Documents of the World Administrative Radio Conference on the use of the geostationary-satellite orbit and the planning of the space services utilizing it (1st session)
(WARC ORB-85 (1)) (Geneva, 1985)

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 101-E
12 August 1985
Original: Spanish

COMMITTEES 4, 5, 6

Argentine Republic

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 2.2: Space services and frequency bands to be planned

ARG/101/1 The Argentine Republic proposes that the space services and frequency bands to be planned should be selected on the basis of the sharing situation, the degree of congestion of the GSO, the type of service and the position of the allocation.

ARG/101/2 On the above basis, the Argentine Republic proposes that the fixed-satellite service should be planned in the bands 3.4 - 4.2, 4.5 - 4.8, 5.925 - 7.075, 10.7 - 12.2 and 14 - 14.5 GHz.

Reasons: Having analyzed the services which will use the GSO most intensively, such as the fixed-satellite service (FSS) and the broadcasting-satellite service (BSS), it is considered that the FSS is the service which should be planned.

The broadcasting-satellite service has been planned at previous conferences and thus does not have to be planned at this Conference.

The mobile-satellite service generally operates through specialized user organizations such as INMARSAT and does not use the GSO very intensively.

The GSO is used relatively intensively by satellites in the fixed-satellite service in some portions of the 4 and 6 GHz bands. Although the 11, 12 and 14 GHz bands are used to a lesser extent, they are expected to be used increasingly in the medium term.

Agenda item 2.3: Planning principles

Introduction

The purposes of the International Telecommunication Union are laid down in the Basic Provisions of the International Telecommunication Convention. Their importance is highlighted by the Preamble to the Convention, which fully recognizes the sovereign right of each country to regulate its telecommunication and the growing importance of telecommunication for the preservation of peace and the economic and social development of peoples by means of efficient telecommunication services.

To obtain the above benefits, efficient management of the resources offered by current radiocommunications is essential. In view of the main features of these resources, which are permanent but limited, they must be allocated equitably so that they may be used by all the countries of the world.

The means of achieving this end may vary according to the needs of each service, but any method adopted must meet a series of requirements making it acceptable to all or a majority of countries and complying with Article 33 of the Convention and Resolutions Nos. 2 and 3 of WARC-79.

These requirements have come to be called principles.

ARG/101/3 The Argentine Administration therefore proposes that the method should be based on the following general planning principles:

1) to achieve efficient utilization of the geostationary-satellite orbit/frequency spectrum resource, while ensuring satisfactory operation of the space services to be planned;

2) to guarantee, in practice, equitable access to the geostationary-satellite orbit and the frequencies allocated to each of the space services to be planned for use by all countries or groups of countries, taking account of the needs of the developing countries;

3) to base the planning process on administrations' requirements to be brought into service or notified only during the period between two consecutive orbit planning conferences;

4) to ensure that the Plan application procedures allow for the inclusion of new requirements and modifications to existing allotments and assignments, in accordance with the modification procedures adopted by the Conference;

5) to use, as far as possible, uniform technical parameters and criteria to reduce the range of different systems and facilitate the introduction of new technology;

6) to select quality objectives compatible with the efficient use of both resources (GSO and spectrum). These objectives must not go far beyond an absolutely necessary minimum level.

7) to minimize the administrative costs associated with the access mechanism;

8) to respect the rights of all services sharing bands on a primary basis with the services to be planned and of services which have already been planned.

Agenda item 2.3: Planning methods

ARG/101/4 The Argentine Republic proposes that an *a priori* planning method for the fixed-satellite service be adopted by the Conference.

Reasons: The Argentine Republic has studied in detail the advantages and disadvantages of the various planning methods contained in the Report of the CPM and considers that an *a priori* planning method is the most appropriate framework for guaranteeing access to the GSO for all countries. It also hopes that flexible planning for a period of about ten years will enable administrations to submit more realistic requirements and will not have a significant impact on the administrative costs of planning. For flexible planning, a minimum set of technical parameters must be established to ensure compatibility of the various space systems. It should also be stressed that when deciding on the characteristics of these parameters, efforts to optimize the relevant technical standards or achieve more efficient use of the orbit/spectrum resource must not go beyond a strictly necessary and economic level.

Agenda item 4: Resolution No. 505 of WARC-79

The Argentine Administration has studied the prevailing situation as regards occupancy of the frequency bands between 0.5 GHz and 2 GHz and has considered the implications and conclusions of Recommendation No. 705 of WARC-79, CCIR Report 941 and Annex I to CCIR Report 631. It has deduced that the sharing criteria applicable in this band would not meet the minimum requirements for compatibility between services to ensure effective sharing as regards quality of service. Our Administration considers that sharing between these services is virtually impossible and that development of the broadcasting-satellite service (sound) calls for an exclusive band.

ARG/101/5 In view of the above, the Argentine Administration proposes that the Table of Frequency Allocations (Article 8 of the Radio Regulations) should remain unchanged in the portion of the spectrum from 470 MHz to 2 290 MHz.

ARG/101/6 The Argentine Republic proposes that WARC-ORB(1) should incorporate in the Radio Regulations, without amendment, the provisions and associated Plans drawn up for the broadcasting-satellite service in the band 12.2 - 12.7 GHz and associated feeder links in the band 17.3 - 17.8 GHz in Region 2 pursuant to Recommendation No. 1 (CARR-SAT-R2), and adopt the Final Acts required for the purpose.

The date of entry into force of the provisions and associated Plans for the broadcasting-satellite service in the band 12.2 - 12.7 GHz and associated feeder links in the band 17.3 - 17.8 GHz in Region 2 shall be the date of entry into force of the Final Acts of the first session of WARC-ORB by virtue of which they are incorporated in the Radio Regulations, pursuant to the Final Acts and Resolution No. 1 of CARR-SAT-R2.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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COMMITTEE 4

SUMMARY RECORD

OF THE

SECOND MEETING OF COMMITTEE 4

(TECHNICAL PARAMETERS AND CRITERIA)

1. Paragraph 4.5.1

Add another sentence at the end of the paragraph, reading:

"Proposals 37/13 and 37/14 would definitely be concerned with Working Group 4C, whereas Proposal 37/19 should be dealt with by Working Group A."

2. Paragraph 4.7.1

Add the words "in the fixed-satellite service" at the end of the third sentence, and replace the word "equitable" by "practicable" in the fourth sentence.

3. Paragraph 4.8.1

The second sentence should read: "Proposals IND/54/3 and IND/54/4 concerned frequency band pairing and segmentation, while Proposal IND/54/5 concerned permissible inter-satellite interference critieria."

4. Paragraph 4.11.1

Concerns the Spanish text only.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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COMMITTEE 4

SUMMARY RECORD

OF THE

SECOND MEETING OF COMMITTEE 4

(TECHNICAL PARAMETERS AND CRITERIA)

Monday, 12 August 1985, at 0900 hrs

Chairman: Mr. R.G. AMERO (Canada)

Subjects discussed:		Documents
1.	Working arrangements	-
2.	Review of the draft structure of Committee 4	DT/7
3.	Allocation of documents	DT/9
4.	Continuation of preliminary introduction of documents	33, 35, 36, 37, 39 41, 53, 54, 56, 57, 59, 60, 61, 76

1. Working arrangements

1.1 The Chairman informed the meeting that Mr. G. Korolev of the IFRB Secretariat, had been assigned to assist with the operation of Working Groups 4A and 4B.

2. Review of the draft structure of Committee 4 (Document DT/7)

2.1 The Chairman referred to Document DT/7 which gave an initial outline of definition of the structure of Committee 4. No Chairman had as yet been appointed to Working Group 4A and consultations were still going forward regarding that matter.

2.2 The structure represented an attempt to divide the work of the Committee on a logical basis and was in no way intended to curtail discussion outside the framework of the terms of reference. A number of areas could possibly give rise to Committee 4 topics, e.g. computer programs and their technical parameters but, as they could also give rise to inter-sessional work, their precise status had still to be resolved.

2.3 The delegate of the United Kingdom endorsed the draft structure presented in Document DT/7 but detected a degree of overlap between the functions of Working Groups 4B and 4C as regards the parameters and criteria relating to fixed-satellites and feeder links operating in fixed-satellite bands, depending upon whether the topic was treated as an inter-service sharing situation or whether it was considered a part of the fixed-satellite service.

2.4 The Chairman said that that problem would be discussed with the Chairmen of the Working Groups concerned.

2.5 The delegate of the United States of America endorsed the draft structure presented in Document DT/7 but stressed the role of operational situations and factors in the evaluation of technical parameters and criteria, proposing that the words "operational factors and" be inserted after the word "account" in the paragraph setting out the terms of reference of Working Group 4C.

2.6 The Chairman suggested that that modification should be accepted.

It was so agreed.

3. Allocation of documents (Document DT/9)

3.1 The Chairman explained that the document represented an attempt to identify and allocate Proposals among the different Working Groups. It was, however, incomplete as documents had been received since the list was compiled and were, moreover, still coming in. The original intent had been to undertake a general discussion of the situation prevailing, in order to define aspects useful to the different Working Groups. Problems had, however, arisen in that the situation was not always clear cut. Document DT/9 might possibly be reissued if a large number of modifications appeared necessary.

3.1.1 Document 12 submitted by France (paragraphs 13-17) should be included on the list of documents allocated to Committee 4 as relevant to its discussion of the situation prevailing.

3.1.2 Document 11 submitted by France (11/6, especially paragraphs 13-17), and Document 41 submitted by Spain (42/8, item 1) should be included on the list of documents allocated to Working Group 4A.

3.1.3 Document 12 submitted by France (Appendices 4 and 9), Document 17 submitted by Senegal (17/6, paragraph 5), Document 20 submitted by Kenya (2.1 iv)), Document 26 submitted by China (paragraph 2.2, with the exception of sub-paragraphs 2.2.3.1 and 2.2.6), Document 27 submitted by China (27/16) and Document 68 submitted by Colombia (68/4) should be included on the list of documents allocated to Working Group 4B.

3.2 It had also seemed advisable to draw up a general list of documents with technical implications, the precise nature of which would depend upon the planning approach adopted in Committee 5. The documents on that list, which would be reconsidered in the light of the work of Committee 5, were Documents 25, 28, 36, 41, 53, 63 and 64.

3.3 The delegate of the United States of America suggested that it might be less time-consuming to submit any Proposals directly to Working Group Chairmen.

3.4 The delegate of Canada considered that Document 41, submitted by Japan relating to automated planning software, should be allocated to Working Group 4C in view of the list of parameters required.

3.5 The Chairman said that there were problems with addressing computer software requirements which also seemed to fall within the purview of inter-sessional activities. In the case of Document 41, the list of computer parameters made it clear that it should be considered by a Working Group of Committee 4, and an attempt made to allocate it to its logical place.

3.6 He asked for any comments on aspects of Document DT/9 to be submitted directly to him in his capacity as Chairman.

4. Continuation of preliminary introduction of documents

4.1 Document 31

4.1.1 The delegate of the Federal Republic of Germany said that, while the main thrust of the document related to the work of Committee 5, it nonetheless included some technical aspects. Its first Proposal appeared relevant to the discussion of the situation prevailing, and its second Proposal appeared relevant to the terms of reference of Working Group 4C. Proposal 19 stressed that some technologies were not yet mature while Proposal 22 and the final Proposal of the document were already included in the Chairman's preliminary allocation of documents to Working Groups.

4.2 Document 33

4.2.1 The delegate of Sweden said that his delegation's Proposal 33/8 seemed suitable for allocation to Working Group 4C, while Proposal 33/9 could be considered either by Group 4B or 4C or, alternatively at Committee level. Proposal 33/10 appeared suited for submission to the ad hoc Working Group of the Plenary.

4.2.2 The Chairman said that Document 33 related essentially to the work of Committee 5 and that its progress through that Committee should be monitored.

4.3 Document 35

4.3.1 The delegate of Canada explained that the document dealt with three questions of interest to Committee 4: sharing questions between space services (paragraph 4.2), comments on sound broadcasting by satellite (paragraph 4.8) and a draft Resolution proposing the establishment of limits for spurious emissions.

4.4 Document 36

4.4.1 The delegate of Cameroon said that his country's Proposals particularly concerned agenda item 2.3 relating to planning principles and methods, and to Article 33 of the Convention. Cameroon proposed practical solutions for equitable access to the geostationary-satellite orbit, taking into account the prevailing situation. The existing procedures established in the Radio Regulations were difficult to apply fairly to developing nations, and Cameroon's Proposal CME/36/1 was an attempt to find a solution to that problem, which would be discussed in Working Group 5A.

4.4.2 The Chairman said that he had included Document 36 in his general list on account of its technical implications, although the majority of the discussion would be held in Committee 5.

4.5 Document 37

4.5.1 The delegate of Brazil said that Proposal B/37/1 was intended to form the basis for any decisions taken by Committee 4 regarding technical parameters. Brazil's Proposals 37/8, 37/9 and 37/10 would more appropriately be discussed in Working Group 4B which would be dealing with sharing problems, while Proposals 37/11 and 37/12 would have some bearing on the work of Working Group 4C.

4.6 Documents 39 and 41

4.6.1 The delegate of Japan said that his country's Proposals were related to agenda items 2.2, 2.3 and 2.4. Their Proposal J/39/4 to reduce technical parameters to the minimum would be discussed in Working Group 4C. Document 41 dealt with the need for automated planning software to achieve the most effective use of the geostationary-satellite orbit, and proposed the establishment of a panel of experts to develop them. Those Proposals were also intended for discussion in Working Group 4C.

4.7 Document 53.

4.7.1 The delegate of the Federal Republic of Germany said that the document contained Proposals submitted jointly by the Federal Republic of Germany, the Vatican City State, France, Portugal, the United Kingdom and Switzerland. Those administrations considered that if the Conference was to succeed, an early agreement was necessary on the frequency bands to be planned and the planning methods to be used. There was general concern to ensure equitable access to the bands and consequently a need to focus on the bands where congestion was foreseen, notably those at 4/6 GHz and 11 - 12/14 GHz. Furthermore, the administrations concerned believed that a priori planning for the bulk of the fixed-satellite services was neither equitable nor desirable and consequently recommended that the present Conference should recommend to the second session a highly effective management regime based on the progressive upgrading of technical performance as technology permitted, and at least cost for all frequency bands concerned.

4.7.2 The Chairman suggested that informal discussions might be held to decide whether Document 53 might not more suitably be assigned to Committee 5.

4.8 Document 54.

4.8.1 The delegate of India said that of the six Proposals contained in the document, the three contained in section 3 were relevant to Working Group 4C as indicated in Document DT/9. Proposals IND/54/3 and IND/54/4 concerned frequency band segmentation, while Proposal IND/54/5 concerned permissible inter-satellite interference criteria.

4.9 Documents 56 and 57

4.9.1 The delegate of Paraguay said that Paraguay proposed that there should be no planning of broadcasting services in the band 500 - 2 000 MHz for the time being, since it considered that to be a national responsibility and since many of the smaller countries, such as those in South America, would undoubtedly encounter difficulties in using such services. Paraguay had consequently concentrated on the technical difficulties encountered.

4.10 Document 59

4.10.1 The delegate of Chile said that his country's Proposals were concerned with various items of the agenda. Proposal CHL/59/8 would be dealt with by Committee 5, while the general Proposals concerning the sharing of frequency bands and the possible use of new frequency bands would be dealt with by Working Group 4C.

4.10.2 The Chairman suggested that informal discussions should be held on the distribution of Chile's Proposals between Working Groups 4C and 4A.

4.11 Documents 60 and 61

4.11.1 The delegate of Mexico said that Document 60 contained Proposals in the light of the situation in the bands allocated to space services in Mexico, and stressed the importance to the Conference of the CCIR and IFRB reports, particularly in relation to sharing. Document 61 dealt in particular with sound satellite broadcasting, a more detailed introduction to which would be given in Working Group 4A. The document did however stress the particular difficulties Mexico would encounter with the establishment of such a service.

4.12 Document 76

4.12.1 The delegate of France explained that the document was principally a summary of France's Proposals contained in other documents. However, Proposal F/76/15 concerned the critical phases for geostationary-satellites, which might be of concern to Working Group 4C, and Proposal F/76/18 concerned provisions for modifications relating to unplanned services, which might be of interest to Working Group 4B.

4.12.2 The Chairman, drawing attention to Proposal F/76/19 concerning Resolution No. 505, said that as he understood it Committee 4 would be dealing with all aspects of that Resolution. However, that would be confirmed after further discussions with the Chairman of Committee 5.

The meeting rose at 1015 hours.

The Secretary: C. AZEVEDO

The Chairman: R.G. AMERO

INTERNATIONAL TELECOMMUNICATION UNION

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COMMITTEE 5

The Socialist People's Libyan Arab Jamahiriya

PROPOSAL FOR THE WORK OF THE CONFERENCE

The Socialist People's Libyan Arab Jamahiriya Administration attaches great significance to WARC-ORB-85, and considers that the just utilization of the frequency spectrum and of the geostationary satellite orbit is of great concern to all countries. We feel that through the existing regulatory procedures which are mainly implemented on the basis of Articles 11 and 13 of the Radio Regulations, it is extremely difficult to satisfy the demand to guarantee in practice for all countries equitable access to the geostationary orbit, especially in certain positions and bands.

When any administration intends to establish space communications, it has to do so by way of advance publication of information, coordination, notification and registration. However, it is common knowledge that latecomers must bow to the wishes of all first arrivals, in other words, if a latecomer intends to establish a satellite network, this network must not interfere with the ones already established and those planned earlier.

In the beginning, only a few countries were capable of utilizing space services. There were hardly any problems in using the desired orbital positions and parts of the frequency spectrum, but now in the 1980s, with regard to orbital positions and spectrum occupancy, the situation is a completely different one. It is very difficult for some countries to obtain the desired orbital position and associated frequencies due to the present intensive use. This can be clearly seen from the report of the "IFRB" to WARC-ORB-85, "IFRB Circular-letter No. 600", in which many administrations state they have difficulties with existing provisions of the Radio Regulations. Bearing in mind that the radio spectrum and the GSO are limited natural resources, and that WARC-79 through its Resolution No. 3 "Relating to the Use of Geostationary Satellite Orbit and to the Planning of Space Services Utilizing It", made it clear that there is a keen need for a new approach to the management and planning of such services.

Reflecting on this, we are not hesitant to point out our deep concern and that of many other administrations, regarding the danger of saturation of the GSO and the allocated frequency spectrum. We firmly believe that the principle of equitability rises out as a solution ensuring all demands, whether they were announced in the present time or in the future.

In the light of the above, being a country which does not yet have space telecommunication systems of its own, and in order to protect our right and that of all countries with the same predicament, we propose that WARC-ORB-85 considers establishing:

LBY/103/1 1) a national allotment plan based on the principle of satisfying only national requirements, guaranteeing each country an orbital position and an overall bandwidth capable of satisfying all its telecommunication needs;

LBY/103/2 2) the FSS is to be considered as a prime priority and is to be planned in the frequency bands 4/6 GHz, 7/8, 11 - 12/14 and if possible 20/30 GHz;

LBY/103/3 3) all extra requirements that exceed the above proposed requirements are to be satisfied or achieved through modification of the existing provisions of the Radio Regulations, taking into account interference aspects.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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COMMITTEE 5

Burkina Faso

PROPOSALS

Page 1, item 1, third paragraph

Only concerns the French text.

Page 2, item 2.2: Services and bands to be planned

Third paragraph

Replace the last sentence by:

"Planning is therefore desirable now, particularly for feeder links in the bands 14.5 - 14.8 GHz and 17.3 - 18.1 GHz."

Fourth paragraph

Replace the paragraph by the following:

"By virtue of its specific nature and in view of its future development (extension to aeronautical applications), the MSS is a potential candidate for planning. Hence, although the service is not yet sufficiently developed to identify the bases and framework for immediate planning in the same way as for the FSS, its planning should be considered at a later stage."

Proposal BFA/104/4

Only concerns the French text.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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COMMITTEE 5

Burkina Faso

GENERAL PROPOSALS

1. General

Since 1977, Burkina Faso has, like many other countries, been successfully using the INTELSAT satellite network for its international telecommunications, since this is the only optimum transmission facility available to it, and in view of its own future equipment programme, the country is naturally interested in space media and particularly in the work of this Conference.

The proliferation of satellite networks and the complexity of coordination operations have aroused fears in some administrations concerning the possibility of their gaining access to the GOS and the associated radio frequency spectrum when they wish to do so and the severe coordination constraints that are bound to arise if the situation remains unchanged.

WARC-79 Resolution No. 3 enunciates the principle of equitable access for all countries to the GSO and the associated frequency spectrum which are communal but limited natural resources and that principle has been accepted by administrations. At its present session, therefore, it is incumbent on the Conference to find ways and means (planning plan, improved coordination, etc.,) of guaranteeing in practice equitable access to the GSO/spectrum resource.

On the basis of a series of technical considerations, the report of the Conference Preparatory Meeting (CPM) lists seven planning methods: a priori plan (10-20 years); detailed world or regional plan (3-5 years); world or regional plan with guaranteed access; multilateral coordination; periodic revision of coordination procedures and technical factors; a priori plan (10 years) and world-wide plan (10 years).

Each plan doubtless has its advantages and drawbacks as regards technical efficiency and flexibility of application. In order to achieve the objective of WARC-79 Resolution No. 3, Burkina Faso considers that the planning plan should mainly:

BFA/104/1

- avoid imposing technical, financial and equipment constraints that might constitute obstacles to access, particularly by the developing countries, to the GSO spectrum resource;
- take into account existing networks, particularly the international networks serving several countries;
- ensure optimum operation of the GSO spectrum resource while permitting the development and introduction of new technical facilities which make for reduced system costs;

- achieve a consensus among administrations to ensure its effective practical application.

2. Considerations concerning certain agenda items

2.1 Item 2.2: Services and bands to be planned

BFA/104/2 Services

We propose that the following should be planned:

- Fixed-satellite service (FSS);
- Broadcasting-satellite service (BSS);
- Mobile-satellite service (MSS).

The need to plan the FSS no longer needs any demonstration since, being the most developed service, its satellites are causing congestion in the GSO and its planning would appear to be the first priority among the requirements of administrations. There is as yet no sign of any slackening in the development of the FSS, hence the need to plan it.

Development of the BSS has not reached the same critical level as that of the FSS, but several factors such as economic and geographical considerations and operational flexibility may encourage its expansion in the medium term and produce a situation like that in the FSS. Planning of the BSS is therefore essential now.

Even summary planning of the MSS would be desirable since, as a community service playing a major safety role (maritime and aeronautical services), planning would enable it to operate safely.

BFA/104/3 Bands

We propose that the bands 6/4, 8/7, 14/11-12 and 30/20 GHz should be planned.

This choice is dictated by the intensive use made of the bands 6/4 - 14/12 GHz in particular. The use of band 30/20 has not yet reached maturity, nor is it causing alarming congestion. In order to obviate the kind of situation that has already arisen in other bands, however, it would be realistic to plan the band 30/20 GHz without delay.

2.2 Item 2.3: Planning principles, technical parameters and criteria

In the report of the Conference Preparatory Meeting (CPM), the CCIR proposes planning principles and criteria and certain administrations have submitted useful contributions on this subject.

We believe that whatever principles and technical parameters are adopted as a basis for the planning process, the planning plan finally selected should clearly be in keeping with the spirit of WARC-79 Resolution No. 3 and should also meet the concerns expressed in section 1 of this document.

BFA/104/4 Of all the planning methods proposed by the CPM, we believe that a priori planning over 10-15 years would offer the best guarantee of equitable access to the GSO and the associated spectrum. Moreover, it would have the merit of providing, within a fairly reasonable period, tangible experience for the correction of any shortcomings with a view to longer-term planning.

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

ORB-85 CAMR SUR L'UTILISATION DE L'ORBITE DES SATELLITES GÉOSTATIONNAIRES ET LA PLANIFICATION DES SERVICES SPATIAUX UTILISANT CETTE ORBITE

PREMIÈRE SESSION GENÈVE, AOÛT/SEPTEMBRE 1985

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SEANCE PLENIERE
PLENARY MEETING
SESION PLENARIA

ANNEXE 3 AU DOCUMENT 105

Comme indiqué dans le Document 105, cette Annexe contient l'exemple spécifiant les renseignements relatifs aux stations spatiales géostationnaires décrit dans la section 4 du Document 105).

ANNEX 3 TO DOCUMENT 105

As mentioned in Document 105, this Annex contains the specific example of information on geostationary space stations, described in section 4 of Document 105).

ANEXO 3 AL DOCUMENTO 105

Conforme se menciona en el Documento 105, este Anexo contiene el ejemplo concreto de información sobre las estaciones espaciales geoestacionarias, descrito en la sección 4 del Documento 105).

Annexe
Annex
Anexo

ANNEX 3

Report Format "A"

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
INTELSAT IBS 300E	60.0 W	USAIT	860101	10	062W-058W		C	840918	167	850327	850618	752	
INTELSAT5A 300E	60.0 W	USAIT	860101	10	062W-058W		C	840918	166	850326	850618	749	
INTELSAT IBS 304E	56.0 W	USAIT	860401	10	058W-054W		C	840918	169	850327	850618	753	
INTELSAT5A 304E	56.0 W	USAIT	860401	10	058W-054W		C	840918	168	850326	850618	750	
INTELSAT4A ATL3	53.0 W	USAIT	840401		055W-053W		N	750708	67	810728	820413	401	830105
INTELSAT IBS 307E	53.0 W	USAIT	860101	10	055W-052W		C	840424	128	841126	850528	704	
INTELSAT5 CONT1	53.0 W	USAIT	840701	10	055W-053W		C	830927	82	840515	850102	591	
INTELSAT5A CONT1	53.0 W	USAIT	880401	10	055W-053W		C	840228	115	840913	850416	674	
INTELSAT IBS 310E	50.0 W	USAIT	860101	10	055W-052W		C	840424	129	841206	850528	706	
INTELSAT4A ATL2	50.0 W	USAIT	840101	6	055W-045W		C	750708	66	830530	831122	140	
INTELSAT5 CONT2	50.0 W	USAIT	850601	10	055W-045W		C	830913	75	840515	850102	592	
INTELSAT5A CONT2	50.0 W	USAIT	860601	10	055W-045W		C	830913	74	840515	850102	594	
INTELSAT IBS 319.5E	40.5 W	USAIT	860401	10	042W-039W		C	840424	130	841206	850528	707	
INTELSAT5A 319.5E	40.5 W	USAIT	860401	10	042W-039W		C	840424	127	841107	850430	691	
INTELSAT4 ATL5	34.5 W	USAIT	760224		035W-023W		N	751111	89	810410	811222	351	760413
INTELSAT5 ATL4	34.5 W	USAIT	821231		035W-023W		N	760921	121	791009	800513	220	830413
INTELSAT4A ATL4	31.0 W	USAIT	831020		035W-023W		N	750708	68	791009	800513	215	830412
INTELSAT5 ATL6	31.0 W	USAIT	870101	10	035W-023W		C	840313	118	841001	850423	683	
INTELSAT5A ATL6	31.0 W	USAIT	870101	10	035W-023W		C	840710	119	841002	850423	684	
INTELSAT5 ATL3	27.5 W	USAIT	820101		035W-023W		N	760921	120	791009	800513	219	830105
INTELSAT5A ATL2	27.5 W	USAIT	850101	10	035W-023W		C	810727	335	830420	831025	123	
INTELSAT6 332.5E	27.5 W	USAIT	871001	13	035W-023W		C	830830	70	840718	850212	628	
STATSIONAR-8	25.0 W	URS	820630		027W-023W	027W-023W	N	760120	95	770613	770802	50	780223
INTELSAT5 ATL1	24.5 W	USAIT	810317		025W-023W		N	760921	118	770117	770329	34	780124
INTELSAT5A ATL1	24.5 W	USAIT	841001	10	025W-023W		C	810727	334	830420	831025	122	
INTELSAT6 335.5E	24.5 W	USAIT	871001	13	025W-023W		C	830830	69	840717	850212	627	
MARECS A	23.0 W	F MRS	811201		026W-020W	026W-020W	C	780206	219	800122	800819	241	
INTELSAT4A ATL1	21.5 W	USAIT	810601		025W-014W		N	750708	65	791009	800513	212	830105
INTELSAT MCS ATL C	21.5 W	USAIT	821231	10	025W-014W		C	800819	282	810410	811222	348	
INTELSAT5 ATL5	21.5 W	USAIT	811231	10	025W-014W		C	800520	252	810525	820323	378	

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
GDL-4	20.0 W	LUX	840619	10	025W-037E	034W-049E	C	841108	92	840716	850205	610	
INTELSAT MCS ATL A	18.5 W	USA	830801		025W-014W		N	790102	212	790621	791016	175	840228
INTELSAT5 ATL2	18.5 W	USAIT	840701		025W-015W		N	760921	119	791009	800513	218	840815
INTELSAT IBS 341.5E	18.5 W	USAIT	860701	10	020W-017W		C	840710	131	841206	850528	705	
INTELSAT5A ATL4	18.5 W	USAIT	870101	10	025W-013W		C	830802	64	840308	841113	459	
INTELSAT IBS 343.5E	16.5 W	USAIT	860701	10	014W-010W		C	840918	171	850327	850618	754	
INTELSAT4A 343.5E	16.5 W	USAIT	860101	10	018W-015W		C	750506	49	840913	850416	672	
INTELSAT5 343.5E	16.5 W	USAIT	860101	10	018W-015W		C	840925	172	850409	850625	758	
INTELSAT5A 343.5E	16.5 W	USAIT	860701	10	018W-015W		C	840918	170	850326	850618	751	
MARISAT-ATL	15.0 W	USA	760219		016W-015W	016W-015W	N	740305	4	761230	770301	33	750225
STATSIONAR-4	14.0 W	URSIK	821231		016W-012W	016W-012W	N	760120	92	810319	811110	336	820901
POTOK-1	13.5 W	URS	850430	15	015W-013W	015W-013W	N	810908	344	820319	830222	18	841102
STATSIONAR-11	11.0 W	URS	830630	20	011W-006W	011W-006W	C	800701	270	801216	810519	303	
TELECOM-1A	8.0 W	F	840825		011W-005W	015W-006E	N	800701	268	801203	810324	299	840528
TELECOM-1B	5.0 W	F	850801		011W-005W	014W-006E	N	800701	269	801203	810324	472	850506
INTELSAT4A ATL1	4.0 W	USAIT	830901	11	008W-000W		C	750708	65	830414	831018	121	
INTELSAT5 CONT3	4.0 W	USAIT	870701	10	008W-000W		C	840228	112	840913	850423	676	
INTELSAT5A CONT3	4.0 W	USAIT	860701	10	008W-000W		C	840228	116	840913	850416	675	
INTELSAT4A ATL2	1.0 W	USAIT	841231	6	002W-000W		C	750708	66	810511	820309	371	
INTELSAT5 CONT4	1.0 W	USAIT	850101	10	002W-000W		C	830327	83	840515	850102	593	
INTELSAT5A CONT4	1.0 W	USAIT	871001	10	002W-000W		C	840228	117	840913	850423	677	
GDL-5	1.0 E	LUX	870831	10	025W-037E	034W-049E	C	841108	93	840619	850205	612	
TELECOM 1C	3.0 E	F	850630	10	000E-006E	014W-006E	C	821005	29	830408	831206	157	
F-SAT 1	7.0 E	F	871231	10	000E-014E		C	830920	79	840330	841204	564	
APEX	10.0 E	F	860101	10	005E-014E		C	830717	62	840123	840710	388	
GDL-6	19.0 E	LUX	860930	10	025W-037E	034W-049E	C	841108	94	840716	850205	614	
STATSIONAR-2	35.0 E	URS	770901		033E-037E	033E-037E	N	750909	76	761115	770208	26	771230
STATSIONAR-12	40.0 E	URS	841201		038E-042E	038E-042E	N	800701	271	801216	810519	304	840802
STATSIONAR-9	45.0 E	URS	820331		043E-047E	043E-047E	N	760120	96	770613	770802	51	780223
STATSIONAR-5	53.0 E	URSIK	800108		051E-055E	051E-055E	N	760120	93	761129	770208	29	790103

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
INTELSAT5 INDOC3	57.0 E	USAIT	840228		055E-059E		N	800617	262	810525	820323	374	840815
INTELSAT5A INDOC2	57.0 E	USAIT	850101	10	055E-059E		C	830802	68	840308	841113	463	
INTELSAT6 57E	57.0 E	USAIT	871001	13	055E-059E		C	830830	72	840717	850212	625	
INTELSAT MCS INDOC B	60.0 E	USAIT	840217		060E-063E		N	791009	240	790621	791016	177	840720
INTELSAT5 INDOC2	60.0 E	USAIT	820514		060E-063E		N	770201	135	770708	770823	59	830413
INTELSAT5A INDOC1	60.0 E	USAIT	840401	10	060E-063E		C	830802	67	840308	841113	462	
INTELSAT6 60E	60.0 E	USAIT	871001	13	060E-063E		C	830830	71	840717	850212	626	
INTELSAT MCS INDOC A	63.0 E	USAIT	830101		060E-063E		N	790102	214	790621	791016	176	840228
INTELSAT5 INDOC1	63.0 E	USAIT	820514		060E-063E		N	770201	134	770708	770823	58	830413
INTELSAT5A INDOC3	63.0 E	USAIT	850101	10	060E-063E		C	840228	113	840913	850416	673	
MARECS C	64.5 E	F MRS	811201		062E-065E	062E-065E	C	780206	220	800122	800819	243	
INTELSAT MCS IND D	66.0 E	USAIT	841231	10	064E-067E		C	800701	275	810416	811222	353	
INTELSAT5 IND4	66.0 E	USAIT	841231	10	064E-067E		C	800520	253	810525	820323	375	
MARECS IND2	73.0 E	F MRS	811201		071E-077E	071E-077E	C	780206	220	800122	800819	243	
POTOK-2	80.0 E	URS	840530	15	079E-081E	079E-081E	N	810908	345	820420	830301	22	840530
STATSIONAR-1	80.0 E	URS	701201		078E-082E	078E-082E	N			761125			690203
STATSIONAR-13	80.0 E	URS	840930	20	078E-082E	078E-082E	C	800701	276	801216	810519	305	
STATSIONAR-13	80.0 E	URS	861231	20	078E-082E	078E-082E	C	800701	276	801216	850122	598	
STATSIONAR-3	85.0 E	URS	761020		083E-087E	083E-087E	N	750909	77	761115	770208	27	781016
STATSIONAR-6	90.0 E	URS	810109		088E-092E	088E-092E	N	760420	108	761129	770208	30	780717
STATSIONAR-14	95.0 E	URS	840731	20	093E-097E	093E-097E	C	800701	272	801216	810519	306	
STATSIONAR-T	99.0 E	URS	761026		098E-100E	098E-100E	N	760601	2				760211
STATSIONAR-T2	99.0 E	URS	850930		098E-100E	098E-100E	N	800708	10	800930	810519	7	850103

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GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1	INTELSAT IBS 300E	60.0 W	USAIT	EH	11/14/24	24.6	6	EC	R
2	INTELSAT IBS 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	6	EC	R
3	INTELSAT IBS 300E	60.0 W	USAIT	EH	11/14/24	24.6	4	EC	T
4	INTELSAT IBS 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	4	EC	T
5	INTELSAT5A 300E	60.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
6	INTELSAT5A 300E	60.0 W	USAIT	EH	11/14/24	24.6	6	EC	R
7	INTELSAT5A 300E	60.0 W	USAIT	EZ	11/14	29.0	6	EC	R
8	INTELSAT5A 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	6	EC	R
9	INTELSAT5A 300E	60.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
10	INTELSAT5A 300E	60.0 W	USAIT	EH	11/14/24	24.6	4	EC	T
11	INTELSAT5A 300E	60.0 W	USAIT	EZ	11/14	29.0	4	EC	T
12	INTELSAT5A 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	4	EC	T
13	INTELSAT IBS 304E	56.0 W	USAIT	EH	11/14	24.6	6	EC	R
14	INTELSAT IBS 304E	56.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
15	INTELSAT IBS 304E	56.0 W	USAIT	EH	11/14	24.6	4	EC	T
16	INTELSAT IBS 304E	56.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
17	INTELSAT5A 304E	56.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
18	INTELSAT5A 304E	56.0 W	USAIT	EH	11/14	24.6	6	EC	R
19	INTELSAT5A 304E	56.0 W	USAIT	EZ	11/14	29.0	6	EC	R
20	INTELSAT5A 304E	56.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
21	INTELSAT5A 304E	56.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
22	INTELSAT5A 304E	56.0 W	USAIT	EH	11/14	24.6	4	EC	T
23	INTELSAT5A 304E	56.0 W	USAIT	EZ	11/14	29.0	4	EC	T
24	INTELSAT5A 304E	56.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
25	INTELSAT4A ATL3	53.0 W	USAIT	EH	11/14/24	24.8	6	EC	R
26	INTELSAT4A ATL3	53.0 W	USAIT	G	11/14/21/22/23/24	21.0	6	EC	R
27	INTELSAT4A ATL3	53.0 W	USAIT	EH	11/14/24	29.3	4	EC	T
28	INTELSAT4A ATL3	53.0 W	USAIT	G	11/14/21/22/23/24	21.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
29	INTELSAT4A ATL3	53.0 W	USAIT	NEQ	11/14/23	29.1	4	EC	T
30	INTELSAT IBS 307E	53.0 W	USAIT	EH	11/14	24.6	6	EC	R
31	INTELSAT IBS 307E	53.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
32	INTELSAT IBS 307E	53.0 W	USAIT	EH	11/14	24.6	4	EC	T
33	INTELSAT IBS 307E	53.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
34	INTELSAT5 CONT1	53.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
35	INTELSAT5 CONT1	53.0 W	USAIT	EH	11/14	24.6	6	EC	R
36	INTELSAT5 CONT1	53.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
37	INTELSAT5 CONT1	53.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
38	INTELSAT5 CONT1	53.0 W	USAIT	EH	11/14	24.6	4	EC	T
39	INTELSAT5 CONT1	53.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
40	INTELSAT5A CONT1	53.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
41	INTELSAT5A CONT1	53.0 W	USAIT	EH	11/14	24.6	6	EC	R
42	INTELSAT5A CONT1	53.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
43	INTELSAT5A CONT1	53.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
44	INTELSAT5A CONT1	53.0 W	USAIT	EH	11/14	24.6	4	EC	T
45	INTELSAT5A CONT1	53.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
46	INTELSAT IBS 310E	50.0 W	USAIT	EH	11/14	24.6	6	EC	R
47	INTELSAT IBS 310E	50.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
48	INTELSAT IBS 310E	50.0 W	USAIT	EH	11/14	24.6	4	EC	T
49	INTELSAT IBS 310E	50.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
50	INTELSAT4A ATL2	50.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
51	INTELSAT4A ATL2	50.0 W	USAIT	EH	11/14/23/24	24.8	6	EC	R
52	INTELSAT4A ATL2	50.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
53	INTELSAT4A ATL2	50.0 W	USAIT	EH	11/14/23/24	31.3	4	EC	T
54	INTELSAT4A ATL2	50.0 W	USAIT	NEQ	11/14/23/24	29.1	4	EC	T
55	INTELSAT5 CONT2	50.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
56	INTELSAT5 CONT2	50.0 W	USAIT	EH	11/14/15	24.6	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
57	INTELSAT5 CONT2	50.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
58	INTELSAT5 CONT2	50.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
59	INTELSAT5 CONT2	50.0 W	USAIT	EH	11/14/15	24.6	4	EC	T
60	INTELSAT5 CONT2	50.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
61	INTELSAT5A CONT2	50.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
62	INTELSAT5A CONT2	50.0 W	USAIT	EH	11/14	24.6	6	EC	R
63	INTELSAT5A CONT2	50.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
64	INTELSAT5A CONT2	50.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
65	INTELSAT5A CONT2	50.0 W	USAIT	EH	11/14	24.6	4	EC	T
66	INTELSAT5A CONT2	50.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
67	INTELSAT IBS 319.5E	40.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
68	INTELSAT IBS 319.5E	40.5 W	USAIT	NEZ	11/14	29.0	6	EC	R
69	INTELSAT IBS 319.5E	40.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
70	INTELSAT IBS 319.5E	40.5 W	USAIT	NEZ	11/14	29.0	4	EC	T
71	INTELSAT5A 319.5E	40.5 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
72	INTELSAT5A 319.5E	40.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
73	INTELSAT5A 319.5E	40.5 W	USAIT	NEZ	11/14	29.0	6	EC	R
74	INTELSAT5A 319.5E	40.5 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
75	INTELSAT5A 319.5E	40.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
76	INTELSAT5A 319.5E	40.5 W	USAIT	NEZ	11/14	29.0	4	EC	T
77	INTELSAT4 ATL5	34.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
78	INTELSAT4 ATL5	34.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
79	INTELSAT4 ATL5	34.5 W	USAIT	ES	11	31.0	4	EC	T
80	INTELSAT5 ATL4	34.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
81	INTELSAT5 ATL4	34.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
82	INTELSAT5 ATL4	34.5 W	USAIT	EZ	11/14/15	29.0	6	EC	R
83	INTELSAT5 ATL4	34.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
84	INTELSAT5 ATL4	34.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
85	INTELSAT5 ATL4	34.5 W	USAIT	EZ	11/14/15	29.0	4	EC	T
86	INTELSAT4A ATL4	31.0 W	USAIT	EH	11/14/15	31.3	6	EC	R
87	INTELSAT4A ATL4	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
88	INTELSAT4A ATL4	31.0 W	USAIT	EH	11/14/15	31.3	4	EC	T
89	INTELSAT4A ATL4	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
90	INTELSAT4A ATL4	31.0 W	USAIT	NEQ	11/14/15	29.1	4	EC	T
91	INTELSAT5 ATL6	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
92	INTELSAT5 ATL6	31.0 W	USAIT	EH	11/14/15	24.6	6	EC	R
93	INTELSAT5 ATL6	31.0 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
94	INTELSAT5 ATL6	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
95	INTELSAT5 ATL6	31.0 W	USAIT	EH	11/14/15	24.6	4	EC	T
96	INTELSAT5 ATL6	31.0 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
97	INTELSAT5A ATL6	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
98	INTELSAT5A ATL6	31.0 W	USAIT	EH	11/14/15	24.6	6	EC	R
99	INTELSAT5A ATL6	31.0 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
100	INTELSAT5A ATL6	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
101	INTELSAT5A ATL6	31.0 W	USAIT	EH	11/14/15	24.6	4	EC	T
102	INTELSAT5A ATL6	31.0 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
103	INTELSAT5 ATL3	27.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
104	INTELSAT5 ATL3	27.5 W	USAIT	EZ	11/14/15	29.0	6	EC	R
105	INTELSAT5 ATL3	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
106	INTELSAT5 ATL3	27.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
107	INTELSAT5 ATL3	27.5 W	USAIT	EZ	11/14/15	29.0	4	EC	T
108	INTELSAT5 ATL3	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
109	INTELSAT5A ATL2	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
110	INTELSAT5A ATL2	27.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
111	INTELSAT5A ATL2	27.5 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
112	INTELSAT5A ATL2	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
113	INTELSAT5A ATL2	27.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
114	INTELSAT5A ATL2	27.5 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
115	INTELSAT6 332.5E	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
116	INTELSAT6 332.5E	27.5 W	USAIT	EH	11/14/15	24.8	6	EC	R
117	INTELSAT6 332.5E	27.5 W	USAIT	Z3	11	32.4	6	EC	R
118	INTELSAT6 332.5E	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
119	INTELSAT6 332.5E	27.5 W	USAIT	EH	11/14/15	24.8	4	EC	T
120	INTELSAT6 332.5E	27.5 W	USAIT	Z3	11	32.4	4	EC	T
121	STATSIONAR-8	25.0 W	URS	NH	11/12/14/15/22/23	22.0	4	EC	T
122	INTELSAT5 ATL1	24.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
123	INTELSAT5 ATL1	24.5 W	USAIT	EZ	11/14/15	29.0	6	EC	R
124	INTELSAT5 ATL1	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
125	INTELSAT5 ATL1	24.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
126	INTELSAT5 ATL1	24.5 W	USAIT	EZ	11/14/15	29.0	4	EC	T
127	INTELSAT5 ATL1	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
128	INTELSAT5A ATL1	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
129	INTELSAT5A ATL1	24.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
130	INTELSAT5A ATL1	24.5 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
131	INTELSAT5A ATL1	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
132	INTELSAT5A ATL1	24.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
133	INTELSAT5A ATL1	24.5 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
134	INTELSAT6 335.5E	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
135	INTELSAT6 335.5E	24.5 W	USAIT	EH	11/14/15	24.8	6	EC	R
136	INTELSAT6 335.5E	24.5 W	USAIT	Z3	11	32.4	6	EC	R
137	INTELSAT6 335.5E	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
138	INTELSAT6 335.5E	24.5 W	USAIT	EH	11/14/15	24.8	4	EC	T
139	INTELSAT6 335.5E	24.5 W	USAIT	Z3	11	32.4	4	EC	T
140	MARECS A	23.0 W	F MRS	G	11/14/15/22/23/24	20.7	6	EC/ED/EK	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
141	MARECS A	23.0 W	F MRS	G	11/14/15/22/23/24	20.7	4	EC/EK/ER	T
142	INTELSAT4A ATL1	21.5 W	USAIT	EH	11/12/14/15	24.8	6	EC	R
143	INTELSAT4A ATL1	21.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	6	EC	R
144	INTELSAT4A ATL1	21.5 W	USAIT	EH	11/12/14/15	31.3	4	EC	T
145	INTELSAT4A ATL1	21.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
146	INTELSAT4A ATL1	21.5 W	USAIT	NEQ	11/12/14/15	29.1	4	EC	T
147	INTELSAT MCS ATL C	21.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
148	INTELSAT MCS ATL C	21.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
149	INTELSAT5 ATL5	21.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	6	EC	R
150	INTELSAT5 ATL5	21.5 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
151	INTELSAT5 ATL5	21.5 W	USAIT	EZ	11/12/14/15	29.0	6	EC	R
152	INTELSAT5 ATL5	21.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
153	INTELSAT5 ATL5	21.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
154	INTELSAT5 ATL5	21.5 W	USAIT	EZ	11/12/14/15	29.0	4	EC	T
155	GDL-4	20.0 W	LUX	365	11	36.5	6	EC	R
156	INTELSAT MCS ATL A	18.5 W	USA	G6	11/12/14/15/22/23/24/31	21.0	6	EC	R
157	INTELSAT MCS ATL A	18.5 W	USA	G4	11/12/14/15/22/23/24/31	21.0	4	EC	T
158	INTELSAT5 ATL2	18.5 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
159	INTELSAT5 ATL2	18.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	6	EC	R
160	INTELSAT5 ATL2	18.5 W	USAIT	EZ	11/12/14/15	29.0	6	EC	R
161	INTELSAT5 ATL2	18.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
162	INTELSAT5 ATL2	18.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
163	INTELSAT5 ATL2	18.5 W	USAIT	EZ	11/12/14/15	29.0	4	EC	T
164	INTELSAT IBS 341.5E	18.5 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
165	INTELSAT IBS 341.5E	18.5 W	USAIT	EZ	11/14/15	29.0	6	EC	R
166	INTELSAT IBS 341.5E	18.5 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
167	INTELSAT IBS 341.5E	18.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
168	INTELSAT IBS 341.5E	18.5 W	USAIT	EZ	11/14/15	29.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
169	INTELSAT IBS 341.5E	18.5 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
170	INTELSAT5A ATL4	18.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
171	INTELSAT5A ATL4	18.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
172	INTELSAT5A ATL4	18.5 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
173	INTELSAT5A ATL4	18.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
174	INTELSAT5A ATL4	18.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
175	INTELSAT5A ATL4	18.5 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
176	INTELSAT IBS 343.5E	16.5 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
177	INTELSAT IBS 343.5E	16.5 W	USAIT	EZ	11/14/15	29.0	6	EC	R
178	INTELSAT IBS 343.5E	16.5 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
179	INTELSAT IBS 343.5E	16.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
180	INTELSAT IBS 343.5E	16.5 W	USAIT	EZ	11/14/15	29.0	4	EC	T
181	INTELSAT IBS 343.5E	16.5 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
182	INTELSAT4A 343.5E	16.5 W	USAIT	G	11/14/15/23/24	21.0	6	EC	R
183	INTELSAT4A 343.5E	16.5 W	USAIT	EH	11/14/15	24.8	6	EC	R
184	INTELSAT4A 343.5E	16.5 W	USAIT	G	11/14/15/23/24	21.0	4	EC	T
185	INTELSAT4A 343.5E	16.5 W	USAIT	EH	11/14/15	31.3	4	EC	T
186	INTELSAT4A 343.5E	16.5 W	USAIT	NEQ	11/14/15	29.1	4	EC	T
187	INTELSAT5 343.5E	16.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	6	EC	R
188	INTELSAT5 343.5E	16.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
189	INTELSAT5 343.5E	16.5 W	USAIT	NEZ	11/12/14/15	29.0	6	EC	R
190	INTELSAT5 343.5E	16.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
191	INTELSAT5 343.5E	16.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
192	INTELSAT5 343.5E	16.5 W	USAIT	NEZ	11/12/14/15	29.0	4	EC	T
193	INTELSAT5A 343.5E	16.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	6	EC	R
194	INTELSAT5A 343.5E	16.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
195	INTELSAT5A 343.5E	16.5 W	USAIT	EZ	11/12/14/15	29.0	6	EC	R
196	INTELSAT5A 343.5E	16.5 W	USAIT	NEZ	11/12/14/15	29.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
197	INTELSAT5A 343.5E	16.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
198	INTELSAT5A 343.5E	16.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
199	INTELSAT5A 343.5E	16.5 W	USAIT	EZ	11/12/14/15	29.0	4	EC	T
200	INTELSAT5A 343.5E	16.5 W	USAIT	NEZ	11/12/14/15	29.0	4	EC	T
201	MARISAT-ATL	15.0 W	USA	G	11/12/14/15/22/23/24/31	19.0	6	EC/EK/ER	R
202	MARISAT-ATL	15.0 W	USA	G	11/12/14/15/22/23/24/31	19.0	4	EC/EK/ER	T
203	STATSIONAR-4	14.0 W	URSIK	G	11/12/14/15/22/23/24/31	19.0	6	EC	R
204	STATSIONAR-4	14.0 W	URSIK	G	11/12/14/15/22/23/24/31	19.0	4	EC	T
205	STATSIONAR-4	14.0 W	URSIK	NH	11/12/14/15/22/23/24/31	22.0	4	EC	T
206	STATSIONAR-4	14.0 W	URSIK	S	11/12/14/15/22/23/24/31	19.0	4	EC	T
207	POTOK-1	13.5 W	URS	Z1	11/12/14/15/31	25.0	4	EC	R
208	POTOK-1	13.5 W	URS	Z2	11/14/23/24	25.0	4	EC	R
209	POTOK-1	13.5 W	URS	G	11/12/14/15/22/23/24/31	17.0	4	EC	T
210	STATSIONAR-11	11.0 W	URS	G	11/12/14/15/22/23/24/31	19.0	6	EC	R
211	STATSIONAR-11	11.0 W	URS	G	11/12/14/15/22/23/24/31	19.0	4	EC	T
212	STATSIONAR-11	11.0 W	URS	220	11/12/14/15/22/23/31	22.0	4	EC	T
213	TELECOM-1A	8.0 W	F	G	11/12/14/15/23/24/31	21.0	6	EC/ED/EK	R
214	TELECOM-1A	8.0 W	F	SG	11/12/14/15/23/24	22.5	4	EC/EK/ER	T
215	TELECOM-1B	5.0 W	F	G	11/12/14/15/23/24/31	21.0	6	EC/ED/EK	R
216	TELECOM-1B	5.0 W	F	SG	11/12/14/15/23/24	22.5	4	EC/EK/ER	T
217	INTELSAT4A ATL1	4.0 W	USAIT	G	11/12/14/15/23/24	21.0	6	EC	R
218	INTELSAT4A ATL1	4.0 W	USAIT	EH	11/12/14/15	24.8	6	EC	R
219	INTELSAT4A ATL1	4.0 W	USAIT	G	11/12/14/15/23/24	21.0	4	EC	T
220	INTELSAT4A ATL1	4.0 W	USAIT	EH	11/12/14/15	31.3	4	EC	T
221	INTELSAT4A ATL1	4.0 W	USAIT	WH	11/14/23/24	29.3	4	EC	T
222	INTELSAT4A ATL1	4.0 W	USAIT	NEQ	11/12/14/15	29.1	4	EC	T
223	INTELSAT4A ATL1	4.0 W	USAIT	NWQ	11/14/23/24	27.5	4	EC	T
224	INTELSAT5 CONT3	4.0 W	USAIT	G	11/12/14/15/23/24	21.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
225	INTELSAT5 CONT3	4.0 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
226	INTELSAT5 CONT3	4.0 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
227	INTELSAT5 CONT3	4.0 W	USAIT	G	11/12/14/15/23/24	21.0	4	EC	T
228	INTELSAT5 CONT3	4.0 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
229	INTELSAT5 CONT3	4.0 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
230	INTELSAT5A CONT3	4.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	6	EC	R
231	INTELSAT5A CONT3	4.0 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
232	INTELSAT5A CONT3	4.0 W	USAIT	NEZ	11/12/14/15/31	29.0	6	EC	R
233	INTELSAT5A CONT3	4.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	4	EC	T
234	INTELSAT5A CONT3	4.0 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
235	INTELSAT5A CONT3	4.0 W	USAIT	NEZ	11/12/14/15/31	29.0	4	EC	T
236	INTELSAT4A ATL2	1.0 W	USAIT	G	11/12/14/15/23/24	21.0	6	EC	R
237	INTELSAT4A ATL2	1.0 W	USAIT	EH	11/12/14/15	24.8	6	EC	R
238	INTELSAT4A ATL2	1.0 W	USAIT	WH	11/14/23/24	25.2	6	EC	R
239	INTELSAT4A ATL2	1.0 W	USAIT	G	11/12/14/15/23/24	21.0	4	EC	T
240	INTELSAT4A ATL2	1.0 W	USAIT	EH	11/12/14/15	31.3	4	EC	T
241	INTELSAT4A ATL2	1.0 W	USAIT	WH	11/14/23/24	29.3	4	EC	T
242	INTELSAT4A ATL2	1.0 W	USAIT	NEQ	11/12/14/15	29.1	4	EC	T
243	INTELSAT4A ATL2	1.0 W	USAIT	NWQ	11/14/23/24	27.5	4	EC	T
244	INTELSAT4A ATL2	1.0 W	USAIT	SEQ	11/15	27.8	4	EC	T
245	INTELSAT5 CONT4	1.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	6	EC	R
246	INTELSAT5 CONT4	1.0 W	USAIT	EH	11/12/14/15/31	24.6	6	EC	R
247	INTELSAT5 CONT4	1.0 W	USAIT	NEZ	11/12/14/15	29.0	6	EC	R
248	INTELSAT5 CONT4	1.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	4	EC	T
249	INTELSAT5 CONT4	1.0 W	USAIT	EH	11/12/14/15/31	24.6	4	EC	T
250	INTELSAT5 CONT4	1.0 W	USAIT	NEZ	11/12/14/15	29.0	4	EC	T
251	INTELSAT5A CONT4	1.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	6	EC	R
252	INTELSAT5A CONT4	1.0 W	USAIT	EH	11/12/14/15	24.6	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
253	INTELSAT5A CONT4	1.0 W	USAIT	NEZ	11/12/14/15/31	29.0	6	EC	R
254	INTELSAT5A CONT4	1.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	4	EC	T
255	INTELSAT5A CONT4	1.0 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
256	INTELSAT5A CONT4	1.0 W	USAIT	NEZ	11/12/14/15/31	29.0	4	EC	T
257	GDL-5	1.0 E	LUX	365	11	36.5	6	EC	R
258	TELECOM 1C	3.0 E	F	G	11/12/14/15/23/24	21.0	6	EC	R
259	TELECOM 1C	3.0 E	F	SG	11/12/14/15/23/24	22.5	4	EC	T
260	F-SAT 1	7.0 E	F	SG	11/12/14/15/23/24	27.0	6	EC/ED	R
261	F-SAT 1	7.0 E	F	SG	11/12/14/15/23/24	27.0	4	EC	T
262	APEX	10.0 E	F	EAF	11/12/14/15	33.5	6	EC/ED	R
263	APEX	10.0 E	F	EAF	11/12/14/15	30.0	4	EC	T
264	GDL-6	19.0 E	LUX	365	11	36.5	6	EC	R
265	STATSIONAR-2	35.0 E	URS	NH	11/12/13/14/15/31/33	22.0	6	EC	R
266	STATSIONAR-2	35.0 E	URS	NH	11/12/13/14/15/31/33	22.0	4	EC	T
267	STATSIONAR-12	40.0 E	URS	G	11/12/13/14/15/24/31/32	19.0	6	EC	R
268	STATSIONAR-12	40.0 E	URS	Z	11/12/13/14/15/31	25.0	6	EC	R
269	STATSIONAR-12	40.0 E	URS	G	11/12/13/14/15/24/31/32	19.0	4	EC	T
270	STATSIONAR-12	40.0 E	URS	NH	11/12/13/14/15/31/32/33	22.0	4	EC	T
271	STATSIONAR-12	40.0 E	URS	S	11/12	30.0	4	EC	T
272	STATSIONAR-12	40.0 E	URS	Z	11/12/13/14/15/31	25.0	4	EC	T
273	STATSIONAR-9	45.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
274	STATSIONAR-9	45.0 E	URS	NH	11/12/13/14/15/31/33	22.0	6	EC	R
275	STATSIONAR-9	45.0 E	URS	NH	11/12/13/14/15/31/33	22.0	4	EC	T
276	STATSIONAR-5	53.0 E	URSIK	1	11/12/13/14/15/31/32/33	19.0	6	EC	R
277	STATSIONAR-5	53.0 E	URSIK	2	11/12/13/15/31/33	25.0	6	EC	R
278	STATSIONAR-5	53.0 E	URSIK	2	11/12/13/15/31/33	25.0	4	EC	T
279	STATSIONAR-5	53.0 E	URSIK	3	11/12/13/14/15/31/32/33	22.0	4	EC	T
280	STATSIONAR-5	53.0 E	URSIK	4	11/12/13/14/15/31/32/33	30.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
281	INTELSAT5 INDOC3	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
282	INTELSAT5 INDOC3	57.0 E	USAIT	WZ	11/12/14/15	29.0	6	EC	R
283	INTELSAT5 INDOC3	57.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
284	INTELSAT5 INDOC3	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
285	INTELSAT5 INDOC3	57.0 E	USAIT	WZ	11/12/14/15	29.0	4	EC	T
286	INTELSAT5 INDOC3	57.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
287	INTELSAT5A INDOC2	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
288	INTELSAT5A INDOC2	57.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
289	INTELSAT5A INDOC2	57.0 E	USAIT	WZ	11/14	29.0	6	EC	R
290	INTELSAT5A INDOC2	57.0 E	USAIT	NWZ	11/14/15/31	29.0	6	EC	R
291	INTELSAT5A INDOC2	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
292	INTELSAT5A INDOC2	57.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
293	INTELSAT5A INDOC2	57.0 E	USAIT	WZ	11/14	29.0	4	EC	T
294	INTELSAT5A INDOC2	57.0 E	USAIT	NWZ	11/14/15/31	29.0	4	EC	T
295	INTELSAT6 57E	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
296	INTELSAT6 57E	57.0 E	USAIT	WH	11/12/14/15	24.1	6	EC	R
297	INTELSAT6 57E	57.0 E	USAIT	Z1	11	34.1	6	EC	R
298	INTELSAT6 57E	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
299	INTELSAT6 57E	57.0 E	USAIT	WH	11/12/14/15	24.1	4	EC	T
300	INTELSAT6 57E	57.0 E	USAIT	Z1	11	34.1	4	EC	T
301	INTELSAT MCS INDOC B	60.0 E	USAIT	G6	11/12/13/14/15/31/32/33	21.0	6	EC	R
302	INTELSAT MCS INDOC B	60.0 E	USAIT	G4	11/12/13/14/15/31/32/33	21.0	4	EC	T
303	INTELSAT5 INDOC2	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
304	INTELSAT5 INDOC2	60.0 E	USAIT	WZ	11/14/15/31	29.0	6	EC	R
305	INTELSAT5 INDOC2	60.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
306	INTELSAT5 INDOC2	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
307	INTELSAT5 INDOC2	60.0 E	USAIT	WZ	11/14/15/31	29.0	4	EC	T
308	INTELSAT5 INDOC2	60.0 E	USAIT	WH	11/14/15	24.2	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
309	INTELSAT5A INDOC1	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
310	INTELSAT5A INDOC1	60.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
311	INTELSAT5A INDOC1	60.0 E	USAIT	WZ	11/14	29.0	6	EC	R
312	INTELSAT5A INDOC1	60.0 E	USAIT	NWZ	11/14/15/31	29.0	6	EC	R
313	INTELSAT5A INDOC1	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
314	INTELSAT5A INDOC1	60.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
315	INTELSAT5A INDOC1	60.0 E	USAIT	WZ	11/14	29.0	4	EC	T
316	INTELSAT5A INDOC1	60.0 E	USAIT	NWZ	11/14/15/31	29.0	4	EC	T
317	INTELSAT6 60E	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
318	INTELSAT6 60E	60.0 E	USAIT	WH	11/12/14/15	24.1	6	EC	R
319	INTELSAT6 60E	60.0 E	USAIT	Z1	11	34.1	6	EC	R
320	INTELSAT6 60E	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
321	INTELSAT6 60E	60.0 E	USAIT	WH	11/12/14/15	24.1	4	EC	T
322	INTELSAT6 60E	60.0 E	USAIT	Z1	11	34.1	4	EC	T
323	INTELSAT MCS INDOC A	63.0 E	USAIT	G6	11/12/13/14/15/31/32/33	21.0	6	EC	R
324	INTELSAT MCS INDOC A	63.0 E	USAIT	G4	11/12/13/14/15/31/32/33	21.0	4	EC	T
325	INTELSAT5 INDOC1	63.0 E	USAIT	EH	11/13/31/32/33	24.6	6	EC	R
326	INTELSAT5 INDOC1	63.0 E	USAIT	G	11/12/13/14/15/21/32/33	21.0	6	EC	R
327	INTELSAT5 INDOC1	63.0 E	USAIT	WZ	11/14/15/31	29.0	6	EC	R
328	INTELSAT5 INDOC1	63.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
329	INTELSAT5 INDOC1	63.0 E	USAIT	EH	11/13/31/32/33	24.6	4	EC	T
330	INTELSAT5 INDOC1	63.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
331	INTELSAT5 INDOC1	63.0 E	USAIT	WZ	11/14/15/31	29.0	4	EC	T
332	INTELSAT5 INDOC1	63.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
333	INTELSAT5A INDOC3	63.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
334	INTELSAT5A INDOC3	63.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
335	INTELSAT5A INDOC3	63.0 E	USAIT	WZ	11/14/15	29.0	6	EC	R
336	INTELSAT5A INDOC3	63.0 E	USAIT	NWZ	11/14/15/31	29.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
337	INTELSAT5A INDOC3	63.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
338	INTELSAT5A INDOC3	63.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
339	INTELSAT5A INDOC3	63.0 E	USAIT	WZ	11/14	29.0	4	EC	T
340	INTELSAT5A INDOC3	63.0 E	USAIT	NWZ	11/14/15/31	29.0	4	EC	T
341	MARECS C	64.5 E	F MRS	G	11/12/13/14/15/31/32/33	20.7	6	EC/ED/EK	R
342	MARECS C	64.5 E	F MRS	G	11/12/13/14/15/31/32/33	20.7	4	EC/EK/ER	T
343	INTELSAT MCS IND D	66.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
344	INTELSAT MCS IND D	66.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
345	INTELSAT5 IND4	66.0 E	USAIT	G	11/12/13/14/15/21/32/33	21.0	6	EC	R
346	INTELSAT5 IND4	66.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
347	INTELSAT5 IND4	66.0 E	USAIT	WZ	11/14/15/31	29.0	6	EC	R
348	INTELSAT5 IND4	66.0 E	USAIT	G	11/12/13/14/15/21/32/33	21.0	4	EC	T
349	INTELSAT5 IND4	66.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
350	INTELSAT5 IND4	66.0 E	USAIT	WZ	11/14/15/31	29.0	4	EC	T
351	MARECS IND2	73.0 E	F MRS	G	11/12/13/14/15/31/32/33	20.7	6	EC/ED/EK	R
352	MARECS IND2	73.0 E	F MRS	G	11/12/13/14/15/31/32/33	20.7	4	EC/EK/ER	T
353	POTOK-2	80.0 E	URS	Z2	11/12/14/15/31	25.0	4	EC	R
354	POTOK-2	80.0 E	URS	G	11/12/13/14/15/31/32/33	17.0	4	EC	T
355	STATSIONAR-1	80.0 E	URS	NH	11/12/13/15/31/33	23.0	6	EC	R
356	STATSIONAR-1	80.0 E	URS	NH	11/12/13/15/31/33	23.0	4	EC	T
357	STATSIONAR-13	80.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
358	STATSIONAR-13	80.0 E	URS	250	11/12/13/31/33	25.0	6	EC	R
359	STATSIONAR-13	80.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	4	EC	T
360	STATSIONAR-13	80.0 E	URS	300	11/12/31	30.0	4	EC	T
361	STATSIONAR-13	80.0 E	URS	220	11/12/13/14/15/31/32/33	22.0	4	EC	T
362	STATSIONAR-13	80.0 E	URS	250	11/12/13/31/33	25.0	4	EC	T
363	STATSIONAR-3	85.0 E	URS	NH	11/12/13/15/31/33	22.0	6	EC	R
364	STATSIONAR-3	85.0 E	URS	NH	11/12/13/15/31/33	22.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
365	STATSIONAR-6	90.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
366	STATSIONAR-6	90.0 E	URS	NH	11/12/13/31/33	25.0	6	EC	R
367	STATSIONAR-6	90.0 E	URS	1	11/12/31	30.0	4	EC	T
368	STATSIONAR-6	90.0 E	URS	2	11/12/13/15/31/33	25.0	4	EC	T
369	STATSIONAR-6	90.0 E	URS	3	11/12/13/14/15/31/32/33	22.0	4	EC	T
370	STATSIONAR-14	95.0 E	URS	250	11/12/13/31/33	25.0	6	EC	R
371	STATSIONAR-14	95.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
372	STATSIONAR-14	95.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	4	EC	T
373	STATSIONAR-14	95.0 E	URS	300	11/12/13/31	30.0	4	EC	T
374	STATSIONAR-14	95.0 E	URS	220	11/12/13/15/31/32/33	22.0	4	EC	T
375	STATSIONAR-14	95.0 E	URS	250	11/12/13/31/33	25.0	4	EC	T
376	STATSIONAR-T	99.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
377	STATSIONAR-T2	99.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

ORB-85 CAMR SUR L'UTILISATION DE L'ORBITE DES SATELLITES GÉOSTATIONNAIRES ET LA PLANIFICATION DES SERVICES SPATIAUX UTILISANT CETTE ORBITE

PREMIÈRE SESSION GENÈVE, AOÛT/SEPTEMBRE 1985

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SEANCE PLENIERE
PLENARY MEETING
SESION PLENARIA

ANNEXE 2 AU DOCUMENT 105

Comme indiqué dans le Document 105, cette Annexe contient des renseignements sur les faisceaux des stations spatiales géostationnaires (Format "B" de rapport décrit dans la section 3 du Document 105).

ANNEX 2 TO DOCUMENT 105

As mentioned in Document 105, this Annex contains information on the beams of geostationary space stations (Report Format "B", described in section 3 of Document 105).

ANEXO 2 AL DOCUMENTO 105

Conforme se menciona en el Documento 105, este Anexo contiene información sobre los haces de las estaciones espaciales geoestacionarias (Formato "C" del Informe descrito en la sección 3 del Documento 105).

Annexe
Annex
Anexo

ANNEX 2

Report Format "B"

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1	PACSTAR-2	175.0 W	PNG	DOM	32	38.2	6	EC/ED	R
2	PACSTAR-2	175.0 W	PNG	DOM	32	38.2	6	EC	R
3	PACSTAR-2	175.0 W	PNG	SUB	32	42.9	6	EC	R
4	PACSTAR-2	175.0 W	PNG	REG	32	42.9	6	EC	R
5	PACSTAR-2	175.0 W	PNG	REG	32/33	42.9	6	EC	R
6	PACSTAR-2	175.0 W	PNG	RIM	21	50.2	14	EC	R
7	PACSTAR-2	175.0 W	PNG	RIM	32/33	50.2	14	EC	R
8	PACSTAR-2	175.0 W	PNG	SUB	32	39.0	4	EK/ER	T
9	PACSTAR-2	175.0 W	PNG	SUB	32	39.0	4	EC	T
10	PACSTAR-2	175.0 W	PNG	REG	32	39.0	4	EC	T
11	PACSTAR-2	175.0 W	PNG	REG	32/33	39.0	4	EC	T
12	PACSTAR-2	175.0 W	PNG	RIM	21	49.1	12	EC	T
13	PACSTAR-2	175.0 W	PNG	RIM	32/33	49.1	12	EC	T
14	GALS-4	170.0 W	URS	G	13/21/22/32/33	19.0	8	EC	R
15	GALS-4	170.0 W	URS	NH	13/21/22/33	23.0	8	EC	R
16	GALS-4	170.0 W	URS	S	13/33	30.0	8	EC	R
17	GALS-4	170.0 W	URS	G	13/21/22/32/33	19.0	7	EC	T
18	GALS-4	170.0 W	URS	NH	13/21/22/33	23.0	7	EC	T
19	GALS-4	170.0 W	URS	S	13/33	30.0	7	EC	T
20	STATSIONAR-10	170.0 W	URS	G	13/21/22/32/33	19.0	5	EC	R
21	STATSIONAR-10	170.0 W	URS	G	13/21/22/32/33	19.0	6	EC	R
22	STATSIONAR-10	170.0 W	URS	NH	12/21/22/33	22.0	5	EC	R
23	STATSIONAR-10	170.0 W	URS	NH	13/21/22/33	22.0	6	EC	R
24	STATSIONAR-10	170.0 W	URS	NH	13/21/22/33	22.0	4	EC	T
25	LOUTCH P4	170.0 W	URS	G	13/21/32/33	22.0	11	EC	T
26	LOUTCH P4	170.0 W	URS	G	13/21/32/33	22.0	14	EC	R
27	VOLNA-7	170.0 W	URS	G	13/21/32/33	14.0	0	EJ/EU	R
28	VOLNA-7	170.0 W	URS	G	13/21/32/33	18.0	1	EJ	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
29	VOLNA-7	170.0 W	URS	G	13/21/32/33	14.0	0	EJ/EU	T
30	VOLNA-7	170.0 W	URS	G	13/21/32/33	18.0	1	EJ	T
31	STATSIONAR-D2	170.0 W	URS	N6	32/33	25.0	6	EC	R
32	STATSIONAR-D2	170.0 W	URS	N6	13/23/33	25.0	6	EC	R
33	STATSIONAR-D2	170.0 W	URS	N6	21/22	25.0	6	EC	R
34	STATSIONAR-D2	170.0 W	URS	N6	24/32	25.0	6	EC	R
35	STATSIONAR-D2	170.0 W	URS	N6	32	25.0	6	EC	R
36	STATSIONAR-D2	170.0 W	URS	N4	32/33	25.0	4	EC	T
37	STATSIONAR-D2	170.0 W	URS	N4	13/21/33	25.0	4	EC	T
38	STATSIONAR-D2	170.0 W	URS	N4	21/22	25.0	4	EC	T
39	STATSIONAR-D2	170.0 W	URS	N4	24/32	25.0	4	EC	T
40	STATSIONAR-D2	170.0 W	URS	N4	32	25.0	4	EC	T
41	POTOK-3	168.0 W	URS	Z1	21/22	25.0	4	EC	R
42	POTOK-3	168.0 W	URS	Z2	13/33	25.0	4	EC	R
43	POTOK-3	168.0 W	URS	Z3	32	25.0	4	EC	R
44	POTOK-3	168.0 W	URS	Z4	32/24	25.0	4	EC	R
45	POTOK-3	168.0 W	URS	G	13/21/22/24/32/33	17.0	4	EC	T
46	ESDRN	160.0 W	URS	1	13	49.0	14	EC/EH	R
47	ESDRN	160.0 W	URS	3	13	49.0	14	EH	R
48	ESDRN	160.0 W	URS	4	13	43.0	14	EC/EH	R
49	ESDRN	160.0 W	URS	4	13	43.0	11	EC/EH	T
50	ATS-1	149.0 W	USA	G	13/21/22/23/24/32/33	-5.0	0	ED	R
51	ATS-1	149.0 W	USA	G	13/21/22/23/24/32/33	8.0	0	EH	R
52	ATS-1	149.0 W	USA	G	13/21/22/23/24/32/33	16.0	6	EH	R
53	ATS-1	149.0 W	USA	G	13/21/22/23/24/32/33	-5.0	0	ER	T
54	ATS-1	149.0 W	USA	G	13/21/22/23/24/32/33	8.0	0	EH/ER	T
55	ATS-1	149.0 W	USA	G	13/21/22/23/24/32/33	3.0	4	EH/EK	T
56	ATS-1	149.0 W	USA	G	13/21/22/23/24/32/33	15.0	4	EH	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
57	FLTSATCOM-A PAC	145.0 W	USA	G	13/21/22/23/24/32/33	18.0	0	EJ/EG	R
58	FLTSATCOM-A PAC	145.0 W	USA	G	13/21/22/23/24/32/33	18.0	0	EJ/EU	R
59	FLTSATCOM-A PAC	145.0 W	USA	BCN	13/21/22/23/24/32/33	18.0	8	EC/ED	R
60	FLTSATCOM-A PAC	145.0 W	USA	G	13/21/22/23/24/32/33	18.0	0	EG/EJ/EU	T
61	FLTSATCOM-A PAC	145.0 W	USA	BCN	13/21/22/23/24/32/33	18.0	7	EC/EK/ER	T
62	MORELOS-4	145.0 W	MEX	R6	21/22	28.0	6	EC/ED/EK/ER	R
63	MORELOS-4	145.0 W	MEX	R14	21/22	30.7	14	EC/ED/EK/ER	R
64	MORELOS-4	145.0 W	MEX	T4	21/22	30.0	4	EC/ED	T
65	MORELOS-4	145.0 W	MEX	T12	21/22	33.0	12	EC/ED	T
66	US SATCOM V	143.0 W	USA	UH1	21	32.6	4	EC	T
67	US SATCOM V	143.0 W	USA	UH2	21	30.8	4	EC	T
68	US SATCOM V	143.0 W	USA	UV1	21/22	27.0	4	EC	T
69	US SATCOM V	143.0 W	USA	UV2	21/22	27.8	4	EC	T
70	US SATCOM V	143.0 W	USA	6UV	21/22	29.4	6	EC	T
71	US SATCOM V	143.0 W	USA	6UV	21/22	30.3	6	EC	T
72	US SATCOM II-R	143.0 W	USA	HAW	21	24.1	6	EC/ED	R
73	US SATCOM II-R	143.0 W	USA	HAW	21	31.6	6	EC/ED	R
74	US SATCOM II-R	143.0 W	USA	A	21	32.2	6	EC/ED	R
75	US SATCOM II-R	143.0 W	USA	B	21/22	27.4	6	EC/ED	R
76	US SATCOM II-R	143.0 W	USA	C	21/22	29.1	6	EC/ED	R
77	US SATCOM II-R	143.0 W	USA	A	21	29.9	6	EC/ED	R
78	US SATCOM II-R	143.0 W	USA	B	21/22	29.4	6	EC/ED	R
79	US SATCOM II-R	143.0 W	USA	C	21	28.1	6	EC/ED	R
80	US SATCOM II-R	143.0 W	USA	ALS	21	32.8	4	EC/EK/ER	T
81	US SATCOM II-R	143.0 W	USA	CUS	21/22	28.4	4	EC/EK/ER	T
82	MORELOS-3	141.0 W	MEX	R6	21/22	28.0	6	EC/ED/EK/ER	R
83	MORELOS-3	141.0 W	MEX	R14	21/22	30.7	14	EC/ED/EK/ER	R
84	MORELOS-3	141.0 W	MEX	T4	21/22	30.0	4	EC/ED/EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
85	MORELOS-3	141.0 W	MEX	T12	21/22	33.0	12	EC/ED/EK/ER	T
86	US SATCOM I-R	139.0 W	USA	318	21/22	31.8	6	EC/ED	R
87	US SATCOM I-R	139.0 W	USA	360	21/22	36.0	4	EC/ER	T
88	GOES WEST	135.0 W	USA	G	13/21/22/23/24/31/32	0.0	0	ED	R
89	GOES WEST	135.0 W	USA	G	13/21/22/23/24/31/32	5.0	0	EM/EW	R
90	GOES WEST	135.0 W	USA	G	13/21/22/23/24/31/32	16.0	2	ED/EK/EM/EW	R
91	GOES WEST	135.0 W	USA	G	13/21/22/23/24/31/32	0.0	0	EK/ER	T
92	GOES WEST	135.0 W	USA	G	13/21/22/23/24/31/32	5.0	0	EM/EW	T
93	GOES WEST	135.0 W	USA	G	13/21/22/23/24/31/32	17.6	1	EK	T
94	GOES WEST	135.0 W	USA	G	13/21/22/23/24/31/32	18.0	1	EK/EM/ER/EW	T
95	US SATCOM-1	135.0 W	USA	7	21/22/23	31.5	6	EC/ED	R
96	US SATCOM-1	135.0 W	USA	8	21/22/23	32.2	6	EC/ED	R
97	US SATCOM-1	135.0 W	USA	9	21	23.6	6	EC/ED	R
98	US SATCOM-1	135.0 W	USA	1	21/22/23	30.1	4	EC/EK/ER	T
99	US SATCOM-1	135.0 W	USA	2	21/22/23	30.5	4	EC/EK/ER	T
100	US SATCOM-1	135.0 W	USA	3	21/22/23	30.8	4	EC/EK/ER	T
101	US SATCOM-1	135.0 W	USA	4	21/22/23	30.3	4	EC/EK/ER	T
102	US SATCOM-1	135.0 W	USA	5	21	20.6	4	EC/EK/ER	T
103	US SATCOM-1	135.0 W	USA	6	21	20.5	4	EC/EK/ER	T
104	USGCSS PH2 E PAC	135.0 W	USA	2	21/22/23/24/32	20.0	8	EC	R
105	USGCSS PH2 E PAC	135.0 W	USA	3	21/22/23/24/32	32.0	8	EC	R
106	USGCSS PH2 E PAC	135.0 W	USA	2	21/22/23/24/32	20.0	7	EC/EK	T
107	USGCSS PH2 E PAC	135.0 W	USA	3	21/22/23/24/32	32.0	7	EC/EK	T
108	USGCSS PH3 E PAC	135.0 W	USA	G	13/21/22/23/24/32/33	20.2	8	EC	R
109	USGCSS PH3 E PAC	135.0 W	USA	G	13/21/22/23/24/32/33	20.2	8	EC	R
110	USGCSS PH3 E PAC	135.0 W	USA	MBA	21/22/23	27.3	8	EC	R
111	USGCSS PH3 E PAC	135.0 W	USA	G	13/21/22/23/24/32/33	21.0	7	EC/EK/ER	T
112	USGCSS PH3 E PAC	135.0 W	USA	G	13/21/22/23/24/32/33	21.0	7	EC/EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
113	USGCSS PH3 E PAC	135.0 W	USA	MBA	21/22/23	32.0	7	EC	T
114	USGCSS PH3 E PAC	135.0 W	USA	MBA	22/23	32.0	7	EC	T
115	USGCSS PH3 E PAC	135.0 W	USA	SB	22/23	34.6	7	EC	T
116	USASAT 11D	134.0 W	USA	CUS	21/22/23	32.9	6	EC/ED	R
117	USASAT 11D	134.0 W	USA	ERB	22/23	39.6	6	EC/ED	R
118	USASAT 11D	134.0 W	USA	WRB	21/22	34.8	6	EC/ED	R
119	USASAT 11D	134.0 W	USA	ALS	21	40.0	6	EC/ED	R
120	USASAT 11D	134.0 W	USA	HAW	21	43.8	6	EC/ED	R
121	USASAT 11D	134.0 W	USA	PRV	23	46.3	6	EC/ED	R
122	USASAT 11D	134.0 W	USA	CUS	21/22/23	32.9	4	ER/EC/EK	T
123	USASAT 11D	134.0 W	USA	ERB	22/23	39.6	4	ER/EC/EK	T
124	USASAT 11D	134.0 W	USA	WRB	21/22	34.8	4	ER/EC/EK	T
125	USASAT 11D	134.0 W	USA	ALS	21	40.0	4	ER/EC/EK	T
126	USASAT 11D	134.0 W	USA	HAW	21	43.8	4	ER/EC/EK	T
127	USASAT 11D	134.0 W	USA	PRV	23	46.3	4	ER/EC/EK	T
128	USASAT 11C	132.0 W	USA	CUS	21/22/23	32.9	14	EC/ED	R
129	USASAT 11C	132.0 W	USA	ERB	22/23	39.6	14	EC/ED	R
130	USASAT 11C	132.0 W	USA	WRB	21/22	34.8	14	EC/ED	R
131	USASAT 11C	132.0 W	USA	ALS	21	40.0	14	EC/ED	R
132	USASAT 11C	132.0 W	USA	HAW	21	43.8	14	EC/ED	R
133	USASAT 11C	132.0 W	USA	PRV	23	46.3	14	EC/ED	R
134	USASAT 11C	132.0 W	USA	CUS	21/22/23	32.9	12	EC/EK/ER	T
135	USASAT 11C	132.0 W	USA	ERB	22/23	39.6	12	EC/EK/ER	T
136	USASAT 11C	132.0 W	USA	WRB	21/22	34.8	12	EC/EK/ER	T
137	USASAT 11C	132.0 W	USA	ALS	21	40.0	12	EC/EK/ER	T
138	USASAT 11C	132.0 W	USA	HAW	21	43.8	12	EC/EK/ER	T
139	USASAT 11C	132.0 W	USA	PRV	23	46.3	12	EC/EK/ER	T
140	US SATCOM III-R	131.0 W	USA	CUS	21/22/23	31.8	6	EC/ED	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
141	US SATCOM III-R	131.0 W	USA	HAW	21	23.6	6	EC	R
142	US SATCOM III-R	131.0 W	USA	CON	21/22/23	36.0	4	EC/ER	T
143	US SATCOM III-R	131.0 W	USA	HAW	21	23.0	4	EC	T
144	USASAT 10D	130.0 W	USA	CUS	21/22/23	32.8	14	EC/ED	R
145	USASAT 10D	130.0 W	USA	ERB	22/23	39.4	14	EC/ED	R
146	USASAT 10D	130.0 W	USA	WRB	21/22	34.7	14	EC/ED	R
147	USASAT 10D	130.0 W	USA	ALS	21	40.1	14	EC/ED	R
148	USASAT 10D	130.0 W	USA	HAW	21	44.1	14	EC/ED	R
149	USASAT 10D	130.0 W	USA	PRV	23	46.3	14	EC/ED	R
150	USASAT 10D	130.0 W	USA	CUS	21/22/23	32.8	12	EC/EK/ER	T
151	USASAT 10D	130.0 W	USA	ERB	22/23	39.4	12	EC/EK/ER	T
152	USASAT 10D	130.0 W	USA	WRB	21/22	34.7	12	EC/EK/ER	T
153	USASAT 10D	130.0 W	USA	ALS	21	40.1	12	EC/EK/ER	T
154	USASAT 10D	130.0 W	USA	HAW	21	44.1	12	EC/EK/ER	T
155	USASAT 10D	130.0 W	USA	PRV	23	46.3	12	EC/EK/ER	T
156	USRDSS WEST	130.0 W	USA	CUS	21/22/23	40.0	1	EO/EQ/EU/EJ	R
157	USRDSS WEST	130.0 W	USA	CUS	21/22/23	40.0	1	EF	R
158	USRDSS WEST	130.0 W	USA	CUS	21/22/23	29.0	6	EC/ED/EF	R
159	USRDSS WEST	130.0 W	USA	CUS	21/22/23	40.0	2	EF/EQ/EU/EJ	T
160	USRDSS WEST	130.0 W	USA	CUS	21/22/23	40.0	5	EF/ER/EC/EK	T
161	USRDSS WEST	130.0 W	USA	CUS	21/22/23	40.0	5	EJ	T
162	COMSTAR D-1	128.0 W	USA	CUS	21/22/23	24.5	6	EC/ED	R
163	COMSTAR D-1	128.0 W	USA	HAW	21	24.5	6	EC/ED	R
164	COMSTAR D-1	128.0 W	USA	ALS	21	24.5	6	EC/ED	R
165	COMSTAR D-1	128.0 W	USA	PRV	22/23/24	24.5	6	EC/ED	R
166	COMSTAR D-1	128.0 W	USA	CUS	21/22/23	27.0	4	EC/EK/ER	T
167	COMSTAR D-1	128.0 W	USA	HAW	21	27.0	4	EC/EK/ER	T
168	COMSTAR D-1	128.0 W	USA	ALS	21	27.0	4	EC/EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
169	COMSTAR D-1	128.0 W	USA	PRV	22/23/24	27.0	4	EC/EK/ER	T
170	ASC-1	128.0 W	USA	N6	21/22/23	33.8	6	EC	R
171	ASC-1	128.0 W	USA	A14	21	40.2	14	EC	R
172	ASC-1	128.0 W	USA	H14	21	44.2	14	EC	R
173	ASC-1	128.0 W	USA	P14	23	46.3	14	EC	R
174	ASC-1	128.0 W	USA	P14	23	46.3	14	EC	R
175	ASC-1	128.0 W	USA	T6	21/22/23	33.8	6	ED	R
176	ASC-1	128.0 W	USA	N4	21/22/23	33.8	4	EC	T
177	ASC-1	128.0 W	USA	A12	21	40.2	12	EC	T
178	ASC-1	128.0 W	USA	H12	21	44.2	12	EC	T
179	ASC-1	128.0 W	USA	P12	23	46.3	12	EC	T
180	ASC-1	128.0 W	USA	T4	21/22/23	33.8	4	EK/ER	T
181	USASAT 10C	126.0 W	USA	CUS	21/22/23	32.5	14	EC/ED	R
182	USASAT 10C	126.0 W	USA	ERB	22/23	39.0	14	EC/ED	R
183	USASAT 10C	126.0 W	USA	WRB	21/22	34.5	14	EC/ED	R
184	USASAT 10C	126.0 W	USA	ALS	21	40.3	14	EC/ED	R
185	USASAT 10C	126.0 W	USA	HAW	21	44.3	14	EC/ED	R
186	USASAT 10C	126.0 W	USA	PRV	23	46.3	14	EC/ED	R
187	USASAT 10C	126.0 W	USA	CUS	21/22/23	32.5	12	EC/EK/ER	T
188	USASAT 10C	126.0 W	USA	ERB	22/23	39.0	12	EC/EK/ER	T
189	USASAT 10C	126.0 W	USA	ERB	21/22	34.5	12	EC/EK/ER	T
190	USASAT 10C	126.0 W	USA	ALS	21	40.3	12	EC/EK/ER	T
191	USASAT 10C	126.0 W	USA	HAW	21	44.3	12	EC/EK/ER	T
192	USASAT 10C	126.0 W	USA	PRV	23	46.3	12	EC/EK/ER	T
193	USASAT 10B	124.0 W	USA	CUS	21/22/23	32.4	14	EC/ED	R
194	USASAT 10B	124.0 W	USA	ERB	22/23	38.8	14	EC/ED	R
195	USASAT 10B	124.0 W	USA	WRB	21/22	34.5	14	EC/ED	R
196	USASAT 10B	124.0 W	USA	ALS	21	40.4	14	EC/ED	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
197	USASAT 10B	124.0 W	USA	HAW	21	44.4	14	EC/ED	R
198	USASAT 10B	124.0 W	USA	PRV	23	46.3	14	EC/ED	R
199	USASAT 10B	124.0 W	USA	CUS	21/22/23	32.4	12	EC/EK/ER	T
200	USASAT 10B	124.0 W	USA	ERB	22/23	38.8	12	EC/EK/ER	T
201	USASAT 10B	124.0 W	USA	WRB	21/22	34.5	12	EC/EK/ER	T
202	USASAT 10B	124.0 W	USA	ALS	21	40.4	12	EC/EK/ER	T
203	USASAT 10B	124.0 W	USA	HAW	21	44.4	12	EC/EK/ER	T
204	USASAT 10B	124.0 W	USA	PRV	23	46.3	12	EC/EK/ER	T
205	WESTAR-2	123.5 W	USA	CUS	21/22/23	29.0	6	EC	R
206	WESTAR-2	123.5 W	USA	HAW	21	29.0	6	EC/ED	R
207	WESTAR-2	123.5 W	USA	CUS	21/22/23	31.0	4	EC/EK/ER	T
208	WESTAR-2	123.5 W	USA	HAW	21	31.0	4	EC/EK/ER	T
209	WESTAR 5	123.0 W	USA	DOM	21/22/23	29.0	6	EC/ED	R
210	WESTAR 5	123.0 W	USA	DOM	21/22/23	29.0	4	EC/ER	T
211	SPACENET I	120.0 W	USA	CPR	21/22/23	28.9	6	EC	R
212	SPACENET I	120.0 W	USA	HAW	21	28.9	6	EC	R
213	SPACENET I	120.0 W	USA	CUS	21/22/23	31.0	14	EC	R
214	SPACENET I	120.0 W	USA	CPR	21/22/23	29.5	4	EC	T
215	SPACENET I	120.0 W	USA	HAW	21	29.5	4	EC	T
216	SPACENET I	120.0 W	USA	CUS	21/22/23	34.5	12	EC	T
217	USASAT 10A	120.0 W	USA	CUS	21/22/23	32.1	14	EC/ED	R
218	USASAT 10A	120.0 W	USA	ERB	22/23	38.5	14	EC/ED	R
219	USASAT 10A	120.0 W	USA	WRB	21/22	34.3	14	EC/ED	R
220	USASAT 10A	120.0 W	USA	ALS	21	40.6	14	EC/ED	R
221	USASAT 10A	120.0 W	USA	HAW	21	44.5	14	EC/ED	R
222	USASAT 10A	120.0 W	USA	PRV	23	46.3	14	EC/ED	R
223	USASAT 10A	120.0 W	USA	CUS	21/22/23	32.1	12	EC/EK/ER	T
224	USASAT 10A	120.0 W	USA	ERB	22/23	38.5	12	EC/EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
225	USASAT 10A	120.0 W	USA	WRB	21/22	34.3	12	EC/EK/ER	T
226	USASAT 10A	120.0 W	USA	ALS	21	40.6	12	EC/EK/ER	T
227	USASAT 10A	120.0 W	USA	HAW	21	44.5	12	EC/EK/ER	T
228	USASAT 10A	120.0 W	USA	PRV	23	46.3	12	EC/EK/ER	T
229	US SATCOM-2	119.0 W	USA	7	21/22/23	31.6	6	EC/ED	R
230	US SATCOM-2	119.0 W	USA	8	21/22/23	32.0	6	EC	R
231	US SATCOM-2	119.0 W	USA	9	21	23.8	6	EC	R
232	US SATCOM-2	119.0 W	USA	1	21/22/23	30.0	4	EC	T
233	US SATCOM-2	119.0 W	USA	2	21/22/23	30.5	4	EC	T
234	US SATCOM-2	119.0 W	USA	3	21/22	30.7	4	EC	T
235	US SATCOM-2	119.0 W	USA	4	21/22/23	30.2	4	EC/EK/ER	T
236	US SATCOM-2	119.0 W	USA	5	21	21.6	4	EC	T
237	US SATCOM-2	119.0 W	USA	6	21	21.0	4	EC	T
238	ANIK C-3	117.5 W	CAN	DOM	21/22/23	37.6	14	EC/ED	R
239	ANIK C-3	117.5 W	CAN	WC	22/23	40.6	12	EC	T
240	ANIK C-3	117.5 W	CAN	EC	22/23	41.8	12	EC/ER	T
241	ANIK C-3	117.5 W	CAN	E	23	40.7	12	EC/ER	T
242	ANIK C-3	117.5 W	CAN	W	21/22	41.0	12	EC	T
243	ANIK C-3	117.5 W	CAN	W	21/22	41.0	12	EC/ER	T
244	ANIK C-3	117.5 W	CAN	WC	22/23	40.6	12	EC/ER	T
245	MORELOS 2	116.5 W	MEX	319	21/22	31.9	6	EC/ED	R
246	MORELOS 2	116.5 W	MEX	325	21/22	32.5	14	EC	R
247	MORELOS 2	116.5 W	MEX	338	21/22	33.8	6	EC/ED	R
248	MORELOS 2	116.5 W	MEX	310	21/22	31.0	4	EC/ER	T
249	MORELOS 2	116.5 W	MEX	320	21/22	32.0	4	EC/ER	T
250	MORELOS 2	116.5 W	MEX	344	21/22	34.4	12	EC	T
251	ANIK A-3	114.0 W	CAN	G	21/22/23/24/32	5.0	6	ED	R
252	ANIK A-3	114.0 W	CAN	S	21/22/23	30.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
253	ANIK A-3	114.0 W	CAN	G	21/22/23/24/32	3.0	4	EC/EK/ER	T
254	ANIK A-3	114.0 W	CAN	S	21/22/23	30.0	4	EC	T
255	MORELOS 1	113.5 W	MEX	319	21/22	31.9	6	EC/ED	R
256	MORELOS 1	113.5 W	MEX	325	21/22	32.5	14	EC	R
257	MORELOS 1	113.5 W	MEX	338	21/22	33.8	6	EC/ED	R
258	MORELOS 1	113.5 W	MEX	310	21/22	31.0	4	EC/ER	T
259	MORELOS 1	113.5 W	MEX	320	21/22	31.0	4	EC	T
260	MORELOS 1	113.5 W	MEX	320	21/22	32.0	4	ER	T
261	MORELOS 1	113.5 W	MEX	344	21/22	34.4	12	EC	T
262	ANIK C-2	112.5 W	CAN	5	21/22/23	37.6	14	EC/ED	R
263	ANIK C-2	112.5 W	CAN	1	22/23	41.8	12	EC/ER	T
264	ANIK C-2	112.5 W	CAN	2	22/23	40.7	12	EC/ER	T
265	ANIK C-2	112.5 W	CAN	3	21/22	41.0	12	EC/ER	T
266	ANIK C-2	112.5 W	CAN	4	22	40.6	12	EC/ER	T
267	ANIK B-1	109.0 W	CAN	1	21/22/23	29.0	6	EC/ED	R
268	ANIK B-1	109.0 W	CAN	2	21/22/23	30.0	14	EC	R
269	ANIK B-1	109.0 W	CAN	3	21/22/23	28.5	4	EC/EK/ER	T
270	ANIK B-1	109.0 W	CAN	4	22/23	36.0	12	EC	T
271	ANIK B-1	109.0 W	CAN	5	22/23	36.0	12	EC	T
272	ANIK B-1	109.0 W	CAN	6	22	36.0	12	EC	T
273	ANIK B-1	109.0 W	CAN	7	22	36.0	12	EC	T
274	ANIK D-2	108.0 W	CAN	DOM	21/22/23	31.0	6	EC/ED	R
275	ANIK D-2	108.0 W	CAN	DOM	21/22/23	31.0	4	EC/ER	T
276	MUSAT-A	108.0 W	CAN	G	21/22/23/24	15.0	0	EU/EG/EJ/EM	R
277	MUSAT-A	108.0 W	CAN	G	21/22/23/24	15.0	0	EX	R
278	MUSAT-A	108.0 W	CAN	G	21/22/23/24	20.0	1	EG	R
279	MUSAT-A	108.0 W	CAN	G	21/22/23/24	20.0	8	EC/ED	R
280	MUSAT-A	108.0 W	CAN	G	21/22/23/24	19.0	0	EU/EG/EJ	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
281	MUSAT-A	108.0 W	CAN	G	21/22/23/24	20.0	1	EG	T
282	MUSAT-A	108.0 W	CAN	G	21/22/23/24	20.0	7	EC/ER/EK	T
283	ANIK C-1	107.5 W	CAN	NWQ	21/22/23	37.6	14	EC/ED	R
284	ANIK C-1	107.5 W	CAN	ECH	22/23	41.8	12	EC/ER	T
285	ANIK C-1	107.5 W	CAN	EH4	22/23	40.7	12	EC/ER	T
286	ANIK C-1	107.5 W	CAN	WV1	21/22	41.0	12	EC/ER	T
287	ANIK C-1	107.5 W	CAN	WCV	22/23	40.6	12	EC/ER	T
288	MSAT	106.5 W	CAN	G	21/22/23/24/32	10.0	2	ED/EK	R
289	MSAT	106.5 W	CAN	1A	21/22	33.2	0	EG/EU	R
290	MSAT	106.5 W	CAN	1B	21/22	33.2	0	EG/EU	R
291	MSAT	106.5 W	CAN	1C	22/23	33.2	0	EG/EU	R
292	MSAT	106.5 W	CAN	1D	23	33.2	0	EG/EU	R
293	MSAT	106.5 W	CAN	G	21/22/23/24/32	10.0	2	ER	T
294	MSAT	106.5 W	CAN	1A	21/22	34.4	0	EG/EU	T
295	MSAT	106.5 W	CAN	1B	21/22	34.4	0	EG/EU	T
296	MSAT	106.5 W	CAN	1C	22/23	34.4	0	EG/EU	T
297	MSAT	106.5 W	CAN	1D	23	34.4	0	EG/EU	T
298	MSAT	106.5 W	CAN	DOM	21/22/23	30.0	13	ED/EK	R
299	MSAT	106.5 W	CAN	DOM	21/22/23	30.0	14	ED/EK	R
300	MSAT	106.5 W	CAN	DOM	21/22/23	30.0	11	EC/ER	T
301	MSAT	106.5 W	CAN	DOM	21/22/23	30.0	12	EC/ER	T
302	GSTAR I	106.0 W	USA	CUS	21/22/23	32.1	14	EC/ED	R
303	GSTAR I	106.0 W	USA	HAW	21	32.1	14	EC/ED	R
304	GSTAR I	106.0 W	USA	CUS	21/22/23	33.1	14	EC/ED	R
305	GSTAR I	106.0 W	USA	CUS	21/22/23	33.1	12	EC/EK/ER	T
306	GSTAR I	106.0 W	USA	HAW	21	33.1	12	EC/EK/ER	T
307	GSTAR I	106.0 W	USA	CUS	21/22/23	34.1	12	EC/EK/ER	T
308	ATS-5	105.0 W	USA	G	14/21/22/23/24/32	22.0	0	ED	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
309	ATS-5	105.0 W	USA	G	14/21/22/23/24/32	-5.0	0	ER	T
310	ATS-5	105.0 W	USA	G	14/21/22/23/24/32	0.0	0	EH	T
311	ATS-5	105.0 W	USA	G	14/21/22/23/24/32	14.0	1	EH	T
312	ANIK D-1	104.5 W	CAN	2	21/22/23	29.0	6	EC/ED	R
313	ANIK D-1	104.5 W	CAN	1	21/22/23	28.5	4	EC/EK/ER	T
314	GSTAR II	103.0 W	USA	CUS	21/22/23	32.1	14	EC/ED	R
315	GSTAR II	103.0 W	USA	HAW	21	32.1	14	EC/ED	R
316	GSTAR II	103.0 W	USA	CUS	21/22/23	33.1	14	EC/ED	R
317	GSTAR II	103.0 W	USA	CUS	21/22/23	33.1	12	EC/EK/ER	T
318	GSTAR II	103.0 W	USA	HAW	21	33.1	12	EC/EK/ER	T
319	GSTAR II	103.0 W	USA	CUS	21/22/23	34.1	12	EC/EK/ER	T
320	FLTSATCOM E PAC	100.0 W	USA	G	21/22/23/24	18.0	0	EG/EJ	R
321	FLTSATCOM E PAC	100.0 W	USA	G	21/22/23/24	18.0	8	EC	R
322	FLTSATCOM E PAC	100.0 W	USA	G	21/22/23/24	18.0	0	EG/EJ	T
323	FLTSATCOM E PAC	100.0 W	USA	G	21/22/23/24	18.0	7	EC	T
324	FLTSATCOM-A E-PAC	100.0 W	USA	G	21/22/23/24	18.0	0	EJ/EG	R
325	FLTSATCOM-A E-PAC	100.0 W	USA	G	21/22/23/24	18.0	0	EJ/EU	R
326	FLTSATCOM-A E-PAC	100.0 W	USA	G	21/22/23/24	18.0	8	EC/ED	R
327	FLTSATCOM-A E-PAC	100.0 W	USA	G	21/22/23/24	18.0	0	EG/EJ/EU	T
328	FLTSATCOM-A E-PAC	100.0 W	USA	G	21/22/23/24	18.0	7	EC/EK/ER	T
329	FLTSATCOM-B E-PAC	100.0 W	USA	G	21/22/23/24/32	18.0	44	EJ/EG	R
330	FLTSATCOM-B E-PAC	100.0 W	USA	G	21/22/23/24/32	18.0	44	EJ/EU	R
331	FLTSATCOM-B E-PAC	100.0 W	USA	S	21/22/23/24/32	34.0	44	EJ/EG	R
332	FLTSATCOM-B E-PAC	100.0 W	USA	S	21/22/23/24/32	34.0	44	EJ/EU	R
333	FLTSATCOM-B E-PAC	100.0 W	USA	G	21/22/23/24/32	18.0	20	EC/EG/EJ	T
334	FLTSATCOM-B E-PAC	100.0 W	USA	G	21/22/23/24/32	18.0	20	EU/EX	T
335	FLTSATCOM-B E-PAC	100.0 W	USA	S	21/22/23/24/32	34.0	20	EC/EG/EJ	T
336	FLTSATCOM-B E-PAC	100.0 W	USA	S	21/22/23/24/32	34.0	20	EU/EX	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
337	USRDSS CENTRAL	100.0 W	USA	CUS	21/22/23	40.0	1	EO/EQ/EU/EJ	R
338	USRDSS CENTRAL	100.0 W	USA	CUS	21/22/23	40.0	1	EF	R
339	USRDSS CENTRAL	100.0 W	USA	CUS	21/22/23	40.0	6	EC/ED/EF	R
340	USRDSS CENTRAL	100.0 W	USA	CUS	21/22/23	40.0	2	EF/EQ/EU/EJ	T
341	USRDSS CENTRAL	100.0 W	USA	CUS	21/22/23	40.0	5	EF/ER/EC/EK	T
342	USRDSS CENTRAL	100.0 W	USA	CUS	21/22/23	40.0	5	EJ	T
343	USASAT-6B	99.0 W	USA	G	21/22/23/24	2.0	14	ED	R
344	USASAT-6B	99.0 W	USA	S	22/23	37.0	14	EC	R
345	USASAT-6B	99.0 W	USA	CUS	21/22/23	36.0	14	EC	R
346	USASAT-6B	99.0 W	USA	O	21/22/23/24/32	2.0	14	ED	R
347	USASAT-6B	99.0 W	USA	S	22/23	37.0	12	EC/EK/ER	T
348	USASAT-6B	99.0 W	USA	CUS	21/22/23	35.0	12	EC/EK/ER	T
349	WESTAR-1	99.0 W	USA	CUS	21/22/23	29.0	6	EC	R
350	WESTAR-1	99.0 W	USA	HAW	21	29.0	6	EC/ED	R
351	WESTAR-1	99.0 W	USA	CUS	21/22/23	31.0	4	EC/EK/ER	T
352	WESTAR-1	99.0 W	USA	HAW	21	31.0	4	EC/EK/ER	T
353	WESTAR 4	99.0 W	USA	DOM	21/22/23	29.0	6	EC/ED	R
354	WESTAR 4	99.0 W	USA	DOM	21/22/23	29.0	4	EC/ER	T
355	USASAT 6A	97.0 W	USA	CUS	21/22/23	36.0	14	EC/ED	R
356	USASAT 6A	97.0 W	USA	CUS	21/22/23	35.0	12	EC/ER	T
357	COMSTAR D-2	95.0 W	USA	CUS	21/22/23	24.5	6	EC/ED	R
358	COMSTAR D-2	95.0 W	USA	HAW	21	24.5	6	EC/ED	R
359	COMSTAR D-2	95.0 W	USA	ALS	21	24.5	6	EC/ED	R
360	COMSTAR D-2	95.0 W	USA	PRV	22/23/24	24.5	6	EC/ED	R
361	COMSTAR D-2	95.0 W	USA	CUS	21/22/23	27.0	4	EC/EK/ER	T
362	COMSTAR D-2	95.0 W	USA	HAW	21	27.0	4	EC/EK/ER	T
363	COMSTAR D-2	95.0 W	USA	ALS	21	27.0	4	EC/EK/ER	T
364	COMSTAR D-2	95.0 W	USA	PRV	22/23/24	27.0	4	EC/EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
365	USASAT 6C	95.0 W	USA	CUS	21/22/23	36.0	14	EC/ED	R
366	USASAT 6C	95.0 W	USA	CUS	21/22/23	35.0	12	EC/ER	T
367	TELSTAR 3A	95.0 W	USA	CUS	21/22/23	24.5	6	EC/ED	R
368	TELSTAR 3A	95.0 W	USA	ALS	21	24.5	6	EC/ED	R
369	TELSTAR 3A	95.0 W	USA	HAW	21	24.5	6	EC/ED	R
370	TELSTAR 3A	95.0 W	USA	PRV	21/22/23/24	24.5	6	EC/ED	R
371	TELSTAR 3A	95.0 W	USA	CUS	21/22/23	27.0	4	EC/EK/ER	T
372	TELSTAR 3A	95.0 W	USA	ALS	21	27.0	4	EC/EK/ER	T
373	TELSTAR 3A	95.0 W	USA	HAW	21	27.0	4	EC/EK/ER	T
374	TELSTAR 3A	95.0 W	USA	PRV	21	27.0	4	EC/EK/ER	T
375	USASAT 12B	93.5 W	USA	CUS	21/22/23	31.8	6	EC/ED	R
376	USASAT 12B	93.5 W	USA	ERB	22/23	37.2	6	EC/ED	R
377	USASAT 12B	93.5 W	USA	WRB	21/22	34.5	6	EC/ED	R
378	USASAT 12B	93.5 W	USA	ALS	21	40.8	6	EC/ED	R
379	USASAT 12B	93.5 W	USA	HAW	21	45.9	6	EC/ED	R
380	USASAT 12B	93.5 W	USA	PRV	23	46.1	6	EC/ED	R
381	USASAT 12B	93.5 W	USA	CUS	21/22/23	31.8	4	ER/EC/EK	T
382	USASAT 12B	93.5 W	USA	ERB	22/23	37.2	4	ER/EC/EK	T
383	USASAT 12B	93.5 W	USA	WRB	21/22	34.5	4	ER/EC/EK	T
384	USASAT 12B	93.5 W	USA	ALS	21	40.8	4	ER/EC/EK	T
385	USASAT 12B	93.5 W	USA	HAW	21	45.9	4	ER/EC/EK	T
386	USASAT 12B	93.5 W	USA	PRV	23	46.1	4	ER/EC/EK	T
387	WESTAR-3	91.0 W	USA	CUS	21/22/23	29.0	6	EC/ED	R
388	WESTAR-3	91.0 W	USA	HAW	21	29.0	6	EC/ED	R
389	WESTAR-3	91.0 W	USA	CUS	21/22/23	31.0	4	EC/EK/ER	T
390	WESTAR-3	91.0 W	USA	HAW	21	31.0	4	EC/EK/ER	T
391	ADV. WESTAR I	91.0 W	USA	CUS	21/22/23	27.0	6	EC/ED	R
392	ADV. WESTAR I	91.0 W	USA	EB	22/23	40.8	14	EC/ED	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
393	ADV. WESTAR I	91.0 W	USA	CB	22	41.7	14	EC/ED	R
394	ADV. WESTAR I	91.0 W	USA	WB	21/22	36.2	14	EC/ED	R
395	ADV. WESTAR I	91.0 W	USA	ESB	22/23	43.7	14	EC/ED	R
396	ADV. WESTAR I	91.0 W	USA	ESB	23	43.7	14	EC/ED	R
397	ADV. WESTAR I	91.0 W	USA	LAM	21/22	53.8	14	EC/ED	R
398	ADV. WESTAR I	91.0 W	USA	SFM	21	53.8	14	EC/ED	R
399	ADV. WESTAR I	91.0 W	USA	CUS	21/22/23	29.0	4	EC/EK/ER	T
400	ADV. WESTAR I	91.0 W	USA	EB	22/23	40.5	12	EC/EK/ER	T
401	ADV. WESTAR I	91.0 W	USA	CB	22	41.0	12	EC/EK/ER	T
402	ADV. WESTAR I	91.0 W	USA	WB	21/22	36.2	12	EC/EK/ER	T
403	ADV. WESTAR I	91.0 W	USA	ESB	22/23	43.0	12	EC/EK/ER	T
404	ADV. WESTAR I	91.0 W	USA	ESB	23	43.0	12	EC/EK/ER	T
405	ADV. WESTAR I	91.0 W	USA	LAM	21/22	53.0	12	EC/EK/ER	T
406	ADV. WESTAR I	91.0 W	USA	SFM	21	53.0	12	EC/EK/ER	T
407	CONDOR-B	89.0 W	EQACR	M6	24	33.4	6	EC	R
408	CONDOR-B	89.0 W	EQACR	T6	24	33.4	6	EK/ER	R
409	CONDOR-B	89.0 W	EQACR	M4	24	31.4	4	EC	T
410	CONDOR-B	89.0 W	EQACR	T4	24	31.4	4	EK/ER	T
411	USASAT 9A	89.0 W	USA	CUS	21/22/23	31.9	14	EC/ED	R
412	USASAT 9A	89.0 W	USA	ERB	22/23	37.1	14	EC/ED	R
413	USASAT 9A	89.0 W	USA	WRB	21/22	34.7	14	EC/ED	R
414	USASAT 9A	89.0 W	USA	ALS	21	40.5	14	EC/ED	R
415	USASAT 9A	89.0 W	USA	HAW	21	45.6	14	EC/ED	R
416	USASAT 9A	89.0 W	USA	PRV	23	46.0	14	EC/ED	R
417	USASAT 9A	89.0 W	USA	CUS	21/22/23	31.9	12	EC/EK/ER	T
418	USASAT 9A	89.0 W	USA	ERB	22/23	37.1	12	EC/EK/ER	T
419	USASAT 9A	89.0 W	USA	WRB	21/22	34.7	12	EC/EK/ER	T
420	USASAT 9A	89.0 W	USA	ALS	21	40.5	12	EC/EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
421	USASAT 9A	89.0 W	USA	HAW	21	45.6	12	EC/EK/ER	T
422	USASAT 9A	89.0 W	USA	PRV	23	46.0	12	EC/EK/ER	T
423	USASAT 12D	88.5 W	USA	CUS	21/22/23	31.9	6	EC/ED	R
424	USASAT 12D	88.5 W	USA	ERB	22/23	37.1	6	EC/ED	R
425	USASAT 12D	88.5 W	USA	WRB	21/22	34.7	6	EC/ED	R
426	USASAT 12D	88.5 W	USA	ALS	21	40.5	6	EC/ED	R
427	USASAT 12D	88.5 W	USA	HAW	21	45.6	6	EC/ED	R
428	USASAT 12D	88.5 W	USA	PRV	23	46.0	6	EC/ED	R
429	USASAT 12D	88.5 W	USA	CUS	21/22/23	31.9	4	ER/EC/EK	T
430	USASAT 12D	88.5 W	USA	ERB	22/23	37.1	4	ER/EC/EK	T
431	USASAT 12D	88.5 W	USA	WRB	21/22	34.7	4	ER/EC/EK	T
432	USASAT 12D	88.5 W	USA	ALS	21	40.5	4	ER/EC/EK	T
433	USASAT 12D	88.5 W	USA	HAW	21	45.6	4	ER/EC/EK	T
434	USASAT 12D	88.5 W	USA	PRV	23	46.0	4	ER/EC/EK	T
435	COMSTAR D-3	87.0 W	USA	CUS	21/22/23	24.5	6	EC/ED	R
436	COMSTAR D-3	87.0 W	USA	HAW	21	24.5	6	EC/ED	R
437	COMSTAR D-3	87.0 W	USA	ALS	21	24.5	6	EC/ED	R
438	COMSTAR D-3	87.0 W	USA	PRV	22/23/24	24.5	6	EC/ED	R
439	COMSTAR D-3	87.0 W	USA	CUS	21/22/23	27.0	4	EC/EK/ER	T
440	COMSTAR D-3	87.0 W	USA	HAW	21	27.0	4	EC/EK/ER	T
441	COMSTAR D-3	87.0 W	USA	ALS	21	27.0	4	EC/EK/ER	T
442	COMSTAR D-3	87.0 W	USA	PRV	22/23/24	27.0	4	EC/EK/ER	T
443	TELSTAR 3B	87.0 W	USA	CUS	21/22/23	24.5	6	EC/ED	R
444	TELSTAR 3B	87.0 W	USA	HAW	21	24.5	6	EC/ED	R
445	TELSTAR 3B	87.0 W	USA	PRV	22/23/24	24.5	6	EC/ED	R
446	TELSTAR 3B	87.0 W	USA	CUS	21/22/23	27.0	4	EC/EK/ER	T
447	TELSTAR 3B	87.0 W	USA	HAW	21	27.0	4	EC/EK/ER	T
448	TELSTAR 3B	87.0 W	USA	PRV	22/23/24	27.0	4	EC/EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
449	USASAT 9B	87.0 W	USA	CUS	21/22/23	31.9	14	EC/ED	R
450	USASAT 9B	87.0 W	USA	ERB	22/23	37.0	14	EC/ED	R
451	USASAT 9B	87.0 W	USA	ERB	21/22	34.8	14	EC/ED	R
452	USASAT 9B	87.0 W	USA	ALS	21	40.2	14	EC/ED	R
453	USASAT 9B	87.0 W	USA	HAW	21	45.5	14	EC/ED	R
454	USASAT 9B	87.0 W	USA	PRV	23	46.0	14	EC/ED	R
455	USASAT 9B	87.0 W	USA	CUS	21/22/23	31.9	12	EC/EK/ER	T
456	USASAT 9B	87.0 W	USA	ERB	22/23	37.0	12	EC/EK/ER	T
457	USASAT 9B	87.0 W	USA	WRB	21/22	34.8	12	EC/EK/ER	T
458	USASAT 9B	87.0 W	USA	ALS	21	40.2	12	EC/EK/ER	T
459	USASAT 9B	87.0 W	USA	HAW	21	45.5	12	EC/EK/ER	T
460	USASAT 9B	87.0 W	USA	PRV	23	46.0	12	EC/EK/ER	T
461	ATS-3	86.0 W	USA		14/21/22/23/24/32	-5.0	0	ED	R
462	ATS-3	86.0 W	USA	G	14/21/22/23/24/32	8.0	0	EH	R
463	ATS-3	86.0 W	USA	G	14/21/22/23/24/32	-5.0	0	EH/ER	T
464	ATS-3	86.0 W	USA	G	14/21/22/23/24/32	0.0	0	EH	T
465	ATS-3	86.0 W	USA	G	14/21/22/23/24/32	8.0	0	EH	T
466	USASAT 3C	86.0 W	USA	CUS	21/22/23	29.0	6	EC/ED	R
467	USASAT 3C	86.0 W	USA	CUS	21/22/23	28.0	4	EC/ER	T
468	NAHUEL 2	85.0 W	ARG	N6	24	30.5	6	ED/ER/EK/EC	R
469	NAHUEL 2	85.0 W	ARG	N14	24	37.2	14	ED/ER/EK/EC	R
470	NAHUEL 2	85.0 W	ARG	N4	24	34.2	4	ED/ER/EK/EC	T
471	NAHUEL 2	85.0 W	ARG	N12	24	38.7	12	ED/ER/EK/EC	T
472	USASAT 9C	85.0 W	USA	CUS	21/22/23	32.0	14	EC/ED	R
473	USASAT 9C	85.0 W	USA	ERB	22/23	37.0	14	EC/ED	R
474	USASAT 9C	85.0 W	USA	WRB	21/22	34.8	14	EC/ED	R
475	USASAT 9C	85.0 W	USA	ALS	21	40.1	14	EC/ED	R
476	USASAT 9C	85.0 W	USA	HAW	21	44.9	14	EC/ED	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
477	USASAT 9C	85.0 W	USA	PRV	23	45.9	14	EC/ED	R
478	USASAT 9C	85.0 W	USA	CUS	21/22/23	32.0	12	EC/EK/ER	T
479	USASAT 9C	85.0 W	USA	ERB	22/23	37.0	12	EC/EK/ER	T
480	USASAT 9C	85.0 W	USA	WRB	21/22	34.8	12	EC/EK/ER	T
481	USASAT 9C	85.0 W	USA	ALS	21	40.1	12	EC/EK/ER	T
482	USASAT 9C	85.0 W	USA	HAW	21	44.9	12	EC/EK/ER	T
483	USASAT 9C	85.0 W	USA	PRV	23	45.9	12	EC/EK/ER	T
484	USASAT-7B	83.0 W	USA	CUS	22/23	31.8	6	EC/ED	R
485	USASAT-7B	83.0 W	USA	CON	21/22/23	30.0	4	EC/ER	T
486	STSC-1	83.0 W	CUB	275	22/23/24	27.5	6	EC	R
487	STSC-1	83.0 W	CUB	261	22/23/24	26.1	4	EC	T
488	USASAT 9D	83.0 W	USA	CUS	21/22/23	32.2	14	EC/ED	R
489	USASAT 9D	83.0 W	USA	ERB	22/23	37.0	14	EC/ED	R
490	USASAT 9D	83.0 W	USA	WRB	21/22	35.0	14	EC/ED	R
491	USASAT 9D	83.0 W	USA	ALS	21	40.3	14	EC/ED	R
492	USASAT 9D	83.0 W	USA	HAW	21	45.1	14	EC/ED	R
493	USASAT 9D	83.0 W	USA	PRV	23	45.9	14	EC/ED	R
494	USASAT 9D	83.0 W	USA	CUS	21/22/23	32.2	12	EC/EK/ER	T
495	USASAT 9D	83.0 W	USA	ERB	22/23	37.0	12	EC/EK/ER	T
496	USASAT 9D	83.0 W	USA	WRB	21/22	35.0	12	EC/EK/ER	T
497	USASAT 9D	83.0 W	USA	ALS	21	40.3	12	EC/EK/ER	T
498	USASAT 9D	83.0 W	USA	HAW	21	45.1	12	EC/EK/ER	T
499	USASAT 9D	83.0 W	USA	PRV	23	45.9	12	EC/EK/ER	T
500	USASAT 7D	81.0 W	USA	CUS	21/22/23	30.4	6	EC/ED	R
501	USASAT 7D	81.0 W	USA	CUS	21/22/23	31.7	14	EC	R
502	USASAT 7D	81.0 W	USA	CUS	21/22/23	29.3	4	EC/ER	T
503	USASAT 7D	81.0 W	USA	CUS	21/22/23	34.1	12	EC	T
504	NAHUEL 1	80.0 W	ARG	N6	24	30.2	6	ED/ER/EK/EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
505	NAHUEL 1	80.0 W	ARG	N14	24	36.8	14	ED/ER/EK/EC	R
506	NAHUEL 1	80.0 W	ARG	N4	24	33.9	4	ED/ER/EK/EC	T
507	NAHUEL 1	80.0 W	ARG	N12	24	38.3	12	ED/ER/EK/EC	T
508	USASAT 11A	79.0 W	USA	CUS	21/22/23	32.2	14	EC/ED	R
509	USASAT 11A	79.0 W	USA	ERB	22/23	37.0	14	EC/ED	R
510	USASAT 11A	79.0 W	USA	WRB	21/22	35.2	14	EC/ED	R
511	USASAT 11A	79.0 W	USA	ALS	21	40.2	14	EC/ED	R
512	USASAT 11A	79.0 W	USA	PRV	23	45.8	14	EC/ED	R
513	USASAT 11A	79.0 W	USA	CUS	21/22/23	32.2	12	EC/EK/ER	T
514	USASAT 11A	79.0 W	USA	ERB	22/23	37.0	12	EC/EK/ER	T
515	USASAT 11A	79.0 W	USA	WRB	21/22	35.2	12	EC/EK/ER	T
516	USASAT 11A	79.0 W	USA	ALS	21	40.2	12	EC/EK/ER	T
517	USASAT 11A	79.0 W	USA	PRV	23	45.8	12	EC/EK/ER	T
518	USASAT 12A	79.0 W	USA	CUS	21/22/23	32.2	6	EC/ED	R
519	USASAT 12A	79.0 W	USA	ERB	22/23	37.0	6	EC/ED	R
520	USASAT 12A	79.0 W	USA	WRB	21/22	35.2	6	EC/ED	R
521	USASAT 12A	79.0 W	USA	ALS	23	45.8	6	EC/ED	R
522	USASAT 12A	79.0 W	USA	CUS	21/22/23	32.2	4	ER/EC/EK	T
523	USASAT 12A	79.0 W	USA	ERB	22/23	37.0	4	ER/EC/EK	T
524	USASAT 12A	79.0 W	USA	WRB	21/22	35.2	4	ER/EC/EK	T
525	USASAT 12A	79.0 W	USA	PRV	23	45.8	4	ER/EC/EK	T
526	CONDOR-A	77.5 W	EQACR	M6	24	33.4	6	EC	R
527	CONDOR-A	77.5 W	EQACR	T6	24	33.4	6	EK/ER	R
528	CONDOR-A	77.5 W	EQACR	M4	24	31.4	4	EC	T
529	CONDOR-A	77.5 W	EQACR	T4	24	31.4	4	EK/ER	T
530	USASAT 11B	77.0 W	USA	CUS	21/22/23	32.3	14	EC/ED	R
531	USASAT 11B	77.0 W	USA	ERB	22/23	37.0	14	EC/ED	R
532	USASAT 11B	77.0 W	USA	WRB	21/22	35.4	14	EC/ED	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
533	USASAT 11B	77.0 W	USA	ALS	21	40.5	14	EC/ED	R
534	USASAT 11B	77.0 W	USA	PRV	23	45.8	14	EC/ED	R
535	USASAT 11B	77.0 W	USA	CUS	21/22/23	32.3	12	EC/EK/ER	T
536	USASAT 11B	77.0 W	USA	ERB	22/23	37.0	12	EC/EK/ER	T
537	USASAT 11B	77.0 W	USA	WRB	21/22	35.4	12	EC/EK/ER	T
538	USASAT 11B	77.0 W	USA	ALS	21	40.5	12	EC/EK/ER	T
539	USASAT 11B	77.0 W	USA	PRV	23	45.8	12	EC/EK/ER	T
540	USASAT 12C	76.0 W	USA	CUS	21/22/23	32.3	6	EC/ED	R
541	USASAT 12C	76.0 W	USA	ERB	22/23	37.0	6	EC/ED	R
542	USASAT 12C	76.0 W	USA	WRB	21/22	35.4	6	EC/ED	R
543	USASAT 12C	76.0 W	USA	PRV	23	45.8	6	EC/ED	R
544	USASAT 12C	76.0 W	USA	CUS	21/22/23	32.3	4	ER/EC/EK	T
545	USASAT 12C	76.0 W	USA	ERB	22/23	37.0	4	ER/EC/EK	T
546	USASAT 12C	76.0 W	USA	WRB	21/22	35.4	4	ER/EC/EK	T
547	USASAT 12C	76.0 W	USA	PRV	23	45.8	4	ER/EC/EK	T
548	SATCOL-1A	75.4 W	CLM	350	22/23/24	35.0	6	EC/ED	R
549	SATCOL-1A	75.4 W	CLM	323	22/23/24	32.3	4	EC/ER	T
550	SATCOL-1B	75.4 W	CLM	350	22/23/24	35.0	6	EC/ED	R
551	SATCOL-1B	75.4 W	CLM	323	22/23/24	32.3	4	EC/ER	T
552	GOES EAST	75.0 W	USA	G	11/14/21/22/23/24/32	5.0	0	EM	R
553	GOES EAST	75.0 W	USA	G	11/14/21/22/23/24/32	16.0	2	EM	R
554	GOES EAST	75.0 W	USA	G	11/14/21/22/23/24/32	5.0	0	EM	T
555	GOES EAST	75.0 W	USA	G	11/14/21/22/23/24/32	19.0	1	EM	T
556	SATCOL-2	75.0 W	CLM	350	22/23/24	35.0	6	EC/ED	R
557	SATCOL-2	75.0 W	CLM	323	22/23/24	32.3	4	EC/ER	T
558	USASAT 8B	72.0 W	USA	CUS	21/22/23	30.5	6	EC/ED	R
559	USASAT 8B	72.0 W	USA	CUS	21/22/23	28.7	4	EC/ER	T
560	CONDOR-C	72.0 W	EQACR	M6	24	33.4	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
561	CONDOR-C	72.0 W	EQACR	T6	24	33.4	6	EK/ED	R
562	CONDOR-C	72.0 W	EQACR	M4	24	31.4	4	EC	T
563	CONDOR-C	72.0 W	EQACR	T4	24	31.4	4	EK/ER	T
564	SBTS A1	70.0 W	B	6H	24	32.2	6	EC/ED/EK	R
565	SBTS A1	70.0 W	B	6V	24	32.2	6	EC	R
566	SBTS A1	70.0 W	B	4H	24	30.8	4	EC	T
567	SBTS A1	70.0 W	B	4V	24	30.8	4	EC/ER	T
568	FLTSATCOM-B W-ATL	70.0 W	USA	G	11/14/21/22/23/24/32	18.0	44	EJ/EG	R
569	FLTSATCOM-B W-ATL	70.0 W	USA	G	11/14/21/22/23/24/32	18.0	44	EJ/EU	R
570	FLTSATCOM-B W-ATL	70.0 W	USA	S	11/14/21/22/23/24/32	34.0	44	EJ/EG	R
571	FLTSATCOM-B W-ATL	70.0 W	USA	S	11/14/21/22/23/24/32	34.0	44	EJ/EU	R
572	FLTSATCOM-B W-ATL	70.0 W	USA	G	11/14/21/22/23/24/32	18.0	20	EC/EG/EJ	T
573	FLTSATCOM-B W-ATL	70.0 W	USA	G	11/14/21/22/23/24/32	18.0	20	EU/EX	T
574	FLTSATCOM-B W-ATL	70.0 W	USA	S	11/14/21/22/23/24/32	34.0	20	EC/EG/EJ	T
575	FLTSATCOM-B W-ATL	70.0 W	USA	S	11/14/21/22/23/24/32	34.0	20	EU/EX	T
576	USASAT 7C	70.0 W	USA	CUS	21/22/23	31.0	6	EC/ED	R
577	USASAT 7C	70.0 W	USA	CUS	21/22/23	30.0	14	EC/ED	R
578	USASAT 7C	70.0 W	USA	CUS	21/22/23	31.0	4	EC/EK/ER	T
579	USASAT 7C	70.0 W	USA	CUS	21/22/23	30.0	12	EC/EK/ER	T
580	USRDSS EAST	70.0 W	USA	CUS	21/22/23	40.0	1	EO/EQ/EU/EJ	R
581	USRDSS EAST	70.0 W	USA	CUS	21/22/23	40.0	1	EF	R
582	USRDSS EAST	70.0 W	USA	CUS	21/22/23	29.0	6	EC/ED/EF	R
583	USRDSS EAST	70.0 W	USA	CUS	21/22/23	40.0	2	EF/EQ/EU/EJ	T
584	USRDSS EAST	70.0 W	USA	CUS	21/22/23	29.0	5	EF/ER/EC/EK	T
585	USRDSS EAST	70.0 W	USA	CUS	21/22/23	29.0	5	EJ	T
586	USASAT 8A	67.0 W	USA	CUS	21/22/23	31.8	6	EC/ED	R
587	USASAT 8A	67.0 W	USA	CUS	21/22/23	36.0	4	EC/ER	T
588	USASAT 15D	66.0 W	USA	CUS	21/22/23	33.3	14	EC/ED	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
589	USASAT 15D	66.0 W	USA	ERB	22/23	37.3	14	EC/ED	R
590	USASAT 15D	66.0 W	USA	WRB	21/22	36.7	14	EC/ED	R
591	USASAT 15D	66.0 W	USA	OSB	23	45.8	14	EC/ED	R
592	USASAT 15D	66.0 W	USA	USA	21/22/23	33.3	12	EC/ER/EK	T
593	USASAT 15D	66.0 W	USA	ERB	22/23	37.3	12	EC/ER/EK	T
594	USASAT 15D	66.0 W	USA	WRB	21/22	36.7	12	EC/ER/EK	T
595	USASAT 15D	66.0 W	USA	OSB	23	45.8	12	EC/ER/EK	T
596	SBTS A2	65.0 W	B	6H	24	32.2	6	EC/ED/EK	R
597	SBTS A2	65.0 W	B	6V	24	32.2	6	EC	R
598	SBTS A2	65.0 W	B	4H	24	30.8	4	EC	T
599	SBTS A2	65.0 W	B	4V	24	30.8	4	EC/ER	T
600	USASAT 15C	64.0 W	USA	CUS	21/22/23	33.3	14	EC/ED	R
601	USASAT 15C	64.0 W	USA	ERB	22/23	37.3	14	EC/ED	R
602	USASAT 15C	64.0 W	USA	WRB	21/22	36.7	14	EC/ED	R
603	USASAT 15C	64.0 W	USA	OSB	23	45.8	14	EC/ED	R
604	USASAT 15C	64.0 W	USA	CUS	21/22/23	33.3	12	EC/ER/EK	T
605	USASAT 15C	64.0 W	USA	ERB	22/23	37.3	12	EC/ER/EK	T
606	USASAT 15C	64.0 W	USA	WRB	21/22	36.7	12	EC/ER/EK	T
607	USASAT 15C	64.0 W	USA	OSB	23	45.8	12	EC/ER/EK	T
608	USASAT 14D	63.0 W	USA	CUS	21/22/23	33.3	6	EC/ED	R
609	USASAT 14D	63.0 W	USA	ERB	22/23	37.3	6	EC/ED	R
610	USASAT 14D	63.0 W	USA	WRB	21/22	36.7	6	EC/ED	R
611	USASAT 14D	63.0 W	USA	OSB	23	45.8	6	EC/ED	R
612	USASAT 14D	63.0 W	USA	CUS	21/22/23	33.3	4	EC/ER/EK	T
613	USASAT 14D	63.0 W	USA	ERB	22/23	37.3	4	EC/ER/EK	T
614	USASAT 14D	63.0 W	USA	WRB	21/22	36.7	4	EC/ER/EK	T
615	USASAT 14D	63.0 W	USA	OSB	23	45.8	4	EC/ER/EK	T
616	USASAT 15B	62.0 W	USA	CUS	21/22/23	33.3	14	EC/ED	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
617	USASAT 15B	62.0 W	USA	ERB	22/23	37.3	14	EC/ED	R
618	USASAT 15B	62.0 W	USA	WRB	21/22	36.7	14	EC/ED	R
619	USASAT 15B	62.0 W	USA	OSB	23	45.8	14	EC/ED	R
620	USASAT 15B	62.0 W	USA	CUS	21/22/23	33.3	12	EC/ER/EK	T
621	USASAT 15B	62.0 W	USA	ERB	22/23	37.3	12	EC/ER/EK	T
622	USASAT 15B	62.0 W	USA	WRB	21/22	36.7	12	EC/ER/EK	T
623	USASAT 15B	62.0 W	USA	OSB	23	45.8	12	EC/ER/EK	T
624	USASAT 8B	62.0 W	USA	CUS	21/22/23	32.7	6	EC/ED	R
625	USASAT 8B	62.0 W	USA	CUS	21/22/23	31.3	4	ER/EC/EK	T
626	USASAT 14C	61.0 W	USA	CUS	21/22/23	33.7	6	EC/ED	R
627	USASAT 14C	61.0 W	USA	ERB	22/23	37.5	6	EC/ED	R
628	USASAT 14C	61.0 W	USA	WRB	21/22	37.1	6	EC/ED/	R
629	USASAT 14C	61.0 W	USA	OSB	23	45.8	6	EC/ED	R
630	USASAT 14C	61.0 W	USA	CUS	21/22/23	33.7	4	EC/ER/EK	T
631	USASAT 14C	61.0 W	USA	ERB	22/23	37.5	4	EC/ER/EK	T
632	USASAT 14C	61.0 W	USA	WRB	21/22	37.1	4	EC/ER/EK	T
633	USASAT 14C	61.0 W	USA	OSB	23	45.8	4	EC/ER/EK	T
634	INTELSAT IBS 300E	60.0 W	USAIT	EH	11/14/24	24.6	6	EC	R
635	INTELSAT IBS 300E	60.0 W	USAIT	WH	21/22/23/24	24.2	6	EC	R
636	INTELSAT IBS 300E	60.0 W	USAIT	EZ	14	29.0	6	EC	R
637	INTELSAT IBS 300E	60.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R
638	INTELSAT IBS 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	6	EC	R
639	INTELSAT IBS 300E	60.0 W	USAIT	ESR	11	36.7	14	EC	R
640	INTELSAT IBS 300E	60.0 W	USAIT	WSR	21/22	36.7	14	EC	R
641	INTELSAT IBS 300E	60.0 W	USAIT	EH	11/14/24	24.6	4	EC	T
642	INTELSAT IBS 300E	60.0 W	USAIT	WH	21/22/23/24	24.2	4	EC	T
643	INTELSAT IBS 300E	60.0 W	USAIT	EZ	14	29.0	4	EC	T
644	INTELSAT IBS 300E	60.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
645	INTELSAT IBS 300E	60.0 W	USAIT	ESR	11	36.7	11	EC/EK	T
646	INTELSAT IBS 300E	60.0 W	USAIT	ESR	11	36.7	12	EC/EK	T
647	INTELSAT IBS 300E	60.0 W	USAIT	WSR	21/22	36.7	11	EC/EK	T
648	INTELSAT IBS 300E	60.0 W	USAIT	WSR	21/22	36.7	12	EC/EK	T
649	INTELSAT IBS 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	4	EC	T
650	INTELSAT5A 300E	60.0 W	USAIT	O	11/14/22/23/24	2.0	6	EK/ER	R
651	INTELSAT5A 300E	60.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
652	INTELSAT5A 300E	60.0 W	USAIT	EH	11/14/24	24.6	6	EC	R
653	INTELSAT5A 300E	60.0 W	USAIT	WH	22/23/24	24.2	6	EC	R
654	INTELSAT5A 300E	60.0 W	USAIT	EZ	11/14	29.0	6	EC	R
655	INTELSAT5A 300E	60.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R
656	INTELSAT5A 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	6	EC	R
657	INTELSAT5A 300E	60.0 W	USAIT	ESR	11	36.7	14	EC	R
658	INTELSAT5A 300E	60.0 W	USAIT	WSR	22/23	40.0	14	EC	R
659	INTELSAT5A 300E	60.0 W	USAIT	HTM	11/14/22/23/24	14.0	4	EK/ER	T
660	INTELSAT5A 300E	60.0 W	USAIT	BCN	11/14/22/23/24	19.0	11	EK	T
661	INTELSAT5A 300E	60.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
662	INTELSAT5A 300E	60.0 W	USAIT	EH	11/14/24	24.6	4	EC	T
663	INTELSAT5A 300E	60.0 W	USAIT	WH	22/23/24	24.2	4	EC	T
664	INTELSAT5A 300E	60.0 W	USAIT	EZ	11/14	29.0	4	EC	T
665	INTELSAT5A 300E	60.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T
666	INTELSAT5A 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	4	EC	T
667	INTELSAT5A 300E	60.0 W	USAIT	4SR	24	30.0	4	EC	T
668	INTELSAT5A 300E	60.0 W	USAIT	ESR	11	36.7	11	EC	T
669	INTELSAT5A 300E	60.0 W	USAIT	WSR	22/23	40.0	11	EC	T
670	USASAT 15A	60.0 W	USA	CUS	21/22/23	33.7	14	EC/ED	R
671	USASAT 15A	60.0 W	USA	ERB	22/23	37.5	14	EC/ED	R
672	USASAT 15A	60.0 W	USA	WRB	21/22	37.1	14	EC/ED	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
673	USASAT 15A	60.0 W	USA	OSB	23	45.8	14	EC/ED	R
674	USASAT 15A	60.0 W	USA	CUS	21/22/23	33.7	12	EC/ER/EK	T
675	USASAT 15A	60.0 W	USA	ERB	22/23	37.5	12	EC/ER/EK	T
676	USASAT 15A	60.0 W	USA	WRB	21/22	37.1	12	EC/ER/EK	T
677	USASAT 15A	60.0 W	USA	OSB	23	45.8	12	EC/ER/EK	T
678	USASAT 13E	58.0 W	USA	EWH	11	39.0	14	EC	R
679	USASAT 13E	58.0 W	USA	EWV	11	38.7	14	EC	R
680	USASAT 13E	58.0 W	USA	WEH	22/23	35.8	14	EC	R
681	USASAT 13E	58.0 W	USA	WEV	22/23	35.5	14	EC	R
682	USASAT 13E	58.0 W	USA	EH	11	38.9	11	EC	T
683	USASAT 13E	58.0 W	USA	EH	11	38.9	12	EC	T
684	USASAT 13E	58.0 W	USA	EV	11	39.0	11	EC	T
685	USASAT 13E	58.0 W	USA	EV	11	39.0	12	EC	T
686	USASAT 13E	58.0 W	USA	WH	22/23	35.2	12	EC	T
687	USASAT 13E	58.0 W	USA	WV	22/23	35.2	12	EC	T
688	USASAT 8C	58.0 W	USA	CUS	21/22/23	57.7	6	EC/ED	R
689	USASAT 8C	58.0 W	USA	CUS	21/22/23	54.7	4	ER/EC/EK	T
690	USASAT-13H	57.0 W	USA	UPL	11/22/23/24	25.9	6	EC/ED	R
691	USASAT-13H	57.0 W	USA	CRB	22/23/24	33.0	4	EC/EK/ER	T
692	USASAT-13H	57.0 W	USA	W	22/24	32.0	4	EC/EK/ER	T
693	USASAT-13H	57.0 W	USA	S	24	32.0	4	EC/EK/ER	T
694	USASAT-13H	57.0 W	USA	MS	22/23/24	30.0	4	EC/EK/ER	T
695	USASAT-13H	57.0 W	USA	NMC	22/23	33.0	11	EC/EK/ER	T
696	USASAT-13H	57.0 W	USA	CTL	24	27.0	11	EC/EK/ER	T
697	INTELSAT IBS 304E	56.0 W	USAIT	EH	11/14	24.6	6	EC	R
698	INTELSAT IBS 304E	56.0 W	USAIT	WH	21/22/23/24	24.2	6	EC	R
699	INTELSAT IBS 304E	56.0 W	USAIT	EZ	14	29.0	6	EC	R
700	INTELSAT IBS 304E	56.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
701	INTELSAT IBS 304E	56.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
702	INTELSAT IBS 304E	56.0 W	USAIT	ESR	11	36.7	14	EC	R
703	INTELSAT IBS 304E	56.0 W	USAIT	WSR	21/22	36.7	14	EC	R
704	INTELSAT IBS 304E	56.0 W	USAIT	EH	11/14	24.6	4	EC	T
705	INTELSAT IBS 304E	56.0 W	USAIT	WH	21/22/23/24	24.2	4	EC	T
706	INTELSAT IBS 304E	56.0 W	USAIT	EZ	14	29.0	4	EC	T
707	INTELSAT IBS 304E	56.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T
708	INTELSAT IBS 304E	56.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
709	INTELSAT IBS 304E	56.0 W	USAIT	ESR	11	36.7	11	EC/EK	T
710	INTELSAT IBS 304E	56.0 W	USAIT	ESR	11	36.7	12	EC/EK	T
711	INTELSAT IBS 304E	56.0 W	USAIT	WSR	21/22	36.7	11	EC/EK	T
712	INTELSAT IBS 304E	56.0 W	USAIT	WSR	21/22	36.7	12	EC/EK	T
713	INTELSAT5A 304E	56.0 W	USAIT	O	11/14/22/23/24	2.0	6	EK/ER	R
714	INTELSAT5A 304E	56.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
715	INTELSAT5A 304E	56.0 W	USAIT	EH	11/14	24.6	6	EC	R
716	INTELSAT5A 304E	56.0 W	USAIT	WH	22/23/24	24.2	6	EC	R
717	INTELSAT5A 304E	56.0 W	USAIT	EZ	11/14	29.0	6	EC	R
718	INTELSAT5A 304E	56.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R
719	INTELSAT5A 304E	56.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
720	INTELSAT5A 304E	56.0 W	USAIT	ESR	11	36.7	14	EC	R
721	INTELSAT5A 304E	56.0 W	USAIT	WSR	22/23	40.0	14	EC	R
722	INTELSAT5A 304E	56.0 W	USAIT	HTM	11/14/22/23/24	14.0	4	EK/ER	T
723	INTELSAT5A 304E	56.0 W	USAIT	BCN	11/14/22/23/24	19.0	11	EK	T
724	INTELSAT5A 304E	56.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
725	INTELSAT5A 304E	56.0 W	USAIT	EH	11/14	24.6	4	EC	T
726	INTELSAT5A 304E	56.0 W	USAIT	WH	22/23/24	24.2	4	EC	T
727	INTELSAT5A 304E	56.0 W	USAIT	EZ	11/14	29.0	4	EC	T
728	INTELSAT5A 304E	56.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
729	INTELSAT5A 304E	56.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
730	INTELSAT5A 304E	56.0 W	USAIT	4SR	24	30.0	4	EC	T
731	INTELSAT5A 304E	56.0 W	USAIT	ESR	11	36.7	11	EC	T
732	INTELSAT5A 304E	56.0 W	USAIT	WSR	22/23	40.0	11	EC	T
733	USASAT 13D	56.0 W	USA	EWH	11	39.0	14	EC	R
734	USASAT 13D	56.0 W	USA	EWV	11	38.7	14	EC	R
735	USASAT 13D	56.0 W	USA	WEH	22/23	35.8	14	EC	R
736	USASAT 13D	56.0 W	USA	WEV	22/23	35.5	14	EC	R
737	USASAT 13D	56.0 W	USA	EH	11	38.9	11	EC	T
738	USASAT 13D	56.0 W	USA	EH	11	38.9	12	EC	T
739	USASAT 13D	56.0 W	USA	EV	11	39.0	11	EC	T
740	USASAT 13D	56.0 W	USA	EV	11	39.0	12	EC	T
741	USASAT 13D	56.0 W	USA	WH	22/23	35.2	12	EC	T
742	USASAT 13D	56.0 W	USA	WV	22/23	35.2	12	EC	T
743	USASAT 14B	55.0 W	USA	CUS	21/22/23	34.1	6	EC/ED	R
744	USASAT 14B	55.0 W	USA	ERB	22/23	37.7	6	EC/ED	R
745	USASAT 14B	55.0 W	USA	WRB	21/22	37.7	6	EC/ED	R
746	USASAT 14B	55.0 W	USA	OSB	23	45.9	6	EC/ED	R
747	USASAT 14B	55.0 W	USA	CUS	21/22/23	34.1	4	EC/ER/EK	T
748	USASAT 14B	55.0 W	USA	ERB	22/23	37.7	4	EC/ER/EK	T
749	USASAT 14B	55.0 W	USA	WRB	21/22	37.7	4	EC/ER/EK	T
750	USASAT 14B	55.0 W	USA	OSB	23	45.9	4	EC/ER/EK	T
751	INTELSAT4A ATL3	53.0 W	USAIT	EH	11/14/24	24.8	6	EC	R
752	INTELSAT4A ATL3	53.0 W	USAIT	G	11/14/21/22/23/24	21.0	6	EC	R
753	INTELSAT4A ATL3	53.0 W	USAIT	H	11/14/21/22/23/24	14.0	6	ED/EK	R
754	INTELSAT4A ATL3	53.0 W	USAIT	WH	22/23/24	25.2	6	EC	R
755	INTELSAT4A ATL3	53.0 W	USAIT	EH	11/14/24	29.3	4	EC	T
756	INTELSAT4A ATL3	53.0 W	USAIT	G	11/14/21/22/23/24	21.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
757	INTELSAT4A ATL3	53.0 W	USAIT	H	11/14/21/22/23/24	14.0	4	EK/ER	T
758	INTELSAT4A ATL3	53.0 W	USAIT	NEQ	11/14/23	29.1	4	EC	T
759	INTELSAT4A ATL3	53.0 W	USAIT	NWQ	22/23/24	27.5	4	EC	T
760	INTELSAT4A ATL3	53.0 W	USAIT	SEQ	14/24	27.8	4	EC	T
761	INTELSAT4A ATL3	53.0 W	USAIT	SWQ	24	30.0	4	EC	T
762	INTELSAT4A ATL3	53.0 W	USAIT	WH	22/23/24	29.3	4	EC	T
763	INTELSAT IBS 307E	53.0 W	USAIT	EH	11/14	24.6	6	EC	R
764	INTELSAT IBS 307E	53.0 W	USAIT	WH	22/23/24	24.2	6	EC	R
765	INTELSAT IBS 307E	53.0 W	USAIT	EZ	14	29.0	6	EC	R
766	INTELSAT IBS 307E	53.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R
767	INTELSAT IBS 307E	53.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
768	INTELSAT IBS 307E	53.0 W	USAIT	ESR	11	36.7	14	EC	R
769	INTELSAT IBS 307E	53.0 W	USAIT	WSR	21/22	36.7	14	EC	R
770	INTELSAT IBS 307E	53.0 W	USAIT	EH	11/14	24.6	4	EC	T
771	INTELSAT IBS 307E	53.0 W	USAIT	WH	22/23/24	24.2	4	EC	T
772	INTELSAT IBS 307E	53.0 W	USAIT	EZ	14	29.0	4	EC	T
773	INTELSAT IBS 307E	53.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T
774	INTELSAT IBS 307E	53.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
775	INTELSAT IBS 307E	53.0 W	USAIT	ESR	11	36.7	11	EC/EK	T
776	INTELSAT IBS 307E	53.0 W	USAIT	ESR	11	36.7	12	EC/EK	T
777	INTELSAT IBS 307E	53.0 W	USAIT	WSR	21/22	36.7	11	EC/EK	T
778	INTELSAT IBS 307E	53.0 W	USAIT	WSR	21/22	36.7	12	EC/EK	T
779	INTELSAT5 CONT1	53.0 W	USAIT	O	11/14/22/23/24	2.0	6	EK/ED	R
780	INTELSAT5 CONT1	53.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
781	INTELSAT5 CONT1	53.0 W	USAIT	EH	11/14	24.6	6	EC	R
782	INTELSAT5 CONT1	53.0 W	USAIT	WH	22/23/24	24.2	6	EC	R
783	INTELSAT5 CONT1	53.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R
784	INTELSAT5 CONT1	53.0 W	USAIT	NEZ	11/14	29.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
785	INTELSAT5 CONT1	53.0 W	USAIT	ESR	11	36.7	14	EC	R
786	INTELSAT5 CONT1	53.0 W	USAIT	WSR	22/23	40.0	14	EC	R
787	INTELSAT5 CONT1	53.0 W	USAIT	HTM	11/14/22/23/24	14.0	4	EK/ER	T
788	INTELSAT5 CONT1	53.0 W	USAIT	BCN	11/14/22/23/24	19.0	11	EK	T
789	INTELSAT5 CONT1	53.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
790	INTELSAT5 CONT1	53.0 W	USAIT	EH	11/14	24.6	4	EC	T
791	INTELSAT5 CONT1	53.0 W	USAIT	WH	22/23/24	24.2	4	EC	T
792	INTELSAT5 CONT1	53.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T
793	INTELSAT5 CONT1	53.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
794	INTELSAT5 CONT1	53.0 W	USAIT	ESR	11	36.7	11	EC	T
795	INTELSAT5 CONT1	53.0 W	USAIT	WSR	22/23	40.0	11	EC	T
796	INTELSAT5A CONT1	53.0 W	USAIT	O	11/14/22/23/24	2.0	6	ED/EK	R
797	INTELSAT5A CONT1	53.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
798	INTELSAT5A CONT1	53.0 W	USAIT	EH	11/14	24.6	6	EC	R
799	INTELSAT5A CONT1	53.0 W	USAIT	WH	22/23/24	24.2	6	EC	R
800	INTELSAT5A CONT1	53.0 W	USAIT	EZ	14	29.0	6	EC	R
801	INTELSAT5A CONT1	53.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R
802	INTELSAT5A CONT1	53.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
803	INTELSAT5A CONT1	53.0 W	USAIT	ESR	11	36.7	14	EC	R
804	INTELSAT5A CONT1	53.0 W	USAIT	WSR	22/23	40.0	14	EC	R
805	INTELSAT5A CONT1	53.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
806	INTELSAT5A CONT1	53.0 W	USAIT	HTM	11/14/22/23/24	14.0	4	EK/ER	T
807	INTELSAT5A CONT1	53.0 W	USAIT	BCN	11/14/22/23/24	19.0	11	EK	T
808	INTELSAT5A CONT1	53.0 W	USAIT	EH	11/14	24.6	4	EC	T
809	INTELSAT5A CONT1	53.0 W	USAIT	WH	22/23/24	24.2	4	EC	T
810	INTELSAT5A CONT1	53.0 W	USAIT	EZ	14	29.0	4	EC	T
811	INTELSAT5A CONT1	53.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T
812	INTELSAT5A CONT1	53.0 W	USAIT	NEZ	11/14	29.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
813	INTELSAT5A CONT1	53.0 W	USAIT	4SR	24	30.0	4	EC	T
814	INTELSAT5A CONT1	53.0 W	USAIT	ESR	11	36.7	11	EC	T
815	INTELSAT5A CONT1	53.0 W	USAIT	WSR	22/23	40.0	11	EC	T
816	USGCSS PH3 W-ATL	52.5 W	USA	MBA	11/14/15/21/22/23	32.0	8	EC/ED/EJ/EG	R
817	USGCSS PH3 W-ATL	52.5 W	USA	MBA	11/14/15/21/22/23	32.0	8	EG/EJ/EU	R
818	USGCSS PH3 W-ATL	52.5 W	USA	G	11/14/15/21/22/23/24	20.0	8	EC/ED/EJ/EG	R
819	USGCSS PH3 W-ATL	52.5 W	USA	G	11/14/15/21/22/23/24	20.0	8	EG/EJ/EU	R
820	USGCSS PH3 W-ATL	52.5 W	USA	G	11/14/15/21/22/23/24	-4.5	2	ED	R
821	USGCSS PH3 W-ATL	52.5 W	USA	MBA	11/14/22	32.0	7	EC/EG/EJ/EU	T
822	USGCSS PH3 W-ATL	52.5 W	USA	MBA	21/22	32.0	7	EC/EG/EJ/EU	T
823	USGCSS PH3 W-ATL	52.5 W	USA	SD	22/23	34.6	7	EC/EG/EJ/EU	T
824	USGCSS PH3 W-ATL	52.5 W	USA	H	11/14/15/21/22/23/24	21.0	7	EC/EK/ER	T
825	USGCSS PH3 W-ATL	52.5 W	USA	TTK	11/14/15/21/22/23/24	21.0	7	EC/EK/ER	T
826	USGCSS PH3 W-ATL	52.5 W	USA	G	11/14/15/21/22/23/24	-4.5	2	EK/ER	T
827	INTELSAT IBS 310E	50.0 W	USAIT	EH	11/14	24.6	6	EC	R
828	INTELSAT IBS 310E	50.0 W	USAIT	WH	21/22/23/24	24.2	6	EC	R
829	INTELSAT IBS 310E	50.0 W	USAIT	EZ	14	29.0	6	EC	R
830	INTELSAT IBS 310E	50.0 W	USAIT	WZ	21/22/23/24	29.0	6	EC	R
831	INTELSAT IBS 310E	50.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
832	INTELSAT IBS 310E	50.0 W	USAIT	ESR	11	36.7	14	EC	R
833	INTELSAT IBS 310E	50.0 W	USAIT	WSR	21/22	36.7	14	EC	R
834	INTELSAT IBS 310E	50.0 W	USAIT	EH	11/14	24.6	4	EC	T
835	INTELSAT IBS 310E	50.0 W	USAIT	WH	21/22/23/24	24.2	4	EC	T
836	INTELSAT IBS 310E	50.0 W	USAIT	EZ	14	29.0	4	EC	T
837	INTELSAT IBS 310E	50.0 W	USAIT	WZ	21/22/23/24	29.0	4	EC	T
838	INTELSAT IBS 310E	50.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
839	INTELSAT IBS 310E	50.0 W	USAIT	ESR	11	36.7	11	EC/EK	T
840	INTELSAT IBS 310E	50.0 W	USAIT	ESR	11	36.7	12	EC/EK	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
841	INTELSAT IBS 310E	50.0 W	USAIT	WSR	21/22	36.7	11	EC/EK	T
842	INTELSAT IBS 310E	50.0 W	USAIT	WSR	21/22	36.7	12	EC/EK	T
843	INTELSAT4A ATL2	50.0 W	USAIT	H	11/14/22/23/24	14.0	6	EK/ED	R
844	INTELSAT4A ATL2	50.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
845	INTELSAT4A ATL2	50.0 W	USAIT	EH	11/14/23/24	24.8	6	EC	R
846	INTELSAT4A ATL2	50.0 W	USAIT	WH	22/23/23	25.2	6	EC	R
847	INTELSAT4A ATL2	50.0 W	USAIT	BCN	11/14/22/23/24	14.0	4	EK/ER	T
848	INTELSAT4A ATL2	50.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
849	INTELSAT4A ATL2	50.0 W	USAIT	EH	11/14/23/24	31.3	4	EC	T
850	INTELSAT4A ATL2	50.0 W	USAIT	WH	22/23/23	29.3	4	EC	T
851	INTELSAT4A ATL2	50.0 W	USAIT	NEQ	11/14/23/24	29.1	4	EC	T
852	INTELSAT4A ATL2	50.0 W	USAIT	NWQ	22/23/24	27.5	4	EC	T
853	INTELSAT4A ATL2	50.0 W	USAIT	SEQ	14	27.8	4	EC	T
854	INTELSAT4A ATL2	50.0 W	USAIT	SWQ	24	30.0	4	EC	T
855	INTELSAT5 CONT2	50.0 W	USAIT	O	11/14/22/23/24	2.0	6	EK/ED	R
856	INTELSAT5 CONT2	50.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
857	INTELSAT5 CONT2	50.0 W	USAIT	EH	11/14/15	24.6	6	EC	R
858	INTELSAT5 CONT2	50.0 W	USAIT	WH	22/23/24	24.2	6	EC	R
859	INTELSAT5 CONT2	50.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R
860	INTELSAT5 CONT2	50.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
861	INTELSAT5 CONT2	50.0 W	USAIT	ESR	11	36.7	14	EC	R
862	INTELSAT5 CONT2	50.0 W	USAIT	WSR	22/23	40.0	14	EC	R
863	INTELSAT5 CONT2	50.0 W	USAIT	HTM	11/14/22/23/24	14.0	4	EK/ER	T
864	INTELSAT5 CONT2	50.0 W	USAIT	BCN	11/14/22/23/24	19.0	11	EK	T
865	INTELSAT5 CONT2	50.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
866	INTELSAT5 CONT2	50.0 W	USAIT	EH	11/14/15	24.6	4	EC	T
867	INTELSAT5 CONT2	50.0 W	USAIT	WH	22/23/24	24.2	4	EC	T
868	INTELSAT5 CONT2	50.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
869	INTELSAT5 CONT2	50.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
870	INTELSAT5 CONT2	50.0 W	USAIT	ESR	11	36.7	11	EC	T
871	INTELSAT5 CONT2	50.0 W	USAIT	WSR	22/23	40.0	11	EC	T
872	INTELSAT5A CONT2	50.0 W	USAIT	O	11/14/22/23/24	2.0	6	ED/EK	R
873	INTELSAT5A CONT2	50.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
874	INTELSAT5A CONT2	50.0 W	USAIT	EH	11/14	24.6	6	EC	R
875	INTELSAT5A CONT2	50.0 W	USAIT	WH	22/23/24	24.2	6	EC	R
876	INTELSAT5A CONT2	50.0 W	USAIT	EZ	14	29.0	6	EC	R
877	INTELSAT5A CONT2	50.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R
878	INTELSAT5A CONT2	50.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
879	INTELSAT5A CONT2	50.0 W	USAIT	ESR	11	36.7	14	EC	R
880	INTELSAT5A CONT2	50.0 W	USAIT	WSR	22/23	40.0	14	EC	R
881	INTELSAT5A CONT2	50.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
882	INTELSAT5A CONT2	50.0 W	USAIT	HTM	11/14/22/23/24	14.0	4	EK/ER	T
883	INTELSAT5A CONT2	50.0 W	USAIT	BCN	11/14/22/23/24	19.0	11	EK	T
884	INTELSAT5A CONT2	50.0 W	USAIT	EH	11/14	24.6	4	EC	T
885	INTELSAT5A CONT2	50.0 W	USAIT	WH	22/23/24	24.2	4	EC	T
886	INTELSAT5A CONT2	50.0 W	USAIT	EZ	14	29.0	4	EC	T
887	INTELSAT5A CONT2	50.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T
888	INTELSAT5A CONT2	50.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
889	INTELSAT5A CONT2	50.0 W	USAIT	4SR	24	30.0	4	EC	T
890	INTELSAT5A CONT2	50.0 W	USAIT	ESR	11	36.7	11	EC	T
891	INTELSAT5A CONT2	50.0 W	USAIT	WSR	22/23	40.0	11	EC	T
892	USASAT 13C	50.0 W	USA	EUR	11	39.0	14	EC	R
893	USASAT 13C	50.0 W	USA	NEU	22/23	38.0	14	EC	R
894	USASAT 13C	50.0 W	USA	NEU	22/23	37.0	11	EC	T
895	USASAT 13C	50.0 W	USA	EUR	11	38.0	11	EC	T
896	USASAT 13B	47.0 W	USA	EUR	11	39.0	14	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
897	USASAT 13B	47.0 W	USA	NEU	22/23	38.0	14	EC	R
898	USASAT 13B	47.0 W	USA	NEU	22/23	37.0	11	EC	T
899	USASAT 13B	47.0 W	USA	EUR	11	38.0	11	EC	T
900	USASAT 13F	45.0 W	USA	CUS	22/23	35.0	14	EC	R
901	USASAT 13F	45.0 W	USA	CAR	22/23/24	36.0	14	EC	R
902	USASAT 13F	45.0 W	USA	EUR	11/14	37.0	14	EC	R
903	USASAT 13F	45.0 W	USA	CUS	22/23	35.0	12	EC/EK	T
904	USASAT 13F	45.0 W	USA	CAR	22/23/24	36.0	12	EC	T
905	USASAT 13F	45.0 W	USA	EUR	11/14	37.0	11	EC	T
906	USASAT 13F	45.0 W	USA	EUR	11/14	37.0	12	EC	T
907	USASAT 13I	45.0 W	USA	UPL	22/23/24	25.9	6	ED	R
908	USASAT 13I	45.0 W	USA	UPL	22/23/24	25.9	6	EC	R
909	USASAT 13I	45.0 W	USA	CRB	22/23/24	33.0	4	EC	T
910	USASAT 13I	45.0 W	USA	W	24	32.0	4	EC	T
911	USASAT 13I	45.0 W	USA	S	24	32.0	4	EC	T
912	USASAT 13I	45.0 W	USA	4SR	22/23/24	30.0	4	EC	T
913	USASAT 13I	45.0 W	USA	4SR	22/23	33.0	11	EC/EK/ER	T
914	USASAT 13I	45.0 W	USA	4SR	24	27.0	11	EC/EK/ER	T
915	VIDEOSAT-3	43.5 W	F	ISO	11/14/22/23/24	0.0	2	EK/ED	R
916	VIDEOSAT-3	43.5 W	F	AME	22/23/24	33.0	14	EC	R
917	VIDEOSAT-3	43.5 W	F	MET	11/14	38.6	14	EC	R
918	VIDEOSAT-3	43.5 W	F	ISO	11/14/22/23/24	0.0	2	EK/ER	T
919	VIDEOSAT-3	43.5 W	F	MET	11/14	39.6	12	EC	T
920	VIDEOSAT-3	43.5 W	F	AME	22/23/24	32.6	12	EC	T
921	USASAT 13G	43.0 W	USA	CUS	22/23	35.0	14	EC	R
922	USASAT 13G	43.0 W	USA	CAR	22/23/24	36.0	14	EC	R
923	USASAT 13G	43.0 W	USA	EUR	11/14	37.0	14	EC	R
924	USASAT 13G	43.0 W	USA	CUS	22/23	35.0	12	EC/EK	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
925	USASAT 13G	43.0 W	USA	CAR	22/23/24	36.0	12	EC	T
926	USASAT 13G	43.0 W	USA	EUR	11/14	37.0	11	EC	T
927	USASAT 13G	43.0 W	USA	EUR	11/14	37.0	12	EC	T
928	USGCSS P3 MID-ATL	42.5 W	USA	MBA	11/14/15/22/23	32.0	8	EC/ED/EJ/EG	R
929	USGCSS P3 MID-ATL	42.5 W	USA	MBA	11/14/15/22/23	32.0	8	EG/EJ/EU	R
930	USGCSS P3 MID-ATL	42.5 W	USA	G	11/14/15/22/23/24	-4.5	2	ED	R
931	USGCSS P3 MID-ATL	42.5 W	USA	MBA	11/14/15/22/23	32.0	7	EC/EK/ER/EG	T
932	USGCSS P3 MID-ATL	42.5 W	USA	MBA	11/14/15/22/23	32.0	7	EJ/EU	T
933	USGCSS P3 MID-ATL	42.5 W	USA	SD	22/23	34.6	7	EC/EK/ER/EG	T
934	USGCSS P3 MID-ATL	42.5 W	USA	SD	22/23	34.6	7	EJ/EU	T
935	USGCSS P3 MID-ATL	42.5 W	USA	H	11/14/15/22/23/24	21.0	7	EC/EK/ER/EG	T
936	USGCSS P3 MID-ATL	42.5 W	USA	H	11/14/15/22/23/24	21.0	7	EJ/EU	T
937	USGCSS P3 MID-ATL	42.5 W	USA	TTK	11/14/15/22/23/24	21.0	7	EC/EK/ER/EG	T
938	USGCSS P3 MID-ATL	42.5 W	USA	TTK	11/14/15/22/23/24	21.0	7	EJ/EU	T
939	USGCSS P3 MID-ATL	42.5 W	USA	G	11/14/15/22/23/24	-4.5	2	EK/ER	T
940	USASAT 14A	41.0 W	USA	CUS	22/23	36.0	6	EC/ED	R
941	USASAT 14A	41.0 W	USA	ERB	22/23	38.6	6	EC/ED	R
942	USASAT 14A	41.0 W	USA	OSB	23	46.1	6	EC/ED	R
943	USASAT 14A	41.0 W	USA	CUS	22/23	36.0	4	EC/ER/EK	T
944	USASAT 14A	41.0 W	USA	ERB	22/23	38.6	4	EC/ER/EK	T
945	USASAT 14A	41.0 W	USA	OSB	23	46.1	4	EC/ER/EK	T
946	INTELSAT IBS 319.5E	40.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
947	INTELSAT IBS 319.5E	40.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
948	INTELSAT IBS 319.5E	40.5 W	USAIT	EZ	14/15	29.0	6	EC	R
949	INTELSAT IBS 319.5E	40.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
950	INTELSAT IBS 319.5E	40.5 W	USAIT	NEZ	11/14	29.0	6	EC	R
951	INTELSAT IBS 319.5E	40.5 W	USAIT	ESR	11/14	36.7	14	EC	R
952	INTELSAT IBS 319.5E	40.5 W	USAIT	WSR	21/22/23	36.7	14	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
953	INTELSAT IBS 319.5E	40.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
954	INTELSAT IBS 319.5E	40.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
955	INTELSAT IBS 319.5E	40.5 W	USAIT	EZ	14/15	29.0	4	EC	T
956	INTELSAT IBS 319.5E	40.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
957	INTELSAT IBS 319.5E	40.5 W	USAIT	NEZ	11/14	29.0	4	EC	T
958	INTELSAT IBS 319.5E	40.5 W	USAIT	ESR	11/14	36.7	11	EC/EK	T
959	INTELSAT IBS 319.5E	40.5 W	USAIT	ESR	11/14	36.7	12	EC/EK	T
960	INTELSAT IBS 319.5E	40.5 W	USAIT	WSR	21/22/23	36.7	11	EC/EK	T
961	INTELSAT IBS 319.5E	40.5 W	USAIT	WSR	21/22/23	36.7	12	EC/EK	T
962	INTELSAT5A 319.5E	40.5 W	USAIT	O	11/14/22/23/24	2.0	6	ED/EK	R
963	INTELSAT5A 319.5E	40.5 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
964	INTELSAT5A 319.5E	40.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
965	INTELSAT5A 319.5E	40.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
966	INTELSAT5A 319.5E	40.5 W	USAIT	EZ	14/15	29.0	6	EC	R
967	INTELSAT5A 319.5E	40.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
968	INTELSAT5A 319.5E	40.5 W	USAIT	NEZ	11/14	29.0	6	EC	R
969	INTELSAT5A 319.5E	40.5 W	USAIT	ESR	11	36.7	14	EC	R
970	INTELSAT5A 319.5E	40.5 W	USAIT	WSR	22/23	40.0	14	EC	R
971	INTELSAT5A 319.5E	40.5 W	USAIT	HTM	11/14/22/23/24	14.0	4	EK/ER	T
972	INTELSAT5A 319.5E	40.5 W	USAIT	BCN	11/14/22/23/24	19.0	11	EK	T
973	INTELSAT5A 319.5E	40.5 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
974	INTELSAT5A 319.5E	40.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
975	INTELSAT5A 319.5E	40.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
976	INTELSAT5A 319.5E	40.5 W	USAIT	EZ	14/15	29.0	4	EC	T
977	INTELSAT5A 319.5E	40.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
978	INTELSAT5A 319.5E	40.5 W	USAIT	NEZ	11/14	29.0	4	EC	T
979	INTELSAT5A 319.5E	40.5 W	USAIT	4SR	24	30.0	4	EC	T
980	INTELSAT5A 319.5E	40.5 W	USAIT	ESR	11	36.7	11	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
981	INTELSAT5A 319.5E	40.5 W	USAIT	WSR	22/23	40.0	11	EC	T
982	USASAT 13A	37.5 W	USA	EUR	11	39.0	14	EC	R
983	USASAT 13A	37.5 W	USA	NEU	22/23	38.0	14	EC	R
984	USASAT 13A	37.5 W	USA	NEU	22/23	37.0	11	EC	T
985	USASAT 13A	37.5 W	USA	EUR	11	38.0	11	EC	T
986	VIDEOSAT-2	37.5 W	F	MET	11/14	38.6	14	EC	R
987	VIDEOSAT-2	37.5 W	F	ISO	11/14/22/23/24	0.0	2	ED/ER	R
988	VIDEOSAT-2	37.5 W	F	AME	22/23/24	33.6	14	EC	R
989	VIDEOSAT-2	37.5 W	F	MET	11/14	38.6	14	EC	R
990	VIDEOSAT-2	37.5 W	F	MET	11/14	39.6	12	EC	T
991	VIDEOSAT-2	37.5 W	F	ISO	11/14/22/23/24	0.0	2	ER	T
992	VIDEOSAT-2	37.5 W	F	AME	22/23/24	32.6	12	EC	T
993	VIDEOSAT-2	37.5 W	F	MET	11/14	39.6	12	EC	T
994	INTELSAT4 ATL5	34.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
995	INTELSAT4 ATL5	34.5 W	USAIT	H	11/14/15/22/23/24	14.0	6	EK/ED	R
996	INTELSAT4 ATL5	34.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
997	INTELSAT4 ATL5	34.5 W	USAIT	H	11/14/15/22/23/24	14.0	4	EK/ER	T
998	INTELSAT4 ATL5	34.5 W	USAIT	WS	22/23	31.0	4	EC	T
999	INTELSAT4 ATL5	34.5 W	USAIT	ES	11	31.0	4	EC	T
1000	INTELSAT5 ATL4	34.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
1001	INTELSAT5 ATL4	34.5 W	USAIT	ES	11	36.7	14	EC	R
1002	INTELSAT5 ATL4	34.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
1003	INTELSAT5 ATL4	34.5 W	USAIT	EZ	11/14/15	29.0	6	EC	R
1004	INTELSAT5 ATL4	34.5 W	USAIT	O	11/14/15/22/23/24	2.0	6	ED/EK	R
1005	INTELSAT5 ATL4	34.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1006	INTELSAT5 ATL4	34.5 W	USAIT	WS	22/23	40.0	14	EC	R
1007	INTELSAT5 ATL4	34.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1008	INTELSAT5 ATL4	34.5 W	USAIT	B	11/14/15/22/23/24	19.0	11	EK	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1009	INTELSAT5 ATL4	34.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
1010	INTELSAT5 ATL4	34.5 W	USAIT	ES	11	36.7	11	EC	T
1011	INTELSAT5 ATL4	34.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1012	INTELSAT5 ATL4	34.5 W	USAIT	H	11/14/15/22/23/24	14.0	4	EK/ER	T
1013	INTELSAT5 ATL4	34.5 W	USAIT	EZ	11/14/15	29.0	4	EC	T
1014	INTELSAT5 ATL4	34.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1015	INTELSAT5 ATL4	34.5 W	USAIT	WS	22/23	40.0	11	EC	T
1016	INTELSAT5 ATL4	34.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1017	INTELSAT4A ATL4	31.0 W	USAIT	EH	11/14/15	31.3	6	EC	R
1018	INTELSAT4A ATL4	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
1019	INTELSAT4A ATL4	31.0 W	USAIT	H	11/14/15/22/23/24	14.0	6	EK/ED	R
1020	INTELSAT4A ATL4	31.0 W	USAIT	WH	22/23/24	25.2	6	EC	R
1021	INTELSAT4A ATL4	31.0 W	USAIT	EH	11/14/15	31.3	4	EC	T
1022	INTELSAT4A ATL4	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1023	INTELSAT4A ATL4	31.0 W	USAIT	H	11/14/15/22/23/24	14.0	4	EK/ER	T
1024	INTELSAT4A ATL4	31.0 W	USAIT	NEQ	11/14/15	29.1	4	EC	T
1025	INTELSAT4A ATL4	31.0 W	USAIT	NWQ	22/23/24	27.5	4	EC	T
1026	INTELSAT4A ATL4	31.0 W	USAIT	SWQ	24	30.0	4	EC	T
1027	INTELSAT4A ATL4	31.0 W	USAIT	SEQ	14/15	27.8	4	EC	T
1028	INTELSAT4A ATL4	31.0 W	USAIT	WH	22/23/24	25.2	4	EC	T
1029	INTELSAT5 ATL6	31.0 W	USAIT	O	11/14/15/22/23/24	2.0	6	EK/ED	R
1030	INTELSAT5 ATL6	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
1031	INTELSAT5 ATL6	31.0 W	USAIT	EH	11/14/15	24.6	6	EC	R
1032	INTELSAT5 ATL6	31.0 W	USAIT	WH	22/23/24	24.2	6	EC	R
1033	INTELSAT5 ATL6	31.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1034	INTELSAT5 ATL6	31.0 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
1035	INTELSAT5 ATL6	31.0 W	USAIT	ESR	11	36.7	14	EC	R
1036	INTELSAT5 ATL6	31.0 W	USAIT	WSR	22/23	40.0	14	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1037	INTELSAT5 ATL6	31.0 W	USAIT	HTM	11/14/15/22/23/24	14.0	4	EK/ER	T
1038	INTELSAT5 ATL6	31.0 W	USAIT	BCN	11/14/15/22/23/24	19.0	11	EK	T
1039	INTELSAT5 ATL6	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1040	INTELSAT5 ATL6	31.0 W	USAIT	EH	11/14/15	24.6	4	EC	T
1041	INTELSAT5 ATL6	31.0 W	USAIT	WH	22/23/24	24.2	4	EC	T
1042	INTELSAT5 ATL6	31.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1043	INTELSAT5 ATL6	31.0 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
1044	INTELSAT5 ATL6	31.0 W	USAIT	ESR	11	36.7	11	EC	T
1045	INTELSAT5 ATL6	31.0 W	USAIT	WSR	22/23	40.0	11	EC	T
1046	INTELSAT5A ATL6	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
1047	INTELSAT5A ATL6	31.0 W	USAIT	O	11/14/15/22/23/24	2.0	6	ED/EK	R
1048	INTELSAT5A ATL6	31.0 W	USAIT	EH	11/14/15	24.6	6	EC	R
1049	INTELSAT5A ATL6	31.0 W	USAIT	WH	22/23/24	24.2	6	EC	R
1050	INTELSAT5A ATL6	31.0 W	USAIT	EZ	14/15	29.0	6	EC	R
1051	INTELSAT5A ATL6	31.0 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1052	INTELSAT5A ATL6	31.0 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
1053	INTELSAT5A ATL6	31.0 W	USAIT	ESR	11	36.7	14	EC	R
1054	INTELSAT5A ATL6	31.0 W	USAIT	WSR	22/23	40.0	14	EC	R
1055	INTELSAT5A ATL6	31.0 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1056	INTELSAT5A ATL6	31.0 W	USAIT	HTM	11/14/15/22/23/24	14.0	4	EK/ER	T
1057	INTELSAT5A ATL6	31.0 W	USAIT	EH	11/14/15	24.6	4	EC	T
1058	INTELSAT5A ATL6	31.0 W	USAIT	WH	22/23/24	24.2	4	EC	T
1059	INTELSAT5A ATL6	31.0 W	USAIT	EZ	14/15	29.0	4	EC	T
1060	INTELSAT5A ATL6	31.0 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1061	INTELSAT5A ATL6	31.0 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
1062	INTELSAT5A ATL6	31.0 W	USAIT	4SR	24	30.0	4	EC	T
1063	INTELSAT5A ATL6	31.0 W	USAIT	ESR	11	36.7	11	EC	T
1064	INTELSAT5A ATL6	31.0 W	USAIT	WSR	22/23	40.0	11	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1065	UNISAT 1	31.0 W	G	DOM	11/14	37.0	14	EC	R
1066	UNISAT 1	31.0 W	G	O	11/12/14/15/22/23/31	0.0	14	ED	R
1067	UNISAT 1	31.0 W	G	BCG	11	43.0	17	ED	R
1068	UNISAT 1	31.0 W	G	BCG	11	43.0	17	EC	R
1069	UNISAT 1	31.0 W	G	DOM	11/14	37.0	12	EC	T
1070	UNISAT 1	31.0 W	G	DOM	11/14	37.0	12	ER	T
1071	UNISAT 1 ATL	31.0 W	G	NAM	22/23	37.0	14	EC	R
1072	UNISAT 1 ATL	31.0 W	G	EUR	11/14	37.0	14	EC	R
1073	UNISAT 1 ATL	31.0 W	G	NAM	22/23	37.0	12	EC	T
1074	UNISAT 1 ATL	31.0 W	G	EUR	11/14	37.0	12	EC	T
1075	EIRESAT-1	31.0 W	IRL	EUR	11	39.0	13	EC	R
1076	EIRESAT-1	31.0 W	IRL	NA	22/23	39.0	13	EC	R
1077	EIRESAT-1	31.0 W	IRL	EUR	11	38.0	11	EC	T
1078	EIRESAT-1	31.0 W	IRL	NA	22/23	38.0	11	EC	T
1079	INTELSAT4 ATL2	29.5 W	USAIT	H	11/12/14/15/22/23/24	14.0	4	EK/ER	T
1080	INTELSAT5 ATL3	27.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
1081	INTELSAT5 ATL3	27.5 W	USAIT	ES	11	36.7	14	EC	R
1082	INTELSAT5 ATL3	27.5 W	USAIT	EZ	11/14/15	29.0	6	EC	R
1083	INTELSAT5 ATL3	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
1084	INTELSAT5 ATL3	27.5 W	USAIT	O	11/14/15/22/23/24	2.0	6	ED/EK	R
1085	INTELSAT5 ATL3	27.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1086	INTELSAT5 ATL3	27.5 W	USAIT	WS	22/23	40.0	14	EC	R
1087	INTELSAT5 ATL3	27.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1088	INTELSAT5 ATL3	27.5 W	USAIT	B	11/14/15/22/23/24	19.0	11	EK	T
1089	INTELSAT5 ATL3	27.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
1090	INTELSAT5 ATL3	27.5 W	USAIT	ES	11	36.7	11	EC	T
1091	INTELSAT5 ATL3	27.5 W	USAIT	EZ	11/14/15	29.0	4	EC	T
1092	INTELSAT5 ATL3	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1093	INTELSAT5 ATL3	27.5 W	USAIT	H	11/14/15/22/23/24	14.0	4	EK/ER	T
1094	INTELSAT5 ATL3	27.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1095	INTELSAT5 ATL3	27.5 W	USAIT	WS	22/23	40.0	11	EC	T
1096	INTELSAT5 ATL3	27.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1097	INTELSAT5A ATL2	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
1098	INTELSAT5A ATL2	27.5 W	USAIT	O	11/14/15/22/23/24	2.0	6	ED/EK	R
1099	INTELSAT5A ATL2	27.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
1100	INTELSAT5A ATL2	27.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1101	INTELSAT5A ATL2	27.5 W	USAIT	EZ	14/15	29.0	6	EC	R
1102	INTELSAT5A ATL2	27.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1103	INTELSAT5A ATL2	27.5 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
1104	INTELSAT5A ATL2	27.5 W	USAIT	ESR	11	36.7	14	EC	R
1105	INTELSAT5A ATL2	27.5 W	USAIT	WSR	22/23	40.0	14	EC	R
1106	INTELSAT5A ATL2	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1107	INTELSAT5A ATL2	27.5 W	USAIT	HTM	11/14/15/22/23/24	14.0	4	EK/ER	T
1108	INTELSAT5A ATL2	27.5 W	USAIT	BCN	11/14/15/22/23/24	19.0	11	EK	T
1109	INTELSAT5A ATL2	27.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
1110	INTELSAT5A ATL2	27.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1111	INTELSAT5A ATL2	27.5 W	USAIT	EZ	14/15/	29.0	4	EC	T
1112	INTELSAT5A ATL2	27.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1113	INTELSAT5A ATL2	27.5 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
1114	INTELSAT5A ATL2	27.5 W	USAIT	4SR	24	30.0	4	EC	T
1115	INTELSAT5A ATL2	27.5 W	USAIT	ESR	11	36.7	11	EC	T
1116	INTELSAT5A ATL2	27.5 W	USAIT	WSR	22/23	40.0	11	EC	T
1117	INTELSAT6 332.5E	27.5 W	USAIT	O	11/14/15/22/23/24	2.0	6	EK/ED	R
1118	INTELSAT6 332.5E	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
1119	INTELSAT6 332.5E	27.5 W	USAIT	EH	11/14/15	24.8	6	EC	R
1120	INTELSAT6 332.5E	27.5 W	USAIT	EH	11/14/15	24.8	5	EC	R

