frequency Register.

Provisions: The provisions adopted herein that are associated with the Plan.

Agreement: This Instrument and its Annexes.

Plan: The Allotment Plan in [Annex] and the associated provisions[1].

Administration: Any governmental department or service responsible for discharging the obligations undertaken in the Convention and the Radio Regulations.

Contracting Member: Any member of the Union which has approved the Agreement or acceded to it.

Affected Administration: An administration within whose territory the signal of a proposed assignment of another administration exceeds the value prescribed in [section 3.6 of this Agreement].

Allotment: Entry in the Plan of a designated broadcasting channel for use by an administration for the broadcasting service in an allotment area under the conditions specified in the [Plan and/or Agreement]. Each allotment included in the Plan may be used for one or more assignments using the technical criteria specified in [A].

Allotment area: Specifically defined geographical area within a country to which one or more channels are allotted.

---

1 The allotments may be converted into assignments and this will appear as Part B of the Plan.

ARTICLE 2

Frequency Band

The provisions of the Agreement shall apply to the broadcasting service in the frequency band 1 605 - 1 705 kHz as allocated to Region 2 under Article 8 of the Radio Regulations.

ARTICLE 3

Execution of the Agreement

3.1 The Contracting Members shall adopt for their stations in Region 2 in the frequency band which is the subject of the Agreement the technical characteristics and standards which are in conformity with the Agreement.

3.2 The Contracting Members shall not bring into use frequency assignments to broadcasting stations except under the conditions set out in Article 4 of the Agreement.

3.3 The Contracting Members undertake, to the extent possible, to avoid or to reduce any harmful or objectionable interference.

ARTICLE 4

Implementation of the Plan and Notification of Frequency Assignments in the Broadcasting Service

4.1 Assignments corresponding to an allotted channel*

4.1.1. An administration may at any time, without the need for coordination, make assignments corresponding to any of its allotments, at one or more locations within the respective allotment area, provided that:

4.1.1.1 - the characteristics of the assignments are within the standardized parameters given in [Annex A/section 3.5 of this Agreement];

4.1.1.2 - where necessary, the coordination required for the protection of adjacent channels has been successfully concluded [Annex B/ Chapter 3 of this Agreement]; and

4.1.1.3 - the criteria of [ ] are met in cases where the characteristics of the assignments exceed the values of the standardized parameters.

---

* According to the separation distances used in preparing the Allotment Plan, there may be a need for coordination when bringing into use an assignment corresponding to an allotment.

4.2 Assignments corresponding to channels not allotted to the area

4.2.1 An administration may at any time, without the need for coordination, make an assignment on a channel not allotted to it provided that the characteristics of the assignment satisfy the criteria set out in [Annex A] with respect to:

4.2.1.1 - the use of the channel or channels by the administration(s) to which it is allotted in the Plan; and

4.2.1.2 - any broadcasting station of another Region 2 administration previously recorded in the Master Register with a favourable finding.

4.2.2 An administration may make an assignment on a channel not allotted to it or with characteristics which do not satisfy the conditions set out in sections 4.2.1.1 and 4.2.1.2 provided that such use has been successfully coordinated with the affected administration(s).

4.3 When an administration proposes to bring into use an assignment in conformity with the Agreement, it shall notify it to the IFRB in accordance with Article 12 of the Radio Regulations. Any such assignment recorded in the Master Register as a result of the application of Article 12 of the Radio Regulations shall bear a special symbol under the Remarks Column and a date in Column 2a or in Column 2b.

4.4 When the IFRB receives an assignment notice which is not in conformity with the Agreement, it shall return the notice to the notifying administration.

4.5 If the notifying administration resubmits the notice with or without modification and insists that it be reconsidered, and if the Board's finding remains unfavourable, the notice shall be returned to the notifying administration.

ARTICLE 5

Special Arrangements

In order to supplement the procedures laid down in these Provisions, or to facilitate the coordination provided for in Article 4, administrations may conclude or continue special arrangements in conformity with the applicable provisions of the Convention and the Radio Regulations.

ARTICLE 6

Plan

Part A: consists of the allotments in the Region-wide Allotment Plan.

Part B: consists of the assignments to be developed at the Second Session by administrations seeking to convert their allotments to assignments.

ARTICLE 7

Scope of Application of the Agreement

7.1 The Agreement is binding upon the Contracting Members in their mutual relations, but not in their relations with non-contracting countries.

7.2 Should a Contracting Member formulate reservations on the application of any provision of the Agreement, the other Contracting Members shall be free to disregard that provision in their relations with the Member that has made the reservations.

ARTICLE 8

Approval of the Agreement

The signatory Members shall notify the Secretary-General of their approval of this Agreement as soon as possible by depositing an instrument of approval; the Secretary-General shall immediately inform the other Members of the Union.

ARTICLE 9

Accession to the Agreement

9.1 Any Member of the Union in Region 2 which has not signed the Agreement may accede to it at any time by depositing an instrument of accession with the Secretary-General, who shall immediately inform the other Members of the Union. Accession shall apply to the Plan as it stands at the time of accession and shall be made without reservation.

9.2 Accession to the Agreement shall become effective on the date on which the instrument of accession is received by the Secretary-General.

ARTICLE 10

Denunciation of the Agreement

10.1 Any Contracting Member may denounce the Agreement at any time by a notification sent to the Secretary-General, who shall inform the other Members of the Union.

10.2 Denunciation shall become effective one year after the date on which the Secretary-General receives the notification of denunciation.

ARTICLE 11

Entry into Force of the Agreement

The Agreement shall enter into force on [ ] at [ ] hours UTC.

ARTICLE 12

Duration of the Agreement

The Agreement shall remain in force until revised by a competent administrative radio conference.

RECOMMENDATION COM5/B

Incorporation in the Radio Regulations of the Allotment Plan and the Associated Provisions for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

a) that, on the basis of No. 480 of the Radio Regulations, the Second Session of this Conference has been empowered to establish a plan for the entire Region;

b) that the Conference decided to prepare the plan on the basis of objective criteria equally applied to all the countries of the Region;

c) that the plan will be an allotment plan limited to a channelling arrangement, delimitation of the allotment areas and standardized parameters;

d) that the standardized parameters adopted for the establishment of the plan should not lead to any inter-Regional difficulties between the services to which the band is allocated;

e) Recommendation PLEN/A relating to the agenda of the Second Session of this Conference;

recommends the Administrative Council

to place on the agenda of the Second Session of the WARC-ORB in 1988:

1.1 the consideration of consequential changes to Nos. 480 and 481 of Article 8 of the Radio Regulations in this frequency band in Region 2;

1.2 the consideration of the question of incorporation in the Radio Regulations, in the appropriate form, of the Allotment Plan and the associated provisions to be prepared for the broadcasting service in the band 1 605 - 1 705 kHz in Region 2.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 105-E
28 April 1986
Original: English

Source: Documents 95 + Add.1 + Add.2, 96

COMMITTEE 6

NOTE BY THE CHAIRMAN OF COMMITTEE 5

TO COMMITTEE 6

The texts set out in Documents 95 + Add.1 + Add.2, 96 have been modified and adopted by Committee 5, and are submitted to the Editorial Committee.

M. FERNANDEZ-QUIROZ
Chairman of Committee 5

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 106-E
29 April 1986
Original : English

Note by the Secretary-General

FOR INFORMATION

FINAL DAYS OF THE CONFERENCE

1. Report

The copies of the Report will be distributed by means of one copy per delegate, distributed in the document distribution boxes before the closing ceremony.

Note - Delegates who leave the Conference before the closing ceremony are requested to fill in a form available at the Document Distribution Service to enable the Secretariat to dispatch their copies after the Conference.

2. Declarations concerning the Report

When the last text to be included in the Report of the Conference has been approved in second reading by the Plenary Meeting, a time limit will be set for the deposit of declarations concerning the Report.

The declarations are to be handed in to the Executive Secretary of the Conference (office J.165) for presentation in one consolidated Conference document.

A Plenary Meeting will be scheduled to take note only of the declarations and without debate. A second deadline will be fixed for the deposit of additional declarations having regard to the first set of declarations.

A subsequent Plenary Meeting will take note of the additional declarations without debate.

The declarations and additional declarations relating to the Report will be annexed to the Minutes of the Plenary Meetings at which they were taken note of and, subject to a decision by the Conference, will be circulated to Member Administrations (as in the case of the First Session of a previous Conference).

R.E. BUTLER
Secretary-General

BLUE PAGES

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 107-E
29 April 1986

B.8

PLENARY MEETING

8TH SERIES OF TEXTS SUBMITTED BY THE
EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Document	Title
COM.5	96 + DT/35	Chapter 6 - sections 6.2, 6.3

P. PERRICHON
Chairman of Committee 6

Annex: 7 pages

[CHAPTER 6]

6.2 Planning method

The following text is a general description of the steps to be taken in developing the Plan based on the planning method that has been adopted.

6.2.1 Step 1 consists in using the appropriate co-channel standardized distance and identifying within each country the areas to which a minimum number of channels will be allotted. The following method may be used.

6.2.1.1 Taking a geographical map covered with a sufficiently small grid and using a template having a circle with a radius equal to the appropriate standardized distance, determine for any point of the grid the number of countries within this circle; write the number on the map.

6.2.1.2 Move to another point on the grid and repeat 6.2.1.1.

6.2.1.3 Having processed all the points on the grid, draw the boundaries around all the numbers with the same value (see Figures 6.1 and 6.2).

6.2.1.4 Taking into account the frontiers between countries, describe each area using these borders and/or geographical coordinates from the boundaries defined in 6.2.1.3.

6.2.1.5 Identify each area with a single code based on the geographical area symbols contained in Table B1 of the Preface to the International Frequency List.

6.2.2 Step 2 consists in identifying the minimum number of channels to be allotted to each of the areas identified in Step 1.

1. Each of the areas identified in Step 1 is associated with a number corresponding to the number of countries within a distance [X] (see section 6.3.2).

2. Using Table 6.1, determine the minimum number of channels to be allotted to each area.

TABLE 6.1

Minimum number of allotted channels

Total number of administrations	Minimum number of allotted channels	Remaining channels
1	10	0
2	5	0
3	3	1
4	2	2
5	2	0
6-10	1	4-0

6.2.3 Step 3 consists in allotting in each case the channels constituting the minimum number of channels, taking account of the need to minimize adjacent channel interference.

At this stage the minimum number of allotments to neighbouring allotment areas shall be made with a view to reducing adjacent channel problems as much as possible, particularly in the case of allotment areas with only one or two channels.

6.2.4 Step 4 consists in allotting the remaining channels.

The remaining channels may be used during the second session to increase the number of allotments to neighbouring countries, on the basis of the conditions to be adopted at that session.

6.2.5 Step 5 consists in bilateral or multilateral negotiations carried out between neighbouring countries if they so desire.

The second session should adopt any rule that might be needed for these negotiations during that session concerning:

- alternative arrangements of the channels and areas allotted to these countries;

- the determination of the boundaries of allotment areas on the basis of tolerances to be defined;

6.2.6 At this stage, administrations so wishing may use the allotments resulting from steps 3 and 4 and specify the locations and parameters of assignments which are to be included in the Plan appearing in the Regional Agreement. These assignments will be examined using the criteria of sections 6.3 and 6.4 to ensure that the allotments of other administrations are not affected.

The following example illustrates the method:

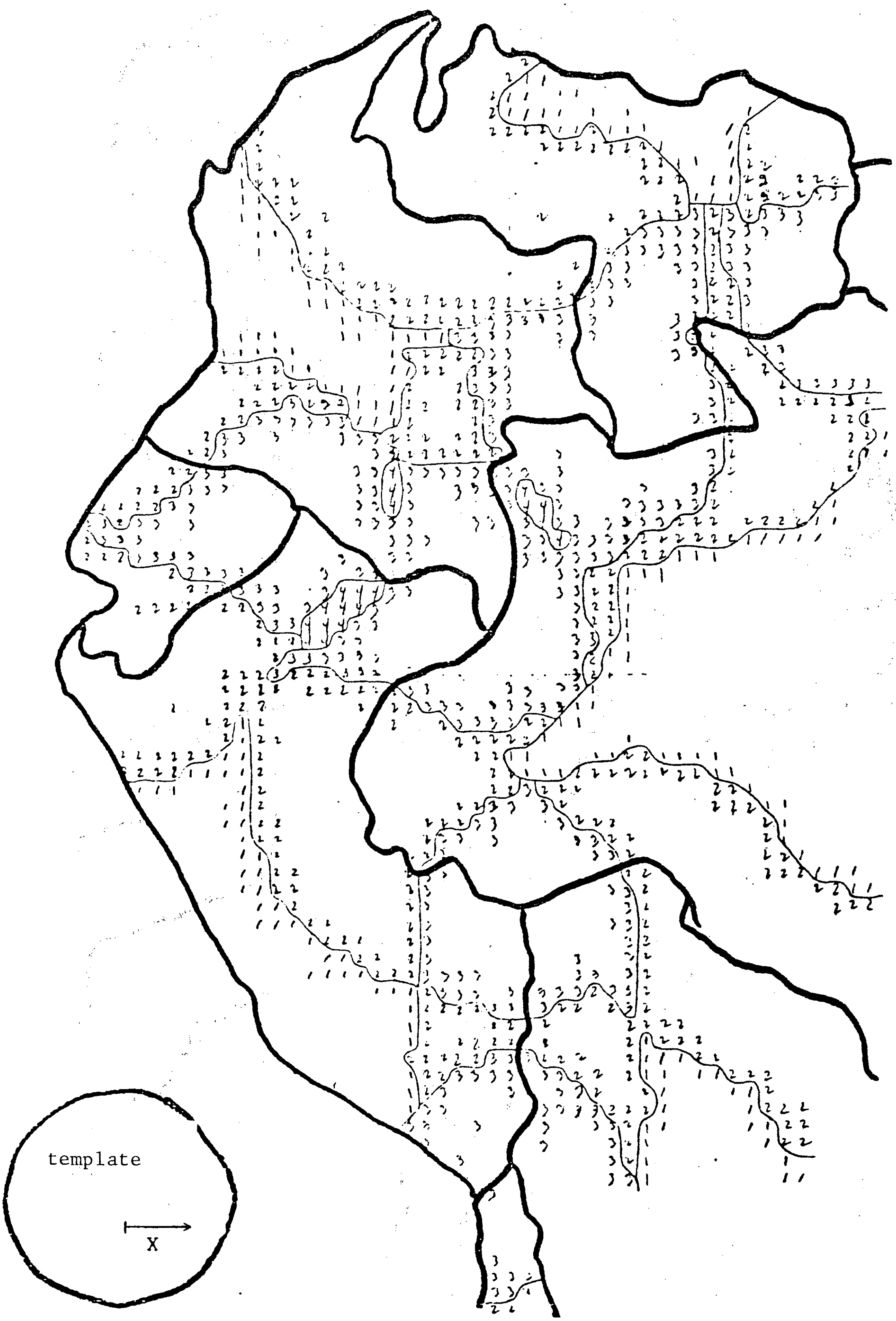


FIGURE 6.1

Number of countries within the template

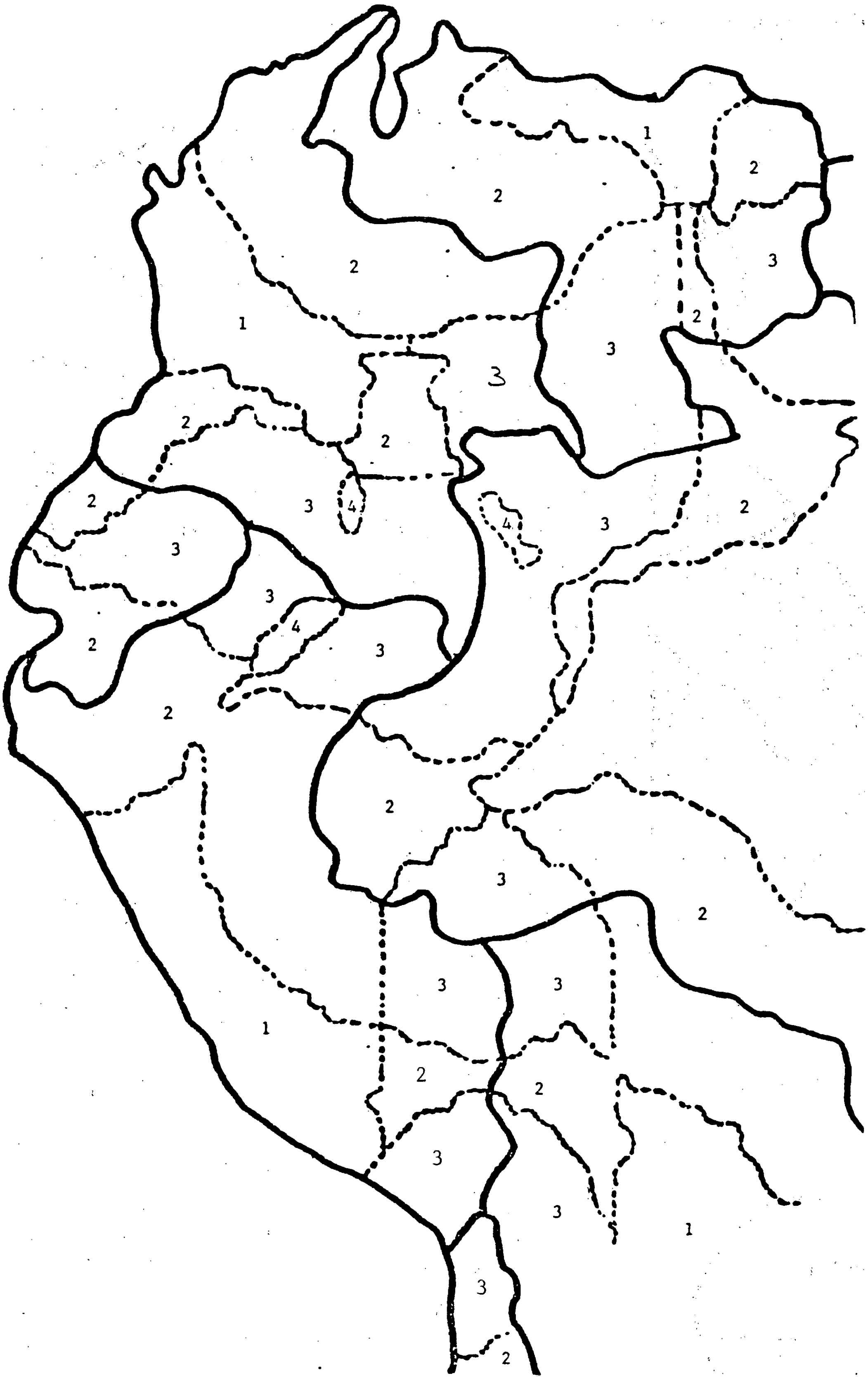


FIGURE 6.2

Number of countries within a distance [X]