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NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1121	INTELSAT6 332.5E	27.5 W	USAIT	WH	22/23/24	24.1	6	EC	R
1122	INTELSAT6 332.5E	27.5 W	USAIT	Z1	22/23	34.3	6	EC	R
1123	INTELSAT6 332.5E	27.5 W	USAIT	Z2	22/23/24	26.6	6	EC	R
1124	INTELSAT6 332.5E	27.5 W	USAIT	Z3	11	32.4	6	EC	R
1125	INTELSAT6 332.5E	27.5 W	USAIT	Z4	14/15	26.7	6	EC	R
1126	INTELSAT6 332.5E	27.5 W	USAIT	ESR	11	36.7	14	EC	R
1127	INTELSAT6 332.5E	27.5 W	USAIT	WSR	22/23	40.0	14	EC	R
1128	INTELSAT6 332.5E	27.5 W	USAIT	HTM	11/14/15/22/23/24	14.0	4	EK/ER	T
1129	INTELSAT6 332.5E	27.5 W	USAIT	BCN	11/14/15/22/23/24	19.0	11	EK	T
1130	INTELSAT6 332.5E	27.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1131	INTELSAT6 332.5E	27.5 W	USAIT	EH	11/14/15	24.8	4	EC	T
1132	INTELSAT6 332.5E	27.5 W	USAIT	WH	22/23/24	24.1	4	EC	T
1133	INTELSAT6 332.5E	27.5 W	USAIT	Z1	22/23	34.3	4	EC	T
1134	INTELSAT6 332.5E	27.5 W	USAIT	Z2	22/23/24	26.6	4	EC	T
1135	INTELSAT6 332.5E	27.5 W	USAIT	Z3	11	32.4	4	EC	T
1136	INTELSAT6 332.5E	27.5 W	USAIT	Z4	14/15	26.7	4	EC	T
1137	INTELSAT6 332.5E	27.5 W	USAIT	ESR	11	36.7	11	EC	T
1138	INTELSAT6 332.5E	27.5 W	USAIT	WSR	22/23	40.0	11	EC	T
1139	GALS-1	26.5 W	URS	2	11/14/15/22/23/24	19.0	8	EC	R
1140	GALS-1	26.5 W	URS	3	11/14/22/23	23.0	8	EC	R
1141	GALS-1	26.5 W	URS	4	11/14	30.0	8	EC	R
1142	GALS-1	26.5 W	URS	2	11/14/15/22/23/24	19.0	7	EC	T
1143	GALS-1	26.5 W	URS	3	11/14/22/23	23.0	7	EC	T
1144	GALS-1	26.5 W	URS	4	11/14	30.0	7	EC	T
1145	STATSIONAR-D1	26.5 W	URS	N6	22/23/24	25.0	6	EC	R
1146	STATSIONAR-D1	26.5 W	URS	N6	11/14/23	25.0	6	EC	R
1147	STATSIONAR-D1	26.5 W	URS	N6	11/14/15	25.0	6	EC	R
1148	STATSIONAR-D1	26.5 W	URS	N6	14/15	25.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1149	STATSIONAR-D1	26.5 W	URS	N6	14/24	25.0	6	EC	R
1150	STATSIONAR-D1	26.5 W	URS	N6	24	25.0	6	EC	R
1151	STATSIONAR-D1	26.5 W	URS	N4	22/23/24	25.0	4	EC	T
1152	STATSIONAR-D1	26.5 W	URS	N4	11/14/23	25.0	4	EC	T
1153	STATSIONAR-D1	26.5 W	URS	N4	11/14/15	25.0	4	EC	T
1154	STATSIONAR-D1	26.5 W	URS	N4	14/15	25.0	4	EC	T
1155	STATSIONAR-D1	26.5 W	URS	N4	14/24	25.0	4	EC	T
1156	STATSIONAR-D1	26.5 W	URS	N4	24	25.0	4	EC	T
1157	INMARSAT AOR-CENTRAL	26.0 W	G INM	G	11/14/15/22/23/24	19.5	1	EG/EJ	R
1158	INMARSAT AOR-CENTRAL	26.0 W	G INM	G	11/14/15/22/23/24	19.5	61	EC/ED	R
1159	INMARSAT AOR-CENTRAL	26.0 W	G INM	G	11/14/15/22/23/24	19.5	1	EG/EJ	T
1160	INMARSAT AOR-CENTRAL	26.0 W	G INM	G	11/14/15/22/23/24	19.5	4	EC/EK/ER	T
1161	STATSIONAR-8	25.0 W	URS	G	11/12/14/15/22/23/24/31	19.0	5	EC	R
1162	STATSIONAR-8	25.0 W	URS	NH	11/12/14/15/22/23	22.0	5	EC	R
1163	STATSIONAR-8	25.0 W	URS	NH	11/12/14/15/22/23	22.0	4	EC	T
1164	LOUTCH P1	25.0 W	URS	G	11/14/15/22/23/24	22.0	14	EC	R
1165	LOUTCH P1	25.0 W	URS	G	11/14/15/22/23/24	22.0	11	EC	T
1166	INTELSAT5 ATL1	24.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
1167	INTELSAT5 ATL1	24.5 W	USAIT	ES	11	37.7	14	EC	R
1168	INTELSAT5 ATL1	24.5 W	USAIT	EZ	11/14/15	29.0	6	EC	R
1169	INTELSAT5 ATL1	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
1170	INTELSAT5 ATL1	24.5 W	USAIT	O	11/14/15/22/23/24	2.0	6	EK/ER	R
1171	INTELSAT5 ATL1	24.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1172	INTELSAT5 ATL1	24.5 W	USAIT	WS	22/23	40.0	14	EC	R
1173	INTELSAT5 ATL1	24.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1174	INTELSAT5 ATL1	24.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
1175	INTELSAT5 ATL1	24.5 W	USAIT	ES	11	37.7	11	EC	T
1176	INTELSAT5 ATL1	24.5 W	USAIT	EZ	11/14/15	29.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1177	INTELSAT5 ATL1	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1178	INTELSAT5 ATL1	24.5 W	USAIT	H	11/14/15/22/23/24	14.5	4	EK/ER	T
1179	INTELSAT5 ATL1	24.5 W	USAIT	H	11/14/15/22/23/24	14.5	11	EK	T
1180	INTELSAT5 ATL1	24.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1181	INTELSAT5 ATL1	24.5 W	USAIT	WS	22/23	40.0	11	EC	T
1182	INTELSAT5 ATL1	24.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1183	INTELSAT5A ATL1	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
1184	INTELSAT5A ATL1	24.5 W	USAIT	O	11/14/15/22/23/24	2.0	6	ED/EK	R
1185	INTELSAT5A ATL1	24.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
1186	INTELSAT5A ATL1	24.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1187	INTELSAT5A ATL1	24.5 W	USAIT	EZ	14/15	29.0	6	EC	R
1188	INTELSAT5A ATL1	24.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1189	INTELSAT5A ATL1	24.5 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
1190	INTELSAT5A ATL1	24.5 W	USAIT	ESR	11	36.7	14	EC	R
1191	INTELSAT5A ATL1	24.5 W	USAIT	WSR	22/23	40.0	14	EC	R
1192	INTELSAT5A ATL1	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1193	INTELSAT5A ATL1	24.5 W	USAIT	HTM	11/14/15/22/23/24	14.0	4	EK/ER	T
1194	INTELSAT5A ATL1	24.5 W	USAIT	BCN	11/14/15/22/23/24	19.0	11	EK	T
1195	INTELSAT5A ATL1	24.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
1196	INTELSAT5A ATL1	24.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1197	INTELSAT5A ATL1	24.5 W	USAIT	EZ	14/15	29.0	4	EC	T
1198	INTELSAT5A ATL1	24.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1199	INTELSAT5A ATL1	24.5 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
1200	INTELSAT5A ATL1	24.5 W	USAIT	4SR	24	30.0	4	EC	T
1201	INTELSAT5A ATL1	24.5 W	USAIT	ESR	11	36.7	11	EC	T
1202	INTELSAT5A ATL1	24.5 W	USAIT	WSR	22/23	40.0	11	EC	T
1203	INTELSAT6 335.5E	24.5 W	USAIT	O	11/14/15/22/23/24	2.0	6	EK/ED	R
1204	INTELSAT6 335.5E	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1205	INTELSAT6 335.5E	24.5 W	USAIT	EH	11/14/15	24.8	6	EC	R
1206	INTELSAT6 335.5E	24.5 W	USAIT	EH	11/14/15	24.8	5	EC	R
1207	INTELSAT6 335.5E	24.5 W	USAIT	WH	22/23/24	24.1	6	EC	R
1208	INTELSAT6 335.5E	24.5 W	USAIT	Z1	22/23	34.3	6	EC	R
1209	INTELSAT6 335.5E	24.5 W	USAIT	Z2	22/23/24	26.6	6	EC	R
1210	INTELSAT6 335.5E	24.5 W	USAIT	Z3	11	32.4	6	EC	R
1211	INTELSAT6 335.5E	24.5 W	USAIT	Z4	14/15	26.7	6	EC	R
1212	INTELSAT6 335.5E	24.5 W	USAIT	ESR	11	36.7	14	EC	R
1213	INTELSAT6 335.5E	24.5 W	USAIT	WSR	22/23	40.0	14	EC	R
1214	INTELSAT6 335.5E	24.5 W	USAIT	HTM	11/14/15/22/23/24	14.0	4	EK/ER	T
1215	INTELSAT6 335.5E	24.5 W	USAIT	BCN	11/14/15/22/23/24	19.0	11	EK	T
1216	INTELSAT6 335.5E	24.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1217	INTELSAT6 335.5E	24.5 W	USAIT	EH	11/14/15	24.8	4	EC	T
1218	INTELSAT6 335.5E	24.5 W	USAIT	WH	22/23/24	24.1	4	EC	T
1219	INTELSAT6 335.5E	24.5 W	USAIT	Z1	22/23	34.3	4	EC	T
1220	INTELSAT6 335.5E	24.5 W	USAIT	Z2	22/23/24	26.6	4	EC	T
1221	INTELSAT6 335.5E	24.5 W	USAIT	Z3	11	32.4	4	EC	T
1222	INTELSAT6 335.5E	24.5 W	USAIT	Z4	14/15	26.7	4	EC	T
1223	INTELSAT6 335.5E	24.5 W	USAIT	ESR	11	36.7	11	EC	T
1224	INTELSAT6 335.5E	24.5 W	USAIT	WSR	22/23	40.0	11	EC	T
1225	PROGNOZ-1	24.0 W	URS	NEQ	11/12/14/15	-2.0	2	EH	T
1226	FLTSATCOM ATL	23.0 W	USA	G	11/14/15/22/23/24	18.0	0	EG/EJ	R
1227	FLTSATCOM ATL	23.0 W	USA	G	11/14/15/22/23/24	8.0	8	EC	R
1228	FLTSATCOM ATL	23.0 W	USA	G	11/14/15/22/23/24	8.0	0	EG/EJ	T
1229	FLTSATCOM ATL	23.0 W	USA	G	11/14/15/22/23/24	18.0	7	EC	T
1230	MARECS A	23.0 W	F MRS	G	11/14/15/22/23/24	18.3	1	EG	R
1231	MARECS A	23.0 W	F MRS	G	11/14/15/22/23/24	20.7	6	EC/ED/EK	R
1232	MARECS A	23.0 W	F MRS	O	11/14/15/22/23/24	0.0	0	ED/EK	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1233	MARECS A	23.0 W	F MRS	G	11/14/15/22/23/24	20.6	1	EG	T
1234	MARECS A	23.0 W	F MRS	G	11/14/15/22/23/24	20.7	4	EC/EK/ER	T
1235	FLTSATCOM-B E-ATL	23.0 W	USA	G	11/14/15/22/23/24	18.0	44	EJ/EG	R
1236	FLTSATCOM-B E-ATL	23.0 W	USA	G	11/14/15/22/23/24	18.0	44	EJ/EU	R
1237	FLTSATCOM-B E-ATL	23.0 W	USA	S	11/14/15/22/23/24	34.0	44	EJ/EG	R
1238	FLTSATCOM-B E-ATL	23.0 W	USA	S	11/14/15/22/23/24	34.0	44	EJ/EU	R
1239	FLTSATCOM-B E-ATL	23.0 W	USA	G	11/14/15/22/23/24	18.0	20	EC/EG/EJ	T
1240	FLTSATCOM-B E-ATL	23.0 W	USA	G	11/14/15/22/23/24	18.0	20	EU/EX	T
1241	FLTSATCOM-B E-ATL	23.0 W	USA	S	11/14/15/22/23/24	34.0	20	EC/EG/EJ	T
1242	FLTSATCOM-B E-ATL	23.0 W	USA	S	11/14/15/22/23/24	34.0	20	EU/EX	T
1243	FLTSATCOM-A ATL	23.0 W	USA	G	11/12/14/15/23/24/31	18.0	0	EJ/EG	R
1244	FLTSATCOM-A ATL	23.0 W	USA	G	11/12/14/15/23/24/31	18.0	0	EJ/EU	R
1245	FLTSATCOM-A ATL	23.0 W	USA	BCN	11/12/14/15/23/24/31	18.0	8	EC/ED	R
1246	FLTSATCOM-A ATL	23.0 W	USA	G	11/12/14/15/23/24/31	18.0	0	EG/EJ/EU	T
1247	FLTSATCOM-A ATL	23.0 W	USA	BCN	11/12/14/15/23/24/31	18.0	7	EC/EK/ER	T
1248	INTELSAT4A ATL1	21.5 W	USAIT	EH	11/12/14/15	24.8	6	EC	R
1249	INTELSAT4A ATL1	21.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	6	EC	R
1250	INTELSAT4A ATL1	21.5 W	USAIT	H	11/12/14/15/22/23/24	14.0	6	ED/EK	R
1251	INTELSAT4A ATL1	21.5 W	USAIT	WH	22/23/24	25.2	6	EC	R
1252	INTELSAT4A ATL1	21.5 W	USAIT	EH	11/12/14/15	31.3	4	EC	T
1253	INTELSAT4A ATL1	21.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
1254	INTELSAT4A ATL1	21.5 W	USAIT	H	11/12/14/15/22/23/24	14.0	4	EK/ER	T
1255	INTELSAT4A ATL1	21.5 W	USAIT	NEQ	11/12/14/15	29.1	4	EC	T
1256	INTELSAT4A ATL1	21.5 W	USAIT	NWQ	22/23/24	27.5	4	EC	T
1257	INTELSAT4A ATL1	21.5 W	USAIT	SEQ	14/15	27.8	4	EC	T
1258	INTELSAT4A ATL1	21.5 W	USAIT	SWQ	24	30.0	4	EC	T
1259	INTELSAT4A ATL1	21.5 W	USAIT	WH	22/23/24	29.3	4	EC	T
1260	INTELSAT MCS ATL C	21.5 W	USAIT	G	11/14/15/22/23/24	19.0	1	EG	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1261	INTELSAT MCS ATL C	21.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R
1262	INTELSAT MCS ATL C	21.5 W	USAIT	G	11/14/15/22/23/24	19.0	1	EG	T
1263	INTELSAT MCS ATL C	21.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1264	INTELSAT5 ATL5	21.5 W	USAIT	O	11/12/14/15/22/23/24	2.0	6	EK/ED	R
1265	INTELSAT5 ATL5	21.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	6	EC	R
1266	INTELSAT5 ATL5	21.5 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
1267	INTELSAT5 ATL5	21.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1268	INTELSAT5 ATL5	21.5 W	USAIT	EZ	11/12/14/15	29.0	6	EC	R
1269	INTELSAT5 ATL5	21.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1270	INTELSAT5 ATL5	21.5 W	USAIT	ESR	11	37.7	14	EC	R
1271	INTELSAT5 ATL5	21.5 W	USAIT	WSR	23	40.0	14	EC	R
1272	INTELSAT5 ATL5	21.5 W	USAIT	HTM	11/12/14/15/22/23/24	14.0	4	EK/ER	T
1273	INTELSAT5 ATL5	21.5 W	USAIT	BCN	11/12/14/15/22/23/24	19.0	11	EK	T
1274	INTELSAT5 ATL5	21.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
1275	INTELSAT5 ATL5	21.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
1276	INTELSAT5 ATL5	21.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1277	INTELSAT5 ATL5	21.5 W	USAIT	EZ	11/12/14/15	29.0	4	EC	T
1278	INTELSAT5 ATL5	21.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1279	INTELSAT5 ATL5	21.5 W	USAIT	ESR	11	37.7	11	EC	T
1280	INTELSAT5 ATL5	21.5 W	USAIT	WSR	23	40.0	11	EC	T
1281	INTELSAT5A 338.5E	21.5 W	USAIT	O	11/14/15/23/24	2.0	6	EK/ED	R
1282	INTELSAT5A 338.5E	21.5 W	USAIT	G	11/14/15/23/24	21.0	6	EC	R
1283	INTELSAT5A 338.5E	21.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1284	INTELSAT5A 338.5E	21.5 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
1285	INTELSAT5A 338.5E	21.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1286	INTELSAT5A 338.5E	21.5 W	USAIT	EZ	11/12/14/15	29.0	6	EC	R
1287	INTELSAT5A 338.5E	21.5 W	USAIT	NEZ	11/12/14/15	29.0	6	EC	R
1288	INTELSAT5A 338.5E	21.5 W	USAIT	ESR	11	36.7	14	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1289	INTELSAT5A 338.5E	21.5 W	USAIT	WSR	23	40.0	14	EC	R
1290	INTELSAT5A 338.5E	21.5 W	USAIT	HTM	11/12/14/15/22/23/24	14.0	4	EK/ER	T
1291	INTELSAT5A 338.5E	21.5 W	USAIT	BCN	11/12/14/15/22/23/24	19.0	11	EK	T
1292	INTELSAT5A 338.5E	21.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
1293	INTELSAT5A 338.5E	21.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1294	INTELSAT5A 338.5E	21.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
1295	INTELSAT5A 338.5E	21.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1296	INTELSAT5A 338.5E	21.5 W	USAIT	EZ	11/12/14/15	29.0	4	EC	T
1297	INTELSAT5A 338.5E	21.5 W	USAIT	NEZ	11/12/14/15	29.0	4	EC	T
1298	INTELSAT5A 338.5E	21.5 W	USAIT	4SR	24	30.0	4	EC	T
1299	INTELSAT5A 338.5E	21.5 W	USAIT	ESR	11	36.7	11	EC	T
1300	INTELSAT5A 338.5E	21.5 W	USAIT	WSR	22/23	40.0	11	EC	T
1301	GDL-4	20.0 W	LUX	365	11	36.5	6	EC	R
1302	GDL-4	20.0 W	LUX	375	11	37.5	14	EC	R
1303	GDL-4	20.0 W	LUX	375	11	37.5	11	EC	T
1304	GDL-4	20.0 W	LUX	375	11	37.5	12	EC	T
1305	INTELSAT4 ATL3	19.5 W	USAIT	H	11/12/14/15/23/24	14.0	4	EK/ER	T
1306	L-SAT	19.0 W	F LST	A	11	41.0	13	EC	R
1307	L-SAT	19.0 W	F LST	B	11	41.0	13	EC	R
1308	L-SAT	19.0 W	F LST	C	11	41.0	13	EC	R
1309	L-SAT	19.0 W	F LST	D	11	41.0	13	EC	R
1310	L-SAT	19.0 W	F LST	E	11/14	41.0	13	EC	R
1311	L-SAT	19.0 W	F LST	350	11/14	35.0	17	EC/EK	R
1312	L-SAT	19.0 W	F LST	440	11	44.0	28	EC	R
1313	L-SAT	19.0 W	F LST	G	11/12/14/15/22/23/24/31	10.0	2	EK/ED	R
1314	L-SAT	19.0 W	F LST	A	11	41.0	12	EC	T
1315	L-SAT	19.0 W	F LST	B	11	41.0	12	EC	T
1316	L-SAT	19.0 W	F LST	C	11	41.0	12	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1317	L-SAT	19.0 W	F LST	D	11	41.0	12	EC	T
1318	L-SAT	19.0 W	F LST	E	11/12	41.0	12	EC	T
1319	L-SAT	19.0 W	F LST	G	11/12/14/15/22/23/24/31	22.0	12	EC	T
1320	L-SAT	19.0 W	F LST	260	11/12/14/15/31	26.0	20	EC	T
1321	L-SAT	19.0 W	F LST	260	11/12/14/15/31	26.0	30	EC	T
1322	L-SAT	19.0 W	F LST	430	11	43.0	19	EC	T
1323	L-SAT	19.0 W	F LST	G	11/12/14/15/22/23/24/31	10.0	2	EK/ER	T
1324	TV-SAT	19.0 W	D	O	11/12/14/15/23/24/31	-4.0	2	ED/EK	R
1325	TV-SAT	19.0 W	D	O	11/12/14/15/23/24/31	-4.0	2	EK/ER	T
1326	TV-SAT	19.0 W	D	DOM	11	45.0	17	EK/ED	R
1327	TV-SAT	19.0 W	D	DOM	11	45.0	17	EC	R
1328	TV-SAT	19.0 W	D	DOM	11	45.0	12	EK/ER	T
1329	LUX-SAT	19.0 W	LUX	R17	11	46.5	17	EC/ED	R
1330	LUX-SAT	19.0 W	LUX	R12	11	48.8	12	EK/ER	T
1331	HELVESAT-I	19.0 W	SUI	460	11	46.0	17	EC	R
1332	HELVESAT-I	19.0 W	SUI	460	11	46.0	12	ER	T
1333	SARIT	19.0 W	I	436	11	43.6	17	EC	R
1334	SARIT	19.0 W	I	390	11	39.0	11	EK	T
1335	INTELSAT MCS ATL A	18.5 W	USA	G16	11/12/14/15/22/23/24/31	19.0	1	EG	R
1336	INTELSAT MCS ATL A	18.5 W	USA	G6	11/12/14/15/22/23/24/31	21.0	6	EC	R
1337	INTELSAT MCS ATL A	18.5 W	USA	G15	11/12/14/15/22/23/24/31	19.0	1	EG	T
1338	INTELSAT MCS ATL A	18.5 W	USA	G4	11/12/14/15/22/23/24/31	21.0	4	EC	T
1339	INTELSAT5 ATL2	18.5 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
1340	INTELSAT5 ATL2	18.5 W	USAIT	ES	11	36.7	14	EC	R
1341	INTELSAT5 ATL2	18.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	6	EC	R
1342	INTELSAT5 ATL2	18.5 W	USAIT	EZ	11/12/14/15	29.0	6	EC	R
1343	INTELSAT5 ATL2	18.5 W	USAIT	O	11/12/14/15/22/23/24	2.0	6	ED/EK	R
1344	INTELSAT5 ATL2	18.5 W	USAIT	WH	22/23/24	24.2	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1345	INTELSAT5 ATL2	18.5 W	USAIT	WS	23	40.0	14	EC	R
1346	INTELSAT5 ATL2	18.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1347	INTELSAT5 ATL2	18.5 W	USAIT	B	11/12/14/15/22/23/24	19.0	11	EK	T
1348	INTELSAT5 ATL2	18.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
1349	INTELSAT5 ATL2	18.5 W	USAIT	ES	11	36.7	11	EC	T
1350	INTELSAT5 ATL2	18.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
1351	INTELSAT5 ATL2	18.5 W	USAIT	H	11/12/14/15/22/23/24	14.0	4	EK/ER	T
1352	INTELSAT5 ATL2	18.5 W	USAIT	EZ	11/12/14/15	29.0	4	EC	T
1353	INTELSAT5 ATL2	18.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1354	INTELSAT5 ATL2	18.5 W	USAIT	WS	23	40.0	11	EC	T
1355	INTELSAT5 ATL2	18.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1356	INTELSAT IBS 341.5E	18.5 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
1357	INTELSAT IBS 341.5E	18.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1358	INTELSAT IBS 341.5E	18.5 W	USAIT	EZ	11/14/15	29.0	6	EC	R
1359	INTELSAT IBS 341.5E	18.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1360	INTELSAT IBS 341.5E	18.5 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
1361	INTELSAT IBS 341.5E	18.5 W	USAIT	ESR	11	36.7	14	EC	R
1362	INTELSAT IBS 341.5E	18.5 W	USAIT	WSR	23	36.7	14	EC	R
1363	INTELSAT IBS 341.5E	18.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
1364	INTELSAT IBS 341.5E	18.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1365	INTELSAT IBS 341.5E	18.5 W	USAIT	EZ	11/14/15	29.0	4	EC	T
1366	INTELSAT IBS 341.5E	18.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1367	INTELSAT IBS 341.5E	18.5 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
1368	INTELSAT IBS 341.5E	18.5 W	USAIT	ESR	11	36.7	11	EC/EK	T
1369	INTELSAT IBS 341.5E	18.5 W	USAIT	ESR	11	36.7	12	EC/EK	T
1370	INTELSAT IBS 341.5E	18.5 W	USAIT	WSR	23	36.7	11	EC/EK	T
1371	INTELSAT IBS 341.5E	18.5 W	USAIT	WSR	23	36.7	12	EC/EK	T
1372	INTELSAT5A ATL4	18.5 W	USAIT	G	11/14/15/22/23/24	21.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1373	INTELSAT5A ATL4	18.5 W	USAIT	O	11/14/15/22/23/24	2.0	6	ED/EK	R
1374	INTELSAT5A ATL4	18.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
1375	INTELSAT5A ATL4	18.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1376	INTELSAT5A ATL4	18.5 W	USAIT	EZ	14/15	29.0	6	EC	R
1377	INTELSAT5A ATL4	18.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1378	INTELSAT5A ATL4	18.5 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
1379	INTELSAT5A ATL4	18.5 W	USAIT	ESR	11	36.7	14	EC	R
1380	INTELSAT5A ATL4	18.5 W	USAIT	WSR	22/23	40.0	14	EC	R
1381	INTELSAT5A ATL4	18.5 W	USAIT	G	11/14/15/22/23/24	21.0	4	EC	T
1382	INTELSAT5A ATL4	18.5 W	USAIT	HTM	11/14/15/22/23/24	14.0	4	EK/ER	T
1383	INTELSAT5A ATL4	18.5 W	USAIT	BCN	11/14/15/22/23/24	19.0	11	EK	T
1384	INTELSAT5A ATL4	18.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
1385	INTELSAT5A ATL4	18.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1386	INTELSAT5A ATL4	18.5 W	USAIT	EZ	14/15	29.0	4	EC	T
1387	INTELSAT5A ATL4	18.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1388	INTELSAT5A ATL4	18.5 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
1389	INTELSAT5A ATL4	18.5 W	USAIT	4SR	24	30.0	4	EC	T
1390	INTELSAT5A ATL4	18.5 W	USAIT	ESR	11	36.7	11	EC	T
1391	INTELSAT5A ATL4	18.5 W	USAIT	WSR	22/23	40.0	11	EC	T
1392	SATCOM PHASE-3	18.0 W	BEL	NH	11/12/14/15/22/23/24/31	18.5	8	EC	R
1393	SATCOM PHASE-3	18.0 W	BEL	NB	11/12/14/15	27.5	7	EC	T
1394	SATCOM PHASE-3	18.0 W	BEL	WB	11/14/23	23.0	7	EC/EK/ER	T
1395	SATCOM-2	18.0 W	BEL	G	11/12/14/15/22/23/24	19.0	8	EC	R
1396	SATCOM-2	18.0 W	BEL	G	11/12/14/15/22/23/24	19.0	7	EC/EK	T
1397	INTELSAT IBS 343.5E	16.5 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
1398	INTELSAT IBS 343.5E	16.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1399	INTELSAT IBS 343.5E	16.5 W	USAIT	EZ	11/14/15	29.0	6	EC	R
1400	INTELSAT IBS 343.5E	16.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1401	INTELSAT IBS 343.5E	16.5 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
1402	INTELSAT IBS 343.5E	16.5 W	USAIT	ESR	11	36.7	14	EC	R
1403	INTELSAT IBS 343.5E	16.5 W	USAIT	WSR	23	36.7	14	EC	R
1404	INTELSAT IBS 343.5E	16.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
1405	INTELSAT IBS 343.5E	16.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1406	INTELSAT IBS 343.5E	16.5 W	USAIT	EZ	11/14/15	29.0	4	EC	T
1407	INTELSAT IBS 343.5E	16.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1408	INTELSAT IBS 343.5E	16.5 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
1409	INTELSAT IBS 343.5E	16.5 W	USAIT	ESR	11	36.7	11	EC/EK	T
1410	INTELSAT IBS 343.5E	16.5 W	USAIT	ESR	11	36.7	12	EC/EK	T
1411	INTELSAT IBS 343.5E	16.5 W	USAIT	WSR	23	36.7	11	EC/EK	T
1412	INTELSAT IBS 343.5E	16.5 W	USAIT	WSR	23	36.7	12	EC/EK	T
1413	INTELSAT4A 343.5E	16.5 W	USAIT	H	11/14/15/23/24	14.0	6	EK/ED	R
1414	INTELSAT4A 343.5E	16.5 W	USAIT	G	11/14/15/23/24	21.0	6	EC	R
1415	INTELSAT4A 343.5E	16.5 W	USAIT	EH	11/14/15	24.8	6	EC	R
1416	INTELSAT4A 343.5E	16.5 W	USAIT	WH	23/24	25.2	6	EC	R
1417	INTELSAT4A 343.5E	16.5 W	USAIT	BCN	11/14/15/23/24	14.0	4	EK/ER	T
1418	INTELSAT4A 343.5E	16.5 W	USAIT	G	11/14/15/23/24	21.0	4	EC	T
1419	INTELSAT4A 343.5E	16.5 W	USAIT	EH	11/14/15	31.3	4	EC	T
1420	INTELSAT4A 343.5E	16.5 W	USAIT	WH	23/24	29.3	4	EC	T
1421	INTELSAT4A 343.5E	16.5 W	USAIT	NEQ	11/14/15	29.1	4	EC	T
1422	INTELSAT4A 343.5E	16.5 W	USAIT	NWQ	23/24	27.5	4	EC	T
1423	INTELSAT4A 343.5E	16.5 W	USAIT	SEQ	14/15	27.8	4	EC	T
1424	INTELSAT4A 343.5E	16.5 W	USAIT	SWQ	24	30.0	4	EC	T
1425	INTELSAT5 343.5E	16.5 W	USAIT	O	11/12/14/15/22/23/24	14.0	6	EK/ED	R
1426	INTELSAT5 343.5E	16.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	6	EC	R
1427	INTELSAT5 343.5E	16.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
1428	INTELSAT5 343.5E	16.5 W	USAIT	WH	22/23/24	24.2	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1429	INTELSAT5 343.5E	16.5 W	USAIT	NEZ	11/12/14/15	29.0	6	EC	R
1430	INTELSAT5 343.5E	16.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1431	INTELSAT5 343.5E	16.5 W	USAIT	ESR	11	36.7	14	EC	R
1432	INTELSAT5 343.5E	16.5 W	USAIT	WSR	22/23	40.0	14	EC	R
1433	INTELSAT5 343.5E	16.5 W	USAIT	HTM	11/12/14/15/22/23/24	14.0	4	EK/ER	T
1434	INTELSAT5 343.5E	16.5 W	USAIT	BCN	11/12/14/15/22/23/24	19.0	11	EK	T
1435	INTELSAT5 343.5E	16.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
1436	INTELSAT5 343.5E	16.5 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
1437	INTELSAT5 343.5E	16.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1438	INTELSAT5 343.5E	16.5 W	USAIT	NEZ	11/12/14/15	29.0	4	EC	T
1439	INTELSAT5 343.5E	16.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1440	INTELSAT5 343.5E	16.5 W	USAIT	ESR	11	36.7	11	EC	T
1441	INTELSAT5 343.5E	16.5 W	USAIT	WSR	22/23	40.0	11	EC	T
1442	INTELSAT5A 343.5E	16.5 W	USAIT	O	11/12/14/15/22/23/24	14.0	6	EK/ER	R
1443	INTELSAT5A 343.5E	16.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	6	EC	R
1444	INTELSAT5A 343.5E	16.5 W	USAIT	EH	11/14/15	24.6	6	EC	R
1445	INTELSAT5A 343.5E	16.5 W	USAIT	WH	22/23/24	24.2	6	EC	R
1446	INTELSAT5A 343.5E	16.5 W	USAIT	EZ	11/12/14/15	29.0	6	EC	R
1447	INTELSAT5A 343.5E	16.5 W	USAIT	WZ	22/23/24	29.0	6	EC	R
1448	INTELSAT5A 343.5E	16.5 W	USAIT	NEZ	11/12/14/15	29.0	6	EC	R
1449	INTELSAT5A 343.5E	16.5 W	USAIT	ESR	11	36.7	14	EC	R
1450	INTELSAT5A 343.5E	16.5 W	USAIT	WSR	22/23	40.0	14	EC	R
1451	INTELSAT5A 343.5E	16.5 W	USAIT	HTM	11/12/14/15/22/23/24	14.0	4	EK/ER	T
1452	INTELSAT5A 343.5E	16.5 W	USAIT	BCN	11/12/14/15/22/23/24	19.0	11	EK	T
1453	INTELSAT5A 343.5E	16.5 W	USAIT	G	11/12/14/15/22/23/24	21.0	4	EC	T
1454	INTELSAT5A 343.5E	16.5 W	USAIT	EH	11/14/15	24.6	4	EC	T
1455	INTELSAT5A 343.5E	16.5 W	USAIT	WH	22/23/24	24.2	4	EC	T
1456	INTELSAT5A 343.5E	16.5 W	USAIT	EZ	11/12/14/15	29.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1457	INTELSAT5A 343.5E	16.5 W	USAIT	WZ	22/23/24	29.0	4	EC	T
1458	INTELSAT5A 343.5E	16.5 W	USAIT	NEZ	11/12/14/15	29.0	4	EC	T
1459	INTELSAT5A 343.5E	16.5 W	USAIT	4SR	24	30.0	4	EC	T
1460	INTELSAT5A 343.5E	16.5 W	USAIT	ESR	11	36.7	11	EC	T
1461	INTELSAT5A 343.5E	16.5 W	USAIT	WSR	22/23	40.0	11	EC	T
1462	WSDRN	16.0 W	URS	1	11/12	49.0	14	EH	R
1463	WSDRN	16.0 W	URS	3	11/12	49.0	14	EH	R
1464	WSDRN	16.0 W	URS	4	11/12	43.0	14	EH	R
1465	WSDRN	16.0 W	URS	4	11/12	43.0	11	EC	T
1466	ZSSRD-2	16.0 W	URS	FLK	11/12	39.0	14	EC/EH	R
1467	ZSSRD-2	16.0 W	URS	FLR	11/12	39.0	11	EC/EH	T
1468	MARISAT-ATL	15.0 W	USA	G	11/14/15/22/23/24	15.0	0	EG	R
1469	MARISAT-ATL	15.0 W	USA	G	11/14/15/22/23/24	19.0	1	EG	R
1470	MARISAT-ATL	15.0 W	USA	G	11/12/14/15/22/23/24/31	19.0	6	EC/EK/ER	R
1471	MARISAT-ATL	15.0 W	USA	G	11/14/15/22/23/24	14.0	0	EG	T
1472	MARISAT-ATL	15.0 W	USA	G	11/14/15/22/23/24	19.0	1	EG/EK	T
1473	MARISAT-ATL	15.0 W	USA	G	11/12/14/15/22/23/24/31	19.0	4	EC/EK/ER	T
1474	INMARSAT AOR-EAST	15.0 W	G INM	G	11/12/14/15/22/23/24/31	19.5	1	EG/EJ	R
1475	INMARSAT AOR-EAST	15.0 W	G INM	G	11/12/14/15/22/23/24/31	19.5	6	EC/ED	R
1476	INMARSAT AOR-EAST	15.0 W	G INM	G	11/12/14/15/22/23/24/31	19.5	1	EG/EJ	T
1477	INMARSAT AOR-EAST	15.0 W	G INM	G	11/12/14/15/22/23/24/31	19.5	4	EC/EK/ER	T
1478	LOUTCH-1	14.0 W	URS	NEQ	11/12/14/15/31	30.0	14	EC	R
1479	LOUTCH-1	14.0 W	URS	NWQ	22/23/24	30.0	14	EC	R
1480	LOUTCH-1	14.0 W	URS	NEQ	11/12/14/15/31	30.0	11	EC	T
1481	LOUTCH-1	14.0 W	URS	NWQ	22/23/24	30.0	11	EC	T
1482	STATSIONAR-4	14.0 W	URSIK	G	11/12/14/15/22/23/24/31	19.0	6	EC	R
1483	STATSIONAR-4	14.0 W	URSIK	G	11/12/14/15/22/23/24/31	19.0	4	EC	T
1484	STATSIONAR-4	14.0 W	URSIK	NH	11/12/14/15/22/23/24/31	22.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1485	STATSIONAR-4	14.0 W	URSIK	S	11/12/14/15/22/23/24/31	19.0	4	EC	T
1486	VOLNA-2	14.0 W	URS	G	11/14/15/23/24	18.0	1	EG/EJ	R
1487	VOLNA-2	14.0 W	URS	G	11/14/15/23/24	18.0	1	EG/EJ	T
1488	GOMS-1	14.0 W	URS	G	11/12/13/14/15/31/32/33	15.0	2	EM	R
1489	GOMS-1	14.0 W	URS	S8	11/12	27.0	8	EM	R
1490	GOMS-1	14.0 W	URS	S28	11/12	38.0	28	EM	R
1491	GOMS-1	14.0 W	URS	DCP	11/12/13/14/15/31/32/33	0.0	0	EM	R
1492	GOMS-1	14.0 W	URS	G	11/12/13/14/15/31/32/33	15.0	1	EM	T
1493	GOMS-1	14.0 W	URS	S7	11/12	27.0	7	EM	T
1494	GOMS-1	14.0 W	URS	S20	11/12	38.0	20	EM	T
1495	GOMS-1	14.0 W	URS	DCP	11/12/13/14/15/31/32/33	0.0	0	EM	T
1496	MORE-14	14.0 W	URS	G	11/12/14/15/22/23/24	18.5	1	EG	R
1497	MORE-14	14.0 W	URS	G	11/12/14/15/22/23/24	18.5	6	EC	R
1498	MORE-14	14.0 W	URS	G	11/12/14/15/22/23/24	18.5	1	EG	T
1499	MORE-14	14.0 W	URS	G	11/12/14/15/22/23/24	18.5	4	EC	T
1500	POTOK-1	13.5 W	URS	Z1	11/12/14/15/31	25.0	4	EC	R
1501	POTOK-1	13.5 W	URS	Z2	11/14/23/24	25.0	4	EC	R
1502	POTOK-1	13.5 W	URS	Z3	24	25.0	4	EC	R
1503	POTOK-1	13.5 W	URS	Z4	14/15	25.0	4	EC	R
1504	POTOK-1	13.5 W	URS	G	11/12/14/15/22/23/24/31	17.0	4	EC	T
1505	MAROTS-B	12.5 W	F	G	11/12/13/14/15/22/23/24	0.0	0	EC/ED/EK/ER	T
1506	MAROTS-B	12.5 W	F	G	31	0.0	0	EC/ED/EK/ER	T
1507	MAROTS-B	12.5 W	F	G	11/12/13/14/15/22/23/24	18.1	1	EC/ED/EK/ER	T
1508	MAROTS-B	12.5 W	F	G	31	18.1	1	EC/ED/EK/ER	T
1509	MAROTS-B	12.5 W	F	G	11/12/13/14/15/22/23/24	0.0	0	EC/ED/EG/ER	R
1510	MAROTS-B	12.5 W	F	G	31	0.0	0	EC/ED/EG/ER	R
1511	MAROTS-B	12.5 W	F	G	11/12/13/14/15/22/23/24	19.0	1	EC/ED/EG/ER	R
1512	MAROTS-B	12.5 W	F	G	31	19.0	1	EC/ED/EG/ER	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1513	USGCSS PH2 ATL	12.0 W	USA	3	22/23	35.0	8	EC	R
1514	USGCSS PH2 ATL	12.0 W	USA	4	11/12/14	32.0	8	EC	R
1515	USGCSS PH2 ATL	12.0 W	USA	5	11/12/14/15/22/23/24/31	20.0	8	EC	R
1516	USGCSS PH2 ATL	12.0 W	USA	2	11/14/15/23/24	20.0	7	EC/EK	T
1517	USGCSS PH2 ATL	12.0 W	USA	3	22/23	35.0	7	EC/EK	T
1518	USGCSS PH2 ATL	12.0 W	USA	4	11/12/14	32.0	7	EC/EK	T
1519	USGCSS PH3 ATL	12.0 W	USA	F2	11/12/14/15/22/23/31	19.8	8	EC	R
1520	USGCSS PH3 ATL	12.0 W	USA	F3	11/12/14/15/22/23/31	19.3	8	EC	R
1521	USGCSS PH3 ATL	12.0 W	USA	273	11/12/14/15/22/23/31	27.3	8	EC	R
1522	USGCSS PH3 ATL	12.0 W	USA	F5	11/12/14/15/22/23/31	21.0	7	EC/EK/ER	T
1523	USGCSS PH3 ATL	12.0 W	USA	F6	11/12/14/15/22/23/31	20.0	7	EC/EK/ER	T
1524	USGCSS PH3 ATL	12.0 W	USA	320	11/12/14/15/22/23	32.0	7	EC	T
1525	USGCSS PH3 ATL	12.0 W	USA	346	21/22	34.6	7	EC	T
1526	HIPPARCOS	12.0 W	F	0	11/12/13/14/15/22/23/24	0.0	2	EH/ED/EK/ER	R
1527	HIPPARCOS	12.0 W	F	0	31	0.0	2	EH/ED/EK/ER	R
1528	HIPPARCOS	12.0 W	F	0	11/12/13/14/15/22/23/24	0.0	2	EH/ED/EK/ER	T
1529	HIPPARCOS	12.0 W	F	0	31	0.0	2	EH/ED/EK/ER	T
1530	F-SAT 2	11.0 W	F	MET	11	38.6	14	EC	R
1531	F-SAT 2	11.0 W	F	442	11	44.2	30	EC	R
1532	F-SAT 2	11.0 W	F	ISO	11/12/14/15/23/24	0.0	2	ED/ER	R
1533	F-SAT 2	11.0 W	F	MET	11	39.6	12	EC	T
1534	F-SAT 2	11.0 W	F	413	11	41.3	20	EC	T
1535	F-SAT 2	11.0 W	F	ISO	11/12/14/15/23/24	0.0	2	ER	T
1536	STATSIONAR-11	11.0 W	URS	G	11/12/14/15/22/23/24/31	19.0	6	EC	R
1537	STATSIONAR-11	11.0 W	URS	G	11/12/14/15/22/23/24/31	19.0	4	EC	T
1538	STATSIONAR-11	11.0 W	URS	220	11/12/14/15/22/23/31	22.0	4	EC	T
1539	TELECOM-1A	8.0 W	F	G	11/12/14/15/23/24/31	21.0	6	EC/ED/EK	R
1540	TELECOM-1A	8.0 W	F	G	11/12/14/15/23/24/31	21.0	8	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1541	TELECOM-1A	8.0 W	F	MET	11	38.6	14	EC	R
1542	TELECOM-1A	8.0 W	F	ISO	11/12/14/15/23/24/31	0.0	2	ED/ER	R
1543	TELECOM-1A	8.0 W	F	AG	22/23/24	28.0	4	EC	T
1544	TELECOM-1A	8.0 W	F	G	11/12/14/15/23/24/31	21.0	7	EC/EK	T
1545	TELECOM-1A	8.0 W	F	MET	11	39.6	12	EC	T
1546	TELECOM-1A	8.0 W	F	SG	11/12/14/15/23/24	22.5	4	EC/EK/ER	T
1547	TELECOM-1A	8.0 W	F	ISO	11/12/14/15/23/24/31	0.0	2	ER	T
1548	TELECOM-1B	5.0 W	F	G	11/12/14/15/23/24/31	21.0	6	EC/ED/EK	R
1549	TELECOM-1B	5.0 W	F	G	11/12/14/15/23/24/31	21.0	8	EC	R
1550	TELECOM-1B	5.0 W	F	ISO	11/12/14/15/23/24/31	0.0	2	ED/ER	R
1551	TELECOM-1B	5.0 W	F	MET	11	38.6	14	EC	R
1552	TELECOM-1B	5.0 W	F	AG	23/24	28.0	4	EC	T
1553	TELECOM-1B	5.0 W	F	G	11/12/14/15/23/24/31	21.0	7	EC/EK	T
1554	TELECOM-1B	5.0 W	F	ISO	11/12/14/15/23/24/31	0.0	2	ER	T
1555	TELECOM-1B	5.0 W	F	MET	11	39.6	12	EC	T
1556	TELECOM-1B	5.0 W	F	SG	11/12/14/15/23/24	22.5	4	EC/EK/ER	T
1557	INTELSAT4A ATL1	4.0 W	USAIT	BCN	11/12/14/15/23/24	14.0	6	EK/ED	R
1558	INTELSAT4A ATL1	4.0 W	USAIT	G	11/12/14/15/23/24	21.0	6	EC	R
1559	INTELSAT4A ATL1	4.0 W	USAIT	EH	11/12/14/15	24.8	6	EC	R
1560	INTELSAT4A ATL1	4.0 W	USAIT	WH	22/23/23	25.2	6	EC	R
1561	INTELSAT4A ATL1	4.0 W	USAIT	BCN	11/12/14/15/23/24	14.0	4	EK/ER	T
1562	INTELSAT4A ATL1	4.0 W	USAIT	G	11/12/14/15/23/24	21.0	4	EC	T
1563	INTELSAT4A ATL1	4.0 W	USAIT	EH	11/12/14/15	31.3	4	EC	T
1564	INTELSAT4A ATL1	4.0 W	USAIT	WH	11/14/23/24	29.3	4	EC	T
1565	INTELSAT4A ATL1	4.0 W	USAIT	NEQ	11/12/14/15	29.1	4	EC	T
1566	INTELSAT4A ATL1	4.0 W	USAIT	NWQ	11/14/23/24	27.5	4	EC	T
1567	INTELSAT4A ATL1	4.0 W	USAIT	SEQ	14/15	27.8	4	EC	T
1568	INTELSAT4A ATL1	4.0 W	USAIT	SWQ	24	30.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1569	INTELSAT5 CONT3	4.0 W	USAIT	O	11/12/14/15/23/24	2.0	6	EK/ED	R
1570	INTELSAT5 CONT3	4.0 W	USAIT	G	11/12/14/15/23/24	21.0	6	EC	R
1571	INTELSAT5 CONT3	4.0 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
1572	INTELSAT5 CONT3	4.0 W	USAIT	WH	23/24	24.2	6	EC	R
1573	INTELSAT5 CONT3	4.0 W	USAIT	WZ	23/24	29.0	6	EC	R
1574	INTELSAT5 CONT3	4.0 W	USAIT	NEZ	11/14/15	29.0	6	EC	R
1575	INTELSAT5 CONT3	4.0 W	USAIT	ESR	11	36.7	14	EC	R
1576	INTELSAT5 CONT3	4.0 W	USAIT	WSR	23	40.0	14	EC	R
1577	INTELSAT5 CONT3	4.0 W	USAIT	HTM	11/12/14/15/23/24	14.0	4	EK/ER	T
1578	INTELSAT5 CONT3	4.0 W	USAIT	BCN	11/12/14/15/23/24	19.0	11	EK	T
1579	INTELSAT5 CONT3	4.0 W	USAIT	G	11/12/14/15/23/24	21.0	4	EC	T
1580	INTELSAT5 CONT3	4.0 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
1581	INTELSAT5 CONT3	4.0 W	USAIT	WH	23/24	24.2	4	EC	T
1582	INTELSAT5 CONT3	4.0 W	USAIT	WZ	23/24	29.0	4	EC	T
1583	INTELSAT5 CONT3	4.0 W	USAIT	NEZ	11/14/15	29.0	4	EC	T
1584	INTELSAT5 CONT3	4.0 W	USAIT	ESR	11	36.7	11	EC	T
1585	INTELSAT5 CONT3	4.0 W	USAIT	WSR	23	40.0	11	EC	T
1586	INTELSAT5A CONT3	4.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	6	EC	R
1587	INTELSAT5A CONT3	4.0 W	USAIT	O	11/12/14/15/23/24/31	2.0	6	ED/EK	R
1588	INTELSAT5A CONT3	4.0 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
1589	INTELSAT5A CONT3	4.0 W	USAIT	WH	23/24	24.2	6	EC	R
1590	INTELSAT5A CONT3	4.0 W	USAIT	EZ	14/15/31	29.0	6	EC	R
1591	INTELSAT5A CONT3	4.0 W	USAIT	WZ	23/24	29.0	6	EC	R
1592	INTELSAT5A CONT3	4.0 W	USAIT	NEZ	11/12/14/15/31	29.0	6	EC	R
1593	INTELSAT5A CONT3	4.0 W	USAIT	ESR	11	36.7	14	EC	R
1594	INTELSAT5A CONT3	4.0 W	USAIT	WSR	23	40.0	14	EC	R
1595	INTELSAT5A CONT3	4.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	4	EC	T
1596	INTELSAT5A CONT3	4.0 W	USAIT	HTM	11/12/14/15/23/24/31	14.0	4	EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1597	INTELSAT5A CONT3	4.0 W	USAIT	BCN	11/12/14/15/23/24/31	19.0	11	EK	T
1598	INTELSAT5A CONT3	4.0 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
1599	INTELSAT5A CONT3	4.0 W	USAIT	WH	23/24	24.2	4	EC	T
1600	INTELSAT5A CONT3	4.0 W	USAIT	EZ	14/15/31	29.0	4	EC	T
1601	INTELSAT5A CONT3	4.0 W	USAIT	WZ	23/24	29.0	4	EC	T
1602	INTELSAT5A CONT3	4.0 W	USAIT	NEZ	11/12/14/15/31	29.0	4	EC	T
1603	INTELSAT5A CONT3	4.0 W	USAIT	4SR	24	30.0	4	EC	T
1604	INTELSAT5A CONT3	4.0 W	USAIT	ESR	11	36.7	11	EC	T
1605	INTELSAT5A CONT3	4.0 W	USAIT	WSR	23	40.0	11	EC	T
1606	INTELSAT4A ATL2	1.0 W	USAIT	H	11/12/14/15/23/24	14.0	6	EK/ED	R
1607	INTELSAT4A ATL2	1.0 W	USAIT	G	11/12/14/15/23/24	21.0	6	EC	R
1608	INTELSAT4A ATL2	1.0 W	USAIT	EH	11/12/14/15	24.8	6	EC	R
1609	INTELSAT4A ATL2	1.0 W	USAIT	WH	11/14/23/24	25.2	6	EC	R
1610	INTELSAT4A ATL2	1.0 W	USAIT	BCN	11/12/14/15/23/24	14.0	4	EK/ER	T
1611	INTELSAT4A ATL2	1.0 W	USAIT	G	11/12/14/15/23/24	21.0	4	EC	T
1612	INTELSAT4A ATL2	1.0 W	USAIT	EH	11/12/14/15	31.3	4	EC	T
1613	INTELSAT4A ATL2	1.0 W	USAIT	WH	11/14/23/24	29.3	4	EC	T
1614	INTELSAT4A ATL2	1.0 W	USAIT	NEQ	11/12/14/15	29.1	4	EC	T
1615	INTELSAT4A ATL2	1.0 W	USAIT	NWQ	11/14/23/24	27.5	4	EC	T
1616	INTELSAT4A ATL2	1.0 W	USAIT	SEQ	11/15	27.8	4	EC	T
1617	INTELSAT4A ATL2	1.0 W	USAIT	SWQ	14/24	30.0	4	EC	T
1618	INTELSAT5 CONT4	1.0 W	USAIT	O	11/12/14/15/23/24/31	2.0	6	EK/ED	R
1619	INTELSAT5 CONT4	1.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	6	EC	R
1620	INTELSAT5 CONT4	1.0 W	USAIT	EH	11/12/14/15/31	24.6	6	EC	R
1621	INTELSAT5 CONT4	1.0 W	USAIT	WH	23/24	24.2	6	EC	R
1622	INTELSAT5 CONT4	1.0 W	USAIT	WZ	23/24	29.0	6	EC	R
1623	INTELSAT5 CONT4	1.0 W	USAIT	NEZ	11/12/14/15	29.0	6	EC	R
1624	INTELSAT5 CONT4	1.0 W	USAIT	ESR	11	36.7	14	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1625	INTELSAT5 CONT4	1.0 W	USAIT	WSR	23	40.0	14	EC	R
1626	INTELSAT5 CONT4	1.0 W	USAIT	HTM	11/12/14/15/23/24/31	14.0	4	EK/ER	T
1627	INTELSAT5 CONT4	1.0 W	USAIT	BCN	11/12/14/15/23/24/31	19.0	11	EK	T
1628	INTELSAT5 CONT4	1.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	4	EC	T
1629	INTELSAT5 CONT4	1.0 W	USAIT	EH	11/12/14/15/31	24.6	4	EC	T
1630	INTELSAT5 CONT4	1.0 W	USAIT	WH	23/24	24.2	4	EC	T
1631	INTELSAT5 CONT4	1.0 W	USAIT	WZ	23/24	29.0	4	EC	T
1632	INTELSAT5 CONT4	1.0 W	USAIT	NEZ	11/12/14/15	29.0	4	EC	T
1633	INTELSAT5 CONT4	1.0 W	USAIT	ESR	11	36.7	11	EC	T
1634	INTELSAT5 CONT4	1.0 W	USAIT	WSR	23	40.0	11	EC	T
1635	INTELSAT5A CONT4	1.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	6	EC	R
1636	INTELSAT5A CONT4	1.0 W	USAIT	O	11/12/14/15/23/24/31	2.0	6	ED/EK	R
1637	INTELSAT5A CONT4	1.0 W	USAIT	EH	11/12/14/15	24.6	6	EC	R
1638	INTELSAT5A CONT4	1.0 W	USAIT	WH	23/24	24.2	6	EC	R
1639	INTELSAT5A CONT4	1.0 W	USAIT	EZ	14/15/31	29.0	6	EC	R
1640	INTELSAT5A CONT4	1.0 W	USAIT	WZ	23/24	29.0	6	EC	R
1641	INTELSAT5A CONT4	1.0 W	USAIT	NEZ	11/12/14/15/31	29.0	6	EC	R
1642	INTELSAT5A CONT4	1.0 W	USAIT	ESR	11	36.7	14	EC	R
1643	INTELSAT5A CONT4	1.0 W	USAIT	WSR	23	40.0	14	EC	R
1644	INTELSAT5A CONT4	1.0 W	USAIT	G	11/12/14/15/23/24/31	21.0	4	EC	T
1645	INTELSAT5A CONT4	1.0 W	USAIT	HTM	11/12/14/15/23/24/31	14.0	4	EK/ER	T
1646	INTELSAT5A CONT4	1.0 W	USAIT	BCN	11/12/14/15/23/24/31	19.0	11	EK	T
1647	INTELSAT5A CONT4	1.0 W	USAIT	EH	11/12/14/15	24.6	4	EC	T
1648	INTELSAT5A CONT4	1.0 W	USAIT	WH	23/24	24.2	4	EC	T
1649	INTELSAT5A CONT4	1.0 W	USAIT	EZ	14/15/31	29.0	4	EC	T
1650	INTELSAT5A CONT4	1.0 W	USAIT	WZ	23/24	29.0	4	EC	T
1651	INTELSAT5A CONT4	1.0 W	USAIT	NEZ	11/12/14/15/31	29.0	4	EC	T
1652	INTELSAT5A CONT4	1.0 W	USAIT	4SR	24	30.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1653	INTELSAT5A CONT4	1.0 W	USAIT	ESR	11	36.7	11	EC	T
1654	INTELSAT5A CONT4	1.0 W	USAIT	WSR	23	40.0	11	EC	T
1655	SKYNET 4A	1.0 W	G	G	11/12/14/15/23/24/31	20.5	8	EC	R
1656	SKYNET 4A	1.0 W	G	S	11	35.6	8	EC	R
1657	SKYNET 4A	1.0 W	G	UHF	11/12/14/15/23/24/31	13.0	0	EG	R
1658	SKYNET 4A	1.0 W	G	EHF	11/12/14/15/23/24/31	18.0	44	EX	R
1659	SKYNET 4A	1.0 W	G	G	11/12/14/15/23/24/31	20.5	7	EC	T
1660	SKYNET 4A	1.0 W	G	EUR	11/12/14/15	28.6	7	EC	T
1661	SKYNET 4A	1.0 W	G	WID	11/12/14/15/23	25.1	7	EC	T
1662	SKYNET 4A	1.0 W	G	S	11	34.6	7	EC	T
1663	SKYNET 4A	1.0 W	G	UHF	11/12/14/15/23/24/31	13.0	0	EG	T
1664	SKYNET 4A	1.0 W	G	BCN	11/12/14/15/23/24/31	17.0	7	ER	T
1665	GEOS-2	0.0 W	F GEO	G	11/12/14/15/23/24/31	0.0	0	ED/EK	R
1666	GEOS-2	0.0 W	F GEO	G	11/12/14/15/23/24/31	0.0	0	EK/ER	T
1667	METEOSAT	0.0 W	F MET	G	11/12/14/15/23/24/31	0.0	0	ED/EK/EM	R
1668	METEOSAT	0.0 W	F MET	G	11/12/14/15/23/24/31	4.0	2	ED/EM	R
1669	METEOSAT	0.0 W	F MET	G	11/12/14/15/23/24/31	0.0	0	EM	T
1670	METEOSAT	0.0 W	F MET	G	11/12/14/15/23/24/31	14.0	1	EM/ER	T
1671	SKYNET A	0.0 E	G	U	11/12/14/15/23/24/31	13.0	0	EC/ED/EG	R
1672	SKYNET A	0.0 E	G	U	11/12/14/15/23/24/31	13.0	0	ER/EU/EQ	R
1673	SKYNET A	0.0 E	G	G	11/12/14/15/23/24/31	17.0	8	EC/ED/EG	R
1674	SKYNET A	0.0 E	G	G	11/12/14/15/23/24/31	17.0	8	ER/EU/EQ	R
1675	SKYNET A	0.0 E	G	S	11	30.0	8	EC/ED/EG	R
1676	SKYNET A	0.0 E	G	S	11	30.0	8	ER/EU/EQ	R
1677	SKYNET A	0.0 E	G	G	11/12/14/15/23/24/31	17.0	44	EC/ED/EG	R
1678	SKYNET A	0.0 E	G	G	11/12/14/15/23/24/31	17.0	44	ER/EU/EQ	R
1679	SKYNET A	0.0 E	G	U	11/12/14/15/23/24/31	13.0	0	EC/ED/EG	T
1680	SKYNET A	0.0 E	G	U	11/12/14/15/23/24/31	13.0	0	ER/EU	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1681	SKYNET A	0.0 E	G	G	11/12/14/15/23/24/31	17.0	7	EC/ED/EG	T
1682	SKYNET A	0.0 E	G	G	11/12/14/15/23/24/31	17.0	7	ER/EU	T
1683	SKYNET A	0.0 E	G	N	11	25.0	7	EC/ED/EG	T
1684	SKYNET A	0.0 E	G	N	11	25.0	7	ER/EU	T
1685	SKYNET A	0.0 E	G	W	11/23	19.0	7	EC/ED/EG	T
1686	SKYNET A	0.0 E	G	W	11/23	19.0	7	ER/EU	T
1687	SKYNET A	0.0 E	G	S	11	30.0	7	EC/ED/EG	T
1688	SKYNET A	0.0 E	G	S	11	30.0	7	ER/EU	T
1689	GDL-5	1.0 E	LUX	365	11	36.5	6	EC	R
1690	GDL-5	1.0 E	LUX	375	11	37.5	14	EC	R
1691	GDL-5	1.0 E	LUX	375	11	37.5	11	EC	T
1692	GDL-5	1.0 E	LUX	375	11	37.5	12	EC	T
1693	TELECOM 1C	3.0 E	F	G	11/12/14/15/23/24	21.0	8	EC	R
1694	TELECOM 1C	3.0 E	F	MET	11/14	38.6	14	EC	R
1695	TELECOM 1C	3.0 E	F	ISO	11/12/14/15/23/24	0.0	2	ED/ER	R
1696	TELECOM 1C	3.0 E	F	G	11/12/14/15/23/24	21.0	6	EC	R
1697	TELECOM 1C	3.0 E	F	G	11/12/14/15/23/24	21.0	7	EC/EK	T
1698	TELECOM 1C	3.0 E	F	MET	11/14	39.6	12	EC	T
1699	TELECOM 1C	3.0 E	F	ISO	11/12/14/15/23/24	0.0	2	ER	T
1700	TELECOM 1C	3.0 E	F	SG	11/12/14/15/23/24	22.5	4	EC	T
1701	TELECOM 1C	3.0 E	F	AG	23/24	28.0	4	EC	T
1702	OTS	5.0 E	F OTS	0	11/12/14/15/23/24/31	2.0	0	ED	R
1703	OTS	5.0 E	F OTS	2	11	29.0	14	EC/EX	R
1704	OTS	5.0 E	F OTS	3	11/14	26.5	14	EC/ED/EX	R
1705	OTS	5.0 E	F OTS	0	11/12/14/15/23/24/31	2.0	0	ER	T
1706	OTS	5.0 E	F OTS	2	11	29.0	11	EK/EX	T
1707	OTS	5.0 E	F OTS	3	11/14	26.5	11	EC/ER/EX	T
1708	OTS	5.0 E	F OTS	4	11	35.5	11	EC/EX	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM		BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1709	TELE-X	5.0 E	S	NOT	413	11	41.3	14	EC	R
1710	TELE-X	5.0 E	S	NOT	416	11	41.6	17	EC	R
1711	TELE-X	5.0 E	S	NOT	420	11	42.0	17	ED/EK	R
1712	TELE-X	5.0 E	S	NOT	OMN	11/12/14/15/24/31	-.2	2	ED/EK	R
1713	TELE-X	5.0 E	S	NOT	438	11	43.8	12	EC	T
1714	TELE-X	5.0 E	S	NOT	435	11	43.5	12	EK/ER	T
1715	TELE-X	5.0 E	S	NOT	003	11/12/14/15/24/31	3.0	2	EK/ER	T
1716	SKYNET 4B	6.0 E	G		G	11/12/14/15/23/24/31	20.5	8	EC	R
1717	SKYNET 4B	6.0 E	G		S	11	35.6	8	EC	R
1718	SKYNET 4B	6.0 E	G		UHF	11/12/14/15/23/24/31	13.0	0	EG	R
1719	SKYNET 4B	6.0 E	G		EHF	11/12/14/15/23/24/31	18.0	44	EX	R
1720	SKYNET 4B	6.0 E	G		G	11/12/14/15/23/24/31	20.5	7	EC	T
1721	SKYNET 4B	6.0 E	G		EUR	11/12/14/15	28.6	7	EC	T
1722	SKYNET 4B	6.0 E	G		WID	11/12/14/15/23	25.1	7	EC	T
1723	SKYNET 4B	6.0 E	G		S	11	34.6	7	EC	T
1724	SKYNET 4B	6.0 E	G		UHF	11/12/14/15/23/24/31	13.0	0	EG	T
1725	SKYNET 4B	6.0 E	G		BCN	11/12/14/15/23/24/31	17.0	7	ER	T
1726	EUTELSAT I-3	7.0 E	F	EUT	E5	11/12/14	32.5	14	EC	R
1727	EUTELSAT I-3	7.0 E	F	EUT	E1	11/12/14/15/31	28.0	14	EC	R
1728	EUTELSAT I-3	7.0 E	F	EUT	E1	11/12/14/15/31	28.0	11	EC/EK	T
1729	EUTELSAT I-3	7.0 E	F	EUT	E2	11/14	34.5	11	EC	T
1730	EUTELSAT I-3	7.0 E	F	EUT	E3	11/12/14/15	34.5	11	EC	T
1731	EUTELSAT I-3	7.0 E	F	EUT	E4	11/14	34.5	11	EC	T
1732	EUTELSAT I-3	7.0 E	F	EUT	E5	11/12/14	32.5	12	EC	T
1733	F-SAT 1	7.0 E	F		SG	11/12/14/15/23/24	27.0	6	EC/ED	R
1734	F-SAT 1	7.0 E	F		ANT	23/24	30.0	6	EC	R
1735	F-SAT 1	7.0 E	F		ISO	11/12/14/15/23/24/31	0.0	2	ED/ER	R
1736	F-SAT 1	7.0 E	F		442	11	44.2	30	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM		BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1737	F-SAT 1	7.0 E	F		SG	11/12/14/15/23/24	27.0	4	EC	T
1738	F-SAT 1	7.0 E	F		ANT	23/24	30.0	4	EC	T
1739	F-SAT 1	7.0 E	F		G	11/12/14/15/23/24/31	21.0	4	ER	T
1740	F-SAT 1	7.0 E	F		ISO	11/12/14/15/23/24/31	0.0	2	ER	T
1741	F-SAT 1	7.0 E	F		413	11	41.3	20	EC	T
1742	EUTELSAT-1	10.0 E	F	EUT	E1	11/14	28.0	14	EC	R
1743	EUTELSAT-1	10.0 E	F	EUT	O	11/12/14/15/21/24/31	4.0	0	ED	R
1744	EUTELSAT-1	10.0 E	F	EUT	E2	11	34.5	11	EC	T
1745	EUTELSAT-1	10.0 E	F	EUT	E3	11/14	34.5	11	EC	T
1746	EUTELSAT-1	10.0 E	F	EUT	E4	11/14	34.5	11	EC	T
1747	EUTELSAT-1	10.0 E	F	EUT	O	11/12/14/15/21/24/31	3.0	0	EK/ER	T
1748	EUTELSAT-1	10.0 E	F	EUT	E1	11/14	28.0	11	EC/ER	T
1749	APEX	10.0 E	F		REU	15	33.5	6	EC	R
1750	APEX	10.0 E	F		AFO	14	33.5	6	EC	R
1751	APEX	10.0 E	F		EAF	11/12/14/15	33.5	6	EC/ED	R
1752	APEX	10.0 E	F		AFC	14/15	33.5	6	EC	R
1753	APEX	10.0 E	F		ANT	23/24	33.5	6	EC	R
1754	APEX	10.0 E	F		F	11	44.2	30	EC	R
1755	APEX	10.0 E	F		ISO	11/12/14/15/23/24/31	0.0	2	ED/ER	R
1756	APEX	10.0 E	F		REU	15	30.0	4	EC	T
1757	APEX	10.0 E	F		AFO	14	30.0	4	EC	T
1758	APEX	10.0 E	F		EAF	11/12/14/15	30.0	4	EC	T
1759	APEX	10.0 E	F		AFC	14/15	30.0	4	EC	T
1760	APEX	10.0 E	F		ANT	23/24	30.0	4	EC	T
1761	APEX	10.0 E	F		F	11	41.3	20	EC	T
1762	APEX	10.0 E	F		ISO	11/12/14/15/23/24/31	0.0	2	ER	T
1763	APEX	10.0 E	F		B2	11	28.0	40	EC/EX	T
1764	APEX	10.0 E	F		B3	11	30.0	90	EC/EX	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1765	PROGNOZ-2	12.0 E	URS	NEQ	11/12/14/15/31	-2.0	2	EH	T
1766	EUTELSAT 1-2	13.0 E	F EUT	E1	11/14	28.0	14	EC	R
1767	EUTELSAT 1-2	13.0 E	F EUT	O	11/12/14/15/21/24/31	4.0	0	ED	R
1768	EUTELSAT 1-2	13.0 E	F EUT	E2	11	34.5	11	EC	T
1769	EUTELSAT 1-2	13.0 E	F EUT	E3	11/14	34.5	11	EC	T
1770	EUTELSAT 1-2	13.0 E	F EUT	E4	11/14	34.5	11	EC	T
1771	EUTELSAT 1-2	13.0 E	F EUT	O	11/12/14/15/21/24/31	3.0	0	EK/ER	T
1772	EUTELSAT 1-2	13.0 E	F EUT	E1	11/14	28.0	11	EC	T
1773	ITALSAT	13.0 E	I	DOM	11	41.0	30	EC/ED/EK	R
1774	ITALSAT	13.0 E	I	SA	11	53.0	28	EC/ED/EK	R
1775	ITALSAT	13.0 E	I	SA	11	53.0	30	EC/ED/EK	R
1776	ITALSAT	13.0 E	I	SB	11	53.0	28	EC/ED/EK	R
1777	ITALSAT	13.0 E	I	SB	11	53.0	30	EC/ED/EK	R
1778	ITALSAT	13.0 E	I	SC	11	53.0	28	EC/ED/EK	R
1779	ITALSAT	13.0 E	I	SC	11	53.0	30	EC/ED/EK	R
1780	ITALSAT	13.0 E	I	SD	11	53.0	28	EC/ED/EK	R
1781	ITALSAT	13.0 E	I	SD	11	53.0	30	EC/ED/EK	R
1782	ITALSAT	13.0 E	I	SE	11	53.0	28	EC/ED/EK	R
1783	ITALSAT	13.0 E	I	SE	11	53.0	30	EC/ED/EK	R
1784	ITALSAT	13.0 E	I	SF	11	53.0	28	EC/ED/EK	R
1785	ITALSAT	13.0 E	I	SF	11	53.0	30	EC/ED/EK	R
1786	ITALSAT	13.0 E	I	BCN	11	41.0	28	EC/ED/EK	R
1787	ITALSAT	13.0 E	I	UHF	11/12/14/15/24/31	0.0	2	EC/ED/EK	R
1788	ITALSAT	13.0 E	I	DOM	11	41.0	20	EC/EK/ER	T
1789	ITALSAT	13.0 E	I	SA	11	49.5	20	EC/EK/ER	T
1790	ITALSAT	13.0 E	I	SC	11	49.5	20	EC/EK/ER	T
1791	ITALSAT	13.0 E	I	SB	11	49.5	18	EC/EK/ER	T
1792	ITALSAT	13.0 E	I	SB	11	49.5	19	EC/EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1793	ITALSAT	13.0 E	I	SD	11	49.5	18	EC/EK/ER	T
1794	ITALSAT	13.0 E	I	SD	11	49.5	19	EC/EK/ER	T
1795	ITALSAT	13.0 E	I	SE	11	49.5	18	EC/EK/ER	T
1796	ITALSAT	13.0 E	I	SE	11	49.5	19	EC/EK/ER	T
1797	ITALSAT	13.0 E	I	SF	11	49.5	18	EC/EK/ER	T
1798	ITALSAT	13.0 E	I	SF	11	49.5	19	EC/EK/ER	T
1799	ITALSAT	13.0 E	I	P	11/14	34.5	38	EC/EK/ER	T
1800	ITALSAT	13.0 E	I	P	11/14	34.5	40	EC/EK/ER	T
1801	ITALSAT	13.0 E	I	BCN	11	41.0	18	EC/EK/ER	T
1802	ITALSAT	13.0 E	I	UHF	11/12/14/15/24/31	0.0	2	EC/EK/ER	T
1803	NIGERIA-1	14.0 E	NIG	373	14	37.3	5	EC/ED/EK/ER	R
1804	NIGERIA-1	14.0 E	NIG	332	14	33.2	4	EC/ER	T
1805	AMS	15.0 E	ISR	C	11/15	40.5	6	EC/ED	R
1806	AMS	15.0 E	ISR	K	15	44.1	14	EC/ED	R
1807	AMS	15.0 E	ISR	C	11/15	36.5	4	EC/ER	T
1808	AMS	15.0 E	ISR	K	11/15	35.1	11	EC/ER	T
1809	AMS	15.0 E	ISR	P	15	44.1	11	EC/ER	T
1810	SICRAL 1A	16.0 E	I	G	11/12/13/14/15/23/24/31	17.0	0	EG	R
1811	SICRAL 1A	16.0 E	I	EUR	11/14/15	31.7	8	EC/EG	R
1812	SICRAL 1A	16.0 E	I	I	11	41.0	8	EC	R
1813	SICRAL 1A	16.0 E	I	I	11	40.5	14	EC	R
1814	SICRAL 1A	16.0 E	I	MED	11/14/15	31.7	44	EG/EQ	R
1815	SICRAL 1A	16.0 E	I	G	11/12/13/14/15/23/24/31	17.0	0	EG	T
1816	SICRAL 1A	16.0 E	I	EUR	11/14/15	31.7	7	EC/EG	T
1817	SICRAL 1A	16.0 E	I	I	11	41.0	7	EC	T
1818	SICRAL 1A	16.0 E	I	I	11	40.5	12	EC	T
1819	SICRAL 1A	16.0 E	I	MED	11/14/15	31.7	20	EG	T
1820	SABS-1	17.0 E	ARS	370	15	37.0	14	EC/ED/EK	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1821	SABS-1	17.0 E	ARS	G	11/12/14/15/24/31	15.0	11	EK	T
1822	SABS 1-2	17.0 E	ARS	FL	15	37.0	14	EC	R
1823	SABS 1-2	17.0 E	ARS	H	11/12/14/15/24/31/32/33	15.0	14	EK/ED	R
1824	SABS 1-2	17.0 E	ARS	TTK	11/12/14/15/24/31/32/33	15.0	11	ER/EK	T
1825	ARABSAT-1	19.0 E	ARSARB	REG	14/15	27.0	6	EC/ED/EK	R
1826	ARABSAT-1	19.0 E	ARSARB	REG	14/15	27.0	4	EC/EK/ER	T
1827	GDL-6	19.0 E	LUX	365	11	36.5	6	EC	R
1828	GDL-6	19.0 E	LUX	375	11	37.5	14	EC	R
1829	GDL-6	19.0 E	LUX	375	11	37.5	11	EC	T
1830	GDL-6	19.0 E	LUX	375	11	37.5	12	EC	T
1831	NIGERIA-2	20.0 E	NIG	373	14	37.3	6	EC/ED/EK/ER	R
1832	NIGERIA-2	20.0 E	NIG	332	14	33.2	4	EC/ER	T
1833	SICRAL 1B	22.0 E	I	G	11/12/14/15/23/24/31	17.0	0	EG	R
1834	SICRAL 1B	22.0 E	I	EUR	11/14/15	31.7	8	EC/EG	R
1835	SICRAL 1B	22.0 E	I	I	11	41.0	8	EC	R
1836	SICRAL 1B	22.0 E	I	I	11	40.5	14	EC	R
1837	SICRAL 1B	22.0 E	I	MED	11/14/15	31.7	44	EG/EQ	R
1838	SICRAL 1B	22.0 E	I	G	11/12/14/15/22/23/24/31	17.0	0	EG	T
1839	SICRAL 1B	22.0 E	I	EUR	11/14/15	31.7	7	EC/EG	T
1840	SICRAL 1B	22.0 E	I	I	11	41.0	7	EC	T
1841	SICRAL 1B	22.0 E	I	I	11	40.5	12	EC	T
1842	SICRAL 1B	22.0 E	I	MED	11/14/15	31.7	20	EG	T
1843	DFS-1	23.5 E	D	G	11/12/14/15/31	8.0	2	ED/EK	R
1844	DFS-1	23.5 E	D	S14	11	44.0	14	EC/ED/EK	R
1845	DFS-1	23.5 E	D	S30	11	45.1	30	EC	R
1846	DFS-1	23.5 E	D	G	11/12/14/15/31	8.0	2	ER/EK	T
1847	DFS-1	23.5 E	D	S11	11	42.7	11	EC/ER/EK	T
1848	DFS-1	23.5 E	D	S12	11	43.4	12	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1849	DFS-1	23.5 E	D	BCN	11	42.3	20	EC	T
1850	DFS-1	23.5 E	D	S20	11	42.3	20	EC	T
1851	ARABSAT-2	26.0 E	ARSARB	REG	14/15	27.0	6	EC/ED/EK	R
1852	ARABSAT-2	26.0 E	ARSARB	REG	14/15	27.0	4	EC/EK/ER	T
1853	ZOHREH-2	26.0 E	IRN	370	11/12/15/31	37.0	14	EC	R
1854	ZOHREH-2	26.0 E	IRN	G	11/12/14/15/24/31	15.0	14	EC/ED	R
1855	ZOHREH-2	26.0 E	IRN	370	11/12/15/31	37.0	11	EC/ER	T
1856	ZOHREH-2	26.0 E	IRN	G	11/12/14/15/24/31	15.0	11	EC/ER	T
1857	DFS-2	28.5 E	D	G	11/12/14/15/31	8.0	2	ED/EK	R
1858	DFS-2	28.5 E	D	S14	11	44.0	14	EC/ED/EK	R
1859	DFS-2	28.5 E	D	S30	11	45.1	30	EC	R
1860	DFS-2	28.5 E	D	G	11/12/14/15/31	7.5	2	ER/EK	T
1861	DFS-2	28.5 E	D	S11	11	42.7	11	EC/ER/EK	T
1862	DFS-2	28.5 E	D	S12	11	43.4	12	EC	T
1863	DFS-2	28.5 E	D	BCN	11	42.3	20	EC	T
1864	DFS-2	28.5 E	D	S20	11	42.3	20	EC	T
1865	GEOS-2	29.0 E	F GEO	G	11/12/14/15/24/31/32/33	0.0	0	ED/EK	R
1866	GEOS-2	29.0 E	F GEO	G	11/12/14/15/24/31/32/33	0.0	0	EK/ER	T
1867	VIDEOSAT-1	32.0 E	F	MET	11/14	38.6	14	EC	R
1868	VIDEOSAT-1	32.0 E	F	ISO	11/12/14/15/31	0.0	2	ED/ER	R
1869	VIDEOSAT-1	32.0 E	F	MET	11/14	39.6	12	EC	T
1870	VIDEOSAT-1	32.0 E	F	ISO	11/12/14/15/31	0.0	2	ER	T
1871	ZOHREH-1	34.0 E	IRN	370	11/12/15/31	37.0	14	EC	R
1872	ZOHREH-1	34.0 E	IRN	G	11/12/14/15/24/31	15.0	14	EC/ED	R
1873	ZOHREH-1	34.0 E	IRN	370	11/12/15/31	37.0	11	EC/ER	T
1874	ZOHREH-1	34.0 E	IRN	G	11/12/14/15/24/31	15.0	11	EC/ER	T
1875	GALS-6	35.0 E	URS	G	11/12/14/15/31	19.0	8	EC	R
1876	GALS-6	35.0 E	URS	NH	11/12/14/15/31	23.0	8	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1877	GALS-6	35.0 E	URS	S	11/12/15/31	30.0	8	EC	R
1878	GALS-6	35.0 E	URS	G	11/12/14/15/31	19.0	7	EC	T
1879	GALS-6	35.0 E	URS	NH	11/12/14/15/31	23.0	7	EC	T
1880	GALS-6	35.0 E	URS	S	11/12/15/31	30.0	7	EC	T
1881	PROGNOZ-3	35.0 E	URS	NQ	11/12/14/15	-2.0	2	EH	T
1882	STATSIONAR-2	35.0 E	URS	NH	11/12/13/14/15/31/33	22.0	5	EC	R
1883	STATSIONAR-2	35.0 E	URS	NH	11/12/13/14/15/31/33	22.0	6	EC	R
1884	STATSIONAR-2	35.0 E	URS	NH	11/12/13/14/15/31/33	22.0	4	EC	T
1885	STATSIONAR-D3	35.0 E	URS	N6	14	25.0	6	EC	R
1886	STATSIONAR-D3	35.0 E	URS	N6	11/12/14/15	25.0	6	EC	R
1887	STATSIONAR-D3	35.0 E	URS	N6	12/15/31	25.0	6	EC	R
1888	STATSIONAR-D3	35.0 E	URS	N6	15/31/32	25.0	6	EC	R
1889	STATSIONAR-D3	35.0 E	URS	N6	14/15	25.0	6	EC	R
1890	STATSIONAR-D3	35.0 E	URS	N6	14/24	25.0	6	EC	R
1891	STATSIONAR-D3	35.0 E	URS	N6	14/15	25.0	6	EC	R
1892	STATSIONAR-D3	35.0 E	URS	N4	14	25.0	4	EC	T
1893	STATSIONAR-D3	35.0 E	URS	N4	11/12/14/15	25.0	4	EC	T
1894	STATSIONAR-D3	35.0 E	URS	N4	12/15/31	25.0	4	EC	T
1895	STATSIONAR-D3	35.0 E	URS	N4	15/31/32	25.0	4	EC	T
1896	STATSIONAR-D3	35.0 E	URS	N4	14/15	25.0	4	EC	T
1897	STATSIONAR-D3	35.0 E	URS	N4	14/24	25.0	4	EC	T
1898	STATSIONAR-D3	35.0 E	URS	N4	14/15	25.0	4	EC	T
1899	VOLNA 11	35.0 E	URS	G	11/12/14/15/31	18.0	1	EJ	R
1900	VOLNA 11	35.0 E	URS	G	11/12/14/15/31	14.0	0	EJ	R
1901	VOLNA 11	35.0 E	URS	G	11/12/14/15/31	14.0	0	EU	R
1902	VOLNA 11	35.0 E	URS	G	11/12/14/15/31	18.0	1	EJ	T
1903	VOLNA 11	35.0 E	URS	G	11/12/14/15/31	12.0	0	EJ/EU	T
1904	PAKSAT I	38.0 E	PAK	DOM	31	41.3	14	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1905	PAKSAT I	38.0 E	PAK	DOM	31	39.9	12	EC/EV/EB/EK	T
1906	STATSIONAR-12	40.0 E	URS	G	11/12/13/14/15/24/31/32	19.0	5	EC	R
1907	STATSIONAR-12	40.0 E	URS	G	33	19.0	5	EC	R
1908	STATSIONAR-12	40.0 E	URS	G	11/12/13/14/15/24/31/32	19.0	6	EC	R
1909	STATSIONAR-12	40.0 E	URS	G	33	19.0	6	EC	R
1910	STATSIONAR-12	40.0 E	URS	Z	11/12/13/14/15/31	25.0	6	EC	R
1911	STATSIONAR-12	40.0 E	URS	G	11/12/13/14/15/24/31/32	19.0	4	EC	T
1912	STATSIONAR-12	40.0 E	URS	G	33	19.0	4	EC	T
1913	STATSIONAR-12	40.0 E	URS	NH	11/12/13/14/15/31/32/33	22.0	4	EC	T
1914	STATSIONAR-12	40.0 E	URS	S	11/12	30.0	4	EC	T
1915	STATSIONAR-12	40.0 E	URS	Z	11/12/13/14/15/31	25.0	4	EC	T
1916	PAKSAT II	41.0 E	PAK	DOM	31	41.3	14	EC	R
1917	PAKSAT II	41.0 E	PAK	FSS	31	35.0	12	EC/EV/EB/EK	T
1918	ZOHREH-4	41.0 E	IRN	DOM	12/15/31	37.0	14	EC/EK/ER	R
1919	ZOHREH-4	41.0 E	IRN	G	11/12/13/14/15/31/32/33	15.0	14	ED	R
1920	ZOHREH-4	41.0 E	IRN	DOM	12/15/31	37.0	11	EC/ER	T
1921	ZOHREH-4	41.0 E	IRN	G	11/12/13/14/15/31/32/33	15.0	11	ER	T
1922	GALS-2	45.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	8	EC	R
1923	GALS-2	45.0 E	URS	NH	11/12/13/14/15/31/33	23.0	8	EC	R
1924	GALS-2	45.0 E	URS	S	11/12/31	30.0	8	EC	R
1925	GALS-2	45.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	7	EC	T
1926	GALS-2	45.0 E	URS	NH	11/12/13/14/15/31/33	23.0	7	EC	T
1927	GALS-2	45.0 E	URS	S	11/12/31	30.0	7	EC	T
1928	STATSIONAR-9	45.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	5	EC	R
1929	STATSIONAR-9	45.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
1930	STATSIONAR-9	45.0 E	URS	NH	11/12/13/14/15/31/33	22.0	5	EC	R
1931	STATSIONAR-9	45.0 E	URS	NH	11/12/13/14/15/31/33	22.0	6	EC	R
1932	STATSIONAR-9	45.0 E	URS	NH	11/12/13/14/15/31/33	22.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1933	LOUTCH P2	45.0 E	URS	G	11/12/13/14/15/31/32/33	22.0	14	EC	R
1934	LOUTCH P2	45.0 E	URS	G	11/12/13/14/15/31/32/33	22.0	11	EC	T
1935	VOLNA-3	45.0 E	URS	G	11/12/13/14/15/31/32	14.0	0	EJ/EU	R
1936	VOLNA-3	45.0 E	URS	G	11/12/13/14/15/31/32	18.0	1	EJ	R
1937	VOLNA-3	45.0 E	URS	G	11/12/13/14/15/31/32	14.0	0	EJ/EU	T
1938	VOLNA-3	45.0 E	URS	G	11/12/13/14/15/31/32	18.0	1	EJ	T
1939	STATSIONAR D-4	45.0 E	URS	N6	11/14/15	25.0	6	EC	R
1940	STATSIONAR D-4	45.0 E	URS	N6	11/12/14/15	25.0	6	EC	R
1941	STATSIONAR D-4	45.0 E	URS	N6	12/13/31/32/33	25.0	6	EC	R
1942	STATSIONAR D-4	45.0 E	URS	N6	32	25.0	6	EC	R
1943	STATSIONAR D-4	45.0 E	URS	N6	15/32	25.0	6	EC	R
1944	STATSIONAR D-4	45.0 E	URS	N6	14	25.0	6	EC	R
1945	STATSIONAR D-4	45.0 E	URS	N6	14/15	25.0	6	EC	R
1946	STATSIONAR D-4	45.0 E	URS	N4	11/14/15	25.0	4	EC	T
1947	STATSIONAR D-4	45.0 E	URS	N4	11/12/14/15	25.0	4	EC	T
1948	STATSIONAR D-4	45.0 E	URS	N4	12/13/31/32/33	25.0	4	EC	T
1949	STATSIONAR D-4	45.0 E	URS	N4	32	25.0	4	EC	T
1950	STATSIONAR D-4	45.0 E	URS	N4	15/32	25.0	4	EC	T
1951	STATSIONAR D-4	45.0 E	URS	N4	14	25.0	4	EC	T
1952	STATSIONAR D-4	45.0 E	URS	N4	14/15	25.0	4	EC	T
1953	ZOHREH-3	47.0 E	IRN	G	11/12/13/14/15/31/32/33	15.0	14	EC/ED	R
1954	ZOHREH-3	47.0 E	IRN	370	11/12/15/31	37.0	14	EC	R
1955	ZOHREH-3	47.0 E	IRN	G	11/12/13/14/15/31/32/33	15.0	11	EC/ER	T
1956	ZOHREH-3	47.0 E	IRN	370	11/12/15/31	37.0	11	EC/ER	T
1957	LOUTCH-2	53.0 E	URS	NWQ	11/12/14/15/31	30.0	14	EC	R
1958	LOUTCH-2	53.0 E	URS	NWQ	11/12/14/15/31	30.0	11	EC	T
1959	STATSIONAR-5	53.0 E	URSIK	1	11/12/13/14/15/31/32/33	19.0	6	EC	R
1960	STATSIONAR-5	53.0 E	URSIK	2	11/12/13/15/31/33	25.0	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1961	STATSIONAR-5	53.0 E	URSIK	2	11/12/13/15/31/33	25.0	4	EC	T
1962	STATSIONAR-5	53.0 E	URSIK	3	11/12/13/14/15/31/32/33	22.0	4	EC	T
1963	STATSIONAR-5	53.0 E	URSIK	4	11/12/13/14/15/31/32/33	30.0	4	EC	T
1964	VOLNA-4	53.0 E	URS	G	11/12/13/14/15/31/32/33	18.0	1	EG/EJ	R
1965	VOLNA-4	53.0 E	URS	G	11/12/13/14/15/31/32/33	18.0	1	EG/EJ	T
1966	MORE-53	53.0 E	URS	G	11/12/13/14/15/31/32/33	18.5	1	EG	R
1967	MORE-53	53.0 E	URS	G	11/12/13/14/15/31/32/33	18.5	6	EC	R
1968	MORE-53	53.0 E	URS	G	11/12/13/14/15/31/32/33	18.5	1	EG	T
1969	MORE-53	53.0 E	URS	G	11/12/13/14/15/31/32/33	18.5	4	EC	T
1970	SKYNET 4C	53.0 E	G	G	11/12/13/14/15/31/32/33	20.5	8	EC/ED/EG/EI	R
1971	SKYNET 4C	53.0 E	G	G	11/12/13/14/15/31/32/33	20.5	8	ER/EU/EY/EX	R
1972	SKYNET 4C	53.0 E	G	S	11	35.0	8	EC/ED/EG	R
1973	SKYNET 4C	53.0 E	G	S	11	35.0	8	ER/EU/EQ	R
1974	SKYNET 4C	53.0 E	G	UHF	11/12/13/14/15/31/32/33	13.0	0	EC/ED/EG	R
1975	SKYNET 4C	53.0 E	G	UHF	11/12/13/14/15/31/32/33	13.0	0	ER/EU/EQ	R
1976	SKYNET 4C	53.0 E	G	EHF	11/12/13/14/15/31/32/33	18.0	44	EC/ED/EG	R
1977	SKYNET 4C	53.0 E	G	EHF	11/12/13/14/15/31/32/33	18.0	44	ER/EU/EQ	R
1978	SKYNET 4C	53.0 E	G	G	11/12/13/14/15/31/32/33	20.0	7	EC/ED/EG/ER	T
1979	SKYNET 4C	53.0 E	G	G	11/12/13/14/15/31/32/33	20.0	7	EV/EX	T
1980	SKYNET 4C	53.0 E	G	N	11/12/15/31	28.0	7	EC/ED/EG/ER	T
1981	SKYNET 4C	53.0 E	G	N	11/12/15/31	28.0	7	EV/EX	T
1982	SKYNET 4C	53.0 E	G	W	11/12/13/14/15/31/33	25.0	7	EC/ED/EG/ER	T
1983	SKYNET 4C	53.0 E	G	W	11/12/13/14/15/31/33	25.0	7	EV/EX	T
1984	SKYNET 4C	53.0 E	G	S	11	34.0	7	EC/ED/EG/ER	T
1985	SKYNET 4C	53.0 E	G	S	11	34.0	7	EV/EX	T
1986	SKYNET 4C	53.0 E	G	UHF	11/12/13/14/15/31/32/33	13.0	0	EC/ED/EG/ER	T
1987	SKYNET 4C	53.0 E	G	UHF	11/12/13/14/15/31/32/33	13.0	0	EV/EX	T
1988	SKYNET 4C	53.0 E	G	BCN	11/12/13/14/15/31/32/33	17.0	7	EC/ED/EG/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1989	SKYNET 4C	53.0 E	G	BCN	11/12/13/14/15/31/32/33	17.0	7	EV/EX	T
1990	INTELSAT5 INDOC3	57.0 E	USAIT	CS	12/15/31	36.7	14	EC	R
1991	INTELSAT5 INDOC3	57.0 E	USAIT	EH	12/13/31/32/33	24.6	6	EC	R
1992	INTELSAT5 INDOC3	57.0 E	USAIT	ES	33	36.7	14	EC	R
1993	INTELSAT5 INDOC3	57.0 E	USAIT	EZ	31/32/32	29.0	6	EC	R
1994	INTELSAT5 INDOC3	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
1995	INTELSAT5 INDOC3	57.0 E	USAIT	WZ	11/12/14/15	29.0	6	EC	R
1996	INTELSAT5 INDOC3	57.0 E	USAIT	O	11/12/13/14/15/31/32/33	2.0	6	ED/EK	R
1997	INTELSAT5 INDOC3	57.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
1998	INTELSAT5 INDOC3	57.0 E	USAIT	WS	11	40.0	14	EC	R
1999	INTELSAT5 INDOC3	57.0 E	USAIT	B	11/12/13/14/15/31/32/33	19.0	11	EK	T
2000	INTELSAT5 INDOC3	57.0 E	USAIT	CS	12/15/31	36.7	11	EC	T
2001	INTELSAT5 INDOC3	57.0 E	USAIT	EH	12/13/31/32/33	24.6	4	EC	T
2002	INTELSAT5 INDOC3	57.0 E	USAIT	ES	33	36.7	11	EC	T
2003	INTELSAT5 INDOC3	57.0 E	USAIT	EZ	31/32/33	29.0	4	EC	T
2004	INTELSAT5 INDOC3	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
2005	INTELSAT5 INDOC3	57.0 E	USAIT	H	11/12/13/14/15/31/32/33	14.0	4	EK/ER	T
2006	INTELSAT5 INDOC3	57.0 E	USAIT	WZ	11/12/14/15	29.0	4	EC	T
2007	INTELSAT5 INDOC3	57.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
2008	INTELSAT5 INDOC3	57.0 E	USAIT	WS	11	40.0	11	EC	T
2009	INTELSAT5A INDOC2	57.0 E	USAIT	O	11/12/13/14/15/31/32/33	2.0	6	ED/EK	R
2010	INTELSAT5A INDOC2	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
2011	INTELSAT5A INDOC2	57.0 E	USAIT	EH	12/13/31/32/33	24.6	6	EC	R
2012	INTELSAT5A INDOC2	57.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
2013	INTELSAT5A INDOC2	57.0 E	USAIT	EZ	31/32/33	29.0	6	EC	R
2014	INTELSAT5A INDOC2	57.0 E	USAIT	WZ	11/14	29.0	6	EC	R
2015	INTELSAT5A INDOC2	57.0 E	USAIT	NWZ	11/14/15/31	29.0	6	EC	R
2016	INTELSAT5A INDOC2	57.0 E	USAIT	ESR	13/33	36.7	14	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2017	INTELSAT5A INDOC2	57.0 E	USAIT	CSR	11/12/15/31	36.7	14	EC	R
2018	INTELSAT5A INDOC2	57.0 E	USAIT	WSR	11	40.0	14	EC	R
2019	INTELSAT5A INDOC2	57.0 E	USAIT	HTM	11/12/13/14/15/31/32/33	14.0	4	EK/ER	T
2020	INTELSAT5A INDOC2	57.0 E	USAIT	BCN	11/12/13/14/15/31/32/33	19.0	11	EK	T
2021	INTELSAT5A INDOC2	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
2022	INTELSAT5A INDOC2	57.0 E	USAIT	EH	12/13/31/32/33	24.6	4	EC	T
2023	INTELSAT5A INDOC2	57.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
2024	INTELSAT5A INDOC2	57.0 E	USAIT	EZ	31/32/33	29.0	4	EC	T
2025	INTELSAT5A INDOC2	57.0 E	USAIT	WZ	11/14	29.0	4	EC	T
2026	INTELSAT5A INDOC2	57.0 E	USAIT	NWZ	11/14/15/31	29.0	4	EC	T
2027	INTELSAT5A INDOC2	57.0 E	USAIT	4SR	14/15	30.0	4	EC	T
2028	INTELSAT5A INDOC2	57.0 E	USAIT	ESR	13/33	36.7	11	EC	T
2029	INTELSAT5A INDOC2	57.0 E	USAIT	CSR	11/12/15/31	36.7	11	EC	T
2030	INTELSAT5A INDOC2	57.0 E	USAIT	WSR	11	40.0	11	EC	T
2031	INTELSAT6 57E	57.0 E	USAIT	O	11/12/13/14/15/31/32/33	2.0	6	EK/ED	R
2032	INTELSAT6 57E	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
2033	INTELSAT6 57E	57.0 E	USAIT	EH	12/13/31/32/33	24.8	6	EC	R
2034	INTELSAT6 57E	57.0 E	USAIT	EH	12/13/31/32/33	24.8	5	EC	R
2035	INTELSAT6 57E	57.0 E	USAIT	WH	11/12/14/15	24.1	6	EC	R
2036	INTELSAT6 57E	57.0 E	USAIT	Z1	11	34.1	6	EC	R
2037	INTELSAT6 57E	57.0 E	USAIT	Z2	14/15	27.2	6	EC	R
2038	INTELSAT6 57E	57.0 E	USAIT	Z3	12/15/31	32.2	6	EC	R
2039	INTELSAT6 57E	57.0 E	USAIT	Z4	12/13/21/32/33	27.1	6	EC	R
2040	INTELSAT6 57E	57.0 E	USAIT	ESR	33	36.7	14	EC	R
2041	INTELSAT6 57E	57.0 E	USAIT	WSR	11	40.0	14	EC	R
2042	INTELSAT6 57E	57.0 E	USAIT	HTM	11/12/13/14/15/31/32/33	14.0	4	EK/ER	T
2043	INTELSAT6 57E	57.0 E	USAIT	BCN	11/12/13/14/15/31/32/33	19.0	11	EK	T
2044	INTELSAT6 57E	57.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2045	INTELSAT6 57E	57.0 E	USAIT	EH	12/13/31/32/33	24.8	4	EC	T
2046	INTELSAT6 57E	57.0 E	USAIT	WH	11/12/14/15	24.1	4	EC	T
2047	INTELSAT6 57E	57.0 E	USAIT	Z1	11	34.1	4	EC	T
2048	INTELSAT6 57E	57.0 E	USAIT	Z2	14/15	27.2	4	EC	T
2049	INTELSAT6 57E	57.0 E	USAIT	Z3	12/15/31	32.2	4	EC	T
2050	INTELSAT6 57E	57.0 E	USAIT	Z4	12/13/21/32/33	27.1	4	EC	T
2051	INTELSAT6 57E	57.0 E	USAIT	ESR	33	36.7	11	EC	T
2052	INTELSAT6 57E	57.0 E	USAIT	WSR	11	40.0	11	EC	T
2053	INTELSAT MCS INDOC B	60.0 E	USAIT	G16	11/12/13/14/15/31/32/33	19.0	1	EG	R
2054	INTELSAT MCS INDOC B	60.0 E	USAIT	G6	11/12/13/14/15/31/32/33	21.0	6	EC	R
2055	INTELSAT MCS INDOC B	60.0 E	USAIT	G15	11/12/13/14/15/31/32/33	19.0	1	EG	T
2056	INTELSAT MCS INDOC B	60.0 E	USAIT	G4	11/12/13/14/15/31/32/33	21.0	4	EC	T
2057	INTELSAT5 INDOC2	60.0 E	USAIT	CS	15/31	36.7	14	EC	R
2058	INTELSAT5 INDOC2	60.0 E	USAIT	EH	12/13/31/32/33	24.6	6	EC	R
2059	INTELSAT5 INDOC2	60.0 E	USAIT	ES	33	36.7	14	EC	R
2060	INTELSAT5 INDOC2	60.0 E	USAIT	EZ	13/31/32/33	29.0	6	EC	R
2061	INTELSAT5 INDOC2	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
2062	INTELSAT5 INDOC2	60.0 E	USAIT	WZ	11/14/15/31	29.0	6	EC	R
2063	INTELSAT5 INDOC2	60.0 E	USAIT	O	11/12/13/14/15/31/32/33	2.0	6	ED/EK	R
2064	INTELSAT5 INDOC2	60.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
2065	INTELSAT5 INDOC2	60.0 E	USAIT	WS	11	40.0	14	EC	R
2066	INTELSAT5 INDOC2	60.0 E	USAIT	B	11/12/13/14/15/31/32/33	19.0	11	EK	T
2067	INTELSAT5 INDOC2	60.0 E	USAIT	CS	15/31	36.7	11	EC	T
2068	INTELSAT5 INDOC2	60.0 E	USAIT	EH	12/13/31/32/33	24.6	4	EC	T
2069	INTELSAT5 INDOC2	60.0 E	USAIT	ES	33	36.7	11	EC	T
2070	INTELSAT5 INDOC2	60.0 E	USAIT	EZ	13/31/32/33	29.0	4	EC	T
2071	INTELSAT5 INDOC2	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
2072	INTELSAT5 INDOC2	60.0 E	USAIT	H	11/12/13/14/15/31/32/33	14.0	4	EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2073	INTELSAT5 INDOC2	60.0 E	USAIT	WZ	11/14/15/31	29.0	4	EC	T
2074	INTELSAT5 INDOC2	60.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
2075	INTELSAT5 INDOC2	60.0 E	USAIT	WS	11	40.0	11	EC	T
2076	USGCSS PH2 INDOC	60.0 E	USA	3	11/12/13/14/15/31/32/33	35.0	8	EC	R
2077	USGCSS PH2 INDOC	60.0 E	USA	4	11/12/13/14/15/31/32/33	20.0	8	EC	R
2078	USGCSS PH2 INDOC	60.0 E	USA	2	11/12/13/14/15/31/32/33	20.0	7	EC/EK	T
2079	USGCSS PH2 INDOC	60.0 E	USA	3	11/12/13/14/15/31/32/33	35.0	7	EC/EK	T
2080	USGCSS PH3 INDOC	60.0 E	USA	G	11/12/13/14/15/31/32/33	20.2	8	EC	R
2081	USGCSS PH3 INDOC	60.0 E	USA	G	11/12/13/14/15/31/32/33	20.2	8	EC	R
2082	USGCSS PH3 INDOC	60.0 E	USA	MBA	11/14/15/31/32/33	27.3	8	EC	R
2083	USGCSS PH3 INDOC	60.0 E	USA	G	11/12/13/14/15/31/32/33	21.0	7	EC/EK/ER	T
2084	USGCSS PH3 INDOC	60.0 E	USA	G	11/12/13/14/15/31/32/33	21.0	7	EC/EK/ER	T
2085	USGCSS PH3 INDOC	60.0 E	USA	MBA	11/14/15/31/32/33	32.0	7	EC	T
2086	USGCSS PH3 INDOC	60.0 E	USA	MBA	11/14/15	32.0	7	EC	T
2087	USGCSS PH3 INDOC	60.0 E	USA	SB	11/14/15	34.6	7	EC	T
2088	INTELSAT5A INDOC1	60.0 E	USAIT	O	11/12/13/14/15/31/32/33	2.0	6	ED/EK	R
2089	INTELSAT5A INDOC1	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
2090	INTELSAT5A INDOC1	60.0 E	USAIT	EH	12/13/31/32/33	24.6	6	EC	R
2091	INTELSAT5A INDOC1	60.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
2092	INTELSAT5A INDOC1	60.0 E	USAIT	EZ	31/32/33	29.0	6	EC	R
2093	INTELSAT5A INDOC1	60.0 E	USAIT	WZ	11/14	29.0	6	EC	R
2094	INTELSAT5A INDOC1	60.0 E	USAIT	NWZ	11/14/15/31	29.0	6	EC	R
2095	INTELSAT5A INDOC1	60.0 E	USAIT	ESR	13/33	36.7	14	EC	R
2096	INTELSAT5A INDOC1	60.0 E	USAIT	CSR	11/12/15/31	36.7	14	EC	R
2097	INTELSAT5A INDOC1	60.0 E	USAIT	WSR	11	40.0	14	EC	R
2098	INTELSAT5A INDOC1	60.0 E	USAIT	HTM	11/12/13/14/15/31/32/33	14.0	4	EK/ER	T
2099	INTELSAT5A INDOC1	60.0 E	USAIT	BCN	11/12/13/14/15/31/32/33	19.0	11	EK	T
2100	INTELSAT5A INDOC1	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2101	INTELSAT5A INDOC1	60.0 E	USAIT	EH	12/13/31/32/33	24.6	4	EC	T
2102	INTELSAT5A INDOC1	60.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
2103	INTELSAT5A INDOC1	60.0 E	USAIT	EZ	31/32/33	29.0	4	EC	T
2104	INTELSAT5A INDOC1	60.0 E	USAIT	WZ	11/14	29.0	4	EC	T
2105	INTELSAT5A INDOC1	60.0 E	USAIT	NWZ	11/14/15/31	29.0	4	EC	T
2106	INTELSAT5A INDOC1	60.0 E	USAIT	4SR	14/15	30.0	4	EC	T
2107	INTELSAT5A INDOC1	60.0 E	USAIT	ESR	13/33	36.7	11	EC	T
2108	INTELSAT5A INDOC1	60.0 E	USAIT	CSR	11/12/15/31	36.7	11	EC	T
2109	INTELSAT5A INDOC1	60.0 E	USAIT	WSR	11	40.0	11	EC	T
2110	INTELSAT6 60E	60.0 E	USAIT	O	11/12/13/14/15/31/32/33	2.0	6	EK/ED	R
2111	INTELSAT6 60E	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
2112	INTELSAT6 60E	60.0 E	USAIT	EH	12/13/31/32/33	24.8	6	EC	R
2113	INTELSAT6 60E	60.0 E	USAIT	EH	12/13/31/32/33	24.8	5	EC	R
2114	INTELSAT6 60E	60.0 E	USAIT	WH	11/12/14/15	24.1	6	EC	R
2115	INTELSAT6 60E	60.0 E	USAIT	Z1	11	34.1	6	EC	R
2116	INTELSAT6 60E	60.0 E	USAIT	Z2	14/15	27.2	6	EC	R
2117	INTELSAT6 60E	60.0 E	USAIT	Z3	12/15/31	32.2	6	EC	R
2118	INTELSAT6 60E	60.0 E	USAIT	Z4	12/13/21/32/33	27.1	6	EC	R
2119	INTELSAT6 60E	60.0 E	USAIT	ESR	33	36.7	14	EC	R
2120	INTELSAT6 60E	60.0 E	USAIT	WSR	11	40.0	14	EC	R
2121	INTELSAT6 60E	60.0 E	USAIT	HTM	11/12/13/14/15/31/32/33	14.0	4	EK/ER	T
2122	INTELSAT6 60E	60.0 E	USAIT	BCN	11/12/13/14/15/31/32/33	19.0	11	EK	T
2123	INTELSAT6 60E	60.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
2124	INTELSAT6 60E	60.0 E	USAIT	EH	12/13/31/32/33	24.8	4	EC	T
2125	INTELSAT6 60E	60.0 E	USAIT	WH	11/12/14/15	24.1	4	EC	T
2126	INTELSAT6 60E	60.0 E	USAIT	Z1	11	34.1	4	EC	T
2127	INTELSAT6 60E	60.0 E	USAIT	Z2	14/15	27.2	4	EC	T
2128	INTELSAT6 60E	60.0 E	USAIT	Z3	12/15/31	32.2	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2129	INTELSAT6 60E	60.0 E	USAIT	Z8	12713/21/32/33	27.1	4	EC	T
2130	INTELSAT6 60E	60.0 E	USAIT	ESR	33	36.7	11	EC	T
2131	INTELSAT6 60E	60.0 E	USAIT	WSR	11	40.0	11	EC	T
2132	INTELSAT MCS INDOC A	63.0 E	USAIT	G16	11/12/13/14/15/31/32/33	19.0	1	EG	R
2133	INTELSAT MCS INDOC A	63.0 E	USAIT	G6	11/12/13/14/15/31/32/33	21.0	6	EC	R
2134	INTELSAT MCS INDOC A	63.0 E	USAIT	G15	11/12/13/14/15/31/32/33	19.0	1	EG	T
2135	INTELSAT MCS INDOC A	63.0 E	USAIT	G4	11/12/13/14/15/31/32/33	21.0	4	EC	T
2136	INTELSAT5 INDOC1	63.0 E	USAIT	CS	12/31	36.7	14	EC	R
2137	INTELSAT5 INDOC1	63.0 E	USAIT	EH	11/13/31/32/33	24.6	6	EC	R
2138	INTELSAT5 INDOC1	63.0 E	USAIT	ES	13/33	36.7	14	EC	R
2139	INTELSAT5 INDOC1	63.0 E	USAIT	EZ	12/13/31/32/33	29.0	6	EC	R
2140	INTELSAT5 INDOC1	63.0 E	USAIT	G	11/12/13/14/15/21/32/33	21.0	6	EC	R
2141	INTELSAT5 INDOC1	63.0 E	USAIT	WZ	11/14/15/31	29.0	6	EC	R
2142	INTELSAT5 INDOC1	63.0 E	USAIT	O	11/12/13/14/15/31/32/33	2.0	6	EK/ED	R
2143	INTELSAT5 INDOC1	63.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
2144	INTELSAT5 INDOC1	63.0 E	USAIT	WS	11	40.0	14	EC	R
2145	INTELSAT5 INDOC1	63.0 E	USAIT	B	11/12/13/14/15/31/32/33	19.0	11	EK	T
2146	INTELSAT5 INDOC1	63.0 E	USAIT	CS	12/31	36.7	11	EC	T
2147	INTELSAT5 INDOC1	63.0 E	USAIT	EH	11/13/31/32/33	24.6	4	EC	T
2148	INTELSAT5 INDOC1	63.0 E	USAIT	ES	13/33	36.7	11	EC	T
2149	INTELSAT5 INDOC1	63.0 E	USAIT	EZ	12/13/31/32/33	29.0	4	EC	T
2150	INTELSAT5 INDOC1	63.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
2151	INTELSAT5 INDOC1	63.0 E	USAIT	H	11/12/13/14/15/31/32/33	14.0	4	EK/ER	T
2152	INTELSAT5 INDOC1	63.0 E	USAIT	WZ	11/14/15/31	29.0	4	EC	T
2153	INTELSAT5 INDOC1	63.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
2154	INTELSAT5 INDOC1	63.0 E	USAIT	WS	11	40.0	11	EC	T
2155	INTELSAT5A INDOC3	63.0 E	USAIT	O	11/12/13/14/15/31/32/33	2.0	6	ED/EK	R
2156	INTELSAT5A INDOC3	63.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R

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NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2157	INTELSAT5A INDOC3	63.0 E	USAIT	EH	12/13/31/32/33	24.6	6	EC	R
2158	INTELSAT5A INDOC3	63.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
2159	INTELSAT5A INDOC3	63.0 E	USAIT	EZ	31/32/33	29.0	6	EC	R
2160	INTELSAT5A INDOC3	63.0 E	USAIT	WZ	11/14/15	29.0	6	EC	R
2161	INTELSAT5A INDOC3	63.0 E	USAIT	NWZ	11/14/15/31	29.0	6	EC	R
2162	INTELSAT5A INDOC3	63.0 E	USAIT	ESR	13/33	36.7	14	EC	R
2163	INTELSAT5A INDOC3	63.0 E	USAIT	CSR	11/12/15/31	36.7	14	EC	R
2164	INTELSAT5A INDOC3	63.0 E	USAIT	WSR	11	40.0	14	EC	R
2165	INTELSAT5A INDOC3	63.0 E	USAIT	HTM	11/12/13/14/15/31/32/33	14.0	4	EK/ER	T
2166	INTELSAT5A INDOC3	63.0 E	USAIT	BCN	11/12/13/14/15/31/32/33	19.0	11	EK	T
2167	INTELSAT5A INDOC3	63.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
2168	INTELSAT5A INDOC3	63.0 E	USAIT	EH	12/13/31/32/33	24.6	4	EC	T
2169	INTELSAT5A INDOC3	63.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
2170	INTELSAT5A INDOC3	63.0 E	USAIT	EZ	31/32/33	29.0	4	EC	T
2171	INTELSAT5A INDOC3	63.0 E	USAIT	WZ	11/14	29.0	4	EC	T
2172	INTELSAT5A INDOC3	63.0 E	USAIT	NWZ	11/14/15/31	29.0	4	EC	T
2173	INTELSAT5A INDOC3	63.0 E	USAIT	4SR	14/15	30.0	4	EC	T
2174	INTELSAT5A INDOC3	63.0 E	USAIT	ESR	13/33	36.7	11	EC	T
2175	INTELSAT5A INDOC3	63.0 E	USAIT	CSR	11/12/15/31	36.7	11	EC	T
2176	INTELSAT5A INDOC3	63.0 E	USAIT	WSR	11	40.0	11	EC	T
2177	MARECS C	64.5 E	F MRS	G	11/12/13/14/15/31/32/33	18.3	1	EG	R
2178	MARECS C	64.5 E	F MRS	G	11/12/13/14/15/31/32/33	20.7	6	EC/ED/EK	R
2179	MARECS C	64.5 E	F MRS	O	11/12/13/14/15/31/32/33	0.0	0	EK/ED	R
2180	MARECS C	64.5 E	F MRS	G	11/12/13/14/15/31/32/33	20.5	1	EG	T
2181	MARECS C	64.5 E	F MRS	G	11/12/13/14/15/31/32/33	20.7	4	EC/EK/ER	T
2182	MARECS C	64.5 E	F MRS	O	11/12/13/14/15/31/32/33	0.0	0	EK/ER	T
2183	INMARSAT IOR	64.5 E	G INM	G	11/12/13/14/15/31/32/33	19.5	1	EG/EJ	R
2184	INMARSAT IOR	64.5 E	G INM	G	11/12/13/14/15/31/32/33	19.5	6	EC/ED	R

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NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2185	INMARSAT IOR	64.5 E	G INM	G	11/12/13/14/15/31/32/33	19.5	1	EG/EJ	T
2186	INMARSAT IOR	64.5 E	G INM	G	11/12/13/14/15/31/32/33	19.5	4	EC/EK/ER	T
2187	SIRIO	65.0 E	I	G	11/12/14/15/31/32/33	-4.0	0	ED	R
2188	SIRIO	65.0 E	I	212	11/12/13/31/33	21.2	11	EC/EX	T
2189	SIRIO	65.0 E	I	212	11/12/13/31/33	21.2	12	EC/EX	T
2190	SIRIO	65.0 E	I	G	11/12/14/15/31/32/33	-4.0	0	ER	T
2191	INTELSAT MCS IND D	66.0 E	USAIT	G	11/12/13/14/15/31/32/33	19.0	1	EG	R
2192	INTELSAT MCS IND D	66.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC	R
2193	INTELSAT MCS IND D	66.0 E	USAIT	G	11/12/13/14/15/31/32/33	19.0	1	EG	T
2194	INTELSAT MCS IND D	66.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
2195	INTELSAT5 IND4	66.0 E	USAIT	O	11/12/13/14/15/21/32/33	2.0	6	EK/ED	R
2196	INTELSAT5 IND4	66.0 E	USAIT	G	11/12/13/14/15/21/32/33	21.0	6	EC	R
2197	INTELSAT5 IND4	66.0 E	USAIT	EH	12/13/31/32/33	24.6	6	EC	R
2198	INTELSAT5 IND4	66.0 E	USAIT	WH	11/14/15	24.2	6	EC	R
2199	INTELSAT5 IND4	66.0 E	USAIT	EZ	31/32/33	29.0	6	EC	R
2200	INTELSAT5 IND4	66.0 E	USAIT	WZ	11/14/15/31	29.0	6	EC	R
2201	INTELSAT5 IND4	66.0 E	USAIT	ESR	33	37.7	14	EC	R
2202	INTELSAT5 IND4	66.0 E	USAIT	WSR	11	40.0	14	EC	R
2203	INTELSAT5 IND4	66.0 E	USAIT	ASR	15/31	37.7	14	EC	R
2204	INTELSAT5 IND4	66.0 E	USAIT	HTM	11/12/13/14/15/21/32/33	14.0	4	EK/ER	T
2205	INTELSAT5 IND4	66.0 E	USAIT	BCN	11/12/13/14/15/21/32/33	19.0	11	EK	T
2206	INTELSAT5 IND4	66.0 E	USAIT	G	11/12/13/14/15/21/32/33	21.0	4	EC	T
2207	INTELSAT5 IND4	66.0 E	USAIT	EH	12/13/31/32/33	24.6	4	EC	T
2208	INTELSAT5 IND4	66.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
2209	INTELSAT5 IND4	66.0 E	USAIT	EZ	31/32/33	29.0	4	EC	T
2210	INTELSAT5 IND4	66.0 E	USAIT	WZ	11/14/15/31	29.0	4	EC	T
2211	INTELSAT5 IND4	66.0 E	USAIT	ESR	33	37.7	11	EC	T
2212	INTELSAT5 IND4	66.0 E	USAIT	WSR	11	40.0	11	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2213	INTELSAT5 IND4	66.0 E	USAIT	ASR	15/31	37.7	11	EC	T
2214	INTELSAT5A 66E	66.0 E	USAIT	O	11/12/13/14/15/31/32/33	2.0	6	ED/EK	R
2215	INTELSAT5A 66E	66.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	6	EC/ER	R
2216	INTELSAT5A 66E	66.0 E	USAIT	WH	11/14/15	24.2	6	EC/ER	R
2217	INTELSAT5A 66E	66.0 E	USAIT	EH	12/13/31/32/33	24.6	6	EC/ER	R
2218	INTELSAT5A 66E	66.0 E	USAIT	WZ	11/14	29.0	6	EC/ER	R
2219	INTELSAT5A 66E	66.0 E	USAIT	EZ	31/32/33	29.0	6	EC/ER	R
2220	INTELSAT5A 66E	66.0 E	USAIT	NWZ	11/14/15/31	29.0	6	EC/ER	R
2221	INTELSAT5A 66E	66.0 E	USAIT	WSR	11	40.0	14	EC/ER	R
2222	INTELSAT5A 66E	66.0 E	USAIT	ESR	13/33	36.7	14	EC/ER	R
2223	INTELSAT5A 66E	66.0 E	USAIT	CSR	11/12/15/31	36.7	14	EC/ER	R
2224	INTELSAT5A 66E	66.0 E	USAIT	HTM	11/12/13/14/15/31/32/33	14.0	4	EK/ER	T
2225	INTELSAT5A 66E	66.0 E	USAIT	BCN	11/12/13/14/15/31/32/33	19.0	11	EK	T
2226	INTELSAT5A 66E	66.0 E	USAIT	G	11/12/13/14/15/31/32/33	21.0	4	EC	T
2227	INTELSAT5A 66E	66.0 E	USAIT	WH	11/14/15	24.2	4	EC	T
2228	INTELSAT5A 66E	66.0 E	USAIT	EH	12/13/31/32/33	24.6	4	EC	T
2229	INTELSAT5A 66E	66.0 E	USAIT	WZ	11/14/15	29.0	4	EC	T
2230	INTELSAT5A 66E	66.0 E	USAIT	EZ	31/32/33	29.0	4	EC	T
2231	INTELSAT5A 66E	66.0 E	USAIT	NWZ	11/14/15/31	29.0	4	EC	T
2232	INTELSAT5A 66E	66.0 E	USAIT	4SR	14/15	30.0	4	EC	T
2233	INTELSAT5A 66E	66.0 E	USAIT	WSR	11	40.0	11	EC	T
2234	INTELSAT5A 66E	66.0 E	USAIT	ESR	13/33	36.7	11	EC	T
2235	INTELSAT5A 66E	66.0 E	USAIT	CSR	11/12/15/31	36.7	11	EC	T
2236	STW-2	70.0 E	CHN	G	11/12/13/14/15/31/32/33	19.5	6	EC/ED/EK/EQ	R
2237	STW-2	70.0 E	CHN	G	11/12/13/14/15/31/32/33	16.5	4	EC/EK/EQ/ER	T
2238	MARISAT-INDOC	72.5 E	USA	G	11/12/13/14/15/31/32/33	15.0	0	EG	R
2239	MARISAT-INDOC	72.5 E	USA	G	11/12/13/14/15/31/32/33	14.0	0	EG/EJ	T
2240	MARECS IND2	73.0 E	F MRS	G	11/12/13/14/15/31/32/33	18.3	1	EG	R

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NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2241	MARECS IND2	73.0 E	F MRS	G	11/12/13/14/15/31/32/33	20.7	6	EC/ED/EK	R
2242	MARECS IND2	73.0 E	F MRS	O	11/12/13/14/15/31/32/33	0.0	0	EK/ED	R
2243	MARECS IND2	73.0 E	F MRS	G	11/12/13/14/15/31/32/33	20.5	1	EG	T
2244	MARECS IND2	73.0 E	F MRS	G	11/12/13/14/15/31/32/33	20.7	4	EC/EK/ER	T
2245	MARECS IND2	73.0 E	F MRS	O	11/12/13/14/15/31/32/33	0.0	0	EK/ER	T
2246	INSAT-1B	74.0 E	IND	O	11/12/13/14/15/31/32/33	11.0	0	EM	R
2247	INSAT-1B	74.0 E	IND	2	31	29.0	5	EC	R
2248	INSAT-1B	74.0 E	IND	2	31	29.0	6	EC/ED/EK	R
2249	INSAT-1B	74.0 E	IND	1	31	31.0	4	EC/ER	T
2250	FLTSATCOM INDOC	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	0	EG/EJ	R
2251	FLTSATCOM INDOC	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	8	EC	R
2252	FLTSATCOM INDOC	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	0	EG/EJ	T
2253	FLTSATCOM INDOC	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	7	EC	T
2254	FLTSATCOM-A IND	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	0	EJ/EG	R
2255	FLTSATCOM-A IND	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	0	EJ/EU	R
2256	FLTSATCOM-A IND	75.0 E	USA	BCN	11/12/13/14/15/31/32/33	18.0	8	EC/ED	R
2257	FLTSATCOM-A IND	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	0	EG/EJ/EU	T
2258	FLTSATCOM-A IND	75.0 E	USA	BCN	11/12/13/14/15/31/32/33	18.0	7	EC/EK/ER	T
2259	FLTSATCOM-B IND	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	44	EJ/EG	R
2260	FLTSATCOM-B IND	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	44	EJ/EU	R
2261	FLTSATCOM-B IND	75.0 E	USA	S	11/12/13/14/15/31/32/33	34.0	44	EJ/EG	R
2262	FLTSATCOM-B IND	75.0 E	USA	S	11/12/13/14/15/31/32/33	34.0	44	EJ/EU	R
2263	FLTSATCOM-B IND	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	20	EC/EG/EJ	T
2264	FLTSATCOM-B IND	75.0 E	USA	G	11/12/13/14/15/31/32/33	18.0	20	EU/EX	T
2265	FLTSATCOM-B IND	75.0 E	USA	S	11/12/13/14/15/31/32/33	34.0	20	EC/EG/EJ	T
2266	FLTSATCOM-B IND	75.0 E	USA	S	11/12/13/14/15/31/32/33	34.0	20	EU/EX	T
2267	GOMSS	76.0 E	URS	G	11/12/13/14/15/31/32/33	15.0	2	EM	R
2268	GOMSS	76.0 E	URS	G	11/12/13/14/15/31/32/33	15.0	0	EM	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2269	GOMSS	76.0 E	URS	G	11/12/13/14/15/31/32/33	15.0	1	EM	T
2270	GOMSS	76.0 E	URS	G	11/12/13/14/15/31/32/33	15.0	0	EM	T
2271	GOMS	76.0 E	URS	S8	11/12	27.0	8	EM	R
2272	GOMS	76.0 E	URS	S28	11/12	38.0	28	EM	R
2273	GOMS	76.0 E	URS	DCP	11/12/13/14/15/31/32/33	0.0	0	EM	R
2274	GOMS	76.0 E	URS	S7	11/12	27.0	7	EM	T
2275	GOMS	76.0 E	URS	S20	11/12	38.0	20	EM	T
2276	PALAPA-A2	77.0 E	INS		32	28.0	6	EC/ED	R
2277	PALAPA-A2	77.0 E	INS		32	29.0	4	EC/ER	T
2278	CSSRD-2	77.0 E	URS	WES	11/12	39.0	14	EC/EH	R
2279	CSSRD-2	77.0 E	URS	WES	11/12	52.0	14	EC/EH	R
2280	CSSRD-2	77.0 E	URS	EES	13	39.0	14	EC/EH	R
2281	CSSRD-2	77.0 E	URS	EES	13	52.0	14	EC/EH	R
2282	CSSRD-2	77.0 E	URS	WES	11/12	39.0	11	EC/EH	T
2283	CSSRD-2	77.0 E	URS	WES	11/12	39.0	12	EC/EH	T
2284	CSSRD-2	77.0 E	URS	WES	11/12	52.0	11	EC/EH	T
2285	CSSRD-2	77.0 E	URS	WES	11/12	52.0	12	EC/EH	T
2286	CSSRD-2	77.0 E	URS	EES	13	39.0	11	EC/EH	T
2287	CSSRD-2	77.0 E	URS	EES	13	39.0	12	EC/EH	T
2288	CSSRD-2	77.0 E	URS	EES	13	52.0	11	EC/EH	T
2289	CSSRD-2	77.0 E	URS	EES	13	52.0	12	EC/EH	T
2290	POTOK-2	80.0 E	URS	Z1	12/13/31/32/33	25.0	4	EC	R
2291	POTOK-2	80.0 E	URS	Z2	11/12/14/15/31	25.0	4	EC	R
2292	POTOK-2	80.0 E	URS	Z3	14/15	25.0	4	EC	R
2293	POTOK-2	80.0 E	URS	Z4	32	25.0	4	EC	R
2294	POTOK-2	80.0 E	URS	G	11/12/13/14/15/31/32/33	17.0	4	EC	T
2295	PROGNOZ-4	80.0 E	URS	NWQ	11/12/15/31	-2.0	2	EH	T
2296	STATSIONAR-1	80.0 E	URS	NH	11/12/13/15/31/33	23.0	5	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2297	STATSIONAR-1	80.0 E	URS	NH	11/12/13/15/31/33	23.0	6	EC	R
2298	STATSIONAR-1	80.0 E	URS	NH	11/12/13/15/31/33	23.0	4	EC	T
2299	STATSIONAR-13	80.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
2300	STATSIONAR-13	80.0 E	URS	250	11/12/13/31/33	25.0	6	EC	R
2301	STATSIONAR-13	80.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	4	EC	T
2302	STATSIONAR-13	80.0 E	URS	300	11/12/31	30.0	4	EC	T
2303	STATSIONAR-13	80.0 E	URS	220	11/12/13/14/15/31/32/33	22.0	4	EC	T
2304	STATSIONAR-13	80.0 E	URS	250	11/12/13/31/33	25.0	4	EC	T
2305	INSAT 1D	82.5 E	IND	DOM	31	28.5	5	EC/ED/EK	R
2306	INSAT 1D	82.5 E	IND	DOM	31	28.5	6	EC/ED/EK	R
2307	INSAT 1D	82.5 E	IND	G	11/12/13/14/15/31/32/33	11.0	0	EC/ED/EK	R
2308	INSAT 1D	82.5 E	IND	DOM	31	31.0	4	EC/EK/ER	T
2309	PALAPA-A1	83.0 E	INS		32	28.0	6	EC/ED	R
2310	PALAPA-A1	83.0 E	INS		32	29.0	4	EC/ER	T
2311	GALS-3	85.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	8	EC	R
2312	GALS-3	85.0 E	URS	NH	11/12/13/15/31/32/33	23.0	8	EC	R
2313	GALS-3	85.0 E	URS	S	12/13/31/33	30.0	8	EC	R
2314	GALS-3	85.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	7	EC	T
2315	GALS-3	85.0 E	URS	NH	11/12/13/15/31/32/33	23.0	7	EC	T
2316	GALS-3	85.0 E	URS	S	12/13/31/33	30.0	7	EC	T
2317	STATSIONAR-3	85.0 E	URS	NH	11/12/13/15/31/33	22.0	5	EC	R
2318	STATSIONAR-3	85.0 E	URS	NH	11/12/13/15/31/33	22.0	6	EC	R
2319	STATSIONAR-3	85.0 E	URS	NH	11/12/13/15/31/33	22.0	4	EC	T
2320	LOUTCH P3	85.0 E	URS	G	11/12/13/15/31/32/33	22.0	11	EC	R
2321	LOUTCH P3	85.0 E	URS	G	11/12/13/15/31/32/33	22.0	14	EC	T
2322	VOLNA-5	85.0 E	URS	G	11/12/13/14/15/31/32/33	14.0	0	EJ/EU	R
2323	VOLNA-5	85.0 E	URS	G	11/12/13/14/15/31/32/33	18.0	1	EJ	R
2324	VOLNA-5	85.0 E	URS	G	11/12/13/14/15/31/32/33	14.0	0	EJ/EU	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2325	VOLNA-5	85.0 E	URS	G	11/12/13/14/15/31/32/33	18.0	1	EJ	T
2326	STATSIONAR D-5	85.0 E	URS	N6	11/12/14/15/31	25.0	6	EC	R
2327	STATSIONAR D-5	85.0 E	URS	N6	12/13/31/33	25.0	6	EC	R
2328	STATSIONAR D-5	85.0 E	URS	N6	12/32/33	25.0	6	EC	R
2329	STATSIONAR D-5	85.0 E	URS	N6	32	25.0	6	EC	R
2330	STATSIONAR D-5	85.0 E	URS	N6	14/15/32	25.0	6	EC	R
2331	STATSIONAR D-5	85.0 E	URS	N6	31/32/33	25.0	6	EC	R
2332	STATSIONAR D-5	85.0 E	URS	N4	11/12/14/15/31	25.0	4	EC	T
2333	STATSIONAR D-5	85.0 E	URS	N4	12/13/31/33	25.0	4	EC	T
2334	STATSIONAR D-5	85.0 E	URS	N4	13/32/33	25.0	4	EC	T
2335	STATSIONAR D-5	85.0 E	URS	N4	32	25.0	4	EC	T
2336	STATSIONAR D-5	85.0 E	URS	N4	14/15/32	25.0	4	EC	T
2337	STATSIONAR D-5	85.0 E	URS	N4	31/32/33	25.0	4	EC	T
2338	LOUTCH-3	90.0 E	URS	NWQ	11/12/13/15/31	30.0	14	EC	R
2339	LOUTCH-3	90.0 E	URS	NWQ	11/12/13/15/31	30.0	11	EC	T
2340	STATSIONAR-6	90.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
2341	STATSIONAR-6	90.0 E	URS	NH	11/12/13/31/33	25.0	6	EC	R
2342	STATSIONAR-6	90.0 E	URS	1	11/12/31	30.0	4	EC	T
2343	STATSIONAR-6	90.0 E	URS	2	11/12/13/15/31/33	25.0	4	EC	T
2344	STATSIONAR-6	90.0 E	URS	3	11/12/13/14/15/31/32/33	22.0	4	EC	T
2345	VOLNA-8	90.0 E	URS	G	11/12/13/15/31/32/33	18.0	1	EG/EJ	R
2346	VOLNA-8	90.0 E	URS	G	11/12/13/15/31/32/33	18.0	1	EG/EJ	T
2347	MORE-90	90.0 E	URS	G	11/12/13/14/15/31/32/33	18.5	1	EG	R
2348	MORE-90	90.0 E	URS	G	11/12/13/14/15/31/32/33	18.5	6	EC	R
2349	MORE-90	90.0 E	URS	G	11/12/13/14/15/31/32/33	18.5	1	EG	T
2350	MORE-90	90.0 E	URS	G	11/12/13/14/15/31/32/33	18.5	4	EC	T
2351	INSAT-1C	93.5 E	IND	G	11/12/13/14/15/31/32/33	11.0	0	EM	R
2352	INSAT-1C	93.5 E	IND	285	12/31	28.5	5	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2353	INSAT-1C	93.5 E	IND	285	12/31	28.5	6	EC/ED/EK	R
2354	INSAT-1C	93.5 E	IND	310	31	31.0	4	EC/EK/ER	T
2355	INSAT-1C	94.0 E	IND	0	11/12/13/14/15/31/32/33	11.0	0	EM	R
2356	INSAT-1C	94.0 E	IND	2	31	28.5	5	EC	R
2357	INSAT-1C	94.0 E	IND	2	31	28.5	6	EC	R
2358	INSAT-1C	94.0 E	IND	1	31	31.0	4	EC/ER	T
2359	CSDRN	95.0 E	URS	1	11/12	43.0	14	EC/EH	R
2360	CSDRN	95.0 E	URS	3	13	43.0	14	EC/EH	R
2361	CSDRN	95.0 E	URS	5	11/12	49.0	14	EC/EH	R
2362	CSDRN	95.0 E	URS	7	13	49.0	14	EC/EH	R
2363	CSDRN	95.0 E	URS	9	13	49.0	14	EC/EH	R
2364	CSDRN	95.0 E	URS	1	11/12	43.0	11	EC/EH	T
2365	CSDRN	95.0 E	URS	3	13	43.0	11	EC/EH	T
2366	STATSIONAR-14	95.0 E	URS	250	11/12/13/31/33	25.0	6	EC	R
2367	STATSIONAR-14	95.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
2368	STATSIONAR-14	95.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	4	EC	T
2369	STATSIONAR-14	95.0 E	URS	300	11/12/13/31	30.0	4	EC	T
2370	STATSIONAR-14	95.0 E	URS	220	11/12/13/15/31/32/33	22.0	4	EC	T
2371	STATSIONAR-14	95.0 E	URS	250	11/12/13/31/33	25.0	4	EC	T
2372	STATSIONAR-T	99.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
2373	STATSIONAR-T2	99.0 E	URS	G	11/12/13/14/15/31/32/33	19.0	6	EC	R
2374	PALAPA-B1	108.0 E	INS		31/32/33	28.0	6	EC	R
2375	PALAPA-B1	108.0 E	INS		31/32/33	28.0	4	EC	T
2376	BS-2	110.0 E	J	H	12/13/31/32/33	20.6	14	EK	R
2377	BS-2	110.0 E	J	O	12/13/15/31/32/33	0.0	2	ED/EK	R
2378	BS-2	110.0 E	J	S	33	39.0	14	EC/ED/EK	R
2379	BS-2	110.0 E	J	O	12/13/15/31/32/33	0.0	2	EK/ER	T
2380	BS-2	110.0 E	J	S	33	40.0	12	EK/ER	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2381	BSE	110.0 E	J	0	12/13/15/31/32/33	-2.0	2	ED	R
2382	BSE	110.0 E	J	2	13/33	41.0	14	EC/ED	R
2383	BSE	110.0 E	J	0	12/13/15/31/32/33	1.0	2	EK/ER	T
2384	PALAPA-B2	113.0 E	INS		31/32/33	28.0	6	EC	R
2385	PALAPA-B2	113.0 E	INS		31/32/33	28.0	4	EC	T
2386	PALAPA B-3	118.0 E	INS	280	31/32/33	28.0	6	EC	R
2387	PALAPA B-3	118.0 E	INS	280	31/32/33	28.0	4	EC	T
2388	STW-1	125.0 E	CHN	G	12/13/15/31/32/33	19.5	6	EC	R
2389	STW-1	125.0 E	CHN	G	12/13/15/31/32/33	16.5	4	EC	T
2390	STATSIONAR-15	128.0 E	URS	G	12/13/15/21/31/32/33	19.0	5	EC	R
2391	STATSIONAR-15	128.0 E	URS	G	12/13/15/21/31/32/33	19.0	6	EC	R
2392	STATSIONAR-15	128.0 E	URS	Z	12/13/21/31/33	25.0	6	EC	R
2393	STATSIONAR-15	128.0 E	URS	G	12/13/15/21/31/32/33	19.0	4	EC	T
2394	STATSIONAR-15	128.0 E	URS	NH	12/13/15/21/31/32/33	22.0	4	EC	T
2395	STATSIONAR-15	128.0 E	URS	S	12/13/21/33	30.0	4	EC	T
2396	STATSIONAR-15	128.0 E	URS	Z	12/13/21/31/33	25.0	4	EC	T
2397	STATSIONAR D-6	128.0 E	URS	N6	12/15/31	25.0	6	EC	R
2398	STATSIONAR D-6	128.0 E	URS	N6	12/13/31/33	25.0	6	EC	R
2399	STATSIONAR D-6	128.0 E	URS	N6	12/21/32/33	25.0	6	EC	R
2400	STATSIONAR D-6	128.0 E	URS	N6	32	25.0	6	EC	R
2401	STATSIONAR D-6	128.0 E	URS	N6	31/32/33	25.0	6	EC	R
2402	STATSIONAR D-6	128.0 E	URS	N4	12/15/31	25.0	4	EC	T
2403	STATSIONAR D-6	128.0 E	URS	N4	12/13/31/33	25.0	4	EC	T
2404	STATSIONAR D-6	128.0 E	URS	N4	12/21/32/33	25.0	4	EC	T
2405	STATSIONAR D-6	128.0 E	URS	N4	32	25.0	4	EC	T
2406	STATSIONAR D-6	128.0 E	URS	N4	31/32/33	25.0	4	EC	T
2407	VOLNA-9	128.0 E	URS	G	12/13/21/31/32/33	18.0	1	EJ	R
2408	VOLNA-9	128.0 E	URS	G	12/13/21/31/32/33	14.0	0	EJ/EU	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2409	VOLNA-9	128.0 E	URS	G	12/13/21/31/32/33	18.0	1	EJ	T
2410	VOLNA-9	128.0 E	URS	G	12/13/21/31/32/33	12.0	0	EJ/EU	T
2411	ETS-2	130.0 E	J	G	12/13/15/31/32/33	0.0	0	ED	R
2412	ETS-2	130.0 E	J	G	12/13/15/31/32/33	10.0	2	ED	R
2413	ETS-2	130.0 E	J	G	12/13/15/31/32/33	0.0	0	EK/ER	T
2414	ETS-2	130.0 E	J	G	12/13/15/31/32/33	10.0	1	EH/EK/ER	T
2415	ETS-2	130.0 E	J	260	13/32/33	26.0	11	EC	T
2416	ETS-2	130.0 E	J	330	13	33.0	34	EH	T
2417	GALS-5	130.0 E	URS	G	12/13/31/32/33	19.0	8	EC	R
2418	GALS-5	130.0 E	URS	NH	12/13/31/32/33	23.0	8	EC	R
2419	GALS-5	130.0 E	URS	S	12/13/31/33	30.0	8	EC	R
2420	GALS-5	130.0 E	URS	G	12/13/31/32/33	19.0	7	EC	T
2421	GALS-5	130.0 E	URS	NH	12/13/31/33	23.0	7	EC	T
2422	GALS-5	130.0 E	URS	S	12/13/31/33	30.0	7	EC	T
2423	CS-2A	132.0 E	J	S	13/33	40.0	28	EC	R
2424	CS-2A	132.0 E	J	G	12/13/31/32/33	-7.0	2	ED/EK	R
2425	CS-2A	132.0 E	J	S	13/33	33.0	6	EC/ED/EK	R
2426	CS-2A	132.0 E	J	S	13/33	40.0	17	EC	T
2427	CS-2A	132.0 E	J	S	13/33	40.0	18	EC	T
2428	CS-2A	132.0 E	J	S	13/33	40.0	19	EC/EK	T
2429	CS-2A	132.0 E	J	G	12/13/31/32/33	-3.0	2	EK/ER	T
2430	CS-2A	132.0 E	J	S	13/33	30.0	4	EC/EK/ER	T
2431	CSE	135.0 E	J	0	11/12/13/15/31/32/33	-7.0	2	ED/EX	R
2432	CSE	135.0 E	J	11	33	32.6	6	EC/ED/EX	R
2433	CSE	135.0 E	J	13	33	39.7	28	EC/EX	R
2434	CSE	135.0 E	J	13	33	39.7	30	EC/EX	R
2435	CSE	135.0 E	J	0	11/12/13/15/31/32/33	-10.0	2	EK/ER/EX	T
2436	CSE	135.0 E	J	10	13/33	30.0	4	EC/EK/ER/EX	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2437	CSE	135.0 E	J	12	33	39.9	17	EC/EX	T
2438	CSE	135.0 E	J	12	33	39.9	18	EC/EX	T
2439	CSE	135.0 E	J	12	33	39.9	19	EC/EX	T
2440	CSE	135.0 E	J	12	33	39.9	20	EC/EX	T
2441	CS-2B	136.0 E	J	S	13/33	40.0	28	EC	R
2442	CS-2B	136.0 E	J	G	12/13/31/32/33	-7.0	2	ED/EK	R
2443	CS-2B	136.0 E	J	S	13/33	33.0	6	EC/ED/EK	R
2444	CS-2B	136.0 E	J	S	13/33	40.0	17	EC	T
2445	CS-2B	136.0 E	J	S	13/33	40.0	18	EC	T
2446	CS-2B	136.0 E	J	S	13/33	40.0	19	EC/EK	T
2447	CS-2B	136.0 E	J	G	12/13/31/32/33	-3.0	2	EK/ER	T
2448	CS-2B	136.0 E	J	S	13/33	30.0	4	EC/EK/ER	T
2449	GMS	140.0 E	J	G	12/13/21/31/32/33	1.0	0	ED	R
2450	GMS	140.0 E	J	G	12/13/21/31/32/33	7.0	0	EM	R
2451	GMS	140.0 E	J	G	12/13/21/31/32/33	17.0	2	ED/EK/EM	R
2452	GMS	140.0 E	J	G	12/13/21/31/32/33	3.0	0	ER	T
2453	GMS	140.0 E	J	G	12/13/21/31/32/33	8.0	0	EM	T
2454	GMS	140.0 E	J	G	12/13/21/31/32/33	18.0	1	EK/EM/ER	T
2455	GMS-2	140.0 E	J	G	12/13/31/32/33	9.5	0	EM	R
2456	GMS-2	140.0 E	J	G	12/13/31/32/33	18.7	2	ED/EK/EM	R
2457	GMS-2	140.0 E	J	O	12/13/21/31/32/33	4.0	2	ED/EK/EM	R
2458	GMS-2	140.0 E	J	G	12/13/31/32/33	11.7	0	EM	T
2459	GMS-2	140.0 E	J	G	12/13/31/32/33	18.3	1	EK/EM/ER	T
2460	GMS-2	140.0 E	J	O	12/13/21/31/32/33	3.5	2	EH/EK/ER	T
2461	GMS-3	140.0 E	J	G	12/13/21/31/32/33	8.9	0	EM	R
2462	GMS-3	140.0 E	J	G	12/13/21/31/32/33	18.2	2	ED/EK/EM	R
2463	GMS-3	140.0 E	J	O	12/13/21/31/32/33	2.5	2	ED/EK	R
2464	GMS-3	140.0 E	J	G	12/13/21/31/32/33	11.4	0	EM	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2465	GMS-3	140.0 E	J	G	12/13/21/31/32/33	18.7	1	EK/EM/ER	T
2466	GMS-3	140.0 E	J	O	12/13/21/31/32/33	2.2	2	EK/ER	T
2467	LOUTCH-4	140.0 E	URS	NWQ	12/13/31/32/33	30.0	14	EC	R
2468	LOUTCH-4	140.0 E	URS	NWQ	12/13/31/32/33	30.0	11	EC	T
2469	STATSIONAR-7	140.0 E	URS	G	12/13/21/31/32/33	19.0	6	EC	R
2470	STATSIONAR-7	140.0 E	URS	NH	12/13/21/31/33	25.0	6	EC	R
2471	STATSIONAR-7	140.0 E	URS	1	12/13/33	30.0	4	EC	T
2472	STATSIONAR-7	140.0 E	URS	2	12/13/21/31/33	25.0	4	EC	T
2473	STATSIONAR-7	140.0 E	URS	3	12/13/21/31/32/33	22.0	4	EC	T
2474	VOLNA-6	140.0 E	URS	G	31/32/33	18.0	1	EG/EJ	R
2475	VOLNA-6	140.0 E	URS	G	31/32/33	18.0	1	EG/EJ	T
2476	GMS-3	140.0 E	J	G	12/13/31/32/33	18.2	2	EM/ED/EK	R
2477	GMS-3	140.0 E	J	O	12/13/31/32/33	2.5	2	ED/EK	R
2478	GMS-3	140.0 E	J	G	12/13/31/32/33	8.9	0	EM	R
2479	GMS-3	140.0 E	J	G	12/13/31/32/33	18.7	1	EM/EK/ER	T
2480	GMS-3	140.0 E	J	O	12/13/31/32/33	2.2	2	EK/ER	T
2481	GMS-3	140.0 E	J	G	12/13/31/32/33	11.4	0	EM	T
2482	MORE-140	140.0 E	URS	G	12/13/31/32/33	18.5	1	EG	R
2483	MORE-140	140.0 E	URS	G	12/13/31/32/33	18.5	6	EC	R
2484	MORE-140	140.0 E	URS	G	12/13/31/32/33	18.5	1	EG	T
2485	MORE-140	140.0 E	URS	G	12/13/31/32/33	18.5	4	EC	T
2486	STATSIONAR-16	145.0 E	URS	G	12/13/21/31/32/33	19.0	6	EC	R
2487	STATSIONAR-16	145.0 E	URS	250	12/13/21/31/33	25.0	6	EC	R
2488	STATSIONAR-16	145.0 E	URS	G	12/13/21/31/32/33	19.0	4	EC	T
2489	STATSIONAR-16	145.0 E	URS	250	12/13/21/31/33	25.0	4	EC	T
2490	STATSIONAR-16	145.0 E	URS	300	12/13/33	30.0	4	EC	T
2491	STATSIONAR-16	145.0 E	URS	220	12/13/21/31/32/33	22.0	4	EC	T
2492	CSE	150.0 E	J	326	12/13/31/32/33	32.6	6	EK/ED/EX	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2493	CSE	150.0 E	J	295	12/13/31/32/33	29.5	4	EK/ER/EX	T
2494	AUSSAT-1	156.0 E	AUS	A	32	33.3	14	EC	R
2495	AUSSAT-1	156.0 E	AUS	B	32	32.4	14	EC	R
2496	AUSSAT-1	156.0 E	AUS	O	32	0.0	14	ED	R
2497	AUSSAT-1	156.0 E	AUS	ONS	32	28.0	14	ED	R
2498	AUSSAT-1	156.0 E	AUS	PNG	32	38.7	14	EC	R
2499	AUSSAT-1	156.0 E	AUS	A	32	32.7	12	EC	T
2500	AUSSAT-1	156.0 E	AUS	B	32	33.4	12	EC	T
2501	AUSSAT-1	156.0 E	AUS	CA	32	37.6	12	EC	T
2502	AUSSAT-1	156.0 E	AUS	N	32	33.4	13	ER	T
2503	AUSSAT-1	156.0 E	AUS	NE	32	38.1	12	EC	T
2504	AUSSAT-1	156.0 E	AUS	PNG	32	39.0	12	EC	T
2505	AUSSAT-1	156.0 E	AUS	SE	32	39.2	12	EC	T
2506	AUSSAT-1	156.0 E	AUS	WA	32	36.7	12	EC	T
2507	AUSSAT-2	160.0 E	AUS	A	32	33.3	14	EC	R
2508	AUSSAT-2	160.0 E	AUS	B	32	32.4	14	EC	R
2509	AUSSAT-2	160.0 E	AUS	O	32	0.0	14	ED	R
2510	AUSSAT-2	160.0 E	AUS	ONS	32	28.0	14	ED	R
2511	AUSSAT-2	160.0 E	AUS	PNG	32	38.7	14	EC	R
2512	AUSSAT-2	160.0 E	AUS	A	32	32.7	12	EC	T
2513	AUSSAT-2	160.0 E	AUS	B	32	33.4	12	EC	T
2514	AUSSAT-2	160.0 E	AUS	CA	32	37.6	12	EC	T
2515	AUSSAT-2	160.0 E	AUS	N	32	33.4	13	ER	T
2516	AUSSAT-2	160.0 E	AUS	NE	32	38.1	12	EC	T
2517	AUSSAT-2	160.0 E	AUS	PNG	32	39.0	12	EC	T
2518	AUSSAT-2	160.0 E	AUS	SE	32	39.2	12	EC	T
2519	AUSSAT-2	160.0 E	AUS	WA	32	36.7	12	EC	T
2520	GMS-160E	160.0 E	J	G	12/13/21/31/32/33	7.0	0	EM	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2521	GMS-160E	160.0 E	J	G	12/13/21/31/32/33	17.0	2	ED/EK/EM	R
2522	GMS-160E	160.0 E	J	O	12/13/21/31/32/33	1.0	0	ED	R
2523	GMS-160E	160.0 E	J	G	12/13/21/31/32/33	8.0	0	EM	T
2524	GMS-160E	160.0 E	J	G	12/13/21/31/32/33	18.0	1	EK/EM/ER	T
2525	GMS-160E	160.0 E	J	O	12/13/21/31/32/33	3.0	0	ER	T
2526	AUSSAT-3	164.0 E	AUS	A	32	33.3	14	EC	R
2527	AUSSAT-3	164.0 E	AUS	B	32	32.4	14	EC	R
2528	AUSSAT-3	164.0 E	AUS	O	32	0.0	14	ED	R
2529	AUSSAT-3	164.0 E	AUS	ONS	32	28.0	14	ED	R
2530	AUSSAT-3	164.0 E	AUS	PNG	32	38.7	14	EC	R
2531	AUSSAT-3	164.0 E	AUS	A	32	32.7	12	EC	T
2532	AUSSAT-3	164.0 E	AUS	B	32	33.4	12	EC	T
2533	AUSSAT-3	164.0 E	AUS	CA	32	37.6	12	EC	T
2534	AUSSAT-3	164.0 E	AUS	N	32	33.4	13	ER	T
2535	AUSSAT-3	164.0 E	AUS	NE	32	38.1	12	EC	T
2536	AUSSAT-3	164.0 E	AUS	PNG	32	39.0	12	EC	T
2537	AUSSAT-3	164.0 E	AUS	SE	32	39.2	12	EC	T
2538	AUSSAT-3	164.0 E	AUS	WA	32	36.7	12	EC	T
2539	GOMS-2	166.0 E	URS	G	11/12/13/14/15/31/32/33	15.0	2	EM	R
2540	GOMS-2	166.0 E	URS	S8	11/12	27.0	8	EM	R
2541	GOMS-2	166.0 E	URS	S28	11/12	38.0	28	EM	R
2542	GOMS-2	166.0 E	URS	DCP	11/12/13/14/15/31/32/33	15.0	0	EM	R
2543	GOMS-2	166.0 E	URS	G	11/12/13/14/15/31/32/33	15.0	1	EM	T
2544	GOMS-2	166.0 E	URS	S7	11/12	27.0	7	EM	T
2545	GOMS-2	166.0 E	URS	S20	11/12	38.0	20	EM	T
2546	GOMS-2	166.0 E	URS	DCP	11/12/13/14/15/31/32/33	15.0	0	EM	T
2547	PACSTAR-1	167.0 E	PNG	DOM	32	38.2	6	EC/ED	R
2548	PACSTAR-1	167.0 E	PNG	DOM	32	38.2	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2549	PACSTAR-1	167.0 E	PNG	SUB	32	42.9	6	EC	R
2550	PACSTAR-1	167.0 E	PNG	REG	32	42.9	6	EC	R
2551	PACSTAR-1	167.0 E	PNG	REG	32/33	42.9	6	EC	R
2552	PACSTAR-1	167.0 E	PNG	RIM	21	50.2	14	EC	R
2553	PACSTAR-1	167.0 E	PNG	RIM	32/33	50.2	14	EC	R
2554	PACSTAR-1	167.0 E	PNG	SUB	32	39.0	4	EK/ER	T
2555	PACSTAR-1	167.0 E	PNG	SUB	32	39.0	4	EC	T
2556	PACSTAR-1	167.0 E	PNG	REG	32	39.0	4	EC	T
2557	PACSTAR-1	167.0 E	PNG	REG	32/33	39.0	4	EC	T
2558	PACSTAR-1	167.0 E	PNG	RIM	21	49.1	12	EC	T
2559	PACSTAR-1	167.0 E	PNG	RIM	32/33	49.1	12	EC	T
2560	VSSRD-2	167.0 E	URS	FLK	13	39.0	14	EC/EH	R
2561	VSSRD-2	167.0 E	URS	ESS	13	52.0	14	EC/EH	R
2562	VSSRD-2	167.0 E	URS	390	13	39.0	11	EC/EH	T
2563	VSSRD-2	167.0 E	URS	520	13	52.0	11	EC/EH	T
2564	VSSRD-2	167.0 E	URS	390	13	39.0	12	EC/EH	T
2565	VSSRD-2	167.0 E	URS	520	13	52.0	12	EC/EH	T
2566	FLTSATCOM W PAC	172.0 E	USA	G	13/21/22/32/33	18.0	0	EG/EJ	R
2567	FLTSATCOM W PAC	172.0 E	USA	G	13/21/22/32/33	18.0	8	EC	R
2568	FLTSATCOM W PAC	172.0 E	USA	G	13/21/22/32/33	18.0	0	EG/EJ	T
2569	FLTSATCOM W PAC	172.0 E	USA	G	13/21/22/32/33	18.0	7	EC	T
2570	FLTSATCOM-A W-PAC	172.0 E	USA	G	13/21/31/32/33	18.0	0	EJ/EG	R
2571	FLTSATCOM-A W-PAC	172.0 E	USA	G	13/21/31/32/33	18.0	0	EJ/EU	R
2572	FLTSATCOM-A W-PAC	172.0 E	USA	BCN	13/21/31/32/33	18.0	8	EC/ED	R
2573	FLTSATCOM-A W-PAC	172.0 E	USA	G	13/21/31/32/33	18.0	0	EG/EJ/EU	T
2574	FLTSATCOM-A W-PAC	172.0 E	USA	BCN	13/21/31/32/33	18.0	7	EC/EK/ER	T
2575	FLTSATCOM-B W-PAC	172.0 E	USA	G	13/21/31/32/33	18.0	44	EJ/EG	R
2576	FLTSATCOM-B W-PAC	172.0 E	USA	G	13/21/31/32/33	18.0	44	EJ/EU	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2577	FLTSATCOM-B W-PAC	172.0 E	USA	S	13/21/31/32/33	34.0	44	EJ/EG	R
2578	FLTSATCOM-B W-PAC	172.0 E	USA	S	13/21/31/32/33	34.0	44	EJ/EU	R
2579	FLTSATCOM-B W-PAC	172.0 E	USA	G	13/21/31/32/33	18.0	20	EC/EG/EJ	T
2580	FLTSATCOM-B W-PAC	172.0 E	USA	G	13/21/31/32/33	18.0	20	EU/EX	T
2581	FLTSATCOM-B W-PAC	172.0 E	USA	S	13/21/31/32/33	34.0	20	EC/EG/EJ	T
2582	FLTSATCOM-B W-PAC	172.0 E	USA	S	13/21/31/32/33	34.0	20	EU/EX	T
2583	INTELSAT4A PAC1	173.0 E	USAIT	H	13/21/32/33	14.0	6	EK/ED	R
2584	INTELSAT4A PAC1	173.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2585	INTELSAT4A PAC1	173.0 E	USAIT	EH	21/32	24.8	6	EC	R
2586	INTELSAT4A PAC1	173.0 E	USAIT	WH	13/32/33	24.5	6	EC	R
2587	INTELSAT4A PAC1	173.0 E	USAIT	BCN	13/21/32/33	14.0	4	EK/ER	T
2588	INTELSAT4A PAC1	173.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2589	INTELSAT4A PAC1	173.0 E	USAIT	NWQ	13/32/33	27.5	4	EC	T
2590	INTELSAT4A PAC1	173.0 E	USAIT	NEQ	21	29.1	4	EC	T
2591	INTELSAT4A PAC1	173.0 E	USAIT	SWQ	32	29.0	4	EC	T
2592	INTELSAT4A PAC1	173.0 E	USAIT	SEQ	32	27.8	4	EC	T
2593	INTELSAT4A PAC1	173.0 E	USAIT	EH	21/32	31.3	4	EC	T
2594	INTELSAT4A PAC1	173.0 E	USAIT	WH	13/32/33	28.8	4	EC	T
2595	INTELSAT5 PAC1	173.0 E	USAIT	O	13/21/32/33	2.0	6	EK/ED	R
2596	INTELSAT5 PAC1	173.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2597	INTELSAT5 PAC1	173.0 E	USAIT	EH	21/32	24.6	6	EC	R
2598	INTELSAT5 PAC1	173.0 E	USAIT	WH	13/32/33	24.2	6	EC	R
2599	INTELSAT5 PAC1	173.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2600	INTELSAT5 PAC1	173.0 E	USAIT	NEZ	21	29.0	6	EC	R
2601	INTELSAT5 PAC1	173.0 E	USAIT	ESR	21	36.7	14	EC	R
2602	INTELSAT5 PAC1	173.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2603	INTELSAT5 PAC1	173.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2604	INTELSAT5 PAC1	173.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2605	INTELSAT5 PAC1	173.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2606	INTELSAT5 PAC1	173.0 E	USAIT	EH	21/32	24.6	4	EC	T
2607	INTELSAT5 PAC1	173.0 E	USAIT	WH	13/32/33	24.2	4	EC	T
2608	INTELSAT5 PAC1	173.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2609	INTELSAT5 PAC1	173.0 E	USAIT	NEZ	21	29.0	4	EC	T
2610	INTELSAT5 PAC1	173.0 E	USAIT	ESR	21	36.7	11	EC	T
2611	INTELSAT5 PAC1	173.0 E	USAIT	WSR	13/33	40.0	11	EC	T
2612	INTELSAT5A PAC1	173.0 E	USAIT	O	13/21/32/33	2.0	6	ED/EK	R
2613	INTELSAT5A PAC1	173.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2614	INTELSAT5A PAC1	173.0 E	USAIT	EH	21/32	24.6	6	EC	R
2615	INTELSAT5A PAC1	173.0 E	USAIT	WH	13/32/33	24.2	6	EC	R
2616	INTELSAT5A PAC1	173.0 E	USAIT	EZ	21/32	29.0	6	EC	R
2617	INTELSAT5A PAC1	173.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2618	INTELSAT5A PAC1	173.0 E	USAIT	NEZ	21	29.0	6	EC	R
2619	INTELSAT5A PAC1	173.0 E	USAIT	ESR	21	36.7	14	EC	R
2620	INTELSAT5A PAC1	173.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2621	INTELSAT5A PAC1	173.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2622	INTELSAT5A PAC1	173.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T
2623	INTELSAT5A PAC1	173.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2624	INTELSAT5A PAC1	173.0 E	USAIT	EH	21/32	24.6	4	EC	T
2625	INTELSAT5A PAC1	173.0 E	USAIT	WH	13/32/33	24.2	4	EC	T
2626	INTELSAT5A PAC1	173.0 E	USAIT	EZ	21/32	29.0	4	EC	T
2627	INTELSAT5A PAC1	173.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2628	INTELSAT5A PAC1	173.0 E	USAIT	NEZ	21	29.0	4	EC	T
2629	INTELSAT5A PAC1	173.0 E	USAIT	4SR	32	30.0	4	EC	T
2630	INTELSAT5A PAC1	173.0 E	USAIT	ESR	21	36.7	11	EC	T
2631	INTELSAT5A PAC1	173.0 E	USAIT	WSR	13/33	40.0	11	EC	T
2632	INTELSAT4A PAC1	174.0 E	USAIT	EH	21/32	24.8	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2633	INTELSAT4A PAC1	174.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2634	INTELSAT4A PAC1	174.0 E	USAIT	H	13/21/32/33	14.0	6	ED/EK	R
2635	INTELSAT4A PAC1	174.0 E	USAIT	WH	13/32/33	24.5	6	EC	R
2636	INTELSAT4A PAC1	174.0 E	USAIT	EH	21/32	31.3	4	EC	T
2637	INTELSAT4A PAC1	174.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2638	INTELSAT4A PAC1	174.0 E	USAIT	H	13/21/32/33	14.0	4	EK/ER	T
2639	INTELSAT4A PAC1	174.0 E	USAIT	NEQ	21	29.1	4	EC	T
2640	INTELSAT4A PAC1	174.0 E	USAIT	NWQ	13/32/33	27.5	4	EC	T
2641	INTELSAT4A PAC1	174.0 E	USAIT	SEQ	21/32	27.8	4	EC	T
2642	INTELSAT4A PAC1	174.0 E	USAIT	SWQ	32	29.0	4	EC	T
2643	INTELSAT4A PAC1	174.0 E	USAIT	WH	13/32/33	28.8	4	EC	T
2644	INTELSAT5 PAC1	174.0 E	USAIT	O	13/21/32/33	2.0	6	EK/ED	R
2645	INTELSAT5 PAC1	174.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2646	INTELSAT5 PAC1	174.0 E	USAIT	EH	21/32	24.6	6	EC	R
2647	INTELSAT5 PAC1	174.0 E	USAIT	WH	13/32/33	24.2	6	EC	R
2648	INTELSAT5 PAC1	174.0 E	USAIT	EZ	21	29.0	6	EC	R
2649	INTELSAT5 PAC1	174.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2650	INTELSAT5 PAC1	174.0 E	USAIT	ESR	21	37.7	14	EC	R
2651	INTELSAT5 PAC1	174.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2652	INTELSAT5 PAC1	174.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2653	INTELSAT5 PAC1	174.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T
2654	INTELSAT5 PAC1	174.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2655	INTELSAT5 PAC1	174.0 E	USAIT	EH	21/32	24.6	4	EC	T
2656	INTELSAT5 PAC1	174.0 E	USAIT	WH	13/32/33	24.2	4	EC	T
2657	INTELSAT5 PAC1	174.0 E	USAIT	EZ	21	29.0	4	EC	T
2658	INTELSAT5 PAC1	174.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2659	INTELSAT5 PAC1	174.0 E	USAIT	ESR	21	37.7	11	EC	T
2660	INTELSAT5 PAC1	174.0 E	USAIT	WSR	13/33	40.0	11	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2661	INTELSAT5A PAC1	174.0 E	USAIT	O	13/21/32/33	2.0	6	ED/EK	R
2662	INTELSAT5A PAC1	174.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2663	INTELSAT5A PAC1	174.0 E	USAIT	EH	21/32	24.6	6	EC	R
2664	INTELSAT5A PAC1	174.0 E	USAIT	WH	13/32/33	24.2	6	EC	R
2665	INTELSAT5A PAC1	174.0 E	USAIT	EZ	21/32	29.0	6	EC	R
2666	INTELSAT5A PAC1	174.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2667	INTELSAT5A PAC1	174.0 E	USAIT	NEZ	21	29.0	6	EC	R
2668	INTELSAT5A PAC1	174.0 E	USAIT	ESR	21	36.7	14	EC	R
2669	INTELSAT5A PAC1	174.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2670	INTELSAT5A PAC1	174.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2671	INTELSAT5A PAC1	174.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T
2672	INTELSAT5A PAC1	174.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2673	INTELSAT5A PAC1	174.0 E	USAIT	EH	21/32	24.6	4	EC	T
2674	INTELSAT5A PAC1	174.0 E	USAIT	WH	13/32/33	24.2	4	EC	T
2675	INTELSAT5A PAC1	174.0 E	USAIT	EZ	21/32	29.0	4	EC	T
2676	INTELSAT5A PAC1	174.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2677	INTELSAT5A PAC1	174.0 E	USAIT	NEZ	21	29.0	4	EC	T
2678	INTELSAT5A PAC1	174.0 E	USAIT	4SR	32	30.0	4	EC	T
2679	INTELSAT5A PAC1	174.0 E	USAIT	ESR	21	36.7	11	EC	T
2680	INTELSAT5A PAC1	174.0 E	USAIT	WSR	13/33	40.0	11	EC	T
2681	USGCSS PH2 W PAC	175.0 E	USA	3	21/22	35.0	8	EC	R
2682	USGCSS PH2 W PAC	175.0 E	USA	4	13/21/32/33	20.0	8	EC	R
2683	USGCSS PH2 W PAC	175.0 E	USA	4	32/33	32.0	8	EC	R
2684	USGCSS PH2 W PAC	175.0 E	USA	2	13/21/32/33	20.0	7	EC/EK/ER	T
2685	USGCSS PH2 W PAC	175.0 E	USA	3	21/22	35.0	7	EC/EK/ER	T
2686	USGCSS PH2 W PAC	175.0 E	USA	4	32/33	32.0	7	EC/EK/ER	T
2687	USGCSS PH3 W PAC	175.0 E	USA	G	13/21/22/31/32/33	20.2	8	EC	R
2688	USGCSS PH3 W PAC	175.0 E	USA	G	13/21/22/31/32/33	20.2	8	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2689	USGCSS PH3 W PAC	175.0 E	USA	MBA	13/21/22/31/32/33	27.3	8	EC	R
2690	USGCSS PH3 W PAC	175.0 E	USA	G	13/21/22/31/32/33	21.0	7	EC/EK/ER	T
2691	USGCSS PH3 W PAC	175.0 E	USA	G	13/21/22/31/32/33	21.0	7	EC/EK/ER	T
2692	USGCSS PH3 W PAC	175.0 E	USA	MBA	13/21/22/31/32/33	32.0	7	EC	T
2693	USGCSS PH3 W PAC	175.0 E	USA	MBA	13/21/22/33	32.0	7	EC	T
2694	USGCSS PH3 W PAC	175.0 E	USA	SB	13/33	34.6	7	EC	T
2695	INTELSAT4A PAC2	176.0 E	USAIT	H	13/21/32/33	14.0	6	EK/ED	R
2696	INTELSAT4A PAC2	176.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2697	INTELSAT4A PAC2	176.0 E	USAIT	EH	21/32	24.8	6	EC	R
2698	INTELSAT4A PAC2	176.0 E	USAIT	WH	13/32/33	24.5	6	EC	R
2699	INTELSAT4A PAC2	176.0 E	USAIT	BCN	13/21/32/33	14.0	4	EK/ER	T
2700	INTELSAT4A PAC2	176.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2701	INTELSAT4A PAC2	176.0 E	USAIT	NWQ	13/32/33	27.5	4	EC	T
2702	INTELSAT4A PAC2	176.0 E	USAIT	NEQ	21	29.1	4	EC	T
2703	INTELSAT4A PAC2	176.0 E	USAIT	SWQ	32	29.0	4	EC	T
2704	INTELSAT4A PAC2	176.0 E	USAIT	SEQ	32	27.8	4	EC	T
2705	INTELSAT4A PAC2	176.0 E	USAIT	EH	21/32	31.3	4	EC	T
2706	INTELSAT4A PAC2	176.0 E	USAIT	WH	13/32/33	28.8	4	EC	T
2707	INTELSAT5 PAC2	176.0 E	USAIT	O	13/21/32/33	2.0	6	EK/ED	R
2708	INTELSAT5 PAC2	176.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2709	INTELSAT5 PAC2	176.0 E	USAIT	EH	21/32	24.6	6	EC	R
2710	INTELSAT5 PAC2	176.0 E	USAIT	WH	13/32/33	24.2	6	EC	R
2711	INTELSAT5 PAC2	176.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2712	INTELSAT5 PAC2	176.0 E	USAIT	NEZ	21	29.0	6	EC	R
2713	INTELSAT5 PAC2	176.0 E	USAIT	ESR	21	36.7	14	EC	R
2714	INTELSAT5 PAC2	176.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2715	INTELSAT5 PAC2	176.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2716	INTELSAT5 PAC2	176.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2717	INTELSAT5 PAC2	176.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2718	INTELSAT5 PAC2	176.0 E	USAIT	EH	21/32	24.6	4	EC	T
2719	INTELSAT5 PAC2	176.0 E	USAIT	WH	13/32/33	24.2	4	EC	T
2720	INTELSAT5 PAC2	176.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2721	INTELSAT5 PAC2	176.0 E	USAIT	NEZ	21	29.0	4	EC	T
2722	INTELSAT5 PAC2	176.0 E	USAIT	ESR	21	36.7	11	EC	T
2723	INTELSAT5 PAC2	176.0 E	USAIT	WSR	13/33	40.0	11	EC	T
2724	INTELSAT5A PAC2	176.0 E	USAIT	O	13/21/32/33	2.0	6	ED/EK	R
2725	INTELSAT5A PAC2	176.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2726	INTELSAT5A PAC2	176.0 E	USAIT	EH	21/32	24.6	6	EC	R
2727	INTELSAT5A PAC2	176.0 E	USAIT	WH	13/32/33	24.2	6	EC	R
2728	INTELSAT5A PAC2	176.0 E	USAIT	EZ	21/32	29.0	6	EC	R
2729	INTELSAT5A PAC2	176.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2730	INTELSAT5A PAC2	176.0 E	USAIT	NEZ	21	29.0	6	EC	R
2731	INTELSAT5A PAC2	176.0 E	USAIT	ESR	21	36.7	14	EC	R
2732	INTELSAT5A PAC2	176.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2733	INTELSAT5A PAC2	176.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2734	INTELSAT5A PAC2	176.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T
2735	INTELSAT5A PAC2	176.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2736	INTELSAT5A PAC2	176.0 E	USAIT	EH	21/32	24.6	4	EC	T
2737	INTELSAT5A PAC2	176.0 E	USAIT	WH	13/32/33	24.2	4	EC	T
2738	INTELSAT5A PAC2	176.0 E	USAIT	EZ	21/32	29.0	4	EC	T
2739	INTELSAT5A PAC2	176.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2740	INTELSAT5A PAC2	176.0 E	USAIT	NEZ	21	29.0	4	EC	T
2741	INTELSAT5A PAC2	176.0 E	USAIT	4SR	32	30.0	4	EC	T
2742	INTELSAT5A PAC2	176.0 E	USAIT	ESR	21	36.7	11	EC	T
2743	INTELSAT5A PAC2	176.0 E	USAIT	WSR	13/33	40.0	11	EC	T
2744	MARISAT-PAC	176.5 E	USA	G	13/21/22/31/32/33	15.0	0	EG	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2745	MARISAT-PAC	176.5 E	USA	G	13/21/22/31/32/33	18.5	1	EG	R
2746	MARISAT-PAC	176.5 E	USA	G	13/21/32/33	19.0	6	EC/ED/EK	R
2747	MARISAT-PAC	176.5 E	USA	G	13/21/22/31/32/33	14.0	0	EG	T
2748	MARISAT-PAC	176.5 E	USA	G	13/21/22/31/32/33	18.5	1	EG/EK	T
2749	MARISAT-PAC	176.5 E	USA	G	13/21/32/33	18.5	4	EC	T
2750	MARISAT-PAC	176.5 E	USA	G	13/21/32/33	19.0	4	EC/EK/ER	T
2751	INTELSAT4A PAC2	177.0 E	USAIT	H	13/21/32/33	14.0	6	EK/ED	R
2752	INTELSAT4A PAC2	177.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2753	INTELSAT4A PAC2	177.0 E	USAIT	EH	21/32	24.8	6	EC	R
2754	INTELSAT4A PAC2	177.0 E	USAIT	WH	13/32/33	24.5	6	EC	R
2755	INTELSAT4A PAC2	177.0 E	USAIT	BCN	13/21/32/33	14.0	4	EK/ER	T
2756	INTELSAT4A PAC2	177.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2757	INTELSAT4A PAC2	177.0 E	USAIT	NWQ	13/32/33	27.5	4	EC	T
2758	INTELSAT4A PAC2	177.0 E	USAIT	NEQ	21	29.1	4	EC	T
2759	INTELSAT4A PAC2	177.0 E	USAIT	SWQ	32	29.0	4	EC	T
2760	INTELSAT4A PAC2	177.0 E	USAIT	SEQ	32	27.8	4	EC	T
2761	INTELSAT4A PAC2	177.0 E	USAIT	EH	21/32	31.3	4	EC	T
2762	INTELSAT4A PAC2	177.0 E	USAIT	WH	13/32/33	28.8	4	EC	T
2763	INTELSAT5 PAC2	177.0 E	USAIT	O	13/21/32/33	2.0	6	EK/ED	R
2764	INTELSAT5 PAC2	177.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2765	INTELSAT5 PAC2	177.0 E	USAIT	EH	21/32	24.6	6	EC	R
2766	INTELSAT5 PAC2	177.0 E	USAIT	WH	13/32/33	24.2	6	EC	R
2767	INTELSAT5 PAC2	177.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2768	INTELSAT5 PAC2	177.0 E	USAIT	NEZ	21	29.0	6	EC	R
2769	INTELSAT5 PAC2	177.0 E	USAIT	ESR	21	36.7	14	EC	R
2770	INTELSAT5 PAC2	177.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2771	INTELSAT5 PAC2	177.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2772	INTELSAT5 PAC2	177.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2773	INTELSAT5 PAC2	177.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2774	INTELSAT5 PAC2	177.0 E	USAIT	EH	21/32	24.6	4	EC	T
2775	INTELSAT5 PAC2	177.0 E	USAIT	WH	13/32/33	24.2	4	EC	T
2776	INTELSAT5 PAC2	177.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2777	INTELSAT5 PAC2	177.0 E	USAIT	NEZ	21	29.0	4	EC	T
2778	INTELSAT5 PAC2	177.0 E	USAIT	ESR	21	36.7	11	EC	T
2779	INTELSAT5 PAC2	177.0 E	USAIT	WSR	13/33	40.0	11	EC	T
2780	INTELSAT5A PAC2	177.0 E	USAIT	O	13/21/32/33	2.0	6	ED/EK	R
2781	INTELSAT5A PAC2	177.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2782	INTELSAT5A PAC2	177.0 E	USAIT	EH	21/32	24.6	6	EC	R
2783	INTELSAT5A PAC2	177.0 E	USAIT	WH	13/32/33	24.2	6	EC	R
2784	INTELSAT5A PAC2	177.0 E	USAIT	EZ	21/32	29.0	6	EC	R
2785	INTELSAT5A PAC2	177.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2786	INTELSAT5A PAC2	177.0 E	USAIT	NEZ	21	29.0	6	EC	R
2787	INTELSAT5A PAC2	177.0 E	USAIT	ESR	21	36.7	14	EC	R
2788	INTELSAT5A PAC2	177.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2789	INTELSAT5A PAC2	177.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2790	INTELSAT5A PAC2	177.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T
2791	INTELSAT5A PAC2	177.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2792	INTELSAT5A PAC2	177.0 E	USAIT	EH	21/32	24.6	4	EC	T
2793	INTELSAT5A PAC2	177.0 E	USAIT	WH	13/32/33	24.2	4	EC	T
2794	INTELSAT5A PAC2	177.0 E	USAIT	EZ	21/32	29.0	4	EC	T
2795	INTELSAT5A PAC2	177.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2796	INTELSAT5A PAC2	177.0 E	USAIT	NEZ	21	29.0	4	EC	T
2797	INTELSAT5A PAC2	177.0 E	USAIT	4SR	32	30.0	4	EC	T
2798	INTELSAT5A PAC2	177.0 E	USAIT	ESR	21	36.7	11	EC	T
2799	INTELSAT5A PAC2	177.0 E	USAIT	WSR	13/33	40.0	11	EC	T
2800	INTELSAT4A PAC2	179.0 E	USAIT	EH	21/32	24.8	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2801	INTELSAT4A PAC2	179.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2802	INTELSAT4A PAC2	179.0 E	USAIT	H	13/21/32/33	14.0	6	ED/EK	R
2803	INTELSAT4A PAC2	179.0 E	USAIT	WH	13/32/33	24.5	6	EC	R
2804	INTELSAT4A PAC2	179.0 E	USAIT	EH	21/32	31.3	4	EC	T
2805	INTELSAT4A PAC2	179.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2806	INTELSAT4A PAC2	179.0 E	USAIT	H	13/21/32/33	14.0	4	EK/ER	T
2807	INTELSAT4A PAC2	179.0 E	USAIT	NEQ	21	29.1	4	EC	T
2808	INTELSAT4A PAC2	179.0 E	USAIT	NWQ	13/32/33	27.5	4	EC	T
2809	INTELSAT4A PAC2	179.0 E	USAIT	SWQ	32	29.0	4	EC	T
2810	INTELSAT4A PAC2	179.0 E	USAIT	SEQ	32	27.8	4	EC	T
2811	INTELSAT4A PAC2	179.0 E	USAIT	WH	13/32/33	24.5	4	EC	T
2812	INTELSAT MCS PAC A	179.0 E	USAIT	G	13/21/32/33	19.0	1	EG	R
2813	INTELSAT MCS PAC A	179.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2814	INTELSAT MCS PAC A	179.0 E	USAIT	G	13/21/32/33	19.0	1	EG	T
2815	INTELSAT MCS PAC A	179.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2816	INTELSAT5 PAC3	179.0 E	USAIT	O	13/21/32/33	2.0	6	EK/ED	R
2817	INTELSAT5 PAC3	179.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2818	INTELSAT5 PAC3	179.0 E	USAIT	EH	21/32	24.6	6	EC	R
2819	INTELSAT5 PAC3	179.0 E	USAIT	WH	13/32/33	24.2	6	EC	R
2820	INTELSAT5 PAC3	179.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2821	INTELSAT5 PAC3	179.0 E	USAIT	EZ	21	29.0	6	EC	R
2822	INTELSAT5 PAC3	179.0 E	USAIT	ESR	21	36.7	14	EC	R
2823	INTELSAT5 PAC3	179.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2824	INTELSAT5 PAC3	179.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2825	INTELSAT5 PAC3	179.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T
2826	INTELSAT5 PAC3	179.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2827	INTELSAT5 PAC3	179.0 E	USAIT	EH	21/32	24.6	4	EC	T
2828	INTELSAT5 PAC3	179.0 E	USAIT	WH	13/32/33	24.2	4	EC	T

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2829	INTELSAT5 PAC3	179.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2830	INTELSAT5 PAC3	179.0 E	USAIT	EZ	21	29.0	4	EC	T
2831	INTELSAT5 PAC3	179.0 E	USAIT	ESR	21	36.7	11	EC	T
2832	INTELSAT5 PAC3	179.0 E	USAIT	WSR	13/33	40.0	11	EC	T
2833	INTELSAT MCS PAC A	180.0 E	USAIT	G	13/21/32/33	19.0	1	EG	R
2834	INTELSAT MCS PAC A	180.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2835	INTELSAT MCS PAC A	180.0 E	USAIT	G	13/21/32/33	19.0	1	EG	T
2836	INTELSAT MCS PAC A	180.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2837	INTELSAT5 PAC3	180.0 E	USAIT	O	13/21/32/33	2.0	6	EK/ED	R
2838	INTELSAT5 PAC3	180.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2839	INTELSAT5 PAC3	180.0 E	USAIT	EH	21/32	24.6	6	EC	R
2840	INTELSAT5 PAC3	180.0 E	USAIT	WH	13/32/33	24.2	6	EC	R
2841	INTELSAT5 PAC3	180.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2842	INTELSAT5 PAC3	180.0 E	USAIT	NEZ	21	29.0	6	EC	R
2843	INTELSAT5 PAC3	180.0 E	USAIT	ESR	21	36.7	14	EC	R
2844	INTELSAT5 PAC3	180.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2845	INTELSAT5 PAC3	180.0 E	USAIT	EH	21/32	24.6	4	EC	T
2846	INTELSAT5 PAC3	180.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2847	INTELSAT5 PAC3	180.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T
2848	INTELSAT5 PAC3	180.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2849	INTELSAT5 PAC3	180.0 E	USAIT	WH	13/32/33	24.2	4	EC	T
2850	INTELSAT5 PAC3	180.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2851	INTELSAT5 PAC3	180.0 E	USAIT	NEZ	21	29.0	4	EC	T
2852	INTELSAT5 PAC3	180.0 E	USAIT	ESR	21	36.7	11	EC	T
2853	INTELSAT5 PAC3	180.0 E	USAIT	WSR	13/33	40.0	11	EC	T
2854	INTELSAT5A PAC3	180.0 E	USAIT	O	13/21/32/33	2.0	6	ED/EK	R
2855	INTELSAT5A PAC3	180.0 E	USAIT	G	13/21/32/33	21.0	6	EC	R
2856	INTELSAT5A PAC3	180.0 E	USAIT	WH	13/32/33	24.2	6	EC	R

GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
2857	INTELSAT5A PAC3	180.0 E	USAIT	EH	21/32	24.2	6	EC	R
2858	INTELSAT5A PAC3	180.0 E	USAIT	EZ	21/32	29.0	6	EC	R
2859	INTELSAT5A PAC3	180.0 E	USAIT	WZ	13/32/33	29.0	6	EC	R
2860	INTELSAT5A PAC3	180.0 E	USAIT	NEZ	21	29.0	6	EC	R
2861	INTELSAT5A PAC3	180.0 E	USAIT	ESR	21	36.7	14	EC	R
2862	INTELSAT5A PAC3	180.0 E	USAIT	WSR	13/33	40.0	14	EC	R
2863	INTELSAT5A PAC3	180.0 E	USAIT	HTM	13/21/32/33	14.0	4	EK/ER	T
2864	INTELSAT5A PAC3	180.0 E	USAIT	BCN	13/21/32/33	19.0	11	EK	T
2865	INTELSAT5A PAC3	180.0 E	USAIT	G	13/21/32/33	21.0	4	EC	T
2866	INTELSAT5A PAC3	180.0 E	USAIT	EH	21/32	24.6	4	EC	T
2867	INTELSAT5A PAC3	180.0 E	USAIT	WH	13/32/33	24.2	4	EC	T
2868	INTELSAT5A PAC3	180.0 E	USAIT	EZ	21/32	29.0	4	EC	T
2869	INTELSAT5A PAC3	180.0 E	USAIT	WZ	13/32/33	29.0	4	EC	T
2870	INTELSAT5A PAC3	180.0 E	USAIT	NEZ	21	29.0	4	EC	T
2871	INTELSAT5A PAC3	180.0 E	USAIT	4SR	32	30.0	4	EC	T
2872	INTELSAT5A PAC3	180.0 E	USAIT	ESR	21	36.7	11	EC	T
2873	INTELSAT5A PAC3	180.0 E	USAIT	WSR	13/33	40.0	11	EC	T

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

ORB-85 CAMR SUR L'UTILISATION DE L'ORBITE DES SATELLITES GÉOSTATIONNAIRES ET LA PLANIFICATION DES SERVICES SPATIAUX UTILISANT CETTE ORBITE

PREMIÈRE SESSION GENÈVE, AOÛT/SEPTEMBRE 1985

Addendum 1 au
Document 105-F/E/S
14 août 1985
Original : français
anglais
espagnol

SEANCE PLENIERE
PLENARY MEETING
SESION PLENARIA

ANNEXE 1 AU DOCUMENT 105

Comme indiqué dans le Document 105, cette Annexe contient des informations d'ordre général sur les stations spatiales géostationnaires (Format "A" de rapport, décrit dans la section 2 du Document 105).

ANNEX 1 TO DOCUMENT 105

As mentioned in Document 105, this Annex contains general information on geostationary space stations (Report Format "A", described in section 2 of Document 105).

ANEXO 1 AL DOCUMENTO 105

Conforme se menciona en el Documento 105, este Anexo contiene información general sobre las estaciones espaciales geoestacionarias (Formato "A" del Informe, descrito en la sección 2 del Documento 105).

Annexe
Annex
Anexo

ANNEX 1

PAGE NO. 1
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Report Format "A"

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
PACSTAR-2	175.0 W	PNG	891231	20	160E-175W		A	850618	201				
GALS-4	170.0 W	URS	850630		172W-168W	172W-168W	N	770425	156	780731	780926	114	811028
STATSIONAR-10	170.0 W	URS	820630		172W-168W	172W-168W	N	760120	97	770613	770802	52	780223
LOUTCH P4	170.0 W	URS	811231		172W-168W	172W-168W	C	771101	180	780829	781031	124	
VOLNA-7	170.0 W	URS	801231		172W-168W	172W-168W	C	771011	175	780626	780815	102	
STATSIONAR-D2	170.0 W	URS	880630	20	172W-168W	172W-168W	A	850611	194				
POTOK-3	168.0 W	URS	850630		169W-167W	169W-167W	N	811208	346				820126
ESDRN	160.0 W	URS	860601	20	161W-159W	161W-082E	N	810901	343	820511	830524	72	840306
ATS-1	149.0 W	USA	661207		151W-016W	151W-016W	N						721229
FLTSATCOM-A PAC	145.0 W	USA	841231	10	146W-144W	146W-144W	A	850102	181				
MORELOS-4	145.0 W	MEX	870331	10	156W-050W	156W-050W	A	820824	25				
US SATCOM V	143.0 W	USA	821217	10	145W-120W			820622	7	840208	840727	414	
US SATCOM II-R	143.0 W	USA	831201	10	143W-099W	135W-099W	A	820622	7				
MORELOS-3	141.0 W	MEX	861231	10	156W-050W	156W-050W	A	820824	24				
US SATCOM I-R	139.0 W	USA	830430	10	143W-099W		C	820622	6	831213	840619	337	
GOES WEST	135.0 W	USA	750206		136W-135W	136W-135W	N	750128	28	741206			761101
US SATCOM-1	135.0 W	USA	760810		138W-095W	138W-095W	N	750304	35	770328	770621	42	781016
USGCSS PH2 E PAC	135.0 W	USA	790130		137W-133W	137W-133W	N	770222	139				780621
USGCSS PH3 E PAC	135.0 W	USA	830601		137W-133W	137W-133W	N	800408	248	810401	811215	344	830720
USASAT 11D	134.0 W	USA	840131	10	135W-090W	135W-090W	A	840410	120				
USASAT 11C	132.0 W	USA	870315	10	135W-120W	135W-120W	A	840228	111				
US SATCOM III-R	131.0 W	USA	830630	10	138W-095W	138W-095W	C	810707	329	831215	840619	347	
USASAT 10D	130.0 W	USA	870615	10	135W-120W	135W-120W	A	840228	108				
USRDSS WEST	130.0 W	USA	871231	10	140W-060W	140W-060W	A	841009	176				
COMSTAR D-1	128.0 W	USA	760515		138W-095W	138W-095W	N	750304	39	770412	770607	39	781020
ASC-1	128.0 W	USA	850930	10	136W-088W	136W-088W	A	850618	202				
USASAT 10C	126.0 W	USA	870915	10	135W-120W	135W-120W	A	840228	107				
USASAT 10B	124.0 W	USA	860915	10	135W-120W	135W-120W	A	840228	106				
WESTAR-2	123.5 W	USA	750530		138W-095W	138W-095W	N	750304	34	770413	770621	45	781011
WESTAR 5	123.0 W	USA	830101	10	135W-099W	135W-099W	C	820622	5	831201	840605	284	

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
SPACENET I	120.0 W	USA	840522	10	135W-060W	135W-060W	C	820629	10	840704	850212	616	
USASAT 10A	120.0 W	USA	870115	10	135W-120W	135W-120W	A	840228	105				
US SATCOM-2	119.0 W	USA	760602		138W-095W	138W-095W	N	750304	38	770328	770621	43	781016
ANIK C-3	117.5 W	CAN	830110		118W-105W		N	770215	138	771230	780207	69	820209
MORELOS 2	116.5 W	MEX	860201	10	156W-050W	156W-050W	N	821012	30	840119	840710	387	840711
ANIK A-3	114.0 W	CAN	750508				N						721106
MORELOS 1	113.5 W	MEX	850801	10	156W-050W	156W-050W	N	821005	28	840119	840710	386	840711
ANIK C-2	112.5 W	CAN	830801		118W-105W		N	770215	137	820910	830517	466	821116
ANIK B-1	109.0 W	CAN	790101		114W-104W		N	770201	136		770412	36	781218
ANIK D-2	108.0 W	CAN	841101	10	114W-104W		C	811222	358	850107	850528	716	
MUSAT-A	108.0 W	CAN	841231		110W-106W	110W-106W	A	791113	241				
ANIK C-1	107.5 W	CAN	840701	10	118W-105W		C	811222	357	840404	841204	569	
MSAT	106.5 W	CAN	871231	10	108W-105W	108W-105W	A	830405	56				
MSAT	106.5 W	CAN	871231	10	108W-105W	108W-105W	A	830405	55				
GSTAR I	106.0 W	USA	851231	10	135W-099W	135W-099W	A	820629	14				
ATS-5	105.0 W	USA	690812		138W-058W	133W-063W	N						721229
ANIK D-1	104.5 W	CAN	820830	10	114W-104W		N	800708	279	821018	830510	465	820803
GSTAR II	103.0 W	USA	861231	10	135W-099W	135W-099W	A	820629	15				
FLTSATCOM E PAC	100.0 W	USA	780209		101W-099W	101W-099W	N	751028	85	790523	790828	165	760601
FLTSATCOM-A E-PAC	100.0 W	USA	841231	10	099W-101W	099W-101W	A	840131	98				
FLTSATCOM-B E-PAC	100.0 W	USA	861231	10	101W-099W	101W-099W	A	830322	50				
USRDSS CENTRAL	100.0 W	USA	870930	10	140W-060W	140W-060W	A	841009	175				
USASAT-6B	99.0 W	USA	810331		130W-100W	130W-063W	N	761012	124	770718	770830	61	840319
WESTAR-1	99.0 W	USA	740716		138W-095W	138W-095W	N	750304	36	770413	770621	44	781011
WESTAR 4	99.0 W	USA	830101	10	135W-099W	135W-099W	C	821207	4	831201	840605	272	
USASAT 6A	97.0 W	USA	820101	10	130W-094W	130W-064W	C	830125	34	831212	840612	325	
COMSTAR D-2	95.0 W	USA	760723		138W-095W	138W-095W	N	750304	32	770412	770607	40	781020
USASAT 6C	95.0 W	USA	830101	10	130W-094W	130W-064W	C	830125	35	831212	840612	331	
TELSTAR 3A	95.0 W	USA	831231	10	135W-099W	135W-099W	A	820622	8				
USASAT 12B	93.5 W	USA	840930	10	135W-088W	135W-088W	A	840410	122				

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
WESTAR-3	91.0 W	USA	790930		138W-090W	138W-095W	N	750304	37	790912	800219	197	810219
ADV. WESTAR I	91.0 W	USA	850731	10	120W-070W	120W-070W	A	820629	13				
CONDOR-B	89.0 W	EQACR	900630	10	128W-025W	128W-025W	A	850709	209				
USASAT 9A	89.0 W	USA	850115	10	135W-120W	135W-120W	A	840228	101				
USASAT 12D	88.5 W	USA	850930	10	135W-088W	135W-088W	A	840410	124				
COMSTAR D-3	87.0 W	USA	780918		095W-080W	095W-080W	N	750304	33	770412	770607	41	781020
TELSTAR 3B	87.0 W	USA	841231	10	120W-070W	120W-070W	A	820622	9				
USASAT 9B	87.0 W	USA	850615	10	135W-120W	135W-120W	A	840228	102				
ATS-3	86.0 W	USA	671105		138W-058W	133W-063W	N						721229
USASAT 3C	86.0 W	USA	841231	10	120W-070W	120W-070W	C	820622	9	831117	840515	246	
NAHUEL 2	85.0 W	ARG	891231	10	117W-014W	117W-014W	A	850625	204				
USASAT 9C	85.0 W	USA	870315	10	135W-120W	135W-120W	A	840228	103				
USASAT-7B	83.0 W	USA	820630	10	138W-055W	138W-055W	N	810623	327	830915	840320	188	840123
STSC-1	83.0 W	CUB	880331	10	130W-055W	130W-055W	A	830719	58				
USASAT 9D	83.0 W	USA	870115	10	135W-120W	135W-120W	A	840228	104				
USASAT 7D	81.0 W	USA	861231	10	125W-065W	125W-065W	C	820629	12	831122	840605	257	
NAHUEL 1	80.0 W	ARG	890630	10	117W-014W	117W-014W	A	850625	203				
USASAT 11A	79.0 W	USA	870315	10	135W-120W	135W-120W	A	840228	109				
USASAT 12A	79.0 W	USA	840930	10	135W-065W	135W-065W	A	840410	121				
CONDOR-A	77.5 W	EQACR	900630	10	128W-025W	128W-025W	A	850709	208				
USASAT 11B	77.0 W	USA	870615	10	135W-120W	135W-120W	A	840228	110				
USASAT 12C	76.0 W	USA	840930	10	135W-065W	135W-065W	A	840410	123				
SATCOL-1A	75.4 W	CLM	860731	10	139W-010W	139W-010W	N	810728	338	821129	830614	79	840105
SATCOL-1B	75.4 W	CLM	860731	10	139W-010W	139W-010W	N	810728	338	821129	830614	80	840105
GOES EAST	75.0 W	USA	740517		076W-075W	076W-075W	N	750128	28	741206			760317
SATCOL-2	75.0 W	CLM	860731	10	139W-010W	139W-010W	N	810728	338	821129	830614	81	840105
USASAT 8B	72.0 W	USA	830930	10	138W-055W	138W-055W	C	830125	37	831012	840424	221	
CONDOR-C	72.0 W	EQACR	900630	10	128W-025W	128W-025W	A	850709	210				
SBTS A1	70.0 W	B	850201	10	070W-060W	099W-003W	N	820706	16	830128	830705	94	841113
FLTSATCOM-B W-ATL	70.0 W	USA	861231	10	075W-065W	075W-065W	A	830322	49				

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
USASAT 7C	70.0 W	USA	850731	8	120W-070W	120W-070W	A	820629	11				
USRDSS EAST	70.0 W	USA	870630	10	140W-060W	140W-060W	A	841009	174				
USASAT 8A	67.0 W	USA	860101	10	138W-055W	138W-055W	C	830125	36	840130	840717	394	
USASAT 15D	66.0 W	USA	890630	10	135W-055W	135W-055W	A	840911	165				
SBTS A2	65.0 W	B	850401	10	070W-060W	099W-003W	N	820706	17	830128	830705	99	841113
USASAT 15C	64.0 W	USA	890630	10	135W-055W	135W-055W	A	840911	164				
USASAT 14D	63.0 W	USA	890630	10	143W-053W	143W-053W	A	840911	161				
USASAT 15B	62.0 W	USA	881231	10	135W-055W	135W-055W	A	840911	163				
USASAT 8B	62.0 W	USA	860630	10	135W-060W	135W-060W	A	830125	37				
USASAT 14C	61.0 W	USA	890630	10	143W-053W	143W-053W	A	840911	160				
INTELSAT IBS 300E	60.0 W	USAIT	860101	10	062W-058W		C	840918	167	850327	850618	752	
INTELSAT5A 300E	60.0 W	USAIT	860101	10	062W-058W		C	840918	166	850326	850618	749	
USASAT 15A	60.0 W	USA	881231	10	135W-055W	135W-055W	A	840911	162				
USASAT 13E	58.0 W	USA	880730	10	059W-051W		C	840515	136	841122	850507	702	
USASAT 8C	58.0 W	USA	870131	10	135W-060W	135W-060W	A	830125	38				
USASAT-13H	57.0 W	USA	870930	10	069W-057W	069W-020W	A	841023	177				
INTELSAT IBS 304E	56.0 W	USAIT	860401	10	058W-054W		C	840918	169	850327	850618	753	
INTELSAT5A 304E	56.0 W	USAIT	860401	10	058W-054W		C	840918	168	850326	850618	750	
USASAT 13D	56.0 W	USA	880730	10	059W-051W		C	840515	135	841122	850507	701	
USASAT 14B	55.0 W	USA	881231	10	143W-053W	143W-053W	A	840911	159				
INTELSAT4A ATL3	53.0 W	USAIT	840401		055W-053W		N	750708	67	810728	820413	401	830105
INTELSAT IBS 307E	53.0 W	USAIT	860101	10	055W-052W		C	840424	128	841126	850528	704	
INTELSAT5 CONT1	53.0 W	USAIT	840701	10	055W-053W		C	830927	82	840515	850102	591	
INTELSAT5A CONT1	53.0 W	USAIT	880401	10	055W-053W		C	840228	115	840913	850416	674	
USGCSS PH3 W-ATL	52.5 W	USA	861231	10	055W-050W		A	840925	173				
INTELSAT IBS 310E	50.0 W	USAIT	860101	10	055W-052W		C	840424	129	841206	850528	706	
INTELSAT4A ATL2	50.0 W	USAIT	840101	6	055W-045W		C	750708	66	830530	831122	140	
INTELSAT5 CONT2	50.0 W	USAIT	850601	10	055W-045W		C	830913	75	840515	850102	592	
INTELSAT5A CONT2	50.0 W	USAIT	860601	10	055W-045W		C	830913	74	840515	850102	594	
USASAT 13C	50.0 W	USA	880630	10	055W-045W	055W-045W	C	840501	134	850311	850611	748	

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
USASAT 13B	47.0 W	USA	880630	10	052W-042W	052W-042W	C	840501	133	850311	850611	747	
USASAT 13F	45.0 W	USA	880101	10	050W-040W		C	840828	154	850327	850618	755	
USASAT 13I	45.0 W	USA	890101	10	069W-020W	069W-020W	A	850611	199				
VIDEOSAT-3	43.5 W	F	880101	10	045W-036W		C	831004	148	850430	850702	766	
USASAT 13G	43.0 W	USA	880601	10	048W-038W		C	840828	155	850327	850618	756	
USGCSS P3 MID-ATL	42.5 W	USA	861231	10	043W-039W		A	840529	140				
USASAT 14A	41.0 W	USA	881231	10	117W-053W	117W-053W	A	840911	158				
INTELSAT IBS 319.5E	40.5 W	USAIT	860401	10	042W-039W		C	840424	130	841206	850528	707	
INTELSAT5A 319.5E	40.5 W	USAIT	860401	10	042W-039W		C	840424	127	841107	850430	691	
USASAT 13A	37.5 W	USA	880630	10	043W-032W	043W-032W	C	840501	132	850311	850611	746	
VIDEOSAT-2	37.5 W	F	871231	10	039W-036W		C	831004	86	840406	841211	575	
VIDEOSAT-2	37.5 W	F	871231	10	039W-036W		C	831004	86	840416	841211	577	
VIDEOSAT-2	37.5 W	F	871231	10	039W-036W		C	831004	86	850204	850528	727	
INTELSAT4 ATL5	34.5 W	USAIT	760224		035W-023W		N	751111	89	810410	811222	351	760413
INTELSAT5 ATL4	34.5 W	USAIT	821231		035W-023W		N	760921	121	791009	800513	220	830413
INTELSAT4A ATL4	31.0 W	USAIT	831020		035W-023W		N	750708	68	791009	800513	215	830412
INTELSAT5 ATL6	31.0 W	USAIT	870101	10	035W-023W		C	840313	118	841001	850423	683	
INTELSAT5A ATL6	31.0 W	USAIT	870101	10	035W-023W		C	840710	119	841002	850423	684	
UNISAT 1	31.0 W	G	860630	10	030W-031W	051W-045E	C	820817	23	830804	840131	173	
UNISAT 1	31.0 W	G	860630	10	030W-031W	051W-045E	C	820817	23	841009	840313	181	
UNISAT 1	31.0 W	G	860630	10	030W-031W	051W-045E	C	820817	23	850211	850604	731	
UNISAT 1 ATL	31.0 W	G	860630	10	030W-031W	051W-045E	C	820831	26	840210	840925	424	
EIRESAT-1	31.0 W	IRL	871231	12	031W-031W	100W-040E	A	850129	182				
INTELSAT4 ATL2	29.5 W	USAIT	720228		035W-023W		N			791009	800513	207	720313
INTELSAT5 ATL3	27.5 W	USAIT	820101		035W-023W		N	760921	120	791009	800513	219	830105
INTELSAT5A ATL2	27.5 W	USAIT	850101	10	035W-023W		C	810727	335	830420	831025	123	
INTELSAT6 332.5E	27.5 W	USAIT	871001	13	035W-023W		C	830830	70	840718	850212	628	
GALS-1	26.5 W	URS	850630		029W-025W	029W-025W	N	770425	153	810422	820302	365	820426
STATSIONAR-D1	26.5 W	URS	880630	20	029W-025W	029W-025W	A	850611	193				
INMARSAT AOR-CENTRAL	26.0 W	G INM	880831	10	028W-024W	028W-024W	A	840821	152				

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
STATSIONAR-8	25.0 W	URS	820630		027W-023W	027W-023W	N	760120	95	770613	770802	50	780223
LOUTCH P1	25.0 W	URS	811231		027W-023W	027W-023W	C	771101	177	780829	781031	121	
INTELSAT5 ATL1	24.5 W	USAIT	810317		025W-023W		N	760921	118	770117	770329	34	780124
INTELSAT5A ATL1	24.5 W	USAIT	841001	10	025W-023W		C	810727	334	830420	831025	122	
INTELSAT6 335.5E	24.5 W	USAIT	871001	13	025W-023W		C	830830	69	840717	850212	627	
PROGNOZ-1	24.0 W	URS	840601		024W-024W	024W-024W	N	810602	316	811102	820420	410	840802
FLTSATCOM ATL	23.0 W	USA	790727		024W-022W	024W-022W	N	751028	84	790523	790828	163	760601
MARECS A	23.0 W	F MRS	811201		026W-020W	026W-020W	C	780206	219	800122	800819	241	
FLTSATCOM-B E-ATL	23.0 W	USA	861231	10	024W-022W	024W-022W	A	830322	48				
FLTSATCOM-A ATL	23.0 W	USA	841231	10	022W-024W	022W-024W	A	840131	97				
INTELSAT4A ATL1	21.5 W	USAIT	810601		025W-014W		N	750708	65	791009	800513	212	830105
INTELSAT MCS ATL C	21.5 W	USAIT	821231	10	025W-014W		C	800819	282	810410	811222	348	
INTELSAT5 ATL5	21.5 W	USAIT	811231	10	025W-014W		C	800520	252	810525	820323	378	
INTELSAT5A 338.5E	21.5 W	USAIT	890101	10	025W-015W		A	841106	180				
GDL-4	20.0 W	LUX	840619	10	025W-037E	034W-049E	C	841108	92	840716	850205	610	
INTELSAT4 ATL3	19.5 W	USAIT	730915		025W-014W		N			791009	800513	208	711004
L-SAT	19.0 W	F LST	860701	10	019W-019W	019W-019W	N	831111	88	850619	850730	782	850313
L-SAT	19.0 W	F LST	860701	10	019W-019W	019W-019W	N	810407	308	820104	830201	6	830802
L-SAT	19.0 W	F LST	860701	10	019W-019W	019W-019W	N	821109	32	831031	840508	232	831031
L-SAT	19.0 W	F LST	860701	10	019W-019W	019W-019W	N	821109	33	830806	840131	176	850109
L-SAT	19.0 W	F LST	860701	10	019W-019W	019W-019W	N	810728	337	830805	840131	174	850108
TV-SAT	19.0 W	D	851001	7	019W-019W	045W-064E	N	820706	366	820204	821221	4	840726
TV-SAT	19.0 W	D	851001	7	019W-019W	045W-064E	C	820706	367	840619	850129	608	
TV-SAT	19.0 W	D	851001	7	019W-019W	045W-064E	C	810921	325	820826	830510	44	
LUX-SAT	19.0 W	LUX	861231	10	019W-018W	066W-054W	A	820727	20				
HELVESAT-I	19.0 W	SUI	861231	10	018W-020W	050W-069E	A	770125	133				
SARIT	19.0 W	I	860630	7	018W-020W	044W-070E	A	821130	371				
INTELSAT MCS ATL A	18.5 W	USA	830801		025W-014W		N	790102	212	790621	791016	175	840228
INTELSAT5 ATL2	18.5 W	USAIT	840701		025W-015W		N	760921	119	791009	800513	218	840815
INTELSAT IBS 341.5E	18.5 W	USAIT	860701	10	020W-017W		C	840710	131	841206	850528	705	

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INTELSAT5A ATL4	18.5 W	USAIT	870101	10	025W-013W		C	830802	64	840308	841113	459	
SATCOM PHASE-3	18.0 W	BEL	811221		019W-017W	019W-017W	N	770322	144	790220			
SATCOM-2	18.0 W	BEL	700320				N						700316
INTELSAT IBS 343.5E	16.5 W	USAIT	860701	10	014W-010W		C	840918	171	850327	850618	754	
INTELSAT4A 343.5E	16.5 W	USAIT	860101	10	018W-015W		C	750506	49	840913	850416	672	
INTELSAT5 343.5E	16.5 W	USAIT	860101	10	018W-015W		C	840925	172	850409	850625	758	
INTELSAT5A 343.5E	16.5 W	USAIT	860701	10	018W-015W		C	840918	170	850326	850618	751	
WSDRN	16.0 W	URS	860601	20	017W-015W	015W-096E	N	810901	341	820511	830524	67	840306
ZSSRD-2	16.0 W	URS	891017	20	017W-015W	096W-015W	A	850521	189				
MARISAT-ATL	15.0 W	USA	760219		016W-015W	016W-015W	N	740305	7	761230	770301	33	750225
MARISAT-ATL	15.0 W	USA	760219		016W-015W	016W-015W	N	740305	4	761230	770301	33	750225
INMARSAT AOR-EAST	15.0 W	G INM	880831	10	019W-011W	019W-011W	A	840821	153				
LOUTCH-1	14.0 W	URS	830106		016W-012W	016W-012W	N	770426	157	780328	780530	84	800107
STATSIONAR-4	14.0 W	URSIK	821231		016W-012W	016W-012W	N	760120	92	810319	811110	336	820901
VOLNA-2	14.0 W	URS	820430		016W-012W	016W-012W	N	771011	170	780602	780815	97	790504
GOMS-1	14.0 W	URS	871231	15	015W-013W	015W-013W	A	850702	206				
MORE-14	14.0 W	URS	890601	15	016W-012W	016W-012W	A	850312	183				
POTOK-1	13.5 W	URS	850430	15	015W-013W	015W-013W	N	810908	344	820319	830222	18	841102
MAROTS-B	12.5 W	F	810301		010W-015W	010W-015W	A	770125	133				
USGCSS PH2 ATL	12.0 W	USA	770530		014W-010W	014W-010W	N			790503	790626	153	780621
USGCSS PH3 ATL	12.0 W	USA	860131		014W-010W	014W-010W	N	800408	250	801015	810113	287	841207
HIPPARCOS	12.0 W	F	880731	10	012W-011W	052W-070E	A	840520	138				
F-SAT 2	11.0 W	F	871231	10	011W-006W	014W-006E	C	830913	73	840320	841120	466	
STATSIONAR-11	11.0 W	URS	830630	20	011W-006W	011W-006W	C	800701	270	801216	810519	303	
TELECOM-1A	8.0 W	F	840825		011W-005W	015W-006E	N	800701	268	801203	810324	299	840528
TELECOM-1A	8.0 W	F	840804		011W-005W	015W-006E	N	800701	268	810421	820302	361	840507
TELECOM-1B	5.0 W	F	850801		011W-005W	014W-006E	N	800701	269	801203	810324	472	850506
INTELSAT4A ATL1	4.0 W	USAIT	830901	11	008W-000W		C	750708	65	830414	831018	121	
INTELSAT4A ATL1	4.0 W	USAIT	830901	11	008W-000W		C	750708	66	830414	831018	121	
INTELSAT5 CONT3	4.0 W	USAIT	870701	10	008W-000W		C	840228	112	840913	850423	676	

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INTELSAT5A CONT3	4.0 W	USAIT	860701	10	008W-000W		C	840228	116	840913	850416	675	
INTELSAT4A ATL2	1.0 W	USAIT	841231	6	002W-000W		C	750708	66	810511	820309	371	
INTELSAT5 CONT4	1.0 W	USAIT	850101	10	002W-000W		C	830327	83	840515	850102	593	
INTELSAT5A CONT4	1.0 W	USAIT	871001	10	002W-000W		C	840228	117	840913	850423	677	
SKYNET 4A	1.0 W	G	851101	10	006W-000W	006W-000W	C	810721	336	830830	840313	182	
GEOS-2	0.0 W	F GEO	780601				N	750128	42				780209
METEOSAT	0.0 W	F MET	771128		001W-001E	001W-001E	N	750408	43				760301
SKYNET A	0.0 E	G	850630	8	012W-004E	012W-004E	A	820810	22				
GDL-5	1.0 E	LUX	870831	10	025W-037E	034W-049E	C	841108	93	840619	850205	612	
TELECOM 1C	3.0 E	F	850630	10	000E-006E	014W-006E	C	821005	29	830408	831004	115	
TELECOM 1C	3.0 E	F	850630	10	000E-006E	014W-006E	C	821005	29	830408	831108	131	
TELECOM 1C	3.0 E	F	850630	10	000E-006E	014W-006E	C	821005	29	830408	831206	157	
OTS	5.0 E	F OTS	830401		005E-006E	005E-006E	N	751223	90	830621			760706
TELE-X	5.0 E	S NOT	870201	7	005E-005E	050W-085E	C	820907	27	850219	850219	733	
SKYNET 4B	6.0 E	G	860301	10	000E-006E	000E-006E	C	820810	22	830830	840313	183	
EUTELSAT I-3	7.0 E	F EUT	850501	17	003E-017E	025W-021E	C	830719	59	840222	841030	446	
F-SAT 1	7.0 E	F	871231	10	000E-014E		C	830920	79	840330	841204	564	
F-SAT 1	7.0 E	F	871231	10	000E-014E		C	830920	79	840330	841204	565	
F-SAT 1	7.0 E	F	871231	10	000E-014E		C	830920	79	840330	841204	568	
EUTELSAT-1	10.0 E	F EUT	830616		010E-012E	025W-021E	N	790605	229	810224	811027	327	820215
EUTELSAT-1	10.0 E	F EUT	830616		010E-012E	025W-021E	N	790605	229	810224	811027	329	820215
EUTELSAT-1	10.0 E	F EUT	830616		010E-012E	025W-021E	N	790605	229	811123	820427	432	830117
APEX	10.0 E	F	860101	10	005E-014E		C	830717	62	840123	840710	388	
APEX	10.0 E	F	860101	10	005E-014E		C	830717	62	840327	841127	479	
APEX	10.0 E	F	860101	10	005E-014E		C	830717	62	840418	841218	582	
APEX	10.0 E	F	860101	10	001E-014E		A	850719	62				
PROGNOZ-2	12.0 E	URS	850120		012E-012E	012E-012E	N	810602	317	811102	820420	411	840802
EUTELSAT 1-2	13.0 E	F EUT	831012		010E-013E	025W-021E	N	800708	278	810224	811027	328	820215
EUTELSAT 1-2	13.0 E	F EUT	831012		010E-013E	025W-021E	N	800708	278	810224	811027	330	820215
EUTELSAT 1-2	13.0 E	F EUT	831012		010E-013E	025W-021E	N	800708	278	811123	820427	433	830117

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SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
ITALSAT	13.0 E	I	871231	7	012E-014E	038W-046E	A	840814	151				
NIGERIA-1	14.0 E	NIG	810601		036W-055E	056W-074E	A	781212	209				
AMS	15.0 E	ISR	860630	10	033W-050E	033W-103E	A	830201	39				
SICRAL 1A	16.0 E	I	871231	8	008E-016E	008E-016E	A	830927	44				
SABS-1	17.0 E	ARS	860402	20	016E-018E	015W-107E	N	791002	235	830726	840103	171	840718
SABS 1-2	17.0 E	ARS	881231	20			A	840417	125				
ARABSAT-1	19.0 E	ARSARB	850209		015W-060E	015W-060E	N	781219	210	790529	791009	172	830406
GDL-6	19.0 E	LUX	860930	10	025W-037E	034W-049E	C	841108	94	840716	850205	614	
NIGERIA-2	20.0 E	NIG	810601		036W-055E	056W-074E	A	781212	209				
SICRAL 1B	22.0 E	I	871231	8	014E-022E	014E-022E	A	830927	45				
DFS-1	23.5 E	D	870601	10	022E-030E	045W-065E	C	830215	40	841109	850507	695	
ARABSAT-2	26.0 E	ARSARB	850619		015W-060E	015W-060E	N	781219	211	790529	791009	173	830406
ZOHREH-2	26.0 E	IRN	811230		026E-047E	006W-110E	C	770816	164	780109	780214	76	
ZOHREH-2	26.0 E	IRN	811230		026E-047E	006W-110E	C	770816	164	780109	780829	106	
DFS-2	28.5 E	D	880323	10	022E-030E	045W-065E	C	830215	41	841109	850507	698	
GEOS-2	29.0 E	F GEO	780714				N	750128	42				780209
VIDEOSAT-1	32.0 E	F	871231	10	029E-035E		C	830927	80	840405	841211	574	
VIDEOSAT-1	32.0 E	F	871231	10	029E-035E		C	830927	80	840405	841211	580	
ZOHREH-1	34.0 E	IRN	811230		026E-047E	006W-110E	C	770816	163	780109	780214	75	
ZOHREH-1	34.0 E	IRN	811230		026E-047E	006W-110E	C	770816	163	780109	780829	105	
GALS-6	35.0 E	URS	860630	20	033E-037E	033E-037E	N	810804	340	830223	830719	109	840503
GALS-6	35.0 E	URS	860630	20	033E-037E	033E-037E	N	810804	340	820420	830322	29	840503
PROGNOZ-3	35.0 E	URS	850410		035E-035E	035E-035E	N	810602	318	811102	820420	412	840802
STATSIONAR-2	35.0 E	URS	770901		033E-037E	033E-037E	N	750909	76	761115	770208	26	771230
STATSIONAR-D3	35.0 E	URS	880630	20	033E-037E	033E-037E	A	850611	195				
VOLNA 11	35.0 E	URS	851231	20	033E-037E	033E-037E	A	840731	150				
PAKSAT I	38.0 E	PAK	861231	10		035E-106E	A	831025	90				
STATSIONAR-12	40.0 E	URS	841201		038E-042E	038E-042E	N	800701	271	801216	810519	304	840802
PAKSAT II	41.0 E	PAK	861231	10		035E-106E	A	831025	91				
ZOHREH-4	41.0 E	IRN	321231		026E-047E	006W-110E	A	780822	203				

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GALS-2	45.0 E	URS	850630		043E-047E	043E-047E	N	770425	154	780731	780926	112	811028
STATSIONAR-9	45.0 E	URS	820331		043E-047E	043E-047E	N	760120	96	770613	770802	51	780223
LOUTCH P2	45.0 E	URS	811231		043E-047E	043E-047E	C	771101	178	780829	781031	122	
VOLNA-3	45.0 E	URS	801231		043E-047E	043E-047E	C	771011	171	780626	780815	98	
STATSIONAR D-4	45.0 E	URS	880630	20	043E-047E	043E-047E	A	850611	196				
ZOHREH-3	47.0 E	IRN	811230		026E-047E	006W-110E	C	770816	165	780109	780829	107	
ZOHREH-3	47.0 E	IRN	811230		026E-047E	006W-110E	C	770816	165	780626	780214	165	
LOUTCH-2	53.0 E	URS	820301		051E-055E	051E-055E	N	770419	150	780328	780530	85	800107
STATSIONAR-5	53.0 E	URSIK	800108		051E-055E	051E-055E	N	760120	93	761129	770208	29	790103
VOLNA-4	53.0 E	URS	820430		051E-055E	051E-055E	N	771011	172	780602	780815	99	790504
MORE-53	53.0 E	URS	890601	15	051E-055E	051E-055E	A	850312	185				
SKYNET 4C	53.0 E	G	870201		045E-060E	045E-060E	A	830927	84				
INTELSAT5 INDOC3	57.0 E	USAIT	840228		055E-059E		N	800617	262	810525	820323	374	840815
INTELSAT5A INDOC2	57.0 E	USAIT	850101	10	055E-059E		C	830802	68	840308	841113	463	
INTELSAT6 57E	57.0 E	USAIT	871001	13	055E-059E		C	830830	72	840717	850212	625	
INTELSAT MCS INDOC B	60.0 E	USAIT	840217		060E-063E		N	791009	240	790621	791016	177	840720
INTELSAT5 INDOC2	60.0 E	USAIT	820514		060E-063E		N	770201	135	770708	770823	59	830413
USGCSS PH2 INDOC	60.0 E	USA	781201		058E-062E	058E-062E	N	770222	140				780621
USGCSS PH3 INDOC	60.0 E	USA	841231		058E-062E	058E-062E	N	800408	251	810325	811124	340	830719
INTELSAT5A INDOC1	60.0 E	USAIT	840401	10	060E-063E		C	830802	67	840308	841113	462	
INTELSAT6 60E	60.0 E	USAIT	871001	13	060E-063E		C	830830	71	840717	850212	626	
INTELSAT MCS INDOC A	63.0 E	USAIT	830101		060E-063E		N	790102	214	790621	791016	176	840228
INTELSAT5 INDOC1	63.0 E	USAIT	820514		060E-063E		N	770201	134	770708	770823	58	830413
INTELSAT5A INDOC3	63.0 E	USAIT	850101	10	060E-063E		C	840228	113	840913	850416	673	
MARECS C	64.5 E	F MRS	811201		062E-065E	062E-065E	C	780206	220	800122	800819	243	
INMARSAT IOR	64.5 E	G INM	890731	10	062E-069E	062E-069E	A	841030	178				
SIRIO	65.0 E	I	830401	1	063E-070E	053E-074E	C	770405	149	840528	850122	600	
INTELSAT MCS IND D	66.0 E	USAIT	841231	10	064E-067E		C	800701	275	810416	811222	353	
INTELSAT5 IND4	66.0 E	USAIT	841231	10	064E-067E		C	800520	253	810525	820323	375	
INTELSAT5A 66E	66.0 E	USAIT	890101	10	064E-067E		A	841106	179				

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STW-2	70.0 E	CHN	801231		069E-071E		A	770308	142				
MARISAT-INDOC	72.5 E	USA	770101		073E-074E	073E-074E	N	761207	131	770614	770809	57	820428
MARECS IND2	73.0 E	F MRS	811201		071E-077E	071E-077E	C	780206	220	800122	800819	243	
INSAT-1B	74.0 E	IND	820415		063E-083E	020E-140E	N	781128	208	791129	800729	231	771013
FLTSATCOM INDOC	75.0 E	USA	800208		074E-076E	074E-076E	N	751028	87	790523	790828	169	760601
FLTSATCOM-A IND	75.0 E	USA	841231	10	074E-076E	074E-076E	A	840131	100				
FLTSATCOM-B IND	75.0 E	USA	861231	10	074E-076E	074E-076E	A	830322	52				
GOMSS	76.0 E	URS	831231	15	075E-077E	075E-077E	C	780227	225	811214	820504	445	
GOMS	76.0 E	URS	861231	15	075E-077E	075E-077E	A	850702	205				
PALAPA-A2	77.0 E	INS	770320		075E-085E	070E-167E	N	750429	45				751112
CSSRD-2	77.0 E	URS	891017	20	076E-078E	015W-096E	A	850521	188				
POTOK-2	80.0 E	URS	840530	15	079E-081E	079E-081E	N	810908	345	820420	830301	22	840530
PROGNOZ-4	80.0 E	URS	850130		080E-080E	080E-080E	N	810602	319	811102	820420	413	840802
STATSIONAR-1	80.0 E	URS	701201		078E-082E	078E-082E	N			761125			690203
STATSIONAR-13	80.0 E	URS	840930	20	078E-082E	078E-082E	C	800701	276	801216	810519	305	
STATSIONAR-13	80.0 E	URS	861231	20	078E-082E	078E-082E	C	800701	276	801216	850122	598	
INSAT 1D	82.5 E	IND	890101	15	060E-102E	020E-140E	A	840424	126				
PALAPA-A1	83.0 E	INS	760714		075E-085E	070E-167E	N	750429	45				751112
GALS-3	85.0 E	URS	850630		083E-087E	083E-087E	N	770425	155	780731	780926	113	811028
STATSIONAR-3	85.0 E	URS	761020		083E-087E	083E-087E	N	750909	77	761115	770208	27	781016
LOUTCH P3	85.0 E	URS	811231		083E-087E	083E-087E	C	771101	179	780829	781031	123	
VOLNA-5	85.0 E	URS	801231		083E-087E	083E-087E	C	771011	173	780626	780815	100	
STATSIONAR D-5	85.0 E	URS	880630	20	083E-087E	083E-087E	A	850611	197				
LOUTCH-3	90.0 E	URS	821130		088E-092E	088E-092E	N	770419	151	780328	780530	86	800107
STATSIONAR-6	90.0 E	URS	810109		088E-092E	088E-092E	N	760420	108	761129	770208	30	780717
VOLNA-8	90.0 E	URS	841231	20	088E-092E	088E-092E	C	801118	289	820310	830222	15	
MORE-90	90.0 E	URS	890601	15	088E-092E	088E-092E	A	850312	184				
INSAT-1C	93.5 E	IND	860701	18	060E-102E	020E-140E	A	850528	191				
INSAT-1C	94.0 E	IND	850101		060E-102E	020E-140E	N	780711	201	791129			810602
CSDRN	95.0 E	URS	860601	20	094E-096E	082E-096E	N	810901	342	771230	830524	69	840306

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
CSDRN	95.0 E	URS	860601	20	094E-096E	082E-096E	N	810901	341	771230	830524	69	840306
STATSIONAR-14	95.0 E	URS	840731	20	093E-097E	093E-097E	C	800701	272	801216	810519	306	
STATSIONAR-T	99.0 E	URS	761026		098E-100E	098E-100E	N	760601	2				760211
STATSIONAR-T2	99.0 E	URS	850930		098E-100E	098E-100E	N	800708	10	800930	810519	7	850103
PALAPA-B1	108.0 E	INS	831030		107E-119E	080E-167E	N	780606	197	790719	791218	185	810902
BS-2	110.0 E	J	840201	7	110E-110E	168W-082E	N	810310	305	820104	830215	10	831024
BSE	110.0 E	J	780423		108E-112E	072E-162W	N	741203	1	760223	760713	2	770117
PALAPA-B2	113.0 E	INS	840731		107E-119E	080E-167E	N	780606	198	790719	791218	187	810902
PALAPA B-3	118.0 E	INS	890630	10	107E-119E	080E-167E	C	840911	157	840905	850409	654	
STW-1	125.0 E	CHN	840417		124E-126E		N	770329	146	800121	800812	239	831021
STATSIONAR-15	128.0 E	URS	840701		126E-130E	126E-130E	N	800701	273	801216	810519	307	840530
STATSIONAR D-6	128.0 E	URS	880630	20	126E-130E	126E-130E	A	850611	198				
VOLNA-9	128.0 E	URS	851231	20	126E-130E	126E-130E	A	840731	149				
ETS-2	130.0 E	J	770305		127E-154E	073E-153W	N	751223	91				770215
GALS-5	130.0 E	URS	860630	20	128E-132E	128E-132E	N	810804	339	830223	830719	108	840503
GALS-5	130.0 E	URS	860630	20	128E-132E	128E-132E	N	810804	339	820420	830322	28	840503
CS-2A	132.0 E	J	830204		128E-132E	168W-082E	N	800603	256	810212	811013	323	821027
CSE	135.0 E	J	771224		133E-137E	072E-162W	N	741210	24	760223	760810	19	770119
CS-2B	136.0 E	J	830806		133E-137E	168W-082E	N	800603	257	810212	811013	325	821027
GMS	140.0 E	J	770712	4	139E-141E	139E-141E	N	750909	80	820104	830208	8	770526
GMS-2	140.0 E	J	810831		139E-141E		N	791120	242	810519	820316	372	840322
GMS-3	140.0 E	J	840810	7	139E-141E		N	830405	54	840322	841127	474	840807
LOUTCH-4	140.0 E	URS	830529		138E-142E	138E-142E	N	770419	152	780328	780530	87	790420
STATSIONAR-7	140.0 E	URS	820630		138E-142E	138E-142E	N	760120	94	761129	770208	31	780620
VOLNA-6	140.0 E	URS	820630		138E-142E	138E-142E	N	771011	174	780602	780815	101	790504
GMS-3	140.0 E	J	840810	7	139E-141E		C	830405	54	840322	841127	474	
MORE-140	140.0 E	URS	890601	15	138E-142E	138E-142E	A	850312	186				
STATSIONAR-16	145.0 E	URS	871231	20	143E-147E	143E-147E	A	830913	76				
CSE	150.0 E	J	830917	3	149E-151E	162W-072E	C	741210	24	830816	840207	177	
AUSSAT-1	156.0 E	AUS	850901	10	155E-165E	100E-180E	N	810217	299	831202	840612	296	840815

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
AUSSAT-2	160.0 E	AUS	850901	10	155E-165E	100E-180E	N	810217	300	831202	840612	305	840815
GMS-160E	160.0 E	J	820101	4	159E-161E		N	750729	72	820104	830208	8	840418
AUSSAT-3	164.0 E	AUS	850901	10	155E-165E	100E-180E	N	810217	301	831202	840612	314	840815
GOMS-2	166.0 E	URS	881231	15	165E-167E	165E-167E	A	850702	207				
PACSTAR-1	167.0 E	PNG	891231	20	167E-180W		A	850618	200				
VSSRD-2	167.0 E	URS	891017	20	166E-168E	054E-173E	A	850521	187				
FLTSATCOM W PAC	172.0 E	USA	801103		171E-173E	171E-173E	N	751028	86	790523	790828	167	760601
FLTSATCOM-A W-PAC	172.0 E	USA	841231	10	171E-173E	171E-173E	A	840131	99				
FLTSATCOM-B W-PAC	172.0 E	USA	861231	10	171E-173E	171E-173E	A	830322	51				
INTELSAT4A PAC1	173.0 E	USAIT	840101	4	171E-177E		C	750429	46	840214	841009	430	
INTELSAT5 PAC1	173.0 E	USAIT	841231	10	171E-177E		C	800520	254	830719	831220	170	
INTELSAT5A PAC1	173.0 E	USAIT	870101	10	171E-177E		C	830802	65	840308	841113	460	
INTELSAT4A PAC1	174.0 E	USAIT	821115		171E-177E		N	750708	63	791009	800513	216	830414
INTELSAT5 PAC1	174.0 E	USAIT	841231	10	171E-177E		C	800520	254	810525	820323	376	
INTELSAT5A PAC1	174.0 E	USAIT	870101	10	171E-177E		C	830802	65	840924	850423	680	
USGCSS PH2 W PAC	175.0 E	USA	770630		173E-177E	173E-177E	N						771031
USGCSS PH3 W PAC	175.0 E	USA	840731		173E-177E	173E-177E	N	800408	249	810430	820309	369	830725
INTELSAT4A PAC2	176.0 E	USAIT	840101	4	171E-179E		C	750429	47	840214	841009	431	
INTELSAT5 PAC2	176.0 E	USAIT	860101	10	171E-179E		C	830927	81	840515	850102	590	
INTELSAT5A PAC2	176.0 E	USAIT	870101	10	171E-179E		C	830802	66	840308	841113	461	
MARISAT-PAC	176.5 E	USA	760611		176E-177E	176E-177E	N	740305	6	761105	761214	25	750225
MARISAT-PAC	176.5 E	USA	760611		176E-177E	176E-177E	N	740305	3	761105	761214	25	750225
INTELSAT4A PAC2	177.0 E	USAIT	840101	4	171E-179E		C	750429	47	840910	850416	671	
INTELSAT5 PAC2	177.0 E	USAIT	860101	10	171E-179E		C	830927	81	840925	850423	681	
INTELSAT5A PAC2	177.0 E	USAIT	870101	10	171E-179E		C	830802	66	840924	850423	678	
INTELSAT4A PAC2	179.0 E	USAIT	821115		171E-179E		N	750708	64	791009	800513	217	830414
INTELSAT MCS PAC A	179.0 E	USAIT	851231	10	178E-180E		C	810707	332	811221	820504	447	
INTELSAT5 PAC3	179.0 E	USAIT	841231	10	171E-179E		C	800520	255	810525	820323	377	
INTELSAT MCS PAC A	180.0 E	USAIT	860101	10	177E-179W		C	810707	332	841109	850430	692	
INTELSAT5 PAC3	180.0 E	USAIT	850101	10	177E-179W		C	800520	255	840925	850423	682	
INTELSAT5A PAC3	180.0 E	USAIT	880101	10	177E-179W		C	840228	114	840924	850423	679	

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

ORB-85 CAMR SUR L'UTILISATION DE L'ORBITE DES SATELLITES GÉOSTATIONNAIRES ET LA PLANIFICATION DES SERVICES SPATIAUX UTILISANT CETTE ORBITE

PREMIÈRE SESSION GENÈVE, AOÛT/SEPTEMBRE 1985

Corrigendum 2 au
Document 105-F/E/S
15 août 1985
Original : français
anglais
espagnol

SEANCE PLENIERE
PLENARY MEETING
SESION PLENARIA

RAPPORT DE L'IFRB A LA CAMR(1) SUR LA SITUATION ACTUELLE EN MATIERE D'UTILISATION DE L'ORBITE DES SATELLITES GEOSTATIONNAIRES

Remplacer la carte de la figure 1 par la carte ci-jointe.

REPORT BY THE IFRB TO THE WARC-ORB(1) ON THE PREVAILING SITUATION ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT

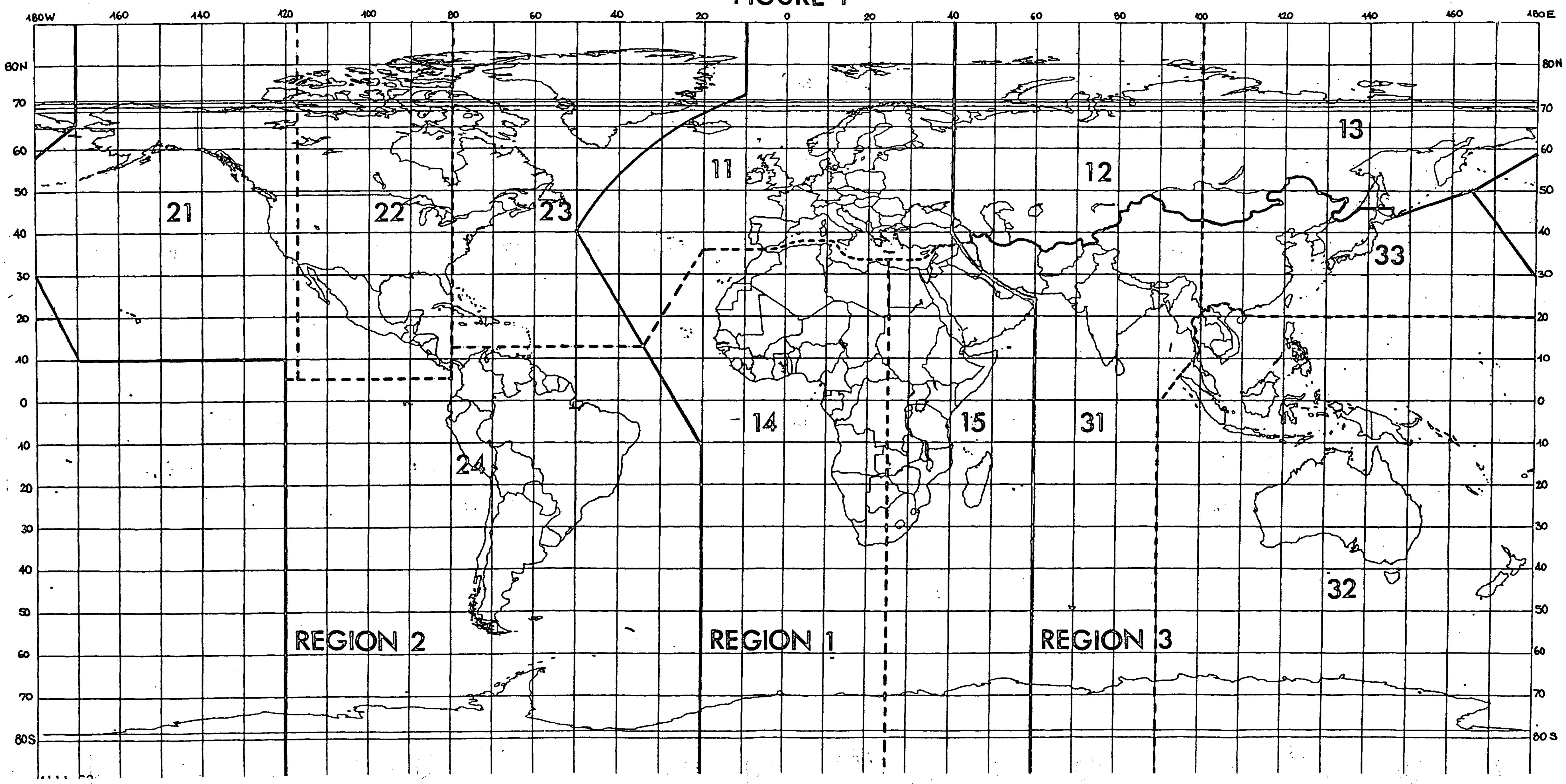
Please replace the map of Figure 1 with the annexed corrected version.

INFORME DE LA IFRB A LA CAMR-ORB(1) SOBRE LA SITUACION PREVALECIENTE EN LA UTILIZACION DE LA ORBITA DE LOS SATELITES GEOESTACIONARIOS

Sírvase sustituir el mapa de la Figura 1 por el mapa anexo.

Annexe / Annex / Anexo

FIGURE 1



LE TRACE 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 POSICION EN CUANTO AL ESTATUTO POLITICO DE PAISES O ZONAS GEOGRAFICAS NI EL RECONOCIMIENTO POR SU PARTE DE ESAS FRONTERAS

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

ORB-85 CAMR SUR L'UTILISATION DE L'ORBITE DES SATELLITES GÉOSTATIONNAIRES ET LA PLANIFICATION DES SERVICES SPATIAUX UTILISANT CETTE ORBITE

PREMIÈRE SESSION GENÈVE, AOÛT/SEPTEMBRE 1985

Corrigendum 1 au
Document 105-E/F/S
14 août 1985
Original : francais
anglais
espagnol

SEANCE PLENIERE
PLENARY MEETING
SESION PLENARIA

RAPPORT DE L'IFRB A LA CAMR(1) SUR LA SITUATION ACTUELLE

EN MATIERE D'UTILISATION DE L'ORBITE DES SATELLITES GEOSTATIONNAIRES

Remplacer la carte de la figure 1 par la carte ci-jointe.

REPORT BY THE IFRB TO THE WARC-ORB(1) ON THE PREVAILING SITUATION

ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT

Please replace the map of Figure 1 with the annexed corrected version.

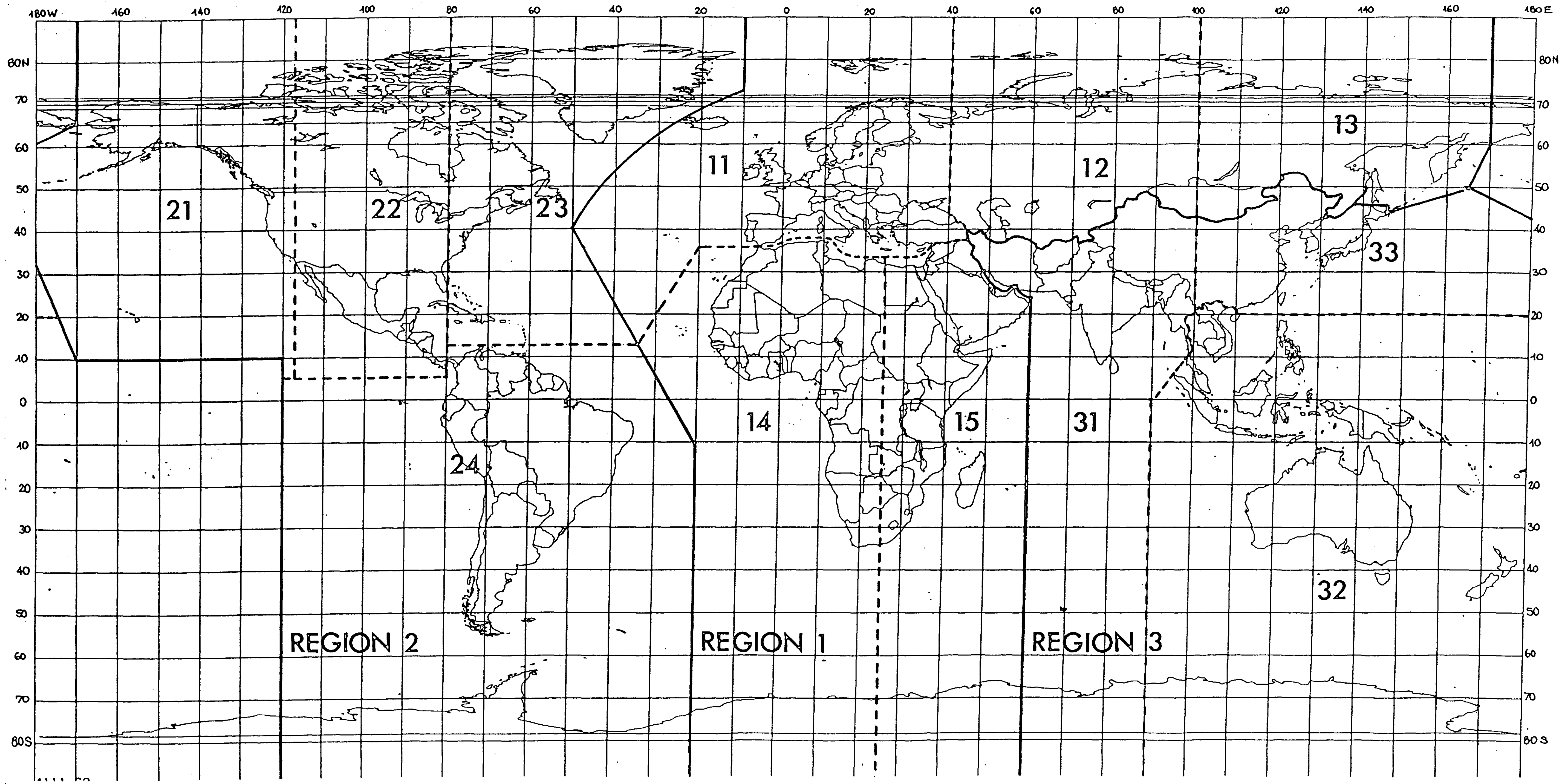
INFORME DE LA IFRB A LA CAMR-ORB(1) SOBRE LA SITUACION PREVALECIENTE

EN LA UTILIZACION DE LA ORBITA DE LOS SATELITES GEOESTACIONARIOS

Sírvase sustituir el mapa de la Figura 1 por el mapa anexo.

Annexe / Annex / Anexo

FIGURE 1



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.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 105-E
12 August 1985
Original: English

PLENARY MEETING

Note by the Secretary-General

REPORT BY THE IFRB TO THE WARC-ORB(1)
ON THE PREVAILING SITUATION OF THE USE OF
THE GEOSTATIONARY-SATELLITE ORBIT

At the request of the IFRB, I transmit the attached Report on the Prevailing Situation of the Use of the Geostationary-Satellite Orbit, for the information of the Conference.

R.E. BUTLER

Secretary-General

Annex : 1

IFRB REPORT TO THE WARC-ORB (1)

ON THE PREVAILING SITUATION OF THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT

1. INTRODUCTION

The IFRB has prepared the present Report at the request of the CPM which met in June-July 1984. The Report may not be fully responsive to the request from the CPM because it had to be prepared within the available limited resources of time and manpower. The Report contains data on space stations in the three phases of the procedures of Articles 11 and 13 of the Radio Regulations, viz.: advance publication, coordination and notification.

The complete Report is presented in two separate parts, called Report A and Report B, as described in sections 2 and 3 below. Briefly:

- Report A contains information on geostationary space stations including the IFRB Special Section numbers and dates (see sample page in Annex 1);

- Report B contains information on the beams transmitted and received by each space station (see sample page in Annex 2).

In addition to providing the Conference with information on all geostationary space stations in the three phases mentioned above, the Board can also provide specific types of Reports which may be requested during the Conference. One example of such a Report is presented in Annex 3 in both the formats, viz. those used for Report A and Report B.

Due to the volume of information and in the interest of economy, only one copy of Reports A and B is distributed separately per delegation.

2. DESCRIPTION OF THE FORMAT OF REPORT "A"

This Report, presented in Annex 1, contains information relating to the geostationary space stations. The column headings for this Report are as follows:

- SPACE STATION : space station identification name.

- LONG : nominal orbital position, in degrees and tenths of a degree, West or East.

- ADM : notifying administration; in the case of multi-administration systems, this abbreviation is composed by the symbol of the notifying administration followed by a symbol representing the system concerned.

- DBIU : date of bringing into use.

- PVAL : period of validity (Resolution No. 4).

- SERV.ARC : service arc.

- VIS.ARC : visibility arc.

- S : status of the space station in the procedures (A = advance publication, C = under coordination, N = notified).

- ADVPUB : date of the advance publication.

- ASEC : advance publication special section number; this number may correspond to an SPA-AA (if the information was received by the IFRB before 1 January 1982) or to an AR11/A special section (the first having been published on 25 May 1982).

- RC/REC : date of receipt by the IFRB of the request for coordination.

- RC/PUB : date of publication by the IFRB of the request for coordination.

- CSEC : number of special section containing the request for coordination; this number may correspond to an SPA-AJ (if the information was received by the IFRB before 1 January 1982) or to an AR11/C special section.

- NOTIF : date of notification.

3. DESCRIPTION OF THE FORMAT OF REPORT "B"

This Report is presented in Annex 2 and contains information on the several beams of each geostationary space station. The column headings for this Report are as follows:

- SPACE STATION : space station identification name.

- LONG : nominal orbital position, in degrees and tenths of a degree, West or East.

- ADM : notifying administration; in the case of multi-administration systems, this abbreviation is composed by the symbol of the notifying administration followed by a symbol representing the system concerned.

- BEAM : beam name. In some most recent cases, the beam name has been provided by the responsible administration; in other cases, the beam name has been chosen by the IFRB. Although there is no rule for the naming of a beam, it can be named by using an abbreviation related to its coverage, or by using the number of the figure in a special section, or by the antenna gain in the direction of maximum radiation multiplied by 10.

- SERVICE AREA : the service area corresponding to a given beam has been determined by using Figure 1, where the three ITU Regions have been divided into sub-Regions (5 for Region 1, 4 for Region 2 and 3 for Region 3). This column shows the sub-Regions which are covered by the beam service area. In many cases, the service area has been indicated by the administration. When not indicated, the 3 dB contour has been used.

- GAIN : space station antenna gain, corresponding to the beam in question (in dB).

- FB : frequency band used by the beam concerned, determined from Table 1 (band 0 refers to all frequencies below 1 GHz; for frequencies above 40 GHz, the band has been indicated by an integer around the specific frequency band used).

- SERVICES : abbreviation corresponding to the class of station given in Appendix 10 of the Radio Regulations and in the Preface to the International Frequency List. This column lists the services which are in use in each frequency band of each beam.

- T/R : transmitting (space-to-Earth)/receiving (Earth-to-space) beam.

4. EXAMPLE OF OTHER TYPES OF REPORTS

An example of one other type of Report that can be produced upon request during the ORB (1) Conference is given in Annex 3. In this example, the Report lists all space stations and respective beams satisfying the following conditions:

- systems which are under coordination or notified;
- beams with service area overlapping Western Europe (sub-region 11);
- beams in the 6 and 4 GHz bands;
- beams used for the fixed-satellite service (EC).

This Report is provided in both Report A and Report B formats as examples of the information that can be produced for the Conference. Reports of types other than "A" and "B" can be obtained from the available information, satisfying different sets of conditions that may be defined by the Conference (for example, space stations within a certain orbital arc, space stations for which the request for coordination has been received before or after a certain date, space stations using global (G), horn (H) or omni-directional (O) beams, etc.).

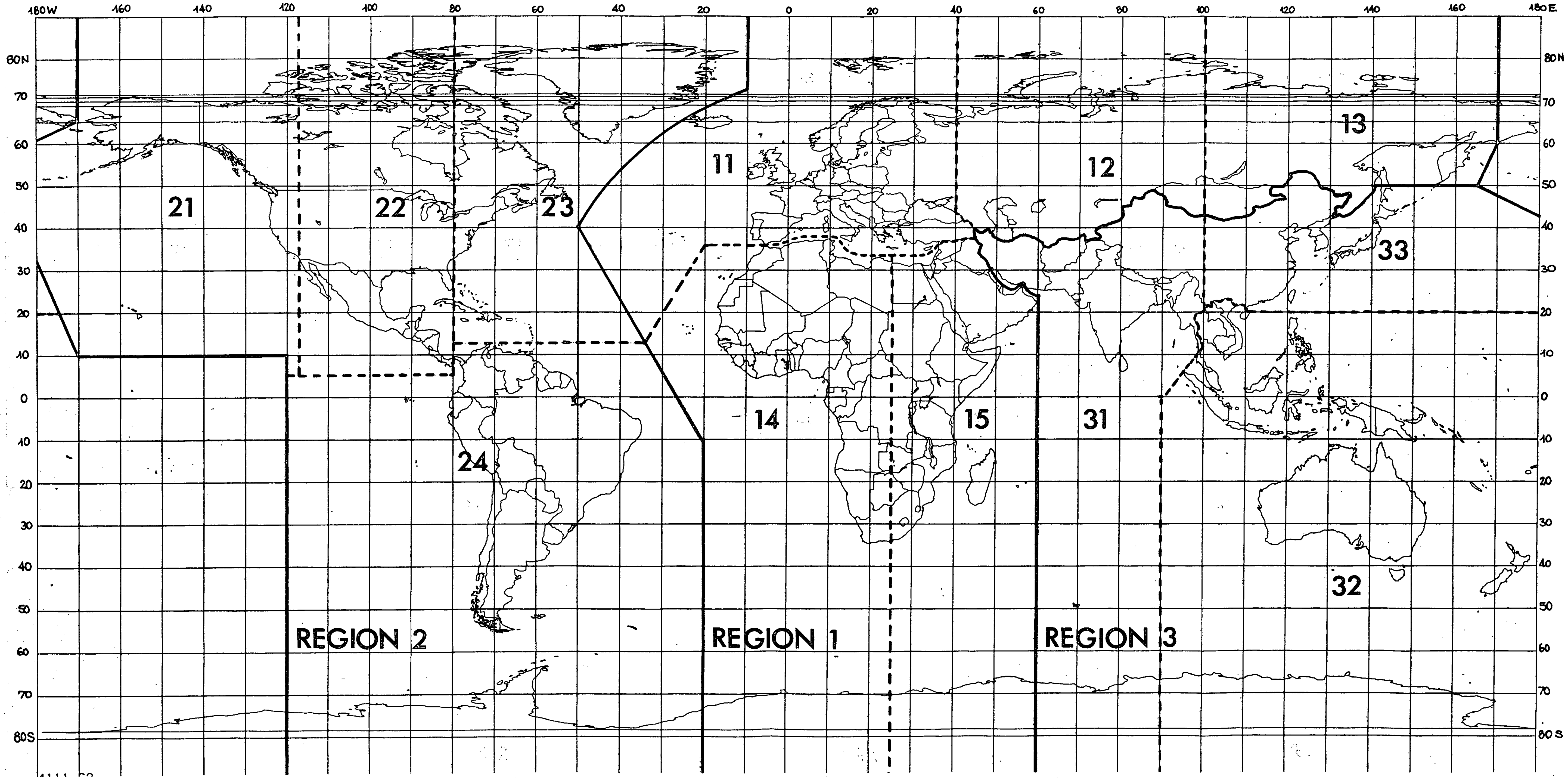
Annexes: 3 (only a sample page of each Annex has been attached to the present Report; one complete set is distributed separately per delegation).