6.3 Planning criteria

6.3.1 Standardized parameters

The Allotment Plan shall be based on the following standard parameters for day and night and for noise zones 1 and 2.

Station power: 1 kW

Antenna: omnidirectional with 90° electrical height

6.3.2 Co-channel standardized distance

The standardized distance shall be:

- for noise zone 1 land path: 330 km, based on skywave protection for the night-time E_{nom} of 3.3. mV/m;
- for noise zone 2 land path: 120 km, based on groundwave protection for the daytime E_{nom} of 1.25 mV/m;
- sea path in noise zones 1 and 2: 450/600 km;*,**
- mixed paths - if the ground portion is less than 10%: same distance as for sea path.

In all other cases, calculations shall be made in accordance with section 6.2.1

* One of these two distances shall be selected by the second session on the basis of a planning exercise for the Caribbean area to be carried out during the intersessional period.

** When deciding on the distance to be used for the establishment of the Plan, consideration should be given to the need to avoid adjacent channel interference in allotment areas to which only one channel is allotted, and to minimize it elsewhere (see section 6.3.4).

6.3.3 Use of different parameters

6.3.3.1 An administration may use a higher radiated power than that produced by the standardized parameters in paragraph 6.3.1 provided that the field strength produced by a standardized parameter station situated at the most critical point on the boundary of the original allotment area is not exceeded:

- in any co-channel allotment area of another administration, at the appropriate standardized distance from the boundary of the originating administration's allotment area;
- at any point in the allotment area of another administration to which a first adjacent channel is allotted.

6.3.3.2 Assignments on non-allotted channels may use a higher radiated power than that produced by a standardized parameter station, provided that the field strength within a neighbouring country without a co-channel or adjacent channel allotment does not exceed the field strength produced by a standardized parameter station situated at the most critical point on the boundary of the originating country.

6.3.3.3 In recognition of the special problems caused by the low ground conductivity of the Caribbean islands situated in noise zone 2, the concept described in paragraph 6.3.3.1 is extended as follows:

a) A reference situation is established in which a station with standardized parameters is located at the boundary of the allotment area of such an island. The resulting field strength to the allotment areas of other administrations is calculated assuming an all-sea path.

b) Before an island administration may bring into use an assignment with a higher radiated power than that associated with a standardized station, the resulting field strength to the allotment areas of other administrations is calculated taking into account the actual ground traversed over the island, the path otherwise being a sea path.

c) The field strengths referred to in b) must not exceed those in a).

This special provision applies only to the daytime situation.

6.3.3.4 In no case shall the station power be greater than 10 kW.

6.3.4 Frontier area considerations for first adjacent channels

To ensure efficient use of the band to be planned, the first adjacent channel interference should be evaluated at the stage of assigning frequencies to stations; in some cases, this will require coordination among the administrations concerned. In order to limit the number of such cases, the following steps should be taken.

6.3.4.1 The procedure to be followed before bringing into use assignments from allotments in frontier areas should contain the following guidelines:

a) An administration proposing to assign a frequency to a station shall coordinate this assignment with another administration if the field strength produced by the proposed assignment in the neighbouring adjacent channel allotment area of that other administration exceeds the nominal field strength.

b) For ease of identification of the administrations with which the above coordination is required, the following distances shall be used:

- ground path in noise zone 1: 53 km
- sea path in noise zone 1: 310 km
- ground path in noise zone 2: 35 km
- sea path in noise zone 2: 160 km

Beyond the above appropriate distance, neither coordination nor the calculation of the nominal usable field strength contour is required.

6.3.4.2 The procedures to be applied for such coordination should be adopted at the second session, taking account of:

a) provisions to resolve cases where, despite the joint efforts to find a solution, coordination is not achieved;

b) the need to address the question of the overlapping of the appropriate contours for a nominal frequency separation of 10 kHz, 20 kHz and 30 kHz;

c) the principle that, for protection purposes, the frontier of a country should be deemed to encompass only its land area, including islands.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

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29 April 1986
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COMMITTEE 3

Note by the Secretary-General

NOTE BY THE IFRB RELATING TO IFRB INTERSESSIONAL WORK FOR BC-R2

At the request of the IFRB, I transmit herewith for the information of the Conference a Note by the IFRB relating to IFRB intersessional work for BC-R2.

The matter of unused credits for preparatory work foreseen initially in 1985 and 1986, and now to be transferred to 1987 and 1988 is for consideration by the Administrative Council.

R.E. Butler
Secretary-General

Annex: 1

I.F.R.B. Date: 29 April 1986

IFRB INTERSESSIONAL WORK FOR BC-R2

1. The tasks to be carried by the IFRB during the intersessional period are identified in the Reports of Committee 5 Ad Hoc 1 and Committee 5 Ad Hoc 2 (Documents DT/35 and DT/34 respectively).

2. The Board has considered the financial implications of the material and manpower resources which it will need to carry out the intersessional work entrusted to it by the Conference. As a result, it has concluded that the balance of budget provisions which already exist for the preparatory work of the IFRB would be sufficient to carry out the intersessional work provided that the unused credits for IFRB preparatory work are made available for intersessional activities in 1986, 1987 and 1988.

V.V. Kozlov
Chairman

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 109-E
29 April 1986

B.9

PLENARY MEETING

9th SERIES OF TEXTS SUBMITTED BY THE
EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Documents	Title
COM.5	DT/35 + Add.2	Chapter 6 - section 6.4

P. PERRICHON
Chairman of Committee 6

Annex: 2 pages

[CHAPTER 6]

6.4 Protection considerations

[6.4.1 Protection of allotments from assignments on allotted channels

Assignments on co-channel allotments are considered to be compatible with each other when they are brought into use in accordance with 6.3.]

6.4.2 Protection of allotments from assignments on non-allotted channels

The signal strengths to be protected are the appropriate values of nominal usable field strength shown in section 3.6. The area to be protected is limited by:

- the boundary of an allotment area;
- the contour corresponding to the E_{nom} of an assignment on an allotted channel when the contour is within the country but extends beyond the allotment area.

The maximum permitted interfering field strength within the area to be protected is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the interfering signal considered is the greater of the groundwave or skywave signal. In all other cases, only groundwave interference is considered.

[The effect of each interfering signal shall be evaluated separately, and the presence of interference from other stations in excess of the permissible level shall not affect the need to limit the interference which would result from proposed modifications or new assignments.] *[The effect of each interfering transmitter shall be evaluated separately, and interference from other transmitters shall not be taken into account in determining the maximum signal strength permitted from each transmitter.]

6.4.3 Protection of assignments on non-allotted channels from assignments on allotted channels

Assignments on non-allotted channels do not receive protection from assignments on allotted channels.

* Alternative version proposed by Committee 6.

6.4.4 Protection of assignments on non-allotted channels from other assignments on non-allotted channels

Assignments on non-allotted channels are protected from subsequent assignments on non-allotted channels. The protected contour encompasses the area in which the groundwave field strength is equal to or greater than the appropriate value of E_{nom} given in section 3.6.

The field strength of skywave interfering signals shall be calculated at the site of an assignment using a non-allotted channel.

The maximum permitted interfering field strength within the area is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the interfering signal considered is the greater of the skywave or groundwave signal. In all other cases, only groundwave interference is considered.

[The effect of each interfering signal shall be evaluated separately, and the presence of interference from other stations in excess of the permissible level shall not affect the need to limit the interference which would result from proposed modifications or new assignments.] *[The effect of each interfering transmitter shall be evaluated separately, and interference from other transmitters shall not be taken into account in determining the maximum signal strength permitted from each transmitter.]

Where the protected contour extends beyond the frontier of the country in which the station is located, the maximum permissible interfering groundwave field strength at the frontier is the field strength of the protected station calculated along the frontier divided by the protection ratio.

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* Alternative version proposed by Committee 6.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

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1 May 1986
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COMMITTEE 5

SUMMARY RECORD

OF THE

NINTH AND LAST MEETING OF COMMITTEE 5

(PLANNING CRITERIA)

Monday, 28 April 1986, at 1410 hrs

Chairman: Mr. M. FERNANDEZ-QUIROZ (Mexico)

Subjects discussed:		Documents
1.	Report of Working Group 5-B	95
2.	Second report of Working Group 5-A	96 + Adds.1 and 2
3.	Intersessional work	-
4.	Summary records of the fourth, fifth and sixth meetings	48, 59, 65
5.	Completion of the Committee's work	-

1. Report of Working Group 5-B (Document 95)

1.1 The Chairman of Working Group 5-B said that Document 95 was the product of five meetings held by the Working Group. It contained a draft Regional Agreement for the use of the band 1 605 - 1 705 kHz in Region 2 and a Recommendation relating to the incorporation into the Radio Regulations of the allotment plan and the associated provisions for the broadcasting service in the band 1 605 - 1 705 kHz in Region 2. It also reproduced a reservation made by the delegate of Cuba. He drew attention to a number of typographical errors in the draft Regional Agreement which included the omission of brackets in the Preamble, Articles 3 and 11 (Spanish only) and of the sub-title (Plan) of Article 6 (all languages).

1.2 The Chairman said that many administrations had been extremely open-minded during the negotiations and he congratulated them for helping to produce a balanced and polished text.

1.3 The delegate of Brazil recalled that Working Group 5-B had concluded it would be best to incorporate the draft Agreement into the Conference's report as an annex. He therefore proposed that the report of Working Group 5-B be revised to reflect that structure.

1.4 The delegate of the United Kingdom endorsed that proposal.

1.5 The delegate of the United States said he had understood the Working Group's conclusions differently: in view of the importance of the Regional Agreement, it should be included in Chapter 8 of the report.

1.6 The representative of the IFRB said that the proposal to annex the Agreement to the report had been advanced merely to prevent the numbering of articles of the Agreement being confused with that of chapters of the report itself.

1.7 The Chairman suggested that the Committee consider the draft Agreement itself and leave in abeyance the question of where it was to be incorporated.

It was so agreed.

Title

1.8 The Chairman of the Conference proposed, with a view to facilitating still further the adoption by consensus of the draft Regional Agreement, that the title should read:

"REGIONAL AGREEMENT FOR THE USE OF THE BROADCASTING SERVICE IN THE BAND 1 605 - 1 705 kHz IN REGION 2"

1.9 The delegates of Cuba and the United States fully endorsed the amendment, which was duly approved.

1.10 The delegate of Cuba said that since the amendment made the draft Agreement acceptable he would withdraw his reservation.

PREAMBLE

It was agreed to insert the words "broadcasting service in the" in the third paragraph, in line with the title.

ARTICLE 1

The definition of Agreement to read "This instrument and its Annexes".

ARTICLE 2

On the suggestion of the Chairman of the Conference, it was agreed to make the same amendment as to the title.

ARTICLE 3

It was agreed to insert the words "for these broadcasting stations" after "frequency assignments" in 3.2 and to delete the first alternative version of 3.3.

ARTICLE 5

In the Spanish version the words "concluir o reconducir" to be replaced by "subscribir o continuar".

With the above amendments, the draft Regional Agreement as a whole was approved.

RECOMMENDATION COM5/B

1.11 The delegate of Cuba said that it was premature to draft such a Recommendation at the first session of the Conference. The Allotment Plan would be drawn up at the second session which was therefore the appropriate time to formulate a Recommendation relating to its incorporation into the Radio Regulations.

1.12 The delegates of the United States, France and Canada, and the representative of the IFRB explained that time had to be allowed for the Administrative Council to ensure that the Recommendation could be considered for inclusion on the agenda of a WARC. By the time the agenda was discussed, all members in Region 2 would have received the report of the first session and the work of the second session would undoubtedly be facilitated by the fact that the Recommendation had already been drafted. The Working Group of the Plenary had approved that very morning the draft agenda for the second session and was urging the Administrative Council to select a date for it four months prior to the WARC-ORB in 1988. The text of Recommendation COM5/B might therefore be made even more specific if so desired.

1.13 The delegate of Cuba reserved the right to make further comments on the Recommendation later.

considering a)

1.14 At the proposal of the representative of the IFRB and the delegate of the United States, it was agreed that the text should read:

> "... Radio Regulations, the second session of this Conference has been empowered to establish ..."

considering e)

1.15 The Chairman drew attention to the fact that the number of the Recommendation would have to be inserted.

recommends the Administrative Council

1.16 The delegate of the United States said that, in the light of the Recommendation drafted in the Working Group of the Plenary the words "an appropriate World Administrative Radio Conference, preferably" could be deleted.

The draft Recommendation COM5/B was approved, as amended.

Position of the draft Regional Agreement in the report to the second session

1.17 The delegate of Canada, supported by the delegate of Chile, proposed that the Agreement be an annex to Chapter VIII.

1.18 The delegate of Colombia proposed that it should form a chapter, not an annex.

1.19 The delegate of the United States suggested that it should be an integral part of Chapter VIII which, otherwise, consisted of only one sentence.

1.20 Following a brief interval for informal consultation, the delegate of Mexico proposed a wording amended slightly by the delegate of the United States to read as follows:

> "In compliance with the terms of reference contained in item 2.1.7 of Resolution No. 913 relating, inter alia, to the establishment of the guidelines for the Agreement, the draft Agreement was prepared by the first session of the Conference to assist the second session; that draft follows."

It was agreed that the draft Agreement should be incorporated in the report as Chapter VIII, introduced by the above wording.

2. Second report from the Chairman of Working Group 5-A (Document 96 + Adds.1 and 2)

2.1 The Chairman of Working Group 5-A introduced Document 96 + Adds.1 and 2.

Section 7.2

On his proposal, it was agreed that the appropriate figures would be inserted later in the spaces currently within square brackets in 7.2.1.3, 7.2.1.5 and the two sub-sections, including the distance [X], of 7.2.2; at the end of sub-section 1 of the latter, the words "see section 7.3.2" were to be added. It was also agreed to delete the square brackets in 7.2.6, to insert the words "sections 7.3 and 7.4" and to delete the square brackets around Table 1 and Figures 1 and 2.