TABLE 1

SPACE SERVICES FREQUENCY BANDS ALLOCATION

FREQUENCY BAND	Band number	FREQUENCY BAND	Band number
1 215 - 1 710 MHz	1	18.8 - 19.7 GHz	19
1 710 - 2 700 MHz	2	19.7 - 21.4 GHz	20
3 400 - 4 800 MHz	4	22.21 - 23.55 GHz	23
5 000 - 5 925 MHz	5	23.6 - 24.05 GHz	24
5 925 - 7 075 MHz	6	27 - 27.5 GHz	27
7 075 - 7 750 MHz	7	27.5 - 29.5 GHz	28
7 900 - 8 500 MHz	8	29.5 - 31 GHz	30
		31 - 32 GHz	31
10.6 - 11.7 GHz	11	32 - 33 GHz	32
11.7 - 12.75 GHz	12	33 - 34.2 GHz	33
12.75 - 13.25 GHz	13	34.2 - 35.2 GHz	34
14 - 14.8 GHz	14	36 - 37 GHz	36
15.35 - 15.7 GHz	15	37 - 37.5 GHz	37
17.3 - 18.1 GHz	17	37.5 - 39.5 GHz	38
18.1 - 18.8 GHz	18	39.5 - 40.5 GHz	40

FIGURE 1


180W
160
140
120
100
80
60
40
20
0
20
40
60
80
100
120
140
160
180E
80N
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80S
21
22
23
24
11
12
13
14
15
31
32
33
REGION 2
REGION 1
REGION 3

ANNEX 1

PAGE NO. 1
08/13/85

Report Format "A"

GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
PACSTAR-2	175.0 W	PNG	891231	20	160E-175W		A	850618	201				
GALS-4	170.0 W	URS	850630		172W-168W	172W-168W	N	770425	156	780731	780926	114	811028
STATSIONAR-10	170.0 W	URS	820630		172W-168W	172W-168W	N	760120	97	770613	770802	52	780223
LOUTCH P4	170.0 W	URS	811231		172W-168W	172W-168W	C	771101	180	780829	781031	124	
VOLNA-7	170.0 W	URS	801231		172W-168W	172W-168W	C	771011	175	780626	780815	102	
STATSIONAR-D2	170.0 W	URS	880630	20	172W-168W	172W-168W	A	850611	194				
POTOK-3	168.0 W	URS	850630		169W-167W	169W-167W	N	811208	346				820126
ESDRN	160.0 W	URS	860601	20	161W-159W	161W-082E	N	810901	343	820511	830524	72	840306
ATS-1	149.0 W	USA	661207		151W-016W	151W-016W	N						721229
FLTSATCOM-A PAC	145.0 W	USA	841231	10	146W-144W	146W-144W	A	850102	181				
MORELOS-4	145.0 W	MEX	870331	10	156W-050W	156W-050W	A	820824	25				
US SATCOM V	143.0 W	USA	821217	10	145W-120W			820622	7	840208	840727	414	
US SATCOM II-R	143.0 W	USA	831201	10	143W-099W	135W-099W	A	820622	7				
MORELOS-3	141.0 W	MEX	861231	10	156W-050W	156W-050W	A	820824	24				
US SATCOM I-R	139.0 W	USA	830430	10	143W-099W		C	820622	6	831213	840619	337	
GOES WEST	135.0 W	USA	750206		136W-135W	136W-135W	N	750128	28	741206			761101
US SATCOM-1	135.0 W	USA	760810		138W-095W	138W-095W	N	750304	35	770328	770621	42	781016
USGCSS PH2 E PAC	135.0 W	USA	790130		137W-133W	137W-133W	N	770222	139				780621
USGCSS PH3 E PAC	135.0 W	USA	830601		137W-133W	137W-133W	N	800408	248	810401	811215	344	830720
USASAT 11D	134.0 W	USA	840131	10	135W-090W	135W-090W	A	840410	120				
USASAT 11C	132.0 W	USA	870315	10	135W-120W	135W-120W	A	840228	111				
US SATCOM III-R	131.0 W	USA	830630	10	138W-095W	138W-095W	C	810707	329	831215	840619	347	
USASAT 10D	130.0 W	USA	870615	10	135W-120W	135W-120W	A	840228	108				
USRDSS WEST	130.0 W	USA	871231	10	140W-060W	140W-060W	A	841009	176				
COMSTAR D-1	128.0 W	USA	760515		138W-095W	138W-095W	N	750304	39	770412	770607	39	781020
ASC-1	128.0 W	USA	850930	10	136W-088W	136W-088W	A	850618	202				
USASAT 10C	126.0 W	USA	870915	10	135W-120W	135W-120W	A	840228	107				
USASAT 10B	124.0 W	USA	860915	10	135W-120W	135W-120W	A	840228	106				
WESTAR-2	123.5 W	USA	750530		138W-095W	138W-095W	N	750304	34	770413	770621	45	781011
WESTAR 5	123.0 W	USA	830101	10	135W-099W	135W-099W	C	820622	5	831201	840605	284	

ANNEX 2

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GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1	PACSTAR-2	175.0 W	PNG	DOM	32	38.2	6	EC/ED	R
2	PACSTAR-2	175.0 W	PNG	DOM	32	38.2	6	EC	R
3	PACSTAR-2	175.0 W	PNG	SUB	32	42.9	6	EC	R
4	PACSTAR-2	175.0 W	PNG	REG	32	42.9	6	EC	R
5	PACSTAR-2	175.0 W	PNG	REG	32/33	42.9	6	EC	R
6	PACSTAR-2	175.0 W	PNG	RIM	21	50.2	14	EC	R
7	PACSTAR-2	175.0 W	PNG	RIM	32/33	50.2	14	EC	R
8	PACSTAR-2	175.0 W	PNG	SUB	32	39.0	4	EK/ER	T
9	PACSTAR-2	175.0 W	PNG	SUB	32	39.0	4	EC	T
10	PACSTAR-2	175.0 W	PNG	REG	32	39.0	4	EC	T
11	PACSTAR-2	175.0 W	PNG	REG	32/33	39.0	4	EC	T
12	PACSTAR-2	175.0 W	PNG	RIM	21	49.1	12	EC	T
13	PACSTAR-2	175.0 W	PNG	RIM	32/33	49.1	12	EC	T
14	GALS-4	170.0 W	URS	G	13/21/22/32/33	19.0	8	EC	R
15	GALS-4	170.0 W	URS	NH	13/21/22/33	23.0	8	EC	R
16	GALS-4	170.0 W	URS	S	13/33	30.0	8	EC	R
17	GALS-4	170.0 W	URS	G	13/21/22/32/33	19.0	7	EC	T
18	GALS-4	170.0 W	URS	NH	13/21/22/33	23.0	7	EC	T
19	GALS-4	170.0 W	URS	S	13/33	30.0	7	EC	T
20	STATSIONAR-10	170.0 W	URS	G	13/21/22/32/33	19.0	5	EC	R
21	STATSIONAR-10	170.0 W	URS	G	13/21/22/32/33	19.0	6	EC	R
22	STATSIONAR-10	170.0 W	URS	NH	12/21/22/33	22.0	5	EC	R
23	STATSIONAR-10	170.0 W	URS	NH	13/21/22/33	22.0	6	EC	R
24	STATSIONAR-10	170.0 W	URS	NH	13/21/22/33	22.0	4	EC	T
25	LOUTCH P4	170.0 W	URS	G	13/21/32/33	22.0	11	EC	T
26	LOUTCH P4	170.0 W	URS	G	13/21/32/33	22.0	14	EC	R
27	VOLNA-7	170.0 W	URS	G	13/21/32/33	14.0	0	EJ/EU	R
28	VOLNA-7	170.0 W	URS	G	13/21/32/33	18.0	1	EJ	R

ANNEX 3

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GEOSTATIONARY SPACE STATIONS / GENERAL INFORMATION

SPACE STATION	LONG	ADM	DBIU	PVAL	SERV.ARC	VIS.ARC	S	ADVPUB	ASEC	RC/REC	RC/PUB	CSEC	NOTIF
INTELSAT IBS 300E	60.0 W	USAIT	860101	10	062W-058W		C	840918	167	850327	850618	752	
INTELSAT5A 300E	60.0 W	USAIT	860101	10	062W-058W		C	840918	166	850326	850618	749	
INTELSAT IBS 304E	56.0 W	USAIT	860401	10	058W-054W		C	840918	169	850327	850618	753	
INTELSAT5A 304E	56.0 W	USAIT	860401	10	058W-054W		C	840918	168	850326	850618	750	
INTELSAT4A ATL3	53.0 W	USAIT	840401		055W-053W		N	750708	67	810728	820413	401	830105
INTELSAT IBS 307E	53.0 W	USAIT	860101	10	055W-052W		C	840424	128	841126	850528	704	
INTELSAT5 CONT1	53.0 W	USAIT	840701	10	055W-053W		C	830927	82	840515	850102	591	
INTELSAT5A CONT1	53.0 W	USAIT	880401	10	055W-053W		C	840228	115	840913	850416	674	
INTELSAT IBS 310E	50.0 W	USAIT	860101	10	055W-052W		C	840424	129	841206	850528	706	
INTELSAT4A ATL2	50.0 W	USAIT	840101	6	055W-045W		C	750708	66	830530	831122	140	
INTELSAT5 CONT2	50.0 W	USAIT	850601	10	055W-045W		C	830913	75	840515	850102	592	
INTELSAT5A CONT2	50.0 W	USAIT	860601	10	055W-045W		C	830913	74	840515	850102	594	
INTELSAT IBS 319.5E	40.5 W	USAIT	860401	10	042W-039W		C	840424	130	841206	850528	707	
INTELSAT5A 319.5E	40.5 W	USAIT	860401	10	042W-039W		C	840424	127	841107	850430	691	
INTELSAT4 ATL5	34.5 W	USAIT	760224		035W-023W		N	751111	89	810410	811222	351	760413
INTELSAT5 ATL4	34.5 W	USAIT	821231		035W-023W		N	760921	121	791009	800513	220	830413
INTELSAT4A ATL4	31.0 W	USAIT	831020		035W-023W		N	750708	68	791009	800513	215	830412
INTELSAT5 ATL6	31.0 W	USAIT	870101	10	035W-023W		C	840313	118	841001	850423	683	
INTELSAT5A ATL6	31.0 W	USAIT	870101	10	035W-023W		C	840710	119	841002	850423	684	
INTELSAT5 ATL3	27.5 W	USAIT	820101		035W-023W		N	760921	120	791009	800513	219	830105
INTELSAT5A ATL2	27.5 W	USAIT	850101	10	035W-023W		C	810727	335	830420	831025	123	
INTELSAT6 332.5E	27.5 W	USAIT	871001	13	035W-023W		C	830830	70	840718	850212	628	
STATSIONAR-8	25.0 W	URS	820630		027W-023W	027W-023W	N	760120	95	770613	770802	50	780223
INTELSAT5 ATL1	24.5 W	USAIT	810317		025W-023W		N	760921	118	770117	770329	34	780124
INTELSAT5A ATL1	24.5 W	USAIT	841001	10	025W-023W		C	810727	334	830420	831025	122	
INTELSAT6 335.5E	24.5 W	USAIT	871001	13	025W-023W		C	830830	69	840717	850212	627	
MARECS A	23.0 W	F MRS	811201		026W-020W	026W-020W	C	780206	219	800122	800819	241	
INTELSAT4A ATL1	21.5 W	USAIT	810601		025W-014W		N	750708	65	791009	800513	212	830105
INTELSAT MCS ATL C	21.5 W	USAIT	821231	10	025W-014W		C	800819	282	810410	811222	348	
INTELSAT5 ATL5	21.5 W	USAIT	811231	10	025W-014W		C	800520	252	810525	820323	378	

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GEOSTATIONARY SPACE STATIONS / BEAMS

NO	SPACE STATION	LONG	ADM	BEAM	SERVICE AREA	GAIN	FB	SERVICES	T/R
1	INTELSAT IBS 300E	60.0 W	USAIT	EH	11/14/24	24.6	6	EC	R
2	INTELSAT IBS 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	6	EC	R
3	INTELSAT IBS 300E	60.0 W	USAIT	EH	11/14/24	24.6	4	EC	T
4	INTELSAT IBS 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	4	EC	T
5	INTELSAT5A 300E	60.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
6	INTELSAT5A 300E	60.0 W	USAIT	EH	11/14/24	24.6	6	EC	R
7	INTELSAT5A 300E	60.0 W	USAIT	EZ	11/14	29.0	6	EC	R
8	INTELSAT5A 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	6	EC	R
9	INTELSAT5A 300E	60.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
10	INTELSAT5A 300E	60.0 W	USAIT	EH	11/14/24	24.6	4	EC	T
11	INTELSAT5A 300E	60.0 W	USAIT	EZ	11/14	29.0	4	EC	T
12	INTELSAT5A 300E	60.0 W	USAIT	NEZ	11/14/23	29.0	4	EC	T
13	INTELSAT IBS 304E	56.0 W	USAIT	EH	11/14	24.6	6	EC	R
14	INTELSAT IBS 304E	56.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
15	INTELSAT IBS 304E	56.0 W	USAIT	EH	11/14	24.6	4	EC	T
16	INTELSAT IBS 304E	56.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
17	INTELSAT5A 304E	56.0 W	USAIT	G	11/14/22/23/24	21.0	6	EC	R
18	INTELSAT5A 304E	56.0 W	USAIT	EH	11/14	24.6	6	EC	R
19	INTELSAT5A 304E	56.0 W	USAIT	EZ	11/14	29.0	6	EC	R
20	INTELSAT5A 304E	56.0 W	USAIT	NEZ	11/14	29.0	6	EC	R
21	INTELSAT5A 304E	56.0 W	USAIT	G	11/14/22/23/24	21.0	4	EC	T
22	INTELSAT5A 304E	56.0 W	USAIT	EH	11/14	24.6	4	EC	T
23	INTELSAT5A 304E	56.0 W	USAIT	EZ	11/14	29.0	4	EC	T
24	INTELSAT5A 304E	56.0 W	USAIT	NEZ	11/14	29.0	4	EC	T
25	INTELSAT4A ATL3	53.0 W	USAIT	EH	11/14/24	24.8	6	EC	R
26	INTELSAT4A ATL3	53.0 W	USAIT	G	11/14/21/22/23/24	21.0	6	EC	R
27	INTELSAT4A ATL3	53.0 W	USAIT	EH	11/14/24	29.3	4	EC	T
28	INTELSAT4A ATL3	53.0 W	USAIT	G	11/14/21/22/23/24	21.0	4	EC	T

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Addendum 2 to
Document 106-E
21 August 1985
Original: Spanish

COMMITTEES 4, 5

Colombia

ELEMENTS FOR THE PLANNING OF THE GEOSTATIONARY ORBIT

Below we identify and extract from Document 106 Colombia's specific proposals to WARC-ORB(1) on the above subject.

OBJECT OF PLANNING

CLM/106/22 The Conference's terms of reference are to undertake the planning of the geostationary orbit and the radio frequency spectrum of the services utilizing it, so that it is not merely to consider regulatory procedures for access to those resources, but will have to determine, for a specific period, the orbit assignments and frequencies required by countries. For this same reason, it will be impossible to continue with the existing procedure which, in theory, can certainly be used by all countries on an equal footing, but which in practice has resulted in the orbit being occupied by just a few of them.

DEFINITION OF THE GEOSTATIONARY ORBIT

CLM/106/23 Define the geostationary orbit (GO) as the orbital space constituted by the ring or torus which in practice represents the limits on the movement of geostationary satellites that comply with the station-keeping provisions of the Radio Regulations. The name of these satellites shows that they fall within the definition given in RR 181: "satellite which remains approximately fixed relative to the Earth".

CONTENT OF PLANNING

CLM/106/24 The planning process will cover, in relation to the geostationary orbit and the radio services utilizing it:

- the orbital positions,
- the frequency spectrum (frequency assignments and band allocations), and
- the radiocommunication services.

CLM/106/25 Considering the long-term implications of the growing activities in the GSO, any solution on the use of the GSO should be both equitable and flexible and take into consideration the economic, technical and legal aspects.

USE FOR THE BENEFIT OF ALL MANKIND

CLM/106/26 The ultimate objective of activities in the GO should be the same as outer space and related science and technology activities, namely, to improve the welfare of mankind as a whole.

THE RIGHT TO COMMUNICATION

CLM/106/27 Any plan to use the orbit/spectrum resource must respect the right of all peoples to create, store, process, receive and disseminate information.

EQUAL ACCESS

CLM/106/28 To guarantee in practice for all countries equitable access to the geostationary-satellite orbit and the frequency bands allocated to space services.

CLM/106/29 It is necessary to define the meaning to be given to "equitable" and "guaranteed" access and how these concepts may be put into practice.

CLM/106/30 The Conference must acknowledge:

- the right of all countries to use the OSR (and not merely to use the access procedures);
- that countries may begin to use the OSR at different times according to their technical resources (one should also add "and economic").

CLM/106/31 The IFRB or some other body must make sure that registration does not provide any permanent priority for any individual country and that assignments do not hinder access for new networks.

CLM/106/32 Orbit positions and frequency bands must be assigned by means of a priori planning "guaranteeing" access to the OSR at the time when the country concerned is ready to establish its system, without higher cost or more complex technical facilities than those involved for the first users.

CLM/106/33 If, for specific reasons, not all bands and services can be planned, for example, because some of them are not intensively used, one must avoid regulatory procedures which result in inequality as is currently the case for the fixed-satellite service (FSS) and the lower frequency bands.

CLM/106/34 In order to avoid granting permanent priority or indefinite allocation of the OSR, it may be agreed that countries should be allowed to interchange the assignments obtained from a priori planning through bilateral agreements in their mutual interest.

CLM/106/35 The conditions laid down in WARC-79 Resolution No. 4 [1] must be reviewed, in particular to prevent a notifying administration from extending the period of operation of a space station indefinitely by virtue of the self-regulation therein embodied (see No. 1.2 of the operative part).

REQUIREMENTS OF THE DEVELOPING COUNTRIES AND SPECIAL INTERESTS OF THE EQUATORIAL COUNTRIES

CLM/106/36 The special needs of the developing countries are explicitly taken into account in Article 33 of the Nairobi Convention [5]. It follows that all measures adopted for utilization of the OSR, in addition to being equitable, must favour solutions which help to speed up the development of these countries.

RIGHTS OF THE EQUATORIAL STATES

CLM/106/37 The equatorial States exercise sovereignty over the corresponding segments of the GO and regard them as an integral part of their territories.

CLM/106/38 Equatorial States have rights of preservation over the relevant segment of the Geostationary Orbit located over their territory for the purposes of conservation and utilization of the Orbit.

CLM/106/39 The Geostationary Orbit is a limited natural resource which shall be preserved in the interests of all States, taking into account the needs of the developing countries and the rights of the equatorial States. For that purpose it shall be governed by a specific legal regime.

CLM/106/40 The placement of a space object in the segment of the Geostationary Orbit superjacent to an equatorial State shall require prior authorization by that State. Transit for peaceful purposes of any space object through this segment shall be allowed.

CLM/106/41 The equatorial States shall have preferential right to the segment of the Geostationary Orbit superjacent to the territory under their jurisdiction. (Legal Sub-Committee, 23rd session)

REGIONAL AND WORLD COOPERATION

CLM/106/42 All States should cooperate in the efficient and economic use of the GO, either regionally or at the world level and either directly or through the United Nations or other competent international organizations.

USE FOR PEACEFUL PURPOSES AND FOR DULY AUTHORIZED REMOTE OBSERVATION

CLM/106/43 The GO must be used exclusively for peaceful purposes, and its planning must thus rule out any consideration contrary to those purposes.

CLM/106/44 The Conference should decide that the OSR must be used by satellites which do not threaten the security of States, i.e. the steps and measures taken to protect their nationals not only from physical and direct attack but also any other activities such as exploration of their territories is to acquire knowledge benefiting exclusively the State using the exploratory artefacts or third States, to the detriment of the States observed. It is particularly important for the developing countries that an equitable international agreement should be concluded which safeguards each

State's sovereignty over its natural resources, respecting the confidential nature of the information obtained by means of remote observation.

RESPONSIBILITY FOR ACTIVITIES IN ORBIT

CLM/106/45 Each State must be internationally responsible for its activities in the geostationary orbit, irrespective whether they are carried out by governmental bodies or non-governmental entities. When States pool forces and operate through an international organization the responsibility will fall on the organization and its participating States.

CLM/106/46 When two or more States jointly launch a space object, "they shall be jointly or severally liable for any damage caused" (Article V of the Convention on International Liability for Damage Caused by Space Objects). The international organizations will not be authorized to submit claims for damage caused to them; only a State Member of the organization having signed the above Convention may do so.

CLM/106/47 The geostationary orbit should not be considered as an area for private enterprise without due authorization and continuous supervision on the part of the States concerned.

CURRENT AND FUTURE DEMAND FOR THE ORBIT/SPECTRUM RESOURCE

CLM/106/48 Planning of the OSR must necessarily take account of each country's estimated demand for traffic and services.

Demand forecasts must be sound and accurate and cover the duration of the Plan which will in principle remain in force until a subsequent World Conference is held.

CLM/106/49 The countries using the OSR most intensively at the present time must reduce their requirements for the benefit of the other countries wishing to use it.

CLM/106/50 All countries must tailor their expressed requirements to what is legitimately necessary, without exaggerating the demand for the OSR by considerations extraneous to a reasonable forecast or projection of requirements.

LOCATION OF NETWORKS ALREADY IN EXISTENCE OR UNDER ACTIVE DEVELOPMENT

CLM/106/51 The Plan should cause minimum disturbance to networks which are already in operation or have reached the stage of active development, because they will certainly have been designed within strict limits imposed by terrestrial services. Any repositioning of the satellites, and *a fortiori*, any change in frequencies, inevitably affects services, generally in an unacceptable way. Nevertheless, networks already in operation will share the burden of the interference problems created by the introduction of new networks.

CLM/106/52 It is necessary to define what is to be understood by networks in "active development". It might, for example, be agreed that the networks covered by this designation will be those that have been duly registered with the International Frequency Registration Board (IFRB) before the adoption of a Plan, under the existing procedure.

UNFORESEEN NETWORKS OR UNFORESEEN CHANGES IN TRAFFIC DEMAND

CLM/106/53 If new networks or modifications cannot wait until the next Conference, the corresponding applications shall be allowed only:

- when they do not cause interference greater than that fixed for the purposes of establishing the Plan, or if the administrations affected accept the higher level of interference;
- if the rights of other administrations are not infringed.

MULTI-ADMINISTRATION NETWORKS

CLM/106/54 The Plan has to enable networks involving more than one administration to operate properly. On the other hand, multi-administration networks must not interfere in any way with efforts to establish individual administrations' networks.

CLM/106/55 The Conference ought to establish a proper definition of what is to be understood by "multi-administration"; such a network should at all events be treated differently from corporations which are international in scope but belong to a single administration or private agency ("transnationals").

CLM/106/56 Care will have to be exercised to ensure that the measures proposed to protect multi-administration systems do not run counter to individual countries' aspirations with regard to individual and direct access to the OSR.

TECHNICAL PARAMETERS AND INTERFERENCE CRITERIA

CLM/106/57 Since the period between conferences is not excessive (greater than the technological life of a generation of satellites), it is desirable that the technical parameters and criteria relating to interference should be fixed for the life of the Plan, despite the fact that technological progress over this period can give rise to unnecessarily large orbital separations.

At the WARC-ORB(1) it will accordingly be necessary to take a decision on the possibility of the WARC-ORB(2) adopting new parameters and criteria to enter into force at the same time as the Plan.

RESTRICTIONS DUE TO SHARING WITH TERRESTRIAL SERVICES

CLM/106/58 The Plan should respect the restrictions imposed on space services sharing the same frequency bands allocated on a primary basis to terrestrial services, or else measures similar to those already applied should be taken.

RESTRICTIONS OWING TO FREQUENCY SHARING BETWEEN PLANNED AND UNPLANNED SERVICES

CLM/106/59 As the result of the adoption of a Plan for not too long a period, it may not be necessary to provide for the protection of systems in operation or in active development against unplanned services. The latter will have to comply with the general provisions of the Radio Regulations relating to unplanned bands and services.

EFFICIENT USE OF THE OSR AND INCENTIVES FOR ADOPTING SUITABLE TECHNOLOGY

CLM/106/60 Care must be exercised to ensure that the Plan adopted meets OSR requirements as efficiently as possible having regard to technical, operational and economic factors and the needs of the developing countries.

CLM/106/61 Annex 4, section 4.3 of the Report of the CPM, [9] describes some of the techniques which will make for more efficient use of the OSR. It should be borne in mind, however, that it will not always be possible or advisable to choose the most advanced technology; preferably, use of the most appropriate technology compatible with the other factors mentioned should be encouraged. The developing countries should not be affected by the higher costs entailed, for example, by the introduction of techniques for reducing the orbital spacing between satellites.

SPECIAL GEOGRAPHICAL SITUATIONS

CLM/106/62 The Plan should take into account "the relevant technical aspects of the special geographical situation of certain countries" (Administrative Council Resolution No. 895).

POSITION OF THE DEVELOPING COUNTRIES

CLM/106/63 The position of the developing countries, i.e. their economic, technological and social level, requires special consideration in any Plan adopted for the use of the OSR.

IMPACT OF THE PLAN ON THE COST OF SATELLITE SYSTEMS AND OF THEIR OPERATION

CLM/106/64 Once the Plan and the corresponding technical parameters have been chosen there should be no reason for the cost of satellite systems to rise because of them for the duration of the Plan, even owing to unforeseen modifications or the introduction of unforeseen new systems. In other words, the cost would be defined when the Plan is chosen and would also be a factor in its choice.

ECONOMIC IMPACT OF TECHNOLOGICAL ADVANCES

CLM/106/65 The technological advances considered for the establishment of satellite telecommunication systems should be aimed not only at a more effective use of the OSR, but at greater economy, especially in the Earth segment. For many countries, the latter represents their only direct investment in these systems. It will therefore be necessary to strike a balance between these factors and, if possible, to leave a gap between the periods selected for introducing changes in the space and Earth segments.

ADMINISTRATIVE COSTS FOR THE ESTABLISHMENT AND OPERATION OF THE PLAN

CLM/106/66 The major cost of the Plan would arise from the effort required to prepare the Planning Conference. Once established, its management should require a minimum effort on the part of the ITU and the administrations.

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

ORB-85 CAMR SUR L'UTILISATION DE L'ORBITE DES SATELLITES GÉOSTATIONNAIRES ET LA PLANIFICATION DES SERVICES SPATIAUX UTILISANT CETTE ORBITE

PREMIÈRE SESSION GENÈVE, AOÛT/SEPTEMBRE 1985

Addendum 1 to
Document 106-E/F/S
15 August 1985

Colombie/Colombia

On the first page, add, before the title of the document the name of "Colombia"

A la primera página, añadese, antes del título del documento el nombre de "Colombia"

Cet addendum ne concerne pas le texte français.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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ELEMENTS FOR THE PLANNING OF THE GEOSTATIONARY ORBIT

(Contribution relating to agenda item 2.3)

SUMMARY

In the light of No. 2.3 of Resolution No. 895 convening the WARC-ORB(1), this document seeks to specify the object of planning and to identify the elements that it should take into account. These elements cover general and legal principles, technical factors and economic factors. The description of each one begins with a definition, followed by some explanatory considerations. The document emphasizes the special treatment that should be given to the needs of the developing countries.

ELEMENTS FOR THE PLANNING OF THE GEOSTATIONARY ORBIT

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Colombia

ELEMENTS FOR THE PLANNING OF THE GEOSTATIONARY ORBIT

(Contribution relating to agenda item 2.3)

INTRODUCTION

Resolution No. 895 of the Administrative Council of the International Telecommuniction Union (ITU) states in No. 2.3 that the World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit and the Pla^ning of Space Services Utilizing It (WARC-ORB) shall:

> "Establish the principles, technical parameters and criteria for the planning, including those for orbit and frequency assignments of the space services and frequency bands identified as per paragraph 2.2, taking into account the relevant technical aspects concerning the special geographical situation of particular countries; and provide guidelines for associated regulatory procedures."

Such "principles", "parameters" and "criteria", and other factors and aspects considered by the International Radio Consultative Committee (CCIR) for this purpose, are analyzed in this document under the general heading of planning elements and are defined with a view to their direct application in the work of the WARC-ORB(1).[1]

OBJECT OF PLANNING

The Conference's terms of reference are to undertake the planning of the geostationary orbit and the radio frequency spectrum of the services utilizing it, so that it is not merely to consider regulatory procedures for access to those resources, but will have to determine, for a specific period, the orbit assignments and frequencies required by countries. For this same reason, it will be impossible to continue with the existing procedure which, in theory, can certainly be used by all countries on an equal footing, but which in practice has resulted in the orbit being occupied by just a few of them.

Radiocommunication services

The first step is to clarify the following point with regard to the scope of the WARC-ORB(1). In the official title of the Conference (World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit and the Planning of Space Services Utilizing It) and in various paragraphs of Resolution No. 895 convening it, reference is made to "space services", a term which is not defined in the Radio Regulations (RR) [1] and which could cover much more than lies within the purview of the Conference and the ITU. What is meant in fact is "radiocommunication services", involving the transmission, emission and/or reception of radio waves for specific telecommunication purposes (RR 20). These are the services that the WARC-ORB has to cover in its planning work.

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1 The Conference will be held in two sessions (1985 and 1988). The abbreviation for the first session is WARC-ORB(1).

Geostationary orbit

The definitions contained in the Radio Regulations (particularly in Nos. 176, 180, 181 and 182) correspond to a purely theoretical or ideal concept of the path followed by geostationary satellites. If we combine these definitions, the RR state that the goestationary-satellite orbit is the circular and direct path described in the plane of the Earth's equator and about its axis by an earth satellite subjected primarily to natural forces, mainly the force of gravity, whose period of revolution is equal to the period of rotation of the Earth about its axis.

The highly simplified hypothesis that the Earth is a rotating mass which is isolated from other heavenly bodies and is perfectly spherical produces this concept of an ideal orbit with a radius of 42,164.2 km in which a satellite revolves with a period of 23 h 56 m 4.091 s. In practice, a satellite cannot stay in a perfectly circular orbit, with a fixed orientation, because luni-solar gravity, the pressure of solar radiation and variations in the Earth's gravitational field produced by deviations from perfect spherical symmetry cause slow and periodic fluctuations in the eccentricity and inclination of the orbit. Station-keeping manoeuvres greatly reduce these deviations from the theoretical orbit, but do not eliminate them. Hence the operational orbit should not be regarded as a circumference, but as a ring or torus around the Earth. With the existing station-keeping methods, this ring can be up to 150 km wide (North-South) and 30 km thick (height), active satellites being kept within a segment of length 150 km (East-West) along the ring. [2]

From the foregoing, it seems appropriate to define the geostationary orbit (GO) as the orbital space constituted by the ring or torus which in practice represents the limits on the movement of geostationary satellites that comply with the station-keeping provisions of the Radio Regulations. The name of these satellites shows that they fall within the definition given in RR 181: "satellite which remains approximately fixed relative to the Earth".

The task of WARC-ORB will be to cover in its planning not the theoretical path of geostationary satellites but the orbital space mentioned above, since that is what is really important and useful in practice.

To sum up, the planning process will cover, in relation to the geostationary orbit and the radio services utilizing it:

- the orbital positions,

- the frequency spectrum (frequency assignments and band allocations),

  and

- the radiocommunication services.

In addition, the planning process cannot lose sight of the fact that the orbit will have other applications which are just as important as, or more important than, telecommunications, although the Conference will obviously be confined to the latter.

PLANNING ELEMENTS

The elements to be defined and analyzed below can be grouped in three categories:

a) general principles and legal elements;

b) technical elements;

c) economic elements.

Most of these elements are set forth in the Report of the Conference Preparatory Meeting (CPM), especially in Chapter 5 and Annex 4. Others correspond to ideas put forward on various occasions by the less developed countries and the equatorial States. We have also followed the recommendation of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE-82):

> "... considering the long-term implications of the growing activities in the GSO, any solution on the use of the GSO should be both equitable and flexible and take into consideration the economic, technical and legal aspects." (emphasis added) [3] (A/CONF.101/8, paragraph 288).

We propose to consider the following list of elements, bearing in mind also what was said in the preceding section on the object of planning.

a. General principles and legal elements

a.1 Use for the benefit of all mankind

a.2 The right to communication

a.3 Equal access

a.4 Requirements of the developing countries and special interests of the equatorial countries

a.5 Regional and world cooperation

a.6 Use for peaceful purposes and for duly authorized remote observation

a.7 Responsibility for activities in orbit

b. Technical elements

b.1 Current and future demand for the orbit/spectrum resource

b.2 Location of networks already in existence or under active development

b.3 Unforeseen networks or unforeseen changes in traffic demand b.4 Multi-administration networks

b.5 Technical parameters and interference criteria

b.6 Restrictions due to sharing with terrestrial services

b.7 Restrictions owing to frequency sharing between planned and unplanned services

b.8 Efficient use of the OSR and incentives for adopting suitable technology

b.9 Special geographical situations

c. Economic elements

c.1 Position of the developing countries

c.2 Impact of the Plan on the cost of satellites and of their operation

c.3 Impact of the Plan on the cost of the earth segment and its operation

c.4 Economic impact of technological advances

c.5 Administrative costs for the establishment and operation of the Plan

a.1 USE FOR THE BENEFIT OF ALL MANKIND

The ultimate objective of activities in the GO should be the same as outer space and related science and technology activities, namely, to improve the welfare of mankind as a whole.

On 20 December 1961, the United Nations General Assembly adopted a resolution stating that:

> "the exploration and use of outer space should be only for the betterment of mankind and to the benefit of States irrespective of the stage of their economic or scientific development,".

This declaration was maintained by the United Nations in 1963 when it adopted the "Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space", and in the "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies" which entered into force in 1967. (Not ratified by Colombia.) [4]

It is acknowledged that there are, and will continue to be, virtually inseparable obstacles in connection with the capacity of many developing countries to realize their potential fully, chiefly as a result of inequitable international economic relations. It is probable, moreover, that not all countries will wish to embark on their own space programmes in the near or distant future as they would rather give precedence to other projects they deem more urgent for their social, cultural or economic content. But if it is nevertheless accepted that space technology and the use of the GO in particular can constitute valuable weapons in combatting poverty and isolation and for disseminating knowledge and information, including the promotion of local cultures, the efforts of the Conference must be directed at making it possible for all countries to benefit from this resource in keeping with their various development levels, differing capacities to absorb new technologies and particular needs and priorities.

If the GO is to be considered as common heritage of mankind, it must not be the exclusive property of those countries which explore and use it but should be for the benefit of all mankind.

Hence, any plan for using the orbit/spectrum resource should be viewed in the light of the general advantages for mankind, for the purpose of maximizing benefits, thus ruling out any application which might cause international dissension and the unjust ascendancy of some countries over others. In the analysis for planning the orbit/spectrum resource, the following questions must be answered:

- what are the potential benefits to the whole of mankind from the services planned; and

- how can efforts be stepped-up to promote and facilitate improved use of the orbit/spectrum resource for the developing countries?

a.2 THE RIGHT TO COMMUNICATION

Any plan to use the orbit/spectrum resource must respect the right of all peoples to create, store, process, receive and disseminate information.

Communications satellites have proved to be potent vehicles for the exchange of information and this, in return, has become a very important factor in economic, military and social power for each country, and possibly an essential element for survival. Consequently, the use of satellite communications systems ought to be an effective form of narrowing the gap between countries with unequal development.

a.3 EQUAL ACCESS

The point was set out in the convocation to the Conference, contained in Resolution No. 3 of WARC-79 (see Radio Regulations [1]):

> "that a world space administrative radio conference shall be convened ... to guarantee in practice for all countries equitable access to the geostationary-satellite orbit and the frequency bands allocated to space services;".

Article 33 (paragraph 154) of the International Telecommunication Convention (Nairobi, 1982) [5] also states that:

> "... Members shall bear in mind that radio frequencies and the geostationary satellite orbit are limited natural resources and that they must be used efficiently and economically, ... so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries."

It is not only the developing countries which have expressed the need to comply with this requirement. Various leading companies in the satellite communications field have stated [6] that a change from the present arrangements for coordination of new satellite networks is inevitable, on technical and political grounds; that the growing demand for parts of the orbital arc has considerably complicated the task of coordinating new satellite networks and that the time is drawing to a close when it is sufficient to "inspect" the orbit in order to find an appropriate orbital location to accommodate a new network. They have likewise stated that the desires of many administrations in relation to "guaranteed" access to the geostationary orbit and the related frequency bands require significant change to be contemplated in the existing a posteriori procedures and that the future satellite needs of the developing nations will have to be recognized.

It is necessary to define the meaning to be given to "equitable" and "guaranteed" access and how these concepts may be put into practice, which gives rise to particular difficulties in the most useful segments of the orbit and at the lower frequencies (6/4 GHz) for the fixed-satellite service, which are already occupied and used intensively by a handful of countries with the greatest economic and technological development capabilities.

Although all countries have had an equal right to use the existing procedure for access to the orbit, the fact of the matter is that the present state of congestion will negate that right in practice; when the less developed countries are in a position to set up their own satellite systems, access will already no longer be possible or will be too expensive. WARC-79 Resolution No. 2 (see Radio Regulations [1]) recognizes this problem and attempts to find a solution:

"considering

that all countries have equal rights in the use of both the radio frequencies allocated to various space radiocommunication services and the geostationary-satellite orbit for these services;

taking into account

that the radio frequency spectrum and the geostationary-satellite orbit are limited natural resources and should be most effectively and economically used;

having in mind

that the use of the allocated frequency bands and fixed positions in the geostationary-satellite orbit by individual countries or groups of countries can start at various dates depending on the requirements and readiness of technical facilities of countries;

resolves

1. that the registration with the IFRB of frequency assignments for space radiocommunication services and their use should not provide any permanent priority for any individual country or groups of countries and should not create an obstacle to the establishment of space systems by other countries;

2. that, accordingly, a country or a group of countries having registered with the IFRB frequencies for their space radiocommunication services should take all practicable measures to realize the possibility of the use of new space systems by other countries or groups of countries so desiring."

As may be seen, the Resolution acknowledges;

- the right of all countries to use the OSR (and not merely to use the access procedures);
- that countries may begin to use the OSR at different times according to their technical resources (one should also add "and economic").

In addition, the IFRB or some other body must make sure that registration does not provide any permanent priority for any individual country and that assignments do not hinder access for new networks. The Resolution leaves it to the first countries to accede to adopt measures to ensure that other countries may also use the OSR. This latter solution is clearly unacceptable and therefore orbit positions and frequency bands must be assigned by means of a priori planning "guaranteeing" access to the OSR at the time when the country concerned is ready to establish its system, without higher cost or more complex technical facilities than those involved for the first users.

If, for specific reasons, not all bands and services can be planned, for example, because some of them are not intensively used, one must avoid regulatory procedures which result in inequality as is currently the case for the fixed-satellite service (FSS) and the lower frequency bands.

In order to avoid granting permanent priority or indefinite allocation of the OSR, it may be agreed that countries should be allowed to interchange the assignments obtained from a priori planning through bilateral agreements in their mutual interest.

In addition, the conditions laid down in WARC-79 Resolution No. 4 [1] must be reviewed, in particular to prevent a notifying administration from extending the period of operation of a space station indefinitely by virtue of the self-regulation therein embodied (see No. 1.2 of the operative part).

a.4 REQUIREMENTS OF THE DEVELOPING COUNTRIES AND SPECIAL INTERESTS OF THE EQUATORIAL COUNTRIES

The special needs of the developing countries are explicitly taken into account in Article 33 of the Nairobi Convention [5]. It follows that all measures adopted for utilization of the OSR, in addition to being equitable, must favour solutions which help to speed up the development of these countries.

In 1982, the Nairobi Plenipotentiary Conference set up an Independent Commission for World Wide Telecommunications Development ("Maitland Commission") which recently published the results of its studies [7 and 8].

The Commission considers that:

"... by the early part of the next century virtually the whole of mankind should be brought within easy reach of a telephone and, in due course, the other services telecommunications can provide." (See [8], section 5.)

It further acknowledged that:

"Telecommunications link all countries. But there is a wide disparity in the extent and quality of service as between industrialized and developing countries, and within developing countries between urban and remote areas." (See [8], section 10.)

"Neither in the name of common humanity nor on grounds of common interest is such a disparity acceptable." (See [8], section 3.)

As regards the choice of technology ([7], Chapter 4, section 34), the Commission highlighted the importance of equitable sharing or the orbit-frequency resources for the rapid growth of telecommunications services in developing countries and emphasized the need for early and satisfactory decisions.

The equatorial countries (Brazil, Colombia, Congo, Ecuador, Gabon, Indonesia, Kenya, Somalia, Uganda, Zaire) share the problems of the developing countries; however, they should be able to gain greater advantage from the fact that the geostationary orbit is above their territories.

Rights of the equatorial States

Frequencies and the orbit are natural resources and fully acknowledged as such (see Article 33 of the International Telecommunication Convention [5]). Being thus qualified, the equatorial States reasserted in the Declaration of Bogotá (December 1976) the right of peoples and nations to permanent sovereignty over their wealth and natural resources, to be exercised in the interest of their national development and of the welfare of the people of the State concerned. The equatorial States therefore exercise sovereignty over the corresponding segments of the GO, regard them as an integral part of their territories and abide by what was proclaimed only by the XXXth United Nations General Assembly:

> "All States freely hold and exercise full and permanent sovereignty, including possession, use and disposal of all their natural wealth and resources and economic activities."

These rights are understood to be aimed at bringing genuine benefits to the respective peoples and to the universal community, unlike the usufruct at present enjoyed only by more developed countries.

The equatorial States have reaffirmed this thesis on various occasions. For instance, at their Second Meeting (April 1982) they established as one of the principles in this connection that:

> "Equatorial States have rights of preservation over the relevant segment of the Geostationary Orbit located over their territory for the purposes of conservation and utilization of the Orbit."

In the Final Protocol to the Final Acts of the Broadcasting Satellite Conference (Geneva, 1977), Colombia, Congo, Ecuador, Gabon, Kenya, Uganda and Zaire stated that:

> "The equatorial countries reserve the right to take whatever steps they may deem fit to preserve and secure the observance of their sovereign rights which include the segments of the geostationary orbit corresponding to their respective national territories, in accordance with the constitutional and legal rules in force in each country."

In the Final Protocol to the Final Acts of WARC-79 (Geneva), the same countries confirmed all the reservations entered at the Broadcasting Satellite Conference (1977) and further demanded that:

> "......any planning or regulation aimed at achieving the rational use of the geostationary orbit through equitable access to it by all countries must take into consideration the position adopted in that connection by the equatorial countries."

Lastly, at the 23rd session of the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space (Geneva, March - April 1984), Colombia, Ecuador, Indonesia and Kenya proposed inter alia the following principle:

> "The Geostationary Orbit is a limited natural resource which shall be preserved in the interests of all States, taking into account the needs of the developing countries and the rights of the equatorial States. For that purpose it shall be governed by a specific legal regime." (underlining added).

Accordingly, any planning method must necessarily take those rights into account.

Prior authorization by the equatorial States

Pursuant to those rights, the following principle was promulgated at the 23rd session of the Legal Sub-Committee (1984), derived in turn from the Declaration issued at the Second Meeting of those States in April 1982:

> "The placement of a space object in the segment of the Geostationary Orbit superjacent to an equatorial State shall require prior authorization by that State. Transit for peaceful purposes of any space object through this segment shall be allowed."

Any orbital positions agreed for assignment within segments belonging to the equatorial States must be submitted to those States for approval during the same Conference if delegations have the necessary powers to do so, or adopted subject to compliance with the rules applicable in each State.

Planning should also observe the conditions that:

> "The equatorial States shall have preferential right to the segment of the Geostationary Orbit superjacent to the territory under their jurisdiction." (Legal Sub-Committee, 23rd session)

Preservation by the equatorial States

In accordance with the position stated during the 23rd session of the Legal Sub-Committee, the equatorial States seek to preserve the segments of the geostationary orbit superjacent to their territories for due and proper use by all States, particularly the developing countries. This would make those segments a kind of reserve within the orbit, aimed at preventing the present inequalities in space from being consolidated or increasing. The equatorial States are not simply attempting to ensure recognition of their rights but are imposing this obligation for the sake of equity in the use of the resource.

a.5 REGIONAL AND WORLD COOPERATION

Another of the principles which Colombia, Ecuador, Indonesia and Kenya proposed to establish at the 23rd session of the Legal Sub-Committee is that all States should cooperate in the efficient and economic use of the GO, either regionally or at the world level and either directly or through the United Nations or other competent international organizations.

Indeed, space is necessarily a field for international cooperation within undertakings ranging from communications to meteorology and the study of natural terrestrial resources, aimed at benefiting mankind in general.

Such cooperation should lead to greater consideration for the expectations and legitimate needs of the developing countries and their position of economic, technical and scientific disadvantage. It also implies that support should be given to efforts aimed at establishing systems of regional coverage, particularly among developing nations, making appropriate allowance for them in the planning of the OSR.

Such cooperation should also include projects aimed at effective transfers of technology and greater and wider use of application already available, such as the data obtained from observation satellites.

The Maitland Commission emphasized three ways of expanding international cooperation [8]:

a) implementing the Resolutions of the ITU Plenipotentiary Conference of Nairobi with a view to ensuring a more efficient role for the Union;

b) greater use of United Nations Development Programme (UNDP) funds by both contributors and beneficiaries;

c) more favourable consideration to aid for expanding telecommunications at the world level and greater priority accorded to international cooperation by international organizations involved in telecommunications.

The Commission also made recommendations concerning the financing and expansion of telecommunications and even suggested considering the economic value of the OSR for financing their development (Chapter 9, paragraph 33, [7]); this means finding an appropriate definition of the characteristics of both orbit and spectrum, to be taken into account for calculating this value, and could give rise to various options such as service bargaining for occupancy of the OSR. One of these recommendations calls on:

> "......those who provide international satellite systems (to) study urgently the feasibility of establishing funds to finance Earth segment and terrestrial facilities in developing countries." [8]

Although there has been extremely fruitful international cooperation in the use of space, it has taken place between the more developed countries. Ways should be found of widening the circle of such cooperation. A thorough examination of possibilities in this respect was made at UNISPACE 82 (see in particular the report of the Third Committee).

a.6 USE FOR PEACEFUL PURPOSES AND FOR DULY AUTHORIZED REMOTE OBSERVATION

The GO must be used exclusively for peaceful purposes, and its planning must thus rule out any consideration contrary to those purposes.

It is known that one of the most important uses of satellites today is the collection of military information as a means of constant supervision and verification of compliance with arms control agreements, but from this there is only one step to the use of artefacts intended for aggressive purposes. It is for this reason that the United Nations has exercised the functions of supervision and regulation since the beginnings of the space era, setting up in 1959 the Permanent Committee on the Peaceful Uses of Outer Space. For their part, at their Second Meeting (Quito, April 1982) the equatorial countries also promulgated the principle of promoting peaceful applications of the GO through international cooperation. The nations of the Group of 77 urged UNISPACE-82 to recommend to all the Member States and particularly those with the appropriate resources to abstain from any activity liable to encourage the arms race in outer space. There is all the more reason to ban such activities on the GO, which is a limited and scarce resource which needs to be used as efficiently as possible for the benefit of humanity.

Linked to this is the danger of illegal use of data from geostationary satellites for the purpose of military preparations or interference in countries' national rights over their territories and natural resources, a risk pointed out by various delegations to UNISPACE-82 ([3] Document A/CONF/101/L.2/Add.1, section 12). While the usefulness and value of remote observation by satellite is acknowledged, there is nevertheless justified concern as regards the dissemination of data obtained in this way. One of the services to be studied by WARC-ORB will indeed be the earth-exploration satellite service (EESS).

The Conference should decide that the OSR must be used by satellites which do not threaten the security of States, i.e. the steps and measures taken to protect their nationals not only from physical and direct attack but also any other activities such as exploration of their territories is to acquire knowledge benefiting exclusively the State using the exploratory artefacts or third States, to the detriment of the States observed. It is particularly important for the developing countries that an equitable international agreement should be concluded which safeguards each State's sovereignty over its natural resources, respecting the confidential nature of the information obtained by means of remote observation.

a.7 RESPONSIBILITY FOR ACTIVITIES IN ORBIT

Each State must be internationally responsible for its activities in the geostationary orbit, irrespective whether they are carried out by governmental bodies or non-governmental entities. When States pool forces and operate through an international organization the responsibility will fall on the organization and its participating States.

This principle constitutes a specific application to the geostationary orbit of the rule enshrined in Article VI of the Space Treaty [4].

It has also been established that when two or more States jointly launch a space object, "they shall be jointly or severally liable for any damage caused" (Article V of the Convention on International Liability for Damage Caused by Space Objects). The international organizations will not be authorized to submit claims for damage caused to them; only a State Member of the organization having signed the above Convention may do so.

It follows that the geostationary orbit should not be considered as an area for private enterprise without due authorization and continuous supervision on the part of the States concerned.

b.1 CURRENT AND FUTURE DEMAND FOR THE ORBIT/SPECTRUM RESOURCE

Planning of the OSR must necessarily take account of each country's estimated demand for traffic and services.

Demand forecasts must be sound and accurate and cover the duration of the Plan which will in principle remain in force until a subsequent World Conference is held.

The sound and accurate forecasts must consider four aspects:

1) the period covered by the forecasts (duration of the Plan);

2) the fact that the orbit/spectrum resource is a limited resource;

3) that the countries using the OSR most intensively at the present time must reduce their requirements for the benefit of the other countries wishing to use it.

4) that all countries must tailor their expressed requirements to what is legitimately necessary, within their capabilities in the period concerned, without exaggerating the demand for the OSR by considerations extraneous to a reasonable forecast or projection of requirements. Article 33, No. 153 of the Nairobi Convention [5] refers to this requirement: "Members shall endeavour to limit the number of frequencies and the spectrum space used to the minimum essential to provide in a satisfactory manner the necessary services."

Inequitable requirements of countries using the OSR most intensively are requirements intended, for example, to offer an exaggerated number of television channels in a country when many other countries lack basic telecommunications services.

The UNISPACE-82 Report (Document A/CONF.101/8, paragraph 284) refers to the extraordinary increase in the use of the GO in the following terms:

> "......it may become necessary for each country or international organization to examine whether all the satellites it is operating are really required. ... these systems use increasing amounts of a limited resource that is for use by all States."

Obviously, an inordinately large period between conferences would contribute to uncertainty and excessive demand. It will be for discussions at WARC-ORB(1) to identify whether the Plan will provide enough space for all the requests for assignments and the whole possible range of requirements.

b.2 LOCATION OF NETWORKS ALREADY IN EXISTENCE OR UNDER ACTIVE DEVELOPMENT

The Plan should cause minimum disturbance to networks which are already in operation or have reached the stage of active development, because they will certainly have been designed within strict limits imposed by terrestrial services. Any repositioning of the satellites, and a fortiori, any change in frequencies, inevitably affects services, generally in an unacceptable way. Nevertheless, networks already in operation will share the burden of the interference problems created by the introduction of new networks.

This planning element is also related to the "international recognition" (RR, Vol. 2, Art. 13, No. 1491) of frequency assignments, which is one of the reasons for entering space stations in the Master International Frequency Register. Such recognition implies protection against harmful interference by other stations; when there is congestion, such as occurs in the FSS in some segments of the GO, the relocation of existing networks or establishment of new networks may impair such protection. It would be desirable, moreover, for the Conference to specify the nature and scope of this international recognition.

It is necessary to define what is to be understood by networks in "active development". It might, for example, be agreed that the networks covered by this designation will be those that have been duly registered with the International Frequency Registration Board (IFRB) before the adoption of a Plan, under the existing procedure.

b.3 UNFORESEEN NETWORKS OR UNFORESEEN CHANGES IN TRAFFIC DEMAND

Application of this element depends on the nature of the Plan (e.g. if provision is made for periodic reviews of the regulatory procedures), on the requirements established for avoiding harmful interference, on whether reserve segments have been left in the OSR and on the frequency of world administrative conferences. It also depends on the acceptance of techniques such as the coordination orbvital arc (COA), sub-regionalizing of service areas and multilateral harmonization by three elements (spectrum segmentation, relocation of satellites and equitable interference). These techniques are described in the CPM Report, Annex 4, section 4.4.9 [9].

If the new networks or modifications cannot wait until the next Conference, the corresponding applications shall be allowed only:

- when they do not cause interference greater than that fixed for the purposes of establishing the Plan, or if the administrations affected accept the higher level of interference;

- if the rights of other administrations are not infringed.

b.4 MULTI-ADMINISTRATION NETWORKS

The Plan has to enable networks involving more than one administration to operate properly. On the other hand, multi-administration networks must not interfere in any way with efforts to establish individual administrations' networks.

This principle means that the Conference ought to establish a proper definition of what is to be understood by "multi-administration"; such a network should at all events be treated differently from corporations which are international in scope but belong to a single administration or private agency ("transnationals").

Generally speaking, multi-administration networks spend a considerable time in preparing their plans and draw them up for a sufficiently long period so that in any plan the necessary resources can be assigned with relative ease. On the other hand, the location of unforeseen networks by such administrations can prove difficult because of their very structure. Furthermore, some orbital positions can be of critical importance for systems intended to supply intercontinental, international or regional services, so that not just the multi-administration network but also its members should take this requirement and the needs of the group into account when formulating individual or country needs.

As an iillustration, we quote below the special characteristics for which INTELSAT is requesting due recognition (see Add.5 to AP-9-22):

- restrictions on the orbital arc: because of its world-wide coverage, the technically acceptable service arc is very small and it is impossible to relocate satellites in order to accommodate other networks;
- use of global beams to ensure full connection of geographically scattered users;
- impossibility of placing operational satellites next to reserve satellites;
- side-lobes of satellite antennas;
- grouping of frequency bands by pairs and cross-connections in the bands 6/4 and 14/11 GHz.

Care will have to be exercised, nevertheless, to ensure that the measures proposed to protect multi-administration systems do not run counter to individual countries' aspirations with regard to individual and direct access to the OSR.

b.5 TECHNICAL PARAMETERS AND INTERFERENCE CRITERIA

Since the period between conferences is not excessive (greater than the technological life of a generation of satellites), it is desirable that the technical parameters and criteria relating to interference should be fixed for the life of the Plan, despite the fact that technological progress over this period can give rise to unnecessarily large orbital separations. Otherwise, a certain amount of disorder may creep into the Plan and it may be difficult to maintain compatibility between different networks.

At the WARC-ORB(1) it will accordingly be necessary to take a decision on the possibility of the WARC-ORB(2) adopting new parameters and criteria to enter into force at the same time as the Plan.

b.6 RESTRICTIONS DUE TO SHARING WITH TERRESTRIAL SERVICES

The Plan should respect the restrictions imposed on space services sharing the same frequency bands allocated on a primary basis to terrestrial services, or else measures similar to those already applied should be taken.

The importance of this condition is immediately apparent if we consider the size of the terrestrial networks and the priority and protection afforded them in most countries.

b.7 RESTRICTIONS OWING TO FREQUENCY SHARING BETWEEN PLANNED AND UNPLANNED SERVICES

As the result of the adoption of a Plan for not too long a period, it may not be necessary to provide for the protection of systems in operation or in active development against unplanned services. The latter will have to comply with the general provisions of the Radio Regulations (see section a.3 above) relating to unplanned bands and services.

b.8 EFFICIENT USE OF THE OSR AND INCENTIVES FOR ADOPTING SUITABLE TECHNOLOGY

Care must be exercised to ensure that the Plan adopted meets OSR requirements as efficiently as possible having regard to technical, operational and economic factors and the needs of the developing countries.

Revision of the technical parameters and interference criteria when the Plan is adopted will surely help to enhance the efficiency of use of the OSR since the Plan would be based on the technology prevalent at the time of its preparation. In addition, the revision of the Plan at conferences held at reasonable intervals would enable the most recent technical standards to be introduced, particularly in satellites located in the more congested orbital segments.

Annex 4, section 4.3 of the Report of the CPM, [9] describes some of the techniques which will make for more efficient use of the OSR. It should be borne in mind, however, that it will not always be possible or advisable to choose the most advanced technology; preferably, use of the most appropriate technology compatible with the other factors mentioned should be encouraged. The developing countries should not be affected by the higher costs entailed, for example, by the introduction of techniques for reducing the orbital spacing between satellites.

b.9 SPECIAL GEOGRAPHICAL SITUATIONS

The Plan should take into account "the relevant technical aspects of the special geographical situation of certain countries" (Administrative Council Resolution No. 895).

The CPM Report (Annex 4, section 4.5) [9] adequately describes these aspects, some of which may arise simultaneously in some countries:

1) special latitude situations,

2) dispersed territory situations,

3) terrain obstruction situations,

4) precipitation and sandstorm situations

5) small countries surrounded by many other countries,

6) countries covering large geographical areas,

7) elongated countries,

8) scattered population centres.

Together with a list of its needs, each country will have to describe those aspects on this list which affect them. At the same time, it may prove necessary to consider different parameters and techniques depending on the case at issue; for instance, a link between satellites may even have to be claimed, in the case of a geographical area of great longitudinal width, at a high latitude where the orbital arc is very small or non-existent.

The choice of new technical parameters and the advisability of their introduction will also depend on these aspects. For example, in areas having scattered population centres, whose requirements are limited to a few telephone channels, low-cost earth stations that can be easily installed are essential and should be subject not to excessively strict but to adequate technical requirements to ensure that they are in keeping with the standards governing the OSR.

c.1 POSITION OF THE DEVELOPING COUNTRIES

The position of the developing countries, i.e. their economic, technological and social level, requires special consideration in any Plan adopted for the use of the OSR.

This principle is duly recognized in Article 33 of the International Telecommunication Convention [5]: "... radio frequencies and the geostationary satellite orbit are limited natural resources and ... must be used efficiently and economically ... taking into account the special needs of the developing countries ...".

c.2 IMPACT OF THE PLAN ON THE COST OF SATELLITES AND OF THEIR OPERATION

Once the Plan and the corresponding technical parameters have been chosen there should be no reason for the cost of satellite systems to rise because of them for the duration of the Plan, even owing to unforeseen modifications or the introduction of unforeseen new systems. In other words, the cost would be defined when the Plan is chosen and would also be a factor in its choice. The operation of systems would be particularly affected at the outset if the Plan provided for the relocation of satellites or the readjustment of frequencies.

c.3 IMPACT OF THE PLAN ON THE COST OF THE EARTH SEGMENT AND ITS OPERATION

The same could be said as for the previous element. It may be foreseen, in general, that the cost of the Earth segment will diminish gradually with the introduction of technological advances and with larger scale production.

c.4 ECONOMIC IMPACT OF TECHNOLOGICAL ADVANCES

The technological advances considered for the establishment of satellite telecommunication systems should be aimed not only at a more effective use of the OSR, but at greater economy, especially in the Earth segment. For many countries, the latter represents their only direct investment in these systems. It will therefore be necessary to strike a balance between these factors and, if possible, to leave a gap between the periods selected for introducing changes in the space and Earth segments.

The CPM Report [9] (Annex 4, section 4.6.1.3.1) refers to the assimilation of technological changes and the gradual introduction of measures to preserve the OSR. It points out that urgent attention should be given to fixing date limits for the introduction of these measures.

c.5 ADMINISTRATIVE COSTS FOR THE ESTABLISHMENT AND OPERATION OF THE PLAN

The major cost of the Plan would arise from the effort required to prepare the Planning Conference. Once established, its management should require a minimum effort on the part of the ITU and the administrations. For the application and operation of the Plan, the costs will depend on the degree of complexity of the regulatory procedures involved.

CONCLUSIONS

WARC-ORB(1) will be facing the complex task of establishing the principles, parameters and criteria needed for the planning of the geostationary orbit and the related frequency spectrum and radiocommunication services. Administrations will therefore have to discuss and agree upon a set of elements which can serve as a basis for selecting one planning method among the various methods which may be proposed to replace the present procedure of access to and use of the orbit.

It is suggested in the first place that the purpose of planning should be specified, with a clear definition of the nature of the geostationary orbit and the services which are to be analyzed (radiocommunication services). This purpose is threefold: orbital positions, frequency spectrum and services.

The 21 elements which it is proposed to apply in the process of analysis to adopt the most suitable planning method may be grouped into three categories:

- general principles and legal elements,
- technical elements,
- economic elements.

The Conference cannot in fact be restricted to the technical elements discussed at the 1984 Preparatory Meeting (CPM). In its analysis, it should take other aspects into account, the importance of which has already been referred to, especially by UNISPACE-82.

The International Telecommunication Convention has stipulated that the special requirements of developing countries should be taken into account. This document has pointed out several ways of achieving this purpose.

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COMMITTEE 5

United States of America

ADDITIONAL PROPOSALS ON A MULTILATERAL PLANNING MEETING

The United States of America, in its earlier proposals contained in Document 30, indicated that alternatives to the existing procedures of the Radio Regulations could be devised "to enhance the assurance that countries with distant requirements can meet those requirements when they are ready to do so." Document 30 proposes, among other things, that multilateral meetings be held on a regular basis to resolve basic incompatibilities among satellite systems. Further
USA/107/53 consideration has been given to this matter and it is proposed that WARC-ORB(1) consider the attached Annex on a Multilateral Planning Meeting (MPM) in connection with its deliberations on planning approaches and guidelines for regulatory procedures.

The main characteristics of the Multilateral Planning Meeting (MPM) are as follows:

1. Facilitates accommodation of, and ensures access to, the orbit/spectrum resource for all new or modified satellite networks;

2. Applicable to services and bands for which WARC-ORB(1) decides there should be planning;

3. Requirements submitted whenever they are known (not later than four months prior to an MPM), together with prescribed information for interference analyses;

4. Held on a regular basis, for example, every two years, for a 3-4 week duration;

5. Involves all affected Administrations, including those with operating satellite networks, as participants; others may attend as observers;

6. Systematically examines new requirements and ways to accommodate new or modified networks through the use of burden sharing guidelines;

7. May decide, as a last resort, to relocate an operational satellite up to three degrees once during its lifetime, if necessary to accommodate a new network;

8. Results in an agreement among participating Administrations that coordination has been completed for all new or modified networks;

9. Administrations with new or modified networks may immediately request the IFRB to register its satellite in accordance with the terms of the MPM agreement.

Annex: 1

ANNEX

MULTILATERAL PLANNING MEETING

Purpose of the Meeting

1. The multilateral planning meeting (MPM) is designed to provide all Administrations with an equitable and workable means for accommodating new or modified networks.

2. The MPM would ensure access to satisfactory orbit locations for all countries with present and foreseen requirements.

3. The outcome of the meeting would be an agreement among Administrations on the terms and conditions that will allow the notification and registration of any new or modified network considered at the MPM.

Applicable Bands and Services

4. The MPM is to be used for networks in the fixed satellite service in bands between 3700 and 7075 MHz.

5. In the intensively used portions of these bands of 5925-6425 MHz for uplinks and 3700-4200 MHz for downlinks, the MPM would be applicable to network requirements submitted two-to-five years prior to network implementation.

6. In the expansion bands of 6425-6725 MHz for uplinks and 4500-4800 for MHz downlinks, the MPM would be applicable to network requirements submitted up to 15 years prior to network implementation.

Periodic Timetable For Planning Meetings

7. The MPM would be conducted on a regularly scheduled [biennual] basis.

8. The Administrative Council would specify the date for each MPM. The ITU would reserve the necessary facilities based on the venue specified by the WARC, and provide the necessary support staff.

Information Requirements for New or Modified Networks

9. In order to identify network requirements and to determine networks affected, each Administration intending to establish or modify a network would be required to submit to the IFRB the following information to be contained in [a modified] Appendix 3 regarding its intended network including:

   - preferred orbit location

   - service arc

   - parameters necessary for the [delta T/T calculations, as specified in Appendix 29 of the Radio Regulations.]

10. The information required to perform detailed interference analysis would be exchanged among affected Administrations in a standard format, as specified in a new appendix to the Radio Regulations. The standard format will facilitate computer processing of the information as well as objective evaluation and comparison with the same type of information from other networks.

IFRB Assistance Upon Request

11. At the request of an Administration planning to establish a new network the IFRB would, through use of its computer programs and other resources, assist in the identification of possible orbit location(s) for that Administration.

Examination for Conformity with Radio Regulations

12. Upon receipt of the information (see, para. 9) on a new or modified network the IFRB would examine the submitted data for completeness and conformity with the provisions of the Radio Regulations.

13. If an Administration submits incomplete information, the IFRB would inform the Administration of the particular deficiencies that exist. Any deficiencies must be corrected [four] months before the MPM if the intended network is to be considered at the meeting.

Identification of Affected Administrations

14. When a complete set of characteristics has been submitted, the IFRB would identify all other affected networks using the calculations specified in Appendix 29. A network is affected if its delta T/T is more than [X]% as a result of the new or modified network.

15. This task would be conducted with computer programs based upon the guidelines and criteria established by WARC-ORB(2) and taking into account the work of the CCIR. Such programs would be designed to function compatibly with the IFRB's data base and advise the Administration responsible for that network of its action.

16. The IFRB should disregard any network that has not been brought into service within five years (fifteen years for the expansion bands) of initial publication of the network characteristics by the IFRB, and advise those Administrations responsible.

Publication of Network Information

17. The network characteristics for each new or modified network would be published in the IFRB's weekly circular within 30 days after the receipt of the complete submission. This circular would identify all Administrations with which the new or modified network must coordinate.

Network Plans to be Considered at the MPM

18. New or modified networks for which the required information (see paragraph 9) has been submitted to the IFRB four months prior to the initiation of the next scheduled MPM would be eligible for consideration at the meeting.

19. All new or modified networks requiring coordination would be considered at the MPM.

Participation

20. Participation at the MPM includes the following Administrations:

- o All Administrations with network requirements on the meeting agenda.
- o Administrations with networks in which the delta T/T is more than X% as a result of a new or modified network. This calculation would be done to cover all potential locations within the service arcs of all new or modified networks to be considered at the MPM.
- o "Multi-Administration" networks would be formally represented by their notifying Administration, but it is expected that the system operators would participate in the meeting.

21. Other Administrations may attend the MPM as observers.

Preparation for the MPM

22. The IFRB would publish in a special circular (ninety) days prior to the MPM, a list of new and modified networks which require accommodation at the MPM. This list would constitute the agenda for the MPM.

23. For each new or modified network, the agenda would also list all potentially affected networks. (See paragraph 20 above.)

24. To the extent practicable, the Adminstrations involved would prepare proposed work plans prior to the meeting. The work plan(s) would identify separate groups of networks to be considered at the MPM based on the interdependency of each of the networks. It is contemplated that the groups would operate simultaneously and resolve difficulties independent of one another. Intergroup coordination will be accomplished as needed.

25. Any Administration who will be participating at the MPM may submit prior to the MPM a proposed arrangement for accommodating the new or modified networks.

26. At the request of any participating Administration, the IFRB could also prepare a proposed arrangement to accommodate the new or modified networks on the MPM agenda. The requesting Administration could then submit this plan as its own if it so desired.

Conduct at Meeting

27. The MPM would initially complete the following tasks:

- Selection of a Chairman
- Confirmation of the Agenda
- Adoption of a work plan
- Verification of system characteristics for all networks involved

28. Upon adoption of the work plan the Administrations would meet in their respective groups to resolve difficulties.

29. The participating Administrations would initially present proposals for accommodating the new or modified networks being considered at the meeting to the appropriate multilateral group.

30. At the request of any participating Administration, the IFRB could provide technical support and advice to assist that Administration in developing proposals for accommodating the new and modified networks.

Decisionmaking

31. Based on proposals made by Administrations, and the guidelines established at the WARC, the MPM will prepare an initial arrangement identifying an orbital location for each new and modified network considered by the MPM which satisfies the following criteria:

(a) the orbital location lies within the service arc specified by the Administration for the network; and

(b) with respect to every other affected network, the orbital location either (i) provides a minimum value of "isolation" between the networks, or (ii) is otherwise accepted by those Administrations for which the minimum value of isolation is not initially provided.

32. In accordance with guidelines established at the WARC-ORB(2), this arrangement will also identify any consequential changes to the orbital locations specified in the frequency assignments for existing networks necessary to accommodate the new and modified networks submitted to the MPM in accordance with the criteria specified above.

33. Once the foregoing decisions have been reached, they will be supplemented by any additional agreements, understandings, undertakings or other representations necessary for Administrations to mutually agree that any coordination required by No. 1060 of the Radio Regulations has been effected for the frequency assignments for the new and modified networks submitted to the MPM and for any consequential modifications to the basic characteristics of existing networks.

34. The agreement which will be transmitted to the IFRB will include all the decisions referred to above in paras. 31-33.

35. Any Administration that was notified by the IFRB prior to the MPM that its network could be affected by a new or modified network submitted to the MPM, but does not participate in the MPM, shall be deemed to have no objection to the agreement reached by the MPM. It shall also be deemed to agree to the coordination of the frequency assignments for the new and modified networks considered by the MPM as well as any consequential modifications to the basic characteristics of existing networks in accordance with the applicable provisions of the Radio Regulations.

Guidelines For Sharing Burdens of Accommodation

36. The MPM should attempt to balance the interference and constraints imposed on existing systems with the need to maximize the remaining capacity of the GSO/frequency spectrum resource.

37. The MPM should seek to identify an orbit location that meets the minimum isolation standards in effect at that time for each new or modified network. Each location must be within the service arc identified by the Administration planning or modifying the network.

38. A new or modified network can be accommodated in any manner, as long as there is consensus on the proposed arrangement from all Adminstrations that it would affect.

39. If consensus cannot be reached, consideration of any operational or technical modifications to any network should take into account the relative costs and operational impact on networks in their various stages of implementation. (Possible annex from committee 4).

40. Networks for which construction of the space station has not yet begun should offer the greatest flexibility to make design changes. They could also be relocated any number of times, as long as such relocation does not compromise the network's ability to meet its service requirements.

41. Networks in which the space station is under construction could also offer flexibility to make changes in network parameters or relocate, to the extent that such changes do not impinge on the network's ability to meet proposed service requirements.

42. Subsequent generation satellites would be subject to design changes. Such changes shall not, however, restrict the networks' ability to meet existing service requirements.

43. For networks whose space stations are already in service the comparable flexibility would be initially limited to acceptance of increased levels of interference or changes in network transmission parameters.

44. Where no alternative exists, the MPM may consider relocating an operational space station. Relocation of operational space stations shall, however, be kept to a minimum.

45. No operational space station should be required to be moved more than one time nor more than three degrees from its original orbit location during its operational lifetime. In any event, no move shall extend outside the agreed upon service arc.

46. In accommodating new or modified networks, the burden of any increased interference must be shared equitably among all Administrations concerned.

Status of Previous Agreements Reached at the Meeting

47. Decisions taken at the MPM would take precedence over any previous bilateral or MPM agreements.

Results of the Meeting

48. The results of the MPM will be an agreement among affected Administrations that coordination has been effected for the new and modified networks considered at the MPM, including consequential changes to the basic characteristics of registered assignments necessary to accommodate the new and modified networks.

49. At the conclusion of the MPM, an Administration may instruct the IFRB to accept for notification the frequency assignments for its new or modified network as established by the MPM. All other Administrations shall promptly update the frequency assignments for their networks as necessary to conform them to the agreements reached at the MPM.

50. The MPM agreement will be sufficient for the IFRB to reach a favorable finding with respect to No. 1504 of the Radio Regulations that coordination has been effected for the frequency assignments for the new or modified networks established by the MPM.

51. Administrations may also agree at the MPM that coordination of specified areas of technical and/or operational detail concerning their particular networks may proceed on a bilateral basis within the bounds agreed upon at the MPM.

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COMMITTEE 5

Republic of Iraq

FURTHER PROPOSALS WITH REGARD TO AGENDA ITEM 2.4

In response to the question raised in Working Group 5B concerning the possible elimination of the advanced publication procedures in section I of Article 11 of the Radio Regulations, this Administration proposes that:

IRQ/108/19 The Advanced Publication Section of Article 11 should be retained to serve as a means of declaration, or announcement, by the responsible administration of its intent to establish its projected satellite network(s). In addition this section should specify the following:

a) the period within which advanced publication should be affected before the date of bringing into use of the projected network(s);

b) the deadline for receiving comments from administrations whose services may be affected by the new network(s);

c) the type and the extent of information that should be provided by the responsible administration on its projected satellite network(s). The information may be those of the present Appendix 4 of the Radio Regulations;

d) procedures for the amendment of published information;

e) action(s) that the IFRB should take in cases of failure to comply with the provisions therein.

IRQ/108/20 The present provision in section I of Article 11 from Radio Regulations 1048 to 1058 inclusive which are in effect providing for a form of "pre-coordination" of satellite networks prior to the commencement of the proper coordination process, as provided for in section II of the same article, can be suppressed.

IRQ/108/21 The application of the coordination procedure of section II (or a simplified version of it as to be decided later) shall commence after a period not exceeding (10) months from the date of publication of the complete information in the IFRB Weekly Circular. The coordination shall be affected with those administrations who have submitted comments regarding possible effects to their services by the new network(s) or whose services may be affected as identified by the Board within the framework of the coordination stage itself, (through the information of Appendix 3 for example).

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BUDGET CONTROL COMMITTEE

SUMMARY RECORD

OF THE

FIRST MEETING OF COMMITTEE 3

(BUDGET CONTROL)

Wednesday, 14 August 1985, at 0900 hrs

Chairman: Mr. R.G. DEODHAR (India)

Subjects discussed:		Documents
1.	Organization of the work of Committee 3	-
2.	Terms of reference and facilities available to delegates	79
3.	Budget of the Conference	46
4.	Contributions of recognized private operating agencies and non-exempt international organizations	47

1. Organization of the work of Committee 3

1.1 The Chairman suggested that, in the light of past experience, three meetings would be adequate for the Committee to accomplish its work. The second meeting could be held in approximately two weeks' time to consider an interim statement of accounts and the third and last meeting would review the final statement of accounts and approve the Committee's report to the Plenary Meeting.

2. Terms of reference and facilities available to delegates (Document 79)

2.1 The Committee took note of the terms of reference assigned to the Committee by the Plenary Meeting and set out in Document 79.

2.2 The Secretary noted that the Committee had been assigned a further task by the Administrative Council in addition to those contained in its terms of reference. In its consideration of the budget of the Union for 1986 at its 40th session in July 1985, the Administrative Council had been unable to assess the projected costs of the intersessional work of the ORB Conference in 1986 because the first session of the Conference, whose prerogative it was to determine the scope and content of that work, had not yet met. Consequently, the Administrative Council, in its Resolution No. 93, had confined itself to setting a ceiling of 900,000.- Swiss francs to the expenditure on intersessional work in 1986 and had invited the Budget Control Committee of the Conference to examine the requests made for such work in conformity with the decisions taken by the Conference, bearing that ceiling in mind.

2.3 The Committee took note of the Administrative Council's request.

2.4 In reply to a request from the delegate of Japan, the Secretary said that copies of the relevant Administrative Council Resolution would be circulated to all delegations.

In addition, he said, in reply to a question from the delegate of Italy, that the figure of 900,000.- Swiss francs was an overall ceiling covering all the intersessional work to be carried out in 1986 by all organs of the Union, notably the IFRB and the CCIR, and would thus have to be shared out between them.

2.5 In the absence of any comments from the floor on the facilities provided to delegates by the Conference, the Chairman requested that any forthcoming suggestions on the subject should be made either verbally or in writing to himself or the Secretary.

3. Budget of the Conference (Document 46)

3.1 The Secretary introduced Document 46, which contained the budget approved by the 39th session of the Administrative Council for WARC-ORB-85. The budget covered expenditure on the Conference throughout 1985, including preparatory work by the IFRB, staff expenditure and expenditure on premises and equipment, but excluding expenditure incurred on behalf of the Conference by the Common Services of the Union, and which are included in a special section of the regular budget of the Union.

In reply to a question from the delegate of the USSR, he said that the sum of 107,000.- Swiss francs entered under item (b) (Travel) of Staff Expenditure was to meet the travel costs of interpreters recruited on a non-local basis from outside Geneva. Such expenditure was unavoidable since it was not possible, especially in the case of certain languages such as Arabic, Chinese and Russian, to find a sufficient number of interpreters resident in Geneva to service the Conference properly.

In the light of those comments, the Committee took note of Document 46.

4. Contributions of recognized private operating agencies and non-exempt international organizations (Document 47)

4.1 The Secretary introduced Document 47 which set out the amount of the contributory unit determined in accordance with the provision of the Convention, applicable to recognized private operating agencies and non-exempt international organizations participating in the work of the Conference. Such agencies and organizations would be requested to inform the Secretary-General of the number of units they agreed to pay; the sum in question would then be credited to the budget of the Union.

In reply to a question from the delegate of Canada, he said that while he was not in a position to express an opinion on the benefit such agencies and organizations might derive from participation in the work of the Conference in relation to the size of their contribution, that contribution helped to defray the expenses of services, such as documentation, that they received on the same footing as delegates.

The meeting rose at 0930 hours.

The Secretary: R. PRELAZ

The Chairman: R.G. DEODHAR

INTERNATIONAL TELECOMMUNICATION UNION

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COMMITTEES 4 AND 5
AND PLENARY

Bolivia, Colombia, Ecuador, Peru and Venezuela

PROPOSALS FOR THE WORK OF THE CONFERENCE

ELEMENTS FOR THE PLANNING OF THE ORBIT/SPECTRUM RESOURCE

The administrations submitting this document put forward the followin considerations and list of planning elements:

1. The Conference should analyze the "radiocommunication services" which use the OSR and not, in general, the "space services", in keeping with the purposes and objectives of the ITU.

2. The Conference should develop an a priori plan to guarantee equitable access to the orbit/spectrum resource.

COMP/110/1 3. Include the following definition in the Radio Regulations:

Geostationary orbit space: space constituted by the ring or torus which constitutes in practice the ambit of movement of the geostationary satellites complying with ITU provisions relating to station-keeping, and whose axis is the orbit of such satellites.

COMP/110/2 4. Planning shall include:

* Orbital positions
* Frequency spectrum
* Radiocommunication services

COMP/110/3 5. Adopt the following list of planning "elements", on the understanding that they relate to general legal and economic principles and to technical parameters and criteria:

a) General principles and legal elements.

a.1) Use for the benefit of all mankind.

The paramount objective of activities in the geostationary orbit (GO) should be the same as that of activities in outer space and that of the science and technology related to the latter, that is, enhancing the well-being of all mankind.

a.2) Right to communication

Any plan for the use of the orbit/spectrum resource should respect the right of all peoples to create, store, process, receive and transmit information.

a.3) Equitable access

All countries should in practice be guaranteed equitable access to the orbit of geostationary satellites and the frequency bands allocated to space services. If it is not possible to plan all the bands and services, for special reasons such as the fact that they are not intensively used, it will be necessary to introduce rules to avoid an inequitable situation, such as that which currently obtains for the fixed-satellite service (FSS) and the lower frequency bands.

In order to optimize the use of the OSR, the assignments obtained as a result of a priori planning should be open to agreement or negotiation among the interested parties.

a.4) Needs of developing countries

Planning should take account of the special needs of developing countries, as stipulated in the International Telecommunication Convention (Articles 10 and 33).

a.5) Regional and world-wide cooperation

All States should cooperate in the efficient and economic use of the GO, on a regional or world-wide scale, either directly or through the United Nations and other competent international organizations.

a.6) Use for peaceful purposes and for duly authorized remote observation

The GO should be used exclusively for peaceful purposes, so that its planning should rule out any consideration contrary to such purposes.

The OSR should be used with satellites that do not infringe the security of countries, in other words, the provisions and measures adopted to protect their nationals, not only from direct physical attack, but also from activities such as the exploration of their territories with the purpose of using the information thus obtained for the exclusive benefit of the country owning the exploratory artefacts, or of third countries, to the detriment of the countries observed.

a.7) Responsibility for activities in the orbit

Each State should be internationally responsible for its activities in the geostationary orbit, irrespective of whether they are carried out by government organizations or non-governmental bodies. If States pool their efforts and act through an international organization, responsibility shall lie with the organization and the States participating in it. Moreover, when two or more States jointly launch a space object, they shall be jointly responsible for any damage caused. The geostationary orbit should therefore not be considered as a field for private enterprise without due authorization and continuous supervision by the States concerned.

b) Technical elements

b.1) Present and future demand of the orbit/spectrum resource.

The planning of the OSR should take into account individual countries' estimates of demand for traffic and services. Demand forecasts should be sound and accurate and should relate to the duration of the plan.

b.2) Location of existing networks under active development.

The plan should cause minimum disturbance to networks which are in service or currently in a stage of active development. Nevertheless, networks in service shall share the burden of interference problems arising from the introduction of new networks.

b.3) Unforeseen networks or unforeseen changes in traffic demand.

The plan should make provision for unforeseen networks or unforeseen traffic demand. If new networks or changes cannot wait for the next conference to be held, requirements should be met only:

- when they do not cause interference greater than that established in the plan, or provided that the administrations affected accept the higher level of interference;

- provided that they do not infringe on the rights of other administrations.

b.4) Multi-administration networks.

The plan should allow for the proper functioning of networks in which several administrations take part. Moreover, multi-administration networks should not interfere in any way with efforts to establish networks of individual administrations, especially in developing countries.

b.5) Technical parameters and interference criteria.

As the period between conferences is not excessive (greater than the technology of one generation of satellites), the technical parameters and interference criteria should be maintained for the whole duration of the plan, even though within the same period technological development might give rise to unnecessarily large orbital separations. The new parameters and criteria should enter into force at the same time as the plan.

b.6) Restrictions due to sharing with terrestrial services.

When the plan is established, the restrictions imposed on space services sharing the same frequency bands allocated on a primary basis to terrestrial services should be complied with, or else measures similar to those currently in force should be taken.

b.7) Restrictions due to frequency sharing between planned and unplanned services.

Unplanned bands and services should comply with the provisions of the Radio Regulations.

b.8) Efficient use of the OSR and incentives to the adoption of appropriate technology.

It should be ensured that the plan adopted meets the requirements of administrations with regard to the OSR in the most efficient way possible from the standpoint of technical, operational and economic factors and of the needs of developing countries.

b.9) Special geographical situations.

The plan should take into account the relevant technical aspects of the special geographical situation of certain countries.

c) Economic elements

c.1) Situation of developing countries.

The situation of developing countries, i.e. their economic, technological and social level, will require special consideration in any plan adopted for the use of the OSR.

c.2) Impact of the plan on the cost of satellite systems and their operation.

Once the plan and the corresponding technical parameters have been decided, they should not give rise to any increase in the cost of space or Earth segments while the plan is in force, either due to unforeseen changes or the introduction of unforeseen networks. In other words, the cost should be determined when the plan is selected and will also be a factor in its selection.

c.3) Economic impact of technological advances.

Technological advances considered for the establishment of communication-satellite systems should be aimed not only at more efficient use of the OSR, but also at greater economy, especially in the Earth segment. It will be necessary to strike a balance between these factors and, if possible, to leave an interval between the periods chosen for introducing changes in the space and Earth segments.

c.4) Administrative costs for establishing and operating the plan.

The main cost of the plan will arise from the preparation of the planning conference. Once it is established, its management should require very little effort on the part of the ITU and the administrations. For the implementation and operation of the plan, costs will depend on the degree of complexity of the regulatory procedures involved.

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COMMITTEE 6

Japan

POWER CONTROL IN THE FEEDER LINKS
TO BROADCASTING SATELLITES AT 12 GHz

Power control was discussed at the CPM-ORB-84, and section 6.2.10 of Annex 6 to the CPM-ORB Report explained that power control is effective in maintaining a nearly constant level of wanted carrier at the satellite-receiver input during periods of rain, although there are possible disadvantages in its use, and that the feeder-link plan should be established without assuming the systematic application of power control; for specific cases power control could be taken into account within specified limits, provided it is compatible with the interference conditions in the feeder-link plan.

In studying feeder-link interference problems, the geographical location of interfering earth stations and wanted-feeder-link beam areas is another important factor affecting the feeder-link carrier-to-interference ratio (C/I_u). This factor is represented as cross-polarization discrimination (XPIsat) of the wanted-satellite antenna as discussed in § 5.4 of CCIR Report 952 (MOD I) in the equation for the C/I_u calculation.

From the result of the study carried out in Japan, the improvement of C/I_u tends to increase as the rain attenuation increases and also as the elevation angle increases. Moreover, C/I_u improvement depends on XPIsat.

This improvement of C/I_u can be regarded as interference margin which would be available for power control without deteriorating C/I_u as set forth in clear weather.

In this connection, the relationship between increase of earth-transmitter power and rain attenuation at its site is derived as an example in Figure 1.

In Figure 1, Curve (a) indicates the upper limit for transmitter-power increase which does not deteriorate the C/I_u in clear weather. The hatched area enclosed by two lines indicates that within this area the transmitter power can be increased linearly or stepwise, for example as shown in Curve (b) of the figure.

Accordingly, the allowable increase of earth-transmitter power applicable to earth-transmitting stations, without deteriorating the interference ratios in clear weather, is derived, taking into account the geographical locations of the earth stations and the feeder-link beam areas.

In line with this, Table I summarizes examples of probable combination of increase of transmitter power and rain attenuation for various values of XPIsat and elevation angle.

Detailed information has already been submitted to the CCIR Final Meeting as a contribution from Japan (Document 10-11S/134).

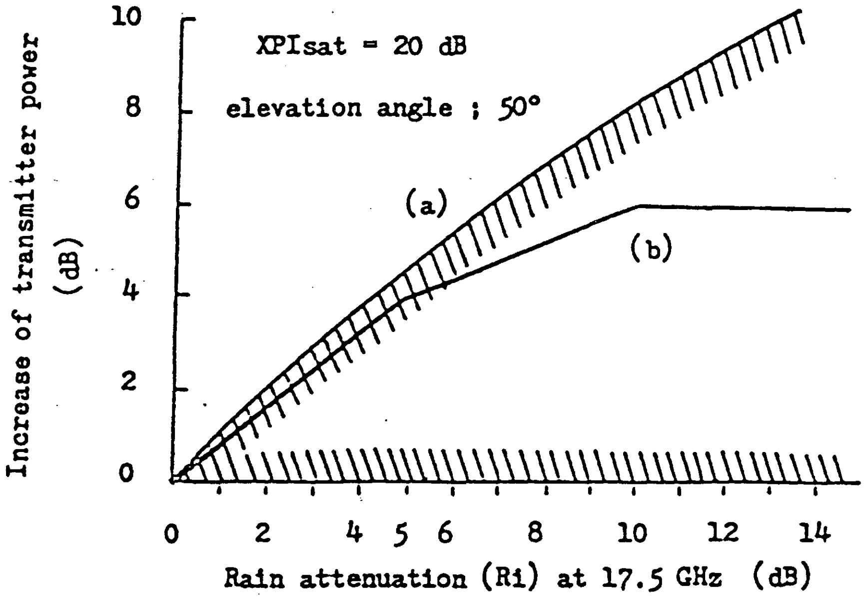

FIGURE 1

The possible increase of transmitter power for power control

Curve (a): upper limit for power control
Curve (b): an example of power control as illustrated in Table I

TABLE I

Possible increase of earth-transmitter power for power control for various values of XPIsat and satellite elevation angle

XPIsat (dB)	Satellite elevation angle (degrees)	Increase of earth-transmitter-power (dB) For rain attenuation 0 dB to 5 dB	For rain attenuation 5 dB to 10 dB and more
10 to 15	0 to 10	0	0
	10 to 30	0 to 4	4 to 7
	30 to 50	0 to 4	4 to 8
	50 to 60	0 to 5	5 to 9
	60 to 90	0 to 5	5 to 10
15 to 20	0 to 10	0	0
	10 to 30	0 to 2	2 to 4
	30 to 40	0 to 3	3 to 4
	40 to 50	0 to 3	3 to 6
	50 to 60	0 to 4	4 to 8
	60 to 90	0 to 5	5 to 9
20 to 25*1	0 to 30	0	0
	30 to 40	0 to 2	2
	40 to 50	0 to 3	3 to 4
	50 to 60*1	0 to 4*1	4 to 6*1
	60 to 90	0 to 5	5 to 8
25 to 30*2	0 to 40	0	0
	40 to 50	0 to 2	2
	50 to 60	0 to 3	3
	60 to 90	0 to 5	5

*1 This case is illustrated with Curve (b) in Figure 1 as an example.

*2 These cases are identical to those given in Table I of Part II in the Final Acts of RARC-SAT-83.

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COMMITTEE 2

SUMMARY RECORD

OF THE

FIRST MEETING OF COMMITTEE 2

(CREDENTIALS)

Wednesday, 14 August 1985, at 1105 hrs

Chairman: Mr. S. SISSOKO (Mali)

Subjects discussed:	Document
1. Terms of reference of the Committee	79
2. Organization of the Committee's work	-

1. Terms of reference of the Committee (Document 79)

The participants took note of the terms of reference of the Committee as set out in Document 79 and further noted that the Committee should report to the Plenary by 10 September 1985.

2. Organization of the Committee's work

2.1 The Chairman proposed that the Committee should set up a small Working Group to carry out its work consisting of the Chairman, the Vice-Chairman and the delegates of the Federal Republic of Germany, Bulgaria and Thailand.

It was so decided.

2.2 In reply to a question by the delegate of United Kingdom, the Secretary of the Committee explained that, after each meeting of the Working Group, it would publish a report listing the countries whose credentials were in order, so that delegations would be kept in touch with the situation and would know which countries were empowered to vote.

The meeting rose at 1115 hours.

The Secretary: The Chairman:

R. MACHERET S. SISSOKO

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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COMMITTEE 7

SUMMARY RECORD

OF THE

FIRST MEETING OF COMMITTEE 7

(EDITORIAL)

Wednesday, 14 August 1985, at 1005 hrs

Chairman: Mr. J.L. BLANC (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

1. <u>Terms of reference of the Editorial Committee (Nos. 473 and 474 of the International Telecommunication Convention, Nairobi, 1982)</u>

<u>Approved</u>.

2. <u>Organization of work</u>

2.1 The <u>Chairman</u> said that, in accordance with past practice, forms would be circulated to delegations to serve as a basis for drawing up the list of participants.

It would be useful if the Committees and Working Groups could begin as soon as possible to prepare their work in a form in which it could be integrated in the report of the first session of the Conference to the second session.

2.2 The <u>Secretary of the Committee</u> added that the Committee Chairmen could be advised of the problem at the next meeting of the Steering Committee so that a draft structure of the report might perhaps be prepared for submission to a forthcoming meeting of that Committee.

Finally, the delegations participating in the Editorial Committee should provide enough members to take account of the possibility that the Committee would have to split up into several Working Groups towards the end of the session.

<u>The meeting rose at 1015 hours</u>.

The Secretary: Chairman:

P.A. TRAUB J.L. BLANC

INTERNATIONAL TELECOMMUNICATION UNION

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COMMITTEES 4 AND 5

United States of America

BURDEN SHARING CONSIDERATIONS
RELATED TO EQUITABLE ACCESS

USA/114/54 1. Introduction

This paper describes the methods and techniques which form the elements of the burden sharing concept as it would be applied to specific frequency bands in the FSS. The concept has different characteristics depending upon the various stages of satellite system development, implementation and operation.

The discussion below defines these different stages and describes the burden sharing elements appropriate for each case.

2. Stages of communication satellite development

The stages of communication satellite system development can generally be put into three categories. These are (a) initial concept and design, (b) implementation, and (c) operation.

2.1 Initial Concept and Design (ICD)

A satellite system in this category has been sufficiently defined such that technical information is available to meet the data requirements of Appendix 4 to the Radio Regulations. This includes specifications of orbit location and frequency, and while the paper design may have been completed implementation has not begun.

2.2 Implementation (IM)

Typically it may take from 36 to 48 months to implement a satellite system. This includes construction of the satellite up to but not including actual launch. Also during this time some ground segments are designed and constructed and the system would have obtained regulatory recognition. Depending on the progress of the implementation programme there can be opportunities to make design changes to accommodate burden sharing. Appendix 3 data on the system should be available.

2.3 Operation (OP)

At this stage the satellite system has been built, launched and is operating from a particular orbit location, with its associated earth segments. Many of the system design features are fixed, although there may be some built-in flexibility such as beam repointing, transponder gain settings, carrier frequency planning, etc.

2.4 Second generation satellite system

At the end of the useful life of a communication satellite, typically 10 years, it is likely to be replaced. At this time, there will be in place an extensive array of earth station users. Therefore, there are a number of transmission parameters which must be retained in order to preserve continued service. On the other hand, the opportunity does exist to incorporate design changes which can assist in burden sharing.

A second generation satellite thus has some of the characteristics of each of the three previous stages.

3. Techniques to be used for burden sharing

Many techniques for improving the use of the GSO in the fixed-satellite service have been identified by Interim Working Party 4/1 of CCIR Study Group 4. These have been enumerated over a number of years and are discussed at length in various CCIR reports. Recommendations have evolved in such areas as station keeping tolerance, pointing accuracy, single entry interference allocation and earth station antenna reference pattern.

In addition, Recommendations are under consideration in the areas of spacecraft antenna, and small aperture earth station antenna side-lobe performance.

The timely introduction and periodic improvement of these techniques provide a mechanism for achieving equitable access for existing and future satellite systems. The use and application of these techniques by existing and future satellite systems constitute aspects of the burden sharing process.

4. Methods applicable to different stages

This paper identifies some of the satellite system parameters which could be considered for adjustment during the different stages of development. Table 1 identifies some of the various system parameters applicable to burden sharing and provides an assessment of their feasibility to be adjusted during the various stages.

TABLE 1

Feasibility of parameter adjustment

METHOD/STAGE	ICD	IM	OP	2nd GEN
- Satellite Relocation	Service Arc	Modest	Small	Modest
- Interference Increase	High	Medium	Medium	High
Traffic Planning	-	High	High	High
- E.S. Antenna Side Lobe	High	Maybe	No	Medium
- Space Craft Antenna Side Lobe	High	Maybe	No	High
- Modulation Scheme	High	Some	Maybe	Maybe
- Transponder Gain Setting	High	High	Maybe	High

The ability to implement any particular technique of burden sharing ranges from high to low as a function of the stage. As an example, the economic, technical and schedule impact of changing the design of a satellite at the beginning of the ICD stage is far less severe than that experienced at the end of the design stage. The same reasoning is valid for the IM stage, in that modifications to the satellite at the beginning of implementation (while expensive and difficult) are far easier to tolerate than modifications made at the end of construction. The latitude for burden sharing allowed by an operational satellite network is severely limited by the existing traffic and installed ground segment.

5. This paper does not represent exhaustive treatment of all technical and operational factors that effect burden sharing. This subject should be given detailed attention during the intersessional period and requires consideration during discussion of "means of achieving efficient harmonization of use of orbit and spectrum".

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COMMITTEES 4 AND 5

United States of America

PROPOSALS REGARDING THE PREVAILING SITUATION

FOR THE 14/11 - 12 GHz FSS BANDS

USA/115/55 Introduction

FSS system in the 14/11 - 12 GHz bands have become operational within the last 6 to 7 years. Within that period they have experienced significant design improvements in orbit/spectrum efficiency and capacity. It is evident that the next several years will witness the continuation of this dynamic phase of technical development resulting in further improvements in performance and cost effectiveness. The current flexible implementation arrangements in this band are an important factor in these positive developments. Some examples of this progress are described in the following section.

One of the attractions of the 14/11 - 12 GHz bands compared to the 6/4 GHz bands, is the ability to employ smaller earth station antennas for various telecommunication services, albeit at the expense of requiring higher satellite e.i.r.p.s. Improved launch systems and satellite transmission power technology is rapidly facilitating this requirement, thus encouraging many new, innovative satellite communication services relying upon small aperture earth station antennas. The principal disadvantage of the higher frequency systems above 10 GHz is the significantly increased RF signal attenuation and depolarization effects in areas subject to heavy rainfalls. This problem is also being mitigated through technology to the extent that significant progress should be forthcoming within several years. Some promising techniques include on-board satellite signal processing, up-link power control and adaptive interference and polarization cancellers.

This band is also amenable to frequency reuse techniques through the employment of spacecraft spot beams or shaped beams which provide good sidelobe discrimination between separated service areas from a single satellite orbit position.

All the past evidence points to the fact that by maintaining flexibility in the implementation of 14/11 - 12 GHz systems, it is likely that the improvements referred to above will meet or outpace future demand for satellite services in the forseeable future.

System design characteristics and developments

The particular space-to-Earth bands that are currently allocated for and used by the FSS vary among the ITU regions as follows:

Region 1: 12.5 - 12.75 GHz

Region 2: 11.7 - 12.2 GHz

Region 3: 12.25 - 12.75 GHz

Worldwide: 10.95 - 11.20 GHz and 11.45 - 11.7 GHz

The Earth-to-space band employed in most cases is 14.0 - 14.5 GHz.

The transponder bandwidths of space stations operating in the above bands vary from 40 MHz to 110 MHz. Some specific bandwidths used are 43, 54, 72 and 110 MHz.

In the United States, the first domestic satellite system operating at 14/11 - 12 GHz was launched in November 1980. It employed single polarization satellite antennas, 43 MHz transponder bandwidths and 20 Watt TWTAs. In April 1983, the United States, taking into account improvements in satellite designs, adapted dual polarization techniques in this band resulting in a two-fold increase in usable bandwidth. Simultaneous with these developments, the output power of TWTAs was also doubled. By late 1983, satellite designs were offered which featured spot beams that provided 8-fold frequency reuse. By 1984, overall spacecraft RF power output designs were increased by a factor of four (from 200 Watts to 800 Watts) compared to the first operational satellites in this band. By virtue of antenna and power features alone, the capacity of FSS satellite systems in this highly dynamic environment have increased at least ten times within the last several years.

With regard to other design aspects, the large variety of telecommunication services which are feasible with 14/11 - 12 GHz satellite systems have resulted in a wide mix of earth station and spacecraft designs. For example, space station receiving system figure-of-merits vary from approximately 3 dB (K^{-1}) to 9 dB(K^{-1}) and per transponder channel e.i.r.p.s vary from 39 to 50 dBW (at edge of average) to 43 to 53 dBW (at boresight) using spot or shaped beams. Earth station antenna diameters vary from approximately 1 metre to 13 metres in diameter.

Operational factors:

Several important aspects of FSS systems operating in the 14/11 - 12 GHz band which need to be recognized in any regulatory arrangement are as follows:

1) The frequency allocations in the space-to-Earth direction currently used for domestic satellite services are different for each of the ITU regions.

2) There is a large imbedded investment in existing systems and networks amounting to billions of dollars.

3) Technological developments are occurring at a rapid rate, and service applications in this band are undergoing many changes. The service and capacity potential of this band has yet to be realized.

4) As of year end 1984 in all ITU regions, the IFRB listed 15 operational satellite systems in this band, 14 in coordination and 37 in advance publication. Assuming a modest orbit reuse factor based on the natural separation of continents and countries, the orbit can accommodate well over 200 satellites.

5) Some of these bands are shared on a primary allocation basis with other services, including the BSS, fixed, mobile and radionavigation.

6) There is interregional sharing of the FSS with the BSS (Region 2 vs. Regions 1 and 3).

7) Many existing or planned 14/11 - 12 GHz FSS systems have been combined with other services and/or frequency bands.

8) There is substantial unused bandwidth in the "expansion" bands allocated to the FSS by WARC-79 (10.7 - 10.95 GHz, downlink; 11.2 - 11.45 GHz, downlink; and 12.75 - 13.25 GHz, uplink) that is available. Since no systems are operating in these bands at present, these bands could be used for some thin route networks (widely distributed earth stations with small antennas) which may require more protection than existing high capacity networks, employing large earth station antennas. Also, it appears that is is premature for existing system operators to make definitive plans to include the use of these frequency bands in future generations of satellites.

9) Bands above 10 GHz could experience significant levels of signal attenuation and depolarization in the presence of heavy rainfall. Service availability could be affected under these circumstances. However, improved technical techniques are emerging that will significantly reduce these environmental effects. The costs of these equipments will diminish as they achieve wide acceptance, and overall system cost effectiveness will undoubtedly increase with further developments.

Conclusions

The FSS in the 14/11 - 12 GHz bands are in a transitional period of rapid development which promises to result in substantial improvements in performance and capacity. Satellite system designs and services are still evolving to meet a number of new innovative customer communication service requirements. It is important to maintain a flexible operational environment in this band in order to realize this potential.

In addition, the expansion bands already allocated to the FSS provide at least a doubling of spectrum/orbit resources through employment of the same technology as that used for current satellite systems.

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COMMITTEES 4 AND 5

United States of America

ADDITIONAL TECHNICAL INFORMATION RELATING TO THE SITUATION PREVAILING IN THE 6/4 GHz FREQUENCY BANDS

USA/116/56 Introduction

Among the various frequency bands allocated to the FSS between 3.4 and 7.025 GHz, there is one band pair which is extensively used world-wide today, (i.e. 5.925 - 6.425 GHz up-link and 3.7 - 4.2 GHz down-link). This frequency pair was developed using the technology of the well-established fixed service bands, at the same frequencies. Because these bands were shared with the fixed service, satellite system designs included frequency plans which were more or less uniform in order to ease sharing constraints with the standard frequency plans of the fixed service.

On the other hand, the modulation characteristic and the earth station antenna sizes varied significantly, making inter-network intra-service sharing a more difficult exercise as the orbit became more heavily used. This has lead existing system operators, especially in the US domestic satellite service, to employ advanced techniques and design (e.g. lower side-lobe antennas, polarization isolation and shaped beams).

Several of the other frequency bands allocated to the FSS in the frequency range are limited in their use by significant inter-service sharing considerations. However, there is a 300 MHz band (4.5 - 4.8 GHz down-link used with 6.425 - 6.725 GHz up-link for example) which does not have significant sharing constraints in many parts of the world. Since these bands are essentially unused by the FSS today, system implementation might initially use larger satellite spacings associated with less advanced technology. In addition, because of the proximity to the conventional 6/4 GHz band, the technology from this band could be transferred to the 6/4 GHz expansion band without significant cost.

Below are listed some technical aspects of these two frequency band pairs which should be considered in evaluating the situation prevailing.

Some major aspects of the 6/4 GHz FSS band systems are:

1) At the present time, there is a very large imbedded investment in high capacity 6/4 GHz systems in international and domestic networks throughout the world. The US satellite system facilities alone amount to 3 or 4 billion US dollars; world-wide the investment is on the order of US $ 20 billion.

2) Existing FSS systems have a wide variety of technical characteristics, performance parameters, and operational features, and the trend is towards more diversity.

3) The band is shared on a primary basis with the most heavily used terrestrial fixed services (FS).

4) Many hybrid (more than one service and/or service frequency band) satellite systems use the 6/4 GHz band.

5) The heavy use of this band dictates satellite spacings which are quite small requiring the application of techniques and designs to limit interference from other satellite networks.

Some major aspects of the 6/4 GHz expansion bands 6.425 - 6.725 GHz up 4.5 - 4.8 GHz down

1) With dual polarization, the total bandwidth per space craft available is 600 MHz for both up- and down-link.

2) Based upon conventional systems, each such satellite could provide from 16 to 32 analogue TV channels, as high as 750 Mbps of digital data, or from 10,000 to 50,000 equivalent voice circuits, or any combination of these services as required by local conditions.

3) The band 4.5 - 4.8 GHz and 6.425 - 6.725 GHz are shared on a primary basis with fixed and mobile services, which are lightly used in many parts of the world.

4) This band is currently not in use, by the FSS, making moderate to large satellite spacing possible initially.

5) The technology developed for the conventional 6/4 GHz bands can be transferred to these frequency bands without any significant cost differences.

6) Propagation effects are essentially identical to those of the conventional 6/4 GHz bands.

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WORKING GROUP 6B

Report from Sub-Working Group 6B-1 to Working Group 6B

ELEMENTS FOR CONSIDERATION WITH RESPECT TO THE APPROPRIATE FREQUENCY BANDS WHERE THE FREQUENCY PLAN FOR FEEDER LINKS SHOULD BE ESTABLISHED

1. Introduction

In the second meeting of Working Group 6B, it was decided to establish a Sub-Working Group 6B-1. The terms of reference of Sub-Working Group 6B-1 are to summarize proposals and the initial discussion in Working Group 6B on the question of frequency bands for planning the broadcasting-satellite feeder links. This will enable Working Group 6B to make a choice on the band(s).

2. Available frequency bands for planning

The following frequency bands are available for planning the broadcasting-satellite feeder links (see Resolution No. 101).

Region 1		Region 3
10.7 - 11.7 GHz		
14.5 - 14.8 GHz	limited to countries outside Europe and to Malta	14.5 - 14.8 GHz
17.3 - 18.1 GHz		17.3 - 18.1 GHz

3. Summary of proposals

All administrations, who have submitted proposals on this item, propose to make use of the frequency band 17.3 - 18.1 GHz when preparing the plan for feeder links.

Also, it is generally accepted that the band 14.5 - 14.8 GHz could be used for some feeder links. Some administrations propose that the use of the band 14.5 - 14.8 GHz could be planned. Many administrations propose that this band should only be used in exceptional cases, or be subject to procedures of coordination.

Very few administrations propose to make use of the band 10.7 - 11.7 GHz.

4. Summary of discussion in Working Group 6B

4.1 There was general agreement that:

- the band 17.3 - 18.1 GHz should be subject to planning;

- the band 10.7 - 11.7 GHz should not be considered for planning.

4.2 Some delegations were of the view that the plan should only be established in the band 17.3 - 18.1 GHz.

Many delegations were of the view that the plan should primarily be prepared for the band 17.3 - 18.1 GHz, and that the band 14.5 - 14.8 GHz should be available for planning in exceptional cases*, or be subject to procedures of coordination (in accordance with the Table of Frequency Allocations).

Some delegations were in favour of preparing the plan, making use of both bands 17.3 - 18.1 GHz and 14.5 - 14.8 GHz, based on the preference of each administration.

Some delegations were of the opinion that the band 17.3 - 17.8 GHz could be used for planning in Region 3, while others suggested the full 17.3 - 18.1 GHz band should be available.

4.3 Considerations on the band 17.3 - 18.1 GHz

This band, which is 800 MHz wide and is allocated on a world-wide primary basis to the FSS (E to S) limited to feeder links for the BSS, would enable a direct frequency translation of the channels of Appendix 30, for a given country. This would have significant economic advantages in the design of the satellites for broadcasting and also ensure efficient and effective use is made of the radio frequency spectrum.

To make better use of the frequency spectrum and the geostationary satellite orbit, it would be helpful to concentrate all (or as much as possible) of the feeder links in one band. This is only possible in the band 17.3 - 18.1 GHz, which has the additional advantage of being chosen in Region 2 in the Plan of 1983. Interregional sharing constraints will thus be minimized.

4.4 Considerations on the band 14.5 - 14.8 GHz

This band, which is 300 MHz wide would probably be insufficient to provide feeder links for all channels of Appendix 30.

One argument put forward for the band 14.5 - 14.8 GHz is that the rainfall attenuation is less than in the band 17.3 - 18.1 GHz. Also, the technology is well established in this band. These factors could in some cases lead to cost savings by using the band 14.5 - 14.8 GHz. These savings are, in the opinion of some delegations, likely to be marginal. Recent estimates provided by one administration shows, on average, 1.5 dB higher attenuation due to rainfall in the band 17.3 - 18.1 GHz compared to the band 14.5 - 14.8 GHz. As to the cost of equipment production, the advantage of large-scale production can be expected if a large number of feeder links are established in one band.

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* The definition of exceptional cases should be elaborated further.

5. Concluding remarks

The frequency plan should provide for feeder links to all channels of Appendix 30, based on the requirements of the administrations.

From the economic point of view, it would be disadvantageous for a given country to have their feeder links partly in one band and partly in the other. This may not apply if an administration wishes to establish only a part of its feeder links.

Many delegations were of the view that the planning should try to satisfy the requirements as far as possible by making use of frequencies in the band 17.3 - 18.1 GHz. If this should prove impracticable, the band 14.5 - 14.8 GHz should also be utilized, as appropriate.

Some delegations favoured the use of the band 14.5 - 14.8 GHz on equal terms with the band 17.3 - 18.1 GHz.

It should be clarified in what cases the band 14.5 - 14.8 GHz should be used, because of the limited bandwidth.

L. GRIMSTVEIT
Chairman of Sub-Working Group 6B-1

INTERNATIONAL TELECOMMUNICATION UNION

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WORKING GROUP 6B

Report from Sub-Working Group 6B-1 to Working Group 6B

ELEMENTS FOR CONSIDERATION WITH RESPECT TO THE APPROPRIATE FREQUENCY BANDS WHERE THE FREQUENCY PLAN FOR FEEDER LINKS SHOULD BE ESTABLISHED

1. Introduction

In the second meeting of Working Group 6B, it was decided to establish a Sub-Working Group 6B-1. The terms of reference of Sub-Working Group 6B-1 are to summarize proposals and the initial discussion in Working Group 6B on the question of frequency bands for planning the broadcasting-satellite feeder links. This will enable Working Group 6B to make a choice on the band(s).

2. Available frequency bands for planning

The following frequency bands are available for planning the broadcasting-satellite feeder links (see Resolution No. 101).

Region 1		Region 3
10.7 - 11.7 GHz		
14.5 - 14.8 GHz	limited to countries outside Europe and to Malta	14.5 - 14.8 GHz
17.3 - 18.1 GHz		17.3 - 18.1 GHz

3. Summary of proposals

All administrations, who have submitted proposals on this item, propose to make use of the frequency band 17.3 - 18.1 GHz when preparing the plan for feeder links.

Also, it is generally accepted that the band 14.5 - 14.8 GHz could be used for some feeder links. Some administrations propose that the band 14.5 - 14.8 GHz could be used for planning. Many administrations propose that this band should only be used in exceptional cases, or be subject to procedure of coordination.

Very few administrations propose to make use of the band 10.7 - 11.7 GHz.

4. Summary of discussion in Working Group 6B

4.1 There was general agreement that:

- the band 17.3 - 18.1 GHz should be subject to planning;
- the band 10.7 - 11.7 GHz should not be considered for planning.

4.2 Some delegations were of the view that the plan should only be established in the band 17.3 - 18.1 GHz.

Many delegations were of the view that the plan should primarily be prepared for the band 17.3 - 18.1 GHz, and that the band 14.5 - 14.8 GHz should be available for planning in exceptional cases*, or be subject to procedure of coordination (in accordance with the Table of Frequency Allocations).

Some delegations were in favour of preparing the plan, making use of both bands 17.3 - 18.1 GHz and 14.5 - 14.8 GHz, based on the preference of each administration.

Some delegations were of the opinion that the band 17.3 - 17.8 GHz could be used for planning in Region 3, while others suggested the full 17.3 - 18.1 GHz band should be available.

4.3 Considerations on the band 17.3 - 18.1 GHz

This band, which is 800 MHz wide and is allocated on a world-wide primary basis to feeder links for the BSS, would enable a direct frequency translation of the channels of Appendix 30, for a given country. This would have significant economic advantages in the design of the satellites for broadcasting and also ensure efficient and effective use is made of the radio frequency spectrum.

To make better use of the frequency spectrum and the geostationary satellite orbit, it would be helpful to concentrate all (or as much as possible) of the feeder links in one band. This is only possible in the band 17.3 - 18.1 GHz, which has the additional advantage of being chosen in Region 2 in the Plan of 1983. Interregional sharing constraints will thus be minimized.

4.4 Considerations on the band 14.5 - 14.8 GHz

This band, which is 300 MHz wide would probably be insufficient to provide feeder links for all channels of Appendix 30.

One argument put forward for the band 14.5 - 14.8 GHz is that the rainfall attenuation is less than in the band 17.3 - 18.1 GHz. Also, the technique is well established in this band. These factors could in some cases lead to cost savings by using the band 14.5 - 14.8 GHz. These savings are, in the opinion of some delegations, likely to be marginal. Recent information provided by one administration shows in average 1.5 dB higher attenuation due to rainfall in the band 17.3 - 18.1 GHz compared to the band 14.5 - 14.8 GHz. As to the cost of equipment production, the advantage of large-scale production can be expected if a large number of feeder links are established in one band.

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* The definition of exceptional cases should be elaborated further.

5. Concluding remarks

The frequency plan should provide for feeder links to all channels of Appendix 30, based on the requirements of the administrations.

From the economic point of view, it would be disadvantageous for a given country to have their feeder links partly in one band and partly in the other. This may not apply if an administration wishes to establish a part of its feeder links.

Many delegations were of the view that the planning should try to satisfy, as far as possible, the requirements by making use of frequencies in the band 17.3 - 18.1 GHz. If this should prove impracticable, the band 14.5 - 14.8 GHz should also be utilized, as appropriate.

Some delegations favoured the use of the band 14.5 - 14.8 GHz on equal terms with the band 17.3 - 18.1 GHz.

It should be clarified in what cases the band 14.5 - 14.8 GHz should be used, because of the limited bandwidth.

L. GRIMSTVEIT
Chairman of Sub-Working Group 6B-1

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 **WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT**

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Corrigendum 1 to
Document 118-E
12 September 1985
Original: English

COMMITTEE 5

SUMMARY RECORD

OF THE

SECOND MEETING OF COMMITTEE 5

(PLANNING PRINCIPLES AND CRITERIA AND REGULATORY AND ADMINISTRATIVE PROCEDURES)

1. Delete the reference to the Islamic Republic of Iran in paragraph 1.14.

2. Replace paragraph 1.25 by the following:

"1.25 The delegate of the Islamic Republic of Iran suggested that until the time that the proposal was submitted in writing and discussed further, Committee 5 should not take any decision, even on a provisional basis, in that regard."

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 118-E
23 August 1985
Original: French

COMMITTEE 5

SUMMARY RECORD

OF THE

SECOND MEETING OF COMMITTEE 5

(PLANNING PRINCIPLES AND CRITERIA AND REGULATORY AND ADMINISTRATIVE PROCEDURES)

Thursday, 15 August 1985, at 0905 hrs

Chairman: Mr. M. MENCHEN ALUMBREROS (Spain)

Subject discussed:

1. Reports of Working Group Chairmen

1. Reports of Working Group Chairmen

1.1 The Chairman of Working Group 5A said that his Group had held three meetings. Several proposals had been introduced concerning items 1 and 2 of its terms of reference. A provisional decision had been taken, to the effect that the fixed-satellite service could be considered for planning. Proposals had also been made concerning items 3 and 4 of the Working Group's terms of reference. The Working Group had decided, at that stage of its work, not to define the term "planning". If it were allowed enough time, it would complete the introduction of proposals concerning items 3 and 4 before the following Monday.

1.2 The Chairman of Working Group 5B said that his Group had held two meetings. It had adopted a working method and had decided, with regard to the directives applicable to the regulatory procedures associated with frequency bands and services which would not be planned, that the main lines of the existing procedure could meet the requirements of the various services. The Working Group had also considered the advance publication procedure and, in the same context, discussed coordination procedures in order to establish the relationship between the two types of procedure. Lastly, it would not be able to reach any further conclusions until Working Group 5A had made sufficient progress to provide the information it required.

1.3 The delegate of India suggested that the time devoted in Working Group 5A to introducing proposals should be reduced, thereby providing more time for discussion.

In order to fulfil item 2 of its terms of reference, Working group 5B would need information from Working Group 5A, since it would find it difficult to specify the procedures applicable to the services and frequency bands without knowing which services and bands were concerned. If Working Group 5A's conclusion regarding the fixed-satellite service were confirmed, that would speed up the work of Working Group 5B. Similarly, it would be useful if a similar decision could be taken regarding the frequency bands to be planned.

1.4 The Secretary-General considered that Working Group 5A should settle certain questions concerning the classification of services to be planned.

1.5 He was supported by the delegate of Sweden, who emphasized that contact should be established between Working Group 5A and other Committees and Working Groups of the Conference.

1.6 The Chairman requested delegations to be briefer when introducing documents in Working Group 5A and the Chairman of Working Group 5A said that he would once again ask delegations to curtail their statements. However, the delegate of France observed that it would be difficult to limit the time allowed for introducing new proposals since all delegations should enjoy equal treatment.

1.7 With regard to the resumption of the activities of Working Group 5B, the delegates of Kenya and Saudi Arabia considered that Working Group 5A should first complete its work.

1.8 The Chairman, supported by the delegates of the United States and Liberia, expressed the view that Working Group 5B should consider other services and should try to identify regulatory procedures which could be applied to the space research, earth exploration-satellite and other services.

1.9 The delegate of France suggested that the Working Group should take up item 2.4 of the Conference's agenda.

1.10 The delegate of Algeria requested that as far as possible the two Working Groups should meet consecutively and not simultaneously.

1.11 The delegate of Canada proposed that the provisional decision of Working Group 5A should be communicated to Committee 4, possibly in the form of a note. He was supported by the delegate of the United States, who observed that Committee 4 could provide information of a technical nature on the subject.

1.12 The delegate of the Islamic Republic of Iran, supported by the delegate of India, said that since the decision was provisional, it seemed premature to ask Committee 4 for information.

1.13 The Secretary-General said that, from the procedural standpoint, it would not be advisable to communicate information to Committee 4.

1.14 The delegate of Algeria, supported by the delegates of France, Portugal and the Islamic Republic of Iran, proposed the adoption of the following text: "Committee 5 decides that the fixed-satellite service is the only service to be considered for possible planning by this Conference."

1.15 The delegate of Italy supported the proposal, to which the phrase "in certain frequency bands" might be added. The delegate of Algeria accepted that addition.

1.16 The delegates of Argentina, Kenya, Liberia, Jordan and Mexico supported the proposal as amended, and the Chairman of Working Group 5A said that he had no objection to it.

1.17 The delegate of Canada said that he did not oppose the proposal by the delegate of Algeria; however, he drew attention to the fact that his country had made a proposal concerning the 23 GHz band, for which another conference towards the middle of the next decade might have to establish plans.

1.18 The delegate of Mexico said that there were services other than the fixed-satellite service with relatively few satellites using the orbit/spectrum at the moment, but would likely expand in the future, which might restrict possibilities of future access to those resources. Committee 4 should therefore be asked to establish some technical criteria to determine the rate of orbit/spectrum occupancy above which planning was necessary. He was supported by the delegates of Colombia and Ecuador, who observed that their countries had submitted proposals along those lines to the Conference.

1.19 The delegate of the United States proposed that the words "by this Conference" be deleted to avoid any ambiguity as to which session was meant. For the delegate of Algeria there was no doubt that the wording referred to the two sessions of the Conference.

1.20 The Secretary-General recalled that the second session was to consider broadcasting-satellite service up-links for Regions 1 and 3. Also, as the WARC-ORB 85 had its own character, it would be preferable to find another wording to avoid any misunderstanding.

1.21 The representative of the IFRB agreed with the Secretary-General's comments and proposed the following wording: "With regard to item 2.2 of the agenda of the Conference, Committee 5 ... for possible planning by the second session of the Conference". He was supported by the delegates of Algeria, India, Liberia, the United States and Sweden.

1.22 The delegate of Ecuador having proposed that the words "on the clear understanding that other services may be planned in view of the degree of congestion of the orbit/spectrum" be added, the delegate of Algeria explained that his proposal did not rule out planning of other services by other conferences.

1.23 The Chairman proposed that Committee 5's decision be worded as follows:

"With regard to item 2.2 of the agenda of this session of the Conference, Committee 5 decides that the fixed-satellite service, in certain frequency bands /_ to be identified later_/, is the only service for possible planning at the second session of the Conference".

1.24 The representative of the IFRB requested the Committee to authorize Working Group 5A to examine the text in detail, having regard to the relationship between the fixed-satellite service and other space services sharing the same band.

1.25 The delegate of the Islamic Republic of Iran suggested that the proposal should be submitted in writing.

1.26 After further discussion involving the delegates of Algeria, Colombia, Egypt, China, Kenya, Senegal, the United States, Yugoslavia and Argentina, several of whom considered that the proposed text could give rise to misunderstanding, particularly with regard to the terms "planning" and "possible", the Chairman suggested that the discussion should be closed and the Committee's decision postponed. With regard to the provisional decision of Working Group 5A, he proposed that the Chairman of Committee 4 should be approached unofficially.

It was so decided.

It was also decided that Working Group 5A would continue its work on the basis of the provisional decision and submit a written report to the next meeting of Committee 5.

The meeting rose at 1135 hours.

The Secretary:	The Chairman:
M. GIROUX	M. MENCHEN ALUMBREROS

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 119-E
15 August 1985
Original: English

PLENARY MEETING

United Kingdom

STUDY OF REVERSE BAND WORKING

(Information Note)

1. INTRODUCTION

1.1 During the UK preparations for WARC-ORBIT 1 various methods of resource enhancement were considered in order to maximise the capacity of the geostationary satellite orbit (GSO) and the FSS frequency bands thus facilitating equitable access by all countries. One method of enhancement considered was that of reverse band working (RBW) and this paper provides a summary of a study of reverse band working commissioned by the United Kingdom Administration.

1.2 Currently satellite communications systems operate with one frequency band allocated for transmission to the satellite and a completely separate band for transmissions from the satellite to the ground. For example many systems transmit to the satellite in the 6GHz band and receive from the satellite in the 4 GHz band. Another such pair of bands is the case of 14GHz up and 11 GHz down. However there is no technical impediment to systems working in the reverse direction e.g. 4GHz up and 6GHz down. This is known as reverse band working. For the purposes of this paper the conventional method of working will be known as forward band working (FBW).

1.3 The choice of higher frequency in the earth to space direction for FBW was made many years ago because the most sensitive path is that of space to earth where only limited transmit power is available and least attenuation in the lower band for the space to earth direction was preferred. The development of improved satellite power sources and amplifiers has led to a reduction in the necessity for this restriction. Thus it is that reverse band systems are feasible and when combined with FBW systems can produce significant resource enhancement.

1.4 It is important to recognise from the outset that RBW is only one aspect of resource enhancement and several techniques can be employed together to give a larger resource capacity

2. FUNDAMENTALS OF REVERSE BAND WORKING

2.1 In reverse band working the up and down frequencies are transposed with respect to the forward band working case. Examination of the relevant formulae for calculating carrier to interference ratios (C/I) indicate that although the role of uplink and downlink C/I reverse the overall C/I is the same. Thus it can be concluded that for a set of systems operating only in the RBW mode then the C/I situation is virtually the same as a set of systems operational only in the FBW mode. Some slight differences can occur due to the higher rainfall attenuation and hence rain margin at the higher frequency but this is a relative minor effect.

2.2 When a mixed arrangement of systems using FBW and RBW is operated then additional interference entries occur from the alternate band system. For the purposes of this paper this additional interference entry is termed cross-directional interference. The magnitude of the cross-directional interference can be a critical factor in limiting the overall benefits of mixed direction working.

2.3 It is important to recognise that the terrestrial interference entries are different in the forward and reverse band cases as they are unbalanced and originate from potentially different networks.

3. GENERAL SYSTEM PARAMETERS AND CASE STUDIES

3.1 For the purposes of this study a number of parameters were selected and various assumptions were made. The analysis was then conducted by using a general approach to obtaining C/I figures where possible and to assessing the situation for a number of case studies, each having a set of different parameters that would represent realistic networks.

Five cases were considered. The details are as follows.

CASE 1

FREQUENCY BANDS	6/4 GHz
SPACECRAFT ANTENNA	A) GLOBAL B) SPOT BEAM (2.7m)
EARTH STATION ANTENNA DIAMETER	(INTELSAT Std A) 33m
COVERAGE AREA SEPARATION	OVERLAPPING (0 dB advantage)

CASE 2

FREQUENCY BANDS	6/4 GHz
SPACECRAFT ANTENNA	A) GLOBAL B) SPOT BEAM (2.7m)
EARTH STATION ANTENNA DIAMETER	(INTELSAT Std B) 11m
COVERAGE AREA SEPARATION	OVERLAPPING (0 dB advantage)

CASE 3

FREQUENCY BANDS	14/11 GHz
SPACECRAFT ANTENNA	SPOT BEAM (2.7m)
EARTH STATION ANTENNA DIAMETER	(INTELSAT Std E3) 9m
COVERAGE AREA SEPARATION	OVERLAPPING (0 dB advantage)

CASE 4

FREQUENCY BANDS	6/4 GHz
SPACECRAFT ANTENNA	A) GLOBAL B) SPOT BEAM (2.7m)
EARTH STATION ANTENNA DIAMETER	(reference domestic) 7m
COVERAGE AREA SEPARATION	OVERLAPPING (0 dB advantage)

CASE 5

FREQUENCY BANDS	6/4 GHz
SPACECRAFT ANTENNA	SPOT BEAM (2.7m)
EARTH STATION ANTENNA DIAMETER	(reference domestic) 7m
COVERAGE AREA SEPARATION	NON-OVERLAPPING
BEAM SEPARATION ADVANTAGE	3 dB

3.2 The possible satellite spacings for the co-directional situation were analysed for these five cases assuming a multiple entry threshold C/I of 26 dB. The following table summarizes the results of this analysis.

MINIMUM ORBITAL SPACING OF SATELLITES (degrees)				
CASE	NO POLARISATION ALTERNATION		WITH POLARISATION ALTERNATION	
	32-25log(Theta)	29-25log(Theta)	32-25log(Theta)	29-25log(Theta)
1	1.3	1.0	0.8	0.6
2	2.3	2.5	1.9	1.5
3	1.9	1.5	1.1	0.9
4	4.5	3.5	2.7	2.1
5	3.4	2.6	2.0	1.5

4. SPECIFIC INTERFERENCE CONSIDERATIONS

4.1 When a set of reverse band or forward band systems is operated in isolation then the number of satellites that can be accommodated in orbit is dependent upon the satellite spacing. This is in turn dependent upon the acceptable threshold of interference.

4.2 When both forward and reverse band systems are operated in proximity using the same frequency bands then there is a possibility for interference between the two types of systems. This interference (denoted cross-directional interference) gives rise to a potential increase in the interference that already exists between adjacent networks working in the same direction.

4.3 If it is possible to introduce a mixed band working arrangement where an optimised co-directional system previously existed then if the reverse system is also of the same optimised and homogeneous form the maximum theoretical increase in the number of satellites will be 100%.

4.4 When cross-direction interference is taken into account then the enhanced orbit capacity will be less than 100%, the precise figure depending upon the level of interference which is dependent on satellite antenna performance and coverage areas. In one example (case study 4) we would get a satellite spacing of 3.5 degrees for FBW systems but this spacing would have to be increased to 4 degrees if a similar pattern of RBW systems is overlaid, ie an improvement of 76%.

4.5 It is worth noting that if the co-directional satellite systems are homogeneous, and consequently the satellites are equally spaced at S degrees, then the addition of similar reverse band systems could not achieve spacings less than S degrees and the best cross-directional interference situation arises when the two arrangements are offset by a spacing of S/2 degrees. Thus, in a homogeneous equally-spaced satellite arrangement there is no need to strive for spacings between the forward and reverse satellites of less than S/2, except where it is necessary to cater for satellite location tolerance.

4.6 If however some flexibility in the arrangements is required, as is currently the case, then it is worthwhile studying how close a cross-directional satellite may be placed. Thus there is a need for analysis of the case where a degree of inhomogeneity is recognised.

4.7 The value of the cross directional interference is comprised of three factors:-

1) satellite to satellite interference,
2) Earth station to earth station interference,
3) terrestrial radio-relay interference.

These three factors were considered in turn, the first two only occur with RBW. Reference to Figure 1 will assist in understanding these cross-directional interference mechanisms.

5. SATELLITE TO SATELLITE INTERFERENCE

5.1 For the multiple entry situation it is necessary to sum the contributions from the nearby satellites and to include the special case of 'antipodal' satellites. These are the satellites on opposite sides of the limb of the earth which can cause interference if they are not mutually obscured by the earth. The concept of antipodal satellites is depicted in Figure 2.

5.2 Calculations were performed for all of the study cases. In each case the following assumptions were made:-

1) homogeneous network of satellites;
2) satellite transmitter power of 20 W;
3) earth station transmitter power of 100 W;
4) minimum satellite antenna gain of -5 dB.

5.3 The last three were considered to be typical values; any changes in them having the effect of simply offsetting the curves of C/I versus angular separation.

5.4 The study also showed that the interference from forward to reverse is worse than reverse to forward. In a forward band satellite being interfered with at 6 GHz the C/I is 7 dB higher than a satellite being interfered with at 4 GHz. This is due to the frequency dependence of the the path losses and antenna gains. However if we assume the same satellite antenna pattern for both forward and reverse band working, ie their gains are independent of frequency, the difference is only 3.5 dB. The remaining 3.5 dB can be compensated for by increasing the earth station eirp, this will alter the link budgets but will not change the basic satellite spacing factors.

5.5 Antipodal interference depends on the eirp radiated in the direction of the limb of the earth and the receiving satellite antenna gain towards the limb of the earth. Near-antipodal satellites will have an effect which is greater with global beams than with spot beams. In an example considered in the study 40% of the interference came from the satellite nearest the earth (and 13% came from the fourth satellite away) in the case of global beams whereas 98% came from the nearest satellite in the case of spot beams (and no significant interference came from the fourth away).

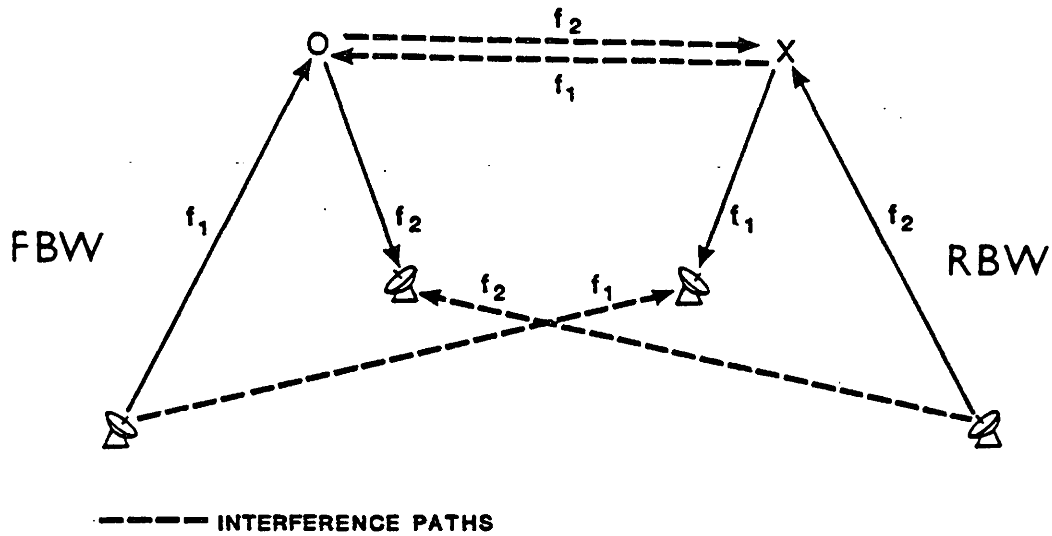

FIGURE 1

ADDITIONAL INTERFERENCE PATHS FOR MIXED FORWARD AND REVERSE BAND SYSTEMS

The interference path between satellites at nearly antipodal locations is shown in the following figure.

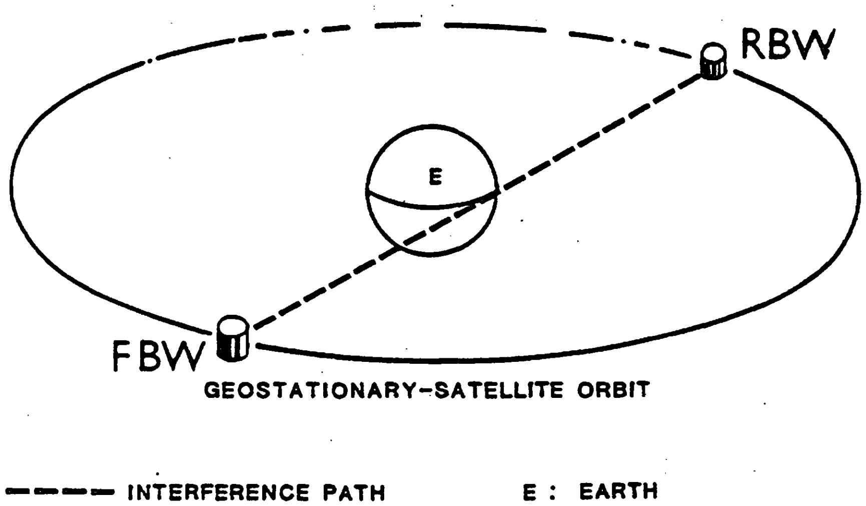

FIGURE 2

ANTIPODAL INTERFERENCE SITUATION

5.6 Figure 3 shows the worst case resulting from a computer analysis of the total satellite to satellite C/I versus orbital separation for the case studies considered. The fluctuations arise when satellite separation is altered and the antipodal satellites pass into the shadow of the earth. The fluctuations are less for global beams.

5.7 Figure 3, with its curve showing the multiple entry C/I excluding antipodal interference, also shows that the antipodal interference can be severe. However by reducing earth edge illumination the C/I rapidly improves. Figure 4 depicts the zones around which pointing restrictions could apply to miminise antipodal interference. If both receive and transmit satellite antennas are pointed away from the limb of the earth by at least half of their respective 3 dB beamwidths, then the C/I is improved by at least 18 dB.

6. EARTH STATION TO EARTH STATION INTERFERENCE

6.1 There are a wide variety of possible interference mechanisms; a short list is given below.

a) Propagation of the interfering signal by tropospheric forward scatter.

b) Propagation by ducting.

c) Propagation by diffraction.

d) Propagation by rain scatter.

e) Propagation by forward scatter due to aircraft.

f) Propagation by reflection due to hills, buildings etc.

6.2 In the case of interference between radio-relay links and earth stations these interference mechanisms have been evaluated in the literature and the results, with the possible exception of the more esoteric cases, summarised in CCIR Reports.

6.3 Thus for the purpose of this study it was sufficient to review each mechanism and study how relatively significant it is, when restricted to the case of earth station to earth station interference.

6.4 The list of mechanisms may be subdivided into two groups, CCIR propagation mode (1) - great circle propagation mechanisms, and propagation mode (2) - scattering.

6.5 The two propagation modes and the appropriate interference criteria were reviewed in detail and numerous example coordination areas were determined, Figure 5 is one example. The results of the review are summarised as follows:-

6.5.1 CCIR Mode 1 (Great circle propagation)

Coordination distances will be less than the coordination distances for radio relay link to earth station interference. Typically at a minimum earth station elevation angle of 3 degrees the required loss between isotropic antennas is reduced by 5dB.

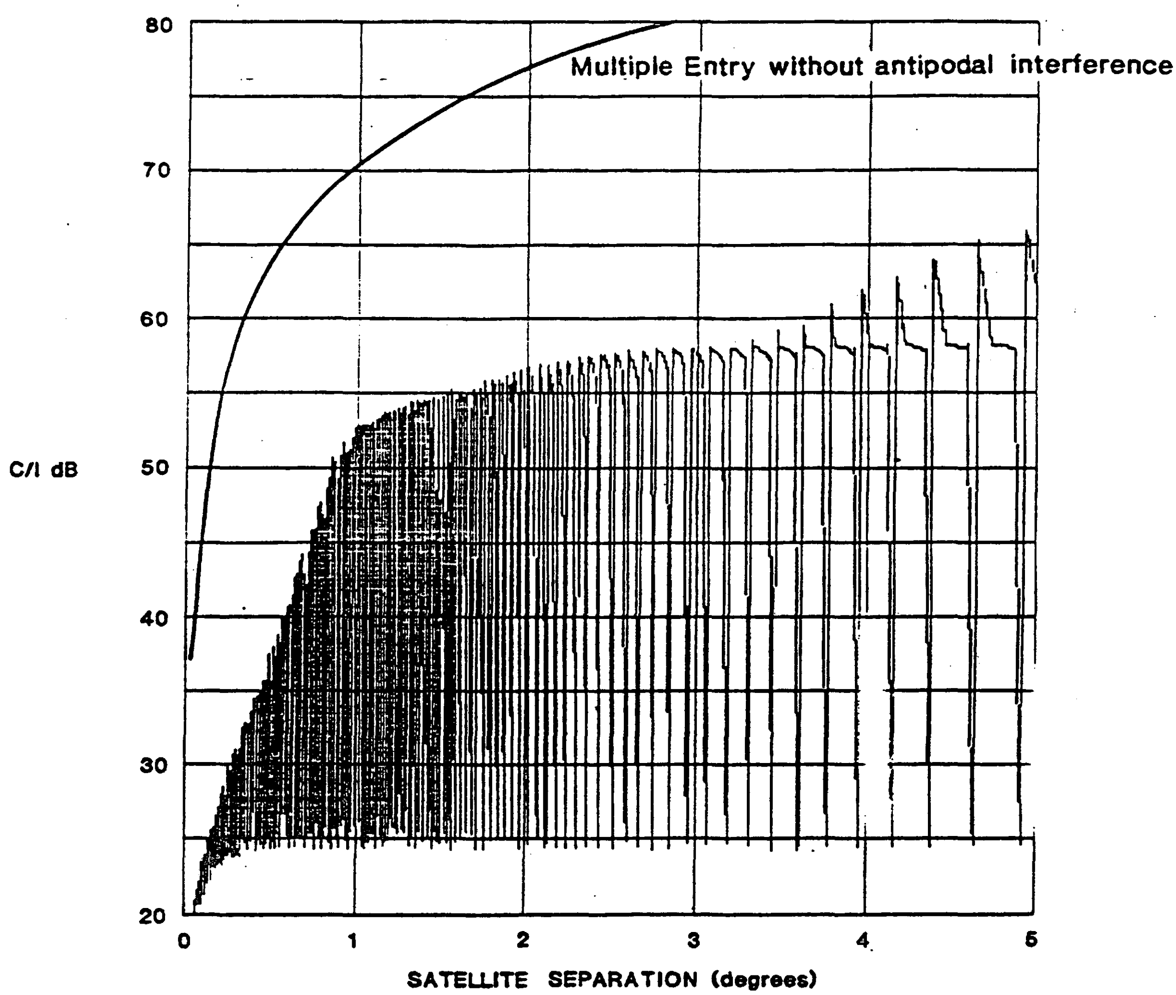

FIGURE 3

SATELLITE TO SATELLITE INTERFERENCE INCLUDING ANTIPODAL REVERSE BAND SATELLITE INTERFERING WITH FORWARD BAND SATELLITE

CASE STUDY 4 (B)

(7 metre earth station —— spot beam)
(edge illumination -3dB)

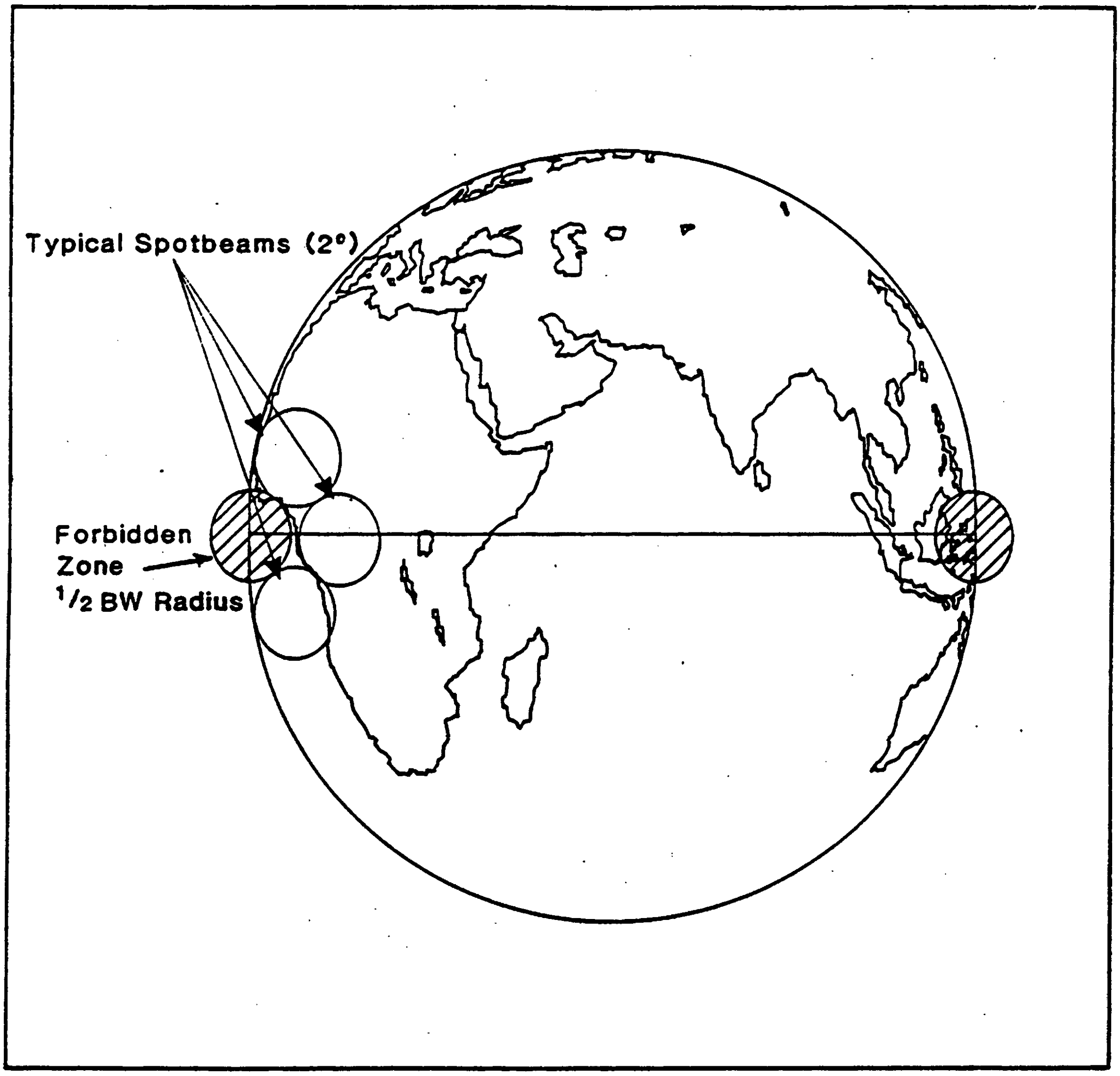

FIGURE 4

POSSIBLE RESTRICTIONS OF BEAM POINTING TO ENABLE A REDUCTION IN ANTIPODAL INTERFERENCE

(1/2 Beamwidth can give 18dB improvement)

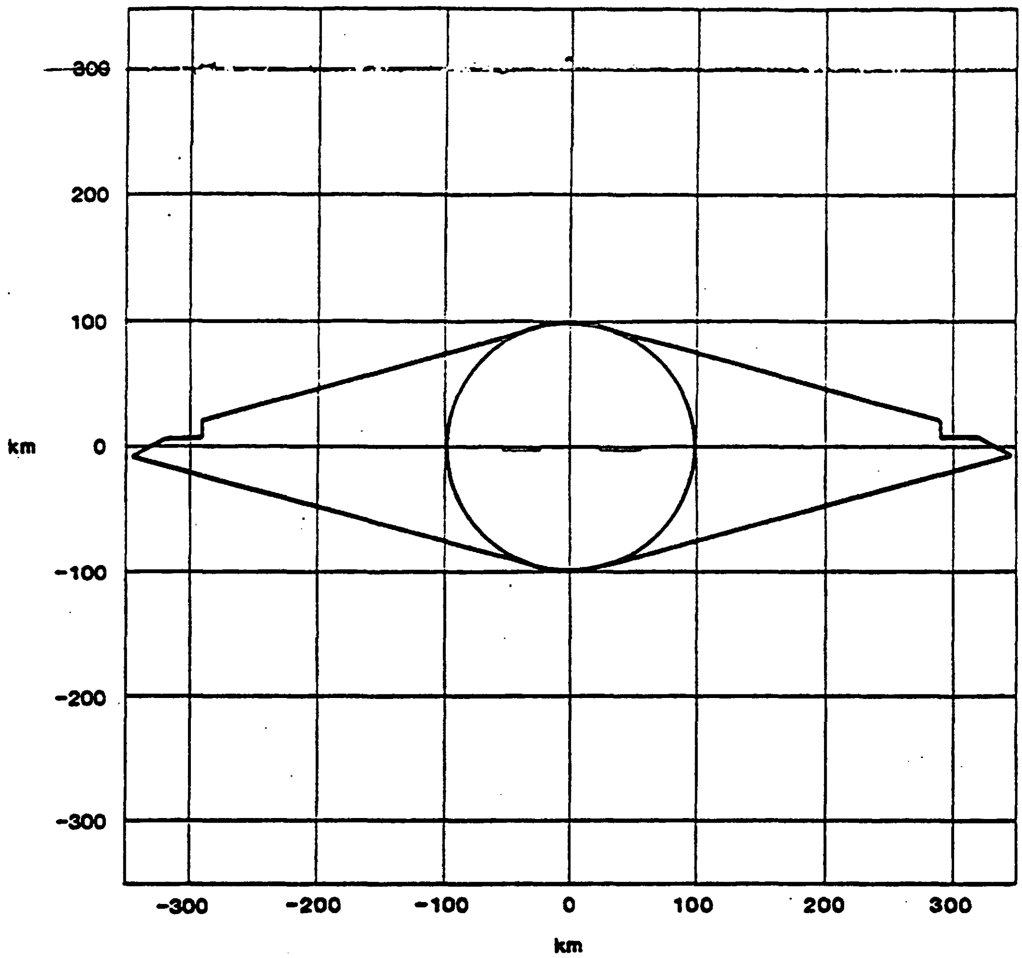

FIGURE 5

EARTH STATION TO EARTH STATION COORDINATION AREA
ASSUMES RBW AND PROPAGATION OF INTERFERENCE BY RAIN SCATTER
AS GIVEN BY CCIR DRAFT REPORT AF/4

LATITUDE 10 DEGREES

NOTES

1. The locus of the rain cell, through which both beams pass, has also been plotted.
2. Loss criterion, 170 dB.
3. Frequency, 4 GHz.
4. CCIR radiation patterns used.
5. Antenna diameters assumed to be 33 metres.
6. Rainfall rate, 20 mm/hr.

6.5.2 CCIR Mode 2 (Scattering from Hydrometeors)

Providing minimum elevation angles of earth stations are not less than 5 degrees in general (assuming no site shielding) coordination distances will be less than for CCIR Mode 1.

6.5.3 Interference Criteria

The increase in total satellite system noise due to interference between earth stations is anticipated to be between 1 and 3% providing that the antenna elevation of the earth stations exceeds 5 degrees.

7. TERRESTRIAL RADIO SERVICES

7.1 If RBW is introduced it may be assumed that the same power, pointing and eirp restrictions on terrestrial radio services will apply in both up and down-link frequency bands whilst currently these restrictions do not cover the bi-directional case. It is not forseen that different arrangements are needed but simply an application of the current arrangements to both up and down frequency bands. With regard to interference into the earth stations from terrestrial radio services this will be governed by the existing coordination procedures (RR Appendix 28) and the same permissible levels of interference will apply in the RBW and FBW cases.

7.2 Thus it may be assumed that the interference from terrestrial radio services into the RBW and FBW fixed satellite services will be within the CCIR criteria for such interference, ie about 10% of the satellite system noise will be due to interference from terrestrial radio services.

7.3 The frequency band sharing considerations between the fixed satellite and terrestrial radio services are discussed in more detail in the next section.

8. FREQUENCY BAND SHARING CONSIDERATIONS

8.1 The frequency bands allocated to the Fixed Satellite Service are usually allocated on an equal primary basis to a terrestrial radio service and this is so in those frequency bands that might be used for RBW. The same radio regulatory restrictions and procedures will therefore have to be applied in both frequency bands if they are used for reverse and forward band working as summarized below:-

8.1.1 The satellite eirp limitations to control the pfd at the earth's surface should not cause any problems, especially for regional and domestic systems with high elevation angles.

8.1.2 The terrestrial services will have to be coordinated with receiving and transmitting earth stations at both frequencies. Since reverse and forward working earth stations will not share the same sites, more earth station sites will have to be coordinated. The coordination area for 6 GHz receive will be greater than the 6 GHz transmit coordination area; at 4 GHz the receive coordination area will still predominate. Use of the extended 6 & 11 GHz frequencies may be a problem in either direction where they are used extensively for terrestrial feeds to earth stations.

8.1.3 The terrestrial radio stations will need to have power, eirp and pointing restrictions in both bands. This should not be a problem where the 4 & 6 GHz links follow the same route as is often the case and already avoid pointing at the GSO. In any case RR 2502.1 and RR 2503.1 state that for their own protection terrestrial receiving stations should avoid directing their antenna at the GSO, so stations at 4 and 11 GHz should point away from the GSO in any case (assuming that operators have paid due account to the Radio Regulations).

8.2 It has been suggested that since the CCIR criteria for interference from the fixed-satellite service into the terrestrial fixed service are based only on an earth station or satellite interfering at one frequency, and with RBW there will be two entries, more stringent limits on satellite eirp's and a tighter Appendix 28 coordination threshold may be necessary. However this study concluded that simultaneous operation only makes a fraction of a decibel difference at the long 20% and short 0.01% or 0.03% target times. Hence the introduction of RBW will not lead to more stringent criteria.

8.3 RBW is most likely to be used for domestic and sub-regional systems with spot beams mainly in the lower latitudes. It therefore seems reasonable to confine these services to earth stations having a minimum elevation angle of 30°, thus reducing the gain of the satellite antennas at the rim of the earth to isotropic.

8.4 The advantages of this are:-

earth station coordination distances will be reduced,

terrestrial pointing restrictions will probably not be needed,

terrestrial eirp limits of less than 55 dBW would not be necessary,

interference between RBW and FBW antipodal satellites would be reduced, and

systems would suffer less rain fades and atmospheric impairments.

9. IMPACT OF REVERSED BAND ON FORWARD BAND

9.1 The study has shown that if the C/I ratio is to be maintained when RBW is introduced some increase in the FBW separation is necessary. The cross directional interference can be minimised by specifying a minimum orbital spacing and by ensuring that satellite antennas with low cross directional gains are used. The potentially more severe antipodal interference can be minimised by ensuring that the RBW satellites using 2° spot beam antenna point at least 1° away from the rim of the earth.

9.2 Assuming that RBW satellites were regularly spaced, the effect they would have on existing and planned systems as notified to the IFRB was examined. Although the study showed that there are some offsets best avoided it is clear that a significant number of existing FBW satellites could be affected no matter what spacing is used.

10. BANDS BEST SUITED TO REVERSE BAND WORKING

10.1 This study has shown that if satellite networks were to be planned by a-priori or other means the best use of the GSO could be obtained if FBW and RBW satellites were planned at the same time. Excluding any problems of sharing bands with equal primary services, this planning would be easiest in the WARC'79 bands which are not yet in general use by the fixed satellite service. The satellites could all be designed with optimum characteristics for RBW, ie with minimal cross directional antenna gains and spot beams. Sharing with terrestrial services will be less acute in these bands especially if the satellite networks are confined to domestic and regional systems with relatively high minimum earth station elevation angles.

11. OTHER TECHNICAL AND ECONOMIC FACTORS

11.1 In order to determine the consequences on the design and construction of earth station and satellite communications equipment of the introduction of a reverse frequency plan, two questions need answering:-

11.1.1 Are there any substantial changes necessary to the performance specifications of the radio equipment units of satellites and earth stations to permit the overall system performance objectives to be met?

11.1.2 Is hardware operating in the reverse frequency bands available or can it be readily developed?

11.2 These questions were considered in detail and it was concluded that in general the adoption of reverse band working will result in minor initial development costs in a number of areas. There are no identifiable technical difficulties associated with the work required and the level of funding to conduct the non-recurring development is small compared to the overall cost of satellite systems. Thus the study concluded that cost is not a significant factor in determining the feasibility of RBW.

12. CONCLUSIONS

12.1 The main conclusions of the study are:-

RBW is a feasible resource enhancement technique:

Orbit utilization could be increased by as much as 60% to 100%:

All FBW constraints apply to RBW and therefore basic orbital spacing is similar:

Cross directional interference is most significant when satellite antenna beams point near the equator (antipodal interference):

Simple measures can limit antipodal interference:

Orbital separations of 0.5° between FBW and RBW satellites is possible:

Earth station to earth station interference may be a problem. However if a minimum elevation angle is imposed the FBW and RBW earth stations could be placed within 100 km of each other. Detailed frequency planning and operational methods could permit even closer spacing:

The maximum value of RBW can be realised by employing larger earth stations operating with satellites employing spot beam antennas:

RBW has high potential for national systems:

If, in order to maximise use of the resources with FBW, it is possible to adopt satellite spacings of less than 1^{o} then RBW may not be able to provide a significant additional resource enhancement:

RBW could well lend itself to operation in the 'WARC 79' bands where there are few if any satellites currently and the correct technology can be introduced such that efficient use of forward and reverse bands can be achieved. This would also remove some of the problems found with the impact of reverse systems on existing FBW systems.

12.2 This study, although not exhaustive, has confirmed that RBW is a feasible method of resource enhancement which WARC-ORBIT 1 should take into account in its consideration of planning methods.

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COMMITTEE 5

Republic of the Philippines

PROPOSALS FOR THE WORK OF THE CONFERENCE

General comments

A. The aim of Resolution No. 3 of WARC-79 was to ensure that a world space administrative radio conference would be convened with the essential objective to guarantee in practice, for all countries, equitable access to the geostationary-satellite orbit and to the frequency bands allocated to the space services utilizing it.

B. It is important that the principles governing any planning method be clearly and adequately defined so that a consensus could be reached that these planning principles will ensure that the objective embodied in Resolution No. 3 will be achieved.

C. The proposals of the Philippines submitted in this document are, in particular, specifically addressed to the agenda item dealing with planning principles. These proposals have been drawn up with the objective to guarantee in practice, for all countries, equitable access to the geostationary-satellite orbit and to the frequency bands allocated to the space services utilizing it.

D. The Philippines agreed with the ASEAN countries that Indonesia be appointed as their coordinator during the WARC-ORB-85.

Agenda item 2.2: Space services and frequency bands to be planned

PHL/120/1 The Philippines proposes that only one service, the fixed-satellite service, and only the frequency bands 4/6 and 11 - 12/14 GHz should be planned with considerations given to the needs of various services using these frequency bands.

Justification

Existing arrangements for coordinating the usage and development of space services in all areas except the fixed-satellite service in the proposed bands are satisfactory. Parts of these bands were allocated to the FSS by the 1979 WARC and they could provide additional capacity for use by new systems which will operate in the service.

Agenda item 2.3: Planning principles

PHL/120/2 1. An administration's requirement for access to the geostationary-satellite orbit (GSO) and frequency bands shall be accommodated on the basis of both actual and planned requirements.

Justification

This principle is in line with Resolution No. 3 of WARC-79 which seeks to guarantee in practice, for all countries, equitable access to the GSO and the frequency bands allocated to the space services utilizing it.

PHL/120/3 2. The planning period should correspond to the lifetime of a satellite i.e. about ten (10) years.

Justification

This planning period will facilitate a priori planning rather than the existing coordination procedures. This 10 year period would ensure that when requirements change as a result of changes in technology, such changes can be incorporated into the new plan.

PHL/120/4 3. The planning method should guarantee that the GSO and frequency bands allocated to the space services utilizing it would be allotted to all countries on an equitable basis with the option open to administrations to use an orbital slot(s) individually or participate in common user or multi-administration satellite as an avenue to achieve this access.

Justification

This proposal is also in line with Resolution No. 3 of WARC-79 which seeks to guarantee, in practice for all countries equitable access to the GSO and the frequency bands allocated to the space services utilizing it. It will provide countries with smaller traffic requirements the options to gain access to the GSO and the frequency bands.

PHL/120/5 The planning method should allocate the frequency/orbit resource to the fullest without any spare capacity reserved.

Justification

This planning principle will enable all requirements to be met to the fullest possible extent.

PHL/120/6 5. An existing system is defined as a system which is in operation when the plan comes into force.

For the first plan, the existing systems will be accommodated within the planning period of about 10 years with minimum disruption being guaranteed. For subsequent plans, new and existing systems will be planned on an equal basis.

Justification

In order to ensure equitable access, new and existing systems should be treated on an equal basis. However, for systems which are already operating when the first plan comes into force, such systems should be minimum disruption to such systems to minimize the cost involved in making any adjustment required.

PHL/120/7 6. The planning method should encourage progressive improvements in satellite technology which will help increase orbit/spectrum capacity, and which are acceptable to the majority of countries.

Justification

Improvement in satellite technology which would help to increase orbit/spectrum capacity is important. However, the cost of achieving this objective should be kept within the resources of the majority of countries.

PHL/120/8 7. In order to improve utilization of orbit/spectrum capacity any planning method adopted should ensure that the inactive spare satellite should be colocated with the active operational satellite.

Justification

This proposal will help increase the capacity of the geostationary-satellite orbit.

PHL/120/9 8. Any adjustment of satellite networks rising from the need to accommodate unplanned requirements and/or improvements in technology should be within the resources of most countries.

Justification

This proposal is to ensure that countries which are required to make adjustments to their satellite networks do not suffer significant financial burden arising from such adjustments.

Agenda 3.1: Frequency bands for feeder links

PHL/120/10 The frequency bands of 17.3 - 18.1 GHz (primary) and 14.5 - 14.8 GHz (auxiliary) be used as the feeder links for BSS in Regions 1 and 3.

Justification

The Philippines supports this proposal from Australia (AUS/7/9) since the combination provides greater planning and operational flexibility than the use of either band alone.

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COMMITTEE 4

SUMMARY RECORD

OF THE

THIRD MEETING OF COMMITTEE 4

(TECHNICAL PARAMETERS AND CRITERIA)

Wednesday, 14 August 1985, at 1050 hrs

Chairman: Mr. R.G. AMERO (Canada)

Subjects discussed:	Documents
1. Opening comments	-
2. Review of the allocation of documents	DT/9(Rev.1)
3. Reports of the Working Group Chairmen	-
4. Discussion of the situation prevailing	-

1. Opening comments

1.1 The Chairman stated that Committee 5 had asked for the Committee's initial assessment of the technical aspects of the situation prevailing as quickly as possible and he hoped that could be transmitted early in the following week.

2. Review of the allocation of documents (DT/9(Rev.1))

2.1 The Chairman drew attention to the revised list of document allocations (DT/9(Rev.1)) which was now more complete and took account of requests made by administrations. It was not necessarily final and a further revision might have to be issued.

2.2 The Chairman of Working Group 4C said that the list for consideration by Working Group 4C was fairly exact but there were some small changes to be made which he would submit for inclusion in the second revision.

2.3 The delegate of the United States said that paragraphs 19, 20 and 21 in Document 5 as well as section 3.4 of the IFRB's report (Document 4), should be added to the list for consideration by the full Committee in connection with the situation prevailing.

2.4 The Chairman considered that Document 4 should be allocated to Working Group 4B and the IFRB should be asked to advise on how Annex 4 should be handled.

2.5 The delegate of the United Kingdom said that certain aspects relating to sharing dealt with in Document 4 must be considered in Working Group 4B because some sharing criteria had originated in the IFRB due to lack of material in the CPM Report. Document 52 and Addenda 1 and 2 should also be assigned to Working Group 4B as it had implications for the selection of the frequency bands to be used.

2.6 The Chairman said it had been agreed with the Chairman of Committee 6 that the detailed examination of planning feeder links should take place in Working Group 4B while Committee 6 should be responsible for deciding which bands were to be planned.

2.7 The delegate of the Federal Republic of Germany said that proposals D/31/23 and D/31/24 should be assigned to Working Group 4B.

2.8 The delegate of Colombia asked for the inclusion of Document 72 in the list for Working Group 4C.

2.9 The delegate of Spain recalled that it had been agreed to delete proposal E/42/8 from Working Group 4B's list but to retain it for Working Group C.

3. Reports of the Working Group Chairmen

3.1 The Chairman said he hoped to report shortly on the outcome of his discussions with the Secretary-General concerning the choice of Chairman for Working Group 4A.

3.2 The Chairman of Working Group 4B said the Working Group had discussed a number of documents from administrations and the CPM Report on the subject of current sharing situation under item a) of its terms of reference and had now set up a Drafting Group 4B-1 with Mr. Gould of the United States Delegation as Chairman.

3.3 The Chairman of Working Group 4C said the Working Group had not encountered problems with its terms of reference. The question of which body should deal with sharing between feeder links and the FSS, which he had raised earlier in the Committee, had now been resolved by assigning it to Working Group 4B. The final form of his Working Group's output would depend partly on decisions of Committee 5. A draft work programme (Document DT/13) had been established and a good start had been made but there was much to do on intra-service sharing. Work had also begun on a paper dealing with the technical characteristics of present-day satellite networks for inclusion in Committee 4's report to Committee 5. The draft should be completed by the end of the week and would be largely concerned with FSS as there would not be much material on other space services.

3.4 The Chairman thought it would be worth including some comments on other space services.

3.5 The Chairman of Working Group 4C pointed out that the CPM Report did not contain much apart from some information on the BSS regarding the situation prevailing and he would be uneasy about introducing that subject in the draft. Some material on the MSS could be incorporated but it would be out of balance with that on the FSS which would be given in some detail.

3.6 The Chairman agreed that he would hesitate to include anything within the terms of reference of Committee 6 concerning the BSS in the 12 GHz band, but any information on the BSS in other portions of the spectrum might be included, if that were acceptable to Committee 4. The amount of information on the MSS in the CPM Report was small and that regrettable fact might be mentioned in the introduction to the Committee's report.

3.7 The Chairman of Working Group 4C said whatever material was available could be included provided there was enough time.

3.8 The Chairman commended the two Working Groups on the progress already made.

4. Discussion of the situation prevailing

4.1 The Chairman said he had gained the impression that delegations favoured the situation prevailing, and especially certain technical parameters, being discussed in the Working Groups, so he had the following suggestions to make about allocations. Proposals USA/5/2 and 5/3, proposal F/12, paragraphs 13-17, proposal D/31, sections 2.1 and 3.1, proposal B/37/4 and 37/5, proposal MEX/60, section 2 to be transferred from the Committee 4 list to Working Group 4C. Proposal S/33/8 should be deleted from the Committee 4 list as it was already allocated to Working Group 4C. Proposal E/10/1 contained a general section which might be transferred elsewhere and he invited the delegate of Spain to make a suggestion. Proposal F/13, sections 1 and 2 should be retained in the Committee 4 list. Proposal F/19/13 had been allocated to Working Group 4B and should be deleted from the Committee 4 list. Proposal CLM/65/1 might more appropriately be referred to Committee 5 and he would like to know the views of the Colombian delegate on that point. Proposal CLM/68/4 could be retained for consideration by Committee 4. His aim had been to avoid the Committee duplicating the work of Working Groups.

4.1.1 However, definitions or modifications to existing definitions could usefully be discussed in full Committee while leaving technical problems to the Working Groups and a paper outlining definitions would be circulated for consideration at the next meeting. The relevant documents were 3, 4, 13, 68 and 72. After an initial discussion an ad hoc Drafting Group might be established to prepare the text of each definition for consideration by the Committee. He would ensure that any impact of the texts on the work of other Committees would be reported by him to their Chairmen so as to ensure proper co-ordination.

4.1.2 He asked the representative of the IFRB to indicate the position about the Board's Document 105 concerning the situation prevailing and for information requested by Working Group 4B about the technical standards used by the Board as indicated in Document 4, Annex E.

4.2 The representative of the IFRB said that Document 105 would be distributed later in the day. As to the information regarding the Note to Heads of Department and certain technical criteria, the Board's work would greatly be facilitated if the Committee could be more precise in its request.

4.3 The Chairman suggested that Working Group 4B and administrations which had requested the information should together draft a note for the Chairman of the Board indicating precisely what they required.

4.4 The Chairman of Working Group 4B said that his Working Group might usefully discuss section 3.4 of Document 4, in view of the interest shown by several countries.

4.5 The delegate of the United States said that his delegation had rather significant concerns about factors in section 3.4, but would await the outcome of the detailed examination which would take place in Working Group 4B.

4.6 The delegate of the United Kingdom said that his delegation was also happy to leave the matter in the hands of Working Group 4B. However, it would be particularly interested to know more about the provisional technical parameters referred to in section 5.3.2.3 of the Board's report (Document 4).

4.7 The representative of the IFRB said that it appeared that what was required were the Technical Standards used in application of Article 14 and Appendix 28, and he was prepared to see that the necessary information was provided. However, he wondered whether the information should be provided as a Committee document, or simply as a working document for Working Group 4B.

4.7.1 It was agreed that the information should be submitted directly to Working Group 4B.

4.8 The Chairman suggested that the Committee should in the meantime identify those sections of documents or definitions which might be considered at the Committee's next meeting. As he saw it, section 1.3 of Annex 1 to Document 3 identified a number of definitions requiring further study; Document 4 identified operational problems with certain definitions and consequently areas which, if improved, would ease future problems for administrations in implementing requirements; Document 13 contained four definitions which might be considered. Documents 68 and 72 required some discussion, although, generally speaking, they were straight forward.

4.8.1 Since there were no objections to that outline, he undertook to provide a list of definitions and document references for the next meeting, when the Committee could decide whether or not it agreed with the arguments put forward, and whether the definitions should be submitted to the special Drafting Group.

4.9 The delegate of the United Kingdom said that the work could be speeded up if a Chairman for the ad hoc Group on Definitions could be appointed quickly, to enable him to produce a document on the various definitions and documents referred to in time for the next meeting of Committee 4.

4.10 The Chairman agreed with that view but felt that the matter of a Chairman should first be discussed with delegations outside the meeting.

4.11 The delegate of Spain suggested that Document 10, at present in the Definitions section of Document DT/9(Rev.1) might more usefully be transferred to the last group on the list: General: no specific proposals. It was so agreed.

4.12 The delegate of Colombia said that his delegation agreed with the Chairman's proposal that Document 65 would more appropriately be dealt with in Committee 5. Document 65 was consequently deleted from the list of Committee 4.

The meeting rose at 1200 hours.

The Secretary: The Chairman:

C. AZEVEDO R.G. AMERO

INTERNATIONAL TELECOMMUNICATION UNION

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WORKING GROUP 6B-2

Yugoslavia (Socialist Federal Republic of)

PROPOSAL FOR THE SELECTION OF ATMOSPHERIC PROPAGATION MODEL FOR FEEDER LINKS TO BROADCASTING SATELLITES

(Agenda item 3.2)

In Annex 6 of CPM Report under item 6.1.1, the discussion of propagation effects is addressed to Annex 2 of the same Report.

In Annex 2, item 2.4.1 under title "Attenuation due to precipitation and clouds", a 14 zones atmospheric model is proposed, based on CCIR Reports 721-1 (MOD I) and 564-2 (MOD I). In short this model may be called "new model".

Great number of planning exercises made in Europe, used for atmospheric attenuation model, applied for WARC-BS-77 and modified for frequency band by means of the formula from CCIR Report 215. This model has 5 zones. We may call it "old model".

In Yugoslavia, some comparison calculations were made for atmospheric attenuation for feeder links in 17 GHz band based on both models. Calculations were made for orbital positions 19°W, 13°W, 7°W and 1°W. The results are given in Table 1, from which it is evident that there are great differences between the two models. In the diagram in Figure 1, the distribution of attenuations of both models is given.

Based on these results, and having in mind that RARC-SAT-R2 also used a new atmospheric model, Yugoslavia proposes that for the planning
YUG/122/10 purposes of feeder links to broadcasting satellites the atmospheric model based on CPM Report, Annex 2, should be used.

TABLE 1

Country Code	Elevation °	Atmospheric apsorption (dB)	Rain attenuation (dB)			
			New model		Old model	
F	33.03	0.29	H	2.52	C	2.66
ZAI	42.86	0.37	P	10.58	A	4.37
D	26.67	0.35	H	2.69	C	3.48
LUX	28.14	0.33	E	1.7	C	3.25
BEN	62.91	0.28	P	8.43	A	3.21
ZAI	42.16	0.37	P	10.63	A	4.43
AUT	27.60	0.34	K	3.73	C	3.33
BEL	27.88	0.34	E	1.69	C	3.29
NMB	41.90	0.24	E	1.32	D	1.40
NIG	56.99	0.30	P	8.81	A	3.45
SUI	30.15	0.31	K	3.57	C	2.98
HOL	26.31	0.36	E	1.71	C	3.54
BNE	55.79	0.30	P	9.04	A	3.51
I	32.62	0.29	L	5.53	C	2.70
CME	59.17	0.29	P	5.45	A	3.35
TCD	50.02	0.32	E	1.10	A	3.83
GAB	60.99	0.28	P	8.71	A	3.28
MLT	39.32	0.25	K	3.32	C	2.15
STP	66.53	0.27	N	5.2	A	3.08
ISR	27.17	0.35	E	1.97	D	2.08
COG	57.76	0.29	P	8.92	A	3.42
AGL	53.15	0.31	N	5.85	A	3.65
CAF	49.90	0.33	P	9.51	A	3.84
ALB	34.99	0.28	L	5.28	C	2.48
EGY	38.94	0.25	E	1.48	D	1.49
SDN	47.24	0.22	E	1.20	D	1.27
SDN	46.20	0.22	E	1.20	D	1.29
SDN	42.26	0.23	E	1.23	D	1.39
YUG	33.53	0.29	L	5.22	C	2.61
SWZ	42.61	0.37	K	2.7	A	4.39
POL	27.76	0.34	H	2.51	C	3.31
ROU	31.47	0.30	K	3.53	B	3.88
BOT	52.23	0.31	C	0.8	A	3.70
ZMB	53.73	0.20	N	5.8	A	3.61
TCH	30.78	0.31	H	2.47	C	2.91
BUL	33.88	0.28	K	3.53	C	2.58
MOZ	45.04	0.35	N	6.44	A	4.18
DDR	29.06	0.33	H	2.41	C	3.12
HNG	32.17	0.30	K	3.38	C	2.75
IFB	48.86	0.33	N	6.14	A	3.90
MWI	46.93	0.34	N	6.27	A	4.04

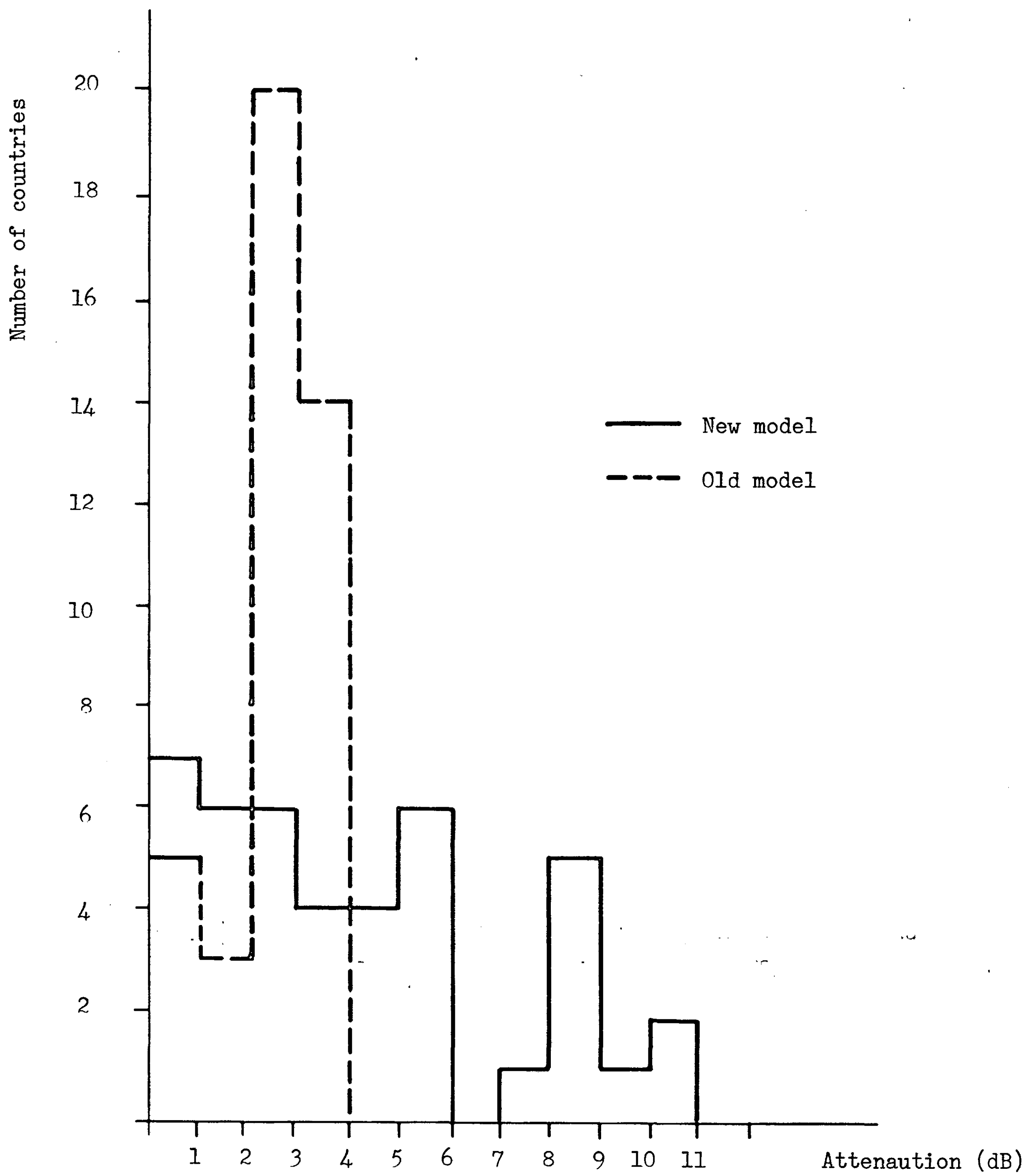
Number of countries
20
18
16
14
12
10
8
6
4
2
New model
Old model
1
2
3
4
5
6
7
8
9
10
11
Attenaution (dB)

FIGURE 1

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COMMITTEE 5

United States of America

PROPOSALS FOR THE WORK OF THE CONFERENCE

(Agenda items 2.2, 2.3 and 2.5)

In Documents 5, 30 and 107, the United States presents detailed proposals for planning principles and criteria to guarantee, in practice, equitable access for all Administrations to the geostationary satellite orbit and associated space services. The United States considers that these proposals constitute an approach to planning the use of the geostationary satellite orbit and frequency bands by the space services to be decided under agenda item 2.2 of the conference.

The essence of this method can be summarized by three elements: (1) the Multilateral Planning Meeting process to be applied to the Fixed Satellite Service in the band 3700-7075 MHz, (2) identification of "expansion bands" (bands added during WARC-79) to satisfy long-term requirements, and (3) simplification and improvement of the current procedures for all other services.

1. The Multilateral Planning Meeting (MPM)

The MPM will guarantee access to the geostationary satellite orbit for the Fixed-Satellite Service in the following bands:

Uplink	Downlink
5925-6425 MHz	3700-4200 MHz
6425-6725 MHz	4500-4800 MHz

At regular intervals (e.g., every two years) meetings would be convened at which Administrations with existing or planned networks would agree on the steps to be taken, including changes to frequency assignments currently registered with the IFRB, to accommodate all new or modified requirements that have arisen since the previous MPM. The result of the MPM would be a coordination agreement among participating Administrations that would allow all new or modified frequency assignments to be notified to the IFRB. Included in the MPM process are guidelines for sharing the burden of accommodating the new and modified requirements among both new and existing system operators. Additional details of the MPM approach are provided in Section 1 of Document 30, Document 107, and the annexed flow chart.

2. Expansion Frequency Bands.

As a result of the increasingly intensive use of the 5925-6425 MHz and 3700-4200 MHz bands by existing and currently planned systems, accommodation of new systems in these bands is likely to require increasingly complex engineering solutions to the problem of achieving compatibility between satellite systems. To supplement the guarantee of access provided by the MPM, the United States is also proposing to identify a pair of bands in which satellite networks could be notified as far as 15 years in advance of operation. These bands would be the 6425-6725 MHz band for earth-to-space (uplink) transmissions and the 4500-4800 MHz band for space-to-earth (downlink) transmissions. These expansion bands are currently unused by the Fixed Satellite Service.

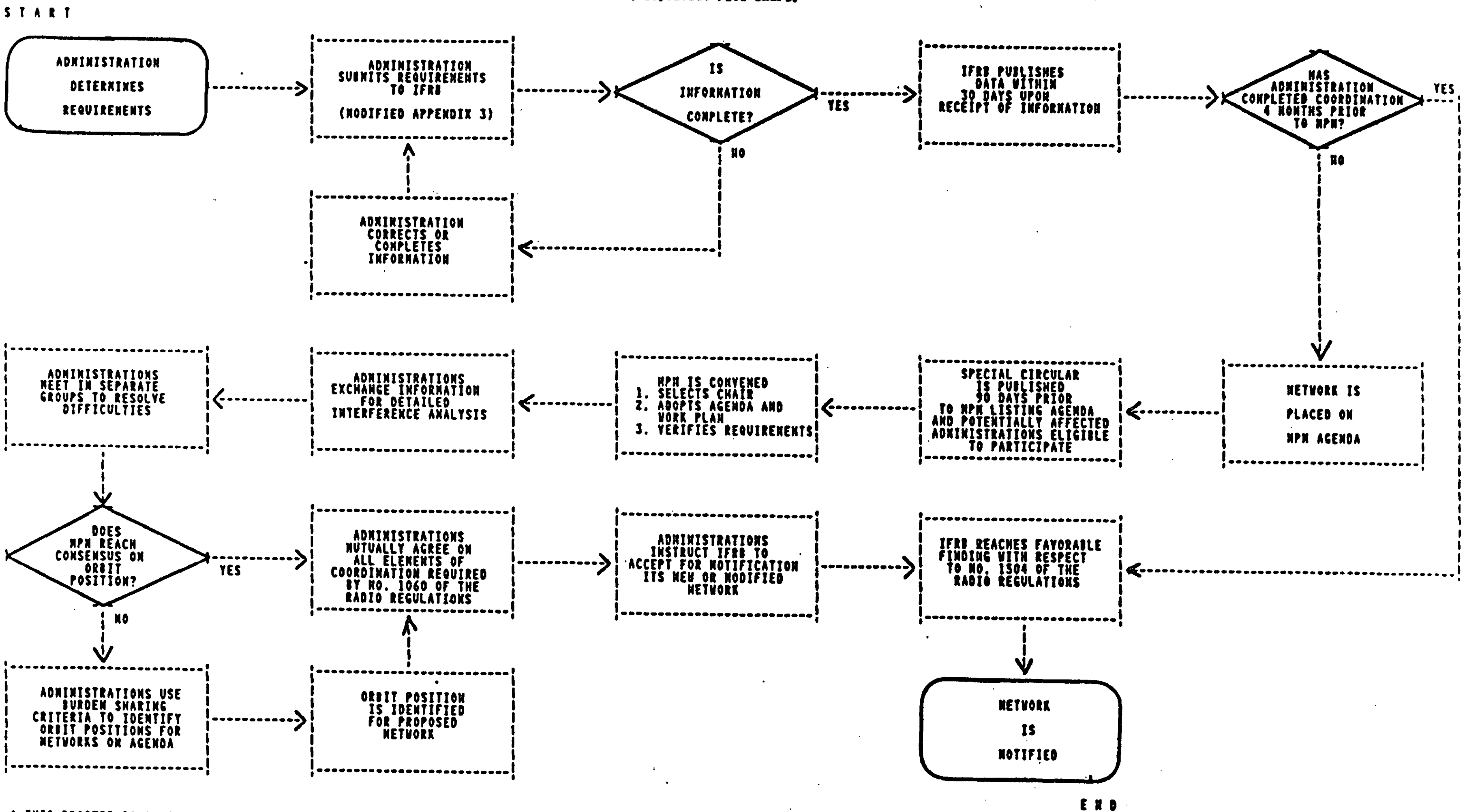
In order to assure the orderly development of these bands, the United States will agree not to use them for domestic services for a period of ten years, and will call upon other Administrations in the industrialized world to join in this voluntary moratorium.

3. Simplify and Improve Current Procedures.

For other bands and services, the United States proposes the simplification and improvement of the current procedures. The administrative burdens and delays imposed on Administrations and the IFRB should be reduced to the extent practical. In addition, the current procedures should be improved by providing guidelines to Administrations and the IFRB on more effective ways to complete any necessary coordination between networks. Additional details are provided in Section 3 of Document 30.

PERIODIC MULTILATERAL PLANNING MEETING *

(Simplified Flow Chart)



* THIS PROCESS IS AVAILABLE FOR NETWORKS BETWEEN 3700 AND 7075 MHz FOR REQUIREMENTS SUBMITTED 2 TO 5 YEARS (15 YEARS FOR EXPANSION BANDS) PRIOR TO NETWORK IMPLEMENTATION.

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Information paper

(The revised version concerns the French text only.)

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Information paper

GENERAL SCHEDULE OF THE WORK OF THE CONFERENCE

(following consideration in the Steering Committee)

Week 1 (8 Aug. - 9 Aug.)
Organization and commencement of work

Week 2 (12 Aug. - 16 Aug.)
Continuation of work in Working Groups and Committees [1)]

Week 3 (19 Aug. - 23 Aug.)[2)]
Continuation of work in Working Groups and Committees [1)]

Week 4 (26 Aug. - 30 Aug.)[2) 3)]
Continuation of work in Working Groups and Committees [1)]

Week 5 (2 Sept. - 6 Sept)[2)]

Tuesday, 3 Sept. - End of work of Working Groups of Committees 4 and 6

Wednesday, 4 - End of work of Working Groups of Committee 5

Thursday, 5 - End of work of Committee 6

Friday, 6 - End of work of Committees 4 and 5

Week 6 (9 Sept. - 13 Sept.)

Tuesday 10 - End of work of Ad Hoc Working Group of Plenary

" " Report of Committee 2

Wednesday 11 - Report of Committee 3

First reading by Plenary of the last texts of the Report to the Second Session and of the last texts of the Final Acts, as appropriate.[4)]

Thursday 12 - Second reading by Plenary of last texts of the Report of the Second Session and of the last texts of the Final Acts, as appropriate.[4)]

Friday 13 - Adoption of the Report, Signing Ceremony as appropriate[4)], and Closing.

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1) Plenary Meetings, as appropriate.

2) Saturday (morning and afternoon) meetings may be necessary.

3) Conclusions in the approach to planning methods by Working Group 5A to be completed by the middle of week 4.

4) Final Acts relating to decisions of BC-SAT-R2 Conference (see item 6 of Agenda).

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COMMITTEE 5

Australia

AGENDA ITEM 2.4 - ADVANCE PUBLICATION PROCEDURE

Australia has noted proposals and discussions that have occurred concerning the advance publication procedures specified in Section I of Article 11 of the Radio Regulations.

The proposals contained in this document follow the pattern described in document DT/12 titled "Possible Simplification of the Advance Publication Procedure". However, the Australian proposals differ from DT/12 in that we propose:

AUS/125/11 The advance publication procedure should be mandatory.

AUS/125/12 It should be mandatory to publish only basic information concerning the proposed satellite network.

AUS/125/13 This publication of advance information on a satellite network does not imply any rights or obligations whatsoever, neither for the publishing administration or for any other administration.

AUS/125/14 The publication of advance information may be made at any time prior to the date of the satellite network being brought into use, but it should preferably occur not later than 2 years before the date of bringing into service of the satellite network.

AUS/125/15 Administrations may seek the assistance of the Board if they encounter difficulties in carrying out this procedure.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 126-E
16 August 1985
Original: French

COMMITTEE 4

France

DEFINITION OF THE TERMS "COVERAGE AREA" AND "SERVICE AREA"

In its Recommendation No. 67, WARC-79 invited CCIR to elaborate a definition of the term "coverage area" and give the technical bases for a definition of the term "service area". Since these definitions may be useful for studying the conditions of use of the geostationary-satellite orbit, the text of the definitions prepared by the Joint CCIR/CCITT Study Group on Vocabulary (CMV) (from CCIR Recommendation 573-1) is given below.

A51a **Coverage area (of a space station),** *Zone de couverture (d'une station spatiale). Zona de cobertura (de una estación espacial)*

Area associated with a space station for a given service and a specified frequency within which, under specified technical conditions, it is feasible for radiocommunications to be established with one or several earth stations, either for reception or transmission or both.

Note 1. – Several coverage areas may be associated with one and the same station, for example, a satellite with several antenna beams.

Note 2. – The technical conditions include the following: charcteristics of the equipment used both at the transmitting and receiving stations, how it is installed, quality of transmission desired, e.g., protection ratios and operating conditions.

Note 3. – The following may be distinguishable:

- interference free coverage area, i.e., that limited solely by natural or artificial noise;
- the nominal coverage area: it is defined, when establishing a frequency plan, by taking into account the foreseen transmitters;
- the actual coverage area, i.e., with allowance made for the noise and interference which exist in practice.

Note 4. – The concept of "coverage area" does not simply apply to a space station on board a non-geostationary satellite for which further study is necessary.

Note 5. – Furthermore, the term "service area" should have the same technical basis as for "coverage area", but also include administrative aspects.

The following text has been suggested as an example:

Service area, *Zone de service, Zona de servicio*

Area associated with a station for a given service and a specified frequency under specified technical conditions where radiocommunications may be established with existing or projected stations and within which the protection afforded by a frequency assignment or allotment plan or by any other agreement must be respected.

Note 1. – Several service areas separate as regards both transmission and reception may be associated with one and the same station.

Note 2. – The technical conditions include the following: characteristics of the equipment used both at the transmitting and receiving stations, how it is installed, quality of transmission desired and operating conditions.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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16 August 1985
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WORKING GROUP 5A

Kingdom of the Netherlands

PLANNING METHOD FOR GUARANTEEING IN PRACTICE EQUITABLE ACCESS TO THE GSO - AGENDA ITEM 2

The present regulatory regime has worked satisfactorily up to now. However, the Netherlands Administration is of the opinion that the present procedure does not stand up to the demands of the FSS in the future. To solve the difficulties arising from the present method, without throwing away its advantages, an alternative method is considered necessary.

After consideration of the methods described in the CPM Report, the Netherlands Administration concluded that none of these methods fully cater for the foreseen demands. However, it appeared to be feasible to combine positive elements of the different methods.

The method proposed by the Netherlands Administration is translated into a procedure as described in the Annex. It is specifically eliminating the first come first served approach and it ensures access to the GSO at any time as if it were an a priori plan. This is achieved by an iterative process which equally distributes the present and future possibilities over the requirements without freezing the technical characteristics for long periods. The essential mechanisms are to be found in paragraphs 38 to 43 and further in paragraphs 44 and 45. This method prevents the introduction of exaggerated requirements to cover any possibility that might occur in a still unknown future.

Annex: 1

ANNEX

Procedure for the planning of the fixed-satellite service

General

1. Although the procedure can be applied to other space services, it is meant primarily for the fixed-satellite service in those frequency bands where congestions occur (the 4/6 GHz band) or is likely to occur in the future.

2. The current procedures laid down in the Radio Regulations are maintained for the other (satellite) services.

3. The agenda for the 2nd session should offer the possibility of the procedure being applied for the first time.
The 2nd session of the Conference should have such terms of reference that deficiencies in the procedure, if any, may be corrected.

4. The new procedure should be included in the main body of the RR.

5. A next competent WARC should evaluate the application and result of the procedure. In addition, it should decide whether the procedure should also be applied to other bands allocated to the Fixed-Satellite Service and/or to the planning of other space services using the geostationary orbit.
A criterion for application of the procedure in a certain band could be a situation in which the accommodation of a new system can be achieved more efficiently by means of multilateral than by bilateral consultations.

Procedure

6. Under the new procedure it will no longer be possible to start at any moment the coordination of a new system in the Fixed-Satellite Service in the bands to which the new procedure applies.

7. Instead, coordination meetings shall be organized every other year. They should in general be held in Geneva with the technical and administrative assistance of the IFRB.

The CCIR shall attend the meetings as an adviser.

A period of two years between subsequent meetings is desirable in order to:

- enable thorough preparation of the precoordination and coordination meetings;
- allow sufficient time for development of the final design of a system after its precoordination and prior to the coordination meeting.

A longer period would unnecessarily hamper the development of satellite communications.

8. **The meetings shall deal with the requirements submitted by administrations for new satellite systems in the Fixed-Satellite Service in the bands to which the procedure applies.**

9. The requirements shall be submitted to the IFRB at least three months before the meeting. The IFRB shall inform all administrations of the requirements received.

10. All requirements sent in during the preceding two years shall be dealt with at the same time and shall receive equal treatment.

11. Only individual administrations or an administration acting on behalf of a group of named administrations shall be able to submit requirements.

12. The coordination meetings have an open character.They shall in any event be attended by administrations which have submitted a requirement. They should also be attended by the administrations affected.

13. Requirements submitted by administrations which are not represented at the meeting will not be dealt with.

14. The procedure can also be applied if the administrations affected are not represented.

    In that case the IFRB shall look after the interests of the administrations concerned.

15. The procedure comprises the following phases:

    - precoordination
    - coordination
    - implementation.

    The precoordination phase comprises the preplanning of a new system.

    The result is a preliminary assignment, which guarantees a successful outcome of the coordination phase for a new system within the precoordinated parameters. On the basis of the precoordinated parameters an administration will be in a position to continue with the definitive system design (see points 21 - 34).

    The coordination phase comprises the detailed multilateral coordination of a new system. The outcome of this phase is a definite assignment (see points 35 - 47).

16. The meetings held every other year are divided into two parts. During the first part the requirements submitted for coordination are dealt with.
    During the second part the requirements tabled for the first time are precoordinated.

17. The coordination meetings should wherever possible be based on the most recent CCIR recommendations and reports.
    Use will be made of the computer facilities provided by the ITU.

18. Methods to be applied to ensure that optimum use is made of the spectrum/orbit, include band segmentation, equalization of interference levels and relocation of satellites (the so-called M 3 method) (see annex 4 point 4.4.9 of the CCIR CPM report).

19. The rights resulting from the application of this procedure may be subject to changes of the assigned orbital position (relocation), an increase of the interference level and/or reduction of the assigned

bandwidth. This applies to planned and coordinated as well as to operational systems.

20. Precoordinated and coordinated assignments shall be registered in the IFL.
As a result, the IFL will offer up-to-date information on the actual and planned use of the frequency bands allocated to the Fixed-Satellite Service.

Precoordination phase

21. The purpose of the precoordination phase is to determine how a requirement for a new satellite system can be met.
In general, the administration concerned will be in a position to order the system to be developed after the meeting during which precoordination has taken place.

22. In submitting a requirement the administration concerned shall supply the following data:
- visible and preferred orbital arc;
- service area(s);
- desired satellite network characteristics;
- preferred frequency band;
- required capacity;
- desired period of operation (maximum [10] years);
- planned date of putting into use.

23. The required capacity in standard types of carrier (to be defined by CCIR) shall be justified on the basis of traffic forecasts. These shall be annexed to the requirement.

24. Detailed technical characteristics of the desired network should be furnished such as G/T, EIRP, antenna beams, maximum pfd, off-axis density, permissible interference levels (for the

satellite as well as for the earth station(s)), satellite repositioning capabilities, space station keeping.

25. In the first place it shall be determined whether, and if so, how, the new requirements can be met without affecting other systems which have already been coordinated or which are already operational.

26. If this proves to be impossible, it shall be studied whether it is possible, given the period of operation of already operational systems, to accommodate the new system at a later moment than asked for originally, without affecting systems which have already been coordinated. If accommodation can take place within two years of the date originally planned, the relevant administration shall accept this solution unless it prefers one of the alternatives mentioned under 28 and 29.
The administration is of course free to put the system into service on the originally desired date, as long as it is willing to accept the ensuing restrictions.

27. If this step does not yield the desired result, it shall be studied whether the requirement can be met by equalizing interference levels and by adjusting the orbital position(s) of systems which have already been coordinated but not yet implemented.
The maximum interference levels as agreed upon in CCIR shall not be exceeded.

28. Not until it has been proved that the foregoing steps do not lead to accommodation of the new system with the desired capacity, shall it be examined whether, and if so, how, this system can be accommodated in the reverse band mode.

29. At the same time it shall be examined whether, and if so, how, the desired system can be accommodated in a different band (if

necessary in the reverse band mode).
Relevant factors could be atmospheric-attenuation, existing infrastructure, etc.

30. If it proves possible to accommodate a new system with the desired capacity in the reverse band mode (see 28) and/or in a different band (see 29), the administration making the request shall accept the alternative or make a choice from the available alternatives, unless this is impossible for technical reasons (see also 44 and following).

31. If an administration cannot yet say - during the precoordination meeting - whether, it will apply any of the alternatives referred to in 30 or which of the alternatives it will apply, or if the administration cannot use any of the alternatives, it shall be studied how the system can be accommodated in the preferred band on the basis of the procedure described in the coordination phase (see 38 up to and including 43).

At this stage of the procedure the consequences for the new system and for the systems which have already been coordinated shall be determined in general terms.

32. The administration concerned shall indicate no longer than 6 months after the meeting, which of the available alternatives it will adopt. If the administration fails to do so it shall start the procedure all over again.

33. In the period of 6 months the administration concerned may try through further or multilateral consultations to find an acceptable solution.

34. The results of the precoordination phase shall be provisionally entered in the IFL.

Coordination phase

35. A precoordinated system shall be coordinated at the next meeting.

If it is not, the provisional entry in the IFL shall be cancelled and the administration concerned shall start the procedure all over again.

36. An administration which wishes a precoordinated system to be coordinated shall provide the data mentioned in Appendix 3 of the RR.
If such data differ substantially from the provisional data entered in the IFL, coordination of the system shall not take place.

37. If a request is made for the coordination of a system which can be accommodated - as has been concluded during the precoordination phase - without affecting coordinated systems, the provisional registration shall be changed into a definite one.

38. If accommodation is possible only at the expense of systems which are already operational, it shall first be examined whether such accommodation can be achieved by equalization of interference levels and by adjusting the orbital position(s) of these systems, taking into account the provision of item 51. An increase in the interference levels shall be accepted up to the maximum level agreed upon by CCIR.
If accommodation can be achieved in this way without further consequences for other systems, this solution shall be accepted by the administration(s) concerned. Of course the administrations concerned may agree upon exceeding the maximum interference levels.

39. If the preceding step does not yield the desired result, the spectrum occupancy of the new system and of the coordinated but not yet operational systems shall be reduced by a certain

percentage, to accommodate the new system with reduced spectrum occupancy.

40. The reduction process shall be terminated as soon as the new system can be accommodated.

41. The spectrum occupancy of operational systems shall be reduced only if after the spectra to be occupied by the new system and by the coordinated but not yet operational systems affected have been reduced by [15%], accommodation of the new system is still not possible.

42. At this stage of the procedure the spectrum occupancy of all systems shall be reduced by the same percentage until the new system can be accommodated.

43. Considering the cumulative effect of the procedure, it shall not be applied to systems of which the occupied spectrum has already been reduced by [60%] in relation to the systems' original spectrum occupancy.
The percentage for international systems serving a minimum of ten administrations is [40%].

44. If a new system could be accommodated without affecting other systems by applying advanced, and therefore expensive technologies, the clearly identifiable extra costs can be paid out of a fund specially created for this purpose by the ITU.
The same applies to extra costs clearly incurred by an administration which has had to accept one of the alternatives mentioned in 28 and 29.

45. The aforegoing possibility applies exclusively to developing countries.

46. The special fund derives its resources from part of the membership fees paid by all ITU member countries.

47. The result of the coordination phase is a final entry in the IFL.

Implementation phase

48. A system must be put into service no longer than 5 or 7 years (see 26) after it has been precoordinated.

49. Extension of this period is possible only if there are problems in connection with the launching of the satellite(s) concerned.

50. Adjustment of the orbital position of an operational system or reduction of the spectrum occupancy need not take place until the relevant new system is put into service.

51. The orbital position of an operational satellite can be adjusted (by a max. of $\pm$ [5°]) twice only.

52. Extension of the period of operation of a system is possible only if this does not affect other systems.
Such extension must be coordinated.

53. If an administration wants to use an operational system for a different purpose or in a different orbital position, this system may immediately be submitted for coordination.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 128-E
20 August 1985
Original: English

PLENARY MEETING

MINUTES

OF THE

SECOND PLENARY MEETING

Thursday, 15 August 1985, at 1540 hrs

Chairman: Dr. I. STOJANOVIĆ (Socialist Federal Republic of Yugoslavia)

Subjects discussed:		Documents
1.	Approval of the Minutes of the first Plenary Meeting	73 and Corr.1
2.	Oral reports by Committee Chairmen on the organization of their work	-
3.	Allocation of documents to Committees	-
4.	Timetable of work	-

1. Approval of the Minutes of the first Plenary Meeting (Document 73 and Corr.1)

The Minutes of the first Plenary Meeting were approved.

2. Oral reports by Committee Chairmen on the organization of their work

2.1 The Chairman of Committee 2 said that his Committee had met once and had formed a sub-committee consisting of the Vice-Chairman and the delegates of Bulgaria, the Federal Republic of Germany and Thailand, to prepare a document for consideration by the Conference. The Committee itself would meet again before the final Plenary Meeting, with a view to reporting to the latter.

2.2 The Chairman of Committee 3 said that his Committee had held one meeting and had taken note of Documents 46 and 47 relating to the budget of the first session of the Conference and to the contributions of recognized private operating agencies and non-exempt international organizations. In due course it would examine the financial implications of the decisions to be adopted by the Conference, bearing in mind Administrative Council Resolution No. 931.

2.3 The Chairman of Committee 4 said that his Committee's work was progressing well. Working Groups 4B and 4C, chaired by Mr. Kosaka (Japan) and Mr. Withers (United Kingdom) respectively, had begun their tasks as outlined in Documents DT/9 and DT/9(Rev.1). It was to be hoped that these Working Groups would shortly be able to provide Committee 5 with suitable information; but Working Group 4C's task during the coming week would be heavy and critical. Working Group 4A would be commencing its work the next day.

2.4 The Chairman of Committee 5 said that his Committee had set up two Working Groups, 5A and 5B, chaired respectively by Mr. Pinheiro (Brazil) and Mr. Challo (Kenya). Working Group 5A had already decided provisionally that the fixed-satellite service was a candidate for planning. There had been difficulties in trying to reconcile the various proposals, including problems in defining what was meant by planning; for the moment, therefore, no precise definition was being sought. However, it had been agreed to carry out the work as quickly as possible, so as not to delay deliberations elsewhere. Working Group 5B was to study procedural and administrative rules relating to planned and unplanned service. Since its work would be affected by Working Group 5A's findings, it had been decided to give priority to Working Group 5A, whilst avoiding, as far as possible, any conflict in the Working Groups' meetings.

2.5 The Chairman of Committee 6 said that two Working Groups, 6A and 6B, had been formed. Working Group 6A was being chaired by Mr. Railton (Papua New Guinea), since Mr. Cassapoglou (Greece), who had been elected, had resigned as he was obliged to leave the Conference for a few weeks; it had begun its work on item 1 of the Committee's terms of reference, as set forth in Document 79, regarding which a number of substantial problems would have to be solved. Working Group 6B, chaired by Mr. Sauvet-Goichon (France), had begun work on item 2 of the Committee's terms of reference; two sub-groups had been established and some progress made, but a considerable workload would need to be disposed of during the coming week in order to achieve real results.

2.6 The Chairman of the Ad hoc Working Group of the Plenary said that two sub-groups had been set up. The first, chaired by Mr. Marchand (Canada), was to consider questions relating to the work to be done between the sessions of the Conference. The second, chaired by Mr. Bates (United Kingdom), was to deal with a draft agenda for the second session of the Conference (Document DT/14). The Ad hoc Working Group's progress depended on the outcome of deliberations in Committees 4, 5 and 6, which he hoped would make the speediest possible progress.

2.7 The Chairman of Committee 7 said that it had held one meeting to date. He hoped that, as at previous Conferences, texts would be submitted to the Committee as quickly as possible.

2.8 The delegate of Venezuela appealed to all participants to adopt a spirit of consensus, especially at the current juncture when it was not known what type of planning would be chosen, a priori or evolutionary. The Conference should strive to focus on common ground and act in accordance with the spirit of the Convention.

2.9 The Chairman, in response to an observation by the delegate of Algeria, said that Committee 1 would be invited to heed the concern of the Chairman of Committee 5 about possible conflict between the work programmes of Working Groups 5A and 5B.

3. Allocation of documents to Committees

3.1 The Chairman of Committee 6 said that although Document 98 had been referred to his Committee, the second paragraph under Proposal seemed beyond that Committee's terms of reference and he therefore requested guidance from the Plenary Meeting.

3.2 The Secretary-General said that documents submitted after a Conference had opened were customarily directed to a particular Committee by the originating delegation. He himself foresaw no difficulty in referring the subject in question to Committee 6 and the matter could be covered in the first session's report to the second session.

3.3 The delegate of Australia said his Delegation, the originator, had realized that the document should be also dealt with by the Ad hoc Working Group of the Plenary under agenda item 5.3.

4. Timetable of work

4.1 The Secretary-General, replying to the delegate of Papua New Guinea, said that a more specific weekly timetable of meetings would be available the next day.

The meeting rose at 1620 hours.

The Secretary-General: The Chairman:

R.E. BUTLER Dr. I. STOJANOVIĆ

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Corrigendum 1 to
Document 129-E
12 September 1985
Original: English

COMMITTEE 4

SUMMARY RECORD

OF THE

FOURTH MEETING OF COMMITTEE 4

(TECHNICAL PARAMETERS AND CRITERIA)

1. Paragraph 6.1

The last line of the first sub-paragraph should read:

"... second part described the transmit and receive beams of the space stations."

(This correction affects the English text only.)

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 129-E
22 August 1985
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COMMITTEE 4

SUMMARY RECORD

OF THE

FOURTH MEETING OF COMMITTEE 4

(TECHNICAL PARAMETERS AND CRITERIA)

Friday, 16 August 1985, at 0900 hrs

Chairman: Mr. R.G. AMERO (Canada)

Subjects discussed:		Documents
1.	Organization of work	-
2.	Approval of the Summary Records of the first and second meetings of Committee 4	92, 102
3.	Oral reports of Working Group Chairmen	-
4.	Election of the Chairman of Working Group 4A	-
5.	Review of the structure of Committee 4	DT/7(Rev.1)
6.	Introduction of Document 105	105 and Adds.1, 2 and 3 and Corr.2
7.	Discussion of terms and definitions identified	DT/23
8.	Analysis of provisional procedures used by the IFRB in the application of Article 14	DT/21

1. Organization of work

The Chairman said that the timetable agreed by the Steering Committee for the following week, 19-23 August 1985, provided for numerous meetings of Committee 4 Working Groups. As a result, many meetings of Working Groups 4A and 4C in particular would have to be held simultaneously. Although that posed problems for small delegations, he believed that those two Groups would have to meet in parallel. He hoped that, with speedy progress by Working Group 4A, it would be possible to keep such simultaneous meetings to a minimum.

2. Approval of the Summary Records of the first and second meetings of Committee 4 (Documents 92 and 102)

2.1 Document 92

The Summary Record of the first meeting of Committee 4 was approved as amended by the delegate of Spain (see Corr.1 to Document 92).

2.2 Document 102

The Summary Record of the second meeting of Committee 4 was approved, subject to amendments submitted by the delegates of Brazil, the Federal Republic of Germany, India, Paraguay and Mexico (see Corr.1 to Document 102).

3. Oral reports of Working Group Chairmen

3.1 The Chairman of Working Group 4B said that it hoped to soon complete discussion of the further documents allocated to it at the previous meeting of the Committee and those since submitted by certain delegations. A Drafting Group had been established and had made very good progress. It hoped to complete drafting based on all except the newly allocated documents in the near future.

3.2 The Chairman of Working Group 4C said that it had held four more meetings and made further progress, but much remained to be done. Drafting had begun on several items and a start had been made on the paper which had been requested concerning the situation prevailing in the fixed-satellite services. Some drafts might be available by Monday, 19 August 1985.

Meanwhile, he had noted several new documents of interest to Working Group 4C and would follow up the question of their allocation after the meeting.

3.3 The Chairman said that it had been a pleasure to report the good progress made by the two Groups to the Plenary Meeting and he hoped that it could be maintained. Some matters had to await decisions from Committees 5 and 6, but he hoped that work could proceed on other elements for incorporation in the Conference report, either on the basis of tentative decisions or in areas which did not depend on other Committees.

The Steering Committee had addressed the matter of the structure of the report of the first session of the Conference using the list of items foreseen by Working Group 4C as constituting the content of its output (Document DL/8). He had explained that it had not been the Working Group's intention to propose what the structure of the report should be. He expected to receive a proposal on that subject from the Secretariat at the next Steering Committee meeting so that the work done by Committe 4 could be adapted to the structure agreed by the Steering Committee.

With regard to the allocation of documents, he understood that some delegations wished to have further contributions reviewed. Since the allocation procedure was less formal than on previous occasions, Working Groups should take note of such contributions and incorporate them in their work without waiting for a decision by the Committee or Plenary Meeting.

4. Election of the Chairman of Working Group 4A

4.1 The Chairman said that several contributions concerned Resolution No. 505, with which Working Group 4A had to deal. Although there seemed to be some agreement among the various proposals, there was not a complete consensus. Following consultations, he understood that the United States delegation could provide a Chairman for Working Group 4A.

4.2 The delegate of the United States said that Mr. Edward Miller (Box No. 443) would be pleased to serve as Chairman of Working Group 4A.

4.3 The Chairman said that, if there was no objection, he would take it that the Committee agreed.

It was so decided.

5. Review of the structure of Committee 4 (Document DT/7(Rev.1))

5.1 The Chairman said that Document DT/7(Rev.1) reflected modifications agreed in the Committee and in discussion with the Chairmen of other Committees. Among the responsibilities which were left to Committee 4 as a whole, he had so far identified only the general item of terminology.

It had been agreed that Working Group 4B would take on sharing between feeder links and other services, which came under agenda item 3.3 and had originally been assigned to Committee 6.

The task assigned to Working Group 4C had been modified to reflect the United States proposal that operational factors should also be taken into account.

5.2 The delegate of Sweden said that there had been a number of proposals to introduce the subject of high-definition television broadcasting by satellite, but it was hard to see where the subject fitted into the terms of reference of the various Working Groups. He believed that it should be dealt with both by Committee 4 and by the ad hoc Working Group of the Plenary. However, the latter needed input from Committees before it could consider proposals. He therefore, wished to see the subject reflected in the structure of the Committee. It could perhaps be included most appropriately under Working Group 4B, but he could accept any other solution.

5.3 The Chairman suggested that the subject might be added to those for consideration by Working Group 4B. The Committee's work programme should remain flexible since requests for analysis and comment would be received from other bodies as needs were identified. Further revisions of the Committee's structure would be produced from time to time, as required, so that everyone would be aware what subjects the Committee was treating.

It was so agreed.

6. Introduction of Document 105 (Document 105 and Adds.1, 2 and 3 and Corr.2)

6.1 The representative of the IFRB, introducing Document 105 and Adds.1, 2 and 3 and Corr.2, said that it had been prepared in response to a request made at the Conference Preparatory Meeting (CPM) and covered the three phases of the procedures of Articles 11 and 13 of the Radio Regulations - advance publication, co-ordination and notification. The first part contained information on space stations, while the second part described the transmit and receive of beams by the space stations.

Adds.1, 2 and 3 were computer printouts and had not been distributed to all participants, but Annexes 1, 2 and 3 of the Document reproduced sample pages of the printouts for information purposes.

The printout in Add.1 listed information contained in reports of format "A" and set out, inter alia, the identification name, visibility and service arcs, date of bringing into use and period of validity of each space station. The printout in Add.2 corresponded to the format of report "B" and gave specifications on the beams of the space station, including the service area, antenna gain, frequency band and services in use in each frequency band of each beam. The printout in Add.3 gave examples for the European Region of space stations using beams in the 6 and 4 GHz bands and, inter alia, of systems under co-ordination or notified.

Because the document had been put together as quickly as possible, minor errors had crept into the data base. The IFRB would be grateful if administrations would draw its attention to any such errors. The IFRB could also, if the Committee so requested, produce additional reports on specific cases which the Committee might wish to investigate further.

Figure 1 in the original Document was inaccurate but the correction could be found in Document 105(Corr.2).

6.2 The Chairman said that some of the information in Document 105 and its Addenda applied to Committee 5, but that Add.2, which gave the technical characteristics of satellites in orbit, might be useful to Working Group 4C or perhaps to Working Group 4B. He echoed the appeal made by the representative of the IFRB for all administrations to review the document carefully with a view to detecting possible errors in descriptions of their space stations.

7. Discussion of terms and definitions identified (Document DT/23)

7.1 The Chairman invited the Committee to consider definitions and terms which might contribute to the future modification of Article 1 of the Radio Regulations (Document DT/23) with a view to deciding whether to establish a Drafting Group to go into the matter in depth.

7.2 The delegate of the USSR said that preparations for the Conference had been made on the basis of the terms and definitions already incorporated in the Radio Regulations, and any changes were unlikely to win approval at the present stage. Such changes went beyond the Committee's mandate, moreover, and it should therefore refrain from taking the subject up.

7.3 The delegate of Colombia said that, on the contrary, the Conference should give due attention to any new definitions which might advance its work. A number of administrations, including his own, had advanced proposals for modification of terms and definitions; Documents 72 and 110, for example, should have been mentioned in paragraph 4 of Document DT/23.

7.4 The Chairman said that Document 72 was to be considered by Working Group 4C, but he had noted the Colombian delegate's comment regarding Document 110.

7.5 The delegate of the United States expressed reservations as to whether the Committee was empowered to consider material of the type set out in the document, particularly as many of the definitions did not have technical implications and might more appropriately be considered by other Committees.

7.6 The Chairman said that he had intended the Committee's discussion to be restricted solely to the technical aspect of the definitions.

7.7 The delegate of Canada said that his delegation had no strong feelings on the subject but thought that it was always useful to refine legislative terminology in the light of technical and operational realities.

7.8 The delegate of the United Kingdom said that his delegation had no strong views on the subject either but thought that Committee 4 would be entitled to produce a technical definition if such a need were demonstrated. The subjects covered in Document DT/23 strayed outside the Committee's competence, however, and the whole question should be deferred for further consideration.

7.9 The delegate of the Federal Republic of Germany said that he supported the remarks made by the delegate of the United Kingdom.

7.10 The Chairman suggested that, in view of the comments made by members of the Committee, the subject be deferred for further consideration; he would consult with those delegations which had expressed reservations and with the Chairman of the Conference as to whether the Committee was competent to deal with the question.

It was so agreed.

8. Analysis of provisional procedures used by the IFRB in the application of Article 14 (Document DT/21)

8.1 The representative of the IFRB informed the Committee that the documents requested by Working Group 4B, namely an analysis of the provisional procedures used by the Board in the application of Article 14 of the Radio Regulations, was now available as Document DT/21.

The meeting rose at 1015 hours.

The Secretary: C. AZEVEDO

The Chairman: R.G. AMERO

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 130-E
26 August 1985
Original: English

COMMITTEE 6

SUMMARY RECORD

OF THE

THIRD MEETING OF COMMITTEE 6

(MATTERS RELATING TO THE BROADCASTING-SATELLITE SERVICE IN THE 12 GHz BAND)

Friday, 16 August 1985, at 1430 hrs

Chairman: Mr. M. MATSUSHITA (Japan)

Subjects discussed:		Documents
1.	Approval of the summary records of the first and second meetings of Committee 6	93, 94
2.	Structure of Committee 6	DT/24, 124
3.	Report by the Chairman of Working Group 6A	DT/26
4.	Report by the Chairman of Working Group 6B	-
5.	General introduction of new documents	81 + Corr.1, 87, 95, 97 + Corr.1, 98, 99, 101, 111, 122

1. Approval of the summary records of the first and second meetings of Committee 6 (Documents 93 and 94)

1.1 The Chairman drew attention to a number of editorial corrections to the summary record of the first meeting.

The summary record was approved as amended (see Corrigendum 1 to Document 93).

1.2 The delegate of Mexico felt that it was important to note, for the information of the Committee, that the international organization mentioned in section 2.3.1 of Document 94 was the Inter-American Telecommunications Conference (CITEL) and that the Resolution referred to related to the incorporation of the Final Acts of WARC SAT-R2 1983 into the Radio Regulations.

Those comments were noted and the summary record was approved.

2. Structure of Committee 6 (Documents DT/24 and 124)

Document DT/24, which gave an overview of the structure of the Committee, was noted.

2.1 The Chairman drew the Committee's attention to Document 124, an information paper setting out the general schedule of the work of the Conference. According to the schedule, the Working Groups of Committee 6 were expected to complete their work by the Tuesday of the fifth week of the Conference and Committee 6 itself should complete its work by the Thursday of that week. Since the Conference was now at the end of its second week, the Committee had only two weeks left to it and he urged its members to keep their discussions concentrated on the substance of the matters in hand in order to enable the deadlines to be met.

3. Report by the Chairman of Working Group 6A (Document DT/26)

3.1 The Chairman of Working Group 6A introduced Document DT/26 which detailed the progress of the Working Group's deliberations to date. After mentioning two editorial corrections to the text, he drew the Committee's attention to the fact that Document DT/26, which represented a consolidation of the results of the Working Group's discussion and approval of Documents DT/16 and DT/20, had not yet been considered by the Working Group itself.

3.2 The delegate of the United States of America noted that the wording of Note 10/XXX in Document DT/26 differed from that appearing in Document DT/16.

3.3 The Chairman of Working Group 6A said it was his understanding that the Working Group has agreed to the altered wording, which had been proposed by the Chairman of the IFRB.

3.4 The delegate of the USSR proposed that the Committee should merely note the contents of the document as information on how the work of the Group was progressing and leave the discussion of the substance of the report to the Working Group itself.

3.5 The delegate of the United States of America supported that proposal.

The proposal was approved and Document DT/26 was noted.

3.6 The delegate of France said that, in the light of the division of opinion recorded in the last paragraph of Document DT/26 and the fact that several delegations, including the French Delegation, considered that further compatibility studies should be carried out before Document 16 was addressed, he was surprised to see that the agenda for the next meeting of Working Group 6A included discussion of Document 16.

3.7 The Chairman of Working Group 6A explained that the subject Working Group 6A would be asked to address at its next meeting was not the consolidated text of Appendix 30 contained in Document 16 but the comments thereon by a number of administrations (contained in Annex 2 to that document), which would serve as a source of advice and assistance to the Working Group in its task.

3.8 The delegate of France further asked what action was being taken by Working Group 6A on the request made by France in Document DT/15.

3.9 The Chairman of Working Group 6A said that, although the French request had been supported by the United Kingdom and Switzerland, a number of other delegations had been opposed to the relevant calculations being carried out by the IFRB at the present juncture. The matter was therefore pending.

4. Report by the Chairman of Working Group 6B

4.1 The Chairman of Working Group 6B said that his Group had so far held four meetings. It had in addition set up two Sub-Working Groups, 6B-1 and 6B-2.

Sub-Working Group 6B-1 had the task of reviewing and consolidating the proposals from administrations on the question of the frequency bands for planning the broadcasting-satellite feeder links. The results of its deliberations were embodied in Document 117, which would be of considerable utility in the further consideration of the subject.

Sub-Working Group 6B-2 had the task of considering the technical parameters for the planning of feeder links. Since the Group had made rapid progress and had almost completed its work on feeder links in the 17 GHz band, Working Group 6B had extended its terms of reference to include examination of the technical parameters for feeder links in the 14 GHz band.

Lastly, Working Group 6B had been asked to identify the frequency bands for which sharing criteria were necessary. One such band, 17.3 - 18.1 GHz, had been identified and that information could now be transmitted to the Chairman of Committee 4. Work on the subject was continuing and should further bands be identified, Committee 4 would be informed.

4.2 In reply to a question by the delegate of Senegal, the Chairman of Working Group 6B said that the Working Group had not yet discussed the question of sharing criteria for the 14 GHz band, but a formal request in connection with that band would probably be transmitted to the Chairman of Committee 4 later.

4.3 The Chairman of the IFRB said that the question of sharing criteria for bands shared between the space and terrestrial services had two aspects. First, there was identification of the need for coordination, and he pointed out that criteria for that were already contained in Appendix 28 of the Radio Regulations. The second aspect was the set of technical criteria which could be used by administrations in effecting coordination, and he assumed that it was to that that the Chairman of Working Group 6B referred. However, the question to be put to the Chairman of Committee 4 should be defined more precisely.

4.4 The Chairman said that it might be desirable to discuss that point informally with a view to further clarification.

4.5 In reply to the delegate of Singapore, he said that the first frequency band identified for feeder links was the 17 GHz band, but other frequency bands would be identified shortly and would be transmitted to Committee 4 as soon as possible.

5. General introduction of new documents (81 + Corr.1, 87, 95, 97 + Corr.1, 98, 99, 101, 111, 122)

5.1 Document 81 + Corr.1

5.1.1 The delegate of Ecuador drew attention to proposal EQA/81/3, together with the Corrigendum to it in Document 81 + Corr.1, as relevant to the work of Committee 6. He reiterated his Administration's support for incorporation of the decisions of CARR-SAT-R2 1983 in the Radio Regulations in respect of the frequency bands 12.2 - 12.7 GHz, and the reservation made by his Administration both unilaterally and jointly with the Colombian Administration at the time of the signing of the Final Acts of that Conference.

5.2 Document 87

5.2.1 The delegate of Iraq said that the portion of Document 87 relevant to Committee 6's work was to be found in section 6 dealing with agenda item 3.1.

5.3 Document 95

5.3.1 The delegate of the Ivory Coast drew the Committee's attention to proposal CTI/95/5 in Document 95 which proposed that the band 17.3 - 18.1 GHz be used for feeder links.

5.4 Document 97 + Corr.1

5.4.1 The delegate of Japan said that Document 97 concerned calculations made in Japan for the carrier-to-noise ratio of feeder links in Region 3. The results of the calculation, based on the assumption that homogeneous e.i.r.p.s were used, were given in Figure 1, and the conclusions were shown in Document 97 + Corr.1. His Delegation believed that the necessary e.i.r.p., which was one of the most important factors in planning feeder links, should be decided bearing in mind the variation of carrier-to-noise ratio.

5.5 Document 98

5.5.1 The delegate of Australia said that feeder links might affect the planning of the BSS for various reasons, many of which were listed in CCIR Report 952. Proposals had been presented for providing feeder links planned on a direct frequency translation basis, and the Region 2 Plan was based on that philosophy. The spectrum to be used for feeder links was also covered by several other proposals before the Conference and it was evident that opinions remained divided as to which band should be planned. He noted that few nations in Region 3 had announced definitive plans for using the BSS 77 Plan assignments in the near future.

His Administration was concerned lest any premature planning should restrict the types of service that might be provided in the future and thus inhibit nations from obtaining the type of satellite-broadcasting service best suited to their needs and economic possibilities. Clearly, any method for reducing feeder-link bandwidth must not entail such high costs as to make the broadcasting-satellite service not viable. His Administration believed that, particularly in Region 3, insufficient consideration had been given to the details of future BSS systems. There were likely to be cases in which the feeder link to down-link relationship might not be based on a simple one-to-one ratio, and feeder-link service areas might not necessarily be identical to down-link service areas. Other considerations, such as the development of high-definition television, and new types of modulation, currently being studied by the CCIR, as well as general advances in technology suggested that it might be too early to plan feeder links in Region 3 until a reasonable number of administrations had indicated their intention of implementing services in accordance with the BSS 77 Plan. It was essential that any Plan should give due consideration to social and economic implications as well as technical criteria. His Administration therefore proposed that the technical criteria for planning be prepared by the present Conference but that actual planning in Region 3 be deferred until there was a demonstrable need for such a Plan. That need should be reassessed at the second session of the Conference, which should consider empowering a later Administrative Radio Conference to develop a feeder-link plan.

5.5.2 Recalling his comment at the second Plenary Meeting, the Chairman enquired which part of Document 98 related to agenda item 5.3 as indicated by the delegate of Australia at that Plenary Meeting.

5.5.3 The delegate of Australia said that the three main points in the document which were directly relevant to Committee 6's work were: which frequency bands should be planned; the technical criteria for planning; and the planning approach to be adopted. The remainder of the proposal should perhaps more properly have been directed to the Ad hoc Working Group of the Plenary, under the appropriate agenda item.

5.5.4 The delegate of the Islamic Republic of Iran said that he did not agree with the proposal made in that document for deferring a plan for feeder links in Region 3. There was no specific reason, so far as technological development was concerned, for differentiating Region 3 from the other regions. If a feeder-link plan was not established for the 1977 down-link plan, that might further delay the implementation of the BSS-77 Plan, especially for developing countries. Exceptional cases and the possibility of unnecessary restrictions being imposed by some administrations during the process of planning might be covered by the adoption of procedures to relax such restrictions during the development of the Plan.

5.5.5 The delegate of Senegal said that while he understood the Australian Delegation's concern, he could not accept its proposal to defer planning, since items 3.1 and 3.2 of the Conference agenda, as established by the Administrative Council, contained no suggestion that feeder-link planning for any region might be deferred.

5.6 Document 99

5.6.1 The delegate of Egypt said that Document 99 gave his Administration's proposals in connection with agenda item 3. Proposal EGY/99/1 referred to agenda item 3.1. Under agenda item 3.2, it was proposed that a precise estimate be made of the e.i.r.p. based on the required value of the carrier-to-noise ratio and his Administration proposed an e.i.r.p. value of 78 dBW and that G/T should be 9 dB in order to obtain a homogeneous plan. Proposal EGY/99/2 dealt with agenda item 3.3.

5.6.2 The delegate of the USSR pointed out, in connection with the calculation in section 2 of Document 99, that it was possible to start from other initial data or parameters; hence, there might be considerable variation in the figures, and the maximum value for the e.i.r.p. could be as much as 10 dB more than 78 dBW.

5.6.3 The Chairman said that detailed calculations in that connection were being undertaken by Working Group 6B.

5.7 Document 101

5.7.1 The delegate of Argentina drew attention to proposal ARG/101/6, which was in accordance with the CITEL decision given in Document 84, to which the Mexican delegate had already referred. Since the matter was under consideration in Working Group 6A and Sub-Working Group 6A-1, he would discuss it in greater detail there.

5.8 Document 111

5.8.1 The delegate of Japan said that in Document 40, Annex 3, his Administration proposed that power control should be permitted on the condition that it did not increase interference to other satellite systems. Document 111 constituted an attempt to set out a practical guideline for that purpose, and he drew particular attention to Figure 1 in the document.

In reply to a question by the delegate of India, he confirmed that Figure 1 meant that if rain attenuation was of the order of 10 to 14 dB the power increase required was only of the order of 5 to 6 dB.

5.9 Document 122

5.9.1 The delegate of Yugoslavia presented Document 122, which gave a comparison of two rain models. Many planning exercises had been carried out on the basis of the old rain model. His Delegation proposed that the rain model given in the CPM Report should be used.

5.9.2 The Chairman indicated that Document 122 would be referred to Sub-Working Group 6B-2.

The meeting rose at 1615 hours.

The Secretary: I. DOLEZEL

The Chairman: M. MATSUSHITA

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COMMITTEE 6

Egypt

PROPOSAL FOR REDUCING INCOMPATIBILITIES IN FEEDER LINKS TO BSS

Introduction

Incompatibilities in feeder links to BSS occurs due to two reasons:

1) the atmospheric attenuation varies in wide range for different feeder links;

2) the satellite receiver figure of merit varies in wide range for different feeder links.

In this proposal we discuss how to reduce these incompatibilities to achieve system homogeneity.

1. Atmospheric attenuation

Feeder-link planning should be based on the atmospheric attenuation exceeded for not more than 1% of the worst month. Document 122 presented rain attenuation calculations based on the two propagation models used in WARC-77 and RARC-83, these calculations indicate a wide range of attenuation in different feeder links. Investigation of the results indicates that attenuations estimated using the WARC-77 model in comparison to those estimated using the RARC-83 model are higher in some cases and appreciably lower in other cases; this proves that we have to deal with these propagation models with care.

EGY/131/3 Egypt proposes to use an average value of the atmospheric attenuation for planning purposes. The following table presents the average and standard deviations calculated from the calculations presented in Document 122.

Attenuation exceeded for not more than 1% of the worst month

	WARC-77	RARC-83
average value	2.5 dB	4.1 dB
standard deviation	0.94 dB	3 dB

EGY/131/4 Egypt proposes to consider an atmospheric attenuation average value of 4 dB for planning purposes.

2. Receiver figure of merit

The standardization of the satellite receiver figure of merit to produce homogeneity in the power-flux density and C/N would improve the situation for sharing with terrestrial and fixed-satellite systems.

For countries which have a wide service area, the following can be used to achieve the objective standard figure of merit.

a) Use of multiple beam antennas:

CCIR Handbook on satellite communications, chapter 4, section 4.2.2.3, provides some information about the application of transponders connected to several beams.

b) Use of low noise receivers:

In early 1980, a projection was made that 18 GHz devices would approach 1.5 dB by 1981 [see Broadcasting satellite systems, CCIR, Geneva, 1983, ISBN 92-61-01751-7, chapter 4, section 4.1.1].

EGY/131/5 Based on the above considerations Egypt proposes to consider a standard value of $\frac{G}{T}$ = 6 dB for planning purposes.

3. Proposal conclusion

EGY/131/6 Based on specifying a standard atmospheric attenuation of 4 dB and standard satellite $\frac{G}{T}$ of 6 dB a preliminary feeder-link planning based on a standard e.i.r.p. of 80 dBW should be exercised.

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COMMITTEE 5

USSR

POSSIBLE IMPROVEMENT IN THE PROCEDURE FOR COORDINATION OF SATELLITE NETWORKS

(Radio Regulations, Article 11)

URS/132/12 With a view to simplifying the procedure, reducing the time taken to process notices and considerably easing the burden on administrations, it is proposed that the advance publication stage should be eliminated and that changes should be made in the coordination procedure. These changes will remove the need to prepare two sets of data: for advance publication by the IFRB and for inclusion in coordination requests to other administrations. It is proposed that instead a single document should be submitted to the IFRB which can be used both to notify all administrations and to initiate the coordination procedure if necessary. The new procedure would essentially be as follows.

An administration planning to establish a satellite network shall send the IFRB information on the system five years before the date on which it is planned to bring the system into service (as under the existing procedure). This information must include the information listed in Appendix 4 and should if possible include the information listed in Appendix 3. Upon receiving the information, the IFRB shall analyze it, using Appendix 29 to the Radio Regulations, and decide with which networks of other administrations coordination is necessary. The information on the system shall then be published in the IFRB Weekly Circular together with a list of the administrations with which coordination is necessary. Such publication serves both as notification to all administrations and a request for coordination with the administrations concerned. If, after studying the information published, any other administrations in addition to those listed consider that unacceptable interference may be caused to their existing or planned services, they may send their comments to the IFRB and to the notifying administration for inclusion in the coordination process. The administrations shall then, within the period specified in the Radio Regulations, undertake the coordination process, supplying the necessary technical data. Upon completion of the coordination process, the networks shall be notified and registered in accordance with the existing procedure.

The procedure proposed would considerably ease the burden on administrations and the IFRB, reduce the time taken to process notices and avoid the complications and divergences between the advance publication and coordination stages to which attention is drawn, for example, in Document 66.

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COMMITTEE 5

Bolivia, Colombia, Ecuador, Peru, Venezuela

PROPOSALS

The above Administrations have taken note of the proposals and discussions relating to the Advance Publication procedures set out in section I of Article 11 of the Radio Regulations, in the light of which they propose:

COMP/133/4 1. That advance publication will continue to be useful and necessary for unplanned services, as the information published properly shows the state of occupancy of the geostationary orbit and facilitates subsequent coordination.

COMP/133/5 2. That studies should be made to simplify advance publication, although no modifications should be accepted which are liable to reduce its usefulness.

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COMMITTEE 6

Note by the Secretary-General

At the request of Working Group 6A, Mr. A. Noll, Legal Adviser, presented, at the fourth meeting of that Working Group, on 19 August 1985, orally the legal opinion, which is, again as requested by that Working Group, reproduced in the Annex to the present Document.

Following the presentation referred to above, the Secretary-General concluded :

"1. A stand-alone resolution of WARC-ORB 85 in a Report to the Second Session will not bring the BC-SAT-R2 Plan and Decisions into sufficient legal force to provide for comparable legal standing with other services planned and operating under the existing regulations and up to at least the 1988 Conference.

2. If there is to be some legal recognition of the BC-SAT-R2 decisions, i.e. at least for those for which there are no difficulties, there is a need to make the regulatory additions at the WARC-ORB 85 through some form of Final Acts. These Acts could of course provide the necessary provisions which could qualify the application of the parts of the BC-SAT-R2 decisions causing incompatibilities and difficulties. The extent of those provisions would of course be a matter for this Conference."

R.E. BUTLER
Secretary-General

Annex: 1

ANNEX

LEGAL OPINION

orally presented in the meeting of Working Group 6A on 19 August 1985 concerning the issue raised and the request made by this Working Group at its preceding meeting on 16 August 1985

"Mr. Chairman, Ladies and Gentlemen,

1. During the last, third meeting of this Working Group the Chairman of the IFRB raised the question as to whether or not this Conference was competent to modify the Plan contained in the Agreement adopted by the BC-SAT-R2. Several Delegations having stressed the importance of this question and expressed the need for legal advice thereon, this Working Group, at the end of its deliberations, decided to invite the Secretary-General and the Legal Adviser to participate in the discussions on the issue at its next, fourth meeting, during which legal advice should be presented orally and, thereafter, if necessary, might be requested in writing.

2. In the framework of this oral presentation, there is a need to look, first, more generally into the whole matter - in the light of various relevant legal instruments related thereto -, before addressing the particular question of the competence or non-competence of this Conference to modify the Plan contained in the Agreement adopted by the BC-SAT-R2 (1983).

3. By virtue of No. 51 of the Nairobi Convention, "only items included in their agenda may be discussed" (emphasis added) by Administrative Conferences. The agenda of this Conference, established by the Administrative Council in its Resolution No. 895 (cf. Art. 54 of the Convention), under "decides further", makes in point 6 thereof first reference to Resolution No. 1 of the Nairobi Plenipotentiary Conference and to Resolution 504 of the WARC-79. With regard to the first Resolution, paragraph 2.3 thereof constitutes a clear decision by the Plenipotentiary Conference (see No. 208 of the Convention) on the inclusion of the matter in the agenda of the WARC-ORB (1). It is also of importance to note the reference in the agenda of this Conference to Resolution 504 of the WARC-79, which, in paragraph 2 under "resolves", with regard to the "interim provisions relating solely to Region 2 in Appendix 30" (see Article 12 thereof) stipulates that they "shall continue to apply pending the decisions of the 1983 regional administrative radio conference after which time the final acts of the 1983 regional conference shall be regarded as superseding such interim provisions for Region 2 now contained in Appendix 30 subject to their adoption by the next competent world administrative radio conference" (emphasis added). In this context, it has to be kept in mind that Resolution No. 504 is mentioned and thus included in the Radio Regulations which stipulate in their No. 840 : "For the use of the band 11.7-12.75 GHz in Regions 1, 2 and 3, see Resolutions 31, 34, 504, 700 and 701" (emphasis added).

4. In accordance with point 6.1 of its agenda, this Conference "shall consider (in French : "examinera") the relevant decisions" (emphasis added) of the BC-SAT-R2 (1983). This implies, in my view, also an examination by the Conference of those decisions with respect to their relevancy. The agenda further provides that the Conference shall "incorporate these decisions in the Radio Regulations, as appropriate," (emphasis added). In the latter respect, two issues merit mentioning. Firstly, the agenda does not specify that the decisions of the BC-SAT-R2 shall be incorporated in Appendix 30 of the RR, but speaks only of their incorporation in the "Radio Regulations". Secondly and more importantly, the term "as appropriate" indicates that the Conference has been given a power of appreciation, evaluation, judgment and discretion as to the "relevancy" of the decisions of the BC-SAT-R2 with respect to their incorporation in the Radio Regulations (hereinafter referred to as "the RR").

5. If the Conference comes to the conclusion that the decisions of the BC-SAT-R2 are all "relevant" and can be incorporated, "as appropriate", in the RR (either by including them in Appendix 30 or otherwise), then it has to do so in accordance with its mandate.

6. If, however, the Conference concludes that an "appropriate" incorporation of those "relevant decisions" in the RR is, in its view, not possible, it may so decide by stating the reasons why it considers itself not in a position to achieve the task attributed to it, which indeed consists in the incorporation of the "relevant decisions" of the BC-SAT-R2, in an appropriate way, in the RR (see paragraph 3 above). In this context, it must not be overlooked that the Conference, in accordance with Nos 51 and 208, may and even must consider the matter, in order to achieve the result wanted in accordance with the terms of its agenda, but is not obliged to incorporate the decisions of the BC-SAT-R2 in the RR, if it considers, for reasons of existing or potential incompatibilities or technical difficulties, such incorporation at the present time as being not "appropriate".

7. After this first conclusion that this Conference may "as appropriate" incorporate the "relevant decisions" of the BC-SAT-R2 (1983) in the RR or may not incorporate them at all, if it comes to the conclusion that this is not "appropriate", the question arises whether out of these "relevant decisions" only some, i.e. a certain part thereof, may be incorporated in the RR by this Conference, because it considers only such incorporation "as appropriate". Although such course of action would, from the strictly legal point of view, be in conformity with the terms of point 6.1 of the agenda, it may technically and practically not be feasable and might lead to an unsatisfactory and hence inappropriate solution. The judgment on such a solution from the technical and practical point of view falls outside the scope of "legal advice" and can only be made by this Working Group and this Conference itself.

8. I turn now to the particular question raised during your preceding meeting, i.e. whether or not this Conference is competent to modify the Plan contained in the Agreement adopted by the BC-SAT-R2 (1983).

9. Again from the strictly legal point of view, there are indeed two alternatives with regard to the interpretation of the mandate of this Conference as contained in point 6.1 of its agenda.

10. **First alternative** : This alternative consists in the strict interpretation of the terms used in this point 6.1 of the agenda. These terms refer to the incorporation by this Conference in the RR, "as appropriate", of "these decisions" of the BC-SAT-R2. The word "these" clearly and undoubtedly refers itself to the preceding words used in point 6.1, i.e. "the relevant decisions" of BC-SAT-R2. A strict interpretation of the terms of point 6.1 of the agenda leads to the result that this Conference is only mandated and empowered to incorporate in the RR the "decisions" as such of the BC-SAT-R2, which the present Conference considers "relevant" for such incorporation, and not any other decisions which it may take itself, e.g. by modifying, amending or altering otherwise those decisions adopted by the BC-SAT-R2. Under such a strict interpretation, any such modification, amendment or alteration would have to be considered as falling outside the scope of the mandate or competence of this Conference. The term "as appropriate" would, under such a strict interpretation, only refer to the scope, method, procedure or ways and means, by which "these relevant decisions" as such and without any modification etc. would have to be incorporated appropriately in the RR by this Conference.

11. **Second alternative** : This alternative, which is legally equally tenable or defendable, could be called the "goal-oriented interpretation" of the terms used in point 6.1 of the agenda. If one takes the view that the ultimate goal to be achieved by this Conference is the completion of "a world-wide plan for the broadcasting-satellite service", as originally envisaged by the 1973 Plenipotentiary Conference in its Resolution No. 27 on the subject and if one concludes further that this goal, because of incompatibilities between the existing provisions in the RR (including their Appendices) and the provisions of the Agreement and the Plan annexed thereto of the BC-SAT-R2, can only be achieved by modifying, amending or altering "the relevant decisions" of the latter, in order to bring them in harmony with, and to incorporate them in, the RR, then such a broader, "goal-oriented interpretation" of the terms of point 6.1 of the agenda can also be justified. Under such an interpretation, a different, i.e. broader and substantive meaning would be attributed to the term "as appropriate" in that point of the agenda. This term would thus mean the tool given to this Conference to ensure its achievement of the final goal of completing a world-wide plan for the BSS through "appropriate" incorporating in the RR of "the relevant decisions" of the BC-SAT-R2 by modifying, amending or altering them otherwise, in order to solve any existing or future incompatibilities or technical difficulties in this respect.

12. The foregoing two alternative solutions for a legally possible and well defendable interpretation of the terms of point 6.1 of the agenda are hereby submitted for the Working Group's consideration. The choice between them is a matter of this Working Group and finally of this Conference itself.

13. However, Mr. Chairman, with your permission, I should like, within the strict framework of giving legal advice on the subject, to present for your Working Group's consideration another, third alternative which could be chosen, thus avoidinng a choice between the two alternative interpretations outline above.

14. **Third alternative** : This Conference could envisage the incorporation in the RR of "the relevant decisions" of the BC-SAT-R2 as such, without touching or modifying them, and could, at the same time, also incorporate in the RR additional provisions or procedures aimed at solving existing or future incompatibilities or technical difficulties, including limitations in the application of the BC-SAT-R2's decisions. Such course of action would at the same time respect the strict interpretation of the terms of point 6.1 of the agenda, as it would remain otherwise in conformity with these terms. It must not be overlooked that these terms contain also a last half-sentence reading ", revising the Radio Regulations only for these purposes as necessary". If this Conference considers it "necessary", "for the purpose" of incorporating, "as appropriate", in the RR "the relevant decisions" of the BC-SAT-R2, to "revise the Radio Regulations" by also incorporating therein such "additional provisions or procedures" as outlined before, it would legally be perfectly well in conformity with its mandate as stipulated in point 6.1 of the agenda. The further question, which certainly arises in the context of this legally possible, third alternative - hereby submitted for your Working Group's consideration -, is : Is the adoption of this third alternative technically and practically possible ? The answer thereto goes beyond legal advice and can only be given by the Conference itself.

15. Mr. Chairman, if there are any further questions from yourself or the Members of your Working Group for additional information, clarification, explanation or legal advice, I certainly remain at your disposal."

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ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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COMMITTEE 5

Note from the Chairman of Committee 4
to the Chairman of Committee 5

Committee 4, at its fifth meeting, considered Document 135 on characteristics of typical in-service networks in the fixed-satellite service. This revised document represents the approved text as modified at that meeting.

The attached information is provided to assist Committee 5 in its work of deciding which services and frequency bands are to be planned (agenda items 2.2 and 2.3). While much of the information is based on the CCIR CPM Report, new information from administrations has been incorporated.

R.G. AMERO
Chairman of Committee 4

Source: DL/6

COMMITTEE 5

THE CHARACTERISTICS OF TYPICAL IN-SERVICE NETWORKS OF THE FIXED-SATELLITE SERVICE

1. Introduction

The FSS has evolved considerably over the last 20 years and handles a wide range of traffic. It is the most heavily utilized of all the space services and probably the most highly developed. This review of the characteristics of typical in-service networks of the FSS is based on the CPM Report, Annex 3, with new material added at WARC-ORB-85.

The FSS networks currently in operation vary considerably with regard to technical parameters, operational techniques and the services provided. For example, the capacity of the radio carriers may vary from a single telephone channel (SCPC) up to several thousand channels; the corresponding bandwidths of the carriers range from about 20 kHz to 70 MHz and modulation may be analogue or digital. These systems are used to provide telephony, television, teleconferencing, data transmissions, intracompany services, communications between computers, telecommunication services for isolated regions and weather forecasting services. The services and characteristics will continue to change in the future with technical progress.

Today's satellite services are implemented in several ways, viz: by independent space networks, by consortia or by lease of space segment from operating organizations. The choice can be related to need or economic viability, although technical characteristics may be similar. Existing systems mainly use the 3 700 - 4 200 MHz, 5 925 - 6 425 MHz, 10.95 - 11.20 GHz, 11.45 - 11.70 GHz, 11.7 - 12.2 GHz and 14.0 - 14.5 GHz bands although some use is also made of the 3 400 - 3 700 MHz, 5 725 - 5 925 MHz, 7 250 - 7 750 MHz and 7 900 - 8 400 MHz bands and of other bands between 12.2 and 12.75 GHz. A beginning has been made in using certain FSS allocations above 15 GHz. Very little use is made, for the FSS, of bands which were newly allocated for the FSS at WARC-79, the so-called expansion bands, namely 4 500 - 4 800 MHz, 10.70 - 10.95 GHz and 11.20 - 11.45 GHz (for down-links) and 6 425 - 7 075 MHz and 12.75 - 13.25 GHz (for up-links).

Some FSS networks use spacecraft with multiservice, and/or multifrequency telecommunication payloads. There would appear to be a growing trend in the use of such satellites, due to the availability of larger spacecraft. This situation may introduce additional constraints to the harmonization process, especially if the orbital position of the satellite is determined by a previous plan (for example, BSS).

Another fundamental characteristic of the FSS is the wide range of service areas. In general, there are three categories of coverage: global, regional and national.

Initial exploitation of the FSS was largely for trans-oceanic communications and this continues to be a growing and very important use of the GSO.

International systems provide a wide range of telecommunication services. INTELSAT and INTERSPUTNIK are examples of the use of frequency ranges 6/4 GHz and 14/11 GHz.

Regional systems in the FSS are operated by specific groups of countries to provide joint telecommunication services. Current systems use the frequency ranges 6/4 and 14/11 GHz. The EUTELSAT regional network will soon begin operation in the 14/11-12 GHz bands for European international traffic and has already come into service to meet certain domestic and international requirements, with the lease of standby capacity. The ARABSAT regional network is already in operation in the 6/4 GHz bands.

National satellite networks are used by various countries to satisfy their national telecommunication needs. Demands for such networks are increasing in all regions. Such systems mainly use the 6/4, the 14/11 and the 14/12 GHz frequency ranges. However, there is at least one operational system which utilizes the 30/20 GHz FSS band.

Apart from the technical differences, an important difference between international and national networks is that the most suitable orbit locations are usually not the same, thus minimizing conflicts in that sense. On the other hand, the technical differences often lead to difficulties in coordination despite the orbit separations that are feasible.

Another major difference between international and national networks relates to the coverage areas. The former can require wide coverages, while the latter might conform approximately to the boundaries of the country itself. This leads to some of the technical disparity between the two types of networks. In the case of domestic systems, where the coverage areas are sufficiently separated, satellites can operate in close proximity.

Feeder links to satellites of various services, such as the mobile-satellite service and the broadcasting-satellite service, may be assigned frequencies in bands allocated to the FSS.

The growing number of satellites in service gives rise to increasing difficulties to administrations trying to use orbital positions within segments of that orbit and in preferred frequency bands that are intensively used by other countries. In fact, there are certain orbital segments and frequency bands that are already congested, and this may lead to coordination processes which may be complex and costly. An analysis of information on the number of satellites in orbit and in various stages of coordination, made available to the CPM by the IFRB, is in Annex I to this document. Up to date information is available in tabular form in Document 105 Addenda 1 and 2.

2. FSS operating networks

2.1 FSS networks operating at 6/4 GHz

By far the most highly developed, both in technology and in utilization, the bands 5 925 - 6 425 MHz and 3 700 - 4 200 MHz are used on nearly all the commercial FSS networks in service as well as those in the planning stage.

This has led existing system operators to employ advanced techniques and design (e.g. lower side-lobe antennas, polarization isolation and shaped beams) to allow larger numbers of satellites to access the orbit in these bands.

Several of the other frequency bands allocated to the FSS in this frequency range are limited in their use by significant inter-service sharing considerations. However, there is substantial bandwidth in the expansion bands at 6 and 4 GHz for which there are no significant sharing problems in many parts of the world and these bands are essentially unused by the FSS today. In addition, because of the proximity to the conventional 6/4 GHz band, the technology from this band could be transferred to the 6/4 GHz expansion band without significant cost to systems operating only in these bands.

Space stations at 6/4 GHz

The earliest FSS space stations were in international service and provided global coverage capabilities. Within ten years, domestic coverage satellites were in service while regional coverage systems are a more recent development as more countries begin to use satellite technology for domestic services or as a supplement to regional terrestrial systems.

Along with the growth in numbers of satellites, the capacity of a single satellite has been increased by frequency reuse accomplished by the use of orthogonal polarization in the same coverage area and/or spatial isolation between narrow spot beams on the same satellite serving different coverage areas. This is generally a characteristic of international networks; in some such networks 6-fold frequency reuse has been obtained in this way. Domestic FSS systems, on the other hand, have utilized orthogonal polarization to achieve a two-fold frequency use.

The predominant transponder bandwidth of 6/4 GHz FSS satellites is 36 MHz, with 40 MHz spacing between transponder centre frequencies, for a total of 12 transponders on a single polarization in a single antenna beam. Use of orthogonal polarizations would therefore provide a total of 24 transponders. Bandwidths up to 80 MHz are used in some FSS networks in the 6/4 GHz band and provide for high bit rate digital transmissions.

Transponders presently operating in the 6/4 GHz bands commonly use 5 W to 8 W travelling-wave tube amplifiers (TWTAs). Some planned satellites will carry transponder TWTAs with powers up to 30 W and solid-state amplifiers with powers up to 8.5 W. Table 1 presents some typical FSS space station parameters.

It is common for present-day FSS space stations to have the capability to maintain station keeping within tolerances of $\pm$ 0.1° in both latitude and longitude. In some cases the North-South excursion may somewhat exceed this figure without detriment to orbit utilization. Such tolerances are often met in actual operations, particularly for domestic networks with large numbers of earth stations, for which steerable antennas are economically unattractive.

Expected satellite lifetimes have increased substantially over the past twenty years, with the design lifetimes of ten years being currently most common for satellites to be launched during the mid-1980s. It should be noted, however, that the design lifetime of a space station may not be the same as its operational life at a particular orbit location. This may occur in a particular satellite network where traffic is rapidly growing and a higher capacity design is introduced before the design life of the first spacecraft is reached. In such cases the earlier launched satellite may be relocated to satisfy other traffic requirements.

TABLE 1

Typical parameters of 6/4 GHz FSS space stations

Parameter	Type of coverage		
	Global	Regional	National
Satellite antenna gain (dBi)			
Transmit	17-19	21-25	28-32
Receive	17-19	21-24	30-34
e.i.r.p. (dBW)	22-24	26-31	30-39
Receiver noise temperature (K)	800-2 000	800-2 000	800-2 000
G/T (dB(K^{-1}))	-17 to -14	-12 to -5	-3 to +5

Earth stations at 6/4 GHz

As the FSS space station e.i.r.p. has increased, lower-cost, smaller diameter earth-station antennas have become operationally feasible. Table 2 provides typical parameters of earth stations presently operating in 6/4 GHz FSS networks.

Coast earth stations providing feeder links to maritime mobile-satellite service spacecraft have characteristics lying within the range indicated for regional networks in Table 2.

The largest antennas are used primarily in global coverage systems although they may also find applications in domestic networks for high capacity links. Antennas with diameters in the range 10 to 15 m are common for medium capacity routes or special service applications in global coverage systems. Smaller antennas in the 3 to 7 m range are particularly suited for services in regional and national coverage systems, as well as for receive-only applications.

2.2 FSS networks operating at 8/7 GHz

Several FSS networks are presently in operation in the 8/7 GHz bands and a number of new networks are expected to become operational in the near future. It should be noted that many of these systems also operate in the mobile satellite service. It should also be noted that these networks are primarily used for official correspondence within and among a number of administrations.

TABLE 2

Typical parameters of 6/4 GHz FSS earth stations

Parameter	Type of coverage		
	Global	Regional	National
Antenna size (m)	4.5-32	4.5-25	3-30
Gain (dBi) Transmit	47-64	47-62	43-63
Receive	43-61	43-59	40-59
Receiver noise temperature (K)	50-150	50-150	50-200
G/T (dB(K-1))	23-41	23-38	17-41
Typical output power (kW)	1-12	0.3-3	0.005-1
e.i.r.p. (dBW)	46-95	46-74	45-84

Some basic factors which are common to a number of satellite systems using the 8/7 GHz band are:

- **large service areas; i.e., approaching the visible areas in size;**
- **Earth coverage, hemispheric coverage and re-directable narrow beam satellite antennas;**
- **capabilities for changing satellite antenna/transponder configurations;**
- **circular polarizations; no frequency reuse within a network;**
- **large differences in earth-station antenna sizes, the smallest are in the order of 1 to 3 m;**
- **relatively high maximum transmission gains (see the Radio Regulations, Appendix 29), which coupled with high up-link satellite antenna gains, result in relatively high up-link sensitivity.**

These factors are consistent with satellite networks which could operate in either or both the FSS and the MSS.

Conversely, there is no uniformity in transponder arrangements, frequency translations, satellite antenna configurations, or types of modulation, carriers, and satellite accessing.

It should also be noted that the meteorological-satellite and earth exploration-satellite services also have frequency allocations with primary status in these frequency bands; these services could have very different characteristics from those of the FSS and MSS.

2.3 FSS networks operating at 14/11 and 14/12 GHz

FSS systems in the 14/11 - 12 GHz bands have only become operational within the last 6-7 years. Over that time, significant improvements in orbit/spectrum efficiency and capacity have resulted from progress in the technologies associated with these systems.

A particular attraction of these bands as compared to the 6/4 GHz bands, is the ability to provide high satellite e.i.r.p., permitting the use of smaller earth station antennas for many telecommunication services. This arises partly from the facility with which satellite transmitting antennas of higher gain can be provided, and partly from the fact that some of the space-to-Earth frequency allocations near 12 GHz are not generally shared with terrestrial services having primary allocation status. A sample analysis of the information on current satellites using these bands, contained in Document 105 (IFRB) indicates that the median value of the gains of satellite beams is about 38 dB, with upper and lower decile values of 49 dB and 29 dB respectively. The availability of improved launch systems and improvements in satellite power technologies have facilitated this development. As a consequence, many new satellite communication services relying upon small aperture earth station antennas are being implemented.

As the physical antenna size required for a particular D/λ is much smaller than at 6/4 GHz, the frequency reuse potential using spacecraft antenna spot or shaped beams is considerably enhanced and some systems under construction will utilize this technique to achieve 8-fold frequency reuse on a single satellite.

The principal disadvantage of the use of frequencies above 10 GHz is the higher RF signal attenuation and depolarization effects in areas subject to heavy rainfall. Various techniques to alleviate these problems are available and include up-link power control and adaptive depolarization cancellers.

At 14/11 GHz and higher frequency bands, the service arc restrictions are severe for networks with very large service areas and those with service areas at high latitudes, since earth stations in these bands normally require operation at higher elevation angles than 6/4 GHz in order to reduce rain attenuation and depolarization effects to acceptable levels.

Allocations for the 12 GHz space-to-Earth frequency bands currently allocated, vary among the ITU regions as follows:

Region 1: 12.5 to 12.75 GHz,

Region 2: 11.7 to 12.2 GHz,

Region 3: 12.2 to 12.5 GHz and 12.5 to 12.75 GHz. (Note that the use of the 12.2 to 12.5 GHz band for the FSS is governed by RR 845.)

In each region there are primary allocations to terrestrial services, in the International Frequency Allocation Table or in footnotes to it, but the down-link power flux-density limits imposed by RR 2574 do not apply in a large number of countries, and the availability of high-gain satellite antennas facilitates the prevention of power flux-density levels in breach of RR 2574 in countries where its terms do apply. These bands are used by both national and international systems.

The 11 GHz (10.7 - 11.7 GHz) space-to-Earth frequency band is allocated on a world-wide basis and the segments, 10.95 - 11.2 GHz and 11.45 - 11.7 GHz, are used by international and national systems. The remaining segments, 10.7 - 10.95 GHz and 11.2 - 11.45 GHz, represent expansion bands that are not currently used.

All of the above bands currently in use utilize the 14 to 14.5 GHz Earth-to-space bands for transmission to the satellite. An additional 500 MHz band from 12.75 - 13.25 GHz is available, but has not been used to date.

With respect to the typical parameters of systems in the 14/11 - 12 GHz bands, space station receiving system figure-of-merits range from approximately -3 dB/k to 9 dB/k while spacecraft transponder e.i.r.p.s vary from 35 to 50 dBW at the edge of coverage using spot or shaped beams. Earth station antenna diameters vary from about 1 metre to as large as 32 metres.

2.4 Frequencies above 15 GHz

Studies are in progress to define the parameters of space stations operating in the 30/20 GHz band, and two administrations have launched experimental space stations operating in these bands. In general, the use of frequency bands around 20 GHz and 30 GHz, where 3.5 GHz of bandwidth is available, would make possible the provision of very high capacity systems using narrow spot beam antennas and high speed digital transmissions.

The research and development of 30/20 GHz band FSS systems have been promoted in many countries, for example the Japanese CS-1 experimental system, NASA's advanced 30/20 GHz system, ESA's OLYMPUS (formerly L-SAT) project, the ITALSAT system, the ATHOS experimental satellite project, the German DFS and other experimental satellite projects.

In Japan, the first operational domestic FSS system using CS-2a and 2b satellites started from the end of May 1983. The 30/20 GHz band is used for transmitting telephone signals using TDMA and FM-TV signals between regional centres with 11.5 m diameter offset Cassegrain antennas. Small transportable 30/20 GHz band earth stations with 3 m diameter antennas are used for emergency communications for telephone and TV signals.

Diversity earth stations may be required (in areas of high precipitation rates) in order to ensure that service availability is high. It is also expected that very broadband transponders will be used at these frequencies.

3. Common user systems

Various networks in the FSS are used by more than one administration on a common basis to satisfy their domestic and/or international communication services.

A particular example of such a user system is the INTELSAT system. Other examples of common user systems are INTERSPUTNIK, ARABSAT, PALAPA and EUTELSAT.

INTELSAT provides satellite communication services to all nations on a non-discriminatory basis. At the end of 1984, the space segment consisted of 15 satellites and the earth segment consisted of a total of about 850 earth station antennas, including about 300 international and nearly 550 domestic antennas in more than 160 countries, territories and dependencies. The international service provided more than 36,000 full time voice and data circuits and over 49,000 half-channel hours of television transmissions. Allotments amounting to some 40 transponders were leased to 27 nations for domestic communications.

The most recent INTELSAT satellites use approximately 500 MHz of spectrum for up-links and down-links in both the 6/4 GHz and the 14/11 GHz FSS bands. Advanced spacecraft antennas with spatially-isolated and polarization isolated beams are used to achieve 4-fold reuse of the 6/4 GHz spectrum in INTELSAT V and a 6-fold reuse in INTELSAT VI services (see Table 3). In the earth segment, some INTELSAT users have introduced TDMA-PCM-DSI, which achieves a bandwidth utilization efficiency of about 35 channels/MHz as compared to 15 channels/MHz in the FDM-FM transmission mode.

In addition, modified INTELSAT-VA series of satellites under construction will use the 14/12 GHz band for the provision of international business services directly to urban centres in many countries, while the INTELSAT-VI series satellites will be equipped to use 75 MHz of spectrum in the 6/4 GHz bands newly allocated at the WARC-79.

Special issues of relevance to common-user systems

Service arc considerations

The choice of orbital locations for a common-user system may be more constrained by the geographical locations of the various users of the system than would be the case for some national system. The choice of orbital locations for a satellite system which must have the capability to connect all users in a given region is limited by the need to provide visibility, at satisfactory angles of elevation, for earth stations at the edge of the coverage area.

In the Atlantic Region for INTELSAT, for example, the location of the Primary Path satellite cannot be varied by more than 1.5° without reducing the elevation angle of the limiting earth stations to less than 5°, i.e., the minimum for satisfactory operation in the 6/4 GHz band. In the Indian and Pacific Ocean Regions the service arc for the Primary Path satellite is only 3° wide.

Space station coverage considerations

The size of satellite antenna beam coverage may also be affected by the geographic extent of the user administrations. The largest such beam would occur in systems providing service on a global basis. In such a case, a beam which covers all administrations served by the common user system, whether global or regional, is particularly useful for TV distribution services, in which several widely dispersed earth stations which are not located in other coverage beams require simultaneous reception of a certain telecast. Such beams can also provide connectivity for widely distributed, thin-route earth stations throughout the service area and the trend is to limit the bandwidth required for use in such beams to the minimum.

TABLE 3

Characteristics of INTELSAT satellites

Satellite	No. of transponders	Frequency spectrum (MHz)	Total bandwidth (MHz)	Frequency reuse	Achievable channel capacity
Intelsat-IVA	20	5 925-6 425 3 700-4 200	800	2 x 6/4	6 000 2-way voice + 2 TV channels
Intelsat-V(1)	27	5 925-6 425 14 000-14 500 3 700-4 200 10 950-11 200 11 450-11 700	2 137	4 x 6/4 2 x 14/11	12 000 2-way voice + 2 TV channels
Intelsat-VA(2)	32	5 925-6 425 14 000-14 500 3 700-4 200 10 950-11 200 11 450-11 700	2 252	4 x 6/4 2 x 14/11	15 000 2-way voice + 2 TV channels
Intelsat-VI	50	5 850-6 425 3 625-4 200 14 000-14 500 10 950-11 200 11 450-11 700	3 200	6 x 6/4 2 x 14/11	35 000 2-way voice(3) + 2 TV channels

(1) Intelsat-V F5-F9 are equipped to provide Maritime Communications Service using the frequency spectrum:
1 636.5-1 644.5 MHz; 1 535.0-1 542.5 MHz
6 417.5-6 425.0 MHz; 4 192.5-4 200.5 MHz

(2) Intelsat-VA F13-F15 are equipped to provide INTELSAT Business Service using the frequency spectrum:
14 000-14 500 MHz; 12 500-12 750 MHz (Europe), 11 700-11 950 MHz (North America).

(3) This assumes an increased number of digital links using SS-TDMA.

4. Current technology and operational characteristics in the FSS

4.1 Earth-station technology

The most important earth-station technologies are those associated with antenna characteristics and transmitter/receiver techniques. These factors affect the satellite network characteristics, and some of them have much to do with the efficiency of utilization of the geostationary-satellite orbit/spectrum.

Antenna characteristics

The most relevant earth-station element, amongst those mentioned above, is the antenna sub-system. Two important performance parameters of an earth-station antenna have a direct effect on orbit utilization: side-lobe and polarization characteristics.

The antennas used in most earth stations are of the axisymmetric Cassegrain type. It is known that for this type of antenna the effect of blockage and diffraction due to the sub-reflector and its supports results in increased side-lobe levels. Nevertheless, many antennas now in use have improved side-lobe performance, particularly those of D/λ greater than 150. There are also new small asymmetric type antennas that are being installed with better side-lobe performance.

Polarization characteristics

Polarization discrimination depends on the polarizer characteristics and the surface accuracy of the main and sub-reflectors, the former being the major contributor. A typical value of polarization discrimination required for current earth-station antennas is 30 dB (axial ratio of approximately 0.5 dB for circular polarization) and earth-station antennas with polarization discrimination of more than 30 dB are currently feasible. On the other hand, improvement in polarization discrimination beyond a certain threshold (approximately 30 dB), while feasible, does not result in a significant increase in capacity. This is the case, for example, of small-sized earth stations with low traffic requirements, that usually have reduced polarization isolation performance.

High power amplifiers (HPAs)

Klystrons and travelling wave tubes (TWTs) are used at the present time for earth-station high power amplifiers. Though the signal bandwidths of klystrons are about 40 MHz to 80 MHz, a band of 500 MHz can be covered by tuning the cavity in the 6, 14 or 30 GHz bands. Regarding the maximum saturated output power, klystrons of 14 kW in the 6 GHz band, 3 kW in the 14 GHz band and 500 W in the 30 GHz band have been developed. TWTs have signal bandwidths of 500 MHz in the 6, 14 and 30 GHz frequency bands respectively and do not require tuning. Regarding the maximum saturated output power, TWTs of 14 kW in the 6 GHz band, 3 kW in the 14 GHz band and 700 W in the 30 GHz band have been developed.

To reduce the level of intermodulation products produced in the HPA for multi-carrier operation, a linearizer of the pre-distortion type has been developed and used in some earth stations. By using such a linearizer, the level of intermodulation products will be reduced by more than 10 dB in the range of output back-off equal to or larger than about 6 dB.

Receiver techniques

Use of a receive chain with a low system noise temperature at an earth station is an essential requirement in a satellite communication system. The receiving system noise temperature is mostly determined by the noise contribution of the antenna and the first stage amplifier. At present, parametric amplifiers either cooled by gaseous helium or thermo-electrical devices or at ambient temperature are in use. Low noise amplifiers using a GaAs FET have been developed. The noise temperature achieved in the 4 GHz frequency band by these four kinds of low noise amplifiers is less than 20 K, 45 K, 80 K and 80 K respectively. The bandwidth of LNAs currently being used in the 4 GHz frequency band is 500 MHz. In the 11 GHz frequency band, parametric amplifiers with a bandwidth of 750 MHz and a noise temperature of about 90 K and an FET amplifier with a noise temperature of about 120 K are available. In the 20 GHz frequency band, parametric amplifiers with a bandwidth of 2.5 GHz and a noise temperature of about 80 K (cooled by gaseous helium), 200 K (cooled by a thermo-electrical device) and FET amplifiers with a noise temperature of about 220 K (cooled by a thermo-electrical device) or 300 K (ambient temperature) are feasible.

4.2 Technology related to space stations

The most important space station technologies are those associated with antenna characteristics and transponder components. These factors affect the satellite network characteristics and also contribute to the increase of the efficiency of utilization of the geostationary-satellite orbit/spectrum. In particular, satellite antenna technology provides the major technique for the provision of increased frequency reuse from a single orbit location, whether on the same satellite or on different satellites.

Antenna technology

While spot beam antennas provide for more frequency reuse of a given bandwidth, this is limited by the need for coverage and by the separation of the covered areas. Shaped beam technology offers some possibilities to enhance the application of spot beam technology for a wide variety of requirements.

Shaped beam antennas offer the potential for improved side-lobe control particularly where the coverage area itself is rather large thus improving the possibility of frequency reuse between coverage areas closer to each other. However, it should be noted that discrimination beyond-the-edge-of-coverage is a function of satellite antenna dimensions; launch vehicle constraints may be a factor here. Some present launch vehicles can accept a solid antenna with dimensions of up to approximately 3.8 metres.

The orbital positions of existing satellites may have to change to accommodate new satellite systems. To cope with this situation, space-station antennas would have to be designed to take this fact into account. The direction of the radiation patterns would probably have to be changeable by control from the ground. In some cases it may be desirable to reshape beams in service in order to allow for a large change of location. However, the cost and operational impact of introducing such capabilities have not been sufficiently studied.

Transponder components

Since the introduction of communication satellites, there has been continuous improvement in the e.i.r.p. The higher e.i.r.p. levels translate into higher down-link C/N and correspondingly increased channel capacity, for a given size earth station. A domestic satellite concentrates its radiated power onto a single country, and generally achieves a higher e.i.r.p. than an international system with global or large area coverage, for the same size TWTA. In addition, these higher e.i.r.p. levels result from the use of higher power amplifiers in the satellites.

Solid-state devices such as field effect transistors (FETs) are generally less efficient than TWTs as power amplifiers but provide better linearity than TWTs. Thus, higher capacity may be achievable for multiple access systems because of better carrier-to-intermodulation ratios.

4.3 Multiple-access and modulation techniques

Multiple-access techniques and modulation techniques are inter-related. These techniques affect the bandwidth efficiency of systems.

Multiple access

Multiple access is the technique which enables respective transmission links of a large number of earth stations to be interconnected through the same satellite. This technique is essential to exploit the unique geometric properties of wide-area visibility and multiple connectivity which are the features of satellite communication systems.

Multiple-access techniques can be classified into the following two systems in respect of circuit utilization:

- pre-assigned multiple access;

- demand assigned multiple access.

In the former system the channels required among earth stations are assigned permanently. In the latter system the channels are assigned to the stations only on occasion of demand and satellite channels are therefore shared amongst users in time.

Moreover, multiple-access techniques can be classified into the following three systems:

- FDMA: frequency division multiple access;

- TDMA: time division multiple access;

- CDMA: code division multiple access.

In FDMA, the usual practice is pre-assigned multiple access, therefore carrier frequencies are assigned exclusively to each earth station and multiple carriers of different frequencies share a common satellite repeater. Such a multiple carrier operation always results in less capacity being available as compared to the single-access mode due to the power back-off which is required to reduce the level of intermodulation products. The base modulation techniques associated with FDMA can be either single sideband AM, frequency modulation or various digital modulations such as 2-PSK or 4-PSK.

In TDMA, a carrier of the same frequency is shared by multiple stations on the basis of non-overlapping (in time) burst transmissions through a satellite repeater. From the viewpoint of traffic, a TDMA system has greater flexibility than an FDMA system.

The CDMA system is one where signals occupy the same location in both the frequency domain and the time domain, but can be distinguished from others by proper signal processing. Spread spectrum multiple access (SSMA) is one example of a CDMA. The SSMA makes use of a deterministic noiselike signal structure to spread the narrow-band information over a relatively wide band of frequencies. The spectrum spreading is achieved by modulating each signal by a unique code, so that demodulation of a wanted signal can be done by means of correlation detection in which signals having different codes will not be correlated.

Modulation techniques

From the viewpoint of the efficient utilization of the geostationary-satellite orbit/spectrum, it is desirable to adopt bandwidth efficient modulation methods. The modulation methods which are widely used in current satellite communication systems are frequency modulation (FM) and phase shift keying (PSK). Recent developments include the use of the SSB-AM in conjunction with compandors. The SSB-AM provides a high-density analogue modulation alternative to digital systems. The development of highly stable, solid-state linear amplifiers for satellite transponders has given new life to this technique.

Frequency modulation is presently the predominant form of modulation in FSS networks. Typical bandwidths of individual RF carriers presently in use range from about 25 kHz to 36 MHz; (see Table 4).

TABLE 4

Bandwidth of typical FM RF carriers

Bandwidth	Application
25-45 kHz	SCPC
100-250 kHz	Broadcast quality audio programme distribution
1.25-36 MHz	FDM-FM, 12 to 1 800 channel telephony
17-36 MHz	Television, possibly with multiple audio bandwidth sub-carriers

PSK modulation uses digital signals which for voice requires analogue-to-digital conversion. The resulting digital signal is processed and coded usually into 64 kbit/s per channel. The PSK can be accomplished using any number of phase pairs to distinguish the binary state. Theoretically, 4-PSK requires the same power, but half the bandwidth per bit, as compared to 2-PSK for a given link performance. Higher order (greater than 4-phase) PSK systems are more susceptible to noise and, therefore, need more power than either 2- or 4-phase systems to achieve the same standard of performance. A decrease in the number of phases permits closer satellite spacing, however, the utilization of the GSO tends to be optimized when the number of phases is in the range of 4 to 8 and the orbit utilization efficiency tends to decrease as either a higher or a lower number of phases are utilized.

Typical bandwidths and applications of digital modulation (2-PSK and 4-PSK) are as shown in Table 5.

TABLE 5

Bandwidth of typical digital RF carriers

Bandwidth	Application
30-60 kHz	SCPC for thin-route voice applications, and 48-64 kbit/s data with or without FEC
100-8 000 kHz	TDM data and/or digitized voice channels, (high speed digital channels) "thin-route" TDMA
30-72 MHz	High capacity single access or TDMA systems, with or without digital speech interpolation (DSI)

Other digital modulation techniques, amplitude-shift keying (ASK), frequency-shift keying (FSK) and composite modulation techniques involving both amplitude and phase-shift keying have been studied. Of these techniques, ASK and hybrid techniques involving ASK are not appropriate to TDMA because the transponder non-linearities and power-efficiency effects usually constrain the modulation format to have a constant envelope. In the case of FDMA, the use of ASK and hybrid techniques involving ASK is also restricted because of its greater sensitivity to co-channel interference.

Recently, new modulation techniques such as minimal shift keying (MSK) and tamed frequency modulation (TFM), in which the envelopes of modulated carriers are constant, have been studied. Because these modulation techniques are expected as desirable candidates for future systems, further studies are required.

The above are modulation techniques used in the RF domain. Also of importance are baseband and channel modulation techniques. In digital systems, it is possible to use 32 kbit/s modulation and work on 16 kbit/s appears promising. A Recommendation of CCITT Study Group XVIII for 32 kbit/s ADPCM was recently approved. These techniques can yield up to four times the capacity, relative to 64 kbit/s PCM.

It is also possible to gain another factor of two to three in capacity using digital speech interpolation (DSI) in conjunction with any of the above modulation techniques.

Another common technique in use in satellite communication systems is single-channel-per-carrier (SCPC) on selected transponders for use with low-capacity earth stations. Typically PCM (digital) or companded FM (analogue) equipment is used to modulate a single voice transmission, but delta modulation 2-PSK as 4-PSK units are also in service. SCPC type carriers are also in operation for medium speed data (56 kbit/s) and audio distribution.

In satellite video transmissions FM with frame-rate energy dispersal is typical. The baseband may include multiple audio/data sub-carriers. Techniques are under development for dual television signal transmission through interframe interleaving of independent video signals. Such techniques will allow a single satellite transponder to support two independent television transmissions with a quality comparable to today's single television transmission per transponder.

4.4 Some trends in system characteristics

Several other factors will have a significant impact on the changes that can be expected in the future of FSS characteristics affecting orbital utilization.

4.4.1 Traffic growth

FSS system characteristics are probably most affected by the growth in traffic volume carried over the system, the changing pattern of this traffic, and the introduction of new services. Initial loading may consist of a relatively few high density links between major traffic centres. In time, additional links may be established to lower density traffic centres and thin-route services provided to remote locations. Moreover, demand for services may be greatly stimulated by the availability of high quality communication facilities at a given location. Once earth stations are installed to provide basic services to a community, it is also relatively easy and economical to expand the range of services provided. Such additional services might include video and audio programme distribution and data services. Also, it is often more economical for a country to initially lease capacity in an existing, larger capacity satellite. Eventually, traffic may grow to the point where a dedicated satellite is economically justified. Where several near-by countries have been leasing capacity on a global satellite system, such a dedicated satellite system might initially take the form of a regional system, rather than individual national systems, to reduce space segment costs. It is expected that each system will have its own unique pattern of development over time.

4.4.2 Integrated services digital networks

With the rapid growth in international and national digital services, satellite systems are expected to play an increasingly important role. The CCIR is developing a Recommendation which discusses the necessary satellite performance characteristics to meet the CCITT ISDN objectives. Satellite systems which are expected to provide channels for an ISDN should take these performance objectives into account.

4.4.3 Modulation type and transmission parameters

Changing traffic volumes and patterns, as well as the introduction of new services and types of earth stations, can be expected to affect the types of modulation and carrier transmission parameters associated with the FSS system. These changes may result in transmissions having greater or lesser susceptibility to interference and greater or lesser potential to cause interference. For example, as traffic grows on high traffic density links, it is usually more economical to increase the RF carrier capacity by use of more bandwidth efficient modulation techniques than to allocate additional transponders. In addition, SCPC-FDMA transponder configurations are common as lower density, thin-route locations are added to the FSS network. However, low capacity TDMA systems are also under development where several such systems may access a transponder in an FDMA mode.

4.4.4 Trend to limited coverage and beam shaping

Spot beams on space stations in the FSS increase satellite G/T and e.i.r.p. and permit frequency reuse. The use of narrow antenna beams that concentrate gain over the coverage area helps to reduce the earth segment costs and increase satellite capacity.

Such spot beams are becoming almost universal for national coverage FSS systems. When coupled with fast roll-off characteristics of side lobes, a substantial increase in orbit utilization can be achieved. This is because the orbital separation between narrow-beam satellites serving non-overlapping coverage areas can be reduced due to the satellite antenna discrimination. With sufficiently distant coverage areas and/or fast enough roll-off characteristics, such satellites could be located at the same nominal orbital locations; the risk of collision is remote.

The use of spot beams covering different portions of a satellite's service area can also lead to greater orbit utilization. The spatial isolation between narrow beams permits frequency reuse at the orbital location.

In addition, advances in satellite antenna design technology permit shaping of the satellite antenna beam. Such shaping may be used to adapt the contours of the antenna beams to better fit the required coverage areas.

4.4.5 Increase in e.i.r.p. and sensitivity

There is a distinct trend towards increased satellite e.i.r.p. and decreased space-station and earth-station receiver noise temperatures. This trend tends to encourage increased transponder capacity and lower-cost earth stations.

Also, the trend towards higher e.i.r.p. satellites may also be used to advantage to improve orbit utilization by permitting an increase for all FSS systems in the portion of the noise budget allocated to interference from other satellite systems.

4.4.6 Trend towards bandwidth limited and interference limited operation

In many systems, one satellite may be required to serve an increasing number of earth stations. The ability of a single satellite to satisfy such growing requirements may be limited by the bandwidth available in the satellite. In the case of satellites using multiple spot beams for frequency reuse, available capacity may also be limited by interference levels between the various spot beams.

4.4.7 Expansion bands

While little use has been made of the new bands allocated by WARC-79 in the 6/4 and 14/11 GHz ranges, it can be expected that they will be of increasing value in the future as requirements continue to increase.

The propagation conditions which will be experienced in the new bands in the 6 and 4 GHz region result in the same transmission environment as the conventional 6 and 4 GHz bands. This will allow new systems using these bands to employ designs for both spacecraft and earth stations essentially identical to current systems.

Systems using the new bands around 14/11 GHz will be essentially identical to those currently in use in the conventional bands at 14/11 GHz. The additional 500 MHz that is available for both up- and down-links can provide the same capacities as achieved by current systems as the transmission environment is the same. No significant cost impact is expected for new systems.

4.4.8 Higher frequency bands

FSS systems will increasingly use the higher frequency bands for a number of reasons. First, the addition of higher frequency bands to an FSS system may be more economically and technically attractive than more intensive frequency reuse techniques. Additionally, increasing orbital congestion in the lower frequency bands will also lead to the use of the higher bands. In particular, the greater antenna directivities available at the higher frequencies will permit smaller satellite spacings and thus a greater number of satellites to be accommodated. Consideration of terrestrial interference may also lead to an increasing use of higher frequency bands, especially if terrestrial systems are not highly developed in the higher bands. Finally, the higher frequency bands tend to have higher bandwidths available. For example, 3 500 MHz of bandwidth is available between 17 and 31 GHz.

R.G. AMERO
Chairman of Committee 4

Annex: 1

ANNEX 1

The extent of usage of the GSO by the FSS

An example of the usage of fixed-satellite networks operating at 6/4 GHz, is illustrated in Figure A1 which is derived from information (December, 1983) filed by administrations with the IFRB for the use of orbital locations. Some of these satellites are not now in orbit, nor are all satellites operating in the full band, e.g., some are exclusively for feeder links in the maritime mobile-satellite service (MMSS). These factors are illustrated by the breakdown of statistics accompanying the figure. In addition, Figure A2 displays the use of the 6/4 GHz band relative to other currently allocated FSS bands. Also, multiple entries appear at some orbit locations. This provides for contingency or replacement of one satellite series with another and reduces the number of real operational satellites carrying traffic. The total transmission capacity of these satellites depends on a large number of factors including earth-station antenna size and satellite communications payload parameters.

Figure A3 shows networks operating at 7 and 8 GHz which have been published in IFRB circulars. The satellite density is obviously much lower than in the 6 and 4 GHz bands.

Similarly, Figures A4 and A5 show the situation at 14/11 - 12 GHz and above 15 GHz.