Section 7.3

With regard to 7.3.2, it was decided to request the Editorial Committee to add, in the case of the standardized distances of 330 km and 120 km for the land paths for noise zones 1 and 2 respectively, a note relating to the calculation bases agreed upon in Committee 4. With regard to the other three standardized distances, it was decided, on a suggestion by the Chairman, that a Working Group 5 ad hoc 1 should be set up to consider the values. That Group would be presided over by Mr. M.L. Pizarro Aragones (Chile) and would consist of the delegates of Brazil, Canada, Colombia, Cuba, France, the United Kingdom and the United States, and would report directly to the Plenary Meeting.

2.2 The representative of the IFRB said that, since the definition of sea path distances might be of importance to small countries not represented at the Conference and having only one allotment, the Board would like to participate in the Working Group.

With respect to section 7.3.3, it was agreed, in the last line of 7.3.3.1 to replace "an adjacent channel" by "a first adjacent channel" and to insert the text of Addendum 1 to Document 96 as a new 7.3.3.2, renumbering the following sub-sections accordingly with a minor editorial correction to the English text.

With regard to 7.3.4, it was agreed that, in 7.3.4.1 a), the term "adjacent allotment area" would be amended to read "adjacent channel allotment area"; in the last sentence of 7.3.4.1 b), the words "coordination is not required" would be replaced by "neither coordination nor the calculation of the nominal usable field strength contour is required"; and in 7.3.4.2 b) the word "overlapping" would be replaced by "the overlap of".

Subject to those considerations, the second report from the Chairman of Working Group 5-A was approved.

Addendum 2 to Document 96

2.2 The Chairman of Working Group 5-A suggested that the sentence in square brackets in the first paragraph of section 3.9.1 should read as follows:

"The area to be protected is:

- the border of an allotment area,

- the contour corresponding to the E_{nom} of an assignment on an allotted channel."

2.3 The delegate of Brazil said that the suggested second indent would be clearer with the addition of the words "when the contour is inside the country but extends beyond the allotted area".

In response to a comment by the representative of the IFRB, it was proposed that the words "to be protected" should be inserted after "area" in the first line of the second paragraph of section 3.9.1.

The above amendments were adopted.

2.4 The Chairman invited the Committee to consider section 7.4, pointing out that the wording of the section in square brackets would depend on the outcome of the deliberations of Working Group 5 ad hoc 1.

2.5 The representative of the IFRB observed, in connection with section 7.4.3, that there were no cases where an allotted channel was not authorized to cause interference to an unallotted channel.

After some discussion, it was agreed that section 7.4.3 should read "Assignments on unallotted channels do not receive protection from assignments on allotted channels".

2.6 The delegate of Cuba said that that wording might unduly restrict the use of unallotted channels, thus causing difficulties for countries with only a few allotments. He reserved the right to return to that subject in Plenary.

2.7 The Chairman of Committee 4 said that his Committee had had difficulty in placing section 3.9 in Chapter 3 of the report and suggested that sections 3.9.1 and 3.9.2 should be reproduced in full in section 7.4. The delegate of Brazil supported that suggestion, but pointed out that section 3.9.3 on skywave calculation interference would then remain outstanding.

After some discussion, it was agreed that section 3.9.3 should be added at the end of the first paragraph of section 3.9.2, followed by another sentence reading "The field strength of skywave interfering signals shall be calculated at the site of a transmitter using an assignment on a non-allotted channel".

2.8 The Chairman noted that the Committee had concluded consideration of Document 96 + Adds.1 and 2.

3. Intersessional work

3.1 The Chairman of Working Group 5-A said his Group's conclusion had been that much depended on the outcome of the deliberations of Working Group 5 ad hoc 1. If the sea path distances were agreed upon, the intersessional work would be much simpler, but if they were not, additional computer software would have to be produced. Perhaps a small Working Group could be set up to discuss the matter and to report directly to the Plenary Meeting.

3.2 The Chairman suggested the establishment of Working Group 5 ad hoc 2, presided over by a delegate of Canada and composed of delegates of Brazil, Paraguay, the United Kingdom and the United States.

It was so decided.

4. Summary records of the fourth, fifth, and sixth meetings (Documents 48, 59, 65)

The above-mentioned summary records were provisionally approved, on the understanding that delegates wishing to have corrections incorporated in the documents should hand them in directly to the Secretariat.

5. Completion of the Committee's work

After the customary exchange of courtesies, the Chairman declared that Committee 5 had completed its work.

The meeting rose at 1925 hours.

The Secretary: M. GIROUX

The Chairman: M. FERNANDEZ-QUIROZ

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 111-E
6 May 1986
Original: English

COMMITTEE 3

SUMMARY RECORD

OF THE

THIRD AND LAST MEETING OF COMMITTEE 3

(BUDGET CONTROL)

Wednesday, 30 April 1986, at 0905 hrs

Chairman: Mr. E.D. DuCHARME (Canada)

Subjects discussed:	Documents
1. Approval of the summary record of the second meeting	83
2. Position of the Conference accounts at 28 April 1986	84
3. Draft Report of the Budget Control Committee to the Plenary Meeting	DT/24
4. Additional expenditure to be foreseen for implementation of the decisions of the Conference	85, 91, DT/34, 108

1. Summary record of the second meeting of Committee 3 (Document 83)

The summary record of the second meeting was approved.

2. Position of the Conference accounts at 28 April 1986 (Document 84)

2.1 The Chairman informed the Committee that the anticipated saving of 80,000 Swiss francs was considerably in excess of the previously estimated figure.

2.2 In reply to the delegate of the United Kingdom, the Secretary of the Committee explained that an early end to the Conference would have no more than a marginal effect upon expenditure, and that the Report to the second session would certainly be less voluminous than anticipated, which had led to a reduction of the estimate for subhead VI.

The Committee approved the estimated Conference expenses as presented in Document 84. The table annexed to that document would accordingly be reproduced as Annex 2 to the Committee's Report to the Plenary.

3. Draft Report of the Budget Control Committee to the Plenary Meeting (Document DT/24)

3.1 The Secretary explained that the draft Report covered a number of aspects stipulated by the Convention. He emphasized that section 6, relating to additional expenditure, would have to be completed in the light of the Committee's discussion on that aspect in the context of agenda item 4.

3.2 The delegate of the United Kingdom pointed out that the reference, at the end of paragraph 4, to "No. 548 of the Convention" was inaccurate and should be corrected to refer to No. 617.

3.3 The Chairman suggested that he and the Secretary should together complete the Report to the Plenary, on the basis of information examined and approved by the Committee.

It was so agreed.

4. Additional expenditure to be foreseen for implementation of the decisions of the Conference (Documents 85, 91, DT/34, 108)

Document 85

4.1 The Secretary pointed out that the estimated 10,000 Swiss francs would in fact be chargeable to the budget of the second session.

4.2 The Chairman took note of that comment.

It was agreed that the content of Document 85 would be reflected in the Report to the Plenary.

Document 91

The Committee took note of Document 91.

Document DT/34

The Chairman took note of Document DT/34 as a source of information on material to be incorporated into Chapter 9 of the Final Report.

Document 108

4.3 The representative of the IFRB pointed out that the note by the IFRB had been prepared and transmitted prior to the discussions at the previous day's Plenary which were reflected in paragraph 6.3.2 of Document 113 and which implied changes in the type of work required of the Board during the intersessional period. It had not as yet been possible to arrive at a full definition of the tasks involved and, while it was hoped that they could be accomplished within the limits of the available resources, he could not say whether that would in fact be feasible. He would be making a statement to the Plenary in the context of the discussion on Document 113.

4.4 The Chairman suggested that Document 108 should be reflected in section 6 of the Committee's Report, which should take due account of the statement just made by the representative of the IFRB.

It was so agreed.

The meeting rose at 0935 hours.

The Secretary: The Chairman:

R. PRELAZ E.D. DuCHARME

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) **RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2**

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 112-E
29 April 1986

B.10

PLENARY MEETING

10th SERIES OF TEXTS SUBMITTED BY THE EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Documents	Title
COM.5	70	Chapter 6 - section 6.3.5
COM.5	DT/34	Chapter 8

P. PERRICHON
Chairman of Committee 6

Annex: 2 pages

[CHAPTER 6]

6.3.5 Considerations for the use of non-broadcasting stations

The second session should consider the adoption of a procedure to be applied by administrations wishing to implement their allotments with respect to non-broadcasting stations of the other contracting Members. Such procedures will provide for the continued operation of designated non-broadcasting stations provided it does not have an adverse effect upon the implementation of the Plan (see Recommendation COM5/A and Resolution COM5/1).

CHAPTER 8

Preparatory work for the second session of the Conference

8.1 IFRB Intersessional work

8.1.1 Planning method

a) establish a map of the Region identifying, within each country, areas to which the minimum number of channels will be allotted (i.e. steps 6.2.1.1, 6.2.1.2, 6.2.1.3) in accordance with the guidelines and decisions of the Conference and as shown in Figures 6.1 and 6.2. This task shall be completed by [September 1986] and the results communicated to all Region 2 administrations;

[b) develop the necessary microcomputer software for the analysis of a limited number of actual groundwave situations using the Atlas of Ground Conductivities. This task could be restricted to deal with only part of the Region, at any one time;]

c) prepare planning exercises for two standardized distances (in accordance with section 6.3.2 for the Caribbean area);

d) make available the microcomputer software for the calculation of skywave field strengths by administrations;

e) make available the microcomputer software for the calculation of groundwave field strengths on the basis of [distances and ground conductivities being a manual input].

8.1.2 Updating of the Master Register

(See Resolution COM5/1.)

8.2 Technical studies by the CCIR

a) preparation of a report relating to the relationship between physical and electrical antenna height (see Recommendation COM4/A);

b) continuation of studies on sharing criteria for services using the band 1 625 - 1 705 kHz in Region 2 and preparation of a new report on this subject (see Recommendation COM4/B).

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 113-E
29 April 1986

R.4

PLENARY MEETING

4th SERIES OF TEXTS SUBMITTED BY THE
EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for second reading:

Source	Documents	Title
COM.6	B.6/102	Introduction
	B.5/93	Chapter 1 sections
	B.8/107	Chapter 3 (3.6, 3.7)
	B.7/104	Chapter 6
		Chapter 7
		Resolutions
		Recommendations

P. PERRICHON
Chairman of Committee 6

Annex: 28 pages

INTRODUCTION

When allocating the band 1 605 - 1 705 kHz to the broadcasting service in Region 2, the World Administrative Radio Conference Geneva, 1979 (WARC-79), stated in its Recommendation 504 that the use of the band by the new service was subject to a broadcasting plan to be established by a regional administrative radio conference and recommended that such a conference be convened for Region 2.

The Plenipotentiary Conference (Nairobi, 1982) decided in its Resolution 1 that the Conference for Region 2 would be held in two sessions.

Pursuant to that Resolution, the Administrative Council, at its 39th session in 1984, after consulting the Region 2 members, adopted Resolution 913 establishing the agenda, date and duration of the First Session of the Conference.

Consequently, the First Session of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 was held in Geneva from 14 April to [2 May] 1986.

Under its terms of reference, the First Session decided, inter alia, as follows:

- this Report has been adopted for submission to the Second Session;
- the Allotment Plan for the broadcasting service shall contain one or more allotments for each country of Region 2 for possible inclusion in the Radio Regulations by a competent WARC;
- the Plan to be annexed to the Regional Agreement shall contain allotments and may contain assignments;
- the Plan shall not be based on requirements submitted by administrations;
- the Plan shall be based on the use of standardized parameters;

and adopted all Resolutions and Recommendations annexed to the present Report.

Apart from the technical criteria specific to the broadcasting service (such as propagation, technical standards, etc.), the First Session, under item 2.2 of its agenda, considered the problems of compatibility with the other services in the same band [and provisionally defined sharing criteria].

[CHAPTER 1]

1.1.2 Nominal usable field strength (E_{nom})

Agreed minimum value of the field strength required to provide satisfactory reception, under specified conditions, in the presence of atmospheric noise, man-made noise and interference from other transmitters. The value of nominal usable field strength has been employed as the reference for planning.

[CHAPTER 1]

1.1.14 Skywave field strength, 50% of the time

The skywave field strength during the reference hour which is exceeded for 50% of the nights of the year. The reference hour is the period of one hour beginning one and a half hours after sunset and ending two and a half hours after sunset at the midpoint of the short great-circle path.

1.1.15 Characteristic field strength (E_c)

The field strength, at a reference distance of 1 km in a horizontal direction, of the groundwave propagated along perfectly conducting ground for 1 kW station power, taking into account losses in a real antenna.

Note 1 - The gain (G) of the transmitting antenna relative to an ideal short vertical antenna is given in dB by the equation:

$$G = 20 \log \frac{E_c}{300} \qquad (1)$$

where:

E_c is expressed in mV/m.

Note 2 - The effective monopole radiated power (e.m.r.p.) is given in dB (kW) by the following equation:

$$\text{e.m.r.p.} = 10 \log P_t + G \qquad (2)$$

where:

P_t: station power (kW).

1.1.16 Allotment

Entry in the Plan of a designated broadcasting channel for use by an administration for the broadcasting service in an allotment area under the conditions specified in the Plan. Each allotment included in the Plan may be used for one or more assignments using the technical criteria specified in section 6.3.

1.1.17 Allotment area

Specifically defined geographical area within a country to which one or more channels are allotted.

1.2 Symbols and units

Hz:	hertz
kHz:	kilohertz
W:	watt
kW:	kilowatt
mV/m:	millivolt/metre
μV/m:	microvolt/metre
dB:	decibel
dB(μV/m):	decibels with respect to 1 μV/m
dB(kW):	decibels with respect to 1 kW
mS/m:	millisiemens/metre
σ:	ground conductivity

/‾CHAPTER 3_7

3.6 Nominal usable field strength (E_{nom})

Table of nominal usable field strength

	Noise zone 1	Noise zone 2
Daytime	0.5 mV/m	1.25 mV/m
Night-time	3.3 mV/m	6 mV/m

3.7 *Definition of noise zones*

Noise zone 1

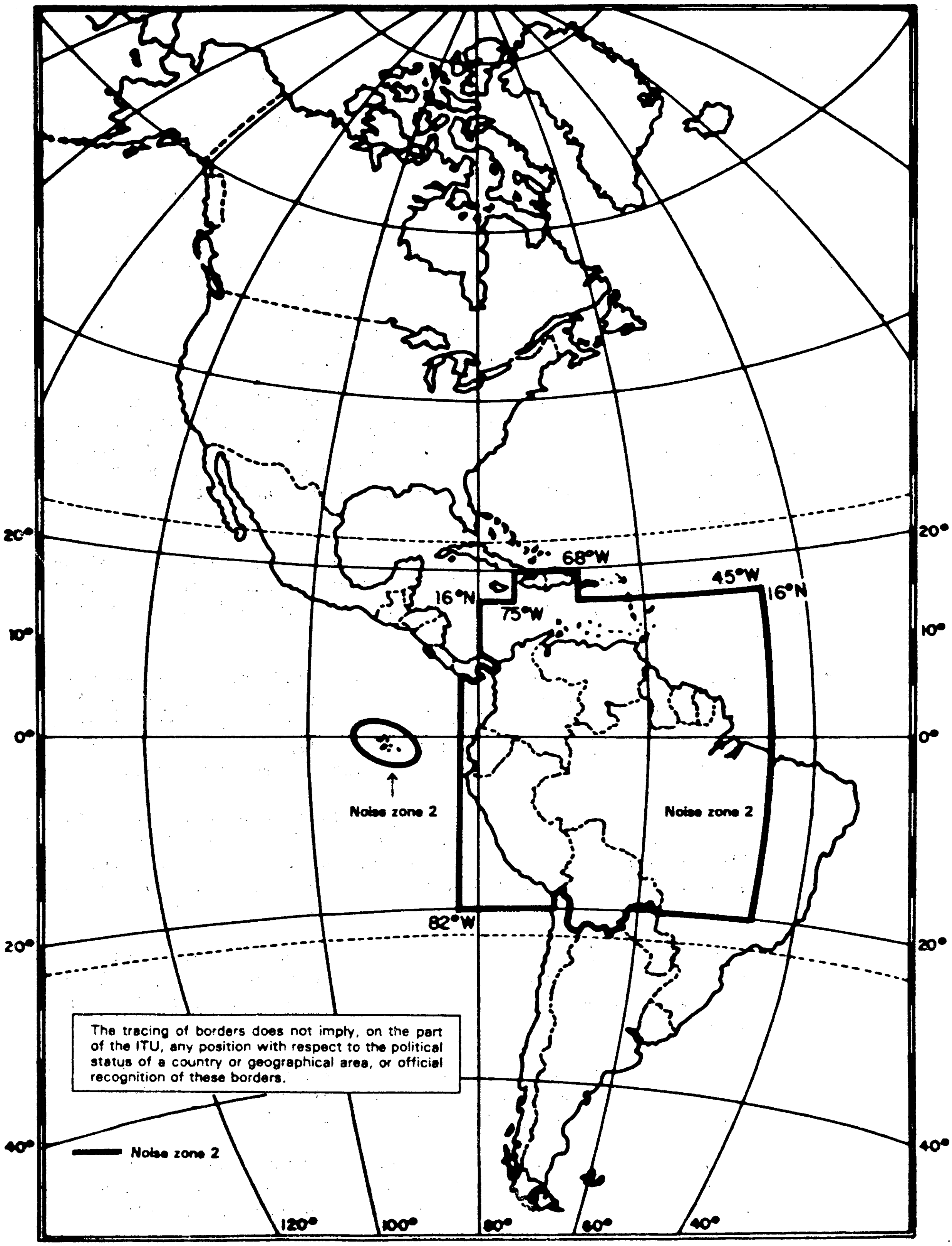
Comprises the whole of Region 2 with the exception of noise zone 2.

Noise zone 2

Comprises the area within the line defined by the coordinates 20° S-45° W, the meridian 45° W to the coordinates 16° N-45° W, the parallel 16° N to the coordinates 16° N-68° W, the meridian 68° W to the coordinates 20° N-68° W, the parallel 20° N to the coordinates 20° N-75° W, the meridian 75° W to the coordinates 16° N-75° W, the parallel 16° N to the coordinates 16° N-80° W, the meridian 80° W to the northeast coast of Panama, the frontier between Panama and Colombia, the southeast coast of Panama and the meridian 82° W to the parallel 20° S, and the parallel 20° S, with the exception of Chile and Paraguay, until the frontier between Paraguay and Brazil until 45° W. Bolivia is entirely included in noise zone 2 as are the archipelago of San Andrés y Providencia and the islands belonging to Colombia and the Colon archipelago or the Galapagos Islands (Ecuador).

Note 1 – See the maps of noise zones on the following page.

NOISE ZONES


68°W
45°W
16°N
16°N
75°W
82°W
Noise zone 2
Noise zone 2
20°
10°
0°
20°
40°
120°
100°
80°
60°
40°
The tracing of borders does not imply, on the part of the ITU, any position with respect to the political status of a country or geographical area, or official recognition of these borders.
Noise zone 2

CHAPTER 6 - PLANNING

6.1 Basis for planning

The Plan for the broadcasting service in Region 2 in the band 1 605 - 1 705 kHz is based on the following principles:

a) the Plan for the broadcasting service shall contain allotments and may contain assignments;

b) the Plan shall not be based on requirements submitted by administrations;

c) the Allotment Plan shall be established without taking into account the stations of other services;

d) an allotment area is determined on the basis of the standardized distance(s) specified in [section 6.3.2].

e) where the separation distance between an allotment area of one administration and those of a number of other administrations is less than the standardized distance(s), the minimum number of channels allotted to that area will depend on the number of administrations involved as indicated in Table [6.1 of section 6.2.2];

f) where the separation distance between an allotment area of one administration and those of all other administrations is greater than the appropriate standardized distance, all ten channels are allotted to that area;

g) the Plan will be based on the use of standardized parameters. However, the possibility should be left open for a group of countries to decide subregionally to develop, at the Conference, part of the Plan, consistent with the Regional Plan, based on a transmitter power less than the standardized parameter;

h) an administration may make assignments on channels not allotted to it in a given allotment area provided that it protects the allotments and assignments of other countries in accordance with [section 6.4]. Such assignments shall not restrict the use of allotments which complies with standardized parameters;

i) where neighbouring countries have allotments on adjacent channels, the procedures to be followed before bringing into use assignments from allotments in border areas are specified in [section 6.3.4];

j) administrations may bring into use assignments with parameters different from the standardized parameters provided the conditions given in [section 6.3.3] are met;

k) administrations so wishing may convert their allotments into assignments at the Second Session using the specified planning criteria; these assignments will also appear in the Plan;

l) for the case mentioned in k) above, where neighbouring countries have allotments in adjacent channels, the procedures referred to in i) must be followed.

6.2 Planning method

The following text is a general description of the steps to be taken in developing the Plan based on the planning method that has been adopted.

6.2.1 Step 1 consists in using the appropriate co-channel standardized distance and identifying within each country the areas to which a minimum number of channels will be allotted. A method which may be used is as follows:

6.2.1.1 Taking a geographical map covered with a sufficiently small grid and using a template having a circle with a radius equal to the appropriate standardized distance, determine for any point of the grid the number of countries within this circle; write the number on the map.

6.2.1.2 Move to another point on the grid and repeat 6.2.1.1.

6.2.1.3 Having processed all the points on the grid, draw the boundaries around all the numbers with the same value (see Figures 6.1 and 6.2).

6.2.1.4 Taking into account the frontiers between countries, describe each area using these frontiers and/or geographical coordinates from the boundaries defined in 6.2.1.3.

6.2.1.5 Identify each area with a single code based on the geographical area symbols contained in Table B1 of the Preface to the International Frequency List.

6.2.2 Step 2 consists in identifying the minimum number of channels to be allotted to each of the areas identified in Step 1.

1. Each of the areas identified in Step 1 is associated with a number corresponding to the number of countries within a distance X (the values of X are given in section 6.3.2).

2. Using Table 6.1, determine the minimum number of channels to be allotted to each area.

TABLE 6.I

Minimum number of allotted channels

Total number of administrations	Minimum number of allotted channels	Remaining channels
1	10	0
2	5	0
3	3	1
4	2	2
5	2	0
6-10	1	4-0

6.2.3 Step 3 consists in allotting in each case the channels constituting the minimum number of channels, taking account of the need to minimize adjacent channel interference.

At this stage the minimum number of allotments to neighbouring allotment areas shall be made with a view to reducing adjacent channel problems as much as possible, particularly in the case of allotment areas with only one or two channels.

6.2.4 Step 4 consists in allotting the remaining channels.

The remaining channels may be used during the Second Session to increase the number of allotments to neighbouring countries, on the basis of the conditions to be adopted at that session.

6.2.5 Step 5 consists in bilateral or multilateral negotiations carried out between neighbouring countries if they so desire.

The Second Session should adopt any rule that might be needed for these negotiations during that session concerning:

- alternative arrangements of the channels and areas allotted to these countries;

- the determination of the boundaries of allotment areas on the basis of tolerances to be defined;

6.2.6 At this stage, administrations so wishing may use the allotments resulting from steps 3 and 4 and specify the locations and parameters of assignments which are to be included in the Plan appearing in the Regional Agreement. These assignments will be examined using the criteria of sections 6.3 and 6.4 to ensure that the allotments of other administrations are not affected.

The following example illustrates the method:

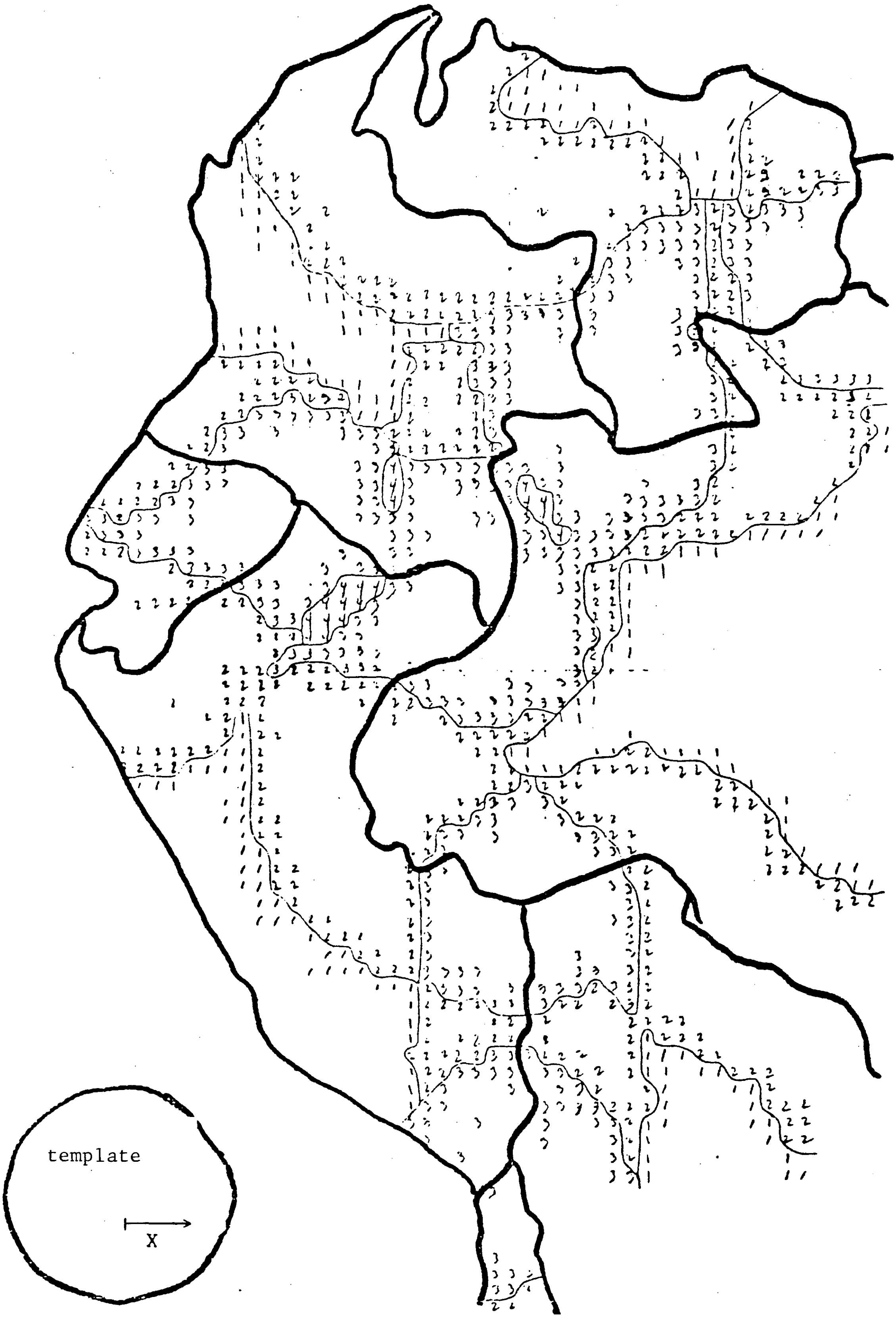


FIGURE 6.1
Number of countries within the template

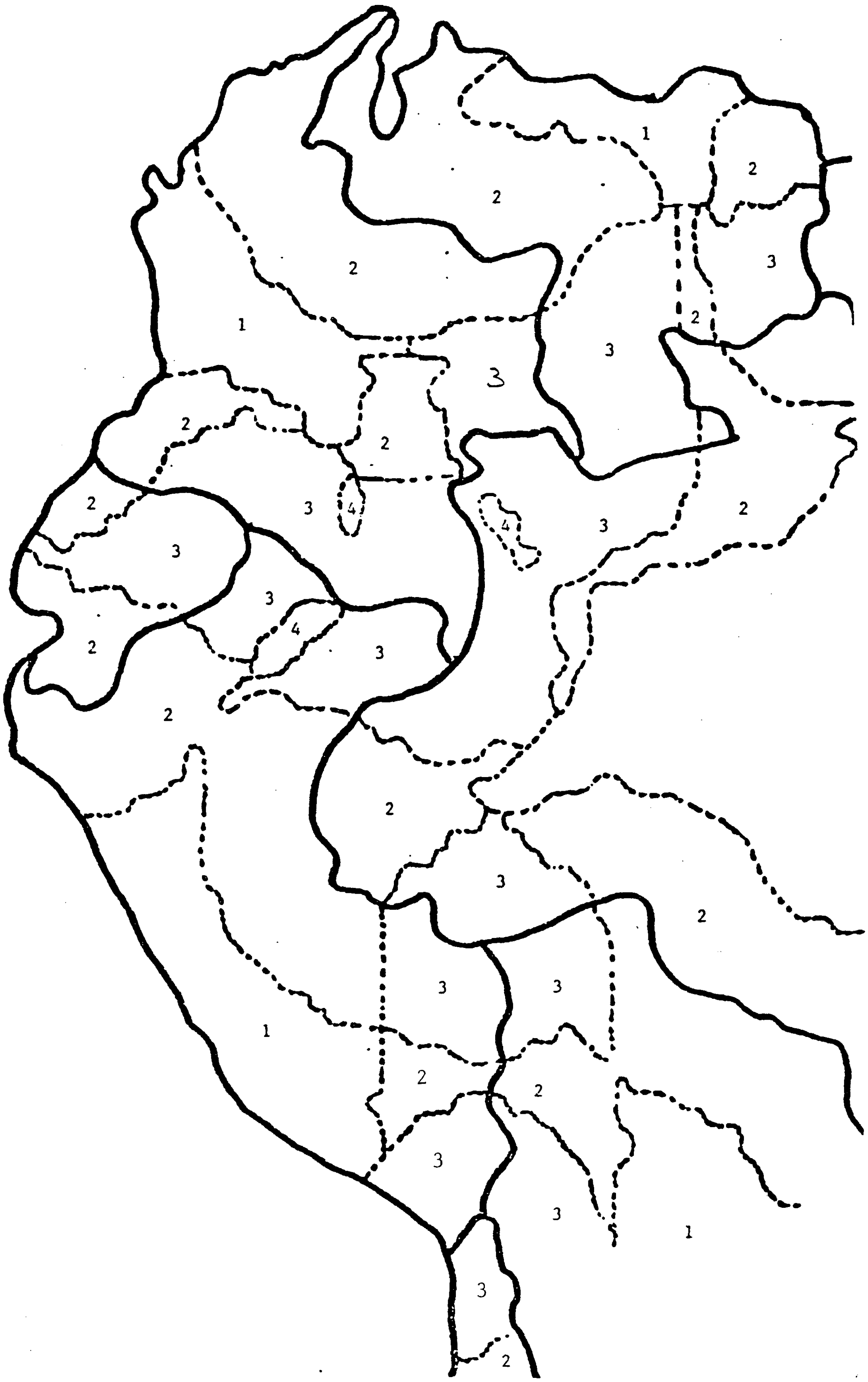


FIGURE 6.2

Number of countries within a distance X

6.3 Planning criteria

6.3.1 Standardized parameters

The Allotment Plan shall be based on the following standard parameters for day and night and for noise zones 1 and 2.

Station power: 1 kW

Antenna: omnidirectional with 90° electrical height

6.3.2 Co-channel standardized distance

The standardized distance, X, shall be:

- for noise zone 1 land path: 330 km, based on skywave protection for the night-time E_{nom} of 3.3. mV/m;

- for noise zone 2 land path: 120 km, based on groundwave protection for the daytime E_{nom} of 1.25 mV/m;

- sea path in noise zones 1 and 2: 450/600 km;*,**

- for mixed paths, the standardized distance means the distance calculated in accordance with section 2.1 in order to meet the E_{nom} of 1.25 mV/m in the two noise zones.

* One of these two distances shall be selected by the second session on the basis of a planning exercise for the Caribbean area to be carried out during the intersessional period.

** When deciding on the distance to be used for the establishment of the Plan, consideration should be given to the need to avoid adjacent channel interference in allotment areas to which only one channel is allotted, and to minimize it elsewhere (see section 6.3.4).

6.3.3 Use of different parameters

6.3.3.1 An administration may use a higher radiated power than that produced by the standardized parameters in section 6.3.1 provided that the field strength produced by a standardized parameter station situated at the most critical point on the boundary of the original allotment area is not exceeded:

- in any co-channel allotment area of another administration, at the appropriate standardized distance from the boundary of the originating administration's allotment area;

- at any point in the allotment area of another administration to which a first adjacent channel is allotted.

6.3.3.2 Assignments on non-allotted channels may use a higher radiated power than that produced by a standardized parameter station, provided that the field strength within a neighbouring country without a co-channel or adjacent channel allotment does not exceed the field strength produced by a standardized parameter station situated at the most critical point on the boundary of the originating country.