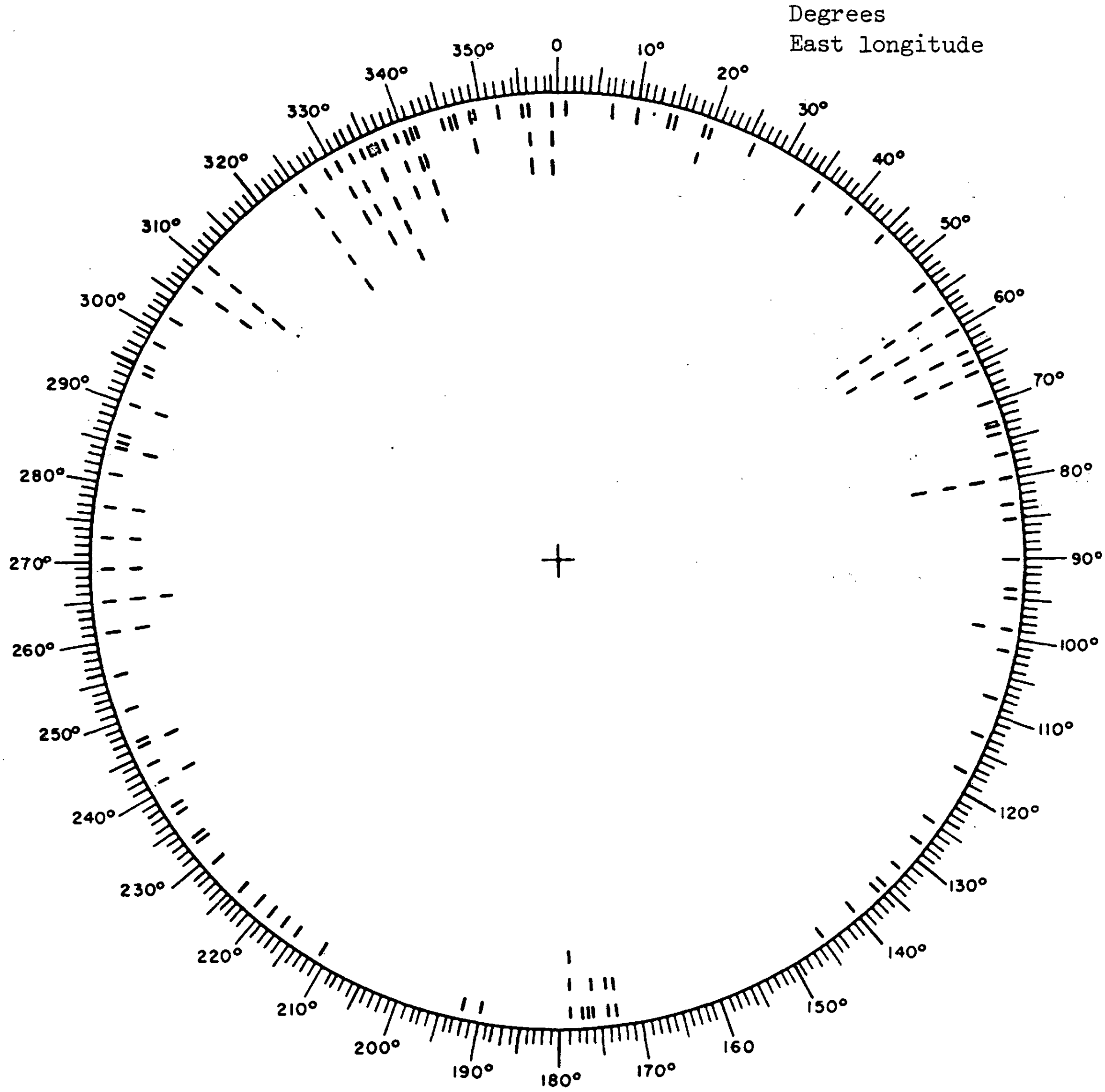

FIGURE A1 - Orbital locations of 6/4 GHz FSS entries [IFRB, 1984]

(IFRB data as of December, 1983)

Each dash within the circle represents one space station at a specific orbital position

Approximate distribution of networks

FSS only one band	FSS only ≥ 2 bands	Total FSS only	FSS and other services
55%	30%	85%	15%

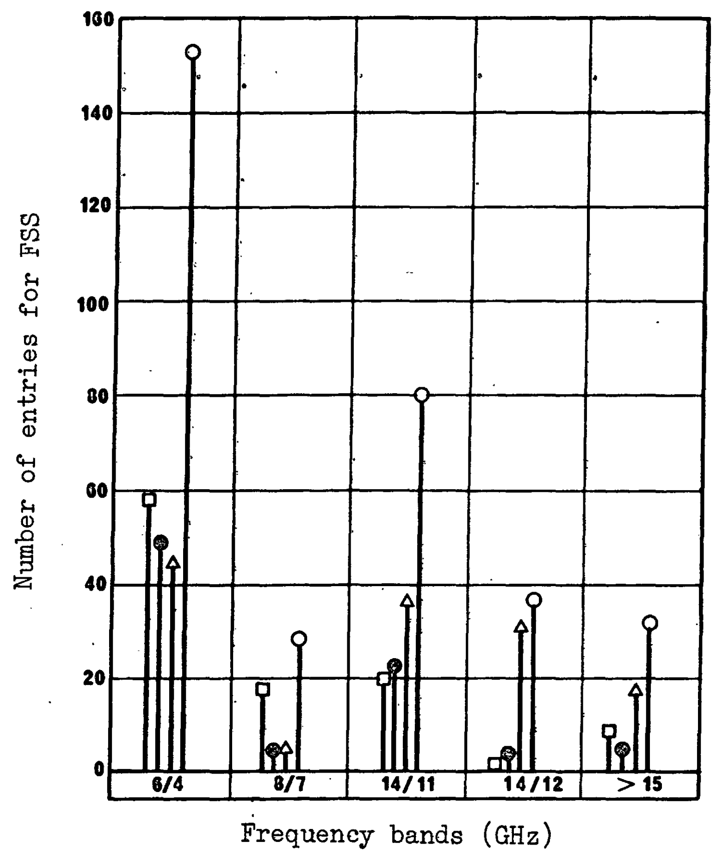

FIGURE A2 - Tabulation of FSS entries by frequency band /IFRB, 1984/

(IFRB data as of December, 1983)

□ registered
⊛ presently being coordinated
△ only advance publication
○ total

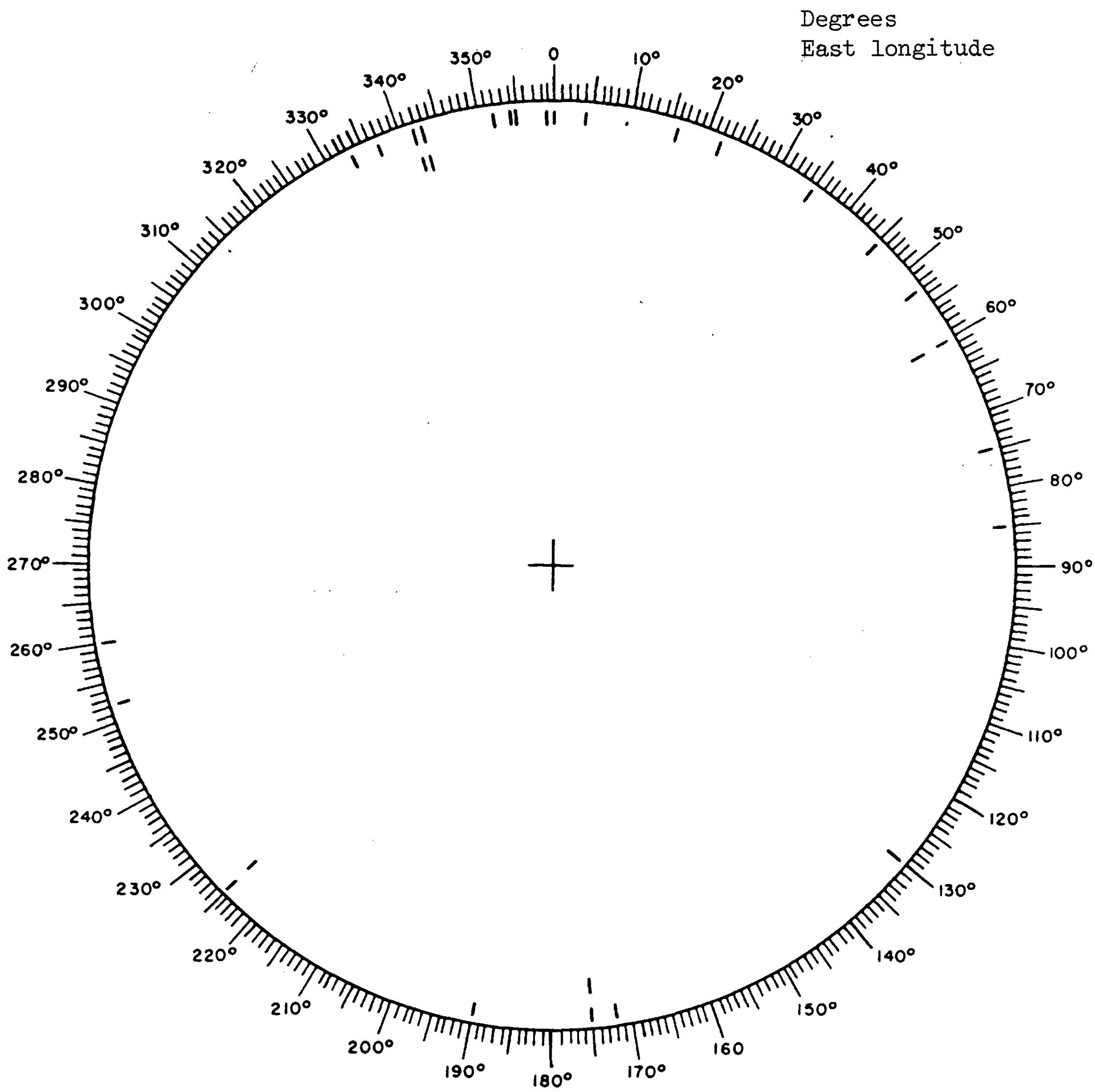

FIGURE A3 - Orbital locations of 8/7 GHz FSS entries

Each dash within the circle represents one space station at a specific orbital position

Approximate distribution of networks

FSS only one band	FSS only ≥2 bands	Total FSS only	FSS and other services
40%	-	40%	60%

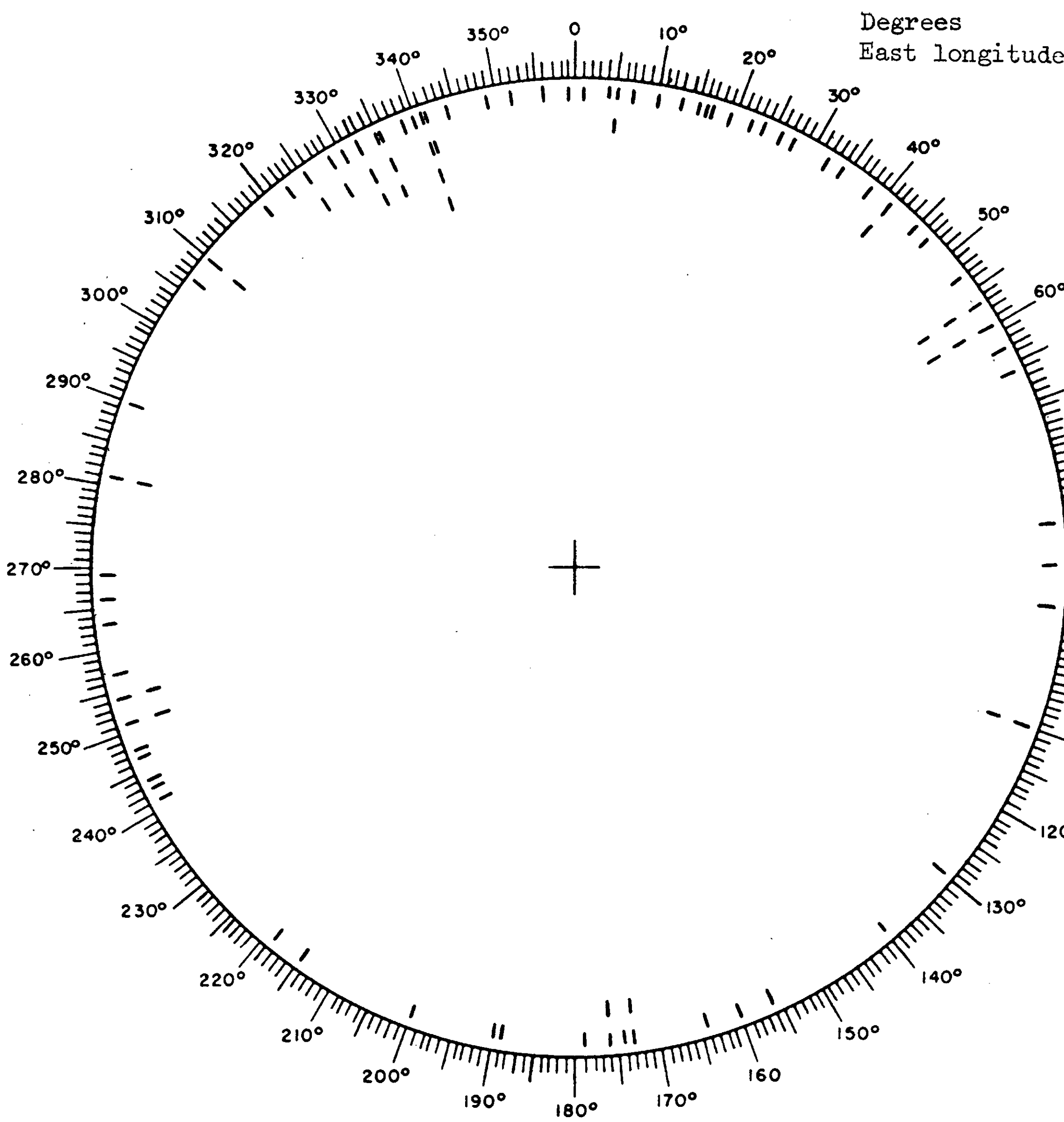

FIGURE A4 - Orbital locations of 14/11-12 GHz FSS entries

Each dash within the circle represents one space station at a specific orbital position

Approximate distribution of networks

FSS only one band	FSS only ≥ 2 bands	Total FSS only	FSS and other services
35%	50%	85%	15%

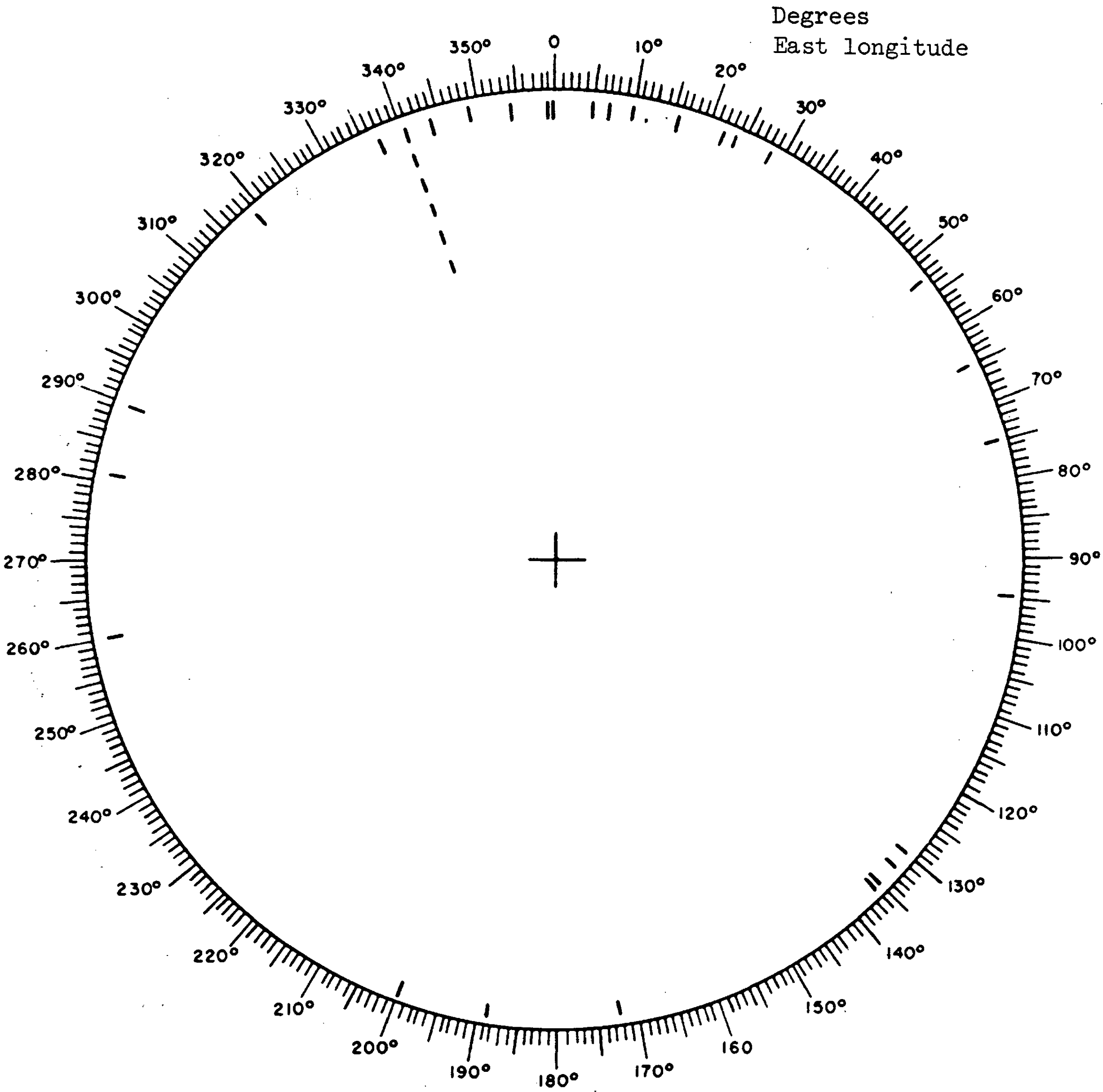

FIGURE A5 - Orbital locations of > 15 GHz FSS entries

Each dash within the circle represents one space station at a specific orbital position

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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COMMITTEE 4

THE CHARACTERISTICS OF TYPICAL IN-SERVICE NETWORKS OF THE FIXED-SATELLITE SERVICE

1. Introduction

The FSS has evolved considerably over the last 20 years and handles a wide range of traffic. It is the most heavily utilized of all the space services and probably the most highly developed. This review of the characteristics of typical in-service networks of the FSS is based on the CPM Report, Annex 3, with new material added at WARC-ORB-85.

The FSS networks currently in operation vary considerably with regard to technical parameters, operational techniques and the services provided. For example, the capacity of the radio carriers may vary from a single telephone channel (SCPC) up to several thousand channels; the corresponding bandwidths of the carriers range from about 20 kHz to 70 MHz and modulation may be analogue or digital. These systems are used to provide telephony, television, teleconferencing, data transmissions, intracompany services, communications between computers, telecommunication services for isolated regions and weather forecasting services. The services and characteristics will continue to change in the future with technical progress.

Today's satellite services are implemented in several ways, viz: by independent space networks, by consortia or by lease of space segment from operating organizations. The choice can be related to need or economic viability, although technical characteristics may be similar. Existing systems mainly use the 3 700 - 4 200 MHz, 5 925 - 6 425 MHz, 10.95 - 11.20 GHz, 11.45 - 11.70 GHz and 14.0 - 14.5 GHz bands although some use is also made of the 3 400 - 3 700 MHz and 5 725 - 5 925 MHz bands and of other bands between 11.7 and 12.75 GHz. A beginning has been made in using certain FSS allocations above 15 GHz. Very little use is made, for the FSS, of bands which were newly allocated for the FSS at WARC-79, the so-called expansion bands, namely 4 500 - 4 800 MHz, 10.70 - 10.95 GHz and 11.20 - 11.45 GHz (for down-links) and 6 425 - 7 075 MHz and 12.75 - 13.25 GHz (for up-links).

Some FSS networks use spacecraft with multiservice, and/or multifrequency telecommunication payloads. There would appear to be a growing trend in the use of such satellites, due to the availability of larger spacecraft. This situation may introduce additional constraints to the harmonization process, especially if the orbital position of the satellite is determined by a previous plan (for example, BSS).

Another fundamental characteristic of the FSS is the wide range of service areas. In general, there are three categories of coverage: global, regional and national.

Initial exploitation of the FSS was largely for trans-oceanic communications and this continues to be a growing and very important use of the GSO.

International systems provide a wide range of telecommunication services. INTELSAT and INTERSPUTNIK are examples of the use of frequency ranges 6/4 GHz and 14/11 GHz.

Regional systems in the FSS are operated by specific groups of countries to provide joint telecommunication services. Current systems use the frequency ranges 6/4 and 14/11 GHz. The EUTELSAT regional network will soon begin operation in the 14/11-12 GHz bands for European international traffic and has already come into service to meet certain domestic and international requirements, with the lease of standby capacity. The ARABSAT regional network will shortly begin operation in the 6/4 GHz bands.

National satellite networks are used by various countries to satisfy their national telecommunication needs. Demands for such networks are increasing in all regions. Such systems mainly use the 6/4, the 14/11 and the 14/12 GHz frequency ranges. However, there is at least one operational system which utilizes the 30/20 GHz FSS band.

Apart from the technical differences, an important difference between international and national networks is that the most suitable orbit locations are usually not the same, thus minimizing conflicts in that sense. On the other hand, the technical differences often lead to difficulties in coordination despite the orbit separations that are feasible.

Another major difference between international and national networks relates to the coverage areas. The former can require wide coverages, while the latter might conform approximately to the boundaries of the country itself. This leads to some of the technical disparity between the two types of networks. In the case of domestic systems, where the coverage areas are sufficiently separated, satellites can operate in close proximity.

Feeder links to satellites of various services, such as the mobile-satellite service and the broadcasting-satellite service, may be assigned frequencies in bands allocated to the FSS.

The growing number of satellites in service gives rise to increasing difficulties to administrations trying to use orbital positions within segments of that orbit and in preferred frequency bands that are intensively used by other countries. In fact, there are certain orbital segments and frequency bands that are already congested, and this may lead to coordination processes which may be complex and costly. An analysis of information on the number of satellites in orbit and in various stages of coordination, made available to the CPM by the IFRB, is in Annex I to this document.

2. FSS operating networks

2.1 FSS networks operating at 6/4 GHz

By far the most highly developed, both in technology and in utilization, the bands 5 925 - 6 425 MHz and 3 700 - 4 200 MHz are used on nearly all the commercial FSS networks in service as well as those in the planning stage.

This has led existing system operators, especially in the US domestic satellite service, to employ advanced techniques and design (e.g. lower side-lobe antennas, polarization isolation and shaped beams) to allow larger numbers of satellites to access the orbit in these bands.

Several of the other frequency bands allocated to the FSS in this frequency range are limited in their use by significant inter-service sharing considerations. However, there is substantial bandwidth in the expansion bands at 6 and 4 GHz for which there are no significant sharing problems in many parts of the world. Since these bands are essentially unused by the FSS today, system implementation might initially use larger satellite spacings associated with less advanced technology. In addition, because of the proximity to the conventional 6/4 GHz band, the technology from this band could be transferred to the 6/4 GHz expansion band without significant cost.

Space stations at 6/4 GHz

The earliest FSS space stations were in international service and provided global coverage capabilities. Within ten years, domestic coverage satellites were in service while regional coverage systems are a more recent development as more countries begin to use satellite technology for domestic services or as a supplement to regional terrestrial systems.

Along with the growth in numbers of satellites, the capacity of a single satellite has been increased by frequency reuse accomplished by the use of orthogonal polarization in the same coverage area and/or spatial isolation between narrow spot beams on the same satellite serving different coverage areas. This is generally a characteristic of international networks; in some such networks 6-fold frequency reuse has been obtained in this way. Domestic FSS systems, on the other hand, have utilized orthogonal polarization to achieve a two-fold frequency use.

The predominant transponder bandwidth of 6/4 GHz FSS satellites is 36 MHz, with 40 MHz spacing between transponder centre frequencies, for a total of 12 transponders on a single polarization in a single antenna beam. Use of orthogonal polarizations would therefore provide a total of 24 transponders. Bandwidths up to 80 MHz are used in some FSS networks in the 6/4 GHz band and provide for high bit rate digital transmissions.

Transponders presently operating in the 6/4 GHz bands commonly use 5 W travelling-wave tube amplifiers (TWTAs). Some planned satellites will carry transponder TWTAs with powers up to 30 W and solid-state amplifiers with powers up to 8.5 W. Table 1 presents some typical FSS space station parameters.

It is common for present-day FSS space stations to have the capability to maintain station keeping within tolerances of $\pm 0.1^{\circ}$ in both latitude and longitude. In some cases the North-South excursion may somewhat exceed this figure without detriment to orbit utilization. Such tolerances are often met in actual operations, particularly for domestic networks with large numbers of earth stations, for which steerable antennas are economically unattractive.

Expected satellite lifetimes have increased substantially over the past twenty years, with the design lifetimes of ten years being currently most common for satellites to be launched during the mid-1980s. It should be noted, however, that the design lifetime of a space station may not be the same as its operational life at a particular orbit location. This may occur in a particular satellite network where traffic is rapidly growing and a higher capacity design is introduced before the design life of the first spacecraft is reached. In such cases the earlier launched satellite may be relocated to satisfy other traffic requirements.

TABLE 1

Typical parameters of 6/4 GHz FSS space stations

Parameter	Type of coverage		
	Global	Regional	National
Satellite antenna gain (dBi)			
Transmit	17-19	21-25	28-32
Receive	17-19	21-24	30-34
e.i.r.p. (dBW)	22-24	26-31	30-39
Receiver noise temperature (K)	800-2 000	800-2 000	800-2 000
G/T ($dB(K^{-1})$)	-17 to -14	-12 to -5	-3 to +5

Earth stations at 6/4 GHz

As the FSS space station e.i.r.p. has increased, lower-cost, smaller diameter earth-station antennas have become operationally feasible. Table 2 provides typical parameters of earth stations presently operating in 6/4 GHz FSS networks.

Coast earth stations providing feeder links to MMSS spacecraft have characteristics lying within the range indicated for regional networks in Table 2.

The largest antennas are used primarily in global coverage systems although they may also find applications in domestic networks for high capacity links. Antennas with diameters in the range 10 to 15 m are common for medium capacity routes or special service applications in global coverage systems. Smaller antennas in the 3 to 7 m range are particularly suited for services in regional and national coverage systems, as well as for receive-only applications.

2.2 FSS networks operating at 8/7 GHz

Several FSS networks are presently in operation in the 8/7 GHz bands and a number of new networks are expected to become operational in the near future. It should be noted that many of these systems also operate in the mobile satellite service. It should also be noted that these networks are primarily used for Government communications within and among a number of administrations.

TABLE 2

Typical parameters of 6/4 GHz FSS earth stations

Parameter	Type of coverage		
	Global	Regional	National
Antenna size (m)	4.5-32	4.5-25	3-30
Gain (dBi) Transmit	47-64	47-62	43-63
Receive	43-61	43-59	40-59
Receiver noise temperature (K)	50-150	50-150	50-200
G/T (dB(K-1))	23-41	23-38	17-41
Typical output power (kW)	1-12	0.3-3	0.005-1
e.i.r.p. (dBW)	46-95	46-74	45-84

Some basic factors which are common to a number of satellite systems using the 8/7 GHz band are:

- large service areas; i.e., approaching the visible areas in size;
- Earth coverage, hemispheric coverage and re-directable narrow beam satellite antennas;
- capabilities for changing satellite antenna/transponder configurations;
- circular polarizations; no frequency reuse within a network;
- large differences in earth-station antenna sizes, the smallest are in the order of 1 to 3 m;
- relatively high maximum transmission gains (see the Radio Regulations, Appendix 29), which coupled with high up-link satellite antenna gains, result in relatively high up-link sensitivity.

These factors are consistent with satellite networks which could operate in either or both the FSS and the MSS.

Conversely, there is no uniformity in transponder arrangements, frequency translations, satellite antenna configurations, or types of modulation, carriers, and satellite accessing.

It should also be noted that the meteorological-satellite and earth exploration-satellite services also have frequency allocations with primary status in these frequency bands; these services could have very different characteristics from those of the FSS and MSS.

2.3 FSS networks operating at 14/11 and 14/12 GHz

FSS systems in the 14/11 - 12 GHz bands have only become operational within the last 6-7 years. Over that time, significant improvements in orbit/spectrum efficiency and capacity have resulted from progress in the technologies associated with these systems.

A particular attraction of these bands as compared to the 6/4 GHz bands, is the ability to provide high satellite e.i.r.p., permitting the use of smaller earth station antennas for many telecommunication services. This arises partly from the facility with which satellite transmitting antennas of higher gain can be provided, and partly from the fact that some of the space-to-Earth frequency allocations near 12 GHz are not generally shared with terrestrial services having primary allocation status. A sample analysis of the information on current satellites using these bands, contained in Document 105 (IFRB) indicates that the median value of the gains of satellite beams is about 38 dB, with upper and lower decile values of 49 dB and 29 dB respectively. The availability of improved launch systems and improvements in satellite power technologies have facilitated this development. As a consequence, many new satellite communication services relying upon small aperture earth station antennas are being implemented.

As the physical antenna size required for a particular D/λ is much smaller than at 6/4 GHz, the frequency reuse potential using spacecraft antenna spot or shaped beams is considerably enhanced and some systems under construction will utilize this technique to achieve 8-fold frequency reuse on a single satellite.

The principal disadvantage of the use of frequencies above 10 GHz is the higher RF signal attenuation and depolarization effects in areas subject to heavy rainfall. Various techniques to alleviate these problems are available and include up-link power control and adaptive depolarization cancellers.

Allocations for the 12 GHz space-to-Earth frequency bands currently allocated, vary among the ITU regions as follows:

Region 1: 12.5 to 12.75 GHz,

Region 2: 11.7 to 12.2 GHz,

Region 3: 12.2 to 12.75 GHz.

In each region there are primary allocations to terrestrial services, in the International Frequency Allocation Table or in footnotes to it, but the down-link power flux-density limits imposed by RR 2574 do not apply in a large number of countries, and the availability of high-gain satellite antennas facilitates the prevention of power flux-density levels in breach of RR 2574 in countries where its terms do apply. These bands are used by both national and international systems.

The 11 GHz (10.7 - 11.7 GHz) space-to-Earth frequency band is allocated on a world-wide basis and the segments, 10.95 - 11.2 GHz and 11.45 - 11.7 GHz, are used by international and national systems. The remaining segments, 10.7 - 10.95 GHz and 11.2 - 11.45 GHz, represent expansion bands that are not currently used.

All of the above bands currently in use utilize the 14 to 14.5 GHz Earth-to-space bands for transmission to the satellite. An additional 500 MHz band from 12.75 - 13.25 GHz is available, but has not been used to date.

With respect to the typical parameters of systems in the 14/11 - 12 GHz bands, space station receiving system figure-of-merits range from approximately -3 dB/k to 9 dB/k while spacecraft transponder e.i.r.p.s vary from 35 to 50 dBW at the edge of coverage using spot or shaped beams. Earth station antenna diameters vary from about 1 metre to as large as 32 metres.

2.4 Frequencies above 15 GHz

Studies are in progress to define the parameters of space stations operating in the 30/20 GHz band, and two administrations have launched experimental space stations operating in these bands. In general, the use of frequency bands around 20 GHz and 30 GHz, where 3.5 GHz of bandwidth is available, would make possible the provision of very high capacity systems using narrow spot beam antennas and high speed digital transmissions.

The research and development of 30/20 GHz band FSS systems have been promoted in many countries, for example the Japanese CS-1 experimental system, NASA's advanced 30/20 GHz system, ESA's OLYMPUS (formerly L-SAT) project, the ITALSAT system, the ATHOS experimental satellite project, the German DFS and other experimental satellite projects.

In Japan, the first operational domestic FSS systems using CS-2a and 2b satellites started from the end of May 1983. The 30/20 GHz band is used for transmitting telephone signals using TDMA and FM-TV signals between regional centres with 11.5 m diameter offset Cassegrain antennas. Small transportable 30/20 GHz band earth stations with 3 m diameter antennas are used for emergency communications for telephone and TV signals.

Diversity earth stations may be required (in areas of high precipitation rates) in order to ensure that service availability is high. It is also expected that very broadband transponders will be used at these frequencies.

3. Common user systems

Various networks in the FSS are used by more than one administration on a common basis to satisfy their domestic and/or international communication services.

A particular example of such a user system is the INTELSAT system. Other examples of common user systems are INTERSPUTNIK, ARABSAT, PALAPA and EUTELSAT.

INTELSAT provides satellite communication services to all nations on a non-discriminatory basis. At the end of 1984, the space segment consisted of 15 satellites and the earth segment consisted of a total of about 850 earth station antennas, including about 300 international and nearly 550 domestic antennas in more than 160 countries, territories and dependencies. The international service provided more than 36,000 full time voice and data circuits and over 49,000 half-channel hours of television transmissions. Allotments amounting to some 40 transponders were leased to 27 nations for domestic communications.

The most recent INTELSAT satellites use approximately 500 MHz of spectrum for up-links and down-links in both the 6/4 GHz and the 14/11 GHz FSS bands. Advanced spacecraft antennas with spatially-isolated and polarization isolated beams are used to achieve 4-fold reuse of the 6/4 GHz spectrum in INTELSAT V and a 6-fold reuse in INTELSAT VI services (see Table 3). In the earth segment, some INTELSAT users have introduced TDMA-PCM-DSI, which achieves a bandwidth utilization efficiency of about 35 channels/MHz as compared to 15 channels/MHz in the FDM-FM transmission mode.

In addition, modified INTELSAT-VA series of satellites under construction will use the 14/12 GHz band for the provision of international business services directly to urban centres in many countries, while the INTELSAT-VI series satellites will be equipped to use 75 MHz of spectrum in the 6/4 GHz bands newly allocated at the WARC-79.

Special issues of relevance to common-user systems

Service arc considerations

The choice of orbital locations for a common-user system may be more constrained by the geographical locations of the various users of the system than would be the case for a national system. The choice of orbital locations for a satellite system which must have the capability to connect all users in a given region is limited by the need to provide visibility, at satisfactory angles of elevation, for earth stations at the edge of the coverage area.

In the Atlantic Region for INTELSAT, for example, the location of the Primary Path satellite cannot be varied by more than 1.5° without reducing the elevation angle of the limiting earth stations to less than 5°, i.e., the minimum for satisfactory operation in the 6/4 GHz band. In the Indian and Pacific Ocean Regions the service arc for the Primary Path satellite is only 3° wide.

At 14/11 GHz and higher frequency bands, the service arc restrictions are even more severe for INTELSAT since earth stations in these bands normally require operation at higher elevation angles than 6/4 GHz in order to minimize rain attenuation and depolarization effects to acceptable levels.

Space station coverage considerations

The size of satellite antenna beam coverage may also be affected by the geographic extent of the user administrations. The largest such beam would occur in systems providing service on a global basis. In such a case, a beam which covers all administrations served by the common user system, whether global or regional, is particularly useful for TV distribution services, in which several widely dispersed earth stations which are not located in other coverage beams require simultaneous reception of a certain telecast. Such beams can also provide connectivity for widely distributed, thin-route earth stations throughout the service area and the trend is to limit the bandwidth required for use in such beams to the minimum.

TABLE 3

Characteristics of INTELSAT satellites

Satellite	No. of transponders	Frequency spectrum (MHz)	Total bandwidth (MHz)	Frequency reuse	Achievable channel capacity
Intelsat-IVA	20	5 925-6 425 3 700-4 200	800	2 x 6/4	6 000 2-way voice + 2 TV channels
Intelsat-V(1)	27	5 925-6 425 14 000-14 500 3 700-4 200 10 950-11 200 11 450-11 700	2 137	4 x 6/4 2 x 14/11	12 000 2-way voice + 2 TV channels
Intelsat-VA(2)	32	5 925-6 425 14 000-14 500 3 700-4 200 10 950-11 200 11 450-11 700	2 252	4 x 6/4 2 x 14/11	15 000 2-way voice + 2 TV channels
Intelsat-VI	50	5 850-6 425 3 625-4 200 14 000-14 500 10 950-11 200 11 450-11 700	3 200	6 x 6/4 2 x 14/11	35 000 2-way voice(3) + 2 TV channels

(1) Intelsat-V F5-F9 are equipped to provide Maritime Communications Service using the frequency spectrum:
1 636.5-1 644.5 MHz; 1 535.0-1 542.5 MHz
6 417.5-6 425.0 MHz; 4 192.5-4 200.5 MHz

(2) Intelsat-VA F13-F15 are equipped to provide INTELSAT Business Service using the frequency spectrum:
14 000-14 500 MHz; 12 500-12 750 MHz (Europe), 11 700-11 950 MHz (North America).

(3) This assumes an increased number of digital links using SS-TDMA.

4. Current technology and operational characteristics in the FSS

4.1 Earth-station technology

The most important earth-station technologies are those associated with antenna characteristics and transmitter/receiver techniques. These factors affect the satellite network characteristics, and some of them have much to do with the efficiency of utilization of the geostationary-satellite orbit/spectrum.

Antenna characteristics

The most relevant earth-station element, amongst those mentioned above, is the antenna sub-system. Two important performance parameters of an earth-station antenna have a direct effect on orbit utilization: side-lobe and polarization characteristics.

The antennas used in most earth stations are of the axisymmetric Cassegrain type. It is known that for this type of antenna the effect of blockage and diffraction due to the sub-reflector and its supports results in increased side-lobe levels. Nevertheless, many antennas now in use have improved side-lobe performance, particularly those of D/λ greater than 150. There are also new small asymmetric type antennas that are being installed with better side-lobe performance.

Polarization characteristics

Polarization discrimination depends on the polarizer characteristics and the surface accuracy of the main and sub-reflectors, the former being the major contributor. A typical value of polarization discrimination required for current earth-station antennas is 30 dB (axial ratio of approximately 0.5 dB for circular polarization) and earth-station antennas with polarization discrimination of more than 30 dB are currently feasible. On the other hand, improvement in polarization discrimination beyond a certain threshold (approximately 30 dB), while feasible, does not result in a significant increase in capacity. This is the case, for example, of small-sized earth stations with low traffic requirements, that usually have reduced polarization isolation performance.

High power amplifiers (HPAs)

Klystrons and travelling wave tubes (TWTs) are used at the present time for earth-station high power amplifiers. Though the signal bandwidths of klystrons are about 40 MHz to 70 MHz, a band of 500 MHz can be covered by tuning the cavity in the 6, 14 or 30 GHz bands. Regarding the maximum saturated output power, klystrons of 14 kW in the 6 GHz band, 3 kW in the 14 GHz band and 500 W in the 30 GHz band have been developed. TWTs have signal bandwidths of 500 MHz in the 6, 14 and 30 GHz frequency bands respectively and do not require tuning. Regarding the maximum saturated output power, TWTs of 14 kW in the 6 GHz band, 3 kW in the 14 GHz band and 700 W in the 30 GHz band have been developed.

To reduce the level of intermodulation products produced in the HPA for multi-carrier operation, a linearizer of the pre-distortion type has been developed and used in some earth stations. By using such a linearizer, the level of intermodulation products will be reduced by more than 10 dB in the range of output back-off equal to or larger than about 6 dB.

Receiver techniques

Use of a receive chain with a low system noise temperature at an earth station is an essential requirement in a satellite communication system. The receiving system noise temperature is mostly determined by the noise contribution of the antenna and the first stage amplifier. At present, parametric amplifiers either cooled by gaseous helium or thermo-electrical devices or at ambient temperature are in use. Low noise amplifiers using a GaAs FET have been developed. The noise temperature achieved in the 4 GHz frequency band by these four kinds of low noise amplifiers is less than 20 K, 45 K, 80 K and 80 K respectively. The bandwidth of LNAs currently being used in the 4 GHz frequency band is 500 MHz. In the 11 GHz frequency band, parametric amplifiers with a bandwidth of 750 MHz and a noise temperature of about 90 K and an FET amplifier with a noise temperature of about 120 K are available. In the 20 GHz frequency band, parametric amplifiers with a bandwidth of 2.5 GHz and a noise temperature of about 80 K (cooled by gaseous helium), 200 K (cooled by a thermo-electrical device) and FET amplifiers with a noise temperature of about 220 K (cooled by a thermo-electrical device) or 300 K (ambient temperature) are feasible.

4.2 Technology related to space stations

The most important space station technologies are those associated with antenna characteristics and transponder components. These factors affect the satellite network characteristics and also contribute to the increase of the efficiency of utilization of the geostationary-satellite orbit/spectrum. In particular, satellite antenna technology provides the major technique for the provision of increased frequency reuse from a single orbit location, whether on the same satellite or on different satellites.

Antenna technology

While spot beam antennas provide for more frequency reuse of a given bandwidth, this is limited by the need for coverage and by the separation of the covered areas. Shaped beam technology offers some possibilities to enhance the application of spot beam technology for a wide variety of requirements.

Shaped beam antennas offer the potential for improved side-lobe control particularly where the coverage area itself is rather large thus improving the possibility of frequency reuse between coverage areas closer to each other. However, it should be noted that discrimination beyond-the-edge-of-coverage is a function of satellite antenna dimensions; launch vehicle constraints may be a factor here.

The orbital positions of existing satellites may have to change to accommodate new satellite systems. To cope with this situation, space-station antennas would have to be designed to take this fact into account. The direction of the radiation patterns would probably have to be changeable by control from the ground. In some cases it may be desirable to reshape beams in service in order to allow for a large change of location. However, the cost and operational impact of introducing such capabilities have not been sufficiently studied.

Transponder components

Since the introduction of communication satellites, there has been continuous improvement in the e.i.r.p. The higher e.i.r.p. levels translate into higher down-link C/N and correspondingly increased channel capacity, for a given size earth station. A domestic satellite concentrates its radiated power onto a single country, and achieves a higher e.i.r.p. than an international system with global or large area coverage, for the same size TWTA. In addition, these higher e.i.r.p. levels result from the use of higher power amplifiers in the satellites.

Solid-state devices such as field effect transistors (FETs) are generally less efficient than TWTs as power amplifiers but provide better linearity than TWTs. Thus, higher capacity may be achievable for multiple access systems because of better carrier-to-intermodulation ratios.

4.3 Multiple-access and modulation techniques

Multiple-access techniques and modulation techniques are inter-related. These techniques affect the bandwidth efficiency of systems.

Multiple access

Multiple access is the technique which enables respective transmission links of a large number of earth stations to be interconnected through the same satellite. This technique is essential to exploit the unique geometric properties of wide-area visibility and multiple connectivity which are the features of satellite communication systems.

Multiple-access techniques can be classified into the following two systems in respect of circuit utilization:

- pre-assigned multiple access;

- demand assigned multiple access.

In the former system the channels required among earth stations are assigned permanently. In the latter system the channels are assigned to the stations only on occasion of demand and satellite channels are therefore shared amongst users in time.

Moreover, multiple-access techniques can be classified into the following three systems:

- FDMA: frequency division multiple access;
- TDMA: time division multiple access;
- CDMA: code division multiple access.

In FDMA, the usual practice is pre-assigned multiple access, therefore carrier frequencies are assigned exclusively to each earth station and multiple carriers of different frequencies share a common satellite repeater. Such a multiple carrier operation always results in less capacity being available as compared to the single-access mode due to the power back-off which is required to reduce the level of intermodulation products. The base modulation techniques associated with FDMA can be either single sideband AM, frequency modulation or various digital modulations such as 2-PSK or 4-PSK.

In TDMA, a carrier of the same frequency is shared by multiple stations on the basis of non-overlapping (in time) burst transmissions through a satellite repeater. From the viewpoint of traffic, a TDMA system has greater flexibility than an FDMA system.

The CDMA system is one where signals occupy the same location in both the frequency domain and the time domain, but can be distinguished from others by proper signal processing. Spread spectrum multiple access (SSMA) is one example of a CDMA. The SSMA makes use of a deterministic noiselike signal structure to spread the narrow-band information over a relatively wide band of frequencies. The spectrum spreading is achieved by modulating each signal by a unique code, so that demodulation of a wanted signal can be done by means of correlation detection in which signals having different codes will not be correlated.

<u>Modulation techniques</u>

From the viewpoint of the efficient utilization of the geostationary-satellite orbit/spectrum, it is desirable to adopt bandwidth efficient modulation methods. The modulation methods which are widely used in current satellite communication systems are frequency modulation (FM) and phase shift keying (PSK). Recent developments include the use of the SSB-AM in conjunction with compandors.

Frequency modulation is presently the predominant form of modulation in FSS networks. Bandwidths of individual RF carriers presently in use range from about 25 kHz to 36 MHz; (see Table 4).

TABLE 4

Bandwidth of typical FM RF carriers

Bandwidth	Application
25-45 kHz	SCPC
100-250 kHz	Broadcast quality audio programme distribution
1.25-36 MHz	FDM-FM, 12 to 1 800 channel telephony
17-36 MHz	Television, possibly with multiple audio bandwidth sub-carriers

PSK modulation uses digital signals which for voice requires analogue-to-digital conversion. The resulting digital signal is processed and coded usually into 64 kbit/s per channel. The PSK can be accomplished using any number of phase pairs to distinguish the binary state. Theoretically, 4-PSK requires the same power, but half the bandwidth per bit, as compared to 2-PSK for a given link performance. Higher order (greater than 4-phase) PSK systems are more susceptible to noise and, therefore, need more power than either 2- or 4-phase systems to achieve the same standard of performance. A decrease in the number of phases permits closer satellite spacing, however, the utilization of the GSO tends to be optimized when the number of phases is in the range of 4 to 8 and the orbit utilization efficiency tends to decrease as either a higher or a lower number of phases are utilized.

Typical bandwidths and applications of digital modulation (2-PSK and 4-PSK) are as shown in Table 5.

TABLE 5

Bandwidth of typical digital RF carriers

Bandwidth	Application
30-60 kHz	SCPC for thin-route voice applications, and 48-64 kbit/s data with or without FEC
100-8 000 kHz	TDM data and/or digitized voice channels, (high speed digital channels) "thin-route" TDMA
30-72 MHz	High capacity single access or TDMA systems, with or without digital speech interpolation (DSI)

The SSB-AM provides a high-density analogue modulation alternative to digital systems. The development of highly stable, solid-state linear amplifiers for satellite transponders has given new life to this technique.

Other digital modulation techniques, amplitude-shift keying (ASK), frequency-shift keying (FSK) and composite modulation techniques involving both amplitude and phase-shift keying have been studied. Of these techniques, ASK and hybrid techniques involving ASK are not appropriate to TDMA because the transponder non-linearities and power-efficiency effects usually constrain the modulation format to have a constant envelope. In the case of FDMA, the use of ASK and hybrid techniques involving ASK is also restricted because of its greater sensitivity to co-channel interference.

Recently, new modulation techniques such as minimal shift keying (MSK) and tamed frequency modulation (TFM), in which the envelopes of modulated carriers are constant, have been studied. Because these modulation techniques are expected as desirable candidates for future systems, further studies are required.

The above are modulation techniques used in the RF domain. Also of importance are baseband and channel modulation techniques. In digital systems, it is possible to use 32 kbit/s delta modulation and work on 16 kbit/s appears promising. A Recommendation of CCITT Study Group XVIII for 32 kbit/s ADPCM was recently approved. These techniques can yield up to four times the capacity, relative to 64 kbit/s PCM.

It is also possible to gain another factor of two to three in capacity using digital speech interpolation (DSI) in conjunction with any of the above modulation techniques.

Another common technique in use in satellite communication systems is single-channel-per-carrier (SCPC) on selected transponders for use with low-capacity earth stations. Typically PCM (digital) or companded FM (analogue) equipment is used to modulate a single voice transmission, but delta modulation 2-PSK as 4-PSK units are also in service. SCPC type carriers are also in operation for medium speed data (56 kbit/s) and audio distribution.

In satellite video transmissions FM with frame-rate energy dispersal is typical. The baseband may include multiple audio/data sub-carriers. Techniques are under development for dual television signal transmission through interframe interleaving of independent video signals. Such techniques will allow a single satellite transponder to support two independent television transmissions with a quality comparable to today's single television transmission per transponder.

4.4 Some trends in system characteristics

Several other factors will have a significant impact on the changes that can be expected in the future of FSS characteristics affecting orbital utilization.

4.4.1 Traffic growth

FSS system characteristics are probably most affected by the growth in traffic volume carried over the system, the changing pattern of this traffic, and the introduction of new services. Initial loading may consist of a relatively few high density links between major traffic centres. In time, additional links may be established to lower density traffic centres and thin-route services provided to remote locations. Moreover, demand for services may be greatly stimulated by the availability of high quality communication facilities at a given location. Once earth stations are installed to provide basic services to a community, it is also relatively easy and economical to expand the range of services provided. Such additional services might include video and audio programme distribution and data services. Also, it is often more economical for a country to initially lease capacity in an existing, larger capacity satellite. Eventually, traffic may grow to the point where a dedicated satellite is economically justified. Where several near-by countries have been leasing capacity on a global satellite system, such a dedicated satellite system might initially take the form of a regional system, rather than individual national systems, to reduce space segment costs. It is expected that each system will have its own unique pattern of development over time.

4.4.2 Integrated services digital networks

With the rapid growth in international and national digital services, satellite systems are expected to play an increasingly important role. The CCIR is developing a report which discusses the necessary satellite performance characteristics to meet the CCITT ISDN objectives. Satellite systems which are expected to provide channels for an ISDN should take these performance objectives into account.

4.4.3 Modulation type and transmission parameters

Changing traffic volumes and patterns, as well as the introduction of new services and types of earth stations, can be expected to affect the types of modulation and carrier transmission parameters associated with the FSS system. These changes may result in transmissions having greater or lesser susceptibility to interference and greater or lesser potential to cause interference. For example, as traffic grows on high traffic density links, it is usually more economical to increase the RF carrier capacity by use of more bandwidth efficient modulation techniques than to allocate additional transponders. In addition, SCPC-FDMA transponder configurations are common as lower density, thin-route locations are added to the FSS network. However, low capacity TDMA systems are also under development where several such systems may access a transponder in an FDMA mode.

4.4.4 Trend to limited coverage and beam shaping

Spot beams on space stations in the FSS increase satellite G/T and e.i.r.p. and permit frequency reuse. The use of narrow antenna beams that concentrate gain over the coverage area helps to reduce the earth segment costs and increase satellite capacity.

Such spot beams are becoming almost universal for national coverage FSS systems. When coupled with fast roll-off characteristics of side lobes, a substantial increase in orbit utilization can be achieved. This is because the orbital separation between narrow-beam satellites serving non-overlapping coverage areas can be reduced due to the satellite antenna discrimination. With sufficiently distant coverage areas and/or fast enough roll-off characteristics, such satellites could be located at the same nominal orbital locations; the risk of collision is remote.

The use of spot beams covering different portions of a satellite's service area can also lead to greater orbit utilization. The spatial isolation between narrow beams permits frequency reuse at the orbital location.

In addition, advances in satellite antenna design technology permit shaping of the satellite antenna beam. Such shaping may be used to adapt the contours of the antenna beams to better fit the required coverage areas.

4.4.5 Increase in e.i.r.p. and sensitivity

There is a distinct trend towards increased satellite e.i.r.p. and decreased space-station and earth-station receiver noise temperatures. This trend tends to encourage increased transponder capacity and lower-cost earth stations.

Also, the trend towards higher e.i.r.p. satellites may also be used to advantage to improve orbit utilization by permitting an increase for all FSS systems in the portion of the noise budget allocated to interference from other satellite systems.

4.4.6 Trend towards bandwidth limited and interference limited operation

In many systems, one satellite may be required to serve an increasing number of earth stations. The ability of a single satellite to satisfy such growing requirements may be limited by the bandwidth available in the satellite. In the case of satellites using multiple spot beams for frequency reuse, available capacity may also be limited by interference levels between the various spot beams.

4.4.7 Expansion bands

While little use has been made of the new bands allocated by WARC-79 in the 6/4 and 14/11 GHz ranges, it can be expected that they will be of increasing value in the future as requirements continue to increase.

The propagation conditions which will be experienced in the new bands in the 6 and 4 GHz region result in the same transmission environment as the conventional 6 and 4 GHz bands. This will allow new systems using these bands to employ designs for both spacecraft and earth stations essentially identical to current systems.

Systems using the new bands around 14/11 GHz will be essentially identical to those currently in use in the conventional bands at 14/11 GHz. The additional 500 MHz that is available for both up- and down-links can provide the same capacities as achieved by current systems as the transmission environment is the same. Again no significant cost impact is expected.

4.4.8 Higher frequency bands

FSS systems will increasingly use the higher frequency bands for a number of reasons. First, the addition of higher frequency bands to an FSS system may be more economically and technically attractive than more intensive frequency reuse techniques. Additionally, increasing orbital congestion in the lower frequency bands will also lead to the use of the higher bands. In particular, the greater antenna directivities available at the higher frequencies will permit smaller satellite spacings and thus a greater number of satellites to be accommodated. Consideration of terrestrial interference may also lead to an increasing use of higher frequency bands, especially if terrestrial systems are not highly developed in the higher bands. Finally, the higher frequency bands tend to have higher bandwidths available. For example, 3 500 MHz of bandwidth is available between 17 and 31 GHz.

D.J. WITHERS
Chairman of Working Group 4C

Annex: 1

ANNEX 1

The extent of usage of the GSO by the FSS

An example of the usage of fixed-satellite networks operating at 6/4 GHz, is illustrated in Figure A1 which is derived from information (December, 1983) filed by administrations with the IFRB for the use of orbital locations. Some of these satellites are not now in orbit, nor are all satellites operating in the full band, e.g., some are exclusively for feeder links in the maritime mobile-satellite service (MMSS). These factors are illustrated by the breakdown of statistics accompanying the figure. In addition, Figure A2 displays the use of the 6/4 GHz band relative to other currently allocated FSS bands. Also, multiple entries appear at some orbit locations. This provides for contingency or replacement of one satellite series with another and reduces the number of real operational satellites carrying traffic. The total transmission capacity of these satellites depends on a large number of factors including earth-station antenna size and satellite communications payload parameters.

Figure A3 shows networks operating at 7 and 8 GHz which have been published in IFRB circulars. The satellite density is obviously much lower than in the 6 and 4 GHz bands.

Similarly, Figures A4 and A5 show the situation at 14/11 - 12 GHz and above 15 GHz.

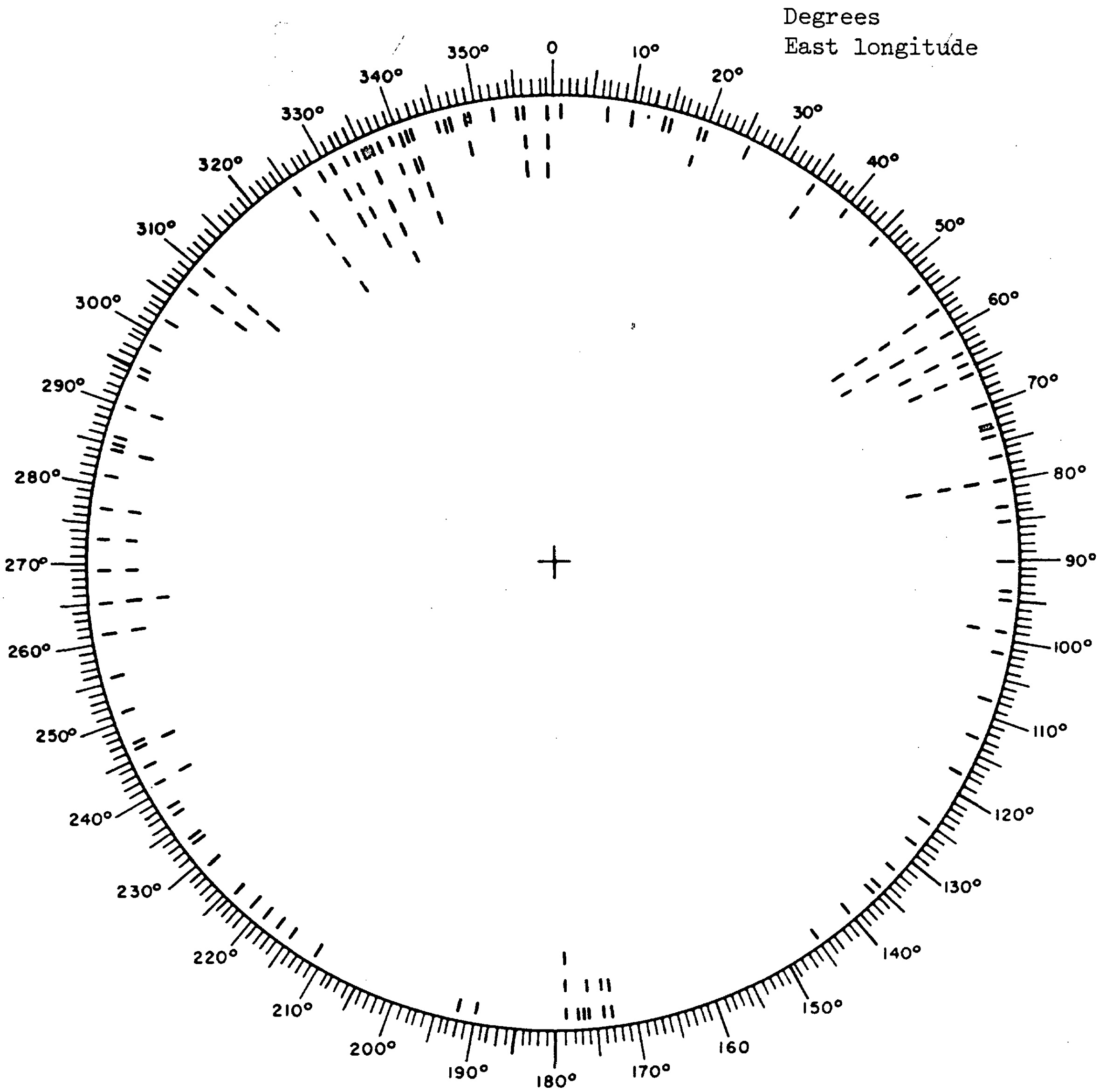

FIGURE A1 - Orbital locations of 6/4 GHz FSS entries [IFRB, 1984]
(IFRB data as of December, 1983)

Each dash within the circle represents one space station at a specific orbital position

Approximate distribution of networks

FSS only one band	FSS only ≥ 2 bands	Total FSS only	FSS and other services
55%	30%	85%	15%

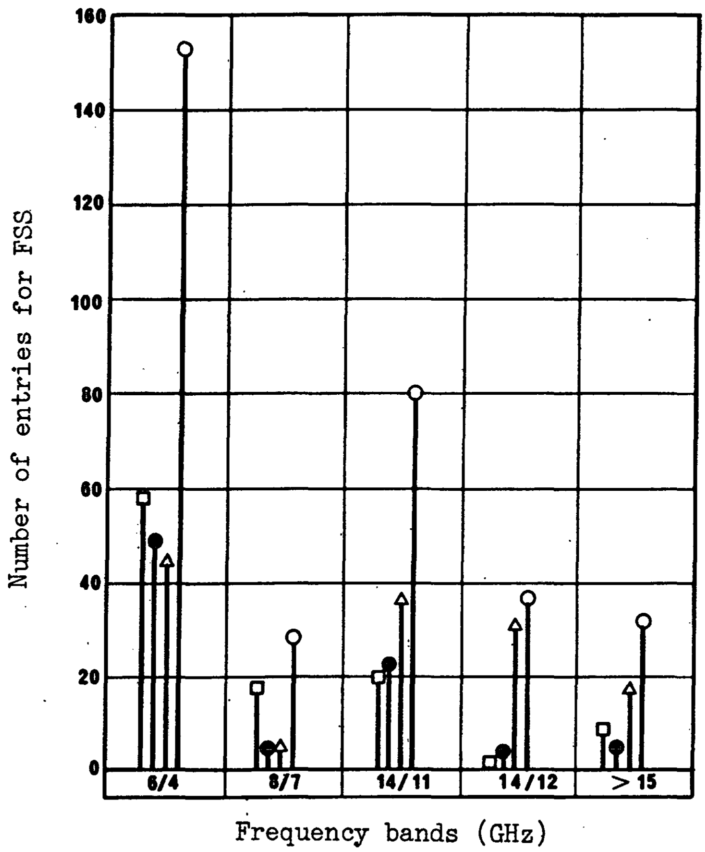

FIGURE A2 - Tabulation of FSS entries by frequency band [IFRB, 1984]

(IFRB data as of December, 1983)

- □ registered
- ● presently being coordinated
- △ only advance publication
- ○ total

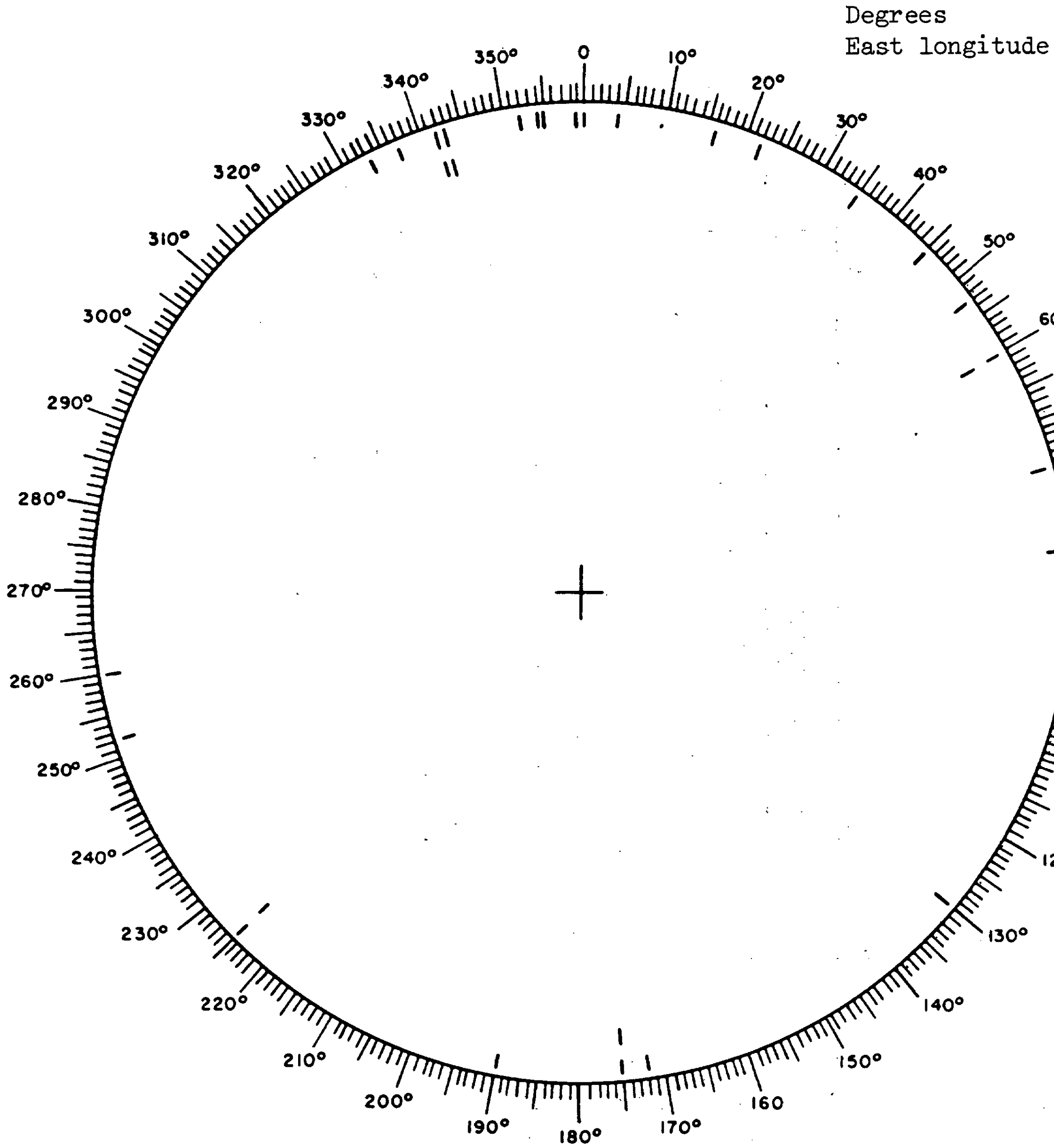

FIGURE A3 - Orbital locations of 8/7 GHz FSS entries

Each dash within the circle represents one space station at a specific orbital position

Approximate distribution of networks

FSS only one band	FSS only ≥ 2 bands	Total FSS only	FSS and other services
40%	-	40%	60%

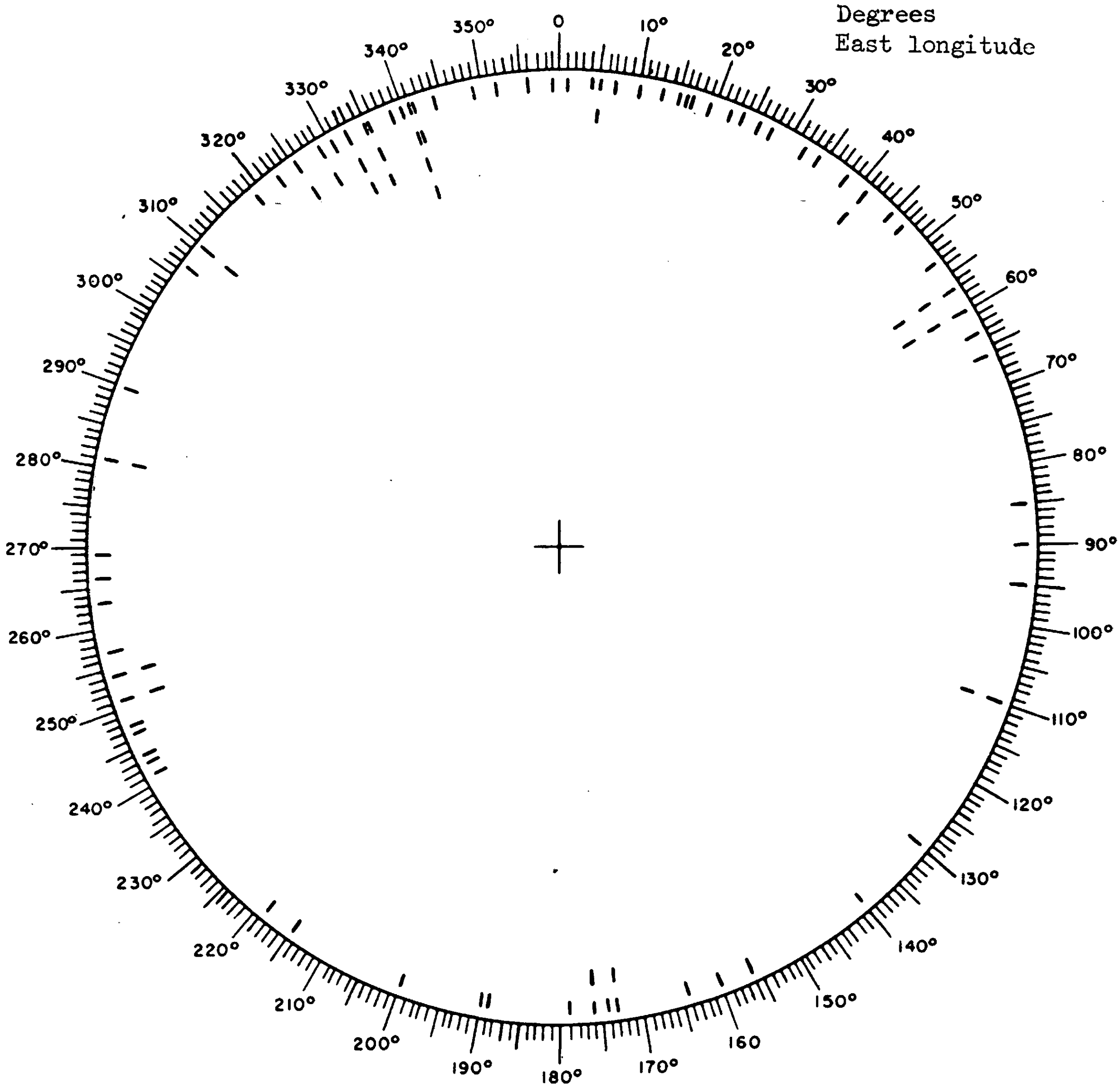

FIGURE A4 - Orbital locations of 14/11-12 GHz FSS entries

Each dash within the circle represents one space station at a specific orbital position

Approximate distribution of networks

FSS only one band	FSS only ≥ 2 bands	Total FSS only	FSS and other services
35%	50%	85%	15%

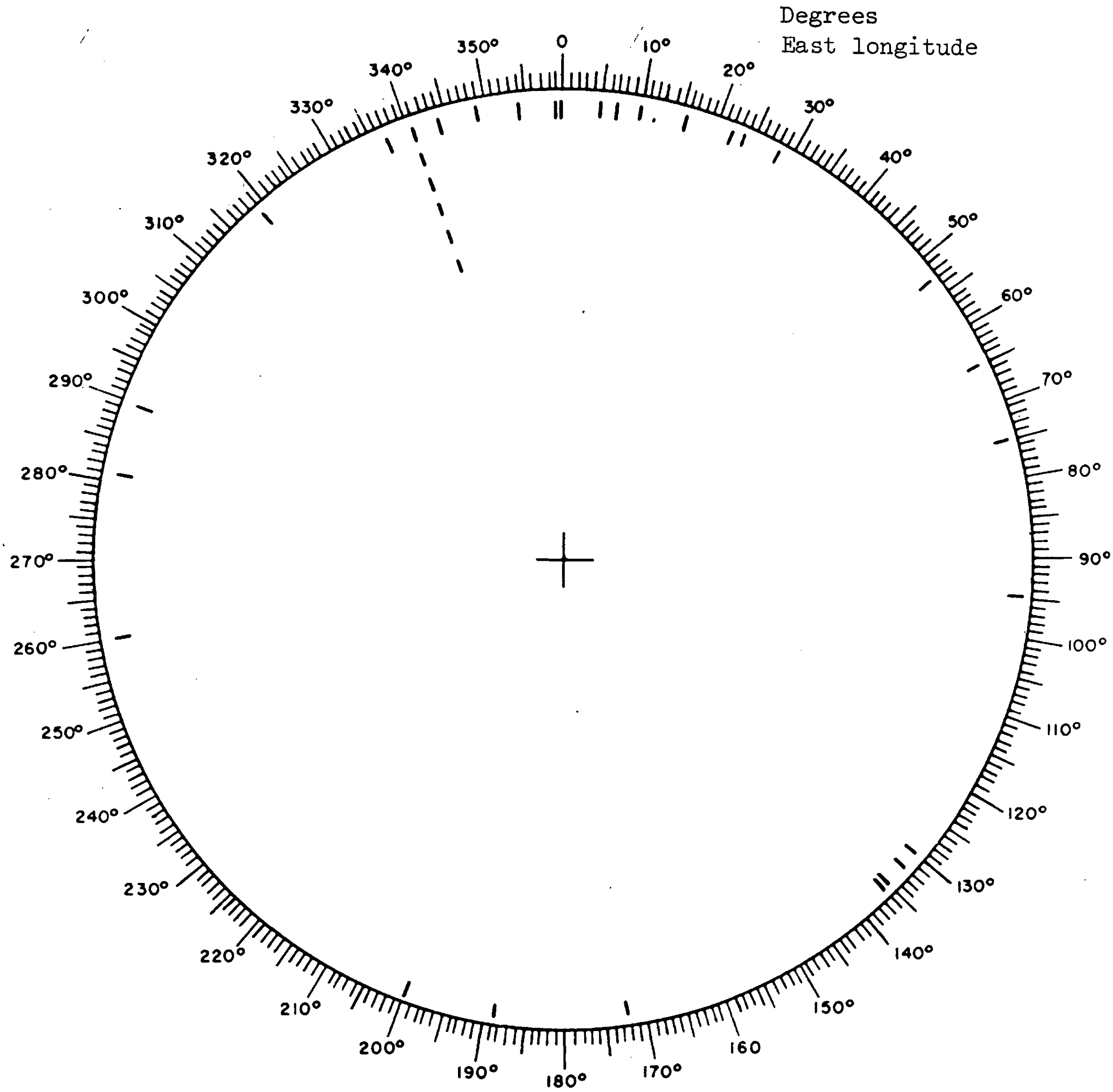

FIGURE A5 - Orbital locations of > 15 GHz FSS entries

Each dash within the circle represents one space station at a specific orbital position

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document No. 136-E
19 August 1985
Original: English

WORKING GROUP 6A

Note by the Secretary-General

INCORPORATION OF THE FINAL ACTS OF SAT-83 IN THE RADIO REGULATIONS

At the request of the IFRB, I transmit the attached Note on Incorporation of the Final Acts of SAT-83 in the Radio Regulations, for the information of Working Group 6A.

At the same time, I draw attention to the fact that the overall legal situation in this respect has already been pointed out to the Working Group in detail. It is reproduced in Document No. 134 of the Conference.

R.E. BUTLER
Secretary-General

Annex: 1

Note by the IFRB

INCORPORATION OF THE FINAL ACTS OF SAT-83 IN THE RADIO REGULATIONS

1. INTRODUCTION

1.1 In Working Group 6A two possible solutions to the incompatibilities between the Region 2 BSS Plan and Appendix 30 (the BSS Plan of Regions 1/3) were identified:

a) to add a note to the assignment concerned indicating that the assignment shall only be brought into use after the limits of the Radio Regulations (Annex 4 of Appendix 30) have been met or that there has been an agreement with the administration concerned;

or;

b) to modify the technical characteristics of the assignments in the Region 2 Plan at this Conference to ensure that the limits of Annex 4 are met before the Plan is included in the Radio Regulations.

1.2 When considering this item, the Plenary of the Conference attributed three tasks to Committee 6:

a) to consider the relevant decisions of the RARC for the Planning of the BSS in Region 2, particularly the incompatibilities between Regions and services;

b) to consider and resolve the incompatibilities between assignments in the Region 2 Plan and those in Appendix 30 to the Radio Regulations, as well as existing assignments in other services;

c) to prepare, as appropriate, the texts of the necessary provisions to be incorporated in the Radio Regulations.

2. INCOMPATIBILITIES BETWEEN REGIONS AND SERVICES

These incompatibilities may concern terrestrial services in Regions 1 and 3 and the Fixed-Satellite Service in Region 1. The terrestrial services should be protected by the appropriate power flux-density limits which are not to be exceeded. Discussions are still continuing in Working Group 6A on the question of protection from the Region 2 BSS Plan to the terrestrial services and the Fixed-Satellite Service of Regions 1 and 3 therefore the Board will not comment on these aspects now.

3. INCOMPATIBILITIES BETWEEN ASSIGNMENTS IN THE PLANS

3.1 In considering the incompatibilities between the two Plans there are number of aspects to be included.

3.2 In accordance with resolves 2 of Resolution 701, the Region 2 Plan shall not exceed the limits of Annex 4 of Appendix 30. The Board had identified those assignments in the Region 2 Plan that did not meet the limits of Annex 4 and the Working Group 6A has now accepted that identification, and the question now for Working Group 6A is how are those few incompatibilities to be resolved.

3.3 The Region 2 RARC had recognized that there could be some assignments in the Plan that did not meet the agreed interregional sharing criteria of WARC 1979 and for that reason it adopted Resolution 4 (Sat-R2) in which Region 2 agreed that a suitable remark would be inserted against the assignments concerned indicating that the assignment would only be brought into use after agreement has been reached with the administration concerned or adequate measures have been adopted to reduce the pfd over the territories of Regions 1 and 3.

3.4 The Plan for Region 2 like all other frequency assignment plans was agreed as a result of many discussions and it represents a compromise that was acceptable to the countries at the conference. If the technical characteristics of one assignment are changed the protection margins for that assignment and many other assignments in the Plan may change and that may result in some assignments in the Plan no longer being acceptable to the countries of Region 2 concerned.

3.5 During the discussions, the Chairman of the Board was asked how the Board would apply such a remark that is placed against an assignment. The remarks column is an integral part of the Plan and therefore the Board when examining an assignment for its conformity with the Plan (paragraph 5.2.1 b) of the Final Acts) would include consideration of the compliance with such remarks when developing its finding.

4. CONCLUSIONS

4.1 The Board has considered this question with respect to the above considerations and it is of the view that the Conference may wish to consider the following options:

- to treat this question in the light of several provisions of the Radio Regulations which consider that the limits may be exceeded with the agreement of the administration concerned such as RR2674. In other terms administrations which consider that the pfd over their territory is unacceptable to them may indicate in the remarks column of the Plan that the pfd over their territory must be reduced before the assignment is placed in service;

<u>or</u>;

- to consider that the Regional Conference did not follow the instructions given to it and recommend to the Administrative Council to convene another conference to prepare another Plan.

4.2 The Board is of the view that this Conference cannot make changes to the technical characteristics of individual assignments in the Region 2 Plan.

4.3 In conclusion the Board is of the view that Region 2, with the adoption of Resolution 4 (Sat-R2), has accepted to ensure that no assignment in the Region 2 Plan will be brought into service unless the limits of Annex 4 are met or that there is an agreement with the administration of Regions 1/3 concerned. With the insertion of such a remark in the remarks column of the Plan of Region 2 the Plan (with its remarks) would then be in conformity with the limits of Annex 4 of Appendix 30 and the incompatibilities between the two Plans could then be considered as resolved.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Corrigendum 1 to
Document 137-E
21 August 1985
Original: Russian

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Please replace page 13 by the following pages:

APPENDIX

TABLE 1

	Parameter	Baltic republics	Ukraine	Kirghizia
I	2	3	4	5
1.	Carrier frequency, GHz	1.0	1.0	1.0
2.	Type of modulation	FM	FM	FM
3.	Polarization	circular	circular	circular
4.	Frequency deviation, kHz	±75	±75	±75
5.	Noise band, kHz	250	250	250
6.	Type of receiver	transportable and automobile	transportable and automobile	
7.	Receiving antenna gain, dB	3.0	3.0	3.0
8.	Effective area of receiving antenna, square metres	0.0143	0.0143	0.0143
9.	Sound channel frequency band, kHz	15	15	15
10.	Gain due to use of pre-emphasis and weighting filters, dB	5.5	5.5	5.5
11.	Gain due to use of controlled compandor, dB	17.5	17.5	17.5
12.	Gain FM, dB	28	28	28

I	2	3	4	5
13.	Necessary signal-to-weighted noise ratio at receiver output, dB	61	61	61
14.	Necessary signal-to-noise ratio at receiver input, dB	10	10	10
15.	Equivalent receiver noise temperature, K	600	600	600
16.	Thermal noise power at receiver input, dBW	-146.8	-146.8	-146.8
17.	Difference losses, dB	0.6	0.6	0.6
18.	Necessary signal level at antenna output, dBW	-136.2	-136.2	-136.2
19.	Working angles of arrival, degrees	20	25	30
20.	Propagation losses, dB	163	163	163
21.	Power reserve for additional eclipse fading, dB	15	15	15
22.	Necessary power flux density at edge of service zone (contour - 3 dB), dBW/m^2	-117.8	-117.8	-117.8
23.	E.i.r.p. at beam centre, dBW	63.2	63.2	63.2
24.	Satellite antenna gain, dB	46.7	40.8	43.7
25.	Satellite antenna beamwidth at level 3 dB, degrees	0.9 x 0.6	2.3 x 1.0	1.3 x 0.8
26.	Approximate diameter of transmitting antenna, m	29.0	14	27
27.	Efficiency of satellite transmitter, %	33	33	33
28.	Losses of satellite transmitting antenna-feed channel, dB	1.5	1.5	1.5
29.	Satellite transmitter power, W	63	245	126

I	2	3	4	5
30.	Number of broadcasting programmes transmitted in the service area	4	2	2
31.	Weight of satellite communications subsystem, kg	145	102	143
32.	Power subsystem weight, kg	190	505.5	180
33.	Total spacecraft weight, kg	603	1,182	687
34.	Theoretical spacecraft life, years	7	7	7
35.	Spacecraft development cost, $M	45.0	48.3	44.5
36.	Spacecraft prototype cost, $M	27.6	29.3	24.8
37.	Spacecraft flight model cost, $M	22.1	23.4	18.5
38.	Launching cost, $M	42.0	47.0	42.0
39.	Total capital cost of space segment, $M	134.0	144	124.0
40.	Successful launch probability	0.9	0.9	0.9
41.	Cost of transmitting earth station, $M	2.5	2.5	2.5
42.	Total capital cost of sound broadcasting-satellite network, $M	136.5	147.5	126.5
43.	Normalized annual cost of satellite broadcasting system, $M	30.8	33.3	28.2
44.	Capital cost of equivalent terrestrial network, $M	9.2	26.7	3.0
45.	Operating cost of equivalent terrestrial network, $M	0.6	2.47	0.25
46.	Normalized cost of equivalent terrestrial network, $M	2.0	6.85	0.70

I	2	3	4	5
47.	**Annual gain for satellite and equivalent terrestrial system**			
	in normalized cost, $M	28.8	26.45	27.5
	in capital cost, $M	127.3	120.8	123.5
48.	**Annual gain on satellite and equivalent terrestrial system**			
	normalized cost	15.4	4.8	40.3
	capital cost	14.8	5.5	42.1

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 137-E
20 August 1985
Original: Russian

COMMITTEE 4
WORKING GROUP 4A

Union of Soviet Socialist Republics

CONCERNING SATELLITE BROADCASTING (SOUND) IN THE BAND 0.5 - 2.00 GHz

(Agenda item 4)

The USSR Administration has carried out studies on the economic aspects of this question. In these studies, a comparison was drawn between the cost of satellite broadcasting (sound) systems and conventional methods of high-quality sound broadcasting. The studies were based on the example of the Ukrainian SSR, the Kirghiz SSR and the Soviet Baltic Republics (Latvian, Lithuanian and Estonian SSR).

The estimated cost of establishing the space segment is based on the method described in Interim Working Party Report PLEN/3 to the XVth CCIR Plenary Assembly (Document PLEN/9).

In the satellite broadcasting (sound) systems, the width of the satellite antenna radiation pattern selected for service to each territory was that given in the Plan for the broadcasting-satellite service adopted at WARC-77.

In the calculations, it was assumed that the Ukrainian and Kirghizian territories were served by two national programmes each and that the territories of the three Baltic Republics were served by national programmes and by one central programme.

For satellite broadcasting (sound) systems, the studies were carried out for the frequency 1 GHz. It was considered that terrestrial sound broadcasting was carried out in the VHF band with a broadcasting quality at the edge of the area corresponding to the quality of satellite broadcasting (sound). The mean operating range of a terrestrial transmitter was taken as equal to 70 km at an antenna height of about 160 m.

In addition to the capital cost of the space segment, the total capital (non-recurrent) cost, including the cost of the transmitting earth station, was determined.

In the calculation of the cost of the terrestrial sound broadcasting network, the establishment and operation of which requires annual current expenditure in addition to non-recurrent expenditure, the normalized annual costs were also determined (A):

$$\text{Normalized annual expenditure (A)} = \frac{\text{capital expenditure}}{\text{amortization period}} + \text{(annual operating expenditure)}$$

The normalized expenditure for the space segment is obtained from the formula:

$$A_{ss} = \frac{C_{fm} + C_{\ell}}{P_{\ell} \cdot t_{sat}} + \frac{K_{ss}}{t}$$

where t - system amortization period

K_{ss} - total capital expenditure for space segment

C_{fm} - cost of satellite flight model

C_{ℓ} - satellite launching cost

P_{ℓ} - successful launch probability

t_{sat} - satellite service life,

and represent the total cost of the production of the satellite and its launching into orbit, covering one year of operation, and the total capital cost of the space segment referred to one year in accordance with the standard period of system amortization.

The economic effectiveness of sound broadcasting was defined as the ratio of cost of satellite broadcasting (sound) to the cost of terrestrial broadcasting.

The initial data and the main results of the energy and economic calculations are given in Table 1.

By way of example, Annexes 1 and 2 for the Ukrainian area contain detailed calculations relating to the satellite and terrestrial sound broadcasting systems respectively.

This study shows that the establishment of terrestrial sound broadcasting systems is 5-40 times cheaper, depending on the geographical location of the service area, the shape and size of the territory, number of broadcast programmes, etc.

Conclusion

In view of the fact that sound broadcasting-satellite systems are not economically justified, the USSR Administration considers it inappropriate to allot frequency bands for satellite broadcasting (sound) in the 0.5 - 2 GHz range.

Annexes: 2

ANNEX 1

Sample calculation of the economic indicators of a space segment for Ukrainian coverage by satellite sound broadcasting

The calculation was based on the method given in Annex VI to Chapter 4 of Interim Working Party Report PLEN/3 (Document PLEN/9) to the XVth CCIR Plenary Assembly.

Step 7 - Satellite weight

A. Communications subsystem power P_{cs}

$$P_{cs} = n\ (P_o/\eta + 10)$$

where:

n - number of satellite transmitters, including reserve transmitters (n = 4);

P_o - satellite transmitter power (in accordance with Table 1 for f = 1.0 GHz, P_o = 245 W);

η - efficiency of satellite transmitter (η = 0.33);

P_{cs} - 4(245)(0.33 + 10) = 3,010 W.

B. Communications subsystem weight

1. Two 245 W amplifiers and two standbys are assumed. From Table C1, the weight of one amplifier is 13.5 kg. Total weight of amplifiers:

$$W_{PA} = 4 \times 13.5 = 54 \text{ kg.}$$

2. Four receivers at a unit weight of 1.5 kg are assumed; thus total receiver weight:

$$W_r = 4 \times 1.5 = 6 \text{ kg.}$$

3. The antenna size is determined from equation C1. Since the aperture is elliptical, the mean geometrical diameter of the antenna is given by the equation:

$$D = 70.5\ .\ \lambda/\sqrt{(2.\lambda) \times (2.\theta)} =$$

$$= 70.5\ .\ 0.30/\sqrt{2.3^o \times 1.0^o} \approx 14 \text{ m}$$

It was found by extrapolation from Figure C1 that W_A = 33 kg.

4. Total weight of communications subsystem = 54 + 6 + 33 = 93 kg. Plus 10% W_{cs} = 93 + 9.3 = 102.3 kg (224 pounds).

C. Electrical subsystem weight

100% eclipse capability is assumed.

a) Eclipse power (from Figure B1)

$P_c = P_{cs} + 220 + 0.2\ (P_{cs} - 200) =$

$= 3{,}010 + 220 + 0.2/3{,}010 - 200/ = 3{,}792$ w

b) Number of batteries $\eta_\delta = 4$

Battery weight = 4 x 50 = 200 pounds (from Figure B2)

c) Solar array weight (from Figure B3)

$W_{SA} = (P_c + P_{cs} + 50 \cdot \eta_\delta) \cdot (1.05 \times 1.37/27.3) =$

$= /3{,}792 + 3{,}010 + 200/ \cdot 1.05 \cdot 1.37/27.3 = 363.7$ kg/800 pounds/

d) Power processing equipment weight (from Figure B4)

$W_{PE} = 20.8 + 7.5\ \eta_\delta = 50.8$ kg/112 pounds/

Total electrical subsystem weight

$W_{TEC} = 91 + 363.7 + 50.8 = 505.5$ kg/1,112 pounds/

D. Structural subsystem weight (from Figure B5)

$W_{SS} = 0.288\ (W_{CS} + W_{TEC}) = 175$ kg/385 pounds/

E. Thermal subsystem weight (from Figure B6)

$W_{TS} = 0.07\ (W_{CS} + W_{TEC}) = 42.5$ kg/93.5 pounds/

F. TT&C subsystem weight (from Table B1)

Subsystem weight $W_{TTC} = 22.7$ kg = 50 pounds

G. Attitude control subsystem weight (from Table B2)

$W_{ACS} = 59.1$ kg (130 pounds)

for $3 \cdot W_{CS} = 3 \times 282 < 1{,}300$ pounds

H. Structural and electrical integration weights (from Figures B7 and B8)

These weights are respectively:

$W_{SI} = W_{SS} \times 0.215 = 37.6$ kg/82.8 pounds/

$W_{EI} = W_{CS} \times 0.136 = 13.9$ kg/30.5 pounds/

I. On-orbit fuel weight (section B9)

This weight is determined as:

$$W_{OF} = (W_{CS} + W_{TEC} + W_{SS} + W_{TS} + W_{TTC} + W_{ACS} + W_{SI} + W_{EI}) \times 1.026 \times 0.207 =$$

$$= 953.3 \times 1.026 \times 0.207 = 203.5 \text{ kg/447.8 pounds/}$$

J. Propulsion hardware weight

This weight is equal to:

$W_{PH} = 0.1 \times W_{OF}$. 20.4 kg/44.8 pounds/

L. Total spacecraft weight

$$W_{TSC} = W_{CS} + W_{TEC} + W_{SS} + W_{TS} + W_{TTC} + W_{ACS} + W_{SI} + W_{EI} + W_{OF} + W_{PH} =$$

$$= 958.3 + 203.5 + 20.4 = 1{,}182.2 \text{ kg/2,600 pounds/}$$

Step 8 - Satellite cost

The calculation was carried out by the procedure described in Annex D, in which recurring and non-recurring costs are determined.

A. Communications subsystem

$$CNR = CNWF /\overline{\ } 1{,}375.6 + 199.6 \times (W_{CS})^{0.67} \_7$$

$$CR = CRWF /\overline{\ } 67.6 \times (W_{CS})^{0.75} - 91.9\_7$$

where W_{CS} = 224 pounds - subsystem weight

CNWF = 0.52/CF + 0.39/ + 0.48

CRWF = 0.56/CF + 0.29/ + 0.44

The communications subsystem complexity factors are:

$C_L1 = 1$ F < 15 GHz

	NR	R	
$C_L2 = 5$	0.392	0.305	$P_o > 40$ W
$C_L3 = 1$	0.100	0.109	Translating transponder
$C_L4 = 1$	0.067	0.073	Number of active amplifiers < 10
$C_L5 = 1$	0.034	0.037	One frequency band
$C_L6 = 1$	0.035	0.034	One receive/transmit antenna
$C_L7 = 2$	0.266	0.255	Single beam, width $2.3^o \times 1^o$
$C_L8 = 2$	0.100	0.227	Single reflector
$C_L9 = 1$	0.100	0.102	Feed elements = 1
CF	1.094	1.112	

then

CNWF = 0.52/1,094 + 0.39/ + 0.48 = 1.25168

CRWF = 0.56/1,112 + 0.29/ + 0.44 = 1.22512

and

CNR = 11.104 million dollars

CR = 4.683 million dollars

B. TT&C subsystem

$TNR = TNWF/477.28 + 8.23 \times W_{TTC}/$

$TR = TRWF/48.28 \times (W_{TTC})^{0.75} - 85.84$

W_{TTC} = 50 pounds - subsystem weight

TNWF = 0.52/CF + 0.234/ + 0.48

TRWF = 0.56/CF + 0.211/ + 0.44

The complexity factors are:

	NR	R	
$T_L1 = 1$	0.110	0.110	Bit rate < 100 kbit/s
$T_L2 = 1$	0.120	0.142	Commands < 1000
$T_L3 = 1$	0.303	0.304	No communications processing
$T_L4 = 1$	0.151	0.152	No storage
$T_L5 = 1$	0.151	0.152	No memory
CF	0.835	0.85	

Then:

TNWF = 1.067

TRWF = 1.034

Therefore:

TNR = 0.948 million dollars

TR = 0.849 million dollars

C. <u>Structure subsystem cost</u>

$$SNR = 1.346 \left[759 + 66 \times (Wi)^{0.66} \right]$$

$$SR = 1.377 \left[2.4 + 7.5 \times (Wi)^{0.75} \right]$$

where $W_1 = W_{SS} + W_{TS} + W_{SI}$ - combined weight of the structural, thermal and structural integration subsystems.

W_1 = 385 + 93.5 + 82.8 = 561.3 pounds

Therefore:

SNR = 6.817 million dollars

SR = 1.194 million dollars

D. Attitude control subsystem cost

$ANR = ANWF \left[734.9 + 79.9(W_2)^{0.75} \right]$

$AR = ARWF \left[25 + 40.9(W_2)^{0.8} \right]$

where $W_2 = W_{PH} + W_{1C9}$ - combined weight with attitude control subsystem

$W_2 = 20.4 + 130 = 150.4$ pounds

ANWF = 0.62/CF + 0.497/ + 0.38

ARWF = 0.50/CF + 0.496/ + 0.50

The complexity factors are:

	NR	R	
$A_L 1 = 1$	0.256	0.282	Inertial
$A_L 2 = 2$	0.255	0.332	Closed loop
$A_L 3 = 2$	0.356	0.365	$< 1^{\circ}$ pointing
CF	0.867	0.979	

Then:

ANWF = 1.226

ARWF = 1.137

Therefore:

ANR = 5.610 million dollars

AR = 2.923 million dollars

E. Electrical subsystem cost

$ENR = 440.3 + 2/ECP2/ + ENWF(ECP3/20)$

$ER = 83.5(ECP1 \cdot ECP2)^{0.21128} + ERWF(ECP3/25)$

$ENWF = 0.56/CF + 1.132/ + 0.44$

$ERWF = 0.52/CF + 0.836/ + 0.48$

Since the power of the supply sources at the beginning of life $P_{BOL} = 7000$ W, then from Table D4 we obtain:

CF(NR) = 0.462

CF(R) = 9.066

Therefore:

ENWF = 1.34

ERWF = 5.63

$ECP1 = W_{TEC} + W_{EI} = 1112 + 30.5 = 1142.5$ pounds

combined weight of the electrical subsystem and electrical integration subsystem:

$ECP2 = P_{EOL} = 5110$ W - power of supply sources at end of life

$ECP3 = P_{BOL}/0.23 = 30435$ - number of cells

Hence:

ENR = 12.700 million dollars

ER = 9.100 million dollars

F. Spacecraft cost

1. The spacecraft non-recurring cost is:

Communications subsystem	11.104
TT&C subsystem	0.948
Structural subsystem	6.817
Attitude control subsystem	5.610
Electrical subsystem	12.700

Total 37.179 x 1.3 = 48.333 million dollars

2. First unit spacecraft cost

Communications subsystem	4.683
TT&C subsystem	0.849
Structural subsystem	1.194
Attitude control subsystem	2.923
Electrical subsystem	9.100
Total	18.745 x 1.25 = 23.436 million dollars

3. Prototype cost

   23.436 x 1.25 = 29.295 million dollars

4. R&D cost

   48.333 - 29.295 = 19.038 million dollars

5. Prototype cost

   0.2 (first unit cost) + 4.5 =

   0.2 · 23.436 + 4.5 = 9.182 million dollars

6. Flight model cost

   23.436 million dollars (first unit cost)

7. Cost

   (48.333 + 23.436 + 9.187) x 0.2 = 16.191 million dollars

8. Total spacecraft cost =

   48.333 + 23.436 + 9.187 + 16.191 = 97.147 million dollars

<u>Step 9</u> - <u>Launch cost</u>

From step 7, the estimated total weight of the spacecraft is 1182.2 kg. The required launch vehicle is of the Ariane 3 class. From Table 4-11, the launch cost is 47.0 million dollars.

Total cost of space segment =

47.0 + 97.147 = 144.2 million dollars

144 million dollars.

ANNEX 2

Sample calculation of the cost of a terrestrial broadcasting network and a broadcast programme distribution network in the Ukrainian Soviet Socialist Republic

1. The mean range of a VHF-FM 4 kW transmitter with a 7 dB gain is:

$R = 70$ km.

2. The mean service area provided by a transmitter with a guaranteed field strength at the edge of the service area is:

$S_1 = 15.4$ thousand km^2.

3. Capital cost (K) of a VHF-FM station transmitting two broadcasting programmes at a mean mast height of 250 m and a mean antenna height of 160 m = 305.2 thousand roubles.

4. Annual operating cost (B_{op}) of a VHF-FM station = 32.1 thousand roubles.

5. Normalized expenditure (A) determined by formula:

$$A = B_{op} + K \cdot \frac{1}{t}$$

where

B_{op} - annual operating cost of station,

K - capital cost of station,

t - amortization period.

The normalized cost of a VHF-FM station = 77.9 thousand roubles.

6. Service area $S_0 = 603.7$ thousand km^2.

7. Minimum number of transmitters required to serve a given territory is derived from the equation:

$$N_{min} = \frac{S_0}{S_1} = \frac{603.7}{15.4} = 39$$

However, having regard to the actual shape of the Ukrainian territory to be served and the partial coverage of distinct service areas by individual transmitters, the total number of transmitting centres required for the complete coverage of the Ukraine with VHF-FM broadcasting is:

$N = 74$.

8. The normalized cost of organizing a programme distribution network will depend to a large extent on the means selected for the transmission of information. In most cases, the most convenient and cheapest method consists in distributing programmes by means of digital radio-relay links. In this case, the normalized cost of one digital channel per km for first class sound broadcasting will amount to:

$A_{RR} = 4.6$ roubles.

9. The total cost of a terrestrial network for broadcasting and programme distribution to transmitting centres is obtained as follows:

$$A_\Sigma = 2 \sum_{i=1}^{i=74} A_{RR} \cdot l_i + N \cdot A_{CT} \qquad (1)$$

where l_i - length of radio-relay link to transmitting centre.

Inserting all the necessary components in (1), we obtain:

normalized cost of transmitting network	5,763 thousand roubles
normalized cost of programme distribution network	189 thousand roubles
total normalized cost	5,952 thousand roubles

If the rouble is taken as equivalent to 1.15 US dollars, the total normalized cost of a terrestrial broadcasting and programme distribution network in the Ukraine will amount to:

$A_\Sigma = 6.85$ million dollars.

Appendix

TABLE 1

I	2	3	4	5
32.	Power subsystem weight, kg	I90	505,5	I80
33.	Total spacecraft weight, kg	603	II82	687
34.	Theoretical spacecraft life, years	7	7	7
35.	Spacecraft development cost, $M	45.0	48.3	44.5
36.	Spacecraft prototype cost, $M	27.6	29.3	24.8
37.	Spacecraft flight model cost, $M	22.I	23.4	I8.5
38.	Launching cost, $M	42.0	47.0	42.0
39.	Total capital cost of space segment, $M	I34.0	I44	I24.0
40.	Successful launch probability	0.9	0.9	0.9
41.	Cost of transmitting earth station, $M	2.5	2.5	2.5
42.	Total capital cost of sound broadcasting-satellite network, $M	I36.5	I47.5	I26.5
43.	Normalized annual cost of satellite broadcasting system, $M	30.8	33.3	28.2
44.	Capital cost of equivalent terrestrial network, $M	9.2	26.7	3.0
45.	Operating cost of equivalent terrestrial network, $M	0.6	2.47	0.25
46.	Normalized cost of equivalent terrestrial network, $M	2.0	6.85	0.70
47.	Annual gain for satellite and equivalent terrestrial system			
	in normalized cost, $M	28.8	26.45	27.5
	in capital cost, $M	I27.3	I20.8	I23.5
48.	Annual gain on satellite and equivalent terrestrial system			
	normalized cost	15.4	4.8	40.3
	capital cost	14.8	5.5	42.1

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Corrigendum 1 to
Document 138-E
12 September 1985
Original: English

COMMITTEE 4

SUMMARY RECORD

OF THE

FIFTH MEETING OF COMMITTEE 4

(TECHNICAL PARAMETERS AND CRITERIA)

1. Paragraph 3.2.1

In the second line, replace "band inversation operation" by "reverse band operation".

2. Paragraph 4.6.4

Amend the beginning of the paragraph to read: "The delegate of Canada thought that ...".

3. Replace paragraph 5.5 by the following:

"5.5 The Director of the CCIR, responding to a request by the Chairman, confirmed that the Conference could ask CCIR to study appropriate questions in the intersessional period for which information was required by the second session. To enable CCIR to submit its report ten months in advance of the second session, the work would have to begin in 1986 in a special meeting arrangement in view of the regular Study Group programme scheduled to begin only in late 1987. The Director had presented that situation to the Administrative Council, which included in the contingency financial provisions for intersessional work, provision for CCIR activity, and the work in 1986 would be limited accordingly. Requirement for any work in 1987 would also be subject to financial provisions by the Administrative Council in 1986. The Chairmen of the CCIR Study Groups concerned would meet with the Director to propose the necessary arrangements for approval by the Plenary Assembly. It should be noted that technical questions not essential for the second session, but of a longer range nature, could be studied in the regular Study Group programme."

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 138-E
26 August 1985
Original: French

COMMITTEE 4

SUMMARY RECORD

OF THE

FIFTH MEETING OF COMMITTEE 4

(TECHNICAL PARAMETERS AND CRITERIA)

Tuesday, 20 August 1985, at 1400 hrs

Chairman: Mr. R.G. AMERO (Canada)

Subjects discussed:		Documents
1.	Opening remarks	-
2.	Approval of the summary record of the third meeting	121
3.	Reports of Working Group Chairmen	-
4.	Approval of elements for Committee 5	135
5.	Relations between Committee 4, Committee 5 and the Plenary ad hoc Group for the intersessional period - Work on high-definition television	-

1. Opening remarks

1.1 The Chairman drew the Committee's attention to Document DT/30; its section 2.1 had been provisionally adopted by Committee 5 and Committee 4 should take it into account in its studies on frequency sharing; he also drew attention to Document DT/33 in which Committee 6 had requested that the advice of Committee 4 be given on certain characteristics necessary for planning in the 14.5 - 14.8 GHz band.

2. Approval of the summary record of the third meeting (Document 121)

The summary record was approved.

3. Reports of Working Group Chairmen

3.1 Report of the Chairman of Working Group 4A

3.1.1 The discussions of the Group concerned Resolution No. 505 (WARC-79) on sound-broadcasting by satellite. The Group had met twice and examined 21 documents containing proposals by 18 administrations.

The Chairman of Working Group 4A asked that his Group be authorized, within its terms of reference, to recommend that studies should be carried out on frequencies other than 0.5 to 2 GHz; he also requested details of the form which the report of his Group should take, particularly with reference to incorporating information from the CPM Report.

3.1.2 The Chairman said that it would be better to have the Secretary-General's opinion on those questions. Moreover, the Steering Committee had not yet decided on the form of the Report of the Conference.

3.2 Report of the Chairman of Working Group 4B

3.2.1 Working Group 4B had held seven meetings up to the present but had spent a great deal of time examining band inversion operation, high-definition television, spurious emissions of space-stations and the sharing criteria described by the IFRB in Documents DT/21 and 4; it was therefore running slightly late on the planned timetable.

After those protracted discussions, the Editorial Group had been dissolved, reconstituted as Working Group 4B-1 under the chairmanship of Mr. Gould (United States of America) and given a different mandate to examine Document 4 and pertinent matters.

In addition, Committee 6 had requested the advice of Committee 4 on the choice of feeder-link polarization from the point of view of inter-service sharing.

3.3 Report of the Chairman of Working Group 4C

3.3.1 Working Group 4C had continued its work, with particular reference to preparing an information document for Committee 5; certain elements had already been given in Document 135.

3.3.2 In reply to a question from the Chairman of Working Group 4C who had asked what should be done with the yellow documents prepared by his Group, the Chairman suggested that, after approval by Working Group 4C, they should be published as working documents with an introductory sentence stating that they were submitted provisionally pending decisions from Committee 5. That procedure would allow Committee 4 to proceed gradually without having to finalize too many documents later.

4. Approval of elements for Committee 5 (Document 135)

4.1 The Chairman said that the technical information contained in the document was intended for Committee 5 and would be particularly welcome to Working Group 5A. A document giving more detailed information could not be prepared, however, until the work of Working Group 4B-1 had gone further. Part of the document could be inserted into the Report of the Conference in the form of an annex relating to intersessional work, or in some other form, according to the structure adopted for the Report.

4.2 The Chairman of Working Group 4C introduced the document which was based on Annex 3 of the CPM Report, on two or three other contributions and on Document 105, the Report of the IFRB on the characteristics of satellite beams. The IFRB was ready to prepare an updated version of Document 105 if Committee 5 so wished.

4.3 The Chairman suggested that the document be considered section by section.

4.3.1 Introduction

4.3.1.1 The delegate of Kenya said that frequency band 8/7 GHz, which appeared on Figure A2 of Annex 1, should be mentioned in the third paragraph.

4.3.1.2 The delegate of France requested that, in the third paragraph of the French text, "(liaisons de connexion)" should be replaced by "(liaisons montantes)".

4.3.1.3 The delegate of the United States of America said that the third paragraph should also contain a reference to the 11.7 - 11.2 GHz band.

4.3.1.4 The representative of ARABSAT said that the last sentence of the eighth paragraph should be amended since the ARABSAT regional network was already in operation.

4.3.1.5 The Chairman suggested that the delegate of Paraguay, who had stated that the sentence beginning with "However ... " at the end of the ninth paragraph was in contradiction with certain other indications later in the document, should, in agreement with the Chairman of Working Group 4C and the delegate of Japan who was also concerned about the matter, submit a proposed amendment to the text.

4.4 Section 2 - FSS operating networks

Paragraph 2.1 - FSS networks operating at 6/4 GHz

4.4.1 In connection with the first paragraph, the delegate of Kenya, supported by the delegates of India and the Islamic Republic of Iran, said that paragraph 3.1.2.2.1 of Annex 3 to the CPM Report should be maintained. That document should be transmitted to Committee 5 which could take into account the advice of Committee 4. Furthermore, the present text of the paragraph could be misleading about the bands for planning. He would therefore prefer a general sentence, as in the CPM text.

4.4.2 The delegate of the United Kingdom, supported by the delegates of the Federal Republic of Germany, the United States of America and Australia said that a decision should be made as to whether the text of the paragraph was incorrect. If it were not, it should be maintained for transmission to Committee 5.

4.4.3 The Chairman of Working Group 4C, supported by the delegate of Canada, said that Committee 4's terms of reference - to provide technical information for the other Committees - should be complied with. The factual data given in the first paragraph were appropriate.

4.4.4 The Chairman, supported by the delegate of the Netherlands, proposed that the paragraph should be placed within square brackets and the matter reconsidered later in the meeting.

4.4.5 The delegate of the United Kingdom said that the paragraph should be examined in relation to the title of the document, which concerned in-service networks.

4.4.6 The delegate of the USSR did not feel that the discussion had any bearing on principles and that the paragraph could be deleted.

4.4.7 The delegate of Syria, while agreeing with the delegate from Kenya, said that there were two possible solutions: the text could be maintained or it could be deleted.

4.4.8 The delegate of the United Kingdom considered that the text of the paragraph was correct and saw no need to delete it.

4.4.9 The Chairman of Working Group 4C said that after informal discussion among participants it had been decided to maintain the present paragraph, without the square brackets.

4.4.10 At the request of the delegate of the USSR, who considered that no particular country should be mentioned, it was decided to delete the phrase: "especially in the US domestic satellite service" in the second paragraph.

4.4.11 In the third paragraph, the delegate of Colombia, supported by the delegates of France, India, Cuba, Iraq, Kenya and China, proposed deleting the last two sentences which did not concern existing networks.

4.4.12 The delegate of the United States of America, like the delegates of the Federal Republic of Germany and the United Kingdom, thought that the extra information contained in the paragraph was important and that it should be communicated to Committee 5. It was Committee 4's job to supply information and it would be unproductive to delete it.

4.4.13 The delegate of France, supported by the delegate of Brazil, proposed as a compromise deleting the penultimate sentence of the paragraph and keeping the last sentence in a slightly amended form.

4.4.14 The delegate of the United States of America suggested another compromise solution which consisted in deleting the word "since" at the beginning of the third sentence and adding the word "and", in such a way that the second sentence of the paragraph would end with the words: "in many parts of the world and these bands ... FSS today".

4.4.15 Summing up the exchanges between participants, the Chairman of Working Group 4C said that, over and above the modification proposed by the delegate of the United States of America, it was decided to add the words: "to systems operating only in these bands" at the end of the last sentence.

Space stations at 6/4 GHz

4.4.16 Referring to the fourth paragraph, the delegate of Canada said that since some space stations used 8 W travelling-wave tubes, he proposed replacing "5 W" with "5 W to 8 W".

4.4.17 The Chairman of Working Group 4C was prepared to accept the amendment.

Section 2.3 - FSS networks operating at 14/11 and 14/12 GHz

4.4.18 The delegate of the USSR did not agree with the comments concerning the band 12.2 - 12.5 GHz for Region 3. The status of that Region was governed by No. 845 of the Radio Regulations and the content of that provision should be reflected in the text.

4.4.19 The Chairman said that he would leave it to the Chairman of Working Group 4C to draft the text.

4.5 Section 3 - Common user systems

4.5.1 The delegate of Spain said that the title was not appropriate since the text referred only to the INTELSAT system. Information should be provided on other common user systems.

4.5.2 The Chairman said that other examples of common user systems were given but took note of Spain's remark.

Special issues of relevance to common user systems - Service arc considerations

4.5.3 Referring to the third line of the first paragraph in the English text, the delegate of Canada suggested replacing the words "a national system" with "some national systems".

4.5.4 The delegate of the USSR asked for the last paragraph to be explained and said that the point made did not concern only the INTELSAT system and that it should be transferred to a different section, such as section 2.3

4.5.5 The delegate of Canada did not object to the paragraph being maintained, provided that an additional paragraph were added concerning service arc characteristics, as suggested by the delegate of the USSR.

4.5.6 The Chairman of Working Group 4C agreed that the paragraph should be transferred and said that he would look for the most appropriate place to insert it. He suggested that the words "for INTELSAT" could be deleted and that the following phrase could be added: "for networks with very large service areas and those with service areas at high latitudes".

4.6 Section 4 - Current technology and operational characteristics in the FSS

Section 4.1 - Earth-station technology

High power amplifiers

4.6.1 Referring to the third line of the first paragraph, the delegate of Indonesia proposed replacing "70 MHz" with "80 MHz" in order to take account of INTELSAT characteristics and systems. The Chairman of Working Group 4C raised no objection.

Section 4.2 - Technology related to space stations

Antenna technology

4.6.2 The delegate of Canada suggested adding a sentence to the second paragraph to indicate that launch vehicles could accept solid antenna diameters of 3.8 metres.

4.6.3 The delegate of the USSR said that such characteristics depended on the type of vehicle used and that it did not appear necessary to add that detail.

4.6.4 The delegate of Canada was prepared to withdraw his proposal but thought that it would be useful to provide an order of magnitude for a parameter which was so significant. He asked the delegate of the USSR whether the latter could supply information which could be incorporated in the proposed text.

4.6.5 The delegate of France, supported by the delegate of the USSR, said that it was possible to use unfurlable antennas, in which case the dimensions of the launch vehicle would not constitute an absolute constraint.

4.6.6 The delegate of the United States of America suggested inserting the text proposed by the delegate of Canada all the same. It appeared obvious from the text that unfurlable antennas could have larger dimensions.

4.6.7 The Chairman suggested that the delegates of Canada and the USSR should agree on a text.

Transponder components

4.6.8 Referring to the third sentence of the first paragraph, the delegate of France suggested adding the word "generally" between "and" and "achieves a higher e.i.r.p.".

The proposal was approved.

Section 4.3 - Multiple-access and modulation techniques

Modulation techniques

4.6.9 The representative of ARABSAT proposed adding the word "typical" at the beginning of the second sentence of the second paragraph.

Section 4.4 - Some trends in system characteristics

Section 4.4.7

4.6.10 The Chairman of Working Group 4C said that, at the beginning of the last sentence of the third paragraph, the word "again" should be deleted.

4.6.11 Referring to the same paragraph, the delegate of Spain said that the reference to cost impact should be aligned with the draft of the third paragraph of section 2.1

It was so decided.

4.7 Annex 1

4.7.1 The delegate of Cuba said that, for the second sentence of the Annex, the Spanish text should be aligned with the English text. He also asked how the information contained in the Annex would be updated.

4.7.2 He was supported on that point by the delegate of Uruguay, who noted that the figures concerning the geostationary satellite orbit dated back to 1983.

4.7.3 The Chairman said that the information contained in Document 105 would be used to bring the figures up-to-date and that further information would be requested from the IFRB Secretariat.

Document 135 was approved subject to the new amendments. The text would be amended with the help of the Chairman of Working Group 4C, then communicated to Committee 5, for use as it saw fit.

5. Relations between Committee 4, Committee 5 and the Plenary ad hoc Group for the intersessional period - Work on high-definition television

5.1 The Chairman said that, after a meeting that same day with the Chairman of Committee 5, the representative of the Chairman of the Plenary ad hoc Group and the delegations which had submitted proposals concerning high-definition television, it had been suggested that a small ad hoc Group might study the question in order to determine whether a frequency band could be allocated to high-definition television, which was to be planned at a later date. It would be useful if a decision in that respect could be taken at the second session of the Conference. The Chairman of Committee 4, who had agreed to chair the small Group, said that a document could be drafted dealing with the matter in general terms and then submitted to the next meeting of Committee 4. The Group could also draft a note, addressed to the Chairman of the Plenary ad hoc Group, concerning the question of allocating a frequency band to high-definition television.

5.2 The delegate of the United Kingdom asked whether it would be a matter of selecting a new frequency band, which would be hard to find, or sharing an existing band.

5.3 The Chairman said that the second session would have to take a decision in that respect. It would consider Article 8 of the Radio Regulations if the proposals prepared between the two sessions of the Conference were acceptable and if there was a consensus with regard to finding a new frequency band.

5.4 The delegate of the USSR asked whether Committee 4 was competent to formulate proposals concerning the Table of Frequency Allocations, to which the Chairman replied that it was not a question of considering Article 8 at the current session.

5.5 The Director of the CCIR said that the first session of the Conference could ask the CCIR to undertake work concerning high-definition television. To enable the CCIR to submit a report in time, which meant with ten months' anticipation, certain measures were required. He proposed holding special meetings already in 1986, in view of the fact that the Study Groups were not scheduled to meet before the fourth quarter of 1987. Also credits would be needed in 1986 for work between the two sessions of the Conference. With regard to the provisional work schedule, the Chairmen of the Study Groups concerned could meet to put forward proposals for consideration by the Plenary Assembly of the CCIR.

It was decided that a decision would be taken in that respect at the next meeting of the Committee.

The meeting rose at 1720 hours.

The Secretary:	The Chairman:
C. AZEVEDO	R.G. AMERO

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 139-E
20 August 1985
Original: English

PLENARY MEETING

United Kingdom

PAST PERFORMANCE OF EXISTING REGULATORY REGIME FOR GSO

INFORMATION NOTE

1. In reviewing the present situation, the Conference has heard several statements to the effect that the present regulatory regime for the GSO has satisfied the interests of a few advanced countries only. The United Kingdom shares the widespread view that any new regulatory regime should improve on the old one. In order to apply that criterion, the following facts are relevant.

2. At 1 August 1985, taking the activities of the INTELSAT, EUTELSAT and INMARSAT systems together, about 140 countries now operate satellite communications through a global distribution of more than 1,000 fixed earth stations and 3,700 ship earth stations, all operating to space stations on the GSO. Not one country wishing to access the GSO, whether for domestic or international traffic, has been unable to do so.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 140-E
21 August 1985
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COMMITTEE 5

First report from the Chairman of Working Group 5A

SERVICES AND FREQUENCY BANDS TO BE PLANNED

I. SERVICES

With respect to item 2 of the Agenda of the Conference, Working Group 5A decided on a provisional basis that the planning shall concern the fixed satellite service only.

II. BANDS

II.1 **Without prejudging the exact limits of the bands as well as the planning principles and methods that may be adopted, Working Group 5A decided provisionally that planning will be carried out in the following bands:**

i) Band 6/4 GHz;
ii) Band 14/11-12 GHz.

II.2 **The band 30/20 GHz will be reviewed in the light of decisions relating to the planning principles and methods.**

II.3 Working Group 5A had discussions on the band 8/7 GHz.

It was not possible to reach an agreement on whether or not planning would be carried out in this band.

F.S.C. PINHEIRO
Chairman of Working Group 5A

INTERNATIONAL TELECOMMUNICATION UNION

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20 August 1985
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COMMITTEES 4, 5

United States of America

COST AND PERFORMANCE CHARACTERISTICS OF USING THE EXPANSION BANDS AT 4/6 GHz

BACKGROUND

1. The 1979 WARC allocated to the Fixed Satellite Service several new frequency bands which had not been available in the past.

   -- For example, the expansion bands at 6.425 - 6.725 GHz (uplink) and 4.5 - 4.8 GHz (downlink) are now available to the FSS on a worldwide basis, in addition to the bands which are already used at 5.925-6.425 and at 3.7-4.2 GHz.

2. The availability of these new expansion bands has a special significance for the WARC-ORB 85.

   -- First, the economic and operational characteristics of these bands are extremely attractive; the transmission characteristics are identical to the other 4/6 GHz bands, and virtually all of the required technology has already been developed and well tested by practical experience.

   -- Second, these bands have not yet been used by any Administrations for FSS systems. Therefore, the orbit is completely open around the world. There is no congestion, and there is no prospect of congestion for many years to come.

   -- Third, these expansion bands, together with other measures, present a solution to the desire to develop greater guarantees of access to the orbit.

PERFORMANCE CHARACTERISTICS AND CAPACITY

3. The 4/6 GHz expansion bands offer a substantial amount of new orbital capacity to Administrations in all three regions of the world.

   -- Because the orbit has not yet been used at these frequencies, there are literally hundreds of unassigned orbital positions available worldwide.

-- Because no established systems operate in these expansion bands, all countries choosing to use these bands in the future can do so on an equal footing, without the constraint of coordinating around existing systems.

-- This open arc also presents much greater opportunity to use larger spacings between satellites, less expensive equipment, and alternative regulatory approaches than are feasible now in the more crowded, conventional bands.

-- INTELSAT does not operate any global beams in the expansion bands, and has not indicated any decision to do so. Therefore, system operators would encounter far fewer problems in finding suitable orbital locations for national domestic satellites, and in coordinating with other space systems than in the conventional 4/6 GHz bands.

-- Although these expansion bands are shared with terrestrial services, they are not as widely used by those services as are the conventional 4/6 GHz bands. Therefore, there is much greater flexibility and efficiency in locating earth stations which will use these expansion bands.

-- FSS systems operating today in the conventional 4/6 GHz bands frequently require extensive earth station site selection surveys, and often must undertake difficult coordination with terrestrial radio relay services which share those frequencies. In contrast, Administrations which choose to use the expansion bands should not have significant sharing problems.

4. Each orbital position offers substantial capacity.

-- 300 MHz are available in each direction from each orbital position; 600 MHz are available with dual polarization, which is now fully accepted and widely used technology for frequency re-use.

-- Each dual polarized satellite will be capable of providing, with conventional technology,

-- Up to 30 analogue TV channels, or

-- Up to 750 Mbps of digital data, or

-- Between 10,000 and 50,000 equivalent voice circuits, or

-- A combination of the above.

-- This capacity would provide a major supplement to existing terrestrial systems in nearly all countries, and would provide substantial growth opportunities for the future.

COSTS OF OPERATION/EQUIPMENT

5. The costs for manufacturing equipment and the costs for using these expansion bands are virtually identical with the costs of the technology and use of the conventional 4/6 GHz bands.

6. The costs of constructing and operating a satellite which uses the 4/6 GHz expansion bands will be virtually the same as the costs for using the conventional bands.

   -- The spacecraft receiver, the TWT's and the associated RF filters must be adjusted, for example, to use the 4.5-4.8 GHz downlink rather than 3.7-4.2 GHz; when it is known in advance that the spacecraft will use these frequencies, the additional costs are negligible.

   -- Spacecraft antenna feeds would also be configured to use the new bands; however, those feeds are already modified for each new FSS user in order to maximize beam efficiency between a particular orbital position and the specific country which it will serve. Therefore, antenna feed modification costs will not be increased by use of the expansion bands.

   -- The total spacecraft costs associated with use of the new expansion bands has been estimated by major manufacturers to be less than 3 percent of the cost of a 2-satellite network. As additional networks are produced, that increase will decline to virtually nothing.

7. The differences in earth station equipment are also limited to changes to only a few components; virtually all of the R&D already done at 4/6 GHz applies directly to use of the expansion bands.

   -- For example, the only modifications required to a current earth station design would be minor adjustments in the radio frequency chain; all other components remain the same as in existing 4/6 GHz systems. (See Table No. 1.)

   -- Only the frequency converter, the high power amplifier, the receiver, and the antenna feed need to be adjusted or retuned in order to use the new frequencies.

   -- The costs of producing the RF components designed to operate in the expansion bands are virtually identical with the present costs in the existing 4/6 GHz bands.

-- The initial, non-recurring costs of manufacturing earth stations to operate in the expansion band would, according to manufacturers calculations, be very small.

-- For example, if a manufacturer produces only 100 earth stations the per station incremental cost would be less than $1500, compared with a total earth station cost of between $100,000 (6 meter) and $300,000 (9 meter). On a production run of 1,000 earth stations, the per station incremental cost would be only $150 or less.

-- This potential increment would certainly not be a determining factor in an Administration's decision whether to launch a system using the expansion bands.

-- As has happened in the past, when the expansion bands become widely used, any incremental costs will become even lower, and may well disappear completely.

8. Engineering and administrative costs are initially lower in the expansion bands because the amount of frequency coordination required between satellite networks and between earth stations and terrestrial stations will be significantly lower than in the conventional bands. Moreover, the initial flexibility of frequency use in these expansion bands will also reduce radio frequency traffic planning engineering costs.

SUMMARY

9. Any incremental costs of modifying current earth station and satellite designs for use in the expansion bands are small or negligible, and even they will disappear after several systems are placed into service. Furthermore, any such incremental costs will be offset by the initially lower engineering and administrative costs of establishing systems in the currently unused expansion bands. Thus, the costs of using the expansion 4/6 bands will be essentially the same as the costs of using the conventional 4/6 GHz bands -- for both the initial and subsequent Administrations which operate systems in the expansion bands.

August 20, 1985

TABLE NO. 1

COMPONENTS REQUIRED FOR A TYPICAL 4/6 GHz TRANSMIT/RECEIVE EARTH STATION

Telephone Channel Bank

Multiplex/Demultiplex

Modulator

IF Amplifier and Distribution System

*Up-Convertor(s) and Frequency Synthesizer

*High-Power Amplifier (HPA)

Waveguide/Cabling

*Antenna Feed Horns

Antenna Reflector

Foundation or Pedestal

*Low-Noise Amplifier (LNA)

*Down-Convertor(s)

Demodulator

Monitor and Control

Equipment Racks

*Equipment which requires minor modification or retuning for operation in the 4/6 GHz expansion bands: 6.425-6.725 GHz (uplink) and 4.5-4.8 GHz (downlink).

INTERNATIONAL TELECOMMUNICATION UNION

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FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Corrigendum 1 to
Document 142-E
23 August 1985
Original: English

UNITED KINGDOM

Please replace page 2 by the following page.

G/142/1 The United Kingdom Administration proposes that appropriate revised sharing criteria be adopted to protect the Region 2 BSS and offers the following criteria to protect both the existing Plan and subsequent modifications.

The limiting p.f.d values falling upon the Region 2 BSS shall be:

-140 dB ($W/m^2/24$ MHz) for $0^\circ \leqslant \Theta < 0.48^\circ$

$-132 + 25 \log \Theta$ ($dBW/m^2/24$ MHz) for $0.48^\circ \leqslant \Theta < 25.1^\circ$

-97 ($dBW/m^2/24$ MHz) for $25.1^\circ \leqslant \Theta < 59.5^\circ$, $\Theta \geqslant 136^\circ$

-100 ($dBW/m^2/24$ MHz) for $59.5^\circ \leqslant \Theta < 136^\circ$

In fact these limits still provide an additional 3 dB protection margin at about 60° and 136°, as shown in Figure 2b).

However, the values given in Annex 4 of Appendix 30 should be retained for protection of the Regions 1 and 3 BSS Plan and its subsequent modification.

TABLE 1

Technical Parameter	Regions 1 & 3		Region 2, before RARC 83		Region 2, as RARC 83
	Individual reception	Community reception	Individual reception	Community reception	Individual reception
required overall C/I ratio with BSS Plan (dB)	31	31	31	31	28
single entry C/I margin (dB)	5	5	5	5	5
edge of service p.f.d dB(W/m^2)	-103	-111	-105	-111	-107
large angle off-axis receiving antenna discrimination (dB)	33	44	38	44	40(or 43)
interference p.f.d limit (dB)					
(a) on-axis	-139	-147	-141	-147	-140
(b) large angle, off-axis	-106	-103	-103	-103	- 97 (or -100)
Appendix 30 provision	Annex 4		Annex 1		Need to revise criteria

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 142-E
20 August 1985
Original: English

COMMITTEE 6

United Kingdom

PROTECTION OF BROADCASTING-SATELLITE SERVICES IN THE 12 GHz BANDS FROM SPACE SERVICES IN OTHER REGIONS

Introduction

Annex 4 of Appendix 30 of the Radio Regulations protects the Broadcasting-Satellite Service (BSS) Plan in Regions 1 and 3 from space services in Region 2. Similarly Annex 1 of Appendix 30 protects space services in Region 2 from the BSS Plan in Regions 1 and 3 and/or its subsequent modifications.

These interregional sharing criteria were carefully determined to provide sufficient, but not excessive protection, taking due account of the technical criteria adopted for the BSS in Annex 8 of Appendix 30. In particular section 2 of Annex 1 was based on the technical criteria which, in 1977, it was assumed Region 2 would eventually adopt for its BSS Plan.

Protection of the BSS - the present situation

Annex 4 still gives the correct criteria for protecting the BSS in Regions 1 and 3 for both individual and community reception. However, at the RARC (B-SAT) 1983, Region 2 adopted the same protection criteria for its BSS Plan and in accordance with resolves 1 of Resolution 31 of the Radio Regulations (1979). It did not reconsider whether the criteria were still appropriate, (although the point was raised by the United Kingdom Administration) having adopted different technical criteria for its own BSS Plan from those previously assumed in the Radio Regulations.

Subsequent analysis indicates that the Region 2 BSS Plan is substantially over-protected if the same criteria of Annex 4 of Appendix 30 are applied, and this could unnecessarily restrict the future development of space services in Regions 1 and 3.

The need for changes to the numerical values in the sharing criteria of Annexes 1 and 4 when applied to protect the Region 2 Plan results from the changes in necessary protection ratios, power flux-density and receiving antenna characteristics adopted at the RARC (B-SAT) 1983.

Figure 1 shows the protection afforded to the Regions 1 and 3 BSS Plan and Figure 2a) the protection to Region 2 envisaged in its BSS Plan.

Appropriate sharing criteria for the Region 2 BSS Plan

Table 1 indicates the salient technical parameters used to derive BSS sharing criteria given in Appendix 30 and shows the equivalent revised figures relevant to the RARC-83 Region 2 BSS Plan. The limiting values are underlined.

The United Kingdom Administration proposes that appropriate revised sharing criteria be adopted to protect the Region 2 BSS and offers the following criteria to protect both the existing Plan and subsequent modifications.

The limiting p.f.d values falling upon the Region 2 BSS shall be:

- 140 dB (W/m^2/24 MHz) or $0^{\circ} \leqslant \Theta < 0.48^{\circ}$

- 135 + 25 log (dBW/m^2/24 MHz) for $0.48^{\circ} \leqslant \Theta < 25.1^{\circ}$

- 97 (dBW/m^2/24 MHz) for $25.1^{\circ} \leqslant 59.5^{\circ}$, $\Theta \geqslant 136^{\circ}$

- 100 (dBW/m^2/24 MHz) for $59.5^{\circ} \leqslant \Theta < 136^{\circ}$

In fact these limits still provide an additional 3 dB protection margin at about 60° and 136°, as shown in Figure 2b).

However, the values given in Annex 4 of Appendix 30 should be retained for protection of the Regions 1 and 3 BSS Plan and its subsequent modification.

TABLE 1

Technical Parameter	Regions 1 & 3		Region 2, before RARC 83		Region 2, as RARC 83
	Individual reception	Community reception	Individual reception	Community reception	Individual reception
required overall C/I ratio with BSS Plan (dB)	31	31	31	31	28
single entry C/I margin (dB)	5	5	5	5	5
edge of service p.f.d dB(W/m^2)	-103	-111	-105	-111	-107
large angle off-axis receiving antenna discrimination (dB)	33	44	38	44	40(or 43)
interference p.f.d limit (dB)					
(a) on-axis	-139	-147	-141	-147	-140
(b) large angle, off-axis	-106	-103	-103	-103	- 97 (or 100)
Appendix 30 provision	Annex 4		Annex 1		Need to revise criteria

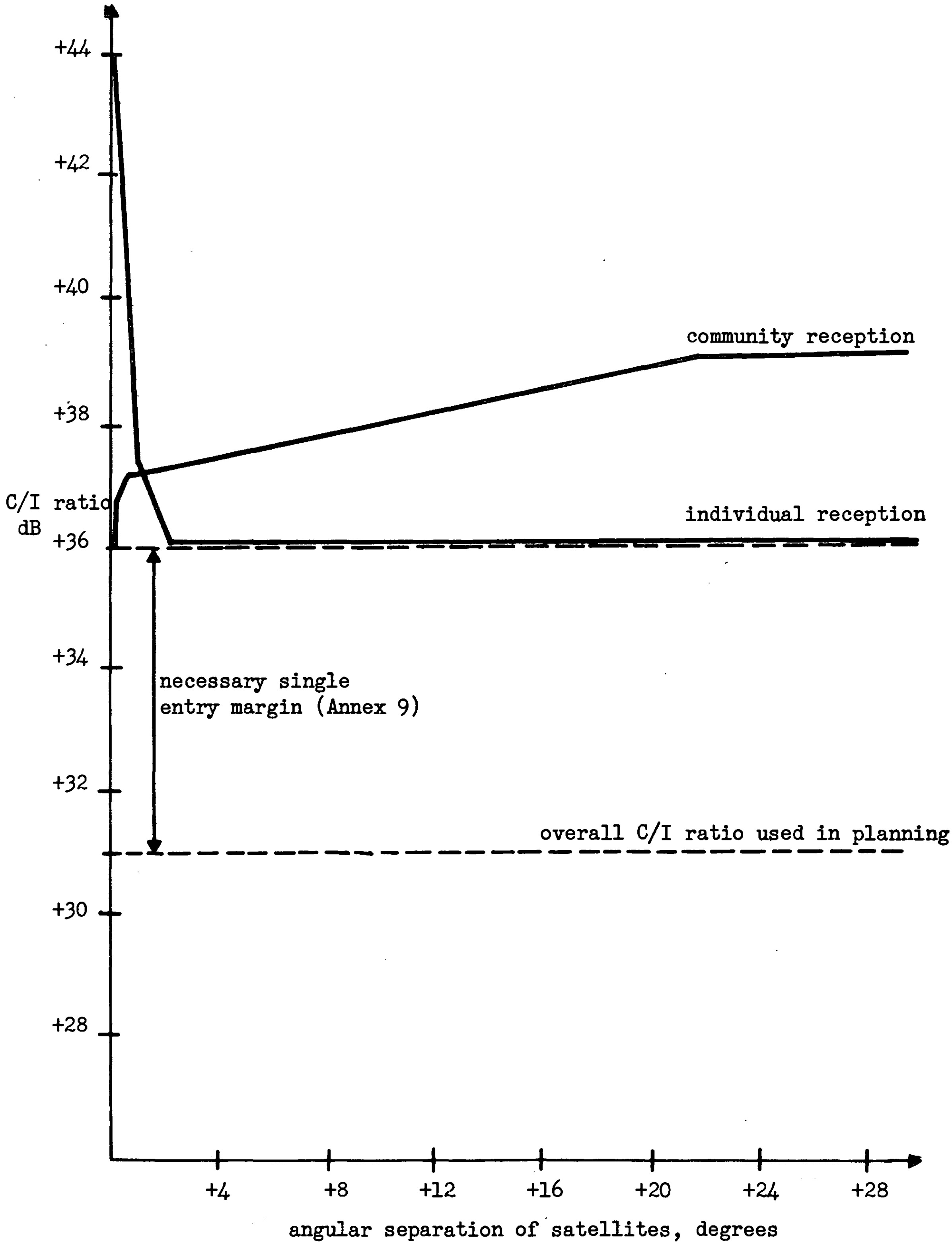

FIGURE 1

C/I ratio which could arise in Region 1 or 3
under the application of Annex 4 of Appendix 30

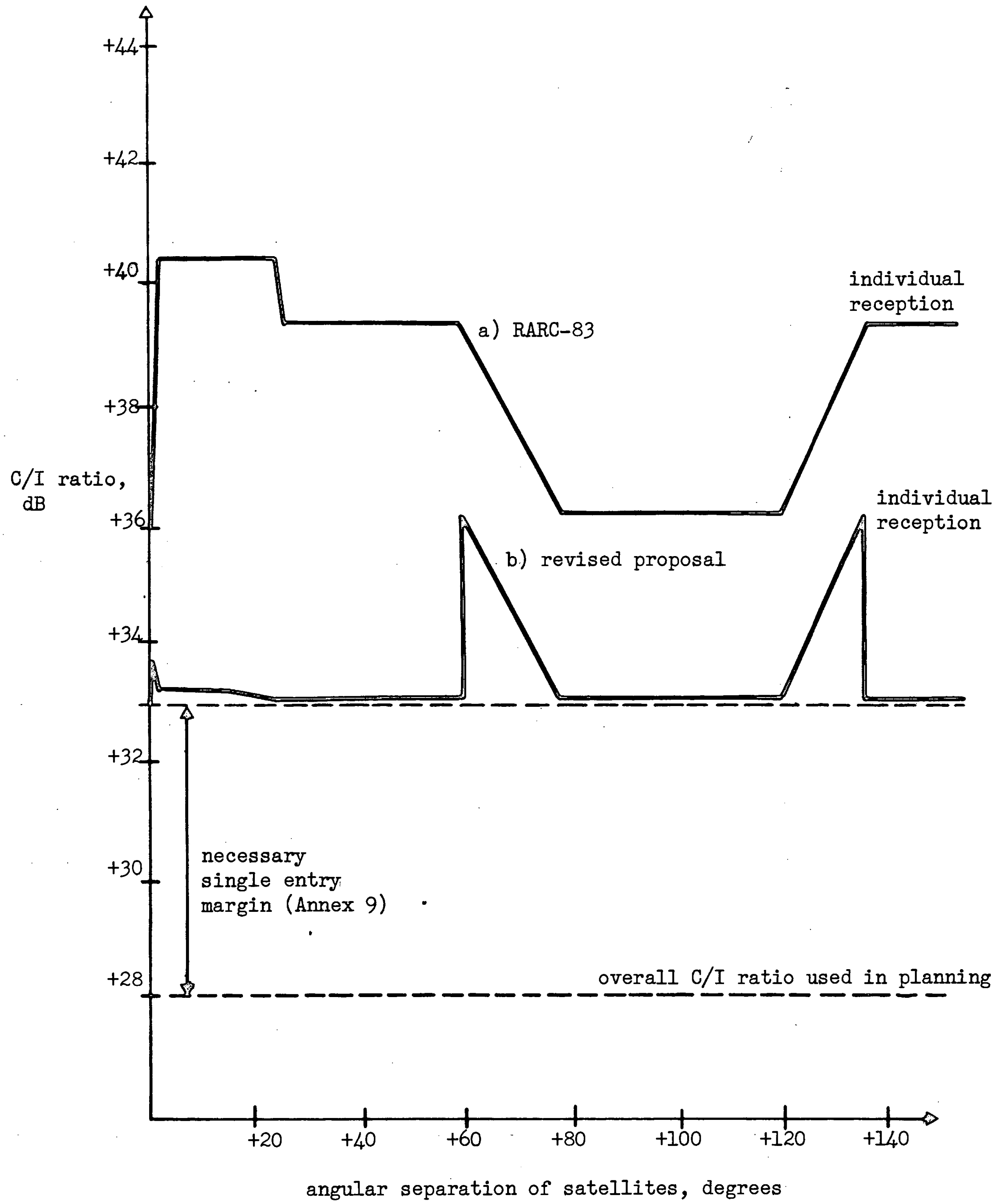

FIGURE 2

C/I ratio which could arise in Region 2

a) under the application of the Annex 4 criteria of Appendix 30

b) under the application of the revised proposal (see text)

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 143-E
21 August 1985
Original : French

COMMITTEE 2

First Report by Working Group C2-A to Committee 2

1. The Working Group of Committee 2 (Credentials) met on 20 August 1985. It examined the credentials of the following delegations :

(In French alphabetical order)

Algeria (People's Democratic Republic of)
Germany (Federal Republic of)
Angola (People's Republic of)
Saudi Arabia (Kingdom of)
Argentine Republic
Australia
Austria
Byelorussian Soviet Socialist Republic
Bulgaria (People's Republic of)
Canada
Chile
China (People's Republic of)
Vatican City State
Colombia (Republic of)
Korea (Republic of)
Costa Rica
Ivory Coast (Republic of the)
Cuba
Denmark
Ecuador
United States of America
Ethiopia
Finland
France
Gabonese Republic
Ghana
Hungarian People's Republic
Iran (Islamic Republic of)
Iraq (Republic of)
Ireland
Israel (State of)
Italy
Japan
Jordan (Hashemite Kingdom of)
Kenya (Republic of)
Liberia (Republic of)
Libya (Socialist People's Libyan Arab Jamahiriya)
Luxembourg
Madagascar (Democratic Republic of)
Malaysia
Malawi

Mali (Republic of)
Malta (Republic of)
Mexico
Monaco
Mongolian People's Republic
Norway
New Zealand
Oman (Sultanate of)
Papua New Guinea
Paraguay (Republic of)
Netherlands (Kingdom of the)
Philippines (Republic of the) *
Poland (People's Republic of)
Portugal
Qatar (State of)
Syrian Arab Republic
German Democratic Republic
Ukrainian Soviet Socialist Republic
Romania (Socialist Republic of)
United Kingdom of Great Britain and Northern Ireland
San Marino (Republic of)
Senegal (Republic of)
Singapore (Republic of)
Somali Democratic Republic
Sri Lanka (Democratic Socialist Republic of)
Sweden
Switzerland (Confederation of)
Suriname (Republic of)
Chad (Republic of)
Czechoslovak Socialist Republic
Togolese Republic
Trinidad and Tobago
Tunisia
Turkey
Union of Soviet Socialist Republics
Uruguay (Eastern Republic of)
Venezuela (Republic of)
Yemen (People's Democratic Republic of)
Yugoslavia (Socialist Federal Republic of) a total of 80 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. SISSIKO
Chairman of Working Group C2-A

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* Provisional credentials

INTERNATIONAL TELECOMMUNICATION UNION

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WORKING GROUP 6A

FIRST REPORT OF WORKING GROUP 6A TO COMMITTEE 6

Working Group 6A has held five (5) meetings, the last being on Tuesday, 20 August 1985.

The Group used the terms of reference contained in Document 79 and also in Document DT/4. So far, two sub-working groups have been set up. These are 6A-1 under the chairmanship of Mr. G.H. Railton of Papua New Guinea, and 6A-2 chaired by Mr. J. Broere of the Netherlands.

Sub-Working Group 6A-1

The terms of reference of 6A-1 are:

1) examine the criteria on interregional sharing adopted by SAT-83 with respect to the decisions on interregional sharing criteria adopted by the WARC-79;

2) examine the incompatibilities between the Region 2 BSS Plan and the services of Regions 1 and 3;

3) make recommendations for dealing with the incompatibilities.

This Sub-Group has reported to the Working Group that it had two meetings and addressed the criteria by which the SAT-R2 Plan could be evaluated with respect to services in Regions 1 and 3 (DT/16 and DT/20).

It has been agreed to address these issues in three parts i.e.:

a) Region 2 BSS into Regions 1 and 3 BSS;

b) Region 2 BSS into Regions 1 and 3 terrestrial services;

c) Region 2 BSS into Regions 1 and 3 FSS.

Region 2 BSS into Regions 1 and 3 BSS

It has been agreed to endorse the Board's decision in section 4 of Document 48 to use the criteria in Annex 4 of Appendix 30 of the Radio Regulations to examine the incompatibilities of the Region 2 BSS plan with the Regions 1 and 3 plan.

Three beams have been identified as exceeding the pfd limits and these are given in Table 1.

TABLE 1

Beams of Region 2 exceeding the pfd limits of Appendix 30

Region 2 beam	Region 1 beam	Affected channels of Region 1	Excess to pfd limit
ALS00002	URS 080	26 - 30 - 34 - 38	0.5 dB
ALS00003	URS 080	26 - 30 - 34 - 38	0.7 dB
BERBER02	CNR 130 E 129 ISL 049	27 - 31 - 39 27 - 31 - 39 29 - 33 - 37	1.7 dB 0.4 dB 1.8 dB

The administrations (the United Kingdom and the United States of America) responsible for the beams which cause some incompatibilities have agreed to coordinate with the parties concerned and have agreed to the following note:

Note 10/xxx - This assignment shall be brought into use only when the limits of [Annex 4] are met or when an agreement is reached with the administration indicated after .../...

Two approaches to solving the above problems were suggested:

1) the above note to be added as a note to the relevant beams within the plan, or

2) [the technical characteristics of the beams be adjusted in order to eliminate the incompatibilities.]

There was no agreement on which approach to use and the problem was referred for the advice of the Secretary-General, the Legal Advisor and the Board (Documents 134, 136).

Region 2 BSS into Regions 1 and 3 terrestrial services

The Sub-Group 6A-1 considered two possible criteria for evaluating the Region 2 Plan with respect to the terrestrial services in Regions 1 and 3, viz:

1) Annex 5 to Appendix 30 of the Radio Regulations as used by the IFRB in Document 48, or

2) Annex 5 to Appendix 30 of the Radio Regulations along with the criteria developed by the CCIR in Reports 631 and 789-1, as suggested by one administration.

An ad hoc Group 6A-1 ad hoc 1 was set up to recommend which criteria should be used.

Region 2 BSS into Regions 1 and 3 FSS

The proposal of the Board in Document 48 was to apply Appendix 29 of the Radio Regulations as the necessary criteria for evaluating the Region 2 BSS Plan.

Difficulties have been experienced in reaching a unanimous decision on which systems of Region 1 and 3 FSS should be taken into account in evaluating the SAT-R2 Plan.

Two viewpoints have been identified:

a) fixed-satellite networks which were communicated to the Board on or before 17 July 1983 for publication under RR 1074

b) fixed-satellite networks which were communicated to the Board under RR 1042 at the date of incorporation of the SAT-R2 Final Acts into the Radio Regulations.

The Working Group was informed that informal discussions were continuing. It was decided to allow time for the above discussions before addressing this problem.

Sub-Working Group 6A-2

The Working Group constituted a second Sub-Working Group 6A-2 with the following terms of reference:

- to review Document 16, taking into account the views of administrations and comments of the IFRB in Document 4;
- to prepare a draft text that consolidates the decisions of the SAT-R2 Conference with the Radio Regulations.

Although the problems facing Working Group 6A and its sub-groups are difficult, the delegations participating have shown their willingness to cooperate and to resolve the major problems.

G.H. RAILTON
Chairman of Working Group 6A

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 145-E
21 August 1985
Original: English

COMMITTEE 4

Canada

CHARACTERISTIC ORBITAL SPACING

(Agenda item 2.3)

1. Introduction

The ultimate goal of a planning or coordination exercise is to arrive at orbital satellite arrangements which adequately and equitably reflect the technology level of satellites and their requirements for protection from interference.

The characteristics of the FSS are such that it is possible to place space stations quite close to each other on the geostationary satellite orbit. For two networks with specified technical characteristics carrying specified types of traffic, the necessary separation angle between their satellites can be readily developed. Due to increasing usage of the orbit, however, it is becoming common practice to select a reasonable separation between satellites and to coordinate and implement systems on the assumption that these spacings will be used. These spacings represent, in simple terms, the complex relationships involving the level of advancement of the technology to be employed, the economic factors involved, the allowable interference, and the state of congestion of the specific orbital arc to be used. This concept of classifying FSS systems or networks in terms of their required separation may be a valuable aid for the purposes of discussion at this conference.

This document develops further the concept of "Characteristic Orbital Spacing" and how it may be used for planning purposes, both at planning conferences or at multilateral meetings.

2. Concept

The **"Characteristic Orbital Spacing (COS)"** of a network may be defined as the minimum spacing required between a hypothetical series of identical satellites serving a given service area, with the satellites assumed to be spaced equally across the visible arc.

The COS is therefore, in essence, a property of a given network. It applies whether or not in practice there are more than one satellite serving a given service area. It is readily quantifiable, without necessitating the detailed consideration of technical parameters, traffic types used, interference standards, etc. Due to its quantifiable nature, it can be readily standardized, and used as a basis for equitably defining any sharing scheme for the spectrum orbit resource. Some of its essential features are discussed below.

3. Application in a Non-Homogeneous Context

It can be shown* that the required orbital separation between two non co-coverage, dissimilar networks can be expressed in terms of the COS and an appropriate multiplicative factor, which is particularly simple for the cases where, by regulation:

- the off-axis EIRP of the earth stations are equal, and
- the off-axis EIRP of the space stations are equal.

For example, if the uplink and downlink service areas are the same, and the wanted and unwanted networks are separated by a satellite discrimination of D db,

$$\text{Required orbital separation} = \text{COS} \times 10^{\frac{-D}{25}}$$

If the uplink and downlink service areas were different, the expression is not much more complicated.

Thus, if the conference were to standardize on earth station off-axis EIRP limits, and space station off-axis EIRP, and to select one or more reference values of COS, the orbital separation required between pairs of satellites could be readily established, without reference to the actual system parameters. The matrix of orbital separations could well be used both in a priori planning, or in an orbital assignment meeting where several requirements are simultaneously to be considered, and where all the system details are not yet available.

4. Choice of COS values

Additional considerations are required when it comes to choosing values of COS for particular requirements. Administrations collectively would have to decide on the approach to be used:

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* See Annex 1.

(a) they can adopt one or more values based upon current practice, the state or level of technology applicable, or the state of congestion. For example, at 6/4 GHz, values of 5, 3.5 and 2 degrees might be used and at 14/12 GHz, 2.5 and 2 degrees;

(b) they may adopt one or more values of single entry C/I covering the majority of signal combinations, with one or more earth station antenna gains and reference patterns; this would yield the usable COS.

The two approaches are essentially equivalent, especially since the COS, the antenna parameters and the single entry C/I are related. In proposing values of COS, administrations would have to evaluate this relationship closely.

5. Aggregate Interference Criteria

Any planning exercise, whether at an ITU conference or at a multilateral meeting, must take into account the aggregation of interference. The COS concept may also be used to ensure that aggregate interference criteria are not exceeded. When orbital assignments are made, the orbital separations between any two space stations must equal or exceed the "single entry" value per the orbital separation matrix of Section 3. Further, a very simple relationship* can be derived which provides a check to ensure that aggregate interferences limits are not exceeded, based purely upon the orbital separations involved.

Thus, even when considering aggregation, the COS concept enables the assignment of orbital positions without the need to define a reference set of parameters.

6. Conclusion

This document describes a concept called the **"Characteristic Orbital Spacing (COS)"** which might be useful for discussions at the conference, and for making orbital assignments whether at an ITU conference or at a multilateral meeting. It shows that, provided there is standardization of:

- off-axis EIRP from earth stations, and
- off-axis EIRP from space stations

the COS can be used to develop a minimum orbital separation matrix for various service areas. This can further be used to make orbital assignments, while ensuring that aggregate criteria are not exceeded. All of this can be done without requiring standardized earth station antenna gains or off-axis radiation patterns.

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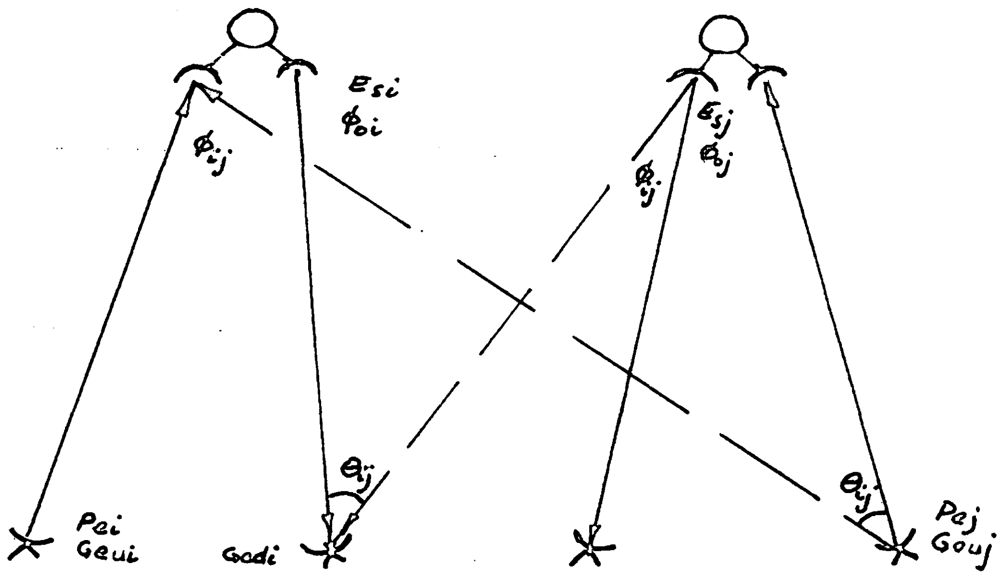
* See Annex 2.