6.3.3.3 In recognition of the special problems caused by the low ground conductivity of the Caribbean islands situated in noise zone 2, the concept described in section 6.3.3.1 is extended as follows:

a) A reference situation is established in which a station with standardized parameters is located at the boundary of the allotment area of such an island. The resulting field strength to the allotment areas of other administrations is calculated assuming an all-sea path.

b) Before an island administration may bring into use an assignment with a higher radiated power than that associated with a standardized station, the resulting field strength to the allotment areas of other administrations is calculated taking into account the actual ground traversed over the island, the path otherwise being a sea path.

c) The field strengths referred to in b) must not exceed those in a).

This special provision applies only to the daytime situation.

6.3.3.4 In no case shall the station power be greater than 10 kW.

6.3.4 Frontier area considerations for first adjacent channels

To ensure efficient use of the band to be planned, the first adjacent channel interference should be evaluated at the stage of assigning frequencies to stations; in some cases, this will require coordination among the administrations concerned. In order to limit the number of such cases, the following steps should be taken.

6.3.4.1 The procedure to be followed before bringing into use assignments from allotments in frontier areas should contain the following guidelines:

a) An administration proposing to assign a frequency to a station shall coordinate this assignment with another administration if the field strength produced by the proposed assignment in the neighbouring adjacent channel allotment area of that other administration exceeds the nominal field strength.

b) For ease of identification of the administrations with which the above coordination is required, the following distances shall be used:

- ground path in noise zone 1: 53 km
- sea path in noise zone 1: 310 km
- ground path in noise zone 2: 35 km
- sea path in noise zone 2: 160 km

Beyond the above appropriate distance, neither coordination nor the calculation of the nominal usable field strength contour is required.

6.3.4.2 The procedures to be applied for such coordination should be adopted at the Second Session, taking account of:

a) provisions to resolve cases where, despite the joint efforts to find a solution, coordination is not achieved;

b) the need to address the question of the overlapping of the appropriate contours for a nominal frequency separation of 10 kHz, 20 kHz and 30 kHz;

c) the principle that, for protection purposes, the frontier of a country should be deemed to encompass only its land area, including islands.

CHAPTER 7 - GUIDELINES FOR THE AGREEMENT*

In compliance with item 2.1.7 of the agenda in Administrative Council Resolution 913 relating to the establishment of guidelines for the agreement, a draft agreement was prepared by the First Session of the Conference to assist the Second Session, as follows:

DRAFT REGIONAL AGREEMENT FOR THE USE BY THE BROADCASTING SERVICE
OF THE BAND 1 605 - 1 705 kHz IN REGION 2

PREAMBLE

Noting No. 480 of the Radio Regulations, which provides:

"In Region 2, the use of the band 1 605 - 1 705 kHz by stations of the broadcasting service shall be subject to a plan to be established by a regional administrative radio conference ...";

fully respecting the sovereign right of each country to regulate within its territory the use of the frequency band 1 605 - 1 705 kHz by the broadcasting service, and to reach special arrangements regarding this service with such countries as it may consider appropriate, without prejudice to other administrations;

seeking to facilitate mutual understanding and cooperation among the Members of Region 2 in achieving a satisfactory broadcasting service in the MF band 1 605 - 1 705 kHz;

recognizing that all countries have equal rights, and that, in the application of the Plan and its provisions, the needs of each country, and in particular those of developing countries, shall be met as far as possible, and

acknowledging that mutual protection of their broadcasting service is a major objective of all countries, in order to ensure better coordination and the use of more efficient facilities;

the delegates of the Members of the International Telecomunication Union assembled in [ ] at a regional administrative conference convened pursuant to the International Telecommunication Convention (Nairobi 1982), have adopted, subject to approval by the competent authorities of their respective countries, the following provisions relating to the broadcasting service in Region 2 for the frequency band between 1 605 and 1 705 kHz.

* Note by the First Session of the Conference - Some passages which appear in square brackets concern references and additions to be incorporated in the final text of the Agreement when it is adopted.

ARTICLE 1

Definitions

For the purposes of the Agreement, the following terms shall have the meanings defined below.

Union: The International Telecommunication Union.

Secretary-General: The Secretary-General of the Union.

IFRB: The International Frequency Registration Board.

CCIR: The International Radio Consultative Committee.

Convention: The International Telecommunication Convention.

Radio Regulations: The Radio Regulations supplementing the provisions of the Convention.

Region 2: The geographical area defined in No. 394 of the Radio Regulations, Geneva, 1979.

Master Register: The Master International Frequency Register.

Provisions: The provisions adopted herein that are associated with the Plan.

Agreement: This Instrument and its Annexes.

Plan: The Allotment Plan in [Annex] and the associated provisions[1].

Administration: Any governmental department or service responsible for discharging the obligations undertaken in the Convention and the Radio Regulations.

Contracting Member: Any member of the Union which has approved the Agreement or acceded to it.

Affected Administration: An administration within whose territory the signal of a proposed assignment of another administration exceeds the value prescribed in section 3.6 of this Report.

Allotment: Entry in the Plan of a designated broadcasting channel for use by an administration for the broadcasting service in an allotment area under the conditions specified in the Plan. Each allotment included in the Plan may be used for one or more assignments using the technical criteria specified in section 6.3.

Allotment area: Specifically defined geographical area within a country to which one or more channels are allotted.

---

1 The allotments may be converted into assignments which will appear as Part B of the Plan.

ARTICLE 2

Frequency Band

The provisions of the Agreement shall apply to the broadcasting service in the frequency band 1 605 - 1 705 kHz as allocated to Region 2 under Article 8 of the Radio Regulations.

ARTICLE 3

Execution of the Agreement

3.1 The Contracting Members shall adopt for their stations in Region 2 in the frequency band which is the subject of the Agreement the technical characteristics and standards which are in conformity with the Agreement.

3.2 The Contracting Members shall not bring into use frequency assignments to broadcasting stations except under the conditions set out in Article 4 of the Agreement.

3.3 The Contracting Members undertake, to the extent possible, to avoid or to reduce any harmful interference.

ARTICLE 4

Implementation of the Plan and Notification of Frequency Assignments in the Broadcasting Service

4.1 <u>Assignments corresponding to an allotted channel</u>

4.1.1. An administration may at any time, without the need for coordination, make assignments corresponding to any of its allotments, at one or more locations within the respective allotment area, provided that:

4.1.1.1 - the characteristics of the assignments are within the standardized parameters given in [Annex A/section 3.5 of this Report];

4.1.1.2 - where necessary, the coordination required for the protection of adjacent channels has been successfully concluded [Annex B/ Chapter 3 of this Report]; and

4.1.1.3 - the criteria of [ ] are met in cases where the characteristics of the assignments exceed the values of the standardized parameters.

4.2 Assignments corresponding to channels not allotted to the area

4.2.1 An administration may at any time, without the need for coordination, make an assignment on a channel not allotted to it provided that the characteristics of the assignment satisfy the criteria set out in [Annex A] with respect to:

4.2.1.1 - the use of the channel or channels by the administration(s) to which it is allotted in the Plan; and

4.2.1.2 - any broadcasting station of another Region 2 administration previously recorded in the Master Register with a favourable finding.

4.2.2 An administration may make an assignment on a channel not allotted to it or with characteristics which do not satisfy the conditions set out in sections 4.2.1.1 and 4.2.1.2 provided that such use has been successfully coordinated with the affected administration(s).

4.3 When an administration proposes to bring into use an assignment in conformity with the Agreement, it shall notify it to the IFRB in accordance with Article 12 of the Radio Regulations. Any such assignment recorded in the Master Register as a result of the application of Article 12 of the Radio Regulations shall bear a special symbol under the Remarks Column and a date in Column 2a or in Column 2b.

4.4 When the IFRB receives an assignment notice which is not in conformity with the Agreement, it shall return the notice to the notifying administration.

4.5 If the notifying administration resubmits the notice with or without modification and insists that it be reconsidered, and if the Board's finding remains unfavourable, the notice shall be returned to the notifying administration.

ARTICLE 5

Special Arrangements

In order to supplement the procedures laid down in these Provisions, or to facilitate the coordination provided for in Article 4, administrations may conclude or continue special arrangements in conformity with the applicable provisions of the Convention and the Radio Regulations.

ARTICLE 6

Plan

Part A: consists of the allotments in the Region-wide Allotment Plan.

Part B: consists of the assignments to be developed at the Second Session by administrations seeking to convert their allotments to assignments.

ARTICLE 7

Scope of Application of the Agreement

7.1 The Agreement is binding upon the Contracting Members in their mutual relations, but not in their relations with non-contracting countries.

7.2 Should a Contracting Member formulate reservations on the application of any provision of the Agreement, the other Contracting Members shall be free to disregard that provision in their relations with the Member that has made the reservations.

ARTICLE 8

Approval of the Agreement

The signatory Members shall notify the Secretary-General of their approval of this Agreement as soon as possible by depositing an instrument of approval; the Secretary-General shall immediately inform the other Members of the Union.

ARTICLE 9

Accession to the Agreement

9.1 Any Member of the Union in Region 2 which has not signed the Agreement may accede to it at any time by depositing an instrument of accession with the Secretary-General, who shall immediately inform the other Members of the Union. Accession shall apply to the Plan as it stands at the time of accession and shall be made without reservation.

9.2 Accession to the Agreement shall become effective on the date on which the instrument of accession is received by the Secretary-General.

ARTICLE 10

Denunciation of the Agreement

10.1 Any Contracting Member may denounce the Agreement at any time by a notification sent to the Secretary-General, who shall inform the other Members of the Union.

10.2 Denunciation shall become effective one year after the date on which the Secretary-General receives the notification of denunciation.

ARTICLE 11

Entry into Force of the Agreement

The Agreement shall enter into force on [ ] at [ ] hours UTC.

ARTICLE 12

Duration of the Agreement

The Agreement shall remain in force until revised by a competent administrative radio conference.

RESOLUTION PLEN/1

Report of the First Session

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

considering

the terms of reference assigned to it by Resolution 913 of the Administrative Council;

resolves

to approve the Report of this session of the Conference;

instructs

1. the Chairman of this session of the Conference to transmit under his signature the Report of the First Session to the Second Session of the Conference;

2. the Secretary-General to transmit this Report to all Members of the Union.

RESOLUTION COM5/1

Updating of the Master International Frequency Register with Regard to Assignments to Stations of the Fixed, Mobile, Aeronautical Radionavigation and Radiolocation Services in the Frequency Band 1 605 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva 1986),

considering

a) that under No. 481 and the Table of Frequency Allocations in Article 8 of the Radio Regulations and until a date to be decided by the second session, the band 1 605 - 1 705 kHz is allocated to the fixed, mobile and aeronautical radionavigation services on a primary basis and to the radiolocation service on a secondary basis;

b) that under No. 481 and the Table of Frequency Allocations in Article 8 of the Radio Regulations and from a date to be decided by the second session, the band 1 605 - 1 625 kHz is allocated exclusively to the broadcasting service, and the band 1 625 - 1 705 kHz is allocated to the broadcasting service on a primary basis, to the fixed and mobile services on a permitted basis, and to the radiolocation service on a secondary basis;

c) that the planning of the band shall be based upon allotment and that the exact location and characteristics of broadcasting stations are not known;

d) that it will be impractical to assess compatibility between the allotments in the Plan and assignments to the other services to which the band is also allocated;

e) that, in view of the difficulties involved in evaluating compatibility between allotments in the Plan and assignments to other services, the Conference will establish a Plan without taking into account existing stations of the non-broadcasting services;

f) Recommendation COM5/A;

resolves

1. that, within 90 days of the end of the first session of this Conference, the IFRB shall send to each administration of Region 2 the list of assignments to its stations of the fixed, mobile, aeronautical radionavigation and radiolocation services recorded in the Master Register in the bands concerned, requesting them to review these assignments with a view to cancelling those which are no longer in use;

2. that administrations shall, within a period of 90 days following the receipt of the list referred to in paragraph 1 above, return the copy of the list indicating the assignments to be deleted from the Master Register as well as such modifications to other assignments as will assist in implementing the Broadcasting Plan;

3. that administrations wishing to maintain in operation non-broadcasting stations in application of [paragraph*] shall indicate the estimated date on which the station in question will cease operation.

4. that the IFRB shall submit a report to the second session of the Conference on all deletions (including the deletion date referred to in paragraph 3 above) of and modifications to assignments to non-broadcasting stations in the band 1 605 - 1 705 kHz recorded in the Master Register on behalf of Region 2 administrations.

urges administrations

1. having assignments in the fixed, mobile, aeronautical radionavigation and/or radiolocation services which are potentially incompatible with the Plan to take all necessary steps to eliminate the potential incompatibility in view of the fact that, in general, the non-broadcasting services have more flexibility to modify their characteristics, including the frequency;

2. to take all possible action with a view to achieving the objectives of this Resolution;

requests the IFRB

1. to bring Recommendation COM5/A to the attention of Region 2 administrations not present at the First Session of the Conference;

2. to provide all administrations with all the necessary assistance in the implementation of the provisions of this Resolution.

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* Note by Committee 5 - The reference to the part of the report which will contain the text currently set out in section 2 of Document DT/11 (see also Document 70) must be added at a later stage.

RECOMMENDATION PLEN/A

Draft Agenda and Duration of the Second Session of the Conference

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2, (First Session, Geneva, 1986),

considering

a) Resolution 1 of the Plenipotentiary Conference, Nairobi, 1982, relating to Future Conferences of the Union;

b) Recommendation 504 of the 1979 WARC, relating to the Preparation of a Broadcasting Plan in the Band 1 605 - 1 705 kHz in Region 2;

c) that, in accordance with No. 480 of the Radio Regulations, the use of the band 1 605 - 1 705 kHz by stations of the broadcasting service shall be subject to a plan to be established by a regional administrative radio conference;

d) that the effective implementation of the Plan in the Region will be facilitated by the incorporation of the Regional Agreement in the Radio Regulations;

e) that the Table of Frequency Allocations provides for other services in the frequency band 1 625 - 1 705 kHz;

f) that the agenda for the First Session contained in Resolution 913 of the Administrative Council, 1984, provides for the First Session to establish a draft agenda for the Second Session of the Conference, relating to the establishment of an agreement and an associated plan, to be submitted to the Administrative Council;

g) the Report of the First Session;

h) that the Second Session will need to consider the report of the IFRB on the work carried out during the intersessional period based on the decision of the First Session;

i) that the Second Session will need to consider technical information made available by the CCIR as a result of studies carried out;

j) that administrations will submit proposals to the Second Session;

<u>recognizing</u>

that the frequency band 1 605 - 1 705 kHz is shared with other services;

<u>recommends to the Administrative Council</u>

1. the following draft agenda for the Second Session on the basis of the Report of the First Session and taking account of considerings h, i and j:

1.1 to draw up an agreement which includes regulatory procedures, appropriate technical standards, an associated frequency allotment plan and possibly assignments derived therefrom for the use of the band 1 605 - 1 705 kHz by the broadcasting service in Region 2;

1.2 to establish regulatory procedures governing the use of the band 1 625 - 1 705 kHz by other services in Region 2;

1.3 to establish a date (or dates) in accordance with No. 481 of the Radio Regulations, and a schedule for the introduction of the broadcasting service in the band 1 605 - 1 705 kHz;

1.4 to review and revise the relevant Resolutions and Recommendations;

1.5 to adopt a procedure to be applied by administrations wishing to implement their allotments in relation to non-broadcasting stations of the other contracting members;

2. to consider a duration of three to four weeks for the Second Session of the Conference in 1988.

3. to select a date at least [6] months before WARC ORB-2 when deciding on the date of the Second Session of this Conference.

RECOMMENDATION PLEN/B

Concerning the Venue for the Second Session

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

a) Resolution 3 of the Plenipotentiary Conference (Nairobi, 1982) concerning invitations to hold conferences or meetings away from Geneva;

b) that there are considerable advantages in holding the Second Session in the Region;

c) the importance of ensuring the active participation of all the countries of the Region:

recommends to the administrations

that an administration in the Region should extend an invitation to hold the Second Session in its country;

requests the Secretary-General

to distribute this Recommendation to the administrations in Region 2 as soon as possible with a view to obtaining their replies before the 41st session of the Administrative Council.

RECOMMENDATION COM4/A

Relationship Between Physical and Electrical Antenna Height

The Regional Administrative Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

that information relating to the relationship between physical antenna height and electrical antenna height would be useful to all administrations when establishing assignments in the 1 605 - 1 705 kHz band;

recommends administrations in Region 2

within the limits of their possibilities, to carry out measurements to define this relationship and submit the relevant data to the CCIR Study Group concerned taking into account the CCIR work schedule;

requests the CCIR

a) to prepare, on the basis of the contributions submitted, a report to the second session of the Conference;

b) to carry out these studies as part of the normal work of the CCIR Study Groups.