Annexes: 2

ANNEX 1

ORBITAL SEPARATION EQUATIONS



System i (wanted)

System j (unwanted)

1. **Assumptions and approximations**

- For the purposes of this computation, the following are not taken into account:

  (a) satellite station-keeping errors
  (b) earth station pointing errors
  (c) differential free space loss between wanted and interfering path
  (d) differences between topocentric and geocentric angles.

- Criteria for C/I ratio applicable under free space conditions

- Wanted receive station at -3dB contour.

2. Symbols

Subscripts	i, j	=	wanted and interference path
	e, s	=	earth station and space station
	u, d, t	=	uplink, downlink, total
	E	=	EIRP
	P_e	=	earth station power into antenna
	Θ	=	earth station subtended angle
	$\emptyset$	=	space station subtended angle
	$\emptyset_o$	=	space station 3dB beam width
	C	=	received carrier level
	I	=	interference level
	f	=	frequency
	D	=	satellite discrimination (dB)
	G	=	antenna gain (dBi)
	L_p	=	free space path loss
	X	=	earth station off axis radiation factor (from X - 25 logθ)
	a	=	fd/fu

3. Derivations

Uplink:

$$C = P_{ei} + G_{eui} - L_{pu} + G_{si}$$

$$I = P_{ej} + X_j - 25 \log \Theta_{ij} - L_{pu} + G_{si} - D_u (\emptyset_{ij}/\emptyset_{oi})$$

$$(C/I)_{ij} = (P_{ei} + G_{eui}) - (P_{ej} + X_j) + D_u (\emptyset_{ij}/\emptyset_{oi}) + 25\log \Theta_{ij} \qquad (1)$$

Downlink:

$$C = E_{si} - L_{pd} + G_{edi}$$

$$I = E_{sj} - D_d(\emptyset_{ij}/\emptyset_{oj}) - L_{pd} + X_i - 25\log \emptyset_{ij}$$

$$(C/I)_{dij} = E_{si} - (E_{sj} - D_d(\emptyset_{ij}/\emptyset_{oj}) + G_{edi} - X_i + 25\log \Theta_{ij} \qquad (2)$$

Total:

$$(C/I)_{ij} = (C/I)_{uij} \oplus (C/I)_{dij}$$

$$G_{edi} = G_{ei} = G_{eui} + 20\log a$$

$$(C/I)_{ij} = [(P_{ei}+G_{ei}-20\log a) + (X_i-X_i) - (P_{ej}+X_j) + D_u(\emptyset_{ij}/\emptyset_{oi}) + 25\log\theta_{ij}]$$

$$\oplus [E_{si}-(E_{sj}-D_d(\emptyset_{ij}/\emptyset_{oj}) + G_{ei} - X_i + 25\log\theta_{ij}]$$

$$= G_{ei}-X_i+25\log\theta_{ij}-10\log \left[10^{\frac{-1}{10}[-20\log a + (X_i+P_{ei}) - (X_j+P_{ej})]} . 10^{\frac{-D_u(\emptyset_{ij}/\emptyset_{oi})}{10}} + 10^{\frac{-1}{10}[E_{si} - (E_{sj}-D_d(\emptyset_{ij}/\emptyset_{oj})]}\right] \quad (3)$$

Let $X_i + P_{ei} = X_j + P_{ej}$ **(4)**

$$E_{si} - D_d(\emptyset_{ij}/\emptyset_{oi}) = E_{sj} - D_d(\emptyset_{ij}/\emptyset_{oj}) \quad (5)$$

Then equation **(3)** becomes:

$$(C/I)_{ij} = G_{ei}-X_i+25\log\theta_{ij}-10\log \left[(a)^2\ 10^{\frac{-D_u(\emptyset_{ij}/\emptyset_{oi})}{10}} + 10^{\frac{-D_d(\emptyset_{ij}/\emptyset_{oi})}{10}}\right] \quad (6)$$

For the simple case of identical uplink, downlink service areas,

$$(C/I)_{ij} = G_{ei} - X_i + 25\log \theta_{ij} - 10\log [(a)^2 + 1] + D_d (\emptyset_{ij}/\emptyset_{oi}) \quad (7)$$

To obtain the "Characteristic Orbital Spacing",

set $i = j$, i.e. $\emptyset_{ij} = 0$

$$(C/I)_{ii} = G_{ei} - X_i + 25\log \theta_{ii} - 10\log [(a)^2 + 1] \quad (8)$$

$$(C/I)_{ij} = (C/I)_{ii} + D (\emptyset_{ij}/\emptyset_{oi}) + 25\log \theta_{ij}/\theta_{ii}$$

setting $(C/I)_{ij} = (C/I)_{ii}$

and $$\theta_{ij} = \theta_{ii}\ 10^{\frac{-1}{25} D (\emptyset_{ij}/\emptyset_{oi})} \quad (9)$$

For the case of different uplink/downlink service areas,

$$(C/I)_{ii} = G_{ei} - X_i + 25\log \Theta_{ii} - 10\log [(a)^2 + 1]$$

$$(C/I)_{ij} - (C/I)_{ii} = -10\log [(a)^2 (10^{\frac{-D_u(\emptyset_{ij}/\emptyset_{oi})}{10}}) + (10^{\frac{-D_d}{10}(\emptyset_{ij}/\emptyset_{oi})})]$$

$$+ 10\log((a)^2 + 1) + 25\log \Theta_{ij}/\Theta_{ii}$$

$$\Theta_{ij} = \Theta_{ii} \left(\frac{a^2\ 10^{\frac{-D_u(\emptyset_{ij}/\emptyset_{oi})}{10}} + 10^{\frac{-D_d(\emptyset_{ij}/\emptyset_{oj})}{}}}{a^2 + 1} \right)^{.4} \qquad \textbf{(10)}$$

ANNEX 2

AGGREGATION OF INTERFERENCE

This Annex shows that aggregation of interference can be expressed in terms of "accumulated orbital separations" rather than total (C/I). For illustrative purposes, take the case of the uplink and down service areas being the same.

For an assigned orbital separation, θ'_{ij},

$$(C/I)_{ij} = (C/I)_{ii} + D_{ij} + 25 \log \frac{\theta'_{ij}}{\theta_{ii}}$$ (derived from equations (7) and (8) of Annex 1)

Define $k_{ij} = \theta'_{ij}/\theta_{ij}$ = a factor relating the actual orbital separation to minimum required, (θ_{ij})

$$(C/I)_{ij} = (C/I)_{ii} + D_{ij} + 25 \log \frac{\theta_{ij}}{\theta_{ii}} + 25 \log k_{ij}$$

$$= (C/I)_{ii} + 25 \log k_{ij}$$

$$(C/I)_{agg} = \sum_j ⓟ (C/I)_{ii} + 25 \log k_{ij}$$

$$= (C/I)_{ii} - 10 \log \left[\sum_j 10^{-\frac{25}{10} \log k_{ij}}\right]$$

$$= (C/I)_{ii} - 10 \log \sum_j (k_{ij})^{-2.5}$$

For the homogeneous co-coverage case, as is well known,

$$(C/I)_{agg.} = (C/I)_{ii} - 4.2 \text{ dB}$$

For equivalence,

$$\sum_j k_{ij}^{-2.5} = 2.6$$

This, so as not to exceed the aggregate criteria,

$$\sum_j k_{ij}^{-2.5} \geqslant 2.6$$

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Addendum 2 to
Document 146-E
23 August 1985
Original: English

COMMITTEES 4 AND 5

SAUDI ARABIA (KINGDOM OF)
BAHRAIN (STATE OF)
IRAQ (REPUBLIC OF)
JORDAN (HASHEMITE KINGDOM OF)
KUWAIT (STATE OF)
OMAN (SULTANATE OF)
QATAR (STATE OF)
SYRIAN ARAB REPUBLIC
YEMEN (PEOPLE'S DEMOCRATIC REPUBLIC OF)

The delegations of the above-mentioned countries wish to associate themselves with the proposal of the administrations contained in Document 146.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Addendum 1 to Document 146-E
22 August 1985
Original: English

COMMITTEES 4 AND 5

Congo/Togo

PROPOSALS FOR THE WORK OF THE CONFERENCE

The Delegations of Congo and Togo wish to associate themselves with the joint position set out in Document 146.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 146-E
21 August 1985
Original: English/French

COMMITTEES 4, 5

Algeria, Angola, Burkina Faso, Cameroon, Egypt, Ethiopia, Gabon, Ghana, Kenya, Libya, Madagascar, Malawi, Mali, Morocco, Nigeria, Senegal, Somalia, Tanzania, Chad, Tunisia

PROPOSALS FOR THE WORK OF THE CONFERENCE

The above-listed delegations hereby submit the following proposals:

Item 2.2 of the agenda: Services and bands to be planned

COMP/146/1 The present Conference should plan the fixed-satellite service (FSS) in the bands 6/4 GHz, 8/7 GHz, 14/11-12 GHz and 30/20 GHz.

Item 2.3 of the agenda: Planning method

COMP/146/2 The proposed planning method involves managing the spectrum/orbit resource in accordance with two different régimes:

- an *a priori* allotment plan as described below;
- the application of an improved version of the present procedures for the management of that part of the spectrum/orbit resource which has not been planned.

A. *A priori* allotment plan

COMP/146/2.1 The *a priori* allotment plan based on the satisfaction of national requirements must guarantee as a minimum to each country an allotment made up of the following associated elements:

- an orbital position;
- a global frequency band of identical bandwidth;
- an appropriate coverage area;
- protection criteria against harmful interference.

COMP/146/2.2 This guarantee must be effective irrespective of the date on which a country decides to use its allotment.

COMP/146/2.3 The Plan must make it possible for any allotment not yet used by a country to be used by another country:

- by agreement between the administrations concerned;
- subject to the condition that the rights of the country for which the allotment is entered in the Plan are duly guaranteed.

COMP/146/2.4 The Plan must also provide for a reserve for future Members of the Union.

COMP/146/2.5 The Plan should take account of technological progress in accordance with procedures to be determined.

COMP/146/2.6 The Plan should take into consideration existing or planned systems.

B. International and regional systems

COMP/146/3 The Conference should:

COMP/146/3.1 Take account of existing intergovernmental, international and regional systems, i.e. INTELSAT, INTERSPUTNIK, EUTELSAT and ARABSAT, during the planning process.

COMP/146/3.2 Guarantee the operational continuity of these systems.

COMP/146/3.3 Identify foreseeable regional intergovernmental systems for the developing countries and give them the same guarantees as the systems referred to in COMP/146/3.1.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Corrigendum 1 to
Document 147-E
12 September 1985
Original: English

COMMITTEE 6

SUMMARY RECORD

OF THE

FOURTH MEETING OF COMMITTEE 6

(MATTERS RELATING TO THE BROADCASTING-SATELLITE SERVICE IN THE 12 GHz BAND)

1. In paragraph 3.4.2, replace "Appendix 1 of the Final Acts ..." by "Annex 1 of the Final Acts ...".

2. Replace the whole of paragraph 3.4.3 by the following:

"3.4.3 The delegate of Canada questioned the propriety of including a discussion of the document at the present Conference, since it dealt with changes to Appendix 30 which were not necessary for the incorporation of the 1983 Conference Final Acts into the Radio Regulations and there would not be time to re-examine the criteria of Appendix 30 at the present stage."

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 147-E
26 August, 1985
Original: English

COMMITEE 6

SUMMARY RECORD

OF THE

FOURTH MEETING OF COMMITTEE 6

(MATTERS RELATING TO THE BROADCASTING-SATELLITE SERVICE
IN THE 12 GHz BAND)

Wednesday, 21 August 1985, at 1400 hrs

Chairman: Dr. M. MATSUSHITA (Japan)

Subjects discussed:	Documents
1. Approval of the summary record of the first meeting of Committee 6	93(Rev.1)
2. Structure of Committee 6	DT/24(Rev.1)
3. General introduction of new documents	104 + Corr.1 120, 131 and 142
4. Reports of the Working Group Chairmen	144

1. Approval of the summary record of the first meeting of Committee 6 (Document 93(Rev.1))

1.1 The Chairman suggested that the summary record be approved, in its amended form.

It was so agreed.

2. Structure of Committee 6 (Document DT/24(Rev.1))

2.1 The Committee took note of the structure set out in Document DT/24(Rev.1).

3. General introduction of new documents (Documents 104 + Corr.1, 120, 131 and 142)

3.1 Document 104 + Corr.1

3.1.1 The Chairman introduced the proposals submitted by Burkino Faso and said that they were, for the most part, addressed to Committee 5. However, the amendment to the third paragraph of item 2.2 specifically referred to the desirability of planning for feeder links in the bands 14.5 - 14.8 GHz and 17.3 - 18.1 GHz, and accordingly related to the work of Committee 6. It would be assigned to Working Group 6B.

3.2 Document 120

3.2.1 The Chairman introduced the proposals submitted by the Republic of the Philippines and noted that they were also addressed to Committee 5. However, proposal PHL/120/10 related to the proposed use of the frequency bands of 17.3 - 18.1 GHz (primary) and 14.5 - 14.8 GHz (auxiliary) as the feeder links for BSS in Regions 1 and 3. The proposal was in line with a similar proposal from Australia and would be examined by Working Group 6B.

3.3 Document 131

3.3.1 The delegate of Egypt said that, although the document had already been discussed in Working Group 6B, he would like to draw attention to his Delegation's proposals regarding techniques for reducing incompatibilities between feeder links to the BSS. In particular, it was suggested that multi-beam antennas should be used to achieve a standard figure of merit and that a better noise figure could be achieved by the use of new technology. In addition, Egypt proposed to use an average value of the atmospheric attenuation for planning purposes, which together with the margin already available in the system (relating to the probability of fading occurrence) should be considered an additional margin. The final proposal was that, on the basis of a standard atmospheric attenuation of 4 dB and standard satellite figure of merit of 6 dB, a preliminary feeder-link planning based on a standard e.i.r.p. of 80 dBW should be exercised, with adjustments for the attenuation margin during the actual planning phase.

3.4 Document 142

3.4.1 The delegate of the United Kingdom asked delegates to note that the proposal on page 2 should in fact be headed "Proposal G/142/1".

The document reflected the conviction that the promotion of greater harmony between regions would be enhanced by a further consideration of the provisions of Appendix 30 in relation to the incorporation of the Region 2 1983 Plan. It examined the application of protection criteria and other services in Regions 1 and 3 and concluded that, as a result of the technical parameters adopted for the Region 2 Plan in 1983, the earlier protection criteria now appeared rather excessive. After reviewing the background to the original criteria, the document presented proposals for modified criteria applicable to the protection of the Region 2 BSS Plan and subsequent modifications. It was hoped that it would be considered in detail in Working Group 6A.

3.4.2 The delegate of Brazil said that the criteria used for Region 2 were based on the principle of reciprocity, so that the values in Appendix 1 of the Final Acts were the same as those found in Annex 1 of Appendix 30.

3.4.3 The delegate of Canada questioned the propriety of including a discussion of the document in a meeting of the full Committee, as it in fact fell within the purview of Working Group 6A. The impression had been given that the Radio Regulations were to be revised only as necessary, and there would not be time to re-examine the criteria of Appendix 30 at the present stage.

3.4.4 The Chairman took note of that objection, referring the document to Working Group 6A.

4. Report of the Working Group Chairmen (Document 144)

4.1 The Chairman of Working Group 6A asked delegates to note that Document 144 should have been addressed to Committee 6, not Working Group 6A. The Working Group had now constituted two Sub-Working Groups, i.e. 6A-1 chaired by himself (Mr. G.H. Railton (Papua New Guinea)) and 6A-2 chaired by Mr. J.F. Broere (Netherlands). The terms of reference of both Sub-Working Groups were elucidated in Document 144.

Sub-Working Group 6A-1 had agreed that the evaluation criteria for the SAT-R2 Plan should be addressed in three parts, i.e.

a) Region 2 BSS into Regions 1 and 3 BSS;

b) Region 2 BSS into Regions 1 and 3 terrestrial services;

c) Region 2 BSS into Regions 1 and 3 FSS.

With regard to the matter of BSS into the 1977 Plan, it had already been reported that good progress had been made and that the incompatibilities in the criteria had been identified. Two approaches to the outstanding problem of how to deal with those criteria had been suggested and were outlined on the second page of Document 144. The second approach had been presented in square brackets, as the complexity of the issue had led to its being discussed with the Secretary-General of the Union, the Legal Adviser and the Chairman of the IFRB, in order to determine an appropriate way of handling these incompatibilities. That advice was included in Documents 134 and 136 which had not yet been addressed but which were to be taken up at the next meeting of Working Group 6A.

The only other problem in the context of BSS related to the question of energy dispersal. Three administrations had agreed to examine that matter and a Working Document could well be produced for the forthcoming meeting of Sub-Working Group 6A-1.

On the subject of terrestrial services two sharing criteria had been suggested, of which one was Annex 5 to Appendix 30, while the other consisted of that same Annex complemented by the criteria developed in Reports 631 and 789-1 of the CCIR. That very difficult problem was being addressed by a small ad hoc Group of 6A-1, which should shortly complete the assignment so that there could be an examination of the Region 2 Plan with respect to terrestrial services, which would complete the Groups's work in that area.

In the context of Region 2 BSS into Regions 1 and 3 FSS, the problem was to determine which FSS networks should be taken into account when evaluating the Region 2 Plan. One group of administrations maintained that they should be the networks communicated to the Board on or before 17 July 1983. Another opinion was that account should be taken of the networks to be communicated to the Board under RR 1042 at the date of incorporation of the Region 2 Final Acts. This matter was still unresolved. The IFRB had made a number of calculations available to the delegations and consultations were currently under way. It was hoped that a consensus would soon be reached.

Sub-Working Group 6A-2 was making excellent progress and would soon be transmitting documents to the Committee.

Although Working Group 6A had to grapple with difficult problems, delegates had shown such a willingness to cooperate in resolving them that he hoped the work would be completed within the time-limit set but felt that this might require night and weekend meetings.

4.2 The Chairman of Working Group 6B said that work was continuing on the choice of frequency bands to be planned and an ad hoc Group had been set up to prepare a compromise proposal generally acceptable to all administrations: the document should be ready on the following day.

Sub-Working Group 6B-2 was also making progress but its task kept expanding with the continuous discovery of new technical parameters. It had also been asked by Working Group 6B to consider what intersessional work should be done on the planning of feeder links which should not be too complicated and the work ought to be completed fairly expeditiously.

The request made at the third meeting of Committee 6, to the Chairman of Committee 4, that it establish sharing criteria for the 17 GHz band should now be extended to include sharing criteria for the 14.5 - 14.8 GHz bands. He hoped that Working Group 6B would complete its work by the end of the following week.

4.3 The Chairman thanked the Working Group Chairmen and all participants for the progress made.

4.4 The Chairman of the IFRB, commenting on the type of sharing criteria between feeder links in the FSS and other services in the 14 and 17 GHz bands which were needed for inclusion in the Final Acts of the 1988 Conference, said that from the regulatory point of view these criteria were those necessary to establish the coordination area around the earth station to protect terrestrial services from the fixed satellite transmitting stations. The other type of sharing criteria were those needed to protect a receiving space station in the FSS from terrestrial services. Those criteria were already in the Radio Regulations. The technical parameters for determination of the coordination area around the transmitting earth station for both the 14.5 - 14.8 and the 17.7 - 18.1 GHz bands exist in Table 1 of Appendix 28 and as far as he knew no proposals had been made to change those critera.

Regarding the protection of fixed satellite feeder links from the terrestrial services, he pointed out that Article 27 of the Radio Regulations covered the 14.5 - 14.8 and 17.7 - 18.1 GHz bands by establishing transmitter power limits and again no proposals had been made to change those provisions.

The second step in the process of establishing technical criteria once the coordination area had been determined was a matter for administrations to decide as the Radio Regulations did not contain any criteria to be used as a basis for reaching agreement. This question was a subject of CCIR studies which is on-going.

4.5 The Chairman of Working Group 6B said it would be useful if the IFRB could prepare a short document summarizing the situation in respect of sharing criteria so that the Working Group could prepare a statement in its report to the effect that there was more or less no intersessional work to be done on the subject.

4.6 The Chairman of the IFRB undertook to prepare a paper outlining the present situation as to sharing criteria and interference in the two bands.

4.7 The Chairman said that as there had been no proposals on the subject from administrations, Working Group 6B could base its deliberations on that paper.

4.8 The Chairman of Committee 4 asked whether the arrangements made by his Committee to consider item 3.3. of the Conference agenda should now be dismantled.

4.9 The Chairman of Working Group 6B proposed that, as a Sub-Group had already been formed by Committee 4, it should examine the IFRB's paper and then report to Committee 6.

4.10 The delegate of the United States of America endorsed that proposal and added that bi-directional satellite sharing criteria in the 18 GHz band might require examination.

The proposal of the Chairman of Working Group 6B was approved.

The meeting rose at 1500 hours.

The Secretary:	The Chairman:
I. DOLEZEL	M. MATSUSHITA

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 148-E
21 August 1985
Original: English

COMMITTEE 4

Republic of San Marino

BROADCASTING-SATELLITE SERVICE (SOUND)

SMR/148/1 The Delegation of the Republic of San Marino supports the Spanish proposal contained in Document 32, concerning broadcasting-satellite service (sound).

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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21 August 1985
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COMMITTEE 5
AD HOC WORKING GROUP

Republic of San Marino

BROADCASTING-SATELLITE SERVICE IN THE BAND 22.5 - 23 GHz IN REGION 1

SMR/149/2 The delegation of the Republic of San Marino supports the Spanish proposal contained in Document 34.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 150-E
26 August 1985
Original : English
French
Spanish

PL = Plenary Meeting
C = Committee
WG = Working Group

LIST OF DOCUMENTS

(101 to 150)

No.	Origin	Title	Destination
101	ARG	Proposals	C.4,C.5 C.6
102	C.4	Summary Record of the second meeting of Committee 4	C.4
103	LBY	Proposals	C.5
104 +Corr.1	BFA	General proposals	C.5
105 +Corr.1, +Corr.2 +Add.1, 2 & 3	SG	Report by the IFRB to the WARC-ORB(1) on the prevailing situation of the use of the geostationary-satellite orbit	PL
106 +Add,1,2	CLM	Elements for the planning of the geostationary orbit	C.4, C.5
107	USA	Additional proposals on a multilateral planning meeting	C.5
108	IRQ	Further proposals with regard to Agenda item 2.4	C.5
109	C.3	Summary Record of the first meeting of Committee 3	C.3
110	BOL,CLM, EQA, PRU, VEN	Elements for the planning of the orbit/ spectrum resource	C.4, C.5 PL
111	J	Power control in the feeder links to broadcasting satellites at 12 GHz	C.6
112	C.2	Summary Record of the first meeting of Committee 2	C.2
113	C.7	Summary Record of the first meeting of Committee 7	C.7
114	USA	Burden sharing considerations related to equitable access	C.4, C.5

No.	Origin	Title	Destination
115	USA	Proposals regarding the prevailing situation for the 14/11 - 12 GHz FSS bands	C.4, C.5
116	USA	Additional technical information to the situation prevailing in the 6/4 GHz frequency bands	C.4, C.5
117 (Rev.1)	WG 6B-1	1st Report : Elements for consideration with respect to the appropriate frequency bands where the frequency plan for feeder links should be established	WG 6B
118	C.5	Summary Record of the second meeting of Committee 5	C.5
119	G	Study of reverse band working - Information Note	PL
120	PHL	Proposals	C.5
121	C.4	Summary Record of the third meeting of Committee 4	C.4
122	YUG	Proposal for the selection of atmospheric propagation model for feeder links to broadcasting satellites	WG 6B-2
123	USA	Proposals (Agenda items 2.2, 2,3 and 2.5)	C.5
124 (Rev.1)	SG	General schedule of the work of the Conference	-
125	AUS	Agenda item 2.4 - Advance publication procedure	C.5
126	F	Definition of the terms "Coverage area" and "Service area"	C.4
127	HOL	Planning method for guaranteeing in practice access to the GSO	WG 5A
128	PL	Minutes of the second plenary meeting	PL
129	C.4	Summary Record of the fourth meeting of Committee 4	C.4

No.	Origin	Title	Destination
130	C.6	Summary Record of the third meeting of Committee 6	C.6
131	EGY	Proposal for reducing incompatibilities in feeder links to BSS	C.6
132	URS	Possible improvement in the procedure for coordination of satellite networks	C.5
133	BOL CLM EQA PRU VEN	Proposals	C.5
134	SG	Note by the Secretary-General - Legal advice	C.6
135 (Rev.1)	C.4	The characteristics of typical in-service networks of the Fixed-Satellite Service	C.4
136	SG	Incorporation of the Final Acts of SAT-83 in the Radio Regulations	WG 6A
137 +Corr.1	URS	Satellite Broadcasting (sound) in the band 0.5 - 2.00 GHZ	C.4 WG 4A
138	C.4	Summary Record of the fifth meeting of Committee 4	C.4
139	G	Past performance of existing regulatory regime for GSO - Information Note	PL
140	WG 5A	First report : Services and frequency bands to be planned	C.5
141	USA	Cost and performance characteristics of using the expansion bands at 4/6 GHz	C.4, C.5
142 +Corr.1	G	Protection of Broadcasting-Satellite Services in the 12 GHz bands from space services in other Regions	C.6
143	WG 2A	First Report to Committee 2	C.2
144	WG 6A	First Report to Committee 6	C.6
145	CAN	Characteristic orbital spacing	C.4

No.	Origin	Title	Destination
146 +Add.1	ALG AGL BFA CME EGY ETH GAB GHA KEN LBY MDG MWI MLI MRC NIG SEN SOM TZA TCD TUN COG TGO	Proposals	C.4, C.5
147	C.6	Summary Record of the fourth meeting of Committee 6	C.6
148	SMR	Broadcasting-Satellite Service (Sound)	C.4
149	SMR	Broadcasting-Satellite Service in the band 22.5 - 23 GHz in Region 1	C.5 Ad hoc WG
150	SG	List of documents published (101 to 150)	-

INTERNATIONAL TELECOMMUNICATION UNION

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FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 151-E
21 August 1985
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COMMITTEES 4, 5
AD HOC WORKING GROUP

Republic of San Marino

STUDY OF THE IMPLICATION OF USING HYBRID SATELLITES

SMR/151/3 The Delegation of the Republic of San Marino supports the Spanish proposal contained in Document 42.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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12 September 1985
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COMMITTEE 5

SUMMARY RECORD

OF THE

THIRD MEETING OF COMMITTEE 5

(PLANNING PRINCIPLES AND CRITERIA AND REGULATORY AND ADMINISTRATIVE PROCEDURES)

1. In paragraph 2.1, the final sentence should read:

"Ad hoc Group 5A-1 was preparing a document on planning principles which should assist the Working Group in taking decisions on planning principles."

2. In paragraph 3.2, read "It was so agreed." (This change affects the English text only.)

3. In the second, third and fourth sub-paragraphs of paragraph 5.2, replace "he" by "the Chairman".

4. Minor editorial corrections affecting the Spanish text only of paragraphs 2.1, 2.2 and 5.2.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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26 August 1985
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COMMITTEE 5

SUMMARY RECORD

OF THE

THIRD MEETING OF COMMITTEE 5

(PLANNING PRINCIPLES AND CRITERIA AND REGULATORY AND ADMINISTRATIVE PROCEDURES)

Thursday, 22 August 1985, at 0900 hrs

Chairman: Mr. M. MENCHEN ALUMBREROS (Spain)

Subjects discussed:		Documents
1.	Approval of the summary record of the first meeting of Committee 5	91
2.	Reports of Working Groups 5A and 5B	140
3.	Relations with other Committees and Groups	135(Rev.1)
4.	Report to the Plenary	-
5.	Organization of work	-

1. Approval of the summary record of the first meeting of Committee 5 (Document 91)

The summary record of the first meeting of Committee 5 was approved, as amended by the delegate of India (see Corrigendum 1 to Document 91).

2. Reports of Working Groups 5A and 5B (Document 140)

2.1 The Chairman of Working Group 5A introduced that Group's first report, contained in Document 140. It was hoped to reach a final decision about planning in the 6/4 GHz and 14/11 - 12 GHz bands after further consideration of the planning principles and methods, decisions on which would enable the band 30/20 GHz to be reviewed. No agreement could be reached with regard to the band 8/7 GHz and Committee 5 itself would probably have to take up the matter. The Working Group was preparing a document on planning principles which should assist the Committee in taking decisions on planning methods.

2.2 The Chairman, in response to questions by the delegates of the United Kingdom, Algeria and the USSR, invited the Committee to approve the report of Working Group 5A as it stood and transmit it to Committee 4 for information only, it being understood that Committee 4 was not being requested to take the relevant final decisions, which in any case were not within that Committee's purview.

It was so agreed.

2.3 In response to comments by the delegate of Saudi Arabia concerning the band 8/7 GHz, the Chairman said the Committee could take up the matter at another meeting.

2.4 The Chairman of Working Group 5B said that discussion in the four meetings held so far had focussed on procedures applicable to unplanned frequency bands and services; procedures pursuant to Sections I and II of Article 11 of the Radio Regulations had likewise been considered. Two ad hoc Working Groups had been set up. The first was to prepare recommendations for Working Group 5B in respect of Article 14 of the Radio Regulations as it applied to space radiocommunication services, taking into account the relevant IFRB report as well as administrations' proposals; the second was to prepare concise consolidated documents on regulatory guidelines relating to Sections I and II of Article 11 of the Radio Regulations, taking into account Appendices 3 and 4.

The oral report of Working Group 5B was approved.

3. Relations with other Committees and Groups (Document 135(Rev.1))

3.1 The Chairman of Committee 4 said that Document 135(Rev.1) represented information approved at Committee level; it related only to the fixed-satellite service and was intended simply to assist Committee 5. Although the details in the Annex were not up to date, Document 105 contained the necessary additional information and could be introduced if Committee 5 so wished. The question of certain minor textual problems, referred to by the delegate of Uruguay in respect of disparities between the Annexes and the Addenda to Document 105, were being attended to and the outcome would be communicated to Committee 5.

3.2 The Chairman suggested that Document 135(Rev.1) should be transmitted to Working Group 5A for the latter to deal with as it saw fit, under its terms of reference. In response to an observation by the delegate of Algeria, he said that the Committee itself should consider paragraph 2.2 of the document since the planning of FSS networks operating at 8/7 GHz was a topic within Committee 5's purview.

It was no agreed.

4. Report to the Plenary

4.1 The Chairman said that his oral report to the Third Plenary meeting would be based on the reports just given by the Chairmen of Working Groups 5A and 5B.

5. Organization of work

5.1 The delegate of the Islamic Republic of Iran said that the Conference was one of the most important events in the history of the Union; it was therefore a source of great satisfaction to note that a good atmosphere prevailed. In some of the discussions within the Working Groups, however, delegations which held viewpoints differing from those of others had been described as proceeding in a counter-productive manner. He recalled in that connection the statement by one delegation that when planning methods were being discussed, their content alone and not their authors should be addressed. All delegations had the right to express whatever views they desired, and every effort should be made to retain an atmosphere conducive to the frank and friendly expression of opinion.

5.2 The Chairman endorsed the comments made by the delegate of the Islamic Republic of Iran and reminded the Committee that, in his opening address, he had appealed for a spirit of cooperation.

In response to queries from the delegates of Algeria and Senegal, he said that Documents 146, 149 and 151 would be allocated to Working Groups 5A and 5B in accordance with the preferences expressed by their authors.

In response to a question from the delegate of Spain, he drew attention to Documents DT/18(Rev.1) and DT/19(Rev.3), which updated the list of documents allocated to the Working Groups.

Document 124 set a deadline of 28 August for conclusions on planning methods; he therefore called upon Working Group 5A to make every effort to arrive at those conclusions in order to enable the Committee to fulfil its task on time.

5.3 The delegate of Indonesia said that his delegation would be submitting a document on the subject which could be discussed either in full Committee or in Working Group 5A.

5.4 The delegate of Sweden suggested that the Committee might have to set a deadline for the submission of proposals to prevent it from becoming overburdened at the last minute and thus unable to complete its task.

5.5 The Chairman, supported by the delegate of Spain, said that proposals which would help to achieve consensus would be welcome at any time but that decisions on whether to consider a given proposal at a given stage should be left to the Working Groups.

The meeting rose at 1000 hours.

The Secretary: The Chairman:

M. GIROUX M. MENCHEN ALUMBREROS

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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WORKING GROUP 4B

Note by the Secretary-General

SHARING CRITERIA BETWEEN THE FEEDER LINKS AND OTHER RADIOCOMMUNICATION SERVICES SHARING THE SAME FREQUENCY BAND WITH EQUAL RIGHTS

At the request of the IFRB, I transmit the attached note on the sharing criteria between the feeder links and other radiocommunication services sharing the same frequency band with equal rights.

R.E. BUTLER
Secretary-General

Annex: 1

ANNEX

Note from the IFRB on the sharing criteria between the feeder links and other radiocommunication services sharing the same frequency band with equal rights

1. At the reqeust of Committee 6 at its meeting on 21 August, the IFRB was requested to provide a summary of the current regulatory situation concerning frequency sharing in the 14 GHz and 17 GHz bands being considered for the feeder links. In this context, the regulatory criteria are those necessary for inclusion in the Radio Regulations.

2. The sharing criteria are required for the following frequency bands and services:

2.1 Frequency band 14.5 - 14.8 GHz
FIXED
MOBILE

2.2 Frequency band 17.7 - 18.1 GHz
FIXED
FIXED-SATELLITE (space-to-Earth)
MOBILE

3. The modes of interference which can occur are the following:

Mode a) Transmitting feeder-link earth station interfering with receiving terrestrial station (fixed or mobile);

Mode b) Transmitting terrestrial station interfering with receiving feeder-link space station;

Mode c) Transmitting space station in the fixed-satellite service interfering with receiving feeder-link space station;

Mode d) Transmitting feeder-link earth station interfering with receiving earth station.

4. Sharing criteria available under various provisions of the Radio Regulations:

4.1 Mode a) is covered for both frequency bands in question by Appendix 28 (Table I). Note (5) in Table I states:

"The parameters associated with these columns are for feeder links to broadcasting satellites and are provisional pending further study by the CCIR: see Resolution 101".

For the time being no other parameters than those in Table I are available.

4.2 Mode b) is covered in Article 27 by RR 2503, RR 2505, RR 2508 and RR 2510 for the frequency band 14.5 - 14.8 GHz with the Footnote No. 2510.2 stating:

> "The application of the limits in this frequency band is provisional (see Resolution No. 101)";

and by RR 2505, RR 2508 and RR 2511 for the frequency band 17.7 - 18.1 GHz with the Footnote No. 2511.2 (see No. 2510.1) stating:

> "The equality of right to operate when a band of frequencies is allocated in different Regions to different services of the same category is established in No. 346. Therefore any limits concerning interregional interference which may appear in CCIR Recommendations should, as far as practicable, be observed by administrations."

4.3 Mode c) is covered by Appendix 29 - Case II.

4.4 Mode d) concerning the frequency band 17.7 - 18.1 GHz only which is allocated for bi-directional use; this mode is not covered by any provisions of the Radio Regulations; however RARC-SAT R2 did develop an approach based on the use of Appendix 28 to deal with this mode.

Conclusion

In accordance with the above the Space Conference might consider

1) either to confirm the sharing criteria used in 4.1, 4.2 and 4.3 above or to develop other criteria intended to replace them as this may be implied from "resolves 3" of Resolution No. 101;

2) to consider the extension to Regions 1 and 3 of the approach adopted by RARC-SAT R2 or to develop an alternative approach applicable to the three regions.

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PLENARY MEETING

MINUTES

OF THE

THIRD PLENARY MEETING

1. Paragraph 1.14

Replace the first sentence by the following:

"1.14 The delegate of Algeria, speaking on a point of order, said that the Chairman had not invited the United Kingdom delegate to introduce his document. An introduction had nevertheless been given and, consequently, Document 139 was not acceptable."

2. Paragraph 3.4

The end of the sixth line should read "... and its work had now started."

(This correction affects the English text only.)

3. Paragraph 3.5

Replace by the following:

"3.5 The Chairman of Committee 5 said that the Committee had held one brief meeting since the last Plenary. A number of provisional decisions had been taken by Working Group 5A, as indicated in Document 140. That document had been transmitted to Committee 4 for information, and Document 135(Rev.1) had been received from Committee 4 and had been passed on to Working Group 5A. Working Group 5A had already started to discuss planning principles and methods and had set up an ad hoc Group to consolidate planning principles and facilitate discussions in the Working Group. Working Group 5A was also discussing planning methods for the bands selected for planning. Work on planning methods should be completed by Wednesday of the following week, although doubts had been raised about the possibility of doing so. Working Group 5B had discussed the existing proposals for regulatory procedures for the unplanned services and had set up two ad hoc Groups, whose terms of reference were set forth in Document DT/35. The work of Working Group 5B was progressing slowly for the time being, since the major part of its work was dependent upon the results of Working Group 5A on planning methods."

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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PLENARY MEETING

MINUTES

OF THE

THIRD PLENARY MEETING

Thursday, 22 August 1985, at 1540 hrs

Chairman: Dr. I. STOJANOVIĆ (Socialist Federal Republic of Yugoslavia)

Subjects discussed:		Documents
1.	Adoption of the agenda	-
2.	Approval of the minutes of the second Plenary Meeting	128
3.	Oral reports by Committee Chairmen on the progress of their work	-
4.	Other business	-

1. Adoption of the agenda

1.1 The delegate of the Islamic Republic of Iran said that it would be inappropriate at the present stage of the Conference for the Plenary to deal with Document 139, proposed under agenda item 4, which should instead be dealt with by the Working Groups in the usual way. He therefore proposed its deletion from the current Plenary agenda.

1.2 The delegates of China, Colombia, Cuba, Egypt, Kenya, Libyan Arab Jamahiriya, Saudia Arabia, Senegal and Tanzania supported that proposal. The delegate of Kenya added that Document 139 might usefully be transmitted to Committee 5 where the subject was already under discussion.

1.3 The delegate of Algeria agreed with those views, adding that Document 139 should be treated in the same way as Document 65.

1.4 The delegate of the Federal Republic of Germany was in favour of retaining Document 139 on the agenda of the present meeting, since it was very relevant to what was going on in the Conference.

1.5 The delegates of Canada, France, Italy, Netherlands, Portugal, Spain, Switzerland and the United States of America supported that view.

1.6 The delegate of the USSR suggested that the matter might be referred to the Steering Committee, which was due to meet after the Plenary. It was undesirable at the present stage of the Conference to have to vote on a question which was not one of principle.

1.7 The delegate of India said that since Committee 5 was already discussing Documents 85, 86 and 83, it should also consider Document 139 and decide whether or not it should be transferred elsewhere.

1.8 The delegate of Italy observed that the suggestion made by the delegate of the USSR would shorten the Plenary but lengthen the Steering Committee meeting. He suggested that the Plenary acknowledge the existence of the Information Note and convey it to Committee 5.

1.9 The delegate of Australia supported the retention of Document 139 on the Plenary agenda. Under that item the Plenary could properly discuss whether the document should be transmitted to the Steering Committee or to Committee 5.

1.10 The delegate of Algeria argued that the Steering Committee was not really competent to deal with matters of substance, and emphasized that if Document 139 were given special status, it should be associated with the Colombian document, No. 65, on the same subject.

1.11 The delegate of the USSR said that since the Plenary was the highest organ of the Conference, it could decide any question which might arise. He had proposed that the Plenary should submit the document to Committee 1, since it was not a question of substance, in order that it should decide the matter. His proposal had been a compromise to which other delegations might agree.

1.12 The Chairman invited the delegate of the United Kingdom to comment on the observation that had been made by the delegations.

1.13 The delegate of the United Kingdom said that he was perplexed by the reaction to the inclusion of Document 139 on the agenda. It had not been intended for discussion, and it was unfortunate if some administrations found hard facts unpalatable. The document had been submitted for information purposes, and described the extent to which the geostationary satellite orbit was already used by many countries. There had been a number of statements in the Conference that the existing procedures benefitted only a few advanced countries. A document from Committee 4 to Committee 5 dealt at length with the subject.

1.14 The delegate of Algeria, speaking on a point of order, said that it could not have been the Chairman's intention to have had Document 139 introduced: such a procedure was inappropriate and the document was not acceptable. His Delegation was prepared to agree to the Soviet proposal, provided that Document 65 was associated with Document 139, and that the two were transmitted to the competent bodies via the Steering Committee. It was not really a matter for the Steering Committee, but he was prepared to agree to that course of action as a compromise.

1.15 The Chairman assured the delegate of Algeria that he had not invited the delegate of the United Kingdom to introduce the document. His intention had been to get the Plenary out of a difficult situation.

1.16 The delegate of the Islamic Republic of Iran said that he too had wished to raise the same point of order.

1.17 The delegate of the United Kingdom suggested that to save time Document 139 should be referred to Committee 5 and removed from the present draft Plenary agenda.

It was so agreed.

2. Approval of the minutes of the second Plenary Meeting (Document 128)

The minutes of the second Plenary Meeting were approved.

3. Oral reports by Committee Chairmen on the progress of their work

3.1 The Chairman drew attention to the fact that the Conference had now reached the end of its second week, and that many delegates shared the view that the progress of work was not quite satisfactory. Greater efficiency was therefore required to achieve positive results. The main problems had been identified and if delegates were to concentrate on reaching agreements and looking for solutions, then lost ground could be recovered. The picture would be clearer when the Committee Chairmen had presented their reports.

3.2 The Chairman of Committee 2 said that the Working Group of Committee 2 had met on 20 August and had examined the credentials of the 80 delegations indicated in Document 143. Those credentials had been found to be in order. Those delegates which had not already submitted credentials were invited to do so as soon as possible.

3.3 The Chairman of Committee 3 said that as he had reported to the last Plenary Meeting, Committee 3 had held its first meeting on 14 August. Paragraph 1.1 of Document 109 (the summary record of that meeting) gave an indication of the timetable required for Committee 3 to complete its work. In accordance with that timetable, the second meeting of Committee 3 would be held at the end of August.

3.4 The Chairman of Committee 4 said that Committee 4 had held five meetings and work was progressing steadily. Its first document, 135(Rev.1), had been approved and transmitted to Committee 5, where it had already been introduced earlier in the day. At the earliest opportunity after the last Plenary Meeting, Committee 4 had elected Mr. Miller of the United States of America as the Chairman of Working Group 4A, and its work had not started. Working Group 4B had established two Sub-Working Groups and their work was progressing satisfactorily. Working Group 4C was making good progress with its heavy workload. At the last meeting of Committee 4, it had been agreed to establish an Ad hoc Group of the Committee to deal with various aspects of high definition television and proposals had been submitted by four administrations. The assistance being given to Committees 5 and 6 added to Committee 4's workload, but the Committee expected to be able to handle it in the time-frame provided. The final form of some of the Committee's documents was dependent on a decision on the overall format of the final report and the Committee might have to go back on some of them. While not being as optimistic as he had been at the previous Plenary, daily problems were being overcome and work was progressing at a steady pace. Evening meetings might be necessary to complete the workload on time.

3.5 The Chairman of Committee 5 said that the Committee had held one brief meeting since the last Plenary. A number of provisional decisions had been taken by Working Group 5A, as indicated in Document 140. That document had been transmitted to Committee 4 for information, and in return Document 135(Rev.11) had been received from Committee 4 and had been passed on to Working Group 5A. Working Group 5A had already started to discuss planning principles and methods and had set up an Ad hoc Group to consolidate planning principles and facilitate discussions in the Working Group. The Working Group was also discussing planning methods for the bands selected for planning. It hoped to complete its work by Wednesday of the following week, although doubts had been raised about its ability to do so. Working Group 5B had discussed the existing proposals for regulatory procedures for the unplanned services and had set up two Ad hoc Groups, whose terms of reference were set forth in Document DT/35. The work of Working Group 5B was progressing slowly for the time being, since the major part of its work was dependent upon the results of Working Group 5A on planning methods.

3.6 The Chairman of Committee 6 said that it had made considerable progress since the last Plenary Meeting but substantial problem areas remained.

Sub-Working Group 6A-1 had examined in detail the two questions referred to it and had identified three sets of issues on which it was continuing to seek agreement. Sub-Working Group 6A-2 had begun work on its task of consolidating the decisions of the SAT-R2 Conference (1983) with the provisions of Appendix 30 to the Radio Regultions. Delegations participating in Working Group 6A had been cooperative in seeking solutions to problems and the results to date were detailed in Document 144.

Working Group 6B had also made progress with the problem of the selection of frequency bands for planning broadcasting-satellite feeder links. There was general agreement that the 17 GHz and 14 GHz bands should be considered for such planning. Sub-Working Groups had been established and the results of their work were expected shortly.

With regard to Conference agenda item 3.3, the 17 GHz and 14 GHz frequency bands had been identified as requiring the development of sharing criteria between services. At the request of the Committee, the Chairman of Committee 4 had agreed to undertake the technical examination of such criteria with the assistance of the IFRB. The results of that examination would be reported to Committee 6 in due course.

In conclusion, detailed examinations were proceeding to determine the most suitable technical characteristics for broadcasting-satellite feeder links in the 17 GHz and 14 GHz bands. The Committee was making every effort to complete its work in the time set by the Steering Committee.

3.7 The Chairman of the Ad hoc Working Group of the Plenary said that it had not met since the previous Plenary but meetings of the two Sub-Groups considering intersessional work and the agenda for the second session of the Conference were envisaged for the coming week. He appealed to the Chairmen of Committees and Working Groups and to all delegates to complete their work within the time limits set by Committee 1.

3.8 The Chairman of Committee 7 said that it had not met since the previous Plenary and he therefore had nothing to add to what he had said at that time.

3.9 The Chairman thanked the Chairmen for their helpful reports and asked delegates if they wished to raise any questions.

3.10 The delegate of the United Kingdom enquired whether the Ad hoc Group set up by Committee 4 on high-definition television broadcasting had the competence to identify new frequency bands, such as those at 22 GHz and 23 GHz, which were not available under the Radio Regulations for broadcasting-satellite services in Region 1.

3.11 The delegate of France said that he too had been surprised to learn that the Ad hoc Group had considered the question of the 22.5/23 GHz band, which was not allocated to the services in question in Region 1 or 2. He shared the concern expressed by the delegate of the United Kingdom about the extent of the Group's competence.

3.12 The Chairman of Committee 4 said that the purpose of the Ad hoc Group was to determine how to meet administrations' needs. All delegations were welcome to participate in its work. The intention was not to exceed the Committee's terms of reference by proposing that the Conference should allocate frequency bands. It was to review the sharing criteria required to accommodate the need for high-definition television broadcasting in existing and other frequency bands. His Committee would work together with the Ad hoc Working Group of the Plenary to determine what intersessional activities and what agenda items for the second session of the Conference were necessary to deal with that question.

4. Other business

The Secretary-General said that the following appointments not notified in time for the first Plenary Meeting had since been confirmed:

Vice-Chairman of the Conference:	H.E. Mr. F. JIMENEZ DAVILA (Argentina)
Chairman of Committee 2 (Credentials):	Mr. S. SISSOKO (Mali)
Vice-Chairman of the Ad hoc Working Group of the Plenary (Intersessional work):	Mr. R. WIKANTO (Indonesia)
Chairman of Committee 7 (Editorial):	Mr. J.L. BLANC (France)
Vice-Chairmen of Committee 7:	Mr. J. DURKIN (United Kingdom) Mr. F. MONINO DIAZ (Spain)

The meeting rose at 1640 hours.

The Secretary-General:

R.E. BUTLER

The Chairman:

Dr. I. STOJANOVIĆ

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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WORKING GROUP 5B

BRAZIL

The following are the views of the Brazilian Administration concerning possible improvements to the Advance Publication Procedure of Section I of Article 11 of the Radio Regulations.

As already stated in Document 37, modifications should aim at reducing the complexity of the current procedure, eliminating any existing ambiguity and reducing the burdens both of the concerned administrations and the IFRB.

Section I of Article 11 has the fundamental purpose of being an information procedure, allowing the ITU Members to take notice of the intention of an administration to implement a satellite network. On the basis of this information, two objectivies are consequently envisaged:

i) assessment of the possible impact of the planned satellite network into both planned or existing networks of other administrations; and

ii) preliminary discussions on possible measures to resolve difficulties in the accommodation of the planned network.

Therefore, changes to be recommended to the Advance Publication Procedure should preserve these two important objectives of this Procedure which has been demonstrated as a necessary step for keeping the existing access mechanism working in a rational and organized fashion.

B/155/23 The following are proposed guidelines for possible amendments to be recommended to Section I of Article 11 of the Radio Regulations.

a) Eliminate reference to the upper limit on the date (five years); RR 1496 may suffice for avoiding premature notifications (see also item h));

b) Appendix 4 should be extensively revised to reduce the amount of unnecessary data and explicitly provide all information needed for Appendix 29 calculations in a straightforward manner;

c) After attesting for completion of the received information, the Board publishes it in one of its Special Sections, including a listing of administrations whose existing or planned networks may be affected by, or may affect, the planned network, with appropriate identification of these concerned networks. The Board need not inform by circular-telegram.

d) Amendments to Appendix 4 data need only to be informed to the extent they can change the scenario already identified;

e) Any administration that feels affected by the proposed network may request to be included in the process, since excess to Appendix 29 threshold has been so demonstrated and confirmed by the Board;

f) An informal coordination may occur at this stage by the initiative of any of the administrations concerned as currently foreseen in RR 1050. Editorial amendments to RR 1050 are recommended to result in a more simple and objective text;

g) After a period of at least /̄ six_/ months of the Advance Publication, coordination may be requested (as per Section II of Article 11) to those administrations with which difficulties still exist and RR 1069 is applicable; Appendix 3 information, in an appropriate revised form, is then sent to those administrations;

In case all difficulties were properly resolved or no administration was identified as affected by, or affecting, the planned network the notification process (Article 13) may be commenced (supposing there is already an Advance Publication for the planned network).

h) Administrations responsible for networks with Advance Publication that have not commenced coordination or notification processes, as appropriate, after the specified period (/̄ six_/ months of the API issue), shall revalidate their API every /̄ six_/ months by telegram to the Board and all concerned administrations, ratifying their intentions to implement the planned satellite networks and informing the reasons for the delays.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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COMMITTEE 5

Indonesia

SOME ELEMENTS ON PLANNING PRINCIPLES

Page 1, section I - General, - sub-section 1, item a) should read:

"a) ..... by inland seas" instead of "a) ..... by high seas".

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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COMMITTEE 5

Indonesia

SOME ELEMENTS ON PLANNING PRINCIPLES

I. General

1. Based on its condition and situation, the terms of "special needs of the developing countries and the geographical situation of particular countries" as stipulated in Article 33 of the ITU Convention applies to Indonesia, namely:

a) dispersed territory situations, i.e. consisting of 13,667 islands separated by high seas;

b) terrain obstruction situation, with high mountains and active volcanoes;

c) countries covering large geographical areas, with a longitude of 5,000 km and latitude of 2,000 km;

d) precipitation, one of the highest rain climatic zones in the world;

e) scattered population centres in those islands;

f) one of the equatorial countries, where the GSO is superjacent to its territory.

These special geographical situations are shared by many developing countries especially the equatorial countries which are situated in the tropical zone.

Therefore, satellite communication is of utmost importance to Indonesia and many developing countries.

In this context, the principles as contained in Document 63 of Kenya, regarding the preferential rights to the GSO which do not prevent other countries, especially developing countries, to access the GSO superjacent to the equatorial countries and its neighbours, deserves support.

The question of equitable access should be overcome appropriately.

2. Telecommunication development utilizing satellite systems should become a real hope for developing countries, especially to close the gap of national telecommunication facilities which would be economically inaccessible through conventional terrestrial means.

It is, therefore, recommended to impose more stringent measures, more readily, to the big users rather than the small users, the developing countries in particular.

The real challenge drawn by the Independent Commission for World Wide Telecommunication Development (ICWTD) is that in the early part of the next century the whole of mankind should be within easy reach of a telephone, and we should endeavour to utilize satellite technology and systems to reach this goal.

3. The aim of laying more stringent criteria to the big users (e.g. more than 5 to 10 satellites, not including multi-administration satellite systems) is to reach a noble aim of equitability of access.

The gap between developed and developing countries might become greater as the lack of various resources (expertise, finance, etc.) in developing countries would not enable the developing countries to keep up with the ever-increasing pace of technology. Also it would be more cumbersome for developing countries to enter the space age with the same stringent criteria as the ones of the developed countries for their satellite networks.

Developing countries, having utilized satellite systems, would face great difficulties in renewing their satellite networks which are not yet fully depreciated. At the same time, satellite networks in advanced countries could be depreciated economically, or even already physically depreciated as they have an advantage of an early implementation.

4. This Conference might have a quick overall view of the industrial relations in developed and developing countries which is an integral part of the space technology and its benefits for mankind.

The initial stage of telecommunication industries established, or to be established, for self-reliance in developing countries will not be able to keep up with the ever-increasing pace of new technologies unless some special measures are taken.

It is a matter of fact that industries which have been developed for some time (and sometimes too expensive to be maintained in developed countries) are shifted to developing countries. This time-lapse between the development and implementation of a new technological stage in industrial countries (which enables more stringent criteria) and the establishment and mastering of the same technology in developing countries should be taken into account. This time-lapse will probably take one or more generations of satellite lifetimes.

National policies to develop telecommunication networks in most of the ITU Member countries, developed as well as developing countries, is that remote or rural areas are always treated with a certain relaxation compared to urban areas. This is a logical and realistic course of action as urban areas are in the forefront in keeping up with the most adaptable latest technology and the urban big requirements involving greater traffic and better facilities.

Telecommunications in remote and rural areas have to be boosted to keep up with the urban areas.

The idea of providing more relaxed criteria to satellite networks in developing countries (or more stringent criteria to satellite systems in industrial countries), is that it would boost developing countries to keep up with satellite development and its technology.

This is in accordance with the spirit of Article 4 of the ITU Convention and the recommendations of the ICWTD.

5. At the present time, it would be fair to say that the big users of satellites should consider when they should leave the 4/6 GHz band to the developing countries and utilize only the higher bands, e.g. in the beginning of the next century when the investment would be economically depreciated or reaching its physical end of life.

As this plausible migration to higher bands would not prevent the industrial countries to develop their satellite telecommunication market because of greater market opportunities offered through the wide and even distribution of the frequency spectrum, this gesture would benefit developing countries due to their unfavourable natural conditions which happen to be situated in the tropical zone with high rainfalls, causing high precipitation at around the 10 GHz band and above.

However, at the same time, multi-administration satellite systems such as INTELSAT and others could still occupy this crowded 4/6 GHz band for the benefit of many countries.

II. Planning principles

Any planning method should take into account the following planning principles:

1) the planning period should be suited to the lifetime of the satellite, which is around 10 years, taking into account that the existing system should not be subject to unacceptable modifications;

2) an existing system is defined as a system which is registered and/or operational;

3) it should support the development of satellite technology for the improvement of the orbit/spectrum capacity provided that such an improvement is within the reach of the majority of countries;

4) for the improvement of the orbit/spectrum capacity the inactive spare satellite should be located at the same orbital position as the operational satellite;

5) any modification of a satellite network to accommodate unforeseen needs or technological advancement, should take into account the difficulties faced by the affected countries.

III. Conclusions

1. The preferential rights of equatorial countries for the GSO superjacent to its country, which does not prevent any country, especially developing countries, to utilize it, should be recognized.

2. In order to guarantee equitable access for all countries, especially the developing countries, more stringent criteria for big users (e.g. having 5 to 10 or more satellites) should be implemented.

In the future (e.g. at the end of this century), the 4/6 GHz band should merely be provided to small user countries having around five satellites or less.

3. Room is available for planning methods, a priori as well as a coordination approach between various satellite systems.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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COMMITTEE 4

Japan

PARAMETERS SUITED FOR THE PLANNING EXERCISE

On Page 3, in the definition of $C_i^*(\phi)$,

$\phi \geqq$ Half Power Beam Width

should be replaced by:

$\phi \geqq$ the service area.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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COMMITTEES 4, 5

Japan

PARAMETERS SUITED FOR THE PLANNING EXERCISE

1. Introduction

For the simplification of interference calculation and for the development of planning softwares, the need for the minimal number of generalized parameters has been recognized and pointed out by some administrations. In accordance with the above requirement, this document proposes a possible selection of technical parameters which is able to provide an accurate result and yet allow a flexible design of satellite system.

2. Simplified C/I based on the power ratio

It is quite common that C/I is used for the precise evaluation of impairment due to interference. However, the computation of real "C/I" determined in each victim carrier band needs a precise information of individual carrier such as carrier power, type of modulation both for wanted and unwanted signals etc. This makes C/I difficult to be used in the planning exercise or in the harmonization purpose. On the other hand, the simplified C/I* defined in a unit of bandwidth which is merely derived from the ratio of interference power and received signal power can be used easily for our purpose yet gives a good approximation of rigorous C/I.

Taking into account the above situation, the simplified expression of C/I defined by the signal to interference power ratio is used throughout this document. The C/I is, therefore, given by the following expression.

---

* Simplified C/I is defined as the worst carrier to interference power ratio for a unit bandwidth when a weakest carrier in a certain bandwidth is allowed to be placed in an arbitrary position in that band.

$$(C/I)^{-1}_{ij} = \frac{P_{ej}\, G_{tj}(\theta_{ji})\, g_{ri}(\phi_{ij})}{P_{ei}\, G_{ti}(0)\, g_{ri}(0)} + \frac{p_{sj}\, g_{tj}(\phi_{ji})\, G_{ri}(\theta_{ij})}{p_{si}\, g_{ti}(0)\, G_{ri}(0)}$$

where

P_{ei} is the output power of the earth station antenna of system i,

P_{si} is the output power of the space station antenna of system i,

$G_{ti}(\theta_{ij})$ is the transmit antenna gain of the earth station antenna i in the direction of satellite j,

$G_{ri}(\theta_{ij})$ is the receive antenna gain of the earth station antenna i in the direction of satellite j,

$g_{ti}(\phi_{ij})$ is the transmit antenna gain of the space station antenna i in the direction of earth station j,

$g_{ri}(\phi_{ij})$ is the receive antenna gain of the space station antenna in the direction of earth station j.

3. <u>Modification of A, B, C, D parameters</u>

The A, B, C, D parameters originally proposed in the CCIR Interim Working Party 4/1 are known as one of the generalized technical parameters which can be used to reduce the potential inhomogeneity. These parameters are considered to help limit the inhomogeneity and yet expected to allow considerable flexibility in the design of satellite systems. However, observation on the definition of the A, B, C, D parameters suggests that the following two points must be reconsidered if they are to be used in the planning exercise.

1) The parameters A, B, C, D are originally considered to deal with the single entry interference environment. On the other hand, the mandatory requirement on the value of interference is based on the aggregation of interference. Therefore, it might be appropriate to modify the parameters in order to meet the aggregate interference environment.

2) In dealing with those kinds of generalized parameters, it would be appropriate to take into account the geographical conditions such as the size of the service areas. For example, if the size of the service area is larger, the gain of satellite antenna will be lower. This requires the transmit power of the earth station antenna to become higher in order to achieve certain C/N_0 if a same size of the earth station antenna is assumed.

If these observations are considered to be relevant, the following modifications might be appropriate:

1) in accordance with the observation 1), it would be appropriate to introduce the nature of aggregate interference into the parameters B and D;

2) in accordance with observation 2), it would be appropriate to consider parameter A (maximum permissible off-axis pfd) to be decided taking into account the size of the service area.

4. <u>Definition of A*, B*, C*, D* parameters</u>

As suggested in the previous section, it would be desirable to define a set of new parameters A*, B*, C* and D* which are suited for use with the aggregate interference criterion. For this purpose, the following parameters are proposed as one of the possible alternatives.

$A_i^*(\theta)$ The maximum up-path off-axis e.i.r.p. (for a certain bandwidth) in the direction of the geostationary orbit radiated at the angle θ to the axis of the main beam. The formulae can be given by the following.

$$A_i^*(\theta) = P_{ei} G_{ti}(\theta)$$

$$\theta \geqq 1^\circ$$

B_i^* The maximum permissible power of aggregate interference (measured in the defined bandwidth) at the output of the satellite receive antenna i with the reference side-lobe slope.

$C_i^*(\phi)$ The maximum down-path off-axis e.i.r.p. (for a certain bandwidth) in the direction of the earth surface radiated at the angle φ to the axis of the main beam. The formulae can be given by the following.

$$C_i^*(\phi) = p_{si} g_{ti}(\phi)$$

$$\phi \geqq \text{Half Power Beam Width}$$

D_i^* The maximum permissible power of aggregate interference (measured in the defined bandwidth) at the output of earth station antenna i with the reference side-lobe slope.

Using those expressions, the aggregate C/I of simplified form is given by the following form.

$$(C/I)_{ij}^{-1} = \frac{A_j^*(\theta_{ji})\, g_{ri}(\phi_{ij})}{P_{ei}\, G_{ti}(0)\, g_{ri}(0)} + \frac{C_j^*(\phi_{ji})\, G_{ri}(\theta_{ij})}{p_{si}\, g_{ti}(0)\, G_{ri}(0)}$$

Then the relation between parameters A*, B*, C* and D* can be now defined as follows.

$$\sum_j A_j^*(\theta_{ji})\, g_{ri}(\phi_{ij}) / l_{uji} \leqq B_i^*$$
$$\sum_j C_j^*(\phi_{ji})\, G_{ri}(\theta_{ij}) / l_{dji} \leqq D_i^*$$

where l_{uji} and l_{dji} represent the transmission loss of up-path and down-path from system j to i respectively.

The interpretation of the parameters A*, B*, C* and D* is similar to the A, B, C, D parameters, that is, A* and C* define the maximum interference to the other systems while B* and D* define the interference environment where the system is to be designed.

5. Use of new parameters for the planning

When a "plan" is to be established, the generalized parameters which define the plan must be flexible enough to allow the satellite system designer to choose suitable system parameters such as antenna size, transmit power etc. In addition to the flexible selection of system parameters, another important requirement for the generalized parameters is to allow the system designer to enjoy the benefit resulting from the use of improved characteristics such as side-lobe reduction of antennas. The following example procedure and the use of new parameters will be considered to provide such flexibility both in "a long term allotment plan" and "a multilateral planning".

For the "long term allotment plan":

1) define service areas for each country,

2) find a service arc for each system,

3) compute a suitable space station antenna gain for each system depending on the size of service area (multi-antennas will be accepted),

4) assume side-lobe reference patterns or their approximations both for satellites and earth stations,

5) assume similar size earth station antenna for each system; this value will not appear in the plan,

6) for the planning purpose, assume standard maximum and minimum e.i.r.p.s for each system; these values will not appear in the plan,

7) using the simplified C/I as the aggregate interference criterion, compute the optimum position of satellites where the worst C/I exceeds the lower limit,

8) based on the solution obtained above, compute the A*, B*, C*, D* parameters,

9) the positions and the associated A*, B*, C*, D* parameters are notified to each administration; these are considered as the planning parameters,

10) the administrations can be then included in the plan and are able to design their own systems provided that the A*, B*, C*, D* parameters be met.

By following the above procedure, a long term allotment plan which allows enough flexibility of system design will be created.

For the multilateral type planning:

1) for the evolutional planning, existing or already planned systems are requested to provide the A*, B*, C*, D* parameters; in addition, the e.i.r.p.s for the weakest density carrier will be also needed to compute the estimated aggregate C/I,

2) using this information and computing the simplified C/I, the locations of satellites or frequency assignments can be harmonized accordingly,

3) in the detail harmonization the frequency band can be segmented and the A*, B*, C*, D* parameters as well as the e.i.r.p.s can be given so as to represent the frequency assignment; this will allow the optimization of frequency assignment.

6. Conclusion

A set of generalized parameters A*, B*, C*, D* is proposed for possible planning approaches. The parameters have similar meaning as the previously studied A, B, C, D parameters but they are not exactly the same. They are compatible with the aggregate interference environment and yet allow a certain amount of freedom in the system designing. These characteristics would be desirable for the multilateral planning approaches and long term allotment plannings.

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COMMITTEE 4

Note from Chairman of Committee 5

Committee 5, at its third meeting, requested me to inform you on the provisional decisions contained in Document 140.

M. MENCHEN
Chairman of Committee 5

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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COMMITTEE 4

PAIRING OF FREQUENCY BANDS FOR NETWORKS OF THE FIXED-SATELLITE SERVICE

Working Group 4C has considered the pairing of frequency bands allocated to the FSS and has come to provisional conclusions, pending decisions of principle to be taken as a result of discussions in Committee 5.

These conclusions are set out in the Annex. It is suggested that they should be drawn to the attention of Committee 5 soon, since they may bear on any choice the Committee might make of pairs of frequency bands for planning.

D.J. WITHERS

Chairman of Working Group 4C

Annex: 1

ANNEX

1. Frequency band pairing

The typical fixed satellite service communication link involves transmission from an earth station to a space station and retransmission from the space station to another earth station. Accordingly, the ITU Table of Frequency Allocations allocates several frequency bands to the fixed satellite service for either Earth-to-space or space-to-Earth use. Although these frequency bands are used in pairs, the Radio Regulations do not require a satellite to use a specific Earth-to-space band with a specific space-to-Earth band. However, it is recognized that utilization of the GSO and the frequency spectrum would be more efficient, and coordination of networks would be facilitated, if specific Earth-to-space and space-to-Earth bands are designated in pairs.

Existing FSS systems show a high degree of standardization of frequency band pairing based mainly on frequency allocations as they existed before WARC-79, the difficulties of coordination with terrestrial services, and the requirements of the FSS themselves. It is clearly necessary that this existing situation be respected as much as possible and that due account is taken of the requirements of satellite networks for which other pairings are operationally essential.

Additional frequency bands newly allocated to the FSS at WARC-79 are being considered for the implementation of future satellite systems. Any band pairing arrangements in these additional frequency bands will have to take account of operational requirements of future fixed satellite systems, the different frequency allocations in the different regions, and the sharing constraints that exist in the relevant bands. Accordingly, any specific list of frequency pairings that can be developed should be used as a guide to be followed whenever feasible, and not as a regulatory requirement.

A number of technical considerations relating to the choice of bands for pairing are to be found in section 4.

2. Translation frequency for narrow-band satellites

Some satellites, for example satellites of the mobile-satellite services with feeder links in FSS bands, need to use only a part of the bandwidth of the allocated FSS band. In such cases the coordination of several narrow-band satellites occupying the same part of the GSO would be facilitated if all the satellites used the same effective translation frequency between the up-link and the down-link. In addition, it is desirable to keep to a minimum the number of translation frequencies.

3. Use of multiple frequency band pairs in satellites

In some satellite networks, it may be economically and operationally advantageous to use more than one pair of frequency bands; for example, to enable the working bandwidth of the network to be increased, to enable several different functions to be performed by one satellite, or to improve network connectivity by enabling communications to be established between users with different earth segments. Cross-strapping of transponders is essential for some applications and should not be prevented by any formal scheme of band pairing.

4. Conclusions and recommendations

The following list of technical considerations, should be taken into account when developing any list of frequency band pairings in studies of which frequency bands should be planned:

- The ratio of mid-band frequencies of up-link and down-link bands should preferably be not so great that antenna design is made difficult, nor so small that duplexer design is made difficult.

- The paired bands, which will not necessarily include the full bandwidth of frequency allocations, should in most cases have equal bandwidth, and the number of translation frequencies for the paired bands should be kept to a minimum.

- Where it is possible to avoid it, no frequency in one band should be a simple multiple of any frequency in its paired band.

- Pairings already well established in practice should be retained.

- To the extent that it is feasible and necessary, consideration should be given to feeder links, having due regard for present utilization by the FSS.

- Continuation of provision for the established practice of cross-strapping from one pair of bands to another in a multi-band satellite is necessary.

- ITU regional variations exist in the FSS allocations for Earth-to-space and space-to-Earth use.

Should Committee 5 so decide, additional studies may be undertaken during the intersessional period with a view to:

1) determining the potential value of frequency band pairings in the work of the Conference, and

2) providing, if possible, a specific list of FSS frequency band pairings which may be used as a guide for administrations to follow, to the extent possible, when designing and implementing future satellite systems,

for consideration by WARC ORB(2).

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COMMITTEE 5
WORKING GROUP 5B

Brazil

REVISION OF THE EXISTING PROCEDURES

B/160/24 The following are proposals for guidelines to revisions of the appendices used in connection with the procedures of Articles 11, 13 and 14 of the Radio Regulations.

a) Appendices 3 and 4

For the sake of simplicity, both appendices should be merged into one single form of notice (named Appendix 3/4) to be prepared under the assumption that information on a satellite network would not be provided on a "frequency assignment" basis (as for the current Appendix 3), but rather, on a "satellite network" basis (as for the current Appendix 4), with a clear identification of the beams in the network.

For purposes of sending information to Advance Publication, only some pertinent items of the new Appendix 3/4 would be provided (data for general information on the network and for Appendix 29 calculations, mainly). For the purposes of coordination under Article 11 or 14 and notification under Article 13, additional information needed for coordination must be provided, complementing the data covered by the Advance Publication information; this additional information should be included in the new appendix. In such cases, more details about the satellite network are given and the formal coordination process can be initiated.

b) Appendices 28 and 29

Guidelines should be given to the intersessional work in view of simplifying as much as possible the method and application of these appendices (especially Appendix 28).

These guidelines should include:

- to make texts the simplest and most straightforward as possible, still allowing the comprehension of the technical basis of the methods used;
- to reduce the technical complexity and to adopt measures to have more realistic results.

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WORKING GROUP 5A

Note by the Secretary-General

USE OF THE TERMS "ASSIGNMENT" AND "ALLOTMENT"
AS PERTAINING TO THE FREQUENCY PLANS

At the request of the IFRB, I transmit the attached IFRB Report to the WARC-ORB(1) concerning the use of the terms "assignment" and "allotment" as pertaining to the frequency plans, for the information of Working Group 5A.

R.E. BUTLER
Secretary-General

Annex: 1

IFRB REPORT TO THE WARC-ORB(1)
CONCERNING THE

USE OF THE TERMS "ASSIGNMENT" AND "ALLOTMENT"
AS PERTAINING TO THE FREQUENCY PLANS

The Region 2 BC-SAT Conference requested this Conference through its Recommendation No. 7 (SAT-R2) to interpret the terms "allotment" and "assignment". When this matter was discussed in the SAT-R2 Conference, 1983, the Board prepared a document giving its view on the matter in so far as the planning of the Broadcasting-Satellite Service was concerned. The above-mentioned document and Recommendation are reproduced in Annexes B and C, respectively, to the IFRB Report contained in Document 4 of this Conference.

2. Working Group 5A requested the Board to prepare a document presenting its views on the meaning of the above terms within the framework of discussions on planning methods for the Fixed-Satellite Service.

3. As indicated in Annex B to Document 4, in the case of the planning of the Broadcasting-Satellite Service, only one case may properly be considered as an allotment plan; this is the case of the feeder links where an administration may assign frequencies to several earth stations within the allotted band/service area.

4. The definition of the term "allotment", contained in RR18, was originally developed for terrestrial services and, despite the reference to space services, is more appropriate for terrestrial services as it was intended to cover allotment plans existing for the aeronautical mobile and the maritime mobile services (Appendices 25, 26 and 27 to the Radio Regulations). As an example of these plans, in Appendix 25 each entry indicates the channel allotted to a number of countries or geographical areas together with the relevant observations, if any. Each Administration concerned has the possibility to assign the allotted channel to any coast station which is located within the country or geographical area (allotment area) under its jurisdiction.

5. In the case of assignment plans such as Appendix 30, or Regional Broadcasting Plans, each entry contains the frequency assigned to each station, together with the pertinent characteristics, such as those listed in Appendix 1 of the Radio Regulations for the MF BC Plan, augmented by other detailed characteristics decided by the planning conference concerned. If the administration concerned wishes to modify any of the basic characteristics, it has to apply the modification procedure contained in the relevant Agreement.

6. With these examples in mind, similar applications to fixed-satellite services would lead to the following:

- assignment plan: such a plan should contain for each entry (satellite network) at least the characteristics listed in Appendix 3 for the space station as well as to each earth station pretaining to the network; this may however be simplified by fixing typical characteristics for the earth stations and indicating the geographical area in which these earth stations may be situated;

- <u>allotment plan</u>: the Board is of the view that the present definition of RR18 cannot fully satisfy the needs of an allotment plan for the Fixed-Satellite Service. The Conference may have to create a new definition, or modify the existing definition. Provided that appropriate regulatory and technical procedures can be developed to assess the compatibility between two allotments, such allotments may be limited for a satellite network to the following information:

  - an orbit arc within which the space station may be located,
  - a bandwidth that may be used within a given frequency band,
  - the service area(s) where the transmitting and/or receiving earth stations may be located.

Should other characteristics be added, they will certainly facilitate the assessment of compatibility but will probably reduce the flexibility of the plan.

7. It may be easily understood that an assignment plan for the FSS would permit more precise calculation of incompatibilities and would lead to a better use of the spectrum/orbit resources. The Board is of the view that in order to reduce the limitations of an allotment plan, two actions are required; on the one hand, the development of detailed regulatory and technical procedures and, on the other hand, restrictions on the variable parameters (such as limited service arc and service area).

INTERNATIONAL TELECOMMUNICATION UNION

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COMMITTEE 6

Report of Working Group 6B to Committee 6

SELECTION OF FREQUENCY BANDS FOR WHICH THE FREQUENCY PLAN SHOULD BE ESTABLISHED FOR FEEDER LINKS

1. Introduction

Agenda item 3.1 of WARC-ORB 85 requests the present session of the Conference to select from among the frequency bands listed in resolves 1 of Resolution No. 101 of WARC-79 those bands for which frequency plans should be established for feeder links.

2. Recapitulation of available frequency bands for planning

The following frequency bands are available for planning the broadcasting-satellite feeder links (see Resolution No. 101).

Region 1		Region 3
10.7 - 11.7 GHz		
14.5 - 14.8 GHz	limited to countries outside Europe and to Malta	14.5 - 14.8 GHz
17.3 - 18.1 GHz		17.3 - 18.1 GHz

3. Conclusions of Working Group 6B

3.1 Working Group 6B proposes, with reference to agenda item 3.1, the following selection of bands to be planned for feeder links:

- a priori planning of bands 14.5 - 14.8 GHz (for countries outside Europe and for Malta) and 17.3 - 18.1 GHz;

- no planning for the band 10.7 - 11.7 GHz.

3.2 Working Group 6B also proposes the inclusion of recommendations in the report of the first session with a view to:

- advising administrations in preparing their requirements;

- giving guidelines for the second session of the Conference for the elaboration of the Plan.

3.3 These recommendations are as follows:

3.3.1 In formulating their requirements, administrations are urged to use the band 17.3 - 18.1 GHz as far as possible, in the light of the following factors:

3.3.1.1 The 14.5 - 14.8 GHz band which has a width of 300 MHz would probably be inadequate to provide feeder links for all the channels in Appendix 30.

3.3.1.2 From the point of view of economy it would be disadvantageous for a given country to have some of its feeder links in one band and the rest in another. This may be irrelevant if an administration wishes to set up only some of its feeder links.

3.3.1.3 Exclusive use of the band 17.3 - 18.1 GHz for feeder links leaves more scope for the fixed and mobile services sharing the band 14.5 - 14.8 GHz on a primary basis with the FSS. It would be advantageous to concentrate all feeder links (or as many as possible) in one band. This is only possible in the band 17.3 - 18.1 GHz, which was also selected by Region 2 in the RABC-83 Plan.

3.3.1.4 Recent estimates supplied by one administration show that on average the feeder-link carrier-to-noise ratio for the band 14.5 - 14.8 GHz is 1.5 dB higher than for systems in the band 17.3 - 18.1 GHz, because of athmospheric propagation conditions.

3.3.2 For planning, the second session of the Conference should follow the following guidelines:

3.3.2.1 For countries requesting to use the band 17.3 - 18.1 GHz and countries not expressing any choice of frequencies, planning should start by using only the band 17.3 - 18.1 GHz in Region 1 and 17.3 - 17.8 GHz in Region 3.

The band 17.8 - 18.1 GHz may be used in Region 3 if the band 17.3 - 17.8 GHz should prove insufficient and in order to provide additional planning flexibility.

3.3.2.2 The band 14.5 - 14.8 GHz should be planned for Region 3 and Region 1 (for countries outside Europe and for Malta) countries which specifically request to use it.

3.3.2.3 In the band 14.5 - 14.8 GHz, the number of channels per beam should be restricted to a number less than in the down-link Plan whenever necessary because of the limited bandwidth.

3.3.2.4 Account should be taken of the protection of the fixed and mobile services sharing the bands, particularly in regions where the band 14.5 - 14.8 GHz is used most intensively.

D. SAUVET-GOICHON
Chairman of Working Group 6B

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 163-E
26 August 1985
Original: French

AD HOC WORKING GROUP OF THE PLENARY
COMMITTEES 3, 4, 5 AND 6

NOTE BY THE CHAIRMAN OF THE AD HOC WORKING GROUP OF THE PLENARY

The proposals which fall within the terms of reference of the ad hoc Working Group of the Plenary (Document 79), as listed in Document DT/14, have been analyzed and grouped together according to the subjects covered by the various Sub-Working Groups of the ad hoc Working Group. The terms of reference of each Sub-Working Group, together with the corresponding proposals, are set out in Documents DT/37 and DT/38.

The Chairman of Committees 3, 4, 5 and 6 are requested to analyze the proposals submitted as soon as possible in their respective Committees and to convey their suggestions to the ad hoc Working Group of the Plenary in order that we may complete our work as soon as possible.

L. CONSTANTINESCU
Chairman of the ad hoc Working Group
of the Plenary

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 164-E
23 August 1985
Original: English

COMMITTEES 4 AND 5

United States of America

TWO REAL PROBLEMS WITH A PRIORI PLANNING

INTRODUCTION

Proponents of an a-priori plan have recognized the merit of making unused orbit locations available to alternative user administrations on an interim basis. Some of their proposals reflect this view. In addition, the value of multi-administration systems (regional or subregional) is also recognized, not only as a permanent arrangement, but also as an interim, cost-effective solution for the satisfaction of early requirements. Most countries advocating a-priori planning also assert that future multi-administration systems can also be accommodated in the orbit allocation scheme.

THE PROBLEM OF THE TRANSFER OF ORBITAL ASSIGNMENTS

An a-priori plan inherently resists the kind of interim arrangements described above. The difficulty is created by the geometry of the relationship between orbit location assignments and their associated service areas. Figure 1 gives a simple model of four representative service areas (countries) A, B, C, and D as shown with the corresponding orbit location assignments a, b, c, and d. Let us examine an attempt to transfer the orbit assignment a of country A to any of the other three countries.

In Figure 1, the assumption is that the country pairs A-C and B-D would each have closely-spaced orbit assignments since their service areas are well separated; and that the assignment pairs a,c are also well separated on the orbit from the assignment pairs b,d to account for the closeness of the service area pairs A-B, B-C, and C-D. For a well-designed plan and, in any case, to accommodate all requirements, this latter spacing would not be greater than required for co- or adjacent-coverage networks.

The following describes what happens when an attempt is made to transfer the assignment a of country A to any of the other countries:

1. Transfer Orbit Assignment a to Country B. At first glance, this is fine as far as country B is concerned. However, since assignment a is close to assignment c, the proximity between service areas B and C reduces the satellite antenna discrimination to near zero, and the small satellite spacing alone is insufficient to provide the necessary isolation between the network using service area C and the proposed network using service area B and orbit location a.

2. Transfer Orbit Assignment a to Country C. This may appear to be a potential boon for country C to have two orbit assignments at its disposal. However, unfortunately, the situation is potentially worse. This is because the service area used for a is now congruent with that used by c. Geometric isolation is zero.

3. Transfer Orbit Assignment a to Country D. Again, no luck. The service area D is also adjacent to service area C and thus cannot tolerate the proximity in orbit of the assignments c and a.

The problems outlined above are, in a real a-priori plan, not just two- but three-dimensional since service areas and associated orbit locations are not as well aligned as in the example. This will generally produce a more complex interference situation, affecting not only one other network but several.

Logic dictates, perhaps better than geometrical models, that orbital assignment transfers are not really possible in an a-priori plan. Thus, one can argue that if an orbit assignment were transferable, a gap would exist in the plan; i.e., the transfer should actually be part of the plan unless positions had intentionally been left open.

THE PROBLEM OF ACCOMMODATING FUTURE MULTI-ADMINISTRATION SYSTEMS

The same problem which makes orbital assignments in an a-priori plan basicallly non-transferable also makes it difficult to consolidate locations for the purpose of creating a new multi-administration network. Basically, multi-administration network would have to be built into an a-priori plan from the beginning and could not be formed on demand at a later time.

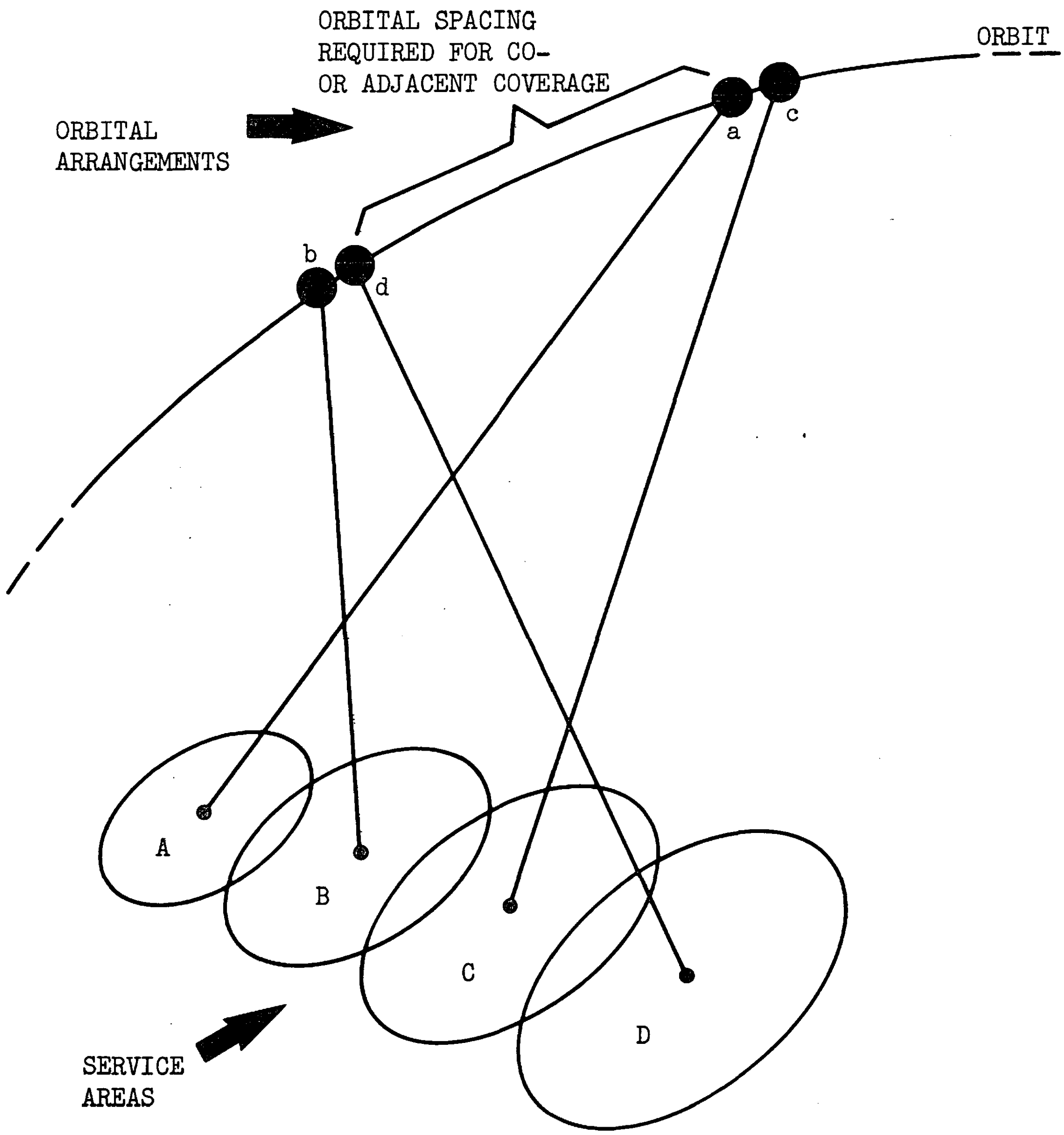
ORBITAL SPACING
REQUIRED FOR CO-
OR ADJACENT COVERAGE
ORBIT
ORBITAL
ARRANGEMENTS
a
c
b
d
A
B
C
D
SERVICE
AREAS

FIGURE 1

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INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 165-E
23 August 1985
Original: French

AD HOC PLENARY GROUP
COMMITTEE 5
COMMITTEE 6

France

PROPOSAL FOR THE WORK OF THE CONFERENCE

1. Introduction

Items 5.2 and 5.3 of the agenda of WARC-ORB 85 state that the first session "shall specify the preparatory actions required to be completed before the commencement of the second session of the Conference" and "recommend a draft agenda for the second session of the Conference for consideration by the Administrative Council".

2. Reasons

Considering Article 33 of the International Telecommunication Convention, Nairobi, 1982;

considering that requirements for feeder links to broadcasting-satellites operating in the bands 11.7 - 12.5 GHz in Region 1 and 11.7 - 12.2 GHz in Region 3 will be satisfied by the planning decided by the Conference.

3. Proposal

The French Administration proposes:

F/165/21 The following item should be included in the agenda of the second session of the Conference:

> to amend the relevant articles and Resolutions of the Radio Regulations so that feeder links to broadcasting satellites operating in the bands 11.7 - 12.5 GHz in Region 1 and 11.7 - 12.2 GHz in Region 3 only use the fixed-satellite service bands planned for the purpose.

4. Work to be carried out

The preparatory actions to be specified under item 5.2 of the agenda of the first session will include all the technical and administrative work to prepare for implementation of the amendments to the Radio Regulations proposed in the agenda of the second session.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Addendum 2 to Document 166-E
7 September 1985
Original: English

Republic of Trinidad & Tobago

The Delegation of the Republic of Trinidad & Tobago wishes to associate itself with the joint position set out in Document 166.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Addendum 1 to
Document 166-E
27 August 1985
Original: English

COMMITTEE 5
WORKING GROUP 5A

Gabon, Morocco, Nigeria, Turkey

PROPOSALS FOR THE WORK OF THE CONFERENCE

The Delegations of Nigeria, Morocco, Gabon and Turkey wish to associate themselves with the joint position set out in Document 166.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 166-E
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COMMITTEE 5
WORKING GROUP 5A

Algeria, Federal Republic of Germany, Austria, Burkina Faso, Cameroon, Chile, Ivory Coast, Ethiopia, Ghana, Greece, Kenya, Liberia, Malawi, Mali, Mexico, Paraguay, Portugal, Syria, San Marino, Senegal, Switzerland, Tanzania, Chad, Tunisia, Yugoslavia

CONSIDERATION ON THE REQUIREMENTS OF THE INTERNATIONAL MULTILATERAL INTERGOVERNMENTAL ORGANIZATIONS

The above-named Administrations, noting the vital role played by international multilateral intergovernmental satellite telecommunications organizations and in the firm belief that many other administrations will share their views, recommend the adoption by the Conference of the planning principle set forth below as an important contribution to achieving the objectives of Resolution No. 3 of WARC-1979.

General observations

1. International multilateral intergovernmental organizations offer and will continue to offer many countries the means to meet their requirements for international telecommunications satellite services on an efficient and affordable basis. Such organizations also enable countries to meet their requirements for domestic services until such time as they may decide to acquire and operate a national or regional system.

2. Global multilateral intergovernmental organizations have provided satellite telecommunications to most Members of the ITU. They must remain able to provide services to all Members of the ITU so desiring.

3. Regional multilateral intergovernmental organizations, which provide space facilities designed to respond to the particular needs of groups of countries linked by special relationships, provide international services between their members which complement other international services available to them through participation in global organizations.

4. For some years in the future many countries may choose to meet their requirements for domestic satellite services through multilateral intergovernmental organizations. For other countries, such organizations will remain for some time the sole means available to meet their domestic requirements.

5. Because the networks of multilateral intergovernmental organizations meet the combined requirements for international and domestic services of many nations, use by such networks of orbital and frequency resources represents an efficient means of utilizing these resources which contributes to assuring continued availability of orbital and spectrum resources to meet the requirements of present and future national and regional systems.

6. Certain spectrum resources and orbital locations within specific arcs are essential in order for such organizations to continue to meet their responsibilities to their members and users.

COMP/166/1 a) <u>International services</u>

The principles of whatever plan or planning approach is adopted by WARC-ORB(1) should provide for a special recognition to be defined by WARC-ORB(1) with respect to present and future requirements for certain spectrum resources and orbital locations necessary to provide international services, to global and regional multilateral organizations created by intergovernmental agreement and characterized by cooperative sharing of telecommunications satellite space segment facilities and joint decision making.

COMP/166/2 b) <u>National services</u>

The principles of whatever plan or planning approach is adopted by WARC-ORB(1), should recognize that the present and future frequency and orbital requirements of those multilateral organizations, as described under paragraph a), which are necessary to provide domestic services for some countries, be treated on a basis of equality with the requirements of other countries planning to operate, now or in the future, their own national systems to provide domestic services in their own territories.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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WORKING GROUP 6A

Note by the Secretary-General

REPORT BY THE IFRB TO THE WARC-ORB(1)
ON INTERREGIONAL SHARING BETWEEN THE
BROADCASTING-SATELLITE SERVICES OF REGION 2
AND THE SERVICES OF REGIONS 1 AND 3
(Energy dispersal requirement per Document DT/40)

At the request of the IFRB, I transmit the attached Report on Interregional Sharing between the Broadcasting-Satellite Services on Region 2 and the Services of Regions 1 and 3, for the information of Working Group 6A.

R.E. BUTLER
Secretary-General

Annex: 1

ANNEX

Report by the IFRB to the WARC-ORB(1) on Interregional Sharing between the Broadcasting-Satellite Services of Region 2 and the Services of Regions 1 and 3

(Energy dispersal requirement per Document DT/40)

The IFRB received a request from Working Group 6A (reference Document DT/40) to carry out PFD calculations to identify those assignments in the Region 2 BSS Plan which do not exceed the value of -138 dBW/m^2/24 MHz on the territory of administrations of Regions 1 and 3, and to further establish the required level of energy dispersal to meet a limit criteria of -160 dB(W/m^2/4 KHz). These calculations were done using the test point file of Table 6 of Document 48 with the result that 31 beam assignments of 22 administrations were identified as not exceeding the level of -138 dBW/m^2/24 MHz. The maximum value of PFD, the associated test point, and the resultant energy dispersal requirements for each beam are presented in Table 1.

TABLE 1

Energy dispersal evaluation

Region 2 (SAT-83) plan beams not exceeding -138 dBW/m^2

NAME	MAXIMUM P.F.D				EXCESS OVER LIMIT -160 dBW/m^2
	dBW/m^2	LONG	LAT	ADM	
ARGINSU4	-140.57	015W00	08S00	ASC	19.43
ATGSJN01	-140.29	029W00	38N30	AZR	19.71
BERBER02	-143.06	029W00	38N30	AZR	16.94
BLZ00001	-147.02	170W00	66N00	URS	12.98
CAN01405	-138.00	015W00	08S00	ASC	22.00
CHLCONT4	-139.75	029W00	38N30	AZR	20.25
CHLCONT5	-142.19	029W00	38N30	AZR	17.81
CHLCONT6	-138.85	130W00	25S00	PTC	21.15
CHLPAC02	-144.00	029W00	38N30	AZR	16.00
CRBBLZ01	-143.64	023W00	63N00	ISL	16.36
CRBJMC01	-139.09	029W00	38N30	AZR	20.91
CYM00001	-145.19	127W00	08S00	TKL	14.81
DMAIFRB1	-140.35	029W00	38N30	AZR	19.65
EQAGAND1	-140.43	127W00	08S00	TKL	19.57
EQAG0001	-139.83	127W00	08S00	TKL	20.17
GRD00003	-140.83	024W00	16N00	CPV	19.17
GRD00059	-143.06	029W00	38N30	AZR	16.94
GTMIFRB2	-138.75	029W00	38N30	AZR	21.25
JMC00002	-140.20	029W00	38N30	AZR	19.80
JMC00005	-143.39	029W00	38N30	AZR	16.61
LCAIFRB1	-140.99	029W00	38N30	AZR	19.01
MSR00001	-139.86	029W00	38N30	AZR	20.14
PAQPAC01	-139.95	130W00	25S00	PTC	20.05
PRG00002	-138.19	024W00	16N00	CPV	21.81
PTRVIR02	-144.92	127W00	08S00	TKL	15.08
SCN00001	-140.17	029W00	38N30	AZR	19.83
SLVIFRB2	-139.27	029W00	38N30	AZR	20.73
TCA00001	-147.00	170W00	66N00	URS	13.00
TRD00001	-139.32	024W00	16N00	CPV	20.68
VCT00001	-141.17	029W00	38N30	AZR	18.83
VRG00001	-140.72	029W00	38N30	AZR	19.28

INTERNATIONAL TELECOMMUNICATION UNION

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FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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26 August 1985
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WORKING GROUP 6A

Note by the Secretary-General

REPORT BY THE IFRB TO THE WARC-ORB(1)
ON INTERREGIONAL SHARING BETWEEN THE
BROADCASTING-SATELLITE SERVICES OF REGION 2
AND THE SERVICES OF REGIONS 1 AND 3
(pfd limits per Document DT/46)

At the request of the IFRB, I transmit the attached report on Interregional Sharing between the Broadcasting-Satellite Services of Region 2 and the Services of Regions 1 and 3, for the information of Working Group 6A.

R.E. BUTLER
Secretary-General

Annex: 1

ANNEX

Report by the IFRB to the WARC-ORB(1) on Interregional Sharing between the Broadcasting-Satellite Services of Region 2 and the services of Regions 1 and 3

(pfd limits per Document DT/46)

At the request of Working Group 6A, the IFRB has carried out pfd calculations for the Region 2 BSS Plan to determine the potential incompatibilities that may exist with respect to the criteria established in Document DT/46.

Three separate test point files were created, one containing those Region 3 test points contained in Table 6 of Doc. 48, and two others for the countries mentioned in RR848 and RR850. These latter two files contain the points already given in Table 6 of Doc. 48 supplemented with some additional points provided by administrations and with test points for countries which previously had none in the table.

The test point file for the countries of Region 3 and for those mentioned in RR848 and RR850 are presented in Tables I, II and III, respectively.

The results of these calculations show that the limit criteria is exceeded by only one beam and this at only one test point, as follows:

BEAM	PFD VALUE				DT/46 CRITERIA		EXCESS PFD (DB)
	dBW/m2	LONG	LAT	ADM	ARRIV. ANGLE	LIMIT	
ALS00002	-133.14	150E00	75N00	URS	2.1	-134.53	1.39

TABLE 1

<u>Test points of Region 3 used for calculations in accordance with DT/46</u>

115E00	30S00	AUS
120E00	20S00	AUS
120E00	30S00	AUS
125E00	20S00	AUS
125E00	30S00	AUS
130E00	20S00	AUS
130E00	30S00	AUS
135E00	20S00	AUS
135E00	30S00	AUS
140E00	20S00	AUS
140E00	30S00	AUS
140E00	37S00	AUS
145E00	20S00	AUS
145E00	30S00	AUS
145E00	38S00	AUS
147E00	42S00	AUS
148E00	20S00	AUS
150E00	30S00	AUS
150E00	37S00	AUS
153E00	30S00	AUS
159E00	55S00	AUS
115E00	05N00	BRU
140E00	12S00	CAR
150E00	12S00	CAR
110E00	20N00	CHN
110E00	30N00	CHN
115E00	30N00	CHN
120E00	26N00	CHN
120E30	30N00	CHN
123E00	53N00	CHN
127E00	50N00	CHN
134E00	48N00	CHN
158W00	20S00	CKH
135W00	23S00	F
140W00	10S00	F
149W00	18S00	F
178E00	18S00	FJI
145E00	13N00	GUM
114E00	22N15	HKG
176W40	00N50	HWL
110E00	00N00	INS
110E00	08S00	INS
115E00	00N00	INS
120E00	00N00	INS
120E00	10S00	INS
125E00	00N00	INS
125E00	10S00	INS
130E00	00N00	INS
140E00	05S00	INS
141E00	35N00	J
160W00	00S00	JAR
150W00	10S00	KIR
173E00	01N00	KIR
127E00	35N00	KOR
128E30	40N00	KRE
113E00	22N00	MAC
108E00	04N00	MLA
146E00	17N00	MRA
170E00	10N00	MRL
165E30	22S00	NCL
166E00	01S00	NRU
160W00	10S00	NZL
167E00	45S00	NZL
169E00	52S00	NZL
172E00	43S00	NZL
173E00	34S00	NZL
175E00	40S00	NZL
119E00	10N00	PHL
121E30	15N00	PHL
123E30	10N00	PHL
162W00	05N00	PLM
150E00	10S00	PNG
155E00	05S00	PNG
160E00	10S00	PNG
130W00	25S00	PTC
171W30	12S00	SMO
127W00	08S00	TKL
175W00	20S00	TON
180E00	10S00	TUV
163E00	12N30	USA
167E00	15S00	VUT
168E00	19N30	WAK
177W00	13S30	WAL

TABLE 2

Test points in countries mentioned in RR848 used for calculations in accordance with DT/46

013E12	10S00	AGL
020E00	10S00	AGL
000W00	30N00	ALG
002E50	20N00	ALG
002E53	30N35	ALG
002W12	35N05	ALG
003E13	36N48	ALG
005E00	20N00	ALG
005E00	30N00	ALG
005E38	22N00	ALG
005E45	19N35	ALG
008E10	27N40	ALG
008E25	36N53	ALG
008W00	28N00	ALG
009E34	28N02	ALG
040E00	20N30	ARS
040E00	30N00	ARS
051E00	25N00	BHR
015E00	05N00	CAF
020E00	07N00	CAF
009E00	05N00	CME
010E00	02N30	CME
015E00	10N00	CME
015E00	00N00	COG
005W00	10N00	CTI
025E00	30N00	EGY
025E30	22N30	EGY
030E00	30N00	EGY
035E00	30N00	EGY
035E00	10N00	ETH
040E00	10N00	ETH
010E00	00N00	GAB
000W00	10N00	GHA
001W00	06N00	GHA
010W00	10N00	GUI
014W30	10N00	GUI
038E00	33N00	IRQ
044E00	33N00	IRQ
045E00	37N00	IRQ
048E00	30N00	IRQ
035E00	32N00	ISR
037E00	30N00	JOR
035E00	00N00	KEN
040E00	00N00	KEN
048E00	29N00	KWT
036E00	34N00	LBN
010E00	26N00	LBY
010E00	30N00	LBY
015E00	30N00	LBY
020E00	21N30	LBY
020E00	30N00	LBY
044E00	25S00	MDG
050E00	14S00	MDG
000W00	20N00	MLI
005W00	20N00	MLI
011W00	14N00	MLI
090E00	50N00	MNG
103E00	45N00	MNG
120E00	47N00	MNG
005W00	30N00	MRC
010W00	30N00	MRC
002E00	14N00	NGR
010E00	20N00	NGR
005E00	10N00	NIG
010E00	10N00	NIG
015E00	20N00	NIG
051E00	25N00	QAT
022E00	13N00	SDN
025E00	10N00	SDN
025E00	20N00	SDN
030E00	10N00	SDN
030E00	20N00	SDN
035E00	20N00	SDN
017W00	13N00	SEN
041E00	00N00	SOM
051E00	12N00	SOM
037E00	36N00	SYR
014E30	14N00	TCD
016E00	09N00	TCD
020E00	10N00	TCD
020E00	20N00	TCD
001E00	06N00	TGO
054E00	23N00	UAE
044E00	13N00	YMS
046E00	16N00	YMS
013E00	05S00	ZAI
018E00	00N00	ZAI
020E00	00N00	ZAI
023E00	10S00	ZAI
025E00	00N00	ZAI
025E00	10S00	ZAI

TABLE 3

Test points in countries mentioned in RR850 used for calculations in accordance with DT/46

010E00 47N00 AUT	023E00 50N00 POL	140E00 55N00 URS
013E00 47N00 AUT	023E00 54N00 POL	140E00 60N00 URS
015E00 47N00 AUT	013E00 50N00 TCH	140E00 65N00 URS
015E00 48N00 AUT	015E00 50N00 TCH	140E00 70N00 URS
023E00 42N00 BUL	017E00 48N00 TCH	150E00 46N00 URS
023E00 44N00 BUL	020E00 48N00 TCH	150E00 60N00 URS
025E00 42N00 BUL	025E00 50N00 URS	150E00 65N00 URS
025E00 44N00 BUL	030E00 50N00 URS	150E00 70N00 URS
027E00 42N00 BUL	030E00 60N00 URS	150E00 75N00 URS
027E00 44N00 BUL	035E00 50N00 URS	155E00 50N00 URS
011E00 51N00 DDR	035E00 60N00 URS	160E00 55N00 URS
013E00 51N00 DDR	040E00 50N00 URS	160E00 60N00 URS
013E00 53N00 DDR	040E00 60N00 URS	160E00 65N00 URS
013E00 54N00 DDR	120E00 50N00 URS	160E00 70N00 URS
014E00 52N00 DDR	120E00 55N00 URS	169E00 54N00 URS
017E00 47N00 HNG	120E00 60N00 URS	170E00 60N00 URS
020E00 46N00 HNG	120E00 65N00 URS	170E00 65N00 URS
020E00 46N30 HNG	120E00 70N00 URS	170W00 66N00 URS
020E00 47N00 HNG	130E00 50N00 URS	171E00 69N00 URS
023E00 48N00 HNG	130E00 55N00 URS	173W00 64N00 URS
015E00 52N00 POL	130E00 60N00 URS	180E00 65N00 URS
015E00 54N00 POL	130E00 65N00 URS	180E00 68N00 URS
020E00 50N00 POL	130E00 70N00 URS	
020E00 54N00 POL	140E00 50N00 URS	

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 **WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT**

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 169-E
26 August 1985
Original: English

WORKING GROUP 6B

Yugoslavia (Socialist Federal Republic of)

CONCERNING FEEDER LINK SERVICE AREA OF BSS

For the expanded document of the Final Report, Yugoslavia proposes that, in Document DT/25(Rev.2), page 2, Note 4, part iii) be replaced with the following text:

YUG/169/11 "iii) Within the national territory of one or more administrations in agreement of serving downlink beam of another administration under the same agreement. To resolve incompatibilities in planning, cases i) and ii) will be protected in meeting their requirements against cases set in iii) of this note."

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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WORKING GROUP 6B

Yugoslavia (Socialist Federal Republic of)

CONCERNING INTERSESSIONAL ACTIVITIES RELATING TO THE PLANNING OF FEEDER LINKS FOR BSS IN REGIONS 1 and 3

YUG/170/12 Referring to Document DT/45, Yugoslavia proposes that a provision be made in submitting requirements for administrations to specify suggested adjustment frequency for feeder link channel assignments at GSO of that administration.

YUG/170/13 Henceforth, Yugoslavia also proposes that for the first intersessional planning exercise the Board performs trial planning for all cases using linear frequency translation in the 17 GHz band followed by additional results in cases in which a suggested adjustment frequency for channel assignments is specified.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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BUDGET CONTROL COMMITTEE

Note by the Secretary-General

POSTITION OF THE CONFERENCE ACCOUNTS

at 23 August 1985

I hereby submit an estimate of the Conference expenses at 23 August 1985 for the consideration of the Budget Control Committee.

The statement shows a surplus of 74,000 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

R. Prélaz

20 August 1985

Position of WRAC-ORB 1985 accounts at 23 August 1985

Items	Budget approved by AC	Budget adjusted at 1.07 1)	Expenditure at 23.8.1985		
			actual	estimated or committed	total
		- Swiss francs (thousands) -			
Subhead I - Preparatory work					
11.521 IFRB preparatory work 2)	152	164	120	75	195
Subhead II - Staff expenditure					
11.531 Salaries and related expenses	1,500	1,598	17	1,520	1,537
11.532 Travel	107	107	7	103	110
11.533 Insurance	41	41	0	34	34
	1,648	1,746	24	1,657	1,681
Subhead III - Premises and equipment					
11.541 Premises, furniture, machines	90	90	9	76	85
11.542 Document production	120	120	58	50	108
11.543 Office supplies and overheads	40	40	24	15	39
11.544 PTT	165	165	13	150	163
11.545 Technical installations	20	20	0	0	0
11.546 Sundry and unforeseen	10	10		10	10
	445	445	104	301	405
Subhead IV - Other expenses					
11.551 Report to the second session	20	20		20	20
Total, Section 11.5/1985	2,265	2,375	248	2,053	2,301
Unused credits					74

1) Budget, including additional credits to take account of changes in the United Nations common system.

2) Credit intended mainly to meet expenditure relating to the creation of a P.4/P.5 post from 1 April 1984 until the end of the second session in 1988.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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BUDGET CONTROL COMMITTEE

Note by the Secretary-General

WORK BETWEEN THE FIRST AND SECOND SESSIONS OF WARC-ORB

Document 44 relating to "Financial responsibilities of Administrative Conferences" provided information that the Administrative Council, after consideration of various factors, made provision for a lump sum of 900,000 Swiss francs for intersessional work in the 1986 Budget. This amount can only be used by the decision of this Conference, through the Budget Control Committee, pending the 41st session of the Administrative Council in 1986. Credits for any computing power resorces have not been included in this lump sum.

The text of the Administrative Council Resolution No. 931 concerning the Budget of the Union is reproduced in Annex 1, in accordance with a request from Committee 3. In the consideration of the credits assigned by the Administrative Council for intersessional work, the Council was aware of the limits provided in the Financial Protocol by the Plenipotentiary Conference for the various elements of activity assigned with the WARC-ORB (two sessions) and preparatory, intersessional and immediate post-conference work. When examining the question of intersessional work in 1986 in preparation for the second session, the Budget Control Committee will wish to know the situation as regards expenditure provided for in the ceilings laid down by the Plenipotentiary Conference in Additional Protocol No. 1. The relevant information is given in Annex 2.

Additional background information is provided in page 4 of Document 44 (extract of Administrative Council Document 40/6327).

R.E. BUTLER

Secretary-General

Annexes: 2

ANNEX 1

RESOLUTION

(approved at the 10th Plenary Meeting)

R No. 931 BUDGET OF THE INTERNATIONAL TELECOMMUNICATION UNION FOR 1986

The Administrative Council,

in view of

254 of the International Telecommunication Convention, Nairobi, 1982,

having considered

the reports of the Secretary-General and the decisions of the Finance Committee, the Staff Committee, the Technical Cooperation Committee and the Plenary Meeting of the Council;

having regard to

Additional Protocol I to the Nairobi Convention, 1982, which sets out the conditions governing the establishment of the annual Union budgets for 1986;

resolves

1. to approve the budgets for 1986, namely :

1.1 the Union budget amounting to 101,429,000 Swiss francs ;

1.2 the budget of regional conferences amounting to 2,858,000 Swiss francs ;

1.3 the Technical Cooperation special accounts budget amounting to 10,707,000 Swiss francs;

1.4 the supplementary publications budget amounting to 9,490,000 Swiss francs ;

as contained in the tables annexed to this Resolution and as explained in detail in Document 6262/CA40;

2. to fix the amount of the contributory unit for 1986 at 232,200 Swiss francs on the basis of the class of contribution chosen by Members under 111 and 113 of the Nairobi Convention, 1982, i.e., on the basis of a total of 393 units;

3. to fix at 46,440 Swiss francs in 1986 the annual value of the contributory unit for defraying the expenses of CCIR and CCITT meetings payable by recognized private operating agencies, scientific or industrial organizations and non-exempt international organizations, in accordance with 618 and 622 of the Nairobi Convention.

invites

the WARC ORB-85 through its Budget Control Committee set up under No. 475 of the Convention to examine the requests in connection with intersessional work to be undertaken during 1986 in conformity with decisions taken by the Conference itself;

resolves

that the amounts considered to be acceptable by the Budget Control Committee of the aforesaid Conference shall be entered in the 1986 budget (Section 11.5) up to a maximum of 900,000 Swiss francs - value on 1 January 1985 - and that an equivalent reduction shall be made in the proposed payment into the Reserve Account of the Union (Section 19).

ANNEX 2

Limit on expenditure set for WARC-ORB 85-88

(Value 1.9.1982)

		Conference	Preparatory work		Total
			IFRB	CCIR	
		- in thousands of Swiss francs -			
Limit	1983	-	-	300	300
	1984	-	405	1,445	1,850
	1985	3,835	365	-	4,200
	1986	-	450	-	450
	1987	-	300	-	300
	1988	3,720*	280	-	4,000
		7,555	1,800	1,745	11,100
			3,545		
Expenditure					
Actual 1983		-	-	49	49
Actual 1984		-	185	1,347	1,532
Approved Budget 1985		2,757	150	-	2,907
1986 Budget		-	800**		800
Budget forecast 1987		-	800**		800
Budget forecast 1988		3,720*	400**		4,120
		6,477	3,731		10,208
Margin/(Excess) 1983/88		(186)			

* Including work immediately following the Conference

** Including an average of 180,000 Swiss francs per year for 1 P.4/P.5 engineer/analyst post authorized until the end of the second session of the 1988 Space Conference under Resolution No. 889.

See the remarks on the following page.

REMARKS

1. The amounts indicated in this Annex are expressed in thousands of Swiss francs - value as at 1.9.1982, i.e. the ceilings set by the Plenipotentiary Conference.

The relevant amounts are as follows :

	Budget value 1.1.1985	Ceiling value 1.9.1982
- IFRB	1,152,000	1,012,000
- CCIR	273,000	245,000
	1,425,000	1,257,000
reduced by the Administrative Council to	900,000	800,000

Thus, the expected deficit in relation to the expenditure limit fixed by WARC-ORB 85/88 amounts to :

186,000 Swiss francs (value at 1.9.1982)

2. Computer facilities : No provision has been made for allocation of additional computer resources. This matter will be reviewed at the 41st session of the Administrative Council.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Addendum 1
to Document 173-E
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WORKING GROUP 5A

Indonesia

SOME VIEWS ON PLANNING METHOD

As requested by several delegations, we would like to submit the text of the oral presentation on Document 173 in Working Group 5A, for information.

Annex: 1

ANNEX

"Thank you Mr. Chairman,

This contribution is a one and a half page document, so I should not really need a long time to present it, however, I would like to ask your indulgence because I also wish to convey a few sentiments as accompaniment to the written views.

Firstly, we have observed with a great concern, the slow progress of our meetings due to very diversified opinions we have, from one extreme to another and by standing on a firm position in many outstanding issues. We are worried, if this trend continues, we will soon find ourselves in a dangerous situation of being trapped by time.

In this conference, we will begin the construction of a foundation upon which the future satellite communications will be developed to cater the needs of all nations, therefore, it is quite obvious that whatever we are going to decide, it will have far reaching impacts to the present and perhaps also to the next generation of mankind. Considering the seriousness of the matter, we do not believe that any planning method will be effective and successful unless we all jointly agree upon it wholeheartedly.

That is the reason why, in this document, all of us are invited to adopt by consensus, a new planning criterion, namely, consensus. If we all could agree to this proposal, I could say at this very moment that we have jointly accomplished a part of our difficult tasks.

Mr. Chairman,

Consensus means willingness to give and to take in order to reach an agreement through the process of understanding, goodwill and cooperation.

If we are willing to report a good result to the present as well as the next generation of mankind, statemanship must be demonstrated to the utmost.

By this introduction, allow me now to elaborate on the most crucial parts of our views, which are points 3 and 4 of this document.

Firstly, point 3, concerning the need of an <u>a priori</u> plan. This is a noble idea and historic as well. I said it is historic, because it is actually a result of an evolutionary process.

Many of us from the developing countries have been watching with great concern, the space race among several countries, primarily from the industrialized countries, in the venture of registering their space stations into GSO.

The fact that spectrum and orbit is a limited resource has been haunting all of us for some time and there it was the developing countries started to wonder whether they could still share this resource at a later time when the need becomes apparent.

This concern has been conveyed in various forms of signal, from a humble plea and polite gestures, an outloud cry and finally ended up in a very strong request as we all witness in Resolution No. 3 of WARC-79,

Mr. Chairman,

This is the historical part of point 3 of this document. I believe, if we fail to appreciate its fairness and appealing for equality as contained in it, it will lead this conference to a dangerous path of no successful result.

Having said that, time is perhaps appropriate for me at this stage to express a little criticism to all of us, to the developed as well as the developing countries, that somehow, in utilizing the space resource, we almost fail to appreciate that God has blessed mankind with more space resource than it needs. Please look at the sky and feel the truth of this statement. We almost fail to see it because our eyes are covered by selfishness.

Mr. Chairman,

I apologize for taking a rather long time in expressing our sentiments but I know you will share with me that we are touching very sensitive issues.

I would like now to turn to point 4 of this document. I know that when you're reading this part, you may start to analyze it from several technical angles, namely, the definition of the spectrum/orbit resource, statistics of the existing satellite networks, its future projection and some other details.

I beg you to consider this matter as realistically as possible and please give the deepest thoughts to it. I beg you not to use technical parameters only but please also use consensus parameters, namely, understanding, goodwill and cooperation.

Let me put it this way, we all are willing to ride on a public bus in a space tour programme. A number of seats are already assigned, and some fat guys are already sitting inside. They feel very uneasy if we push them to make some adjustments on their seats in accommodating new passengers as to fill the bus to its fullest; in other words all seats will be reserved to passengers for relatively long periods of time, all of which is taken at one time decision.

Of course, we could perform a little human engineerings to put more capacity for example by making smaller seats, adding more seats with more sophisticated techniques and other ways possible in order to make the bus more efficient, all of which will be at the risk of losing our comfort. Besides, we might have to apply more stringent safety procedures which could be costly too. Our privileges to enjoy a little privacy on our assigned seat will also be minimized. Our proposal, therefore, is to build a new air-conditioned tourist bus, which is better and more comfortable to every one who does not have a reserved seat in the old public bus but if someone insists to get in the public bus, he may do so as he wishes through applicable booking procedures.

I think, that is all I want to say on point 4 and accordingly I have covered the most crucial parts of this document. If you could receive the messages I have conveyed, you will find the rest of this document as an easy to understand, self explanatory text, therefore I would not like to elaborate further on it. However, we propose to call the planning method described here as a planning method rather than planning methods, although it has more than one basis. All bases are an integral part of the planning method.

Mr. Chairman,

I think in the interest of using time efficiently, I better stop here.

I thank you Mr. Chairman, for allowing me to accomplish my duty in presenting this paper. I thank you all for your patience and I hope you have not tired listening to my sermon.

Thank you very much, Mr. Chairman."

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 173-E
26 August 1985
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COMMITTEE 5 OF
WORKING GROUP 5A

Indonesia

SOME VIEWS ON PLANNING METHOD

1. Introduction

This contribution contains some views which are directed towards development of a planning method which could be jointly agreed upon by all administrations by way of concensus.

2. Definition of the best planning method

The most important criterion in judging the quality of a planning method is whether or not it can be adopted by a concensus.

Considering the importance of the issue under discussion, which has far-reaching impacts to the present generation and perhaps also to the next generation of mankind in the field of satellite communications development, any planning method will risk the effectiveness and successfulness of its implementation should it fail to receive wholehearted support from all administrations, regardless of the finest technical standards that a method might have.

The important value of a concensus should be placed higher than all technical criteria of planning. The best planning method is, therefore, defined as the method that can be jointly agreed upon by all administrations by way of concensus.

3. The need of an a priori plan

Many administrations, primarily from the developing countries, are in favour of planning on a priori basis which can guarantee equitable access for all countries to the orbit/spectrum resource.

4. Special situation in which a priori planning might not be appropriate

A priori planning could not be effectively implemented in an already saturated or nearly saturated part of the spectrum/orbit resource.

5. Proposed planning method

Based on the above views and observations, the following planning method is proposed:

- planning on a priori basis is implemented in non-saturated/nearly saturated parts of the spectrum/orbit resource as needed to satisfy all requirements;

- planning on other bases is implemented in other parts of the spectrum/orbit resource.

As a package deal with the above method, the following conditions will be applied:

- administrations which have existing systems already (definition of existing system is still to be defined) are not entitled to be included in the _a priori_ plan;

- other administrations are entitled to be included in the _a priori_ plan plus an option to participate in the other plan, however,

  if an administration decides to take this option, its allotment in the _a priori_ plan will be withdrawn;

- the planning method is to be reviewed, improved or revised after one period of the _a priori_ plan.

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Document 174-E
26 August 1985
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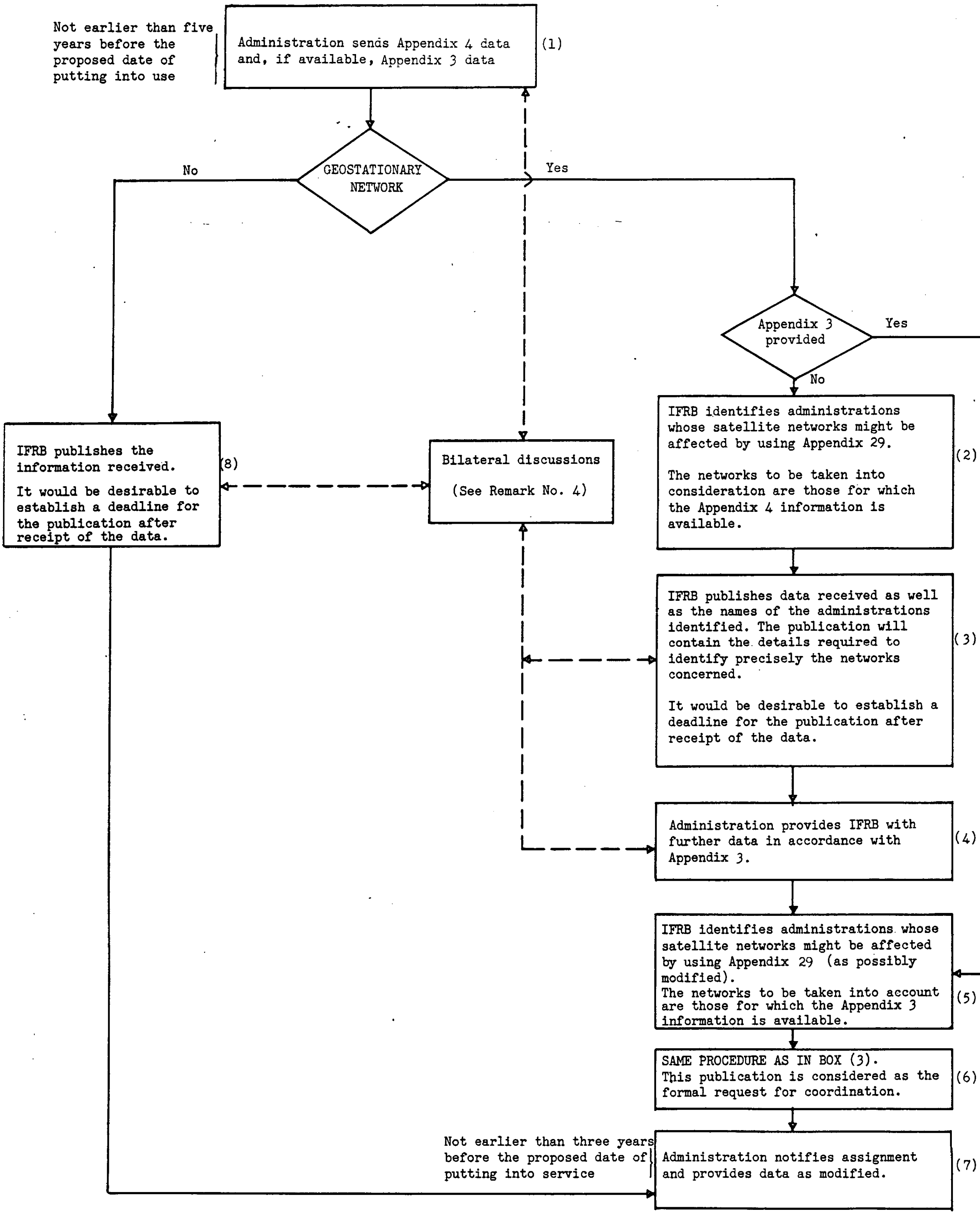
WORKING GROUP 5B

Report of Sub-Working Group 5B-2 to Working Group 5B

POSSIBLE MODIFICATION OF SECTIONS I AND II OF ARTICLE 11

The possible modifications to Sections I and II of Article 11 have been considered by Sub-Working Group 5B-2 and are submitted to Working Group 5B.


Not earlier than five years before the proposed date of putting into use
Administration sends Appendix 4 data and, if available, Appendix 3 data
(1)
GEOSTATIONARY NETWORK
No
Yes
Appendix 3 provided
Yes
No
IFRB identifies administrations whose satellite networks might be affected by using Appendix 29.
The networks to be taken into consideration are those for which the Appendix 4 information is available.
(2)
IFRB publishes the information received.
It would be desirable to establish a deadline for the publication after receipt of the data.
(8)
Bilateral discussions
(See Remark No. 4)
IFRB publishes data received as well as the names of the administrations identified. The publication will contain the details required to identify precisely the networks concerned.
It would be desirable to establish a deadline for the publication after receipt of the data.
(3)
Administration provides IFRB with further data in accordance with Appendix 3.
(4)
IFRB identifies administrations whose satellite networks might be affected by using Appendix 29 (as possibly modified).
The networks to be taken into account are those for which the Appendix 3 information is available.
(5)
SAME PROCEDURE AS IN BOX (3).
This publication is considered as the formal request for coordination.
(6)
Not earlier than three years before the proposed date of putting into service
Administration notifies assignment and provides data as modified.
(7)

REMARKS

1) Appendices 3 and 4 are merged in order to avoid duplication of information: Appendix 4 would be the first section of Appendix 3.

2) The coordination procedure should be carried out, as is the case of the Advance Publication, on the basis of a satellite network and not for each frequency assignment.

The coordination of earth stations will only be required when its characteristics exceed those taken into account in the coordination procedure.

3) Only one special section is published per network. It will be updated, if necessary, as the definition of the characteristics becomes more precise.

4) Bilateral discussions at the Advance Publication stage are presently covered by RR1047 to RR1053. These provisions do not specify which existing and planned services should be taken into account. The second session should also be requested to provide for the assistance the IFRB may give in the framework of the Advance Publication.

5) An improved Appendix 29 (to be used in box (5)) may permit identification of the networks affected with more precision, and so reduce the number of cases where coordination is required.

6) The protection of a satellite network will become effective after the receipt by the IFRB of the information required in Appendix 3.

7) The second session of the WARC-ORB-85 should consider how to treat the amendments to the initial characteristics communicated under the Advance Publication or the Coordination procedures.

J.-L. BLANC
Chairman of Sub-Working Group 5B-2

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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26 August 1985
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COMMITTEE 4
(AD HOC GROUP ON HDTV)

Federal Republic of Germany

PROPOSAL FOR THE WORK OF THE CONFERENCE

1. Introduction

Items 5.2 and 5.3 of the agenda of WARC-ORB 85 state that the first session "shall specify the preparatory actions to be completed before the commencement of the second session of the Conference" and "recommend a draft agenda for the second session of the Conference for consideration by the Administrative Council".

2. Reasons

Considering that the television broadcasting service of the future (i.e. within the next 10 to 15 years) has to take into account production and transmission of HDTV signals;

considering that an HDTV service requires channel bandwidths in the order of 50 MHz and, hence, that the 12 GHz bands allocated to the broadcasting-satellite service can, at least in Region 1 and 3, not be used for such a service;

considering that operation of an HDTV service in the bands 40.5 - 42.5 and 84 - 86 GHz allocated to the broadcasting-satellite service cannot be anticipated in the above-mentioned time frame due to unfavourable propagation conditions and the non-availability of appropriate technology (Report of the CPM, chapter 4.3 and Annex 3.1.3);

considering that the band 22.5 - 23 GHz has already been allocated to the broadcasting-satellite service in Regions 2 and 3 on the basis of procedures as defined by Article 14 of the Radio Regulations (on a primary basis in Japan);

considering further that the CCIR has already carried out extensive studies on HDTV (Report of the CPM, chapter 3.2.3 and Annexes 3.2.3.2 and 4.6.2.5.3);

3. Proposal

D/175/26 The Administration of the Federal Republic of Germany proposes that the following item be included in the agenda of the second session of the Conference:

to prepare for the allocation of a frequency band to the Broadcasting-Satellite Service (HDTV), preferably a frequency band of at least 500 MHz on a world-wide basis, the band 22.5 - 23 GHz being a possible candidate.

4. <u>Work to be carried out</u>

The preparatory actions to be specified under item 5.2 of the agenda of the first session will include all the technical and administrative work to prepare for the implementation of an HDTV service in a suitable frequency band (the frequency range 12.75 to 23.6 GHz may be used as a guideline) and the subsequent amenddemts to the Radio Regulations proposed by the second session of the Conference. In particular, the CCIR should elaborate the technical criteria for sharing and planning such a service in the mentioned frequency range.

INTERNATIONAL TELECOMMUNICATION UNION

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FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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WORKING GROUP 4A

Italy

ECONOMICAL COMPARISON BETWEEN SATELLITE AND TERRESTRIAL BROADCASTING

Working Group 4A requested more information on the economical comparison between a satellite sound broadcasting system and a terrestrial VHF-FM broadcasting stereo network.

From the CCIR studies, results show that for space stations of 2,400 kg, capable of carrying five active transponders, the total cost of two in-orbit space stations plus one-half of an on-ground spare, is estimated to be of the order of US $ 360 M, that is US $ 7.2 M per transponder per year (considering a satellite lifetime of ten years).

A study made by ESA for a medium audio quality system gives US $ 200 M (including design, construction, launching, insurance of the satellites plus ground station and staff costs) for a system capable of carrying ten active transponders, that is US $ 2 M per transponder per year.

A paper presented by Italy at the ESA/EBU symposium on direct satellite broadcasting, Dublin, May 1977, gives the following data for a terrestrial network providing one television programme (which is economically of the same order of magnitude as a stereophonic VHF-FM sound broadcasting network):

- in the United Kingdom (rather flat country), to cover 99% of the population in the UHF band: US $ 10 M per year;
- in Italy (rather mountainous country), to cover 98% of the population in the VHF band: US $ 12.75 M per year;
- in Norway (mountainous country with a very hard climate) to cover 95% of the population in the UHF band: US $ 65 M per year.

From the above-mentioned date it follows that the cost to broadcast one programme from a satellite varies from 0.03 to 0.72 of the cost to broadcast the same programme with a terrestrial network.

REFERENCES

CCIR Report 955

Proceedings of the ESA/EBU symposium on direct satellite broadcasting, Dublin, May 1977.

J. REDMOND - Direct broadcasting to the home via satellite, EBU Review N156, April 1976.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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Corrigendum 1 to
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27 August 1985
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COMMITTEE 5
WORKING GROUP 5A

NOTE BY THE SECRETARY-GENERAL

Pages 1 and 2, replace paragraph beginning with "Leaving aside ...." by the following :

Leaving aside the Plenipotentiary Conference and the Administrative Council, the conferences and meetings organized within the framework of the Union, which have the competence to take decisions in a formal sense, are :

1. Administrative Conferences organized within the framework of Articles 7, 54 and 62/63 of the Convention and

2. Plenary Assemblies and meetings of the International Consultative Committees,

for which the provisions of Chapter XI apply, except that they may adopt such additional rules which must, however, be compatible with the Convention. In the case of the CCIs (Plenary Assemblies and Study Groups) the rules must be published in the form of a Resolution of the Plenary Assemblies.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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COMMITTEE 5
WORKING GROUP 5A

NOTE BY THE SECRETARY-GENERAL

In response to questions on the application of :

Chapter XI (Rules of Procedure of Conferences and other Meetings);

Article 31 (Special Arrangements);

Article 32 (Regional Conferences, Arrangements and Organizations);

No. 271 (provisional resolution of matters not covered by the Convention, the Administrative Regulations and their annexes and which cannot await the next competent conference for settlement); and

No. 286 (providing "the secretariat of other telecommunication meetings on a contractual basis"),

the following is a resumé of the answer provided orally by the Secretary-General to Working Group 5A on Friday 23 August 1985 :

Leaving aside the Plenipotentiary Conference and the Administrative Council, the conferences and meetings organized within the framework of the Union, which have the competence to take decisions in a formal sense, are :

1. Administrative Conferences organized within the framework of Articles 7, 54 and 62/63 of the Convention and

2. Plenary Assemblies and meetings of the International Consultative Committees, for which the provisions of Chapter XI apply, except that they may adopt such additional rules which must, however, be compatible with the Convention. In the case of the CCIs (Plenary Assemblies and Study Groups) the rules must be published in the form of a Resolution of the Plenary Assemblies.

Notwithstanding the above, the Convention and the Administrative Regulations do recognize that other conferences, not within the framework of the Union, but recognized by the Union, do take place.

For example, there is a link between Article 31 of the Convention and Article 7 of the Radio Regulations, in particular No. 376 thereof :

"Members may, under the provisions for special arrangements in Article 31 of the Convention, conclude, on a worldwide basis, and as a result of a conference to which all Members have been invited, special agreements concerning the assignment of frequencies to those of their stations participating in a specific service, on condition that such assignments are within the frequency bands allocated exclusively to that service in Article 8."

In a more restricted way, provisions exist in Nos. 374 and 375 ("Two or more Members ....") of the Radio Regulations.

In all cases arrangements which have produced special agreements under Nos. 374-376 shall not be in conflict with the provisions of the Radio Regulations (see No. 377 thereof).

Furthermore :

(a) Advance notice of such conferences, as well as the terms of the agreement concluded, shall be conveyed to the Secretary-General;

(b) Provision is also made to enable the IFRB to send (on invitation) representatives to participate in an advisory capacity in regard to such conferences.

During the meeting, possibilities have been advanced for "multilateral planning meetings" which, it is to be recognized, do not, under the existing provisions of the Convention, correspond to decision making conferences or meetings of the Union.

On the other hand, if new circumstances necessitate additional recognition of a specialized conference or a meeting, within the framework of the Convention, or as an enlargement of application of Article 31, then there is still the possibility of the application of No. 271 of the Convention for provisional resolution of the matter of such new decision making conference or meeting arrangements, which do not fall within the existing provisions referred to above. In this regard, it should not be overlooked that the Plenipotentiary Conference is scheduled to take place in 1989, i.e. some 6-9 months after the Second Session of the WARC-ORB Conference in 1988. Bearing in mind that the Final Acts of the WARC-ORB 1988 would be unlikely to enter into effect before 1990, then the matters arising from any additional or new mechanisms of decision making could be appropriately treated by the Plenipotentiary Conference 1989.

No. 286 of the Convention defines the role of the Secretary-General in servicing, and providing staff for, conferences and meetings of the Union. It also provides the authority to supply services under contractual arrangements for "other telecommunication meetings" i.e. those which are not strictly within the framework of the Union.

As regards conferences and meetings within the framework of the Union, it is useful to recall that the International Telecommunication Convention of 1959 did, in fact, provide for a different "Administrative Conference" structure than the Montreux Convention of 1965, the provisions of which were carried over in the Malaga-Torremolinos Convention, 1973 and now the Nairobi Convention, 1982. Indeed, in the 1959 Convention there were provisions for special conferences which included :

"Extraordinary Administrative Conferences";
"Special Regional Conferences"; and
"Special Service Conferences, world or regional".

If required, legislative ways and means could be found to provide for a specialised "conference" or "multilateral planning meeting" with power of decision. The title "conference", or "meeting" would be a matter for further consideration, once the principles were adopted. In any case it would seem clear that in this respect there would be need for :

a) modification of the Convention, and
b) complementary and detailed provisions to be inserted into the Radio Regulations to deal with the application of any specialised decision-making multilateral forum for planning related to a particular service.

R.E. BUTLER
Secretary-General

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Corrigendum 1 to
Document 178-E
12 September 1985
Original: English

COMMITTEE 4

SUMMARY RECORD

OF THE

SIXTH MEETING OF COMMITTEE 4

(TECHNICAL PARAMETERS AND CRITERIA)

1. Paragraph 4.2

Amend the penultimate sentence to read:

"The other was whether the decisions of the Conference could refer to frequencies outside the band (0.5 - 2 GHz) as contained in the title of Resolution No. 505."

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 178-E
30 August 1985
Original: English

COMMITTEE 4

SUMMARY RECORD

OF THE

SIXTH MEETING OF COMMITTEE 4

(TECHNICAL PARAMETERS AND CRITERIA)

Tuesday, 27 August 1985, at 1050 hrs

Chairman: Mr. R.G. AMERO (Canada)

Subjects discussed:		Documents
1.	Opening comments by the Chairman	-
2.	Approval of the summary record of the fourth meeting of Committee 4	129
3.	Information from the Chairman of Committee 5	158, 140
4.	Oral reports of Working Group Chairmen	DT/9(Rev.2) DT/13(Rev.2)
5.	Working Group 4C documentation	159

1. Opening comments by the Chairman

1.1 The Chairman noted that Committee 4 had a busy week ahead of it, with two further meetings scheduled towards the end of the week. Those meetings, however, might well be rearranged as dictated by the progress of the Committee's Working Groups, Sub-Working Groups and Drafting Groups, most of which were expected to have completed their work by Friday. At present it was anticipated that Working Group 4A would complete its work that afternoon, Working Group 4B at the end of the week and Working Group 4C on the following Monday at the latest. The Committee was grateful to the Conference Secretariat for the considerable share of Conference resources that had been allocated to it; it was incumbent on the Committee to use that time as efficiently as possible since extensive debate would be precluded the following week, which would be devoted to the final approval of documentation. However, the output of Committee 4 was dependent on certain decisions expected to be arrived at by Working Group 5A and by Committee 5 by Wednesday of the following week. If, as now seemed likely, that deadline could not be met, then Committee 4 could expect to have to cope with the additional work involved in the resultant realigning of texts.

2. Approval of the summary record of the fourth meeting of Committee 4 (Document 129)

The summary record of the fourth meeting of Committee 4 was approved, with an editorial amendment indicated by the Chairman (see Corr.1 to Document 129).

3. Information from the Chairman of Committee 5 (Documents 158, 140)

3.1 The Chairman introduced Document 158, in which the Chairman of Committee 5 drew the Committee's attention to Document 140. In reply to a question from the delegate of the United Kingdom, he said that it was his understanding that Document 140, which was a report from the Chairman of Working Group 5A, had been approved as it stood by Committee 5 for referral to Committee 4.

The Committee took note of the provisional decisions contained in Document 140.

4. Oral reports of Working Group Chairmen (Documents DT/9(Rev.2) and DT/13(Rev.2))

4.1 The Chairman drew attention to the recently issued Documents DT/9(Rev.2), the latest updating of the list of documents allocated to Committee 4 and its Working Groups, and DT/13(Rev.2), the updated work programme for Working Group 4C.

4.2 The Chairman of Working Group 4A said that his Working Group had held seven meetings and had discussed all the documents allocated to it in Document DT/9(Rev.2), leaving only Document 179, recently submitted by Italy, for consideration at its next meeting. As a result of the Group's deliberations, three texts were now ready for its approval. However, two points had arisen which the Working Group did not feel itself competent to resolve and would be referring for decision at a higher level. One was how requests for action from the second session of the Conference should be expressed: in the form of Resolutions or in the form of Recommendations. The other was whether the decisions of the Conference could refer to frequencies outside the band specified in its agenda (0.5 - 2 GHz). The texts in relation to which those points had arisen had been so drafted as to facilitate modification once the issues had been resolved.

4.3 The Chairman of Working Group 4B said that after a slow start his Working Group had set up two Sub-Groups to expedite its work. Sub-Working Group 4B-1, under the Chairmanship of Mr. R.G. Gould (United States), had dealt with reverse-band working, spurious emissions from space stations, and IFRB sharing criteria, and had finished the bulk of its work the previous day. Its report was before Working Group 4B for review and approval and should be ready for submission to Committee 4 at its next meeting. Sub-Working Group 4B-2, under the Chairmanship of Mr. K.R.E. Dunk (United Kingdom), had been considering sharing criteria related to feeder links, despite the absence of a formal decision on the matter from Committee 6. The Group had met twice and was expected to finish its work by the end of the week.

4.4 The Chairman of Working Group 4C said that his Group had continued to make good progress and, although a great deal still remained to be done, hoped to complete its work by Monday at the latest. However, a number of decisions depended on the outcome of the deliberations now under way in Committee 5 and might have to be left to Committee 4 itself to take. That was the case with the provisional conclusions contained in the Group's report in Document DT/43, one element of which was taken up in Document 159 to be discussed later at the present meeting.

The delegate of Algeria had in the course of the Working Group's discussions expressed reservations, despite the chair's ruling to the contrary, that some of the work being done was of an administrative nature not properly within the terms of reference of Committee 4 and should be referred to Committee 5. The delegate of Algeria might wish to comment further on that point.

With regard to the work to be done during the intersessional period, Working Group 4C had already identified a number of topics. Since then further subjects had come forward. In view of the fact that it would be difficult to support studies on a very wide range of topics it was suggested that Working Group 4C should prepare a list of the topics proposed for study in the intersessional period and place them in order of priority.

4.5 The delegate of Algeria said that he had no wish to block the work of the Committee but that he felt impelled to maintain his reservations. He agreed to a suggestion by the Chairman that when Committee 4 came to examine the relevant portions of the report by Working Group 4C it would discuss them in depth before approving the report for transfer to other committees or the Plenary.

4.6 The Chairman of Sub-Working Group PL-A-1 said that a list of topics for intersessional work would be useful in principle.

4.7 The Chairman said there were bound to be contraints on the amount of intersessional work that could be carried out, dictated by the volume of work the CCIR could handle and the resources available to administrations. He would be better placed to assess the position after the meetings of the two ad hoc Groups of the Plenary that afternoon. At present it appeared that two general areas should be given priority: work relating to agenda item 2.2 and Committee 5's decision of principle on the planning process, and work relating to agenda item 2.6.

In response to a request for clarification from the delegate of the United Kingdom he said that the ad hoc Groups were meeting to decide points with regard to organization of their work in relation to that of the committees. Any decision on the priority to be given to topics for intersessional work would of course be made at Committee 4 level before being transmitted to the Working Groups concerned with the intersessional period.

It was agreed that Working Group 4C should be asked to prepare an interim report on the topics for intersessional work and the priority to be given them for submission to the next meeting of Committee 4.

4.8 The Chairman of Working Group 4 ad hoc 1 said that the Group had held only one meeting since the last meeting of Committee 4. A further meeting would be held that afternoon, when an additional contribution from the Federal Republic of Germany would be considered. A point that was proving difficult to resolve was whether the Conference would be overstepping its mandate in proposing that Article 8 should be addressed by the second session. In response to the delegate of the United Kingdom, who referred to Working Group 4A's difficulty in deciding whether frequencies outside the band specified in the agenda could be addressed, he said the two questions were of a similar nature and were still under examination. His report to the next meeting of Committee 4 would go into the matter in more detail.

4.9 The delegate of the USSR said he shared the doubts that had been expressed as to the propriety of Committee 4 and its ad hoc Group addressing Article 8.

5. Working Group 4C documentation (Document 159)

5.1 The Chairman of Working Group 4C introduced Document 159 containing technical considerations on the pairing of frequency bands for networks of the fixed-satellite service, which were submitted to Committee 4 for approval, with a view to their transmission to Committee 5, to be taken into account in Committee 5's deliberations should it so desire. He noted that one delegation had reserved its position on the text of the document pending further consideration.

5.2 The Chairman said that some editorial points arose in connection with Document 159 which he would deal with outside the meeting.

5.3 The delegate of the United Kingdom, drawing attention to the words "Should Committee 5 so decide, ..." in the second paragraph of section 4 of the document, said his delegation's view was that it was for Committee 4, rather than Committee 5, to decide on the need for additional technical studies during the intersessional period.

5.4 The Chairman of Working Group 4C concurred with that view and said that a better drafting for the phrase would be: "Depending upon the outcome of Committee 5's discussions, ..."

5.5 The delegate of the USSR said the view taken in Document 159 was unduly positive and made no mention of the difficulties and shortcomings inherent in frequency band pairing. He drew attention to the third paragraph in section 4.6.1.2.1 of the CPM Report and proposed that the text of that paragraph be included in Document 159, so that negative as well as positive aspects of frequency band pairing could be evaluated. At present, that method was not in use in many satellite systems and those in which it was not used had greater flexibility. No immediate decision should therefore be taken on pairing.

5.6 The delegate of Brazil said that the USSR delegate's suggestion that there was no merit in frequency band pairing must be viewed with caution. It was because the subject had both positive and negative aspects that it was necessary to pursue it during the intersessional period.