RECOMMENDATION COM5/A

Use of the Band 1 605 - 1 705 kHz in Region 2 by the Non-Broadcasting Services and the Development and Implementation of the Region 2 Broadcasting Plan

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva 1986),

considering

a) that under No. 481 and the Table of Frequency Allocations in Article 8 of the Radio Regulations and until a date to be decided by the second session, the band 1 605 - 1 705 kHz is allocated to the fixed, mobile and aeronautical radionavigation services on a primary basis and to the radiolocation service on a secondary basis;

b) that under No. 481 and the Table of Frequency Allocations in Article 8 of the Radio Regulations and from a date to be decided by the second session, the band 1 605 - 1 625 kHz is allocated exclusively to the broadcasting service, and the band 1 625 - 1 705 kHz is allocated to the broadcasting service on a primary basis, to the fixed and mobile services on a permitted basis, and to the radiolocation service on a secondary basis;

c) that the operation of non-broadcasting services in this band by the Region 2 administrations might hinder the implementation of the Plan for the broadcasting service in the band 1 605 - 1 705 kHz;

recommends

a) that the Region 2 administrations should henceforth refrain from assigning frequencies in the band 1 625 - 1 705 kHz to their stations in the non-broadcasting service, which might inhibit the implementation of the Plan;

b) that, when using frequencies in the band 1 605 - 1 705 kHz for stations in the non-broadcasting services, administrations should take all necessary steps to ensure that the full implementation of the Plan adopted by the Conference is not compromised.

RECOMMENDATION COM5/B

Incorporation in the Radio Regulations of the Allotment Plan and the Associated Provisions for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

a) that, on the basis of No. 480 of the Radio Regulations, the Second Session of this Conference has been empowered to establish a plan for the entire Region;

b) that the Conference decided to prepare the Plan on the basis of objective criteria equally applied to all the countries of the Region;

c) that the Plan will be an allotment plan limited to a channelling arrangement, delimitation of the allotment areas, and standardized parameters;

d) that the standardized parameters adopted for the establishment of the Plan should not lead to any inter-Regional difficulties between the services to which the band is allocated;

e) Recommendation PLEN/A relating to the agenda of the Second Session of this Conference;

recommends the Administrative Council

to place on the agenda of the Second Session of the WARC-ORB in 1988:

1.1 the consideration of consequential changes to Nos. 480 and 481 of Article 8 of the Radio Regulations in this frequency band in Region 2;

1.2 the consideration of the question of incorporation in the Radio Regulations, in the appropriate form, of the Allotment Plan and the associated provisions to be prepared for the broadcasting service in the band 1 605 - 1 705 kHz in Region 2.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 114-E
30 April 1986
Original: French

PLENARY MEETING

REPORT OF THE BUDGET CONTROL COMMITTEE TO THE PLENARY MEETING

The Budget Control Committee held three meetings during the Conference and examined the questions arising from its terms of reference.

Under Nos. 475 to 479 of the International Telecommunication Convention (Nairobi, 1982), the Committee's terms of reference are:

a) to determine the organization and the facilities available to delegates;

b) to examine and approve the accounts for expenditure incurred throughout the duration of the Conference;

1. Determination of the organization and facilities available to delegates

As there were no comments by delegations on the subject, Committee 3 concluded that the organization and the facilities available to delegates were satisfactory.

2. Budget of the Conference

The Committee noted the budget of the Conference as approved by the 40th session of the Administrative Council (1985) and as adjusted under Administrative Council Resolution No. 647 to allow for changes in the common system of salaries and allowances of the United Nations and the specialized agencies. This budget is contained in Annex 1 to this report.

3. Situation of conference expenditure

Under No. 478 of the Convention, the Budget Control Committee has to submit a report to the Plenary Meeting showing, as accurately as possible, the estimated total expenditure of the Conference.

Accordingly, Annex 2 contains a statement showing the budget of the Conference, together with a breakdown of credits among the budget subheads and items, as well as the actual expenditure incurred as at 28 April 1986. There is also an indication of the expenditure committed up to that date and an estimate of expenditure up to the date of closure of the Conference.

The statement shows that the total amount is estimated at 1,051,000 Swiss francs, i.e., 80,000 Swiss francs less than the credit allocated by the Administrative Council and adjusted in accordance with its Resolution No. 647.

4. Recognized private operating agencies and international organizations not exempted

Under Article 16 of the Financial Regulations of the Union, the report of the Budget Control Committee to the Plenary Meeting must include a list of the recognized private operating agencies and international organizations which are required to contribute to the expenses of the Conference. To this shall be added a list of the international organizations which have been exempted from payment under No. 617 of the Convention.

This list is contained in Annex 4 hereto.

5. Sharing of conference expenditure

This Conference being a regional conference within the meaning of No. 50, Article 7 of the Nairobi Convention (1982), the expenditure arising from it must be borne by all the Members of Region 2 and the Members of other Regions taking part in the Conference according to the class of contribution they have chosen. Annex 3 hereto lists the members required to bear the costs of the Conference.

According to the statement of account in Annex 2 hereto, total expenditure is estimated at 1,051,000 Swiss francs. On the basis of the number of contributory units of the Members required to bear the cost of the Conference (Annex 3), the amount of the contributory units may be estimated at 7,400 Swiss francs.

Under Article 28 of the Financial Regulations of the Union, interest is payable on regional conference accounts after a period of 60 days from the date of their dispatch. Since invoices can probably be sent to participants on 30 June 1986, they should be settled not later than 31 August 1986. From 1 September 1986 they will be subject to interest at 3% for the first 180 days and at 6% thereafter.

6. Additional expenditure to be envisaged for implementation of the decisions of the Conference

The Plenipotentiary Conference, (Nairobi, 1982) decided, inter alia, that the Budget Control Committees of the various conferences should submit a report estimating the costs that may be entailed by the execution of the decisions adopted by such conferences.

Pursuant to this decision, the Budget Control Committee considered the notes by the Director of the CCIR and the Chairman of the IFRB concerning intersessional work.

a) CCIR intersessional activities (Document 85)

The Budget Control Committee noted that the specific studies to be undertaken by the CCIR would be carried out as a part of normal CCIR activities. Nevertheless, the cost of publishing the CCIR's report to the second session, estimated at 10,000 Swiss francs, would be chargeable to the budget for the second session.

b) IFRB intersessional work (Document 108)

The Budget Control Committee also took note of the tasks to be carried out by the IFRB prior to the second session of the Conference (Document DT/34). It was informed that the IFRB had not been able to draw up a precise estimate of the related costs but that the required information would be transmitted to the forthcoming session of the Administrative Council. The initial conclusion reached by the IFRB was that the funds still available under the credits approved for preparatory work for the first session, i.e. 173,000 Swiss francs, would be sufficient to carry out the intersessional work. Any requirements in excess of that amount would be the subject of a request to the forthcoming session of the Council.

The Budget Control Committee therefore proposes that the Administrative Council authorize the transfer of this sum to the account for payments using credits granted for previous years, where it should remain available for use in 1986, 1987 and 1988.

In accordance with No. 479 of the Convention, this report will be transmitted to the Secretary-General, together with any comments by the Plenary Meeting, for referral to the Administrative Council at its next annual session.

The Plenary Meeting is requested to approve this report.

E.D. DuCHARME
Chairman of the Budget
Control Committee

Annexes: 4

ANNEX 1

Budget of the BC-R2 Conference

Items	1986 budget	1986 budget (adjusted)
	- Swiss francs -	
I - Preparatory work		
20.611 IFRB preparatory work	200,000	200,000
II - Staff expenses		
20.621 Salaries and related expenses of the Conference Secretariat staff	365,000	370,800
20.622 Salaries and related expenses of the translation, typing and reproduction services staff	336,000	338,200
20.623 Travel (recruitment)	14,000	14,000
20.624 Insurance	46,000	46,000
	761,000	769,000
III - Travel expenses		
20.631 Subsistence costs at Conference venue	-	-
20.632 Travel to Conference venue and back	-	-
20.633 Transport of material to Conference venue and back	-	-
	-	-
IV - Premises and equipment		
20.641 Premises, furniture, machines	35,000	35,000
20.642 Document production	20,000	20,000
20.643 Office supplies and overheads	20,000	20,000
20.644 Postage, telephone calls, telegrams	15,000	15,000
20.645 Technical installations	5,000	5,000
20.646 Sundry and unforeseen	10,000	10,000
	105,000	105,000
V - Other expenses		
20.651 Interest credited to the ordinary budget	37,000	37,000
VI - Final Acts		
20.661 Report to the Second Session	20,000	20,000
Total, Section 20.6	1,123,000	1,131,000

ANNEX 2

Position of RARC BC-R2 accounts at 28 April 1986

Items		Budget approved by AC	Budget adjusted at 1.04 1)	Expenditure at 28.4.1986		
				actual	estimated or committed	total
		- Swiss francs (thousands) -				
Subhead I - Preparatory work						
20.611	IFRB preparatory work	200	200	27	173	200
Subhead II - Staff expenditure						
20.621	Sec. staff salaries	365	371	0	365	365
20.622	Com. serv. staff salaries	336	338	57	265	322
20.623	Travel (recruitment)	14	14	5	6	11
20.624	Insurance	46	46	0	32	32
		761	769	62	668	730
Subhead IV - Premises and equipment						
20.641	Premises, furniture, machines	35	35	0	42	42
20.642	Document production	20	20	0	12	12
20.643	Office supplies and overheads	20	20	4	12	16
20.644	PTT	15	15	0	15	15
20.645	Technical installations	5	5	0	3	3
20.646	Sundry and unforeseen	10	10	1	7	8
		105	105	5	91	96
Subhead V - Other expenses						
20.651	Interest	37	37	0	15	15
Subhead VI - Final Acts						
20.661	Report to the 2nd Session	20	20	0	10	10
Total, Section 20.6		1123	1131	94	957	1051
Unused credits						80

1) Budget, including additional credits to take account of changes in the United Nations common system.

ANNEX 3

Contributions by Members of the Union towards defraying the expenses of the regional Conference

Members of Region 2:

		Contributory units
1.	Argentina (Republic of)	3
2.	Bahamas (Commonwealth of the)	1/2
3.	Barbados	1/4
4.	Belize	1/8
5.	Bolivia (Republic of)	1/4
6.	Brazil (Federal Republic of)	3
7.	Canada	18
8.	Chile	1
9.	Colombia (Republic of)	1
10.	Costa Rica	1/4
11.	Cuba	1/2
12.	Denmark	5
13.	Dominican Republic	1/2
14.	El Salvador (Republic of)	1/4
15.	Ecuador	1/2
16.	United States of America	30
17.	France	30
18.	Grenada	1/8
19.	Guatemala (Republic of)	1/4
20.	Guyana	1/4
21.	Haiti (Republic of)	1/8
22.	Honduras (Republic of)	1/4
23.	Jamaica	1/4
24.	Mexico	1
25.	Nicaragua	1/2
26.	Panama (Republic of)	1/2
27.	Paraguay (Republic of)	1/2
28.	Netherlands (Kingdom of the)	10
29.	Peru	1/4
30.	United Kingdom of Great Britain and Northern Ireland	30
31.	Saint Vincent and the Grenadines	1/8
32.	Suriname (Republic of)	1/4
33.	Trinidad and Tobago	1
34.	Uruguay (Eastern Republic of)	1/2
35.	Venezuela (Republic of)	2
		142

ANNEX 4

Recognized private operating agencies and international organizations taking part in the Conference

	Number of contributory units
1. Recognized private operating agencies	
None	
2. International organizations	
2.1 United Nations	
–	
2.2 Specialized agencies	
International Civil Aviation Organization (ICAO)	*
2.3 Other organizations	
International Amateur Radio Union (IARU)	*

* Exempted from all contributions under Administrative Council Resolution No. 925.

BLUE PAGES

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1)

RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 115-E
30 April 1986

B.11

PLENARY MEETING

11th SERIES OF TEXTS SUBMITTED BY THE
EDITORIAL COMMITTEE TO THE PLENARY MEETING

The following texts are submitted to the Plenary Meeting for first reading:

Source	Document	Title
IFRB	-	Chapter 6 - section 6.3.2

P. PERRICHON
Chairman of Committee 6

Annex: 1 page

- for sea paths and mixed paths in noise zones 1 and 2, the IFRB will carry out planning exercises in the following manner:*,**

  a) starting with a separation distance of 600 km, try to find at least one channel per allotment area;

  b) if this is not possible, repeat the above using a separation distance of 550 km, and if necessary repeat again using a distance of 500 km;

  c) if it is still not possible to provide at least one channel per allotment area, the IFRB will use, as the standardized distances, the distances calculated in accordance with section 2.1 in order to meet the E_{nom} of 1.25 mV/m;

- as a separate planning exercise for both sea paths and mixed paths, the IFRB will use a standardized distance in noise zones 1 and 2 of 450 km.*,**

* The exact distance will be decided by the second session based on the results of the intersessional planning exercises carried out by the IFRB.

** [Same text as page R.4/11.]

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 116-E
20 May 1986
Original: English

PLENARY MEETING

MINUTES
OF THE
SIXTH PLENARY MEETING

Wednesday, 30 April 1986, at 1015 hrs

Chairman: Mr. F. Savio C. PINHEIRO (Brazil)

Subjects discussed:		Documents
1.	Approval of the minutes of the fourth Plenary Meeting	80
2.	Report by the Chairman of Committee 2 (Credentials)	-
3.	Ninth series of texts submitted by the Editorial Committee for first and second reading (Series B.9)	109
4.	Tenth series of texts submitted by the Editorial Committee for first and second reading (Series B.10)	112
5.	Fourth series of texts submitted by the Editorial Committee for second reading (Series R.4)	113
6.	Approval of outstanding text	
7.	Statement by the delegate of Brazil	
8.	Dates for the Second Session	

1. Approval of the minutes of the fourth Plenary Meeting (Document 80)

The minutes of the fourth Plenary Meeting were approved.

2. Report by the Chairman of Committee 2 (Credentials)

2.1 The Chairman of Committee 2 said that the credentials submitted by Peru had been examined and found to be in order and should therefore be listed under paragraph 2 of the annex to Document 99 among the provisional credentials submitted by countries having the right to vote.

The Plenary Meeting took note of the report by the Chairman of Committee 2.

3. Ninth series of texts submitted by the Editorial Committee for first and second reading (Series B.9) (Document 109)

Section 6.4: Protection considerations

It was agreed to make the following amendments:

6.4.1: decision to be taken later;

6.4.2: final paragraph, delete the first sentence and asterisk and the square brackets around the second sentence;

6.4.4: third paragraph, delete "within the area";

fifth paragraph, delete the first sentence and asterisk and the square brackets around the second sentence;

final paragraph, replace "frontier" by "border" throughout.

The ninth series of texts (B.9) submitted by the Editorial Committee was approved, as amended, on first reading.

3.1 The Chairman invited the Plenary Meeting to proceed to a second reading of the ninth series of texts (B.9).

The ninth series of texts (B.9) submitted by the Editorial Committee was approved on second reading.

4. Tenth series of texts submitted by the Editorial Committee for first and second reading (Series B.10) (Document 112)

Chapter 8: Preparatory work for the Second Session of the Conference

It was agreed to make the following amendments:

8.1.1 b): delete the square brackets.

8.1.1 c): delete the words "for two standardized distances" and "for the Caribbean area".

8.1.1 e): insert "both" before "being a normal input" and delete the square brackets; replace "contribución" by "introducción" in the Spanish text.

8.2: add after "Recommendation COM4/B": "These studies will be carried out as part of the normal CCIR Study Group activities".

The tenth series of texts (B.10) submitted by the Editorial Committee was approved, as amended, on first reading.

4.1 The Chairman invited the meeting to consider the tenth series of texts (B.10) submitted by the Editorial Committee for second reading.

The tenth series of texts (B.10) submitted by the Editorial Committee was approved on second reading.

5. Fourth series of texts submitted by the Editorial Committee for second reading (Series R.4) (Document 113)

It was agreed to make the following amendments:

Introduction:

- fourth paragraph, replace "2 May" by "1 May" and delete the square brackets;

- fifth paragraph in the last line replace "la adopción de" by "y adoptó" in the Spanish text and "all" by "the" in the English text; delete "todas" in the Spanish and "toutes" in the French texts;

- final paragraph: delete the square brackets.

Chapter 6: Planning

Subject to a decision to be taken later in the meeting on sub-sections 6.3.2 and 6.3.4.1 b), the following amendments were agreed:

delete all the square brackets in 6.1 and replace "frontier" by "border" throughout 6.3.4.

Recommendation PLEN/A

It was agreed to replace "at least [6] months" by "some 5 months" in recommends to the Administrative Council 3.

Resolution COM5/1 and Recommendations PLEN/B, COM4/A, COM5/A and COM5/B

Approved, subject to editorial changes in the Spanish texts.

The fourth series of texts submitted by the Editorial Committee for second reading (Series R.4) was approved, as amended, and subject to the above comments.

6. Approval of outstanding texts on second reading

Section 6.3.2

6.1 The Chairman of the ad hoc Group set up by fifth Plenary to consider the method proposed by Canada for defining the standardized distances for mixed paths said that his Group had concluded that the method offered both advantages and disadvantages and it had reluctantly agreed on the text now appearing in the fourth indent of section 6.3.2 in Document 113. However, since then, further consultations had been held with various delegations in an attempt to improve the provision.

6.2 The representative of the IFRB (Mr. Brooks) read out a proposed text of the third and fourth indents of section 6.3.2 prepared on the basis of the aforesaid consultations. The Chairman said that the text could be submitted as a blue document that afternoon.

The meeting was suspended at 1210 hours and resumed at 1610 hours.

Eleventh series of texts submitted by the Editorial Committee to the Plenary Meeting for first and second reading (Series B.11) (Document 115)

6.3 The Chairman invited the meeting to consider the text read out by the representative of the IFRB before the suspension.

6.4 The delegate of Chile pointed out that the Plenary had already approved on first reading the first three indents of section 6.3.2 as they appeared in Document 107 on the basis of the text put forward by Committee 5 ad hoc 1, and that the question of standardized distances for mixed paths, the only point on which a consensus had not been reached, had now been settled by the text appearing in Document 113. He therefore proposed that Document 115 should not be considered at that late stage. The delegate of Paraguay said that, although Paraguay, as a land-locked country, was not concerned by the problem of mixed path distances, he supported that proposal in the interests of reaching an early solution. The delegate of Cuba said he fully shared the concern expressed by the delegate of Chile and further proposed that the meeting should approve the text prepared by Committee 5 ad hoc 1 as it appeared in Document 107. It was quite unacceptable to make radical changes to the text at that late stage, particularly on the basis of a document submitted by the IFRB. The representative of the IFRB (Mr. Brooks) said he wished to make it quite clear that the text appearing in Document 115 was the result of consultations with a number of delegations.

6.5 The Chairman pointed out that when the text in question had been read out before the suspension of the meeting no delegation had objected to its submission as a blue document. Moreover, the decisions on sea path distances had not been radically changed, but had merely been reworded to take account of the new proposal on mixed path distances, on which no final consensus had been reached at any stage of the proceedings. The delegate of Canada endorsed that clarification, adding that the text in Document 115 would have the effect of expanding the planning exercises to cover mixed path distances.

6.6 The delegate of the United States of America drew attention to the substantial increase in interference that would result from the use of the 10% ground portion criterion proposed in Document 107 and observed that the approach used in Document 113 was an improvement in that each administration would now be allotted at least one channel. Nevertheless, the IFRB did not consider the procedure involved to be satisfactory. The delegate of France agreed, adding that the text in Document 115 represented a further improvement in that respect. The delegates of Guyana, Honduras, Mexico and Trinidad and Tobago said they were in favour of that text. The delegate of the United Kingdom also supported that text and proposed that the footnote to the text appearing in Document 113 should be added, to make it clear that a planning exercise would be carried out for the Caribbean area.

6.7 The Chairman proposed, in the light of the discussion, that the text in Document 115 should be taken as a basis for the relevant parts of section 6.3.2, in which any amendments proposed could be inserted.

It was so agreed.

6.8 The delegate of Brazil, observing that part of the difficulty experienced by certain delegations might lie in the absence of a provision taking account of the effect on mixed path distances decided upon, proposed the addition of the following paragraph:

> "In the case of both planning exercises, if the total path includes more than 120 km or 330 km of land in noise zones 2 and 1, respectively, the standardized distances will be limited to 120 km and 330 km in noise zones 2 and 1, respectively."

6.9 The delegate of Colombia supported that proposal.

6.10 The representatives of the IFRB (Mr. Berrada and Mr. Brooks), noting that the text as it stood could lead to some ambiguity in interpretation with regard to the overall standard distance for a mixed path, proposed the following amended wording for the Brazilian text:

> "In the case of mixed paths, for both planning exercises, the standardized distances will be limited to the sea portion of the path plus the total portion of 120 km or 330 km of land path in noise zones 2 and 1 respectively".

6.11 Following a request for further clarification from the delegate of Cuba, it became clear from a discussion in which the delegates of France and Brazil, the representative of the IFRB (Mr. Brooks) and the Chairman took part, that the overall standardized distance for a mixed path would be variable, depending on the proportion of land and sea in the path, up to a maximum of 600 km (the standardized sea path distance), the actual distance being determined by the cut-off point when the land portion or portions of the mixed path had reached a cumulative maximum of 120 km or 330 km in noise zones 2 and 1 respectively.

On that understanding, the Brazilian proposal as amended by the IFRB was approved for insertion as the third indent of section 6.3.2.

6.12 The delegate of the United Kingdom said that, since the text just approved provided for a planning exercise covering the whole Region, he withdrew his proposal for a footnote specifically mentioning the Caribbean area.

The eleventh series of texts (B.11) submitted by the Editorial Committee was approved, as amended, on first and second reading.

Section 6.3.4.1 b) (Document 113)

6.13 In the light of the text that had been adopted for section 6.3.2, the delegate of Canada withdrew his proposed amendment to the text of section 6.3.4.1 b). The text was approved on first and second reading.

Section 6.4.1 (Document 109)

6.14 Similarly, the delegate of the United Kingdom, in the light of the text adopted for section 6.3.2, withdrew his objection to the removal of the square brackets; however, he reserved the right to return to the substance of the text concerned depending on the distances which were selected by the Second Session of the Conference. The square brackets are deleted and text approved on first and second reading.

Section 8.1.1 (Document 112)

6.15 The representative of the IFRB (Mr. Brooks) said that as a result of the decisions regarding planning exercises the square brackets on the second last line of section 8.1.1 a), together with the text therein, could be removed and replaced by "January 1987".

6.16 In reply to the delegate of the United States, who proposed that section 6.3.2 should be included in the planning steps listed in 8.1.1 subparagraph a), the delegate of Canada observed that the action of including section 6.3.2 among the reference steps was already covered in subparagraph c).

6.17 The delegate of the United States said he would not press his proposal on the understanding that the final date for completion of the planning exercise described in section 6.3.2 would also be January 1987.

6.18 The Chairman declared that on second reading all the texts had thus been approved and he thanked the Chairmen, Vice-Chairmen and members of all the Committees for their invaluable contributions to the excellent results achieved.

6.19 The Secretary-General proposed that, as was customary once the present session of the Conference had completed its work, the Plenary should entrust the Secretary-General with the task of carrying out the final numbering of the chapters, articles and paragraphs of the report to the Second Session, and correcting any errors of an editorial nature therein.

It was so agreed.

7. Statement by the delegate of Brazil

7.1 The delegate of Brazil made the following statement:

"The Brazilian Administration, considering a) the agreed use of the band 1 605 - 1 705 kHz for non-broadcasting stations as established in paragraph 6.3.5 in Chapter 6 of the report to the Second Session (BC-R2(2)); and b) the contents of No. 342 of the Radio Regulations, declares that it intends to continue using the the aeronautical radionavigation service in the band 1 625 - 1 705 kHz, in some regions of the country, in the channels to be allotted to Brazil in the planning, whilst however, taking the necessary precautions not to affect adversely other administrations which may in the future use stations operating in conformity with the Convention or according to the Plan to be established at the Second Session of this Conference".

The Plenary took note of that statement.

8. Dates for the Second Session of the Conference

8.1 The Secretary-General said that if the Administrative Council should decide that WARC-ORB-2 could complete its work in five weeks and three days, with a reserve of one day, he would suggest that it be rescheduled to begin on 29 August 1988 in order to assure best use of the Union's resources and prevent undue strain on Headquarters staff. Similarly, and subject to an Administrative Council decision on postponement of the Region 3 Conference, he would suggest that the Second Session of the Region 2 Conference should take place from 29 February to 1 April 1988 if held in Geneva. The problem of over-extension of ITU services was a serious one and he would be urging the Administrative Council to seek ways and means of avoiding the situation which had arisen in 1985, when some resources had been under-utilized in the early part of the year and overburdened towards the end of the year.

The Plenary took note of those comments.

The meeting rose at 1810 hours.

The Secretary-General:

R.E. BUTLER

The Chairman:

F. Savio C. PINHEIRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 117-E
30 April 1986

PLENARY MEETING

STATEMENTS RELATING TO THE REPORT

The Delegations mentioned below submitted the following statements on their position with regard to the Report of the First Session of the Conference.

1

Original: Spanish

Republic of Honduras:

The Delegation of the Republic of Honduras to the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, Switzerland, from 14 April to 2 May 1986) declares that it does not agree with the value of 330 km adopted for the co-channel standardized distance for land paths in noise zone 1, since this value does not meet the requirements resulting from the physical limitations prevailing in the Central American region.

It also reserves for its Government the right to take such action as it may consider necessary to safeguard its national broadcasting service should other countries fail to comply with the provisions agreed during this First Session.

2

Original: Spanish

For the Republic of Costa Rica:

The Delegation of the Republic of Costa Rica to the First Session of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (BC-R2(1)), held in Geneva (Switzerland) from 14 April to 1 May 1986, reserves for its country the right to accept or not to accept any of the decisions of the First Session which might affect its sovereign rights relating to the use of the band in question.

3

Original: Spanish

For the Eastern Republic of Uruguay:

Taking into account:

a) the small number of countries (less than half the total number of countries in Region 2) participating in the First Session of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (BC-R2(1)) and the few delegations present when decisions were taken on the method to be used for planning that band;

b) the allotment planning method adopted by the First Session;

c) the fact that the allotment planning method gives small and medium-size countries very little latitude to site their stations;

d) the coordination which the administrations of neighbouring countries will have to carry out after the Second Session of the Conference in order to solve adjacent channel problems in frontier areas;

the Delegation of the Eastern Republic of Uruguay reserves for its Government the right to take any action that it may consider necessary to safeguard its interests, should the requirements of its broadcasting service in the band 1 605 - 1 705 kHz not be met under the planning method and associated provisions adopted by the Conference.

4

Original: Spanish

For the Argentine Republic:

The Delegation of the Argentine Republic reserves for its Government the right to take any action that it may consider necessary to ensure the proper operation of its stations in the fixed, mobile, aeronautical radionavigation and radiolocation services operating in the band in question and recorded in the International Frequency Register.

It also reserves for its Government the right to accept or not to accept any decisions taken by the Conference which might in any way limit the radio spectrum capacity technically available in its territory and jeopardize the planning and future installation of its broadcasting service stations in the band 1 605 - 1 705 kHz.

5

Original: Spanish

For Cuba:

The Delegation of the Republic of Cuba to the First Session of the ITU Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 declares, with regard to the report drawn up at the First Session:

1. That the aforesaid report contains no reference to the proposal made by the Cuban Delegation in the first Plenary Meeting of the Conference, to the effect that the new band 1 605 - 1 705 kHz should not be used for purposes of aggression against one country's sovereignty by another country, as is currently the case in the MF broadcasting band which is being used systematically by the United States Administration to operate anti-Cuban stations broadcasting in Spanish to Cuban territory with a view to promoting destabilization and increasing interference to established Cuban stations, thus infringing the International Telecommunication Convention and the Radio Regulations.

If, having regard to the foregoing and to the aggressive broadcasting policy adopted by the present United States Administration, the new band is used to perpetrate further aggression against Cuba, the Cuban Administration reserves the right to take any action it may consider necessary to protect its interests in respect of its national broadcasting services, including a refusal to hold bilateral discussions with the United States on the band in question, as it was obliged to do with regard to the segment 535 - 1 605 kHz as a result of the daily broadcasts directed against Cuban state sovereignty from anti-Cuban transmitters.

2. That the value of 0.5 mV/m adopted for nominal usable groundwave field strength in noise zone 1 severely limits the possibilities of allotting channels to countries in Central America, the Caribbean and the neighbouring or adjacent continental areas. This value, which was adopted at the Regional Conference for planning the band 535 - 1 605 kHz, has repeatedly been contested by the Cuban Administration on the grounds that it is neither practical nor appropriate for use in the above-mentioned regions.

3. That it is totally unacceptable for the services other than the broadcasting service sharing the band 1 605 - 1 705 kHz in conformity with Article 8 of the Radio Regulations to be restricted or removed from the Table, in view of the serious economic implications for both Cuba and the other developing countries using those services. The Administration of Cuba holds the view that only a small number of administrations in the Region would wish to use the above-mentioned band exclusively for broadcasting services.

4. That it would be inappropriate to incorporate the future allotment plan and associated provisions in the Radio Regulations on the strength of the First Session, in which only a minority of the countries belonging to the Region took part.

Furthermore, the Cuban Administration holds the view that an attempt is being made to find ways and means of compelling all the countries of the Region to observe the Regional Agreement, which is neither admissible or customary in ITU proceedings.

5. That it reserves the right to revert to all these matters during the Second Session of the Conference, with a view to finding just and equitable solutions for all the countries of Region 2.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 118-E
20 May 1986
Original: English

PLENARY MEETING

MINUTES

OF THE

SEVENTH PLENARY MEETING

Thursday, 1 May 1986, at 0910 hrs

Chairman: Mr. F. Savio C. PINHEIRO (Brazil)

Subjects discussed:	Documents
1. Report of the Budget Control Committee	114
2. Declarations relating to the Report of the First Session of the Conference	117

1. Report of the Budget Control Committee (Document 114)

1.1 The Chairman of the Budget Control Committee introduced Document 114. He drew attention to the surplus of 80,000 Swiss francs over the budget mentioned in the third paragraph of section 3, and the estimated amount of 7,400 Swiss francs for the contributory unit, referred to in the second paragraph of section 5. The Budget Control Committee, at its previous meeting, had authorized him and the Committee Secretary to amend the text of the report if they saw fit; accordingly he proposed that, in the last sentence of the first paragraph of sub-section 6 b), the words "resulting from a more precise evaluation of the required resources" should be inserted after the phrase "in excess of that amount". He felt that the additional expenditure referred to in section 6 was very reasonable and that the Administrative Council would welcome such a report.

The report was approved, as amended.

2. Declarations relating to the Report of the First Session of the Conference (Document 117)

The meeting took note of the declarations contained in Document 117.

The meeting rose at 0925 hours.

The Secretary-General:
R.E. BUTLER

The Chairman:
F. Savio C. PINHEIRO

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 119-E
1 May 1986

PLENARY MEETING

ADDITIONAL DECLARATIONS CONCERNING THE REPORT

The Delegations indicated below have submitted the following additional declarations concerning those published in Document 117.

1

Original: English

For the United States of America:

The United States of America, noting its statement (No. 111) in the final protocol to the International Telecommunication Convention, Nairobi, 1982, makes the following declaration concerning the first statement of Declaration Number 5 entered by the Republic of Cuba:

Cuba has improperly introduced the term "Aggression" in a technical forum of the International Telecommunication Union. Cuba is, in fact, complaining of programming on an MF broadcasting station in the United States which has been properly notified to, and registered by, the International Frequency Registration Board. The issue of programme content is not appropriate for consideration in either session of this Conference or in any forum of the ITU.

Concerning incompatibilities, the United States has been willing to discuss radio interference, but Cuba has not. In August, 1983, representatives of the United States and Cuba met in San Jose, Costa Rica, for talks concerning the band 535 - 1 605 kHz. The United States requested further talks to be held in Mexico City in October, 1983, with the objective of eliminating or substantially reducing the level of interference to broadcasting. However, at the last moment, the Cuban Government informed the United States that it did not intend to continue the talks. Cuba now acknowledges that it "refused to hold" those discussions and threatens not to cooperate with the United States with respect to the new band. The United States will continue to support the development of radio broadcasting and will seek to eliminate interference to broadcasting in any band.

Therefore, given the history of failed attempts to resolve interference problems with Cuba, as well as this new indication of Cuba's continued refusal to attempt to resolve these matters, the United States reserves its rights with respect to existing interference and any future interference by Cuba with United States broadcasting.

2

Original: Spanish

For Cuba:

The Delegation of the Republic of Cuba to the First Session of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 has duly noted the declarations concerning the Report contained in Document 117 of the Conference and further states:

That notwithstanding the various comments made by administrations on the Report, it considers that the Report generally fulfils the objectives established in the agenda of the First Session contained in Administrative Council Resolution No. 913.

The Cuban Administration will attend the Second Session of the Conference with a view to preparing, with all the countries of Region 2 and in a climate of mutual respect and understanding, a Regional Agreement which meets the interests of the whole of Region 2.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 120-E
20 May 1986
Original: English

PLENARY MEETING

MINUTES

OF THE

EIGHTH AND LAST PLENARY MEETING

Thursday, 1 May 1986, at 1430 hrs

Chairman: Mr. F. Savio C. PINHEIRO (Brazil)

Subjects discussed:	Documents
1. Additional declarations concerning the Report	119
2. Adoption of the Report of the First Session	-
3. Closure of the First Session of the Conference	

1. Additional declarations concerning the Report (Document 119)

The Plenary Meeting took note of the additional declarations concerning the Report (Document 119).

2. Adoption of the Report of the First Session

The Report of the First Session was adopted.

3. Closure of the First Session of the Conference

3.1 The Secretary-General delivered the address reproduced in Annex 1.

3.2 The Chairman delivered the address reproduced in Annex 2.

3.3 The delegate of the United States paid tribute to the outstanding qualities of leadership evinced by the Chairman which had enabled the First Session of the Conference to proceed apace with its work. Indeed, the great technical and communications expertise already demonstrated by Mr. Pinheiro during visits to various Central and Latin American countries earlier in 1986 were undoubtedly the harbinger of a brilliant career and he wished him well for the future.

3.4 The Chairman declared closed the First Session of the Conference.

The meeting rose at 1455 hours.

The Secretary-General: R.E. BUTLER

The Chairman: F. Savio C. PINHEIRO

Annexes: 2

ANNEX 1

Closing address by the Secretary-General

Mr. Chairman,
Ladies and Gentlemen,

The Report of the First to the Second Session of the Conference which you have just adopted translates into tangible form the work you have carried out for the last three weeks. The Union's experience has shown that even if there are a relatively small number of administrations participating in a Regional Conference of this character, it does not necessarily mean that the solutions for the problems involved are easy ones. We have been faced with reality again. We all know that broadcasting by the nature of its special characteristics as a service, is always a sensitive subject and within the international context presents many complexities not encountered with other services.

On this occasion you have pioneered a new approach to the planning of medium frequency broadcasting based on the allotment plan with associated procedures. It offers guarantees as well as simplification in the international planning and coordination procedures when the time arrives for the translation of an allotment into an operational assignment. Hence the importance of the intersessional work programme including the field exercises which you have initiated.

The conference has produced a technical basis for future preparations. Provision has also has been made for the adoption of appropriate requirements in the continued operation of designated non-broadcasting services sharing the same band in the Region.

The results which have been achieved are due not only to the leadership of the Conference, its Chairman, Vice-Chairmen and Chairmen of the Committees and Working Groups but also to the mutual understanding and cooperation between all participants.

Mr. Chairman, I wish to thank you most sincerely for your particular efforts, friendliness and skill performed in and outside the meetings. In doing so you were as discreet as usual, always acting as an unfailing model of conciliation and patience. At the outset the conference realized that it had appointed a very good Chairman. Now we all know that we had an excellent one.

Ladies and Gentlemen,

On behalf of my senior colleagues, myself and indeed all of the ITU personnel, I wish you well in the intersessional processes and preparations which will go on at the national as well as in the international cooperation context in the next two years. You can be assured that the permanent organs of the Union are always at your disposal and to help in any way that you may feel useful.

Thank you.

ANNEX 2

Closing address by the Chairman of the Conference

Ladies and Gentlemen,

Any conference dealing with the broadcasting service presents difficulties by its very nature. We are all aware of its importance as a direct service to the people.

Our region, with its many islands and large number of countries of varying sizes, presents a particular challenge. Nevertheless, this First Session of the Conference is completing its work a day earlier than planned. It is important to note that we have not held any Plenary Meetings at night. The technical parameters, the planning method and the guidelines for the agreement contained in our report are simple, clear and precise, which will undoubtedly be a great help to the Second Session in 1988.

By finishing the Conference a day earlier than scheduled, we are making a saving in the ITU budget - a modest one, perhaps, but a saving none the less. Because the planning method we have adopted is a simple one, the cost of the intersessional work will be significantly reduced.

Ladies and Gentlemen,

I think we have achieved a great success in our common task and the reason is simple. The success of this First Session of the Conference is due to the spirit of cooperation you have all shown over nearly three weeks of laborious work.

I should not like to conclude the proceedings without expressing special gratitude to the Committee Chairmen - Mr. Montanaro (Paraguay) of Committee 2, Mr. DuCharme (Canada) of Committee 3 and the Working Group of the Plenary, Mr. Pizarro (Chile) of Committee 4, Mr. Fernández (Mexico) of Committee 5 and Mr. Perrichon (France) of Committee 6.

I should also like to thank the Vice-Chairmen of the Conference and the Committees, Mr. Butler, the Secretary-General, Mr. Jipguep, the Deputy Secretary-General, the members of the Board, Mr. Harbi, the Technical Secretary, Mr. Schuster, the Secretary of the Plenary, Mr. Macheret, the Executive Secretary, and all the staff of the ITU Secretariat and the interpreters.

Ladies and Gentlemen, please accept my thanks and my best wishes for your safe return home.

INTERNATIONAL TELECOMMUNICATION UNION

BC-R2(1) RARC TO ESTABLISH A PLAN FOR THE BROADCASTING SERVICE IN THE BAND 1605-1705 kHz IN REGION 2

FIRST SESSION GENEVA, APRIL/MAY 1986

Document 121-E
16 June 1986
Original : English
French
Spanish

FINAL LIST OF DOCUMENTS

A. Basic documents of the Conference

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1st meeting	31+Corr.1		
2nd meeting	49+Corr.1	COMMITTEE 5 (Planning Criteria)	
3rd meeting	66+Corr.1		
4th meeting	80	Summary Records	
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B. Complete list of documents in numerical order

LIST OF DOCUMENTS
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PL = Plenary Meeting
C = Committee
WG = Working Group

No.	Origin	Title	Destination
1	SG	Agenda of the Conference	PL
2	SG	Credentials of delegations	C.2
3+Add.1	SG	Note by the Secretary-General	C.4
4	USA	Proposals	C.4
5	SG	Budget of the Conference	C.3
6	SG	Contributions of non-exempt recognized private operating agencies and international organizations	C.3
7+Corr.1	CAN	Proposals	C.4, C.5, WG/PL
8	B	Proposals	C.4, C.5
9	SG	Participation requests submitted by international organizations	PL
10	SG	Loss of the right to vote	PL
11	USA	Additional proposals	C.4, C.5
12	SG	Financial responsabilities of administrative conferences	C.3
13	CHL	Planning method	C.5
14	CHL	Technical bases for planning the broadcasting service in the band 1 605 - 1 705 kHz	C.4
15	SG	Invitations	-
16	PRG	Proposals	C.5
17	PRG	Antenna system for the broadcasting service in the band 1 605 - 1 705 kHz (Information document)	-

No.	Origin	Title	Destination
18(Rev.1) +Corr.1	SG	Provisional rules for attending regional administrative conferences by Members not belonging to the Region concerned	C.3
19	SG	Note by the Secretary-General: text of a Resolution adopted in the fourth meeting of the Permanent Technical Committee of CITEL	-
20	CUB	Planning	C.5
21	CUB	Required field strength	C.4
22	CUB	Sky-wave propagation	C.4
23	ARG	Proposals (Agenta item 2.1.7)	C.5
24	ARG	Proposals (Agenta items 2.1.6 and 2.1.7)	C.4, C.5
25	PL	Structure of the First Session of the RARC BC-R2(1)	-
26	PL	Conference chairmanships	-
27	SG	Secretariat of the Conference	-
28	C.1	General schedule of the work of the Conference	-
29	ARG	Proposals (Agenta item 2.2)	C.4
30	SG	Allocation of documents	-
31+Corr.1	PL	Minutes of the First Plenary Meeting	PL
32+Corr.1	C.4	Note from the Chairman of Committee 4	C.4
33	SG	Note by the IFRB to the Conference: Status of the primary and permitted services	-
34	SG	Report by the IFRB to the Conference	-

No.	Origin	Title	Destination
35	C.4	Summary Record of the First Meeting of Committee 4	C.4
36+Corr.1	C.5	Summary Record of the First Meeting of Committee 5	C.5
37	C.3	Summary Record of the First Meeting of Committee 3	C.3
38	C.2	Summary Record of the First Meeting of Committee 2	C.2
39	C.6	Summary Record of the First Meeting of Committee 6	C.6
40	ARG	Proposals (Agenda item 2.1.7)	C.5
41+Corr.1	C.5	Summary Record of the Second Meeting of Committee 5	C.5
42+Corr.1	C.5	Summary Record of the Third Meeting of Committee 5	C.5
43(Rev.1)	C.3	Information note to the Chairmen of Committee 4 and 5	C.4, C.5
44	WG/4A	First Report of Working Group 4A to Committee 4	C.4
45	C.5	First Report of Committee 5 to the Plenary	PL
46	WG/4A	Second Report of Working Group 4A to Committee 4	C.4
47	C.4	First series of texts from Committe 4 to the Editorial Committee	C.6
48	C.5	Summary Record of the Fourth Meeting of Committee 5	C.5
49+Corr.1	PL	Minutes of the Second Plenary Meeting	PL
50	SG	List of Documents (1 to 50)	-

No.	Origin	Title	Destination
51	SG	Position of the Conference accounts at 18 April 1986	C.3
52	WG/4B	First Report of Working Group 4-B to Committee 4	C.4
53	C.4	Summary record of the second meeting of Committee 4	C.4
54	Conference Chairman	Draft Structure of the Report of the First Session of the Conference	PL
55	WG/2A	First Report by Working Group C2-A to Committee 2	C.2
56	C.6	B.1	PL
57	USA	Proposed Draft of Final Acts of the Second Session	WG/5B
58	C.4	Second series of texts from Committee 4 to the Editorial Committee	C.6
59	C.5	Summary record of the fifth meeting of Committee 5	C.5
60+Corr.1	B	Proposals	C.4
61	C.6	B.2	PL
62	C.4	Summary record of the third meeting of Committee 4	C.4
63	GT/4B	Second Report of Working Group 4-B to Committee 4	C.4
64	C.4	Summary record of the fourth meeting of Committee 4	C.4
65	C.5	Summary record of the sixth meeting of Committee 5	C.5
66+Corr.1	PL	Minutes of the third Plenary Meeting	PL
67	WG/4C	Final report of Working Group 4-C to Committee 4	C.4
68	C.4	Committe 4 (Chapter 2 - Propagation)	C.4

No.	Origin	Title	Destination
69	C.4	Recommandation No. [Com4/4]	C.4
70	C.5	Note from the Chairman of Committee 5 to the Chairman of the Working Group of the Plenary	WG/PL
71	C.4	Summary record of the fifth meeting of Committee 4	C.4
72	C.6	R.1	PL
73	C.4	Third series of texts from Committee 4 to the Editorial Committee	C.6
74	C.6	B.3	PL
75	WG/5A	First report from the Chairman of Working Group 5-A to Committee 5	C.5
76	C.6	B.4	PL
77	WG/4B	Third report of Working Group 4-B to Committee 4	C.4
78	C.4	Fourth series of texts from Committee 4 to the Editorial Committee	C.6
79	WG/4B	Final Report of Working Group 4-B	C.4
80	PL	Minutes of the fourth Plenary Meeting	PL
81+Corr.1	C.4	Summary record of the sixth and last meeting of Committee 4	C.4
82	C.5	Summary record of the seventh meeting of Committee 5	C.5
83	C.3	Summary record of the second meeting of Committee 3	C.3
84	SG	Position of the Conference accounts at 28 April 1986	C.3
85	SG	CCIR Intersessional Activity	C.3

No.	Origin	Title	Destination
86	C.5	Summary record of the eighth meeting of Committee 5	C.5
87	C.4	Note from Committee 4 to Committee 5	C.5
88	C.4	Fifth and last series of texts submitted by Committee 4 to the Editorial Committee	C.6
89	C.5	First series of texts from Committee 5 to the Editorial Committee	C.6
90	C.6	R.2	PL
91	C.4	Note from Committee 4 to Committee 3	C.3
92	WG/2A	Second report of the Working Group of Committee 2 (Credentials)	C.2
93	C.6	B.5	PL
94	WG/PL	First series of texts from the Working Group of the Plenary to the Editorial Committee	C.6
95	WG/5B	Report of the Working Group 5-B	C.5
96 +Add.1,2	WG/5A	Second report from the Chairman of Working Group 5-A to Committee 5	C.5
97	WG/PL	Second and last series of texts from the Working Group of the Plenary to the Editorial Committee	C.6
98	C.2	Summary record of the second and last meeting of Committee 2	C.2
99+Corr.1	C.2	Report of Committee 2 to the Plenary Meeting (Credentials)	PL
100	SG	List of documents (51 to 100)	
101	PL	Minutes of the fifth plenary meeting	PL
102	C.6	B.6	PL
103	C.6	R.3	PL

No.	Origin	Title	Destination
104	C.6	B.7	PL
105	C.5	Note by the Chairman of Committee 5 to Committee 6	C.6
106	SG	Last days of the Conference	-
107	C.6	B.8	PL
108	SG	Note by the IFRB relating to IFRB Inter-sessional Work for BC-R2	C.3
109	C.6	B.9	PL
110	C.5	Summary Record of the ninth and last meeting of Committee 5	C.5
111	C.3	Summary Record of the third and last meeting of Committee 3	C.3
112	C.6	B.10	PL
113	C.6	R.4	PL
114	C.3	Report of the Budget Control Committee to the Plenary	PL
115	C.6	B.11	PL
116	PL	Minutes of the sixth plenary meeting	PL
117	-	Statements relating to the Report	PL
118	PL	Minutes of the seventh plenary meeting	PL
119	-	Additional Declarations concerning the Report	PL
120	PL	Minutes of the eighth and last plenary meeting	PL
121	SG	List of documents published	-
122	SG	List of participants	-

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

BC-R2(1) CARR CHARGÉE D'ÉTABLIR UN PLAN POUR LE SERVICE DE RADIODIFFUSION DANS LA BANDE 1605-1705 kHz DANS LA RÉGION 2

PREMIÈRE SESSION GENÈVE, AVRIL/MAI 1986

Document 122-F/E/S
19 mai 1986

LISTE DES PARTICIPANTS - LIST OF PARTICIPANTS - LISTA DE PARTICIPANTES

Cette liste comprend les sections suivantes — This list includes the following sections — Esta lista comprende las secciones siguientes

***

<u>Symboles utilisés — Symbols used — Símbolos utilizados</u>

C : Chef de délégation — Head of delegation — Jefe de delegación
CA : Chef adjoint — Deputy Head — Subjefe
D : Délégué — Delegate — Delegado
A : Conseiller — Adviser — Asesor

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II. AUTRES MEMBRES — OTHER MEMBERS — OTROS MIEMBROS

-

III. EXPLOITATIONS PRIVÉES RECONNUES — RECOGNIZED PRIVATE OPERATING AGENCIES — EMPRESAS PRIVADAS DE EXPLOTACIÓN RECONOCIDAS

-

IV. ORGANISATIONS INTERNATIONALES — INTERNATIONAL ORGANIZATIONS — ORGANIZACIONES INTERNACIONALES

IV.1 NATIONS UNIES — UNITED NATIONS — NACIONES UNIDAS

-

IV.2 INSTITUTIONS SPECIALISEES — SPECIALIZED AGENCIES — INSTITUCIONES ESPECIALIZADAS

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IV.3 ORGANISATIONS REGIONALES (ART. 32 DE LA CONVENTION) — REGIONAL ORGANIZATIONS (ART. 32 OF THE CONVENTION) — ORGANIZACIONES REGIONALES (ART. 32 DEL CONVENIO)

-

IV.4 AUTRES ORGANISATIONS — OTHER ORGANIZATIONS — OTRAS ORGANIZACIONES

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Mlle E. Miles

M. J. Jipguep, Vice-Secrétaire général

Assistante: Mme Ch. Pierrard

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VI.1

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Secrétaire exécutif	:	M. R. Macheret
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Secrétaire administratif	:	M. J. Escudero

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