5.7 The Chairman of Working Group 4C said that the Working Group had indeed in its discussions taken into account the problems inherent in any rigid band pairing and it was for that reason that the third paragraph in section 1 indicated that any list of frequency pairings should be used as a guide and not as a regulatory requirement. That paragraph might be amended to reflect more emphatically the problems mentioned in the CPM Report or alternatively he could accept the proposal for the inclusion of the relevant paragraph from the CPM Report.

It was agreed that the third paragraph from section 4.6.1.2.1 of the CPM Report should be inserted after the first paragraph of section 1 of Document 159.

5.8 The delegate of Canada proposed that in the sixth indent in section 4 of the document the words "the use of FSS allocations for" should be inserted after the words "consideration should be given to".

It was so agreed.

5.9 The Canadian delegate further proposed that the words "if necessary and" should be inserted after "providing" in paragraph 2) of section 4.

It was so agreed.

5.10 The United Kingdom delegate proposed that in the amended paragraph now beginning "Depending upon the outcome of Committee 5's discussions," the words "may be undertaken" should be changed to "should be undertaken".

5.11 The delegate of the USSR opposed that amendment saying he could not agree to such a categorical statement; he further suggested that in the first paragraph in section 4 the words "should be taken into account" should be changed to "may be taken into account".

5.12 After further discussion, in which the delegates of the United Kingdom, the Federal Republic of Germany and Australia and the representative of the IFRB said that the correct word was "should" rather than "may", and the Chairman pointed out that Document 159 was merely a note addressed to Committee 5 for information which would not prejudice any decision that might be taken by Committee 4 regarding intersessional work, the delegate of the USSR proposed that, since the whole question of additional studies would depend upon the decision taken by Committee 5 as to whether or not it would adopt the principle of frequency band pairing, the order of the paragraphs in section 4 should be reversed so that it began with the amended wording "Depending upon the outcome of Committee 5's discussions ...". Since that transposition would mean that the whole of section 4 would be dependent on the decision to be taken by Committee 5, he could at that stage agree to the retention of the word "should" after the words "additional studies" and he would not insist on his proposed amendment to change "should be taken into account" to "may be taken into account" in what would now become the second paragraph of the section.

The USSR proposal was adopted.

Document 159 as thus amended was approved for transmission to Committee 5.

The meeting rose at 1220 hours.

The Secretary:	The Chairman:
C. AZEVEDO	R.G. AMERO

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 179-E
27 August 1985
Original: English

COMMITTEE 5

United States of America

MORATORIUM ON USE OF THE 4/6 GHz EXPANSION BANDS

The United States is proposing special voluntary arrangements for the recently opened expansion bands at 4.5-4.8 GHz (downlink) and at 6.425-6.725 GHz (uplink). The key objective of this proposal is to provide a guarantee of orbital and spectrum resources for the Fixed Satellite service in the future.

1. The United States proposes, in particular, that:

USA/179/56 A. The new Fixed Satellite bands at 4.5-4.8 GHz and 6.425-6.725 GHz should be available for use primarily by developing countries.

--These bands are not used by FSS systems at the present time, and they provide a substantial amount of orbit and spectrum resources which are immediately available.

--These bands have highly favorable economic and performance characteristics. (See Doc. 141).

USA/179/57 B. Countries should be permitted to notify and register plans for their systems in these expansion bands up to 15 years in advance of planned launch.

--This compares with a 5-year advanced publication period which is now provided by the Radio Regulations.

--The purpose of this change is to accommodate the long term interests of many countries which do not have immediate requirements for their own domestic satellite systems, but which do believe they will have such requirements in the future.

USA/179/58 C. In order to guarantee that the 4/6 GHz expansion bands are available for use primarily by developing countries, the United States proposes that countries which already have extensive satellite systems should voluntarily refrain from using those bands.

--As part of a comprehensive solution to the work of this Conference, the United States will take the lead in volunteering to observe a moratorium of at least 10 years on our own use of those bands.

--We call upon other industrialized countries to do so as well.

MORATORIUM PROPOSAL

The moratorium would include the following elements:

2. If the moratorium is part of an acceptable package of recommendations to the WARC-ORB 88, the United States will not submit requirements for any domestic satellite systems operating in these bands for a period of at least ten years from the time the Final Acts of the WARC-ORB 88 come into force.

3. In this context, the United States defines domestic satellite systems as any satellite system over which the United States Government has sole licensing jurisdiction, and which provides service only between points within the domestic jurisdiction of the United States.

4. The United States has not suggested that the moratorium apply to use of these bands by international satellite systems, the operation of which requires the authorization and consent of multiple governments.

--Such international systems would occupy relatively few orbital positions compared with the potential total of domestic systems. Therefore, such systems are unlikely to create congestion in these bands.

--In addition, the option to use these bands for international, regional and subregional systems, as well as for domestic requirements, may be of particular interest to developing countries.

5. The United States has conditionally authorized one system which for technical reasons plans to use an international uplink in the 6.425-6.725 GHz band. That system is designed to provide communications services between the US and a number of Central and South American countries and, if desired, to provide capacity available for domestic use within the latter countries. This system will begin international operations only when one or more other governments authorize such operations and when other relevant international obligations are met.

6. The United States believes that, taken together, the elements of this proposal offer an attractive and effective guarantee of equitable access to the geostationary orbit, with particular focus on the needs of developing countries.

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

ORB-85 CAMR SUR L'UTILISATION DE L'ORBITE DES SATELLITES GÉOSTATIONNAIRES ET LA PLANIFICATION DES SERVICES SPATIAUX UTILISANT CETTE ORBITE

PREMIÈRE SESSION GENÈVE, AOÛT/SEPTEMBRE 1985

Corrigendum 1
Document 180-F/E/S
29 août 1985
Original: français
anglais
espagnol

GROUPE DE TRAVAIL 6A
WORKING GROUP 6A
GRUPO DE TRABAJO 6A

1. - A la page 7, Article 15A, dans la dernière phrase du paragraphe 1668, remplacer les mots "service de radiodiffusion par satellite" par "service fixe par satellite".

- On page 7, Article 15A, in the last sentence of paragraph 1668, replace the words "broadcasting-satellite service" by "fixed-satellite service".

- A la página 7, Artículo 15A, en la última frase del párrafo 1668, sustitúyanse las palabras "servicio de radiodifusión por satélite" por "servicio fijo por satélite".

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2. - A la page 27, sous décide, lire:

"que toutes les Résolutions de la Conférence administrative mondiale des radiocommunications (Genève, 1979) énumérées ci-dessus sont abrogées."

- Does not concern the English text.

- No concierne al texto español.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 180-E
28 August 1985
Original: English

WORKING GROUP 6A

Source: DT/39(Rev.1), DT/47, DT/50

First Report of Sub-Working Group 6A2 to Working Group 6A

Sub-Working Group 6A2 held six meetings between 21 and 28 August 1985 and considered Document DT/36 on the consequential modifications to the Radio Regulations contained in Part III of the Final Acts of the Regional Administrative Conference for the Planning of the Broadcasting-Satellite Service in Region 2, Geneva, 1983 (see Annex 1). A Resolution was agreed upon for the abrogation of the Resolutions of the WARC-79 on which all the necessary action had been taken (see Annex 3).

The Sub-Working Group also started to consider the consolidated version of Appendix 30 to the Radio Regulations, prepared by the General Secretariat in Document 16, together with the comments from administrations in Document DT/29. Agreement was reached on Articles 1, 2, 3, 4, 6 and 8 (see Annex 2).

It should be borne in mind that the texts in Annexes 1, 2 and 3 have been adopted on the understanding that they are still subject to any decisions emanating from discussions in Working Group 6A and Committee 6.

J.F. BROERE
Chairman

Annexes : 3

A N N E X 1

Consequential modifications to the Radio Regulations

1. Modifications to the provisions of Article 8 of the Radio Regulations

ARTICLE 8

Table of Frequency Allocations

GHz
11.7 — 12.75

<table>
<tr><th></th><th colspan="3">Allocation to Services</th></tr>
<tr><th></th><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td>[SUP]</td><td rowspan="3">11.7 — 12.5
FIXED
BROADCASTING
BROADCASTING-SATELLITE
Mobile except aeronautical mobile

838</td><td>11.7 — 12.1
FIXED 837
FIXED-SATELLITE (space-to-Earth)
Mobile except aeronautical mobile

836 839</td><td rowspan="2">11.7 — 12.2
FIXED
MOBILE except aeronautical mobile
BROADCASTING
BROADCASTING-SATELLITE

838</td></tr>
<tr><td>MOD
[SUP]</td><td>12.1 — 12.2
FIXED-SATELLITE (space-to-Earth)

836 839 842</td></tr>
<tr><td>MOD
[SUP]</td><td rowspan="2">12.2 — 12.7
FIXED
MOBILE except aeronautical mobile
BROADCASTING
BROADCASTING-SATELLITE

839 844 846</td><td>12.2 — 12.5
FIXED
MOBILE except aeronautical mobile
BROADCASTING

838 845</td></tr>
<tr><td>SUP</td><td rowspan="2">12.5 — 12.75
FIXED-SATELLITE (space-to-Earth) (Earth-to-space)

848 849 850</td><td rowspan="2">12.5 — 12.75
FIXED
FIXED-SATELLITE (space-to-Earth)
MOBILE except aeronautical mobile
BROADCASTING-SATELLITE 847</td></tr>
<tr><td>[SUP]</td><td>12.7 — 12.75
FIXED
FIXED-SATELLITE (Earth-to-space)
MOBILE except aeronautical mobile</td></tr>
</table>

MOD **836** In Region 2, in the band 11.7 - 12.2 GHz, transponders on space stations in the fixed-satellite service may be used additionally for transmissions in the broadcastng-satellite service, provided that such transmissions do not have a maximum e.i.r.p. greater than 53 dBW per television channel and do not cause greater interference or require more protection from interference than the coordinated fixed-satellite service frequency assignments. With respect to the space services, this band shall be used principally for the fixed-satellite service.

MOD **837** Different category of service: in Canada, Mexico and the United States, the allocation of the band 11.7 - 12.1 GHz to the fixed service is on a secondary basis (see No. **424**).

MOD **839** [The use of the band 11.7 - 12.7 GHz in Region 2 by the fixed-satellite and broadcasting-satellite services is limited to national and sub-regional systems. The use of the band 11.7 - 12.2 GHz by the fixed-satellite service in Region 2 is subject to previous agreement between the administrations concerned and those having services, operating or planned to operate in accordance with the Table, which may be affected (see Articles **11**, **13** and **14**). For the use of the band 12.2 - 12.7 GHz by the broadcasting-satellite service in Region 2, see Article 15.]

[SUP] **840**

SUP **841**

MOD **842** Additional allocation: the band 12.1 - 12.2 GHz in Brazil and Peru, is also allocated to the fixed service on a primary basis.

SUP **843**

MOD **844** In Region 2, in the band 12.2 - 12.7 GHz, existing and future terrestrial radiocommunication services shall not cause harmful interference to the space services operating in conformity with the Broadcasting-Satellite Plan for Region 2 contained in Appendix **30**.

MOD **846** In Region 2, in the band 12.2 - 12.7 GHz, assignments to stations of the broadcasting-satellite service in the Plan for Region 2 contained in Appendix **30** may also be used for transmissions in the fixed-satellite service (space-to-Earth), provided that such transmissions do not cause more interference or require more protection from interference than the broadcasting-satellite service transmissions operating in conformity with the Region 2 Plan. With respect to the space services, this band shall be used principally for the broadcasting-satellite service.

MOD **847** The broadcasting-satellite service in the band 12.5 - 12.75 GHz in Region 3 is limited to community reception with a power flux-density not exceeding -111 dB(W/m^2) as defined in Annex 8 of Appendix **30**. See also Resolution **34**.

MOD **869** [The use of the band 17.3 - 18.1 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. For the use of the band 17.3 - 17.8 GHz in Region 2 by the feeder links for the broadcasting-satellite service in the band 12.2 - 12.7 GHz, see Article **15A**.]

2. Modifications to the provisions of Article 11 of the Radio Regulations

ARTICLE 11

NOC

Coordination of Frequency Assignments to Stations in a Space Radiocommunication Service Except Stations in the Broadcasting-Satellite Service and to Appropriate Terrestrial Stations[1]

MOD **A.11.1** [1]For the coordination of frequency assignments to stations in the broadcasting-satellite service and other services in the frequency band 11.7 - 12.2 GHz (in Region 3), 11.7 - 12.5 GHz (in Region 1) and 12.2 - 12.7 GHz (in Region 2) [as well as the coordination of frequency assignments to feeder link stations utilizing the fixed-satellite service (Earth-to-space) in the frequency band 17.3 - 17.8 GHz (in Region 2)] and other services in [these bands] in Region 2, see also Article **15** [and Article **15A** respectively].

3. Modifications to the provisions of Article 12 of the Radio Regulations

ARTICLE 12

MOD (Title)

Notification and Recording in the Master International Frequency Register of Frequency Assignments[1] to Terrestrial Radiocommunication Stations[2,3,[4]]

MOD **A.12.3**

[3]For the notification and recording of frequency assignments to terrestrial stations in the frequency bands 11.7 - 12.2 GHz (in Region 3), 12.2 - 12.7 GHz (in Region 2) and 11.7 - 12.5 GHz (in Region 1), so far as their relationship to the broadcasting-satellite service in these bands is concerned, see also Article **15**.

ADD **A.12.4**

[[4]For the notification and recording of frequency assignments to terrestrial stations in the frequency band 17.7 - 17.8 GHz (in Region 2), so far as their relationship to the fixed-satellite service (Earth-to-space) in this band is concerned, see also Article **15A**.]

4. Modifications to the provisions of Article 13 of the Radio Regulations

ARTICLE 13

NOC

Notification and Recording in the Master International Frequency Register of Frequency Assignments[1] to Radio Astronomy and Space Radiocommunication Stations Except Stations in the Broadcasting-Satellite Service[2]

MOD **A.13.2**

[2]For notification and recording of frequency assignments to stations in the broadcasting-satellite service and other services in the frequency bands 11.7 - 12.2 GHz (in Region 3), 11.7 - 12.5 GHz (in Region 1) and 12.2 - 12.7 GHz (in Region 2), [as well as the notification and recording of frequency assignments to feeder-link stations in the fixed-satellite service (Earth-to-space) in the frequency band 17.3 - 17.8 GHz (in Region 2)] and other services in [these bands] in Region 2, see also Article **15** [and Article **15A** respectively].

5. Modifications to the provisions of Article 15 of the Radio Regulations

ARTICLE 15

MOD (Title) **Coordination, Notification and Recording of Frequency Assignments to Stations of the Broadcasting-Satellite Service in the Frequency Bands 11.7 - 12.2 GHz (in Region 3), 12.2 - 12.7 GHz (in Region 2) and 11.7 - 12.5 GHz (in Region 1) and to the Other Services to Which These Bands Are Allocated, so far as Their Relationship to the Broadcasting-Satellite Service in These Bands is Concerned**

MOD **1656** The provisions and associated Plans for the broadcasting-satellite service in the frequency bands 11.7 - 12.5 GHz (in Region 1), 12.2 - 12.7 GHz (in Region 2) and 11.7 - 12.2 GHz (in Region 3), as contained in Appendix **30** to the Radio Regulations, shall apply to the assignment and use of frequencies by stations of the broadcasting-satellite service in these bands and to the stations of other services to which these bands are allocated so far as their relationship to the broadcasting-satellite service in these bands is concerned. [For the broadcasting-satellite service in Region 2, Resolution No. 2 (SAT-R2) is also applicable.]

6. New Article 15A of the Radio Regulations

ADD

ARTICLE 15A

Coordination, Notification and Recording of Frequency Assignments to Stations in the Fixed-Satellite Service (Earth-to-Space) in the Frequency Band 17.3 - 17.8 GHz (Region 2) Providing Feeder Links for the Broadcasting-Satellite Service and also to Stations of Other Services to Which this Band is Allocated in Region 2, so far as Their Relationship to the Fixed-Satellite Service (Earth-to-space) in this Band is Concerned in Region 2

1668 The provisions and associated Plan for feeder links associated with the broadcasting-satellite service, utilizing the fixed-satellite service (Earth-to-space) in the band 17.3 - 17.8 GHz (Region 2), as contained in [...], shall apply to the assignment to and use by feeder links of frequencies in this band and to stations of other services to which this band is allocated in Region 2 so far as the relationship of these other services to the fixed-satellite service (Earth-to-space) in this band is concerned in Region 2. [For the broadcasting-satellite service in Region 2, Resolution No. 2 (SAT-R2) is also applicable.]

7. Modifications to the provisions of Appendix 3 to the Radio Regulations

APPENDIX 3

MOD (Title)

Notices Relating to Space Radiocommunications and Radio Astronomy Stations[1]

(See Articles **11** and **13**)

ADD [1] For notices of assignments to feeder links (other than those for telecommand and tracking) in the band 17.3 - 17.8 GHz for the broadcasting-satellite service in the frequency band 12.2 - 12.7 GHz in Region 2, the basic characteristics to be furnished are prescribed in [...].

A N N E X 2

ARTICLE 1

General Definitions

1.1 For the purposes of this Appendix the following terms shall have the meanings defined below:

[1977 Conference: World Administrative Radio Conference for the Planning of the Broadcasting-Satellite Service in Frequency Bands 11.7 - 12.2 GHz (in Regions 2 and 3) and 11.7 - 12.5 GHz (in Region 1), called in short World Broadcasting-Satellite Administrative Radio Conference, Geneva, 1977;]

[1983 Conference: Regional Administrative Radio Conference for the Planning in Region 2 of the Broadcasting-Satellite Service in the Frequency Band 12.2 - 12.7 GHz and Associated Feeder Links in the Frequency Band 17.3 - 17.8 GHz, called in short Regional Administrative Conference for the Planning of the Broadcasting-Satellite Service in Region 2, (Sat-R2), Geneva, 1983.]

Regions 1 and 3 Plan: The Plan for the Broadcasting-Satellite Service in the Frequency Bands 11.7 - 12.2 GHz in Region 3 and 11.7 - 12.5 GHz in Region 1 contained in this Appendix, together with any modifications resulting from the successful application of the procedures of Article 4 of this Appendix.

Region 2 Plan: The Plan for the Broadcasting-Satellite Service in the Frequency Band 12.2 - 12.7 GHz in Region 2 contained in this Appendix, together with any modifications resulting from the successful application of the procedures of Article 4 of this Appendix.

Frequency assignment in conformity with the Plan: Any frequency Ossignment which appears in the Regions 1 and 3 Plan or the Region 2 Plan or for which the procedure of Article 4 of this Appendix has been successfully applied.

ARTICLE 2

Frequency Bands

2.1 The provisions of this Appendix apply to the broadcasting-satellite service in the frequency bands between 11.7 GHz and 12.2 GHz in Region 3, between 11.7 GHz and 12.5 GHz in Region 1 and between 12.2 GHz and 12.7 GHz in Region 2 and to the other services to which these bands are allocated in Regions 1, 2 and 3, insofar as their relationship to the broadcasting-satellite service in these bands is concerned.

ARTICLE 3

Execution of the Provisions and Associated Plans

3.1 The Members of the Union in Regions 1, 2 and 3 shall adopt, for their broadcasting-satellite space stations[1] operating in the frequency bands referred to in this Appendix, the characteristics specified in the appropriate Regional Plan.

3.2 The Members of the Union shall not change the characteristics specified in the Regions 1 and 3 Plan or in the Region 2 Plan, or bring into use assignments to broadcasting-satellite space stations or to stations in the other services to which these frequency bands are allocated, except as provided for in the Radio Regulations and the appropriate Articles and Annexes of this Appendix.

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1 In Region 2, such stations may also be used for transmissions in the fixed-satellite service (space-to-Earth) in accordance with No. **846** of the Radio Regulations.

ARTICLE 4

Procedure for Modifications to the Plans

4.1 When an administration intends to make a modification[1] to one of the Regional Plans, i.e. either:

a) to modify the characteristics of any of its frequency assignments to a space station[2] in the broadcasting-satellite service which are shown in the appropriate Regional Plan, or for which the procedure in this Article has been successfully applied, whether or not the station has been brought into use; or

b) to include in the appropriate Regional Plan a new frequency assignment to a space station in the broadcasting-satellite service; or

c) to cancel a frequency assignment to a space station in the broadcasting-satellite service;

the following procedure shall be applied before any notification of the frequency assignment is made to the International Frequency Registration Board (see Article 5 of this Appendix).

4.1.1 Before an administration proposes to include in the Region 2 Plan under the provisions of 4.1b), a new frequency assignment to a space station or to include in the Plan new frequency assignments to a space station whose orbital position is not designated in the Plan for this administration, all of the assignments to the service area involved should normally have been brought into service or have been notified to the Board in accordance with Article 5 of this Appendix. Should this not be the case, the administration concerned shall inform the Board of the reasons therefor.

4.2 The term "frequency assignment in conformity with the Plan" used in this and the following Articles is defined in Article 1.

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1 The intention not to employ energy dispersal where required in accordance with paragraph [...] shall be treated as a modification and thus subject to the appropriate provisions of this Article. The use of greater energy dispersal than that required in accordance with paragraph [...] shall not be considered as a modification.

2 The expression "frequency assignment to a space station", wherever it appears in this Article, shall be understood to refer to a frequency assignment associated with a given orbital position. See also Annex 8 for the orbital position limitations.

4.3 Proposed modifications to a frequency assignment in conformity with one of the Regional Plans or the inclusion in that Plan of a new frequency assignment

For Regions 1 and 3:

4.3.1 An administration proposing a modification to the characteristics of a frequency assignment in conformity with the Regions 1 and 3 Plan, or the inclusion of a new frequency assignment in that Plan, shall seek the agreement of those administrations:

4.3.1.1 of Regions 1 and 3 having a frequency assignment to a space station in the broadcasting-satellite service in the same or adjacent channel which is in conformity with the Regions 1 and 3 Plan, or in respect of which proposed modifications to that Plan have already been published by the Board in accordance with the provisions of paragraph 4.3.5.1 or 4.3.6 of this Article; or

4.3.1.2 of Region 2 having a frequency assignment to a space station in the broadcasting-satellite service with the necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment, which is in conformity with the Region 2 Plan, or in respect of which proposed modifications to that Plan have already been published by the Board in accordance with the provisions of paragraph 4.3.5.1 or 4.3.6 of this Article; or

4.3.1.3 having no frequency assignment in the broadcasting-satellite service in the channel concerned but in whose territory the power flux-density value exceeds the prescribed limit as a result of the proposed modification or having such an assignment for which its associated service area does not cover the whole of the territory of the administration, and in whose territory [outside] that service area, the power flux-density from the broadcasting-satellite space station subject to this modification exceeds the prescribed limit as a result of the proposed modification; or

4.3.1.4 having a frequency assignment in the band 11.7 - 12.2 GHz in Region 2 or 12.2 - 12.5 GHz in Region 3 to a space station in the fixed-satellite service which is recorded in the Master Register or which has ben coordinated or is being coordinated under the provisions of No. **1060** of the Radio Regulations, or those of paragraph 7.2.1 of this Appendix;

4.3.1.5 which are considered to be affected.

4.3.2 The services of an administration are considered to be affected when the limits shown in Annex 1 are exceeded.

For Region 2:

4.3.3 An administration proposing a modification to the characteristics of a frequency assignment in conformity with the Region 2 Plan, or the inclusion of a new frequency assignment in that Plan, shall seek the agreement of those administrations:

4.3.3.1 of Region 2 having a frequency assignment in the Region 2 Plan to a space station in the broadcasting-satellite service in the same or adjacent channel which is in conformity with that Plan, or in respect of which proposed modifications to that Plan have already been published by the Board in accordance with the provisions of paragraph 4.3.5.1 or 4.3.6 of this Article; or

4.3.3.2 of Regions 1 and 3 having a frequency assignment to a space station in the broadcasting-satellite service with the necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment, which is in conformity with the Regions 1 and 3 Plan, or in respect of which proposed modifications to that Plan have already been published by the Board in accordance with the provisions of paragraph 4.3.5.1 or 4.3.6 of this Article; or

4.3.3.3 having no frequency assignment in the broadcasting-satellite service in the channel concerned but in whose territory the power flux-density value exceeds the prescribed limit as a result of the proposed modification or having such an assignment for which its associated service area does not cover the whole of the territory of the administration, and in whose territory [outside] that service area, the power flux-density from the broadcasting-satellite space station subject to this modification exceeds the prescribed limit as a result of the proposed modification; or

4.3.3.4 having a frequency assignment in the band 12.5 - 12.7 GHz in Region 1 or 12.2 - 12.7 GHz in Region 3 to a space station in the fixed-satellite service which is recorded in the Master Register or which has been coordinated or is being coordinated under the provisions of No. **1060** of the Radio Regulations, or those of paragraph 7.2.1 of this Appendix; or

4.3.3.5 having a frequency assignment to a space station in the broadcasting-satellite service in the band 12.5 - 12.7 GHz in Region 3 with the necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment and which

a) is recorded in the Master Register, or

b) has been coordinated or is being coordinated under the provisions of Resolution **33**, or

c) appears in a Region 3 Plan to be adopted at a future administrative radio conference, taking account of modifications which may be introduced subsequently in that Plan, in accordance with the Final Acts of the conference;

4.3.3.6 which are considered to be affected.

4.3.4 The services of an administration are considered to be affected when the limits shown in Annex 1 are exceeded.

For all Regions:

4.3.5 An administration intending to modify characteristics in one of the Regional Plans shall send to the Board, not earlier than five years but preferably not later than eighteen months before the date on which the assignment is to be brought into use, the relevant information listed in Annex 2. Modifications to that Plan involving additions under 4.1b) shall lapse if the assignment is not brought into use by that date.

4.3.5.1 Where as a result of the intended modification the limits defined in Annex 1 are not exceeded, this fact shall be indicated when submitting to the Board the information required by 4.3.5. The Board shall then publish this information in a special section of its weekly circular.

4.3.5.2 In all other cases the administration shall notify the Board of the names of the administrations whose agreement it considers should be sought in order to arrive at the agreement referred to in 4.3.1 or 4.3.3 as well as of those with which agreement has already been reached.

4.3.6 The Board shall determine on the basis of Annex 1 the administrations whose frequency assignments are considered to be affected within the meaning of 4.3.1 or 4.3.3. The Board shall include the names of those administrations with the information received under 4.3.5.2 and shall publish the complete information in a special section of its weekly circular. The Board shall immediately send the results of its calculations to the administration proposing the modification to the appropriate Regional Plan.

4.3.7 The Board shall send a telegram to the administrations listed in the special section of the weekly circular drawing their attention to the information it contains and shall send them the results of its calculations.

4.3.8 An administration which feels that it should have been included in the list of administrations whose services are considered to be affected may, giving the technical reasons for so doing, request the Board to include its name. The Board shall study this request on the basis of Annex 1 and shall send a copy of the request with an appropriate recommendation to the administration proposing the modification to the appropriate Regional Plan.

4.3.9 Any modification to a frequency assignment which is in conformity with the appropriate Regional Plan or any inclusion in that Plan of a new frequency assignment which would have the effect of exceeding the limits specified in Annex 1 shall be subject to the agreement of all affected administrations.

4.3.10 The administration seeking agreement or the administration with which agreement is sought may request any additional technical information it considers necessary. The administrations shall inform the Board of such requests.

4.3.11 Comments from administrations on the information published pursuant to 4.3.6 should be sent either directly to the administration proposing the modification or through the Board. In any event the Board shall be informed that comments have been made.

4.3.12 An administration that has not notified its comments either to the administration seeking agreement or to the Board within a period of four months following the date of the weekly circular referred to in 4.3.5.1 or 4.3.6 shall be understood to have agreed to the proposed assignment. This time limit may be extended by up to three months for an administration that has requested additional information under 4.3.10 or for an administration that has requested the assistance of the Board under 4.3.20. In the latter case the Board shall inform the administrations concerned of this request.

4.3.13 If, in seeking agreement, an administration modifies its initial proposal, it shall again apply the provisions of 4.3.5 and the consequent procedure with respect to any other administration whose services might be affected as a result of modifications to the initial proposal.

4.3.14 If no comments have been received on the expiry of the periods specified in 4.3.12, or if agreement has been reached with the administrations which have made comments and with which agreement is necessary, the administration proposing the modification may continue with the appropriate procedure in Article 5 and shall inform the Board, indicating the final characteristics of the frequency assignment together with the names of the administrations with which agreement has been reached.

4.3.15 The agreement of the administrations affected may also be obtained in accordance with this Article, for a specified period.

4.3.16 When the proposed modification to the appropriate Regional Plan involves developing countries, administrations shall seek all practicable solutions conducive to the economical development of the broadcasting-satellite systems of these countries.

4.3.17 The Board shall publish in a special section of its weekly circular the information received under 4.3.14 together with the names of any administrations with which the provisions of this Article have been successfully applied. The frequency assignment concerned shall enjoy the same status as those appearing in the appropriate Regional Plan and will be considered as a frequency assignment in conformity with that Plan.

4.3.18 When an administration proposing to modify the characteristics of a frequency assignment or to make a new frequency assignment receives notice of disagreement from an administration whose agreement it has sought, it should first endeavour to solve the problem by exploring all possible means of meeting its requirement. If the problem still cannot be solved by such means, the administration whose agreement has been sought should endeavour to overcome the difficulties as far as possible, and shall state the technical reasons for any disagreement if the administration seeking the agreement requests it to do so.

4.3.19 If no agreement is reached between the administrations concerned, the Board shall carry out any study that may be requested by these administrations; the Board shall inform them of the result of the study and shall make such recommendations as it may be able to offer for the solution of the problem.

4.3.20 An administration may at any stage in the procedure described, or before applying it, request the assistance of the Board, particularly in seeking the agreement of another administration.

4.3.21 The relevant provisions of Article 5 of this Appendix shall be applied when frequency assignments are notified to the Board.

4.4 Cancellation of frequency assignments

When a frequency assignment in conformity with one of the Regional Plans is no longer required, whether or not as a result of a modification, the administration concerned shall immediately so inform the Board. The Board shall publish this information in a special section of its weekly circular and delete the assignment from the appropriate Regional Plan.

4.5 Master copy of the Plans

4.5.1 a) The Board shall maintain an up-to-date master copy of the Regions 1 and 3 Plan taking account of the application of the procedure specified in this Article. The Board shall prepare a document listing the amendments to be made to the Plan as a result of modifications made in accordance with the procedure in this Article.

b) The Board shall maintain an up-to-date master copy of the Region 2 Plan, including the overall equivalent protection margins of each assignment, taking account of the application of the procedure specified in this Article. This master copy shall contain the overall equivalent protection margins derived from the Plan as established by the 1983 Conference and those derived from all modifications to the Plan as a result of the successful completion of the modification procedure described in this Article. The Board shall prepare a document listing the amendments to be made to the Plan as a result of modifications made in accordance with the procedure described in this Article.

4.5.2 The Secretary-General shall be informed by the Board of modifications made to the Regional Plans and shall publish an up-to-date version of those Plans in an appropriate form when justified by the circumstances.

ARTICLE 6

Coordination, Notification and Recording in the Master International Frequency Register of Frequency Assignments to Terrestrial Stations Affecting Broadcasting-Satellite Frequency Assignments in the Bands 11.7 - 12.2 GHz (in Region 3), 11.7 - 12.5 GHz (in Region 1) and 12.2 - 12.7 GHz (in Region 2)[1]

Section I. Coordination Procedure to Be Applied

6.1.1 Before an administration notifies to the Board a frequency assignment to a terrestrial transmitting station, it shall initiate coordination with any other administration having a frequency assignment to a broadcasting-satellite station in conformity with the appropriate Regional Plan if

- the necessary bandwidths of the two transmissions overlap; and
- the power flux-density which would be produced by the proposed terrestrial transmitting station exceeds the value derived in accordance with Annex 3 at one or more points on the edge of the service area which is within the coverage area of the broadcasting-satellite station of that administration.

6.1.2 For the purpose of effecting coordination, the administration responsible for the terrestrial station shall send to the administrations concerned, by the fastest possible means, a copy of a diagram drawn to an appropriate scale indicating the location of the terrestrial station and all other data of the proposed frequency assignment and the approximate date on which it is planned to bring the station into use.

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1 These procedures do not replace the procedures prescribed for terrestrial stations in Articles **11** and **12** of the Radio Regulations.

6.1.3 An administration with which coordination is sought shall acknowledge receipt of the coordination data immediately by telegram. If no acknowledgement is received within fifteen days of dispatch, the administration seeking coordination may dispatch a telegram requesting acknowledgement of receipt of the coordination data, to which the receiving administration shall reply. Upon receipt of the coordination data an administration with which coordination is sought shall promptly examine the matter with regard to interference[1] which would be caused to its frequency assignments in conformity with the appropriate Regional Plan and shall, within an overall period of two months from dispatch of the coordination data, either notify the administration requesting coordination of its agreement to the proposed assignment or, if this is not possible, indicate the reasons therefor and make such suggestions as it may be able to offer with a view to a satisfactory solution of the problem.

6.1.4 No coordination is required when an administration proposes to change the characteristics of an existing assignment in such a way as not to increase the level of interference to the service to be rendered by the broadcasting-satellite stations of other administrations.

6.1.5 An administration seeking coordination may request the Board to endeavour to effect coordination where:

a) an administration with which coordination is sought fails to acknowledge receipt under paragraph 6.1.3 within one month of dispatch of the coordination data;

b) an administration which has acknowledged receipt under paragraph 6.1.3 fails to give a decision within three months of dispatch of the coordination data;

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1 The criteria to be employed in evaluating interference levels shall be based on the relevant CCIR Recommendations or, in the absence of such Recommendations, shall be agreed between the administrations concerned.

c) the administration seeking coordination and an administration with which coordination is sought disagree on the acceptable level of interference; or

d) coordination between administrations is not possible for any other reason.

In so doing, it shall furnish the Board with the necessary information to enable it to endeavour to effect such coordination.

6.1.6 Either the administration seeking coordination or an administration with which coordination is sought, or the Board, may request any additional information which they may require to assess the level of interference to the services concerned.

6.1.7 Where the Board receives a request under paragraph 6.1.5a), it shall forthwith send a telegram to the administration concerned requesting immediate acknowledgement.

6.1.8 Where the Board receives an acknowledgement following its action under paragraph 6.1.7 or where the Board receives a request under paragraph 6.1.5b), it shall forthwith send a telegram to the administration concerned requesting an early decision in the matter.

6.1.9 Where the Board receives a request under paragraph 6.1.5d), it shall endeavour to effect coordination in accordance with the provisions of paragraph 6.1.2. Where the Board receives no acknowledgement of its request for coordination within the period specified in paragraph 6.1.3, it shall act in accordance with paragraph 6.1.7.

6.1.10 Where an administration fails to reply within one month of dispatch of the Board's telegram sent under paragraph 6.1.7 requesting an acknowledgement or fails to give a decision on the matter within 2 months of dispatch of the Board's telegram of request sent under paragraph 6.1.8, the administration with which coordination was sought shall be considered to have undertaken that no complaint will be made in respect of any harmful interference which may be caused by the terrestrial station being coordinated to the service rendered or to be rendered by its satellite-broadcasting station.

6.1.11 Where necessary, as part of the procedure under paragraph 6.1.5, the Board shall assess the level of interference. In any case, the Board shall inform the administrations concerned of the results obtained.

6.1.12 In the event of continuing disagreement between one administration seeking to effect coordination and one with which coordination has been sought, the administrations concerned may explore the possibility of reaching an agreement on the use of the proposed frequency assignment for a specified period.

Section II. Notification Procedure for Frequency Assignments

6.2.1 Any frequency assignment to a fixed, land or broadcasting station shall be notified to the International Frequency Registration Board if the use of the frequency concerned is capable of causing harmful interference to the service rendered or to be rendered by a broadcasting-satellite station of any other administration, or if it is desired to obtain international recognition of the use of the frequency[1].

6.2.2 For this notification, an individual notice for each frequency assignment shall be drawn up as prescribed in Section A of Appendix 1 to the Radio Regulations, which specifies the basic characteristics to be furnished as required. It is recommended that the notifying administration should also supply the additional data called for in that Section, together with such further data as it may consider appropriate.

6.2.3 Whenever practicable, each notice should reach the Board before the date on which the assignment is brought into use. The notice made in accordance with paragraph 6.2.2 must reach the Board not earlier than three years and not later than 3 months before the date on which the assignment is to be brought into use.

6.2.4 Any frequency assignment, the notice of which reaches the Board less than 3 months before it is brought into use, shall, where it is to be recorded, bear a remark in the Master Register to indicate that it is not in conformity with paragraph 6.2.3.

Section III. Procedure for the Examination of Notices and the Recording of Frequency Assignments in the Master Register

6.3.1 Whatever the means of communication, including telegraph, by which a notice is transmitted to the Board, it shall be considered complete if it contains at least the appropriate basic characteristics specified in Section A of Appendix 1 to the Radio Regulations.

6.3.2 Complete notices shall be considered by the Board in the order of their receipt.

6.3.3 Any notice which is incomplete shall be returned by the Board immediately, by airmail, to the notifying administration with the reasons therefor.

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1 The attention of administrations is specifically drawn to the provisions of Section I of this Article.

6.3.4 Upon receipt of a complete notice, the Board shall include the particulars thereof, with the date of receipt, in its weekly circular; this circular shall contain the particulars of all such notices received since publication of the previous circular.

6.3.5 The circular shall constitute the acknowledgement to the notifying administration of the receipt of a complete notice.

6.3.6 Complete notices shall be considered by the Board in the order specified in paragraph 6.3.2. The Board cannot postpone the formulation of a finding unless it lacks sufficient data to reach a decision; moreover, the Board shall not act upon any notice which has a technical bearing on an earlier notice still under consideration by the Board until it has reached a finding with respect to such earlier notice.

6.3.7 The Board shall examine each notice:

6.3.8 - with respect to its conformity with the Convention, the relevant provisions of the Radio Regulations and the provisions of this Appendix (with the exception of those relating to the coordination procedure and the probability of harmful interference);

6.3.9 - with respect to its conformity with the provisions of paragraph 6.1.1 relating to coordination of the use of the frequency assignment with the other administrations concerned;

6.3.10 - where appropriate, with respect to the probability of harmful interference to a broadcasting-satellite station whose frequency assignment is in conformity with the appropriate Regional Plan.

6.3.11 Depending upon the findings of the Board subsequent to the examination prescribed in paragraphs 6.3.8, 6.3.9 and 6.3.10, further action shall be as follows:

6.3.12 <u>Finding unfavourable with respect to paragraph 6.3.8</u>

6.3.13 Where the notice includes a specific reference to the fact that the station will be operated in accordance with the provisions of No. **342** of the Radio Regulations, it shall be examined immediately with respect to paragraphs 6.3.9 and 6.3.10.

6.3.14 If the finding is favourable with respect to paragraph 6.3.9 or 6.3.10, as appropriate, the assignment shall be recorded in the Master Register. The date of receipt by the Board of the notice shall be entered in Column 2d.

6.3.15 If the finding is unfavourable with respect to paragraph 6.3.9 or 6.3.10, as appropriate, the notice shall be returned immediately by airmail to the notifying administration with the reasons of the Board for this finding. In those circumstances the notifying administration shall undertake not to bring into use the frequency assignment until the condition specified in paragraph 6.3.14 can be fulfilled. But the administrations concerned may explore the possibility of reaching an agreement on the use of the proposed frequency assignment for a specified period.

6.3.16 Where the notice does not include a specific reference to the fact that the station will be operated in accordance with the provisions of No. **342** of the Radio Regulations, it shall be returned immediately by airmail to the notifying administration with the reasons of the Board for this finding and with such suggestions as the Board may be able to offer with a view to the satisfactory solution of the problem.

6.3.17 If the notifying administration resubmits the notice unchanged, it shall be treated in accordance with the provisions of paragraph 6.3.16.

6.3.18 If the notifying administration resubmits the notice with a specific reference to the fact that the station will be operated in accordance with the provisions of No. **342** of the Radio Regulations, it shall be treated in accordance with the provisions of paragraphs 6.3.13 and 6.3.14 or 6.3.15, as appropriate.

6.3.19 If the notifying administration resubmits the notice with modifications which, after re-examination, result in a favourable finding by the Board with respect to paragraph 6.3.8, the notice shall be treated under the provisions of paragraphs 6.3.20 to 6.3.32. However, in any subsequent recording of the assignment, the date of receipt by the Board of the resubmitted notice shall be entered in Column 2d.

6.3.20 Finding favourable with respect to paragraph 6.3.8

6.3.21 Where the Board finds that the coordination procedure mentioned in paragraph 6.3.9 has been successfully completed with all administrations whose broadcasting-satellite services may be affected, the assignment shall be recorded in the Master Register. The date of receipt by the Board of the notice shall be entered in Column 2d.

6.3.22 Where the Board finds that the coordination procedure mentioned in paragraph 6.3.9 has not been applied, and the notifying administration requests the Board to effect the required coordination, the Board shall take the appropriate action necessary and shall inform the administrations concerned of the results obtained. If the Board's efforts are successful, the notice shall be treated in accordance with paragraph 6.3.21. If the Board's efforts are unsuccessful, the notice shall be examined by the Board with respect to the provisions of paragraph 6.3.10.

6.3.23 Where the Board finds that the coordination procedure mentioned in paragraph 6.3.9 has not been applied and the notifying administration does not request the Board to effect the required coordination, the notice shall be returned immediately by airmail to the notifying administration with the reasons of the Board for this action and with such suggestions as the Board may be able to offer with a view to the satisfactory solution of the problem.

6.3.24 Where the notifying administration resubmits the notice and the Board finds that the coordination procedure mentioned in paragraph 6.3.9 has been successfully completed with all administrations whose broadcasting-satellite services may be affected, the assignment shall be recorded in the Master Register. The date of receipt by the Board of the original notice shall be entered in Column 2d. The date of the receipt by the Board of the resubmitted notice shall be entered in the Remarks Column.

6.3.25 Where the notifying administration resubmits the notice with a request that the Board effect the required coordination, it shall be treated in accordance with the provisions of paragraph 6.3.22. However, in any subsequent recording of the assignment, the date of receipt by the Board of the resubmitted notice shall be entered in the Remarks Column.

6.3.26 Where the notifying administration resubmits the notice and states it has been unsuccessful in effecting the coordination, it shall be examined by the Board with respect to the provisions of paragraph 6.3.10. However, in any subsequent recording of the assignment, the date of receipt by the Board of the resubmitted notice shall be entered in the Remarks Column.

6.3.27 <u>Finding favourable with respect to paragraphs 6.3.8 and 6.3.10</u>

6.3.28 The assignment shall be recorded in the Master Register. The date of receipt by the Board of the notice shall be entered in Column 2d.

6.3.29 <u>Finding favourable with respect to paragraph 6.3.8 but unfavourable with respect to paragraph 6.3.10</u>

6.3.30 The notice shall be returned immediately by airmail to the notifying administration with the reasons of the Board for this finding and with such suggestions as the Board may be able to offer with a view to the satisfactory solution of the problem.

6.3.31 Should the notifying administration resubmit the notice with modifications which result, after re-examination, in a favourable finding by the Board with respect to paragraph 6.3.10, the assignment shall be recorded in the Master Register. The date of receipt by the Board of the original notice shall be entered in Column 2d. The date of receipt by the Board of the resubmitted notice shall be indicated in the Remarks Column.

6.3.32 Should the notifying administration resubmit the notice, either unchanged or with modifications which decrease the probability of harmful interference but not sufficiently to permit the provisions of paragraph 6.3.31 to be applied and should that administration insist upon reconsideration of the notice but the Board's finding remain unchanged, the notification shall again be returned to the notifying administration in accordance with paragraph 6.3.30. In those circumstances, the notifying administration shall undertake not to bring into use the proposed frequency assignment until the condition specified in paragraph 6.3.31 can be fulfilled. But the administrations concerned may explore the possibility of reaching an agreement on the use of the frequency assignment for a specified period. In that event the Board shall be notified of the agreement and the frequency assignment shall be recorded in the Master Register with a note indicating that the assignment is valid only for the specified period. The notifying administration using the frequency assignment during a specified period shall not subsequently use this circumstance to justify continued use of the frequency beyond the period specified if it does not obtain the agreement of the administration or the administrations concerned.

6.3.33 Change in the basic characteristics of assignments already recorded in the Master Register

6.3.34 A notice of a change in the basic characteristics of an assignment already recorded, as specified in Appendix 1 to the Radio Regulations (except those entered in Columns 2c, 3 and 4a of the Master Register), shall be examined by the Board in accordance with paragraphs 6.3.8 and 6.3.9 and, where appropriate, paragraph 6.3.10 and paragraphs 6.3.12 to 6.3.32 inclusive shall be applied. Where the change should be recorded, the original assignment shall be amended according to the notice.

6.3.35 However, in the case of a change in the basic characteristics of an assignment which is in conformity with paragraph 6.3.8, should the Board reach a favourable finding with respect to paragraph 6.3.9 and, if applicable, paragraph 6.3.10, or find that the change does not increase the probability of harmful interference to assignments already recorded, the amended assignment shall retain the original date in Column 2d. In addition, the date of receipt by the Board of the notice relating to the change shall be entered in the Remarks Column.

6.3.36 The projected date of bringing into use of a frequency assignment may be extended on request of the notifying administration by three months. In the case where the administration states that, due to exceptional circumstances, it needs a further extension of this period, such extension may be provided but it shall in no case exceed six months from the original projected date of bringing into use.

6.3.37 In applying the provisions of this Section, any resubmitted notice which is received by the Board more than two years after the date of its return by the Board shall be considered as a new notice.

6.3.38 Recording of frequency assignments notified before being brought into use

6.3.39 If a frequency assignment notified in advance of bringing into use has received a favourable finding by the Board with respect to paragraphs 6.3.8 and 6.3.9, and, where appropriate, 6.3.10, it shall be entered provisionally in the Master Register with a special symbol in the Remarks Column indicating the provisional nature of that entry.

6.3.40 Within one month after the date of bringing into use, either as originally notified or as modified in application of paragraph 6.3.36, the notifying administration shall confirm that the frequency assignment has been brought into use. When the Board is informed that the assignment has been brought into use, the special symbol shall be deleted from the Remarks Column.

6.3.41 If the Board does not receive this confirmation within the period referred to in paragraph 6.3.40, the entry concerned shall be cancelled. The Board shall consult the administration concerned before taking such action.

ARTICLE 8

Miscellaneous Provisions Relating to the Procedures

8.1 If it is requested by any administration, the Board, using such means at its disposal as are appropriate in the circumstances, shall conduct a study of cases of alleged contravention or non-observance of these provisions or of harmful interference.

8.2 The Board shall thereupon prepare and forward to the administration concerned a report containing its findings and recommendations for the solution of the problem.

8.3 On receiving the Board's recommendations for the solution of the problem, an administration shall promptly acknowledge the receipt by telegram and shall subsequently indicate the action it intends to take. In cases when the Board's suggestions or recommendations are unacceptable to the administrations concerned, further efforts should be made by the Board to find an acceptable solution to the problem.

8.4 In a case where, as a result of a study, the Board submits to one or more administrations suggestions or recommendations for the solution of a problem, and where no answer has been received from one or more of these administrations within a period of three months, the Board shall consider that the suggestions or recommendations concerned are unacceptable to the administrations which did not answer. If it was the requesting administration which failed to answer within this period, the Board shall close the study.

8.5 If it is requested by any administration, particularly by an administration of a country in need of special assistance, the Board, using such means at its disposal as are appropriate in the circumstances, shall render the following assistance:

a) computation necessary in the application of Annexes 1, 3 and 4;

b) any other assistance of a technical nature for completion of the procedures in this Appendix.

8.6 In making a request to the Board under paragraph 8.5, the administration shall furnish the Board with the necessary information.

ANNEX 3

[DRAFT]
RESOLUTION [COM6/A]

Relating to the Abrogation of Resolutions of the World Administrative Radio Conference, Geneva, 1979

The World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit and the Planning of Space Services Utilizing It, First Session, Geneva, 1985,

considering

its agenda (Conference Document 1), in particular agenda item 6.1 and the action taken on a number of Resolutions of the World Administrative Radio Conference, Geneva, 1979;

further considering

that all necessary action has been taken on the following Resolutions:

RESOLUTION No. 31	Relating to the Application of Certain Provisions of the Final Acts of the World Broadcasting-Satellite Administrative Radio Conference, Geneva, 1977, to Take into Account Changes Made by the World Administrative Radio Conference, Geneva, 1979 to the Table of Frequency Allocations for Region 2 in the Band 11.7 - 12.7 GHz
RESOLUTION No. 100	Relating to the Coordination, Notification and Recording in the Master International Frequency Register of Assignments to Stations in the Fixed-Satellite Service with Respect to Stations in the Broadcasting-Satellite Service in Region 2
RESOLUTION No. 503	Relating to the Coordination, Notification and Recording in the Master International Frequency Register of Frequency Assignments to Stations in the Broadcasting-Satellite Service in Region 2
RESOLUTION No. 504	Relating to the Final Acts of the World Broadcasting-Satellite Administrative Radio Conference, Geneva, 1977, with Respect to Region 2

RESOLUTION No. 700	Relating to Sharing Between the Fixed-Satellite Service in Regions 1 and 3 and the Broadcasting-Satellite Service in Region 2 in the Band 12.2 - 12.7 GHz
RESOLUTION No. 701	Relating to the Convening of a Regional Administrative Radio Conference for the Detailed Planning of the Broadcasting-Satellite Service in the 12 GHz Band and Associated Feeder Links in Region 2

<u>resolves</u>

[that all the said Resolutions of the World Administrative Radio Conference, Geneva, 1979, are abrogated.]

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 **WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT**

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 181-E
27 August 1985
Original : French

COMMITTEE 2

SECOND REPORT OF THE WORKING GROUP OF COMMITTEE 2 (CREDENTIALS)

The Working Group of Committee 2 held a second meeting on 27 August 1985 to examine the Credentials of the following delegations * :

Bahrain (State of)
Cameroon (Republic of)
Egypt (Arab Republic of)
Spain
Greece
Guatemala (Republic of)
India (Republic of)
Kuwait (State of)
Morocco (Kingdom of)
Nigeria (Federal Republic of)
Pakistan (Islamic Republic of)
Democratic People's Republic of Korea
Tanzania (United Republic of)
Thailand
Tonga (Kingdom of)

The Credentials of these delegations were all found to be in order.

S. SISSOKO
Chairman of the Working Group C2-A

*In the alphabetical order of the French version of the country names.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 **WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT**

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 182-E
27 August 1985
Original: Spanish

COMMITTEE 5
WORKING GROUP 5A

Argentina, Uruguay, Venezuela

CONSIDERATION OF THE REQUIREMENTS OF THE INTERNATIONAL MULTILATERAL INTERGOVERNMENTAL ORGANIZATIONS

The above-named Administrations, noting the vital role played by international multilateral intergovernmental satellite telecommunications organizations, recommend the adoption by the Conference of the planning principle set forth below.

ARG, URG, VEN/182/1

a) International services

The principles of whatever plan or planning approach is adopted by WARC-ORB(1) should provide for a special recognition to be defined by WARC-ORB(1) with respect to present and future requirements for certain spectrum resources and orbital locations necessary to provide international services, to global and regional multilateral organizations created by intergovernmental agreement and characterized by cooperative sharing of telecommunications satellite space segment facilities and joint decision making.

ARG, URG, VEN/182/2

b) National services

The principles of whatever plan or planning approach is adopted by WARC-ORB(1) should recognize that the present and future frequency and orbital requirements of those multilateral organizations, as described under paragraph a), which are necessary to provide domestic services for some countries, be treated on a basis of equality with the requirements of other countries planning to operate, now or in the future, their own national systems to provide domestic services in their own territories.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 183-E
27 August 1985
Original: Spanish

COMMITTEE 5

Bolivia, Colombia, Ecuador, Peru, Venezuela

STRUCTURE OF THE PLANNING METHOD

As a contribution to the work of WARC-ORB(1), the following proposals are put forward for the structure of the planning method which could be adopted for some services and frequency bands. Special reference is made to Documents DT/32 and DT/34 relating to the methods considered by Working Group 5A.

A priori planning

First, "a priori" planning is proposed in which orbital positions, frequency bands and service areas are assigned or allotted to all administrations submitting the corresponding requests within the time limit laid down by the Conference and for a planning period which is also specified.

Planning principles

The planning method should be based on a suitable set of technical, economic and legal elements and on the corresponding regulatory procedures and standards.

Forum

Planning shall be carried out and adopted at world conferences. The interval between successive conferences shall be related to the duration of the plan.

Scope of application

The plan shall be applicable world-wide but account shall be taken of different regional and subregional characteristics, which are linked in particular to:

- special geographical situations;
- the situation of the developing countries.

Duration of the plan

The plan shall have a fixed duration coinciding with the interval between conferences. A first interval of ten years is proposed.

Type of requirements

All administrations shall be free to submit their requirements, which shall be agreed on by the Conference with the necessary access guaranteed for all countries. The requirements shall make specific reference to orbital positions, frequency bands and service areas.

Accommodation of requirements

WARC-ORB(1) shall draw up precise rules for the submission of requirements to the ITU prior to the second session of the Conference. These requirements shall undergo preliminary analysis by a Group of Experts, so that the Conference can revise and approve the plan drawn up.

Accommodation of existing networks

The plan shall cause minimum interference to systems in service or being actively developed. However, systems in service shall share the burden of the interference problems arising from the introduction of new systems.

Accommodation of unforeseen requirements

The plan shall make provision for accommodating unforeseen systems or traffic requirements. If new systems or modifications do not allow delay until a subsequent conference, the corresponding requests shall be accommodated only if:

- they do not cause greater interference than that laid down for establishing the plan, or the affected administration accepts the higher level of interference;

- they do not infringe the rights of other administrations.

Results

At the outcome of the Conference, administrations shall obtain allotments or assignments of orbital positions, frequency bands and service areas for the period of duration of the plan.

Transfer of assignments or allotments

Allotments or assignments of orbital positions and associated frequencies obtained by means of *a priori* planning may be the subject of agreements or arrangements between the parties concerned, on condition that the levels of interference they cause are not greater than those which the affected administrations that are not involved in such agreements or arrangements are prepared to accept.

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

ORB-85 CAMR SUR L'UTILISATION DE L'ORBITE DES SATELLITES GÉOSTATIONNAIRES ET LA PLANIFICATION DES SERVICES SPATIAUX UTILISANT CETTE ORBITE

PREMIÈRE SESSION GENÈVE, AOÛT/SEPTEMBRE 1985

Corrigendum 2 au
Document 184-F/E/S
29 août 1985

COMMISSION 5
COMMITTEE 5
COMISIÓN 5

Ce Corrigendum ne concerne pas le texte français.

This Corrigendum does not concern the English text.

Anexo, página 2, párrafo 1

Añádase el texto siguiente al final del primer párrafo:

Puede preverse que al aplicar el principio de agrupación por pares de las bandas de frecuencias surgirán dificultades. Teniendo en cuenta estas dificultades, cabe preguntarse si ha de exigirse a los futuros sistemas que se ajusten de forma estricta a una lista específica de agrupación por pares de las bandas de frecuencias.

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

ORB-85 CAMR SUR L'UTILISATION DE L'ORBITE DES SATELLITES GÉOSTATIONNAIRES ET LA PLANIFICATION DES SERVICES SPATIAUX UTILISANT CETTE ORBITE

PREMIÈRE SESSION GENÈVE, AOÛT/SEPTEMBRE 1985

Corrigendum 1
Document 184-F/E/S
29 août 1985

COMMISSION 5
COMMITTEE 5
COMISION 5

A la première page, lire "COMMISSION 5" au lieu de "COMMISSION 4" pour la destination du document.

First Page, read "COMMITTEE 5" instead of "COMMITTEE 4" for destination of the document.

Este corrigendum no concierne al texto español.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 184-E
27 August 1985
Original: English

COMMITTEE 4

NOTE FROM THE CHAIRMAN OF COMMITTEE 4

Committee 4, at its sixth meeting, considered Document 159 on technical considerations related to pairing of frequency bands for networks in the fixed-satellite service. The agreed text is annexed to this document.

Information contained in the annex reflects standard technical considerations on frequency band pairing in the FSS. Committee 4 reached some provisional conclusions, subject to later review as a result of Committee 5 decisions, and agreed to draw this to the attention of Committee 5 to assist it in its task of choosing the specific pairs of frequency bands for planning. The intersessional work identified is dependent on the decision of Committee 5 and may, therefore, be revised at a later date.

R.G. AMERO
Chairman of Committee 4

Annex: 1

ANNEX

Pairing of frequency bands for networks in the fixed-satellite service

1. Frequency band pairing

The typical fixed satellite service communication link involves transmission from an earth station to a space station and retransmission from the space station to another earth station. Accordingly, the ITU Table of Frequency Allocations allocates several frequency bands to the fixed satellite service for either Earth-to-space or space-to-Earth use. Although these frequency bands are used in pairs, the Radio Regulations do not require a satellite to use a specific Earth-to-space band with a specific space-to-Earth band. However, it is recognized that utilization of the GSO and the frequency spectrum would be more efficient, and coordination of networks would be facilitated, if specific Earth-to-space and space-to-Earth bands are designated in pairs. It can be foreseen that difficulties will arise in implementing the principle of pairing frequency bands. Having regard to these difficulties, it may be doubted whether future systems should be required to conform in a rigid way to a specific list of frequency band pairings.

Existing FSS systems show a high degree of standardization of frequency band pairing based mainly on frequency allocations as they existed before WARC-79, the difficulties of coordination with terrestrial services, and the requirements of the FSS themselves. It is clearly necessary that this existing situation be respected as much as possible and that due account is taken of the requirements of satellite networks for which other pairings are operationally essential.

Additional frequency bands newly allocated to the FSS at WARC-79 are being considered for the implementation of future satellite systems. Any band pairing arrangements in these additional frequency bands will have to take account of operational requirements of future fixed satellite systems, the different frequency allocations in the different regions, and the sharing constraints that exist in the relevant bands. Accordingly, any specific list of frequency pairings that can be developed should be used as a guide to be followed whenever feasible, and not as a regulatory requirement.

A number of technical considerations relating to the choice of bands for pairing are to be found in section 4.

2. Translation frequency for narrow-band satellites

Some satellites, for example satellites of the mobile-satellite services with feeder links in FSS bands, need to use only a part of the bandwidth of the allocated FSS band. In such cases the coordination of several narrow-band satellites occupying the same part of the GSO would be facilitated if all the satellites used the same effective translation frequency between the up-link and the down-link. In addition, it is desirable to keep to a minimum the number of translation frequencies.

3. Use of multiple frequency band pairs in satellites

In some satellite networks, it may be economically and operationally advantageous to use more than one pair of frequency bands; for example, to enable the working bandwidth of the network to be increased, to enable several different functions to be performed by one satellite, or to improve network connectivity by enabling communications to be established between users with different earth segments. Cross-strapping of transponders is essential for some applications and should not be prevented by any formal scheme of band pairing.

4. Conclusions and recommendations

Dependent upon the outcome of Committee 5 discussions, additional studies should be undertaken during the intersessional period with a view to:

1) determining the potential value of frequency band pairings in the work of the Conference, and

2) providing, if necessary and if possible, a specific list of FSS frequency band pairings which may be used as a guide for administrations to follow, to the extent possible, when designing and implementing future satellite systems,

for consideration by WARC-ORB(2).

The following list of technical considerations, should be taken into account when developing any list of frequency band pairings in studies of which frequency bands should be planned:

- The ratio of mid-band frequencies of up-link and down-link bands should preferably be not so great that antenna design is made difficult, nor so small that duplexer design is made difficult.

- The paired bands, which will not necessarily include the full bandwidth of frequency allocations, should in most cases have equal bandwidth, and the number of translation frequencies for the paired bands should be kept to a minimum.

- Where it is possible to avoid it, no frequency in one band should be a simple multiple of any frequency in its paired band.

- Pairings already well established in practice should be retained.

- To the extent that it is feasible and necessary, consideration should be given to the use of FSS allocations for feeder links, having due regard for present utilization by the FSS.

- Continuation of provision for the established practice of cross-strapping from one pair of bands to another in a multi-band satellite is necessary.

- ITU regional variations exist in the FSS allocations for Earth-to-space and space-to-Earth use.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Corrigendum 1 to
Document 185-E
7 September 1985
Original: French

BUDGET CONTROL COMMITTEE

SUMMARY RECORD

OF THE

SECOND MEETING OF COMMITTEE 3

(BUDGET CONTROL)

Replace the third sub-paragraph of 2.2 by the following:

"In reply to comments by the delegate of the USSR to the effect that the position set out in Document 171 was not very clear with regard to the financial implications of Administrative Council Resolution No. 931 opposed by some countries at the recent session, the Secretary-General observed that that Resolution related to the 1986 budget whereas the first session of the ORB Conference was covered by the 1985 budget.".

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 185-E
2 September 1985
Original: French

BUDGET CONTROL COMMITTEE

SUMMARY RECORD

OF THE

SECOND MEETING OF COMMITTEE 3

(BUDGET CONTROL)

Wednesday, 28 August 1985, at 0900 hrs

Chairman: Mr. R.G. DEODHAR (India)

Subjects discussed:		Documents
1.	Summary record of the first meeting of Committee 3	109
2.	Position of the Conference accounts at 23 August 1985	171
3.	Intersessional work of the Union's organs	172

1. Summary record of the first meeting of Committee 3 (Document 109)

The summary record was approved.

2. Position of the Conference accounts at 23 August 1985 (Document 171)

2.1 The Chief of the Finance Department introduced the documents. The budget adjusted at 1 August would be lower due to a modification in the exchange rate between the dollar and the Swiss franc; item 11.521, subhead I, would be reduced by 2,500 Swiss francs and item 11.531, subhead II, by 54,000 Swiss francs. The situation would be reassessed the following week, when approximately the same margins should appear.

In reply to questions raised by the delegates of France and the Netherlands on the repercussions of extra meetings which might be necessary towards the end of the Conference, the Chief of the Finance Department said that allowance had been made for such expenditure.

2.2 Supplementing the explanation provided by the Chief of the Finance Department, the Secretary-General said that if the Conference finished on time, the budget estimates for the first session would probably not be exceeded. He stressed that at present Conference expenditure, at 1985 value, was within the budget approved by the Administrative Council in 1984 and the figures set by the Nairobi Plenipotentiary Conference.

Although it might be necessary to hold extra meetings during the last few days of the Conference, there should not be any problem in connection with interpretation because the work would be organized sequentially without any of the parallel activity which occurred when Working Groups or Sub-Groups met.

In reply to comments by the delegate of the USSR to the effect that the position set out in Document 171 was not very clear, that the Conference budget actually seemed to have been exceeded and that Administrative Council Resolution No. 931 had been opposed by three countries at the last session, the Secretary-General observed that that Resolution related to the 1986 budget, whereas the first session of the ORB Conference was provided for in the 1985 budget.

The Conference budget in its present form was based on figures valid at 1 January 1984 and approved by the Administrative Council in June 1984; however, the financial Protocol contained provisions for adjusting the annual budget to take account of salary changes in the United Nations common system. Moreover, as the Chief of the Finance Department had already pointed out, the budget was adjusted from month to month on the basis of the new dollar exchange rate and, for that reason, fluctuated constantly.

If it were not used, the credit balance of 74,000 Swiss francs in the Annex to Document 171 would be paid into the ITU Reserve Account and be available pending the decisions to be taken at the next Administrative Council session.

3. Intersessional work of the Union's organs (Document 172)

3.1 The Secretary-General commented on the document, particularly the paragraph concerning intersessional work which bore out the explanation he had given concerning Document 171.

He also requested delegates to refer to Document 44, which set out the financial responsibilities of administrative conferences and mentioned the allocation by the Administrative Council of a lump sum of 900,000 Swiss francs for ORB Conference intersessional work in 1985.

3.2 The delegate of the Netherlands, supported by the delegate of Canada speaking as the Chairman of Ad hoc Working Group PL/1, said that it was essential to keep within the budget. He suggested that the Budget Control Committee should send a note to Committees 4, 5 and 6 stressing that the resources available for intersessional work were limited and that the volume of such work must be reduced as far as possible.

3.3 The Secretary-General having confirmed that that was the most practical course of action, bearing in mind the authority given to the Budget Control Committee, and a proposal by the delegate of the United States of America to send the note also to Working Groups PL/1 and PL/2 having been accepted, it was so decided.

3.4 The Chairman of the IFRB summed up the situation concerning intersessional work. It was difficult at the present stage to assess the volume of work which would result from the discussions of Committee 5. In the case of Committee 6, the work required had already been identified and a preliminary estimate could be drawn up early the following week.

3.5 The Director of the CCIR shared the Chairman of the IFRB's view that everything would depend on the decisions taken by the Committees, particularly Committees 4 and 5. It should be noted that two types of study were proposed in Committee 4's documents: general, long-term studies and studies on the specific requirements of the planning to be carried out at the second session. The former studies might be included in the CCIR's long-term work programme.

3.6 The Secretary-General drew the Committee's attention to the remarks at the end of the document and said that it was not yet possible to determine the implications of intersessional work for the ITU's computer facilities. It was preferable to await the results of the Conference and of the analysis under way. The absence of a figure for computer facilities did not mean that there would be no requirements in that area.

Following the Administrative Council's decision to curtail the first session of the Conference and thanks to economy measures taken by the ITU, the overall budget for the Conference had been reduced by some 1,425,000 Swiss francs as compared with the initial estimates but, as to the commitments made up to 1988, it was very likely that the limits set in the Nairobi Plenipotentiary Conference Protocol would be exceeded. In that case, the Members of the Union would have to be consulted by referendum.

The limit on expenditure for intersessional work had been set at 800,000 Swiss francs for 1986 and 1987 (value 1.9.1982) but a prudent approach should be adopted for those which were financial projections.

The amount of 400,000 Swiss francs entered for 1988 related to the first six months of the year; again, those figures did not take account of essential computer resources.

If expenditure on intersessional work could not be contained within the limits set, it would be necessary to draw up an order of priorities in accordance with Plenipotentiary Conference Resolution No. 48; that task would have to be done by the Working Group of the Plenary, which would need to receive all the relevant information from Committee 3.

3.7 The Chairman of Working Group PL/1 stressed that the questions submitted to the CCIR and the IFRB in the intersessional period must be very clear, with very specific objectives; questions which did not have a direct bearing on the Conference and were not to be examined at the second session could be submitted to the CCIR and the IFRB through the usual channels.

Working Group PL/1 had contemplated modifying the work programme to take budgetary restrictions into account but it was still too early to say what scenario might be adopted.

3.8 The Secretary-General drew the Committee's attention to Article 80 of the Convention which provided that no decision of the Conference should be put into effect if it would result in an increase of authorized expenses beyond the Protocol limits.

To avoid any misunderstanding, it should be noted that the present Conference could only issue directives or take decisions for future studies in relation to items on its agenda.

3.9 The Chairman of the IFRB said that there were two aspects to intersessional work: first, planning activities in connection with feeder links and, secondly, planning activities relating to the 6 GHz band. If those activities called for the development of complex software, the process was likely to be very costly and absorb a large share of IFRB resources.

3.10 Concluding the discussion, the Secretary-General confirmed that the assumption of the delegate of the United States of America was correct, in that 180,000 Swiss francs had already been committed for a P.4/P.5 engineer/analyst, leaving 600,000 Swiss francs to distribute among the various intersessional activities in 1985.

The meeting rose at 1010 hours.

The Secretary:	The Chairman
R. PRELAZ	R.G. DEODHAR

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 186-E
4 September 1985
Original: English

COMMITTEE 5

SUMMARY RECORD

OF THE

FOURTH MEETING OF COMMITTEE 5

(PLANNING PRINCIPLES AND CRITERIA AND REGULATORY AND ADMINISTRATIVE PROCEDURES)

Wednesday, 28 August 1985, at 1545 hrs

Chairman: Mr. M. MENCHEN ALUMBREROS (Spain)

Subjects discussed:	Documents
1. Approval of the summary records of the second and third meetings of Committee 5	118, 152
2. Reports of Working Group Chairmen	-
2.1 Working Group 5A	-
2.2 Working Group 5B	-
3. Report to the Plenary	-
4. Consideration of documents transmitted for other Committees	163, 184, 182, 183, 179, 173, 166, 164, 157, 156

1. Approval of the summary records of the second and third meetings of Committee 5 (Documents 118 and 152)

The summary record of the second meeting of Committee 5 was approved, subject to amendments submitted by the delegate of the Islamic Republic of Iran (see Corrigendum 1 to Document 118).

The summary record of the third meeting of Committee 5 was approved, subject to amendments suggested by the Chairman and the delegate of Tanzania.

2. Reports of Working Group Chairmen

2.1 Working Group 5A

2.1.1 The Chairman of Working Group 5A said that the Working Group had held fourteen meetings and had examined Documents DT/32 and DT/34. It was now considering Document DT/48 and had reached agreement on some planning principles but thought it advisable to wait until they had all been dealt with before submitting them to Committee 5. Some overlapping between certain principles had been noted. His intention was to finish the work on planning principles that week and then to tackle planning methods. Some administrations were already considering a compromise solution on the latter subject and he hoped that, with the cooperation of all concerned, the work could be completed by the middle of the following week.

2.1.2 The Chairman recalled that Working Group 5A was supposed to complete its work by the morning of 2 September and on the afternoon and on the evening of that day Committee 5 had to adopt the planning methods so as to enable Working Group 5B to establish the relevant guidelines and procedures. So he urged that Working Group to make haste.

2.1.3 The delegate of Norway said that the development of a "compromise planning method" had been the subject of a preliminary discussion in Working Group 5A, but he wondered when it would be discussed in substance.

2.1.4 The Chairman said he understood that several administrations were actively engaged in a search for such a compromise solution. Their efforts were most welcome and the discussion of that matter would continue.

2.1.5 The Chairman of Working Group 5A said that the proposals from the different administrations did indeed seem very difficult to reconcile, and that all proposals tending to a compromise would be most welcome.

2.1.6 The delegate of Norway took note of those explanations.

2.2 Working Group 5B

2.2.1 The Chairman of Working Group 5B said that since the Committee had last met the Working Group had held one and a half meetings. At the full meeting it had discussed procedures applicable to coordination as provided for in Article 11, Section II of the Radio Regulations. The primary purpose of the discussion had been to enable Sub-Working Group 5B Ad hoc 2 to take account of the Working Group's views on coordination procedures. The Sub-Working Group's report would be examined that evening. At the half meeting the report of the Sub-Working Group 5B Ad hoc 1 had been considered but that work had yet to be completed.

2.2.2 The Chairman hoped that Working Group 5B which so far had not been allotted much time would be able to finish its work by the following week.

3. Report to the Plenary

3.1 The Chairman said that he would prepare a note concerning the progress made by the Working Groups for submission to the Plenary the following day.

4. Consideration of documents transmitted from other Committees (Documents 163, 184, 182, 183, 179, 173, 166, 164, 157, 156)

4.1 The Chairman invited the Committee to consider a number of documents which had been transmitted to it from other Committees. He drew attention to Document 163 and suggested that it be referred to the two Working Groups of Committee 5 so that they might comply as soon as possible with the request made in it by the Chairman of the Ad hoc Working Group of the Plenary.

It was so agreed.

4.2 The Secrêtary-General emphasized that the financial implications of any intersessional work must first be examined by the Budget Control Committee to which the Administrative Council had delegated some of its responsibilities.

4.3 The Chairman confirmed that as soon as any proposals on intersessional work had been formulated they would be submitted to Committee 3 for consideration.

4.4 The Chairman of Committee 4 explained that the purpose of Document 184 was to provide Committee 5 with some technical considerations on pairing of frequency bands in fixed-satellite service networks based on provisional conclusions reached by Committee 4 which it hoped would be helpful for the discussion on which bands and services were to be planned. The information in the annex to the document dealt with two aspects: the choice of band pairing to be planned in 1988 under item 2.2 of the Conference agenda and band pairing which might be adopted to promote the efficient use of the geostationary orbit under item 2.6 of the agenda.

The annex was to be reviewed further by Committee 4 in the light of decisions reached by Committee 5. Document 184 formed one of a series to be presented to Committee 5.

4.5 The representative of the IFRB said that the document included some very important points relating both to band pairing and to planning in general. The first two sections and the conclusions presented in the annex provided material for consideration in the second session and some of those elements could well provide a basis for intersessional work.

4.6 The delegate of the Islamic Republic of Iran asked for an elucidation of the reference, at the end of the first paragraph of the annex to Document 184, "to conform in a rigid way to a specific list of frequency band pairing".

4.7 The Chairman of Committee 4 explained that that reference was a response to the concern of some delegations regarding the possible implications of a rigid band-pairing scheme. That concern had been apparent for some time, but it could be dispelled by work to be done at the intersessional stage.

An evaluation of the benefits of band pairing should be effected and its results should be considered at the second session.

4.8 The delegate of the Islamic Republic of Iran, while accepting that explanation, still wondered what exactly was meant by "rigid" pairing.

4.9 The Chairman felt that this aspect would be dealt with by the Working Group.

4.10 The Chairman of Committee 4 reviewed the procedure for initiating intersessional studies. However, the representative of the IFRB felt that it would be more appropriate to focus attention upon the criteria set out, of which some might be important during the intersessional period.

4.11 The Chairman of Committee 4 agreed with that emphasis, and said that his Committee had yet to discuss the matter of intersessional activities.

4.12 The delegate of the United Kingdom felt that there was a need for firm recommendations for intersessional work from Committee 4, and that they should be carefully noted by Committee 5.

4.13 The Chairman emphasized that that aspect was not the prime concern of Committee 5, and that there was still a great deal to be done as regards the development of planning principles and criteria and regulatory and administrative procedures. He suggested that Document 184 should be conveyed to Working Group 5A.

It was so agreed.

4.14 The Chairman introduced a series of documents (182, 183, 179, 173, 166, 164, 157, 156) which had been submitted at the last minute and which had, in all cases, either been considered by Working Group 5A or appeared suitable for consideration by that Working Group. He suggested that those documents should officially be conveyed to Working Group 5A.

It was so agreed.

4.15 The delegate of Australia hoped that more meetings could be scheduled to accommodate the increased workload of Working Group 5A.

4.16 The Chairman presented a revised timetable providing for extra meetings, but emphasized that the Working Group was called upon to deal with complicated and difficult matters and would need to proceed with all despatch to deal with all the business in hand.,

4.17 The delegate of Japan said that his delegation had recognized the need for a measure of compromise in order to further the work of Committee 5. Suggestions to that end had been put forward in a document (190) which would be issued the following day, and more detailed proposals would follow.

4.18 The Chairman welcomed that initiative and expressed the hope that a solution would be found. Document 190 would be examined by Working Group 5A in due course.

4.19 The delegate of Algeria questioned the propriety of giving pre-eminence to a document that had not yet been issued. All documents should be dealt with on an equal footing.

4.20 The Chairman stressed that all suggestions would be given equal consideration, and said he was sure that the Japanese Delegation was laying no claim to preferential treatment.

4.21 The Chairman of Working Group 5A thought that the Japanese document could be a response to his Working Group's appeal for a compromise and re-emphasized that all such proposals would be most welcome. A major effort of cooperation would be required if a successful outcome were to be attained in the short time available.

4.22 The Chairman concurred with those sentiments and associated himself with that appeal.

The meeting rose at 1655 hours.

The Secretary: M. GIROUX

The Chairman: M. MENCHEN ALUMBREROS

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FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 187-E
28 August 1985
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PLENARY MEETING

REPORT OF THE CHAIRMAN OF COMMITTEE 6

Committee 6, with the terms of reference as indicated in Document 79 has set up two Working Groups (6A and 6B)[1]. Although these terms of reference are difficult and complex, considerable progress has been already achieved; however, some substantial problems still remain to be solved.

1. Working Group 6A (matters concerning the Final Acts for Region 2)

Working Group 6A, chaired by Mr. G.H. Railton (PNG) with the terms of reference shown in item 1 on page 4 of Document 79, has set up two Sub-Working Groups and an ad hoc Group. Working Group 6A and Sub-Working Groups have had meetings every day and made every effort to make progress. The first report of this Working Group was issued in Document 144.

1.1 Examination of criteria on interregional sharing and of incompatibilities between Region 2 BSS Plan and services of Regions 1 and 3

After extensive discussions, agreement was reached on the following issues:

1) Region 2 BSS into Region 1 and 3 BSS;

2) Region 2 BSS into Region 1 and 3 terrestrial services;

3) Region 2 BSS into Region 1 and 3 FSS.

- In relation to item 1) above, three beams of Region 2 have been identified as exceeding the pfd limits, based on the criteria agreed. Extensive discussions were made to solving this problem and a solution may come soon.

- In relation to item 2) above, two possible criteria for protecting the terrestrial services were considered and an ad hoc Group was set up to solve the problem. After extensive discussions agreement was almost reached on the limits of pfd of Region 2 BSS space stations and the use of energy dispersal in the Region 2 BSS Plan. The IFRB assists by providing all required calculations for evaluating the impact of the Region 2 BSS Plan on Regions 1 and 3 services.

- In relation to item 3) above, necessary criteria for evaluating the Region 2 BSS Plan was agreed. Difficulties have been experienced in reaching a unanimous decision on which systems of Regions 1 and 3 FSS systems should be taken into account, regarding the cut-off date for submission of the satellite networks to the Board, and which should be subject to an analysis.

- Informal discussions are continuing, including the evaluation of the incompatibilities between the Region 2 BSS Plan and the Regions 1 and 3 FSS systems.

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[1] Structure of Committee 6 is shown in Document DT/24(Rev.1).

1.2 Review of Document 16 and consolidation of decisions of SAT-R2 with the Radio Regulations

Discussions are in progress and partial agreements have been reached on a step by step basis as the work progresses, however, this is still subject to decisions to be taken after further discussions in Working Group 6A and Committee 6.

1.3 Examination of incorporation of Region 2 BSS feeder-link Plan into the Radio Regulations .

Discussion has started, taking into account the technical parameters examined by Working Group 6B.

2. Working Group 6B (feeder-links for BC-SAT Regions 1 and 3)

Working Group 6B, chaired by Mr. D. Sauvet-Goichon (F) with the terms of reference as shown in item 2 on page 4 of Document 79, has set up two Sub-Working Groups. These Groups have had meetings every day and considerable progress has been made, although some tasks still have to be resolved. The first report of Working Group 6B was issued in Document 162.

2.1 Selection of frequency bands for the BSS feeder-link Plan

After lengthy discussions, general agreement is reached on selecting two frequency bands, i.e. 14.5 - 14.8 GHz and 17.3 - 18.1 GHz, for a priori planning for feeder-links. However, no planning for the band 10.7 - 11.7 GHz is considered. Furthermore, intersessional activities, among other things, relating to the feeder-link planning are under discussion.

The 14 and 17 GHz bands are now identified, for which sharing criteria between services need to be developed. It was decided at the fourth meeting of Committee 6 that technical examination on sharing criteria would better be carried out by Committee 4. The Chairman of Committee 4 accepted this task.

2.2 Technical parameters for BSS feeder-link planning

The technical parameters for BSS feeder-link planning have been examined for both the 14 and 17 GHz bands. About twenty parameters and methods of resolving incompatibilities in planning feeder links have been under extensive discussion. Furthermore, selection of centre frequencies for planning the BSS feeder-link channels was examined. Good progress has been made in substance.

3. The above is basically a progress report to reflect the work at the Working Group level as it stands to this date, however, no document has been yet submitted for discussion and approval by Committee 6.

Committee 6 makes every effort for achieving all the work assigned to it by the date as set forth by the Steering Committee.

M. MATSUSHITA
Chairman of Committee 6

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PLENARY MEETING

REPORT FROM THE CHAIRMAN OF COMMITTEE 4

TO THE FOURTH PLENARY MEETING

1. Committee 4 held one meeting since the third Plenary meeting, at which time the substance of Document 184 was approved for transmission to Committee 5 for information. The document presents some provisional conclusions regarding technical considerations on frequency band pairing which may be useful to Committee 5.

2. The work in all three Working Groups is proceeding at a reasonable pace with Working Group 4A (Satellite sound broadcasting) scheduled to finish Thursday morning (29 August). Preliminary decisions on the bulk of the Committee 4 material are expected at Working Group level this week. Final meetings of Working Groups 4B and 4C are expected early next week.

3. Committee 4 ad hoc Group 1 (High definition television) held one additional meeting at which a decision was taken to defer the matter of a future Region 1 allocation to the ad hoc Working Group of the Plenary. Depending on the decision in that Working Group 4, ad hoc 1 may then proceed to examine the technical aspects and the requirements for intersessional work.

4. The main obstacles in completing the work of Committee 4 are:

1) the uncertainty about the structure and nature of the report of this session, and

2) the delay in reaching a decision in Committee 5 on the bands and services to be planned.

Regarding the first item, and as noted previously, some of the Committee 4 texts will have to be restructured which will require some time to complete. Of more significance, however, is the impact on Committee 4 of any delays in the decisions of Committee 5, particularly Working Group 5A. Even preliminary indications would be useful, otherwise, Committee 4 will be placed in an extremely difficult situation in the last few days of this session.

5. Notwithstanding the above, there is still room for optimism that problems will be overcome on a daily basis and that Committee 4 will be able to cope with whatever demands are placed on it in the remainder of this session.

R.G. AMERO
Chairman of Committee 4

INTERNATIONAL TELECOMMUNICATION UNION

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Corrigendum 1 to
Document 189-E
29 August 1985
Original : Russian

COMMITTEE 5

USSR

AGENDA ITEMS 2.2 AND 2.3

Page 1, URS/189/14, replace 2nd and 3rd paragraphs by the following text :

"However, considering that planning the FSS in all the frequency bands is an extremely complicated task, and also in the lignt of the preliminary decisions adopted at the Conference by Working Group 5A, it proposes that the FSS be planned initially in the band 4 500 - 4 800 MHz (space-to-Earth) and in a 300 MHz-wide section of the band 6 425 - 7 075 MHz (Earth-to-space) and in a 300 MHz-wide section of the band 6 425 - 7 075 MHz (Earth-to-space), as well as in the bands 10.7 - 10.95 GHz and 11.2 - 11.45 GHz (space-to-Earth) and 12.75 - 13.25 GHz (Earth-to-space) additionally allocated by WARC-79 and hitherto not intensively used. Operational and registered systems, systems for which advance publication information was already published before the beginning of the first session of the Conference and systems in the process of coordination should be included in the plans.

In the future, FSS plans should be established in the frequency bands 20/40 GHz to satisfy future requirements of administrations using advanced technologies."

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Document 189-E
28 August 1985
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COMMITTEE 5

USSR

AGENDA ITEMS 2.2 AND 2.3

1. Introduction

The USSR Administration's proposals to the first session of WARC-ORB (Document 9) expressed the opinion that the fixed-satellite service should be developed on a planned basis. Working Group 5A adopted a preliminary decision to the effect that of all the space services (except the broadcasting-satellite service) only the fixed-satellite service should be considered for planning, and that the frequency bands 6/4 and 14/11-12 GHz should be planned.

At the Working Group 5A meeting, the USSR delegation expressed its opinion concerning the frequency bands in which it considered the FSS should be planned initially. This document puts forward specific proposals on items 2.2 and 2.3 of the agenda of the Conference in the light of the preliminary decisions adopted by Working Group 5A.

2. Agenda item 2.2

URS/189/14 The USSR Administration considers that the fixed-satellite service should be planned in all the frequency bands allocated to it by the Radio Regulations, and that systems operating in those bands and systems registered before planning begins should be included in the plans, as an integral part thereof, as they stand and without being subject to any further procedure.

However, considering that planning the FSS in all the frequency bands is an extremely complicated task, and also in the light of the preliminary decisions adopted at the Conference by Working Group 5A, it proposes that the FSS be planned initially in the band 4 500 - 4 800 MHz (space-to-Earth) and in a 300 MHz-wide section of the band 6 425 - 7 075 MHz (Earth-to-space), as well as in the bands 10.7 - 10.95 GHz and 11.2 - 11.45 GHz (Earth-to-space) and 12.75 - 13.25 GHz (space-to-Earth), additionally allocated by WARC-79 and hitherto not intensively used. Operational and registered systems, systems for which advance publication information was already published before the beginning of the first session of the Conference and systems in the process of coordination should be included in the plans.

Subsequently, FSS plans should be established in the frequency bands 20/40 GHz to satisfy future requirements of administrations using advanced technologies.

3. Agenda item 2.3

URS/189/15 We propose an a priori plan for a period of about ten years, based on generalized technical parameters. It should be an allotment plan, in which each country is allotted one or more geostationary satellite positions and one or more service areas, according to its requirements, together with corresponding frequency bands.

For planning using generalized technical parameters, a frequency band proposed for initial planning of total bandwidth 800 MHz (space-to-Earth) and 800 MHz (Earth-to-space) may be allotted for each orbital position. If orthogonal polarization is used, this frequency band may be used twice for each orbital position for service to the same area, thereby effectively doubling the total bandwidth.

Under this planning method administrations do not have to submit detailed requirements, since each administration can be allotted a whole planned frequency band which it may use at its own discretion.

Given that the bands proposed for planning are as yet not congested to any great extent, establishing the plan should not pose any fundamental problems.

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COMMITTEE 5

Japan

PROPOSALS CONCERNING AGENDA ITEMS 2.2, 2.3, 2.4 AND 2.5

I. Introduction

1. This Administration expressed its views of a general nature on the cited agenda items in Document 39. In that document, we have pointed out the need for a thorough review of the current regulatory regime, implemented as the procedures of Articles 11 and 13 of the Radio Regulations, in order to meet the basic objectives of this Conference.

2. During the first half of this Conference, we have carefully listened to and examined the proposals and interventions made by other administrations. As a result of seeking a more satisfactory and acceptable arrangement for all administrations, we have formed a set of proposals which are submitted herein for the consideration of the Conference.

II. Background of proposals

3. There are very diversified views among administrations on the "desirable approaches" for the detailing of access to the orbit spectrum resources. Among others, the following three can be thought to be representative.

i) Basically, the current coordination procedure is preferred. Modifications to simplify the procedures to facilitate successful coordination are welcomed.

ii) The primary difficulty of the current bilateral coordination procedure is that it tends to increase the coordination difficulties particularly for the new entries. An extensive change of current procedure to incorporate multilateral adjustments of network parameters of existing and planned systems will solve the current problem.

Multilateral adjustments or harmonization can be made in the form of multilateral coordinations, by means of meetings held periodically (about 2 years) among concerned administrations or by holding planning conferences periodically (every 7 to 10 years).

iii) The essential requirement to satisfy all countries is to reserve orbital positions for all countries for possible future use of the orbit/spectrum resources. To meet this requirement drawing up a long term allotment plan is necessary. Even if the requirement of each country is not materialized at the time of the Conference, each administration should be entitled to request at least one orbital position.

4. The Administration of Japan appreciates the concerns behind the proposals from administrations as roughly categorized above. Our observations on these proposals are as follows:

i) The current regulatory procedure as modified appropriately will continue to be adequate for application to all services other than the FSS and also to the FSS in frequency bands above 15 GHz.

ii) The multilateral planning approaches would be suited for relatively congested bands of the FSS and those that require flexible use of the orbit/spectrum resources. Typical bands of this kind would be the conventionally utilized FSS bands below 15 GHz for public telecommunications. Part of the newly allocated bands in WARC 1979 may also fall into this category.

iii) A long term allotment plan may be drawn up taking advantage of the new allocations made in WARC 1979. In particular a part of the extended bands in 6/4 GHz seems adequate to accommodate the long term requirements of all countries for their domestic systems.

iv) From the results of quantitative studies made in our Administration, it is pointed out that the evolutionary approach described in ii) above is not compatible with the long term allotment plan of iii). They cannot be applied within the same bands. Even if the orbit segmentation is applied, both approaches would not be able to coexist in the same band in the congested parts of the orbit due to the strong interaction between orbital segments.

v) Drawing up a long term allotment plan in the FSS would be the first such experience in radio telecommunications history. Furthermore, we have to take into account the complexities and diversified system parameters of the FSS. It is our view that application of a long term allotment plan should be confined only to a part of the relatively unused extended bands.

III. Proposals

A set of proposals regarding agenda items 2.2 to 2.5 follows, (see also attached Table 1).

J/190/12 5. Proposal

The Administration of Japan proposes that a long term allotment plan be applied in the band 4.5 to 4.8 GHz (space-to-Earth) and associated 300 MHz bandwidth (Earth-to-space) to be selected from the newly allocated band around 6 GHz. The allotment plan shall guarantee at least one orbital position for each country. The plan shall be optimized with regard to orbital positions to make the most efficient use of the orbit/spectrum resources. The plan may be defined with orbital position(s), service area(s) and a minimal number of technical parameters to maintain the aggregated amount of interference within the acceptable level. Since drawing up a long term allotment plan in the FSS has never been tried, the plan should be subject to review in a future WARC competent to space services.

Reasons

i) The technology level of 6/4 GHz satellite networks has matured for use by all countries. Furthermore, the propagation characteristics of this set of bands is so ideal that no specific measure to maintain the required circuit availability is required in all countries in the world.

ii) In the band 4.5 to 4.8 GHz, no satellite network is currently operational. This is quite important to drawing up a plan with conservative technical parameters.

iii) For most of the countries, a bandwidth of 300 MHz, which could be readily doubled to 600 MHz by the use of dual polarization, will suffice for their long term traffic demands, especially taking into account the possibility of using other frequency bands.

iv) The newly allocated band 3.4 to 3.7 GHz will be more conveniently utilized together with the conventional down-link frequency band of 3.7 to 4.2 GHz because they are contiguous. In fact, INTELSAT VI is going to use 3.6 to 3.7 GHz which will be in operation from 1987. As to the band 3.4 to 3.6 GHz, it will continue to be difficult for use by the systems in the FSS because of sharing difficulties with other services.

v) Application of long term allotment plan to 14/11-12 GHz band does not seem adequate because the technological status is not as well matured as in 6/4 GHz, and has more adverse effect due to precipitation. This will necessarily lead to a more expensive system implementation.

J/190/13 6. Proposal

In the 6/4 GHz and 14/11-12 GHz FSS bands, a multilateral planning approach should be applied except the bands proposed for the long term allotment plan detailed above. The details of the multilateral planning approach will be the subject of further discussion, taking into account the proposals made by several administrations such as France, the United States, India, Spain, etc.

In implementing this kind of planning approach, an aggregate interference criterion should be utilized and compulsory flexibilities on some of the technical parameters should be imposed both to the existing and future networks to guarantee the access of orbit for the new systems.

Reasons

i) The current bilateral coordination procedure tends to increase the coordination burdens to new entries when the orbit becomes relatively congested. To solve this problem and to make more efficient use of the orbit/spectrum resources, multilateral adjustments of network parameters are essential.

ii) A long term allotment plan would not be able to be drawn up with reasonable technical parameters if already existing and planned networks are to be accommodated in the same band.

iii) By incorporating compulsory flexibilities in some of the technical parameters of existing systems, it is possible to guarantee, in practice, the equitable access to all countries when requirements arise.

J/190/14 7. Proposal

For the FSS using frequency bands other than 6/4 GHz and 14/11-12 GHz and those for other space services, existing coordination procedure, modified for simplification, should be applied.

Reason

Since no congestion is foreseen with the satellites in the services and band cited above, the current procedure should work quite satisfactorily.

IV. Conclusion

8. A set of proposals regarding the planning method to be applied for different bands has been presented, which our Administration hopes a large majority of administrations can accept.

To provide firm guidelines of the intersessional work and to lead the second session of this Conference successfully, more detailed work in other committees is essential, which are still waiting for the major outcomes of Committee 5. Therefore, we suggest that Committee 5 should agree on conclusions as soon as possible, even if it might be on a provisional basis, and continue detailed arguments toward the end of the first session of this Conference.

A. ARAI
Head of the Japanese Delegation

<u>TABLE 1</u>

<u>Observations and proposals of planning methods</u>

Frequency bands \ Planning method		Current procedure (Improved)	Multilateral planning approaches: Multilateral planning meeting (Frequent/with concerned adm. only)	Multilateral planning approaches: 7-10 years plan by Conference based on concrete space programme	Long term allotment plan (at least one orbital slot for each adm.)	Comments
6/4 GHz existing bands		Not desirable	Most desirable (proposed)	Not desirable	Not desirable and unacceptable	1. Congested bands require flexible and multilateral approach
6/4 GHz extended bands	3.4 - 3.7 GHz and associated 300 MHz in 6 GHz	Feasible	Most desirable (proposed)	Not desirable	Not desirable and unacceptable	2. Some part may not be usable for FSS 3. Desirable to be used with the existing 6/4 GHz
	4.5 - 4.8 GHz and associated 300 MHz in 6 GHz	Feasible	Most desirable	Feasible	Feasible (proposed)	4. The only band that a long term allotment plan may be feasible
8/7 GHz bands		Most desirable (proposed)	Not desirable	Not desirable	Not desirable and unacceptable	5. Co-equal status with MSS and ESS which makes planning difficult
14/11-12 GHz existing and extended bands		Not desirable	Most desirable (proposed)	Not desirable	Not desirable and unacceptable	6. Congestion has begun 7. Extended band should be used with the existing bands
30/20 GHz bands and beyond		Most desirable (proposed)	Feasible	Not desirable	Not desirable and unacceptable	8. The orbit is almost vacant

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WORKING GROUP 6A

Note by the Secretary-General

SUPPLEMENTAL REPORT BY THE IFRB TO THE WARC-ORB(1)
ON INTERREGIONAL SHARING BETWEEN THE
BROADCASTING-SATELLITE SERVICES OF REGION 2
AND THE SERVICES OF REGIONS 1 AND 3

At the request of the IFRB, I transmit the attached supplemental report on Interregional Sharing between the Broadcasting-Satellite Services of Region 2 and the Services of Regions 1 and 3, for the information of Working Group 6A

R.E. BUTLER
Secretary-General

Annexes: 4

SUPPLEMENTAL REPORT BY THE IFRB TO THE WARC-ORB(1)
ON INTERREGIONAL SHARING BETWEEN THE
BROADCASTING-SATELLITE SERVICES OF REGION 2
AND THE SERVICES OF REGIONS 1 AND 3

In IFRB Circular-letter No. 603 the Board had presented to administrations the results of the compatibility examinations that it had undertaken in response to Resolution No. 4 of the Final Acts of SAT-83. This document was presented to this conference as Document 48 and its corrigenda.

The conclusion of the Sub-Working Group was to develop new pfd criteria to be considered for determining the potential incompatibility between the Region 2 BSS Plan and the services of Regions 1 and 3. The total pfd criteria now being proposed for application are summarized in Table 1 of Document DT/46(Rev.2), divided into four different sets, dependent upon the frequency band, type of service and the region of implementation of the service.

The Board had been requested to conduct various studies on an informal basis to aid in the evaluation of the criteria as they were in the process of development; several informal documents were produced in response to these requests, as well as the two formal documents (Documents 167 and 168) which were recently transmitted to the Conference.

This document is being put forth at the further request of Sub-Working Group 6A-1 with the objective of evaluating the pfd criteria now being put forth for adoption, by summarizing in one document the results of the Board's technical examination to determine the Region 2 BSS Plan assignments which, if implemented with the Plan parameters, would exceed the pfd limits of these criteria under consideration.

The criteria presented in Document DT/46(Rev.2) are reproduced in the following table for convenience:

Frequency band	Power flux-density limit	Territory where the limit is applied	Source
1. a) 12.2-12.5 GHz b) 12.5-12.7 GHz	-125 dB ($W/m^2/4$ kHz) -125 dB ($W/m^2/4$ kHz)	Regions 1 and 3 Region 3 and territories of countries in Region 1 enumerated in RR 848 and 850	Res. 31 (WARC-79) Final acts SAT-R2, Res. 31
2. 12.2-12.5 GHz	-132 dB ($W/m^2/5$ MHz); for $0 \leq \gamma < 10^\circ$ $-132+4.2(\gamma-10)$ dB($W/m^2/5$ MHz); for $10^\circ \leq \gamma \leq 15^\circ$ -111 dB($W/m^2/5$ MHz); for $15^\circ < \gamma \leq 90^\circ$	Regions 3 and part of Region 1 to the west of 30°E	WARC-77 WARC-79
3. 12.2-12.7 GHz	-134 dB($W/m^2/5$ MHz); for $\gamma = 0^\circ$ $-134+4.6975\gamma^2$ dB($W/m^2/5$ MHz); for $0^\circ < \gamma \leq 0.8^\circ$ $-128.5+25\lg\gamma$ dB($W/m^2/5$ MHz); for $\gamma > 0.8^\circ$	Part of Region 1 to the east of 30°E	CCIR preparatory meeting 1982 and Reports 789-1 and 631 Documents 9, 16
4. 12.5-12.7 GHz	-148 dB($W/m^2/4$ kHz) for $\gamma = 0^\circ$ $-148 + 4.6975\gamma^2$ dB($W/m^2/4$ kHz); for $0^\circ < \gamma \leq 0.8^\circ$ $-142.5 + 25\lg\gamma$ dB($W/m^2/4$ kHz); for $\gamma > 0.8^\circ$	Region 3 and territories of countries in Region 1 enumerated in RR 848 and 850	

The results of the Board's technical examination for the criteria presented in the four rows of the table are presented in Annexes 1 to 4, respectively.

ANNEX 1

The criteria of the first row of the table of Document DT/46(Rev.2) was defined in Annex 5 of Appendix 30 for the purpose of protecting terrestrial services in Regions 1 and 3 from the Region 2 broadcasting-satellite service. This limit is the following:

> -125 dBW/m^2/4 kHz, for broadcasting-satellite space stations using circular polarization.

The results of the Board's previous analysis with respect to this criterion was presented in Table 7 of Document 48, in the columns related to paragraph 1 of Annex 5. These results did not include any energy dispersal and it was noted in paragraph 5.4 of the document that a total of 19 beams of eight administrations exceeded the limit criteria, the maximum being an excess of 20 dB.

The conclusion to date of Working Group 6A is that an energy dispersal of 22 dB in a 4 kHz reference bandwidth must be used for all of the Region 2 BSS plan assignments which exceed a value of -138 dBW/m^2/24 MHz (reference Document DT/40). The Board performed an analysis at the request of the Working Group to identify the beams which do not exceed this pfd; the results of this analysis were presented in Document 167 and it may be noted that none of the beams included in Table 7 of Document 48 were identified by that analysis, with the consequential conclusion that the beams identified in Table 7 must use 22 dB of energy dispersal with respect to a 4 kHz reference bandwidth. With this fact in mind, it may be concluded that:

> NONE OF THE REGION 2 BSS BEAMS EXCEED THE -125 dBW/m^2/4 kHz CRITERIA AT ANY OF THE TEST POINTS LISTED IN TABLE 6 OF DOCUMENT 48.

ANNEX 2

The criteria of the second row of the table of Document DT/46(Rev.2) is from paragraph 2 of Annex 5 to Appendix 30 and this relates to protection of the terrestrial services of Regions 1 and 3 using a 5 MHz reference bandwidth. The application of these criteria to Region 1 was restricted to that territory of Region 1 which is west of 30°E.

The Board, in its analysis presented in Document 48, had identified different categories of test points in the list of test points presented in Table 6 of that document. The points identified with a symbol of 1A in the Region column were not included in the analysis vis-à-vis these criteria.

The results of this analysis were presented in Tables 7 and 9 of the document. It should be noted that the reference antenna pattern of Figure 5 of Annex 5 was used for all of the beams except those which are identified with a symbol in the Remarks column of the Plan as using the Figure 6 "fast roll-off" pattern.

It should also be noted that several points which were east of 30°E inadvertently had the A left out of the REG symbol, with the consequence that the two administrations of MWI and SWZ should be deleted from Table 9.

However, the conclusions of the analysis as presented in paragraph 5.4 of the document remain valid for the criteria of paragraph 2 of Annex 5. The detailed results of this analysis are reproduced here in Table 1 to this annex.

Table 1

Region	Affected Adms. \ Region 2 Beams	ARGINSU5	ARGNORT4	ARGNORT5	ARGSUR04	ARGSUR05	B CE311	B CE312	B CE411	B CE511	B NO611	B NO711	B SE911	B SU111	B SU211	BOL00001	CAN01404	CAN01405	CAN01504	CAN01505	CAN01605	CAN01606	CLM00001	CRBEC001	FLKANT01	GRLDNK01	GUFMGG02	HWA00002	HWA00003	MEX01SUR	PRU00004	SPMFRAN3	USAEH001	USAEH002	USAEH003	USAEH004	VEN11VEN
REGION 1	AFS			2.0				0.8																													
	AGL			0.5			5.2		0.5																												
	ALG								2.5						1.6	0.6				0.0											0.2						
	AOE		4.4													1.2			0.7												0.6						
	ASC		9.3		0.1											4.1								4.1							0.2						
	AUT																																4.1				
	AZR		2.1																2.3				4.4	1.										5.5			6.
	BDI							0.9																													
	BEL																					1.1											5.				
	BEN										2.7	1.4																									
	BOT			1.				1.4																													
	CAF						3.5		1.6	0.1																											
	CME						4.1		2.3	0.3																											
	COG						4.3		1.	0.2																											
	CPV		2.2										2.6										5.											5.5			8.6
	CTI													1.8	5.3																0.6						
	CVA								0.2																								3.7				
	D																									0.9						0.0	4.8				
	DDR																									1.8						0.7	5.1				
	DNK																									2.8						1.5	5.5				
	E		3.7						0.7							0.8			1.6	2.1	1.5										0.4		3.6				
	F																					1.2											5.				
	G																	3.3		15.8	12.3	4.5				3.7					0.4		5.7				
	GAB						4.5		1.2	0.4																											
	GHA										0.2			2.3	5.7																						
	GMB		6.2													2.1															0.3						
	GNB		6.3													2.2								0.4													
	GNE						4.3		1.5	0.4																											
	GUI													1.9	5.5	2.3								0.5							0.9						
	HOL																					1.5				0.5							5.3				
	HVO													1.7	5.3																0.6						
	I								0.7																								3.3				
	IRL																	1.8		9.5	4.4	2.5															
	ISL																13.7	9.6	22.6	20.7	19.	14.4		4.8		21.3					0.6	1.8	5.7				
	LBR													2.	5.5	2.5															0.9						
	LBY								2.8																								2.				
	LIE																																4.4				
	LSO							0.7																													
	LUX																																5.				
	MCO																					0.0											4.2				
	MLI														3.5	1.8															0.6						
	MLT								1.5																								2.6				
	MRC														1.1	0.5				0.5	0.3										0.2						
	MTN		5.5											0.6	4.4	1.7			0.1					0.0							0.6						
	NGR						0.9		3.1																								0.8				
	NIG						2.7		2.9	0.2																							0.6				
	NMB			1.1			4.7			0.7																											
	NOR	17.2		4.4		0.3				0.7															15.7	25.	1.1					3.5	5.5				
	POL																									0.2											
	POR		3.													0.5	0.1		2.4	2.3	1.8										0.4						
	RRW							0.8																													
	S																									7.3						2.3					
	SEN		6.2																					0.4													
	SHN													3.3	5.4																2.4						
	SMR								0.1																								3.7				
	SRL															2.4								0.7							0.9						
	STP						4.6		1.3	0.5																											
	SUI																																4.4				
	TCD						2.7		2.7																												
	TCH																									0.6											
	TGO										0.1																										
	TRC													2.9	5.3	6.2															4.6						
	TUN								2.1																								2.3				
	TZA							1.																													
	UGA							0.6																													
	ZAI			0.4			5.		0.4	0.4																											
	ZMB			0.6				1.2																													
	ZWE			0.8				1.4																													
REGION 3	CHN																											1.2	0.7								
	F			3.3																													3.0				
	HWL																																	0.8			
	KIR																													0.7							
	KRE																											1.2									
	MRL																																		0.5		
	PTC			3.7																																	
	TKL			1.9																																	
	WAK																																			0.4	

ANNEX 3

The criteria of row 3 of the table in Document DT/46(Rev.2) is for the purpose of providing a criteria similar to that of paragraph 2 of Annex 5 as just discussed in Annex 2 of this document, but for the part of Region 1 East of 30°E which was previously lacking a pfd criteria for a 5 MHz reference bandwidth.

Sub-Working Group 6A-1 has agreed upon these criteria on a provisional basis and has requested that the Board perform an analysis to determine the effect of such. Since the criteria are very sensitive to the arrival angle, the Board has undertaken this study by calculating the pfd along lines of constant arrival angle to determine those beams which exceed the criteria on any part of the land masses of Region 1 East of 30°E. Test points were generated by incrementing the latitude and determining the longitude which yields the desired arrival angle. The resulting values of pfd at the test points thus generated were then compared to the pfd limit values per the criteria of row 3.

Different arrival angles were examined but it was found out that the most critical points resulted from the very low angles. A summary of the results of this analysis which show the maximum values of excess pfd are presented in Table 1 of this Annex.

The conclusions are that 22 beams show an excess pfd for one or both of the low arrival angles of 0° or 0.8°. It should be noted again that the beam reference antenna patterns used for this analysis are as specified in the SAT-83 Plan.

Table 1

BEAM NAME	ARRIVAL ANGLE (DEG.)	AREA OF P.F.D. EXCESS GEOGRAPHICAL LIMIT SOUTH LONG. LAT.	NORTH LONG. LAT.	MAXIMUM P.F.D. EXCESS (dB)	COUNTRIES INVOLVED
ALS00002	0. 0.8 5.	117E23 50N00 123E03 60N00 ------ 169E37 75N00 -------	133E04 72N00 136E02 72N00	18.4 15.9 2.4	MNG/URS
ALS00003	0. 0.8 5.	110E04 55N00 117E45 65N00 ------ 160E37 75N00 -------	124E04 72N00 127E02 72N00	13.1 10.8 0.3	URS
B CE312	0. 0.8	35E12 25S00 ---	35E32 20N00 ---	3.0 ---	MOZ/MWI/TZA KEN/ETH/SDN
B CE412	0. 0.8	35E48 15N00 ---	31E12 50N00 ---	1.7 ---	SDN/EGY/ARS ISR/TUR/URS CYP
CAN01101	0. 0.8	149E23 60N00 154E45 65N00	161E04 72N00 164E02 72N00	13.7 11.6	URS
CAN01201	0. 0.8	155E35 68N00 ---	161E04 72N00 ---	2.0 ---	URS
CAN01203	0. 0.8	160E57 64N00 ------ 169E37 70N00 -------	167E01 70N00	2.9 0.1	URS
CAN01303	0. 0.8	162E36 66N00 ---	167E01 70N00 ---	1.9 ---	URS
CAN01403	0. 0.8	------ 167E01 70N00 ------- ---	 ---	0.5 ---	URS
CLMAND01	0. 0.8	172E23 60N00 ---	176W05 72N00 ---	2.1 ---	URS
CLM00001	0. 0.8	176W24 60N00 ---	173W45 65N00 ---	2.4 ---	URS
HWA00002	0. 0.8	116E08 45N00 117E17 45N00	119E04 55N00 118E39 50N00	3.7 0.8	MNG/URS

Table 1 (cont.)

BEAM NAME	ARRIVAL ANGLE (DEG.)	AREA OF P.F.D. EXCESS BOUNDARY POINT SOUTH LONG. LAT.	NORTH LONG. LAT.	MAXIMUM P.F.D. EXCESS (dB)	COUNTRIES INVOLVED
HWA00003	0. 0.8	107E08 45N00 ---	112E23 60N00 ---	2.7 ---	MNG/URS
MEX02NTE	0. 0.8	147E23 50N00 156E45 65N00	160E01 70N00 162E37 70N00	3.8 0.8	URS
MEX02SUR	0. 0.8	155E08 45N00 ---	169E01 70N00 ---	2.2 ---	URS
USAEH002	0. 0.8	------ 171W45 65N00 ------- ------ 169W46 65N00 -------		7.4 4.4	URS
USAEH003	0. 0.8	180W45 65N00 178W46 65N00	174W02 70N00 172W38 70N00	7.8 4.8	URS
USAEH004	0. 0.8	164E23 50N00 165E39 50N00	174W32 75N00 170W23 75N00	8.3 5.3	URS
USAWH101	0. 0.8	134E08 45N00 141E03 60N00	157E31 75N00 161E22 75N00	7.4 4.6	URS
USAWH102	0. 0.8	128E04 55N00 141E37 70N00	148E31 75N00 152E22 75N00	5.6 2.8	URS
VENAND03	0. 0.8	------ 179W02 70N00 ------- ---	 ---	0.5 ---	URS
VEN11VEN	0. 0.8	------ 173W09 65N00 ------- ---	 ---	0.4 ---	URS

ANNEX 4

The criteria of row 4 of the table in Document DT/46(Rev.2) is for the purpose of providing a criteria to protect the terrestrial services in Region 3 and in the territory of administrations of Region 1 mentioned in footnotes RR848 and RR850. These criteria are for a reference bandwidth of 4 kHz and they differ from those of row 3 (as just discussed in Annex 3) by a constant value of -14 dB. However, in total, these criteria are 8 dB less stringent than those of row 3 since this analysis includes the 22 dB energy dispersal in the 4 kHz reference bandwidth.

The Board had previously been requested by the Working Group to examine these criteria and the results of this analysis were presented in Document 168. This analysis was done on the basis of establishing files of test points related to the territories of Region 3 and to the administrations mentioned in footnotes RR848 and RR850. These results are presented in this document as Table 1.

However, examination of the results presented in Document 168 showed that the arrival angle sensitivity is not properly reflected by an analysis using a file of test points when large land masses are involved. Consequently, it was decided to supplement the analysis as presented in Document 168 by performing another analysis along the same method as just described in Annex 3.

It was found out again that the most critical points resulted from the very low arrival angles. A summary of the results of this analysis which show the maximum values of excess pfd are presented in Table 2 of this Annex.

The conclusions are that 4 beams show an excess pfd for one or both of the low arrival angles of 0° or 0.8°. It should be noted again that the beam reference antenna patterns used for this analysis are as specified in the SAT-83 Plan.

Table 1

BEAM	P.F.D. VALUE				DT/46 CRITERIA		EXCESS P.F.D. (DB)
	dBW/m2	LONG	LAT	ADM	ARRIV. ANGLE	LIMIT	
ALS00002	-133.14	150E00	75N00	URS	2.1	-134.53	1.39

Table 2

BEAM NAME	ARRIVAL ANGLE (DEG.)	AREA OF P.F.D. EXCESS GEOGRAPHICAL LIMIT SOUTH LONG. LAT.	NORTH LONG. LAT.	MAXIMUM P.F.D. EXCESS (dB)	COUNTRIES INVOLVED
ALS00002	0. 0.8	125E36 66N00 129E54 68N00	133E04 72N00 136E02 72N00	10.4 7.9	URS
ALS00003	0. 0.8	121E01 70N00 ------ 127E02 72N00 -------	124E04 72N00	5.1 2.8	URS
CAN01101	0. 0.8	158E01 70N00 ------ 164E02 72N00 -------	161E04 72N00	5.7 3.5	URS
USAEH004	0. 0.8	170E57 64N00 ---	180W05 72N00 ---	0.3 ---	URS

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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WORKING GROUP 5B2

Note by the Secretary-General

REPORT BY THE IFRB TO THE WARC-ORB(1) ON

NOTIFICATION OF FREQUENCY ASSIGNMENTS TO

STATIONS IN THE SPACE RADIOCOMMUNICATION SERVICES

At the request of the IFRB, I transmit the attached report on Notification of Frequency Assignments to Stations in the Space Radiocommunication Services, prepared at the request of Working Group 5B2.

R.E. BUTLER

Secretary-General

Annex: 1

REPORT BY THE IFRB TO THE WARC-ORB(1) ON
NOTIFICATION OF FREQUENCY ASSIGNMENTS TO STATIONS
IN THE SPACE RADIOCOMMUNICATION SERVICES

1. In the present procedures, the advance publication procedure is to be applied for each satellite network and the coordination RR1060 is to be carried out for each assignment. However, in practice, administrations negotiate the coordination on the basis of a network. In any case, the notification and registration procedure (Article 13) is to be applied for each assignment separately. Working Group 5B2 concluded to recommend that the coordination procedure should, in the revised regulations, be made for each network and requested the IFRB to prepare a document on the consequences of the possible extension of this approach to the notification and registration procedure.

2. The registration in the Master Register of a frequency assignment determines its legal status by reference to the rights and obligations of the country on behalf of which the assignment is registered. Hence, the notification and registration procedure is based on the sovereign responsibility of each Administration to assign frequencies to stations located on their own territory or under their responsibility. In terrestrial radiocommunications, point-to-point communication links are notified by and recorded on behalf of the administration (A) on the territory of which the transmitting station is located, implying that this is based on an agreement with the Administration (B) on the territory of which the receiving station is located and shall be protected. The recording in the Master Register of the transmitting station pertaining to A with the Board's favourable finding afford protection to the receiving station pertaining to B.

Article 13 of the Radio Regulations applicable to space radiocommunications specifies that the notification and recording of the transmit and receive frequencies shall be made separately. In so far as assignments to space stations are concerned, the responsible Administration acts on its own behalf for national systems or can be nominated to act for a group of Administrations. However, for earth stations, the notification is made by the Administration on whose territory the earth station is located.

3. Once notified, the proposed assignment is to be examined for its compatibility both with registered assignments or assignments under coordination to other space or earth stations as well as to recorded assignments to terrestrial stations operating in the same frequency band. The adequate protection of receiving assignments against potential interference from transmitting assignments is dependent on the overlap of their respective bandwidths. This fact, among others, leads to the building up of the notification and registration procedures in the Radio Regulations as well as all the service documents on the basis of frequency assignments. In this respect, reference is made, among others, to number 77 of the Convention and mainly to RR2187 which specifies that "Frequency assignments in the International Frequency List shall be arranged in numerical ascending order of the frequencies assigned".

4. The notification and registration on the basis of satellite networks would lead to two major difficulties:

- the first relates to the need for a satellite network composed of one space station and several earth stations to be notified by and recorded on behalf of one administration while some earth stations may be located within the territory of another administration;

- the second relates to the need to combine the assignments of a satellite network with those pertaining to other satellite networks and with those pertaining to terrestrial services in order to conform to RR2187.

5. A reference was also made to the notification and registration of stations instead of frequency assignments. In this context, it should be recalled that with RR19 an "assignment" is the authorization for a station to use a frequency (singular) under specified conditions, while a "station" in accordance with RR58 may comprise one or more transmitters or receivers or a combination. The term "station" is also used in RR60 "Earth station" and RR61 "Space station". Consequently, an earth or space station in a satellite network may be able to operate on a variety of frequencies in a series of frequency bands, which may be allocated even to different services for space radiocommunication. Document 105 and its Addenda provide many examples for various beams in various frequency bands operated from the same space station in the geostationary-satellite orbit and such hybrid satellite systems/methods seem to proliferate.

6. In view of the continual growth in the volume and complexity of the work of the IFRB, the Plenipotentiary Conference, 1982, adopted a considerable continued investment into improved computerized systems to be used by the IFRB (see Additional Protocol 1, paragraph 3 and Resolution No. 69 of the Nairobi Conference). The Frequency Management System (FMS), subsquently designed after thorough studies initiated in 1977 with investments so far of roughly 20 million SFR, is based on the notification and registration of frequency assignments. (The FMS was described in IFRB Circular-letter No. 601 of 20 December 1984.)

Approaches to the frequency management based on networks or stations would require a complete reconstruction of the data bases and practically to a review of the complete system.

7. The Board is aware of the difficulty for Administrations to consider complete satellite systems on the basis of the published data in the IFL and weekly IFRB Circulars. In order to overcome these difficulties, List VIII A, which is the "List of stations in the Space Radiocommunication Services and in the Radio Astronomy Service", and in which the information is organized on a network basis, could assist.

8. In conclusion, therefore, a change in the present regulations towards a network or station treatment for notification and registration for space radiocommunications as opposed to the present assignment treatment would require at least:

- changes in the relevant provisions throughout all the Radio Regulations;
- a change in the procedure for examination of compatibility between the space and terrestrial services;
- a major change to the computer based FMS system for the treatment of notifications; and
- consideration of the substantial question of sovereignty for other than national systems.

For reasons of simplicity and economy, the Board strongly recommends that no departure be made from the present system.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

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COMMITTEE 6

SECOND REPORT OF WORKING GROUP 6B TO COMMITTEE 6

1. Selection of centre frequencies for planning the broadcasting-satellite feeder-link channels in Regions 1 and 3 in frequency bands 14.5 - 14.8 and 17.3 - 18.1 GHz

The planning for both-feeder link bands shall use the general characteristics of the BSS R1,3 Plan, and as far as possible linear translation and one translation frequency for a set of transponders serving the channels assigned to the same beam and administration.

1.1 General characteristics of the BSS R1,3 Plan

	Region 1	Region 3	
Maximum allocated frequency band	11.7 - 12.5	11.7 - 12.2	GHz
Maximum available bandwidth	800	500	MHz
Necessary bandwidth of a channel	27	27	MHz
Channel separation	19.18	19.18	MHz
Number of channels	40	24	
Centre frequency of the lowest channel	11 727.48	11 727.48	MHz
Centre frequency of the highest channel	12 475.50	12 168.62	MHz
Lower guard band	14.00	14.00	MHz
Upper guard band	11.00	17.90	MHz

1.2 Centre frequencies for planning the broadcasting-satellite feeder links in the band 17.3 - 18.1 GHz

1.2.1 As the maximum available bandwidth of 800 MHz is the same for Region 1 BSS Plan and for the feeder-link band 17.3 - 18.1 GHz a translation frequency of 5.60 GHz can be used for a single frequency subtractive mixing. In Region 3 the same translation frequency of 5.6 GHz appears to be the optimum for single frequency subtractive mixing also in the case of the feeder-link band 17.3 - 17.8 GHz. This will produce a linear translation of all channels and preserve the same guard bands. This kind of conversion will produce down-link channels free from any spurious mixing products which might arise from combination of harmonic frequencies up to 10th order of any spectral line within the feeder-link channels and up to 10th order harmonics of the translation frequency.

1.2.2 In the case when a translation frequency other than 5.60 GHz is desirable for a single conversion mixing, then the ratio of the translation frequency to any frequency within the necessary bandwidth of a feeder-link channel must not be equal to 3/10 or 1/3.

1.2.3 Table 1 indicates channel numbers and corresponding centre frequencies of the BSS R1,3 Plan and the feeder links for the translation frequency of 5.60 GHz.

1.3 Centre frequencies for planning the broadcasting-satellite feeder links in the band 14.5 - 14.8 GHz

1.3.1 As the maximum available bandwidth for the feeder-link band 14.5 - 14.8 GHz is only 300 MHz in comparison to 800 and 500 MHz for Regions 1 and 3, respectively, several translation frequencies must be considered to allow any channel in the Plan to be used. Consequently, a particular feeder-link channel must be assigned to several BSS Plan channels simultaneously.

1.3.2 For the feeder-link band 14.5 - 14.8 GHz, 14 channels and two appropriate guard bands should be assumed.

1.3.3 Selection of translation frequencies for this purpose is a complex task due to two domains within the possible range of translation frequencies which would create spurious mixing products within certain channels. Therefore, it is necessary to optimize the translation frequencies. Ratios of translation frequency to any frequency within the necessary bandwidth of a feeder-link channel to be avoided are 1/6 and 2/11.

1.3.4 The following parameters shall be used for planning feeder links in the frequency band 14.5 - 14.8 GHz:

Necessary bandwidth of a channel	27 MHz
Channel separation	19.18 MHz
Number of channels	14
Centre frequency of the lowest channel (1)	14 525.30 MHz
Centre frequency of the highest channel (14)	14 774.64 MHz
Lower guard band	11.80 MHz
Upper guard band	11.83 MHz

Translation frequencies:

a)	for BSS channels 1 to 14	2 797.82 MHz
b)	for BSS channels 15 to 28	2 529.30 MHz
c)	for BSS channels 29 to 40	2 260.78 MHz

1.3.5 Table 2 indicates channel numbers and centre frequencies in the feeder-link band and the relationship to the BSS R1,3 Plan for the three translation frequencies.

1.4 Recommendations:

i) Recognizing the reduced channel capacity of the 14.5 - 14.8 GHz band administrations should be advised that if more than three channels are requested there may be difficulties in meeting all requirements. More than three channels in this band assigned to one administration would add to the complexity of the satellite.

ii) When certain channel families pertaining to a given beam and administration are split between two translation frequencies, that frequency which provides the greater number of channels should be chosen.

iii) There may be further complexity in a choice of channels if there is a requirement for a combination of 14 GHz and 17 GHz feeder links to a single satellite.

Such cases should be treated on an individual basis during the development of the Plan at the second session.

TABLE 1

Table showing correspondence between channel numbers and assigned frequencies in the BSS R1,3 Plan and for the associated feeder links using the translation frequency of 5 600 MHz

Channel No.	Plan assignm. MHz	Feeder assignm. MHz	Channel No	Plan assignm. MHz	Feeder assignm. MHz
1	11 727.48	17 327.48	21	12 111.08	17 711.08
2	11 746.66	17 346.66	22	12 130.26	17 730.26
3	11 765.84	17 365.84	23	12 149.44	17 749.44
4	11 785.02	17 385.02	24	12 168.62	17 768.62
5	11 804.20	17 404.20	25	12 187.80	17 787.80
6	11 823.38	17 423.38	26	12 206.98	17 806.98
7	11 842.56	17 442.56	27	12 226.16	17 826.16
8	11 861.74	17 461.74	28	12 245.34	17 845.34
9	11 880.92	17 480.92	29	12 264.52	17 864.52
10	11 900.10	17 500.10	30	12 283.70	17 883.70
11	11 919.28	17 519.28	31	12 302.88	17 902.88
12	11 938.46	17 538.46	32	12 322.06	17 922.06
13	11 957.64	17 557.64	33	12 341.24	17 941.24
14	11 976.82	17 576.82	34	12 360.42	17 960.42
15	11 996.00	17 596.00	35	12 379.60	17 979.60
16	12 015.18	17 615.18	36	12 398.78	17 998.78
17	12 034.36	17 634.36	37	12 417.96	18 017.96
18	12 053.54	17 653.54	38	12 437.14	18 037.14
19	12 072.72	17 672.72	39	12 456.32	18 056.32
20	12 091.90	17 691.90	40	12 475.50	18 075.50

TABLE 2

Table showing correspondence between channel numbers and assigned frequencies for the feeder links in the frequency band 14.5 - 14.8 GHz and the relationship to the BSS R1,3 Plan assignments

Feeder-link assignments		Translation frequencies (MHz)					
		2 797.82		2 529.30		2 260.78	
		BSS R1,3 plan assignments					
Ch. No.	Frequency (MHz)	Ch. No.	Frequency (MHz)	Ch. No.	Frequency (MHz)	Ch. No.	Frequency (MHz)
1	14 525.30	1	11 727.48	15	11 996.00	29	12 264.52
2	14 544.48	2	11 746.66	16	12 015.18	30	12 283.70
3	14 563.66	3	11 765.84	17	12 034.36	31	12 302.88
4	14 582.84	4	11 785.02	18	12 053.54	32	12 322.06
5	14 602.02	5	11 804.20	19	12 072.72	33	12 341.24
6	14 621.20	6	11 823.38	20	12 091.90	34	12 360.42
7	14 640.38	7	11 842.56	21	12 111.08	35	12 379.60
8	14 659.56	8	11 861.74	22	12 130.26	36	12 398.78
9	14 678.74	9	11 880.92	23	12 149.44	37	12 417.96
10	14 697.92	10	11 900.10	24	12 168.62	38	12 437.14
11	14 717.10	11	11 919.28	25	12 187.80	39	12 456.32
12	14 736.28	12	11 938.46	26	12 206.98	40	12 475.50
13	14 755.46	13	11 957.64	27	12 226.16	--	---------
14	14 774.64	14	11 976.82	28	12 245.34	--	---------

2. Technical characterisitics for feeder-link planning

2.1 Overall performance

Assuming that there is no transponder output back-off, a 0.5 dB noise contribution of the feeder link to the overall link requires that:

$$(C/N)_u = (C/N)_{d(total)} + 10 \text{ dB} \qquad (1)$$

For down-links, the WARC-BS-77 has adopted a figure of C/N equal to 14.5 dB for 99% of the worst month at the edge of the service area. The up-link C/N required is 24 dB for 99% of the worst month, to produce an overall performance of 14 dB.

Where there are difficulties in planning feeder links, account should be taken of the protection ratio margin available on the space-to-Earth link in protection ratios at the earth station receiver input.

2.2 Carrier-to-noise ratio

The minimum $(C/N)_u$ required for planning of the feeder links in Regions 1 and 3 is 24 dB. It may be desirable for some administrations to achieve a significantly higher value of C/N, however, the use of any value higher than 24 dB should not prevent the interference conditions from being met in the plan.

2.3 Co-channel carrier-to-interference protection ratio

The protection ratio to be planned for co-channel interference is 40 dB.

2.4 Adjacent channel carrier-to-interference protection ratio

Tests carried out recently by one administration showed that the adjacent channel protection ratio in feeder links for just perceptible interference could be reduced to 19 dB, when signals are passed through a 12 GHz TWT amplifier operating at saturation with an AM-PM conversion factor of 2^{o}/dB and then received through an SAW filter with 27 MHz bandwidth before the demodulator.

These tests were carried out using a TWT with a low value of AM-PM conversion. It is believed that the effects of adjacent channel interference will be intensified by AM-PM conversion by the same mechanism as that reported for the intensification of noise. An additional margin of 2 dB above the 19 dB measured in laboratory tests is therefore recommended. It is recommended that an adjacent channel protection ratio of 21 dB be used in feeder-link planning.

Some administrations proposed that planning should use a value of 24 db but where this cannot be applied a value of 21 dB used.

2.5 Feeder link e.i.r.p.

A uniform value of e.i.r.p. for each band should be used for initial planning. For the 17.3 - 18.1 GHz band this should be 84 dBW and for the 14.5 to 14.8 GHz band 82 dBW.

These are initial values to be used in developing the plan. They will be adjusted, if necessary, during the plan development on a case-by-case basis to ensure that the minimum carrier-to-noise and carrier-to-interference criteria specified in the plan are met for the feeder-link systems of all administrations. Adjustments will also be made, if required to accommodate the requirements of particular administrations.

Some administrations consider that these initial planning values may not meet their requirements.

2.6 Transmitting antenna

2.6.1 Antenna diameter

For a given value of e.i.r.p. and a given relative antenna pattern, the off-axis radiation power depends on the diameter of the antenna. The larger the diameter of the antenna, the smaller is the off-axis radiation power which is a potential source of interference between adjacent orbital positions.

So for planning of feeder links it is necessary to define a reference antenna diameter. For the 17.3 - 18.1 GHz band the value adopted is 5 m and for the 14.5 to 14.8 GHz band 6 m.

Smaller antennas of for example 2.5 m, can also be used provided there is no degradation of the interference situation. In practice this means that the e.i.r.p. might need to be reduced or the antenna diagram improved so there is no increase in the off-axis radiation power, and hence no unacceptable interference to the adjacent orbital position and other services.

2.6.2 On-axis gain

The on-axis gain for the 5 m antenna at 17.3 - 18.1 GHz and for the 6 m antenna at 14.5 to 14.8 GHz is taken as 57 dBi.

[2.7] Off-axis radiated power

The following is based on a transmitting antenna side-lobe response pattern which follows the characteristics of 32-25 log φ.

[2.7.1] Co-polar off-axis radiated power

The co-polar radiated power of the earth station for off-axis beam angles $\varphi > 1^{o}$[1] must not be more than:

for $1^{o} \leqslant \varphi \leqslant 48^{o}$, E - 25 - 25 log φ (dBW)

for $\varphi > 48^{o}$, E - 67 (dBW)

where

E (dBW) is the earth station on-axis e.i.r.p.

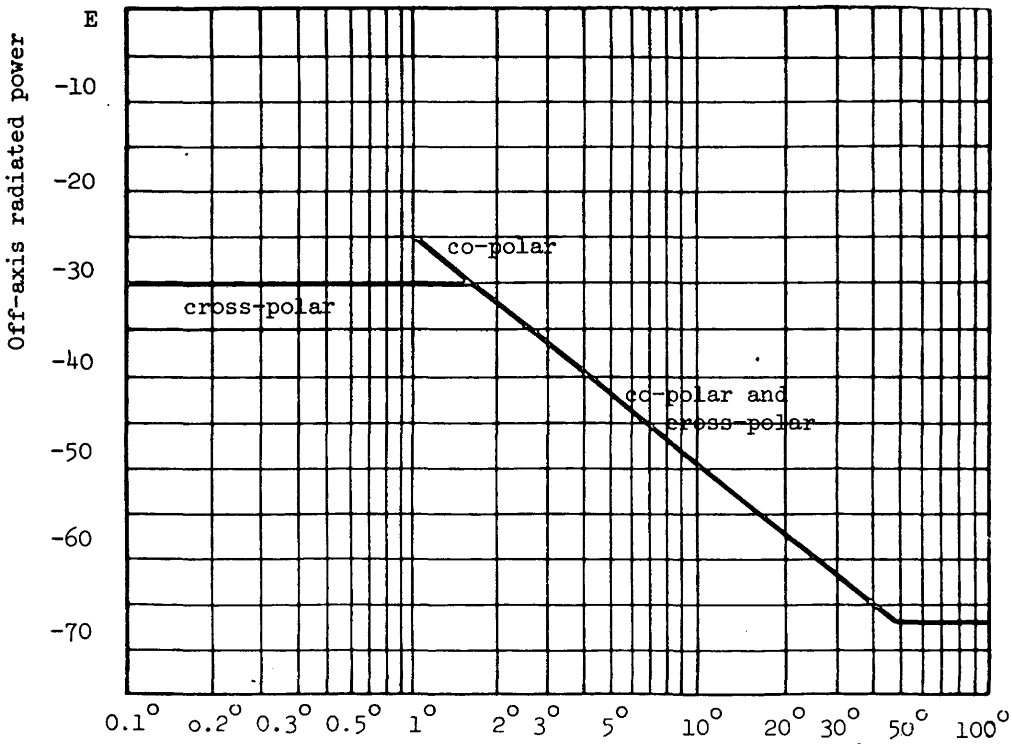

FIGURE 1

Earth station off-axis radiated power

Note - For $0 \leqslant \varphi \leqslant 1^{o}$ refer 2.21.9

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[1] Section 2.21.9 deals with co-polar radiated power of the earth station for off-axis beam angles $0^{o} \leqslant \varphi \leqslant 1^{o}$ which may be useful to resolve incompatibilities in planning feeder links.

In circumstances where independent planning of orbit positions is adversely affected, the off-axis co-polar radiated power of the earth station should be based on an antenna pattern of 29 - 25 log φ (dBi), for values of off-axis angle, φ, in the regions of the adjacent and next-but-one adjacent orbital positions in the plane of the geostationary orbit.

[2.7.2] Cross-polar off-axis radiated power

The cross-polar radiated power of the earth station must not be more than:

for $0^\circ \leqslant \varphi \leqslant 1.6^\circ$, E - 30 (dBW)

for $1.6^\circ < \varphi \leqslant 48^\circ$, E - 25 - 25 log φ (dBW)

For $\varphi > 48^\circ$, E - 67 (dBW)

where

E (dBW) is the earth station on-axis e.i.r.p.

In circumstances where insufficient cross-polar isolation is achieved, the off-axis cross-polar radiated power of the earth station should be based on an antenna pattern of 24 - 25 log φ (dBi) for $0.76^\circ \leqslant \varphi \leqslant 22.9^\circ$ and -10 (dBi) for $\varphi > 22.9^\circ$

2.8 Earth station mispointing loss

An allowance of 1 dB should be made for the loss in gain due to earth station antenna mispointing.

2.9 Satellite receiving antenna

If a common transmit/receive antenna is used, the cross-polar gain, beamwidth, pointing accuracy and the radiation pattern would be tied to the down-link antenna characteristics.

Where separate antennas are used for transmit and receive the parameters of the receiving antenna are given in the following subsections. Separate receiving antennas offer greater flexibility in terms of independence of the feeder-link frequency, polarization and service area.

2.9.1 Cross-section of receiving antenna beam

Initial planning is to be based on beams of elliptical or circular cross-section. If the cross section of the receiving antenna beam is elliptical, the effective beamwidth φ_0 is a function of the angle of rotation q between the plane containing the satellite and the major axis of the beam cross-section and the plane in which the beamwidth is required.

The relationship between the maximum gain of an antenna and the half-power beamwidth can be derived from the expression:

$$Gm = 27843/ab$$

or

$$Gm(dB) = 44.44 - 10 \log a - 10 \log b$$

where a and b are the angles (in degrees) subtended at the satellite by the major and minor axes of the elliptical cross-section of the beam.

A minimum value of 0.6° for the half power beamwidth is adopted for planning, except where an administration requests a lower value for its own beams.

2.9.2 Co-polar response pattern

The reference co-polar response pattern is given by the formula:

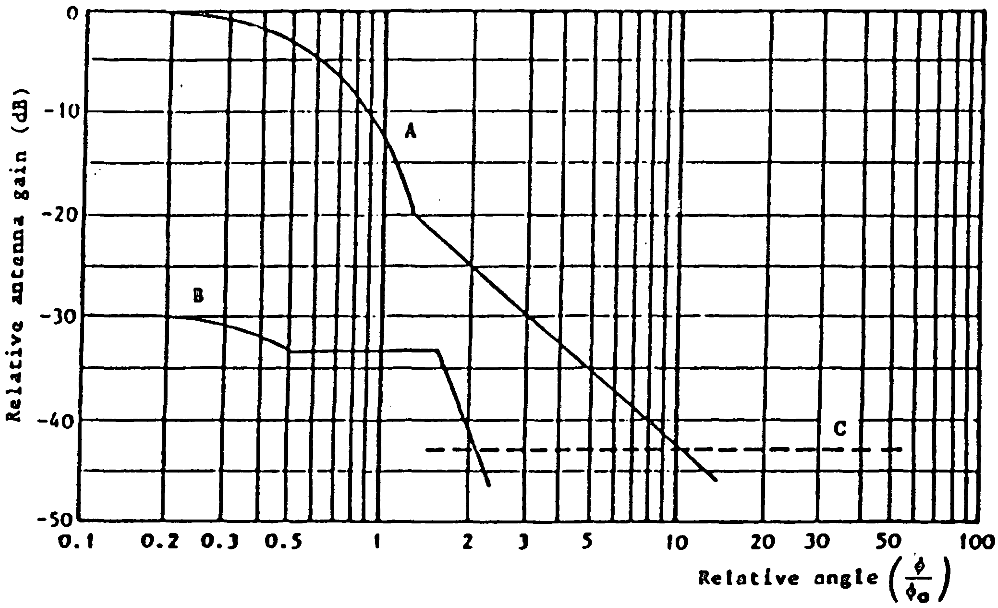
Co-polar relative gain (dB)

$$G = -12\left(\frac{\varphi}{\varphi_o}\right)^2 \text{ for } 0 \leq \frac{\varphi}{\varphi_o} \leq 1.30$$

$$G = -17.5 - 25 \log\left(\frac{\varphi}{\varphi_o}\right) \text{ for } \frac{\varphi}{\varphi_o} > 1.30$$

After intersection with curve C:

as curve C (see Figure 2 - curve A)



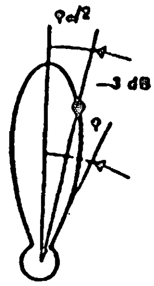


FIGURE 2

<u>Satellite receive antenna pattern</u>

Curve A - co-polar component (2.9.2)

Curve B - cross-polar component (2.9.3)

Curve C - minus the on-axis gain

2.9.3 Cross-polar response pattern

The reference cross-polar response pattern is given by the formula:

Cross-polar relative gain (dB)

$$G = -30 - 12\left(\frac{\varphi}{\varphi_0}\right)^2 \quad \text{for } 0 \leq \frac{\varphi}{\varphi_0} \leq 0.5$$

$$G = -33 \quad \text{for } 0.5 < \frac{\varphi}{\varphi_0} \leq 1.67$$

$$G = -\left[40 + 40 \log\left|\frac{\varphi}{\varphi_0} - 1\right|\right] \quad \text{for } 1.67 < \frac{\varphi}{\varphi_0}$$

After intersection with curve C:

as curve C (see Figure 2 - curve B).

2.10 Satellite receiving antenna pointing accuracy

The deviation of the receiving antenna beam from its nominal pointing direction should not exceed 0.2° in any direction. Moreover, the angular rotation of the receiving beam about its axis should not exceed ±1°; this latter limit is not necessary for beams of circular cross-section using circular polarization.

Should only one antenna be used for transmission and reception, the pointing accuracy for the receiving antenna is governed by, but not necessarily equal to, the transmitting antenna. Where two separate reflectors are used for transmission and reception, steering the transmitting antenna by using an automatic pointing mechanism operating by detection of a land radio-frequency beacon is possible. With this precise antenna pointing system, the receiving beam with slave control from the transmitting antenna may be stabilized to within 0.2°.

2.11 Satellite system noise temperature

The planning should be based on a satellite system noise temperature of 1800 K. One administration believes a figure of 1000 K would be more appropriate.

2.12 Type of polarization

Circular polarization is assumed in planning. Linear polarization may be used at a given orbit position subject to the agreement of all the affected administrations.

2.13 Sense of polarization

In the case of uniform frequency translation the polarization sense of the feeder link should be either:

all opposite to their corresponding down-links,

or

all the same sense as their corresponding down-links

for each orbit position.

In the case of a non-uniform frequency translation plan it is necessary to maintain a uniform polarization/frequency arrangement at each orbit position.

Choice of the sense of circular polarization when common transmit/receive antennas are used is influenced by the technology.

For simple elliptical beams, the opposite sense of polarization on the Earth-space and space-Earth links permits the use of a simple and economical orthomode transducer to provide isolation between transmit and receive signals.

For shaped beams employing multiple horns, the same sense of polarization permits the use of simple and economical satellite antenna configurations avoiding the complexity of a separate orthomode transducer for each feed horn in the case of the opposite sense. Isolation between transmit and receive signals is provided by filters.

It is necessary to have one choice of polarization within one orbit position. However, provided there is no interaction between feeder links to two adjacent orbital positions it does not appear to be essential to make the same choice for all orbital positions.

2.14 Automatic gain control

The plan should not take account of automatic gain control on-board satellites. Up to 15 dB of automatic gain control is permitted, subject to no increase in interference to other satellite systems.

2.15 Power control

The plan should not take account of power control. Power control is permitted only to the extent that interference to other satellites does not increase by more than 0.5 dB relative to that calculated in the feeder-link plan.

Guidelines should be developed for the use of power control based on the following information:

The allowable increase of earth-transmitter power applicable to earth-transmitting stations, without deteriorating the interference ratios in clear weather, is derived, taking into account the geographical locations of the earth stations and the feeder-link beam areas.

In line with this, Table 3 summarizes examples of probable combination of increase of transmitter power and rain attenuation for various values of cross-polarization discrimination (XPIsat) and elevation angle.

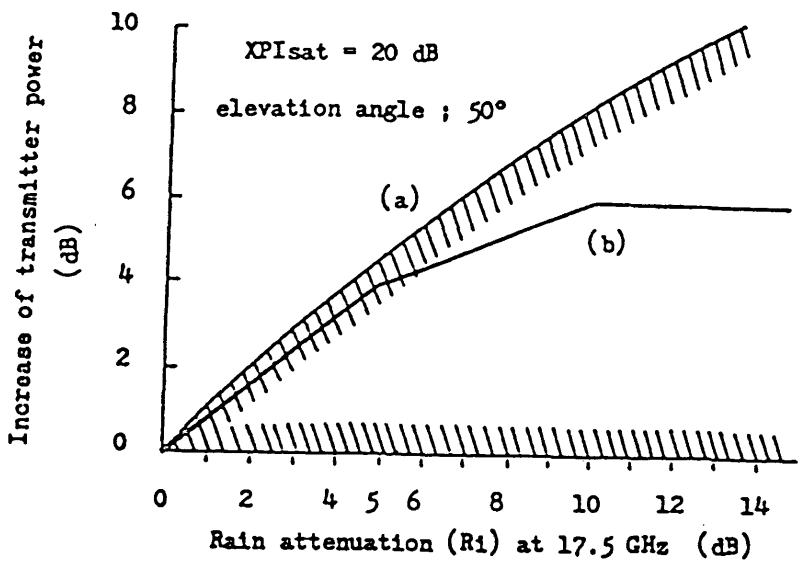


FIGURE 3

<u>The possible increase of transmitter power for power control</u>

Curve (a): upper limit for power control
Curve (b): an example of power control as illustrated in Table 1
XPI: cross-polarization discrimination

TABLE 3

Possible increase of earth-transmitter power for power control for various values of XPIsat and satellite elevation angle

XPIsat (dB)	Satellite elevation angle (degrees)	Increase of earth-transmitter power (dB)	
		For rain attenuation 0 dB to 5 dB	For rain attenuation 10 dB and more
10 to 15	0 to 10	0	0
	10 to 30	0 to 4	4 to 7
	30 to 50	0 to 4	4 to 8
	50 to 60	0 to 5	5 to 9
	60 to 90	0 to 5	5 to 10
15 to 20	0 to 10	0	0
	10 to 30	0 to 2	2 to 4
	30 to 40	0 to 3	3 to 4
	40 to 50	0 to 3	3 to 6
	50 to 60	0 to 4	4 to 8
	60 to 90	0 to 5	5 to 9
20 to 25*1	0 to 30	0	0
	30 to 40	0 to 2	2
	40 to 50	0 to 3	3 to 4
	50 to 60*1	0 to 4*1	4 to 6*1
	60 to 90	0 to 5	5 to 8
25 to 30*2	0 to 40	0	0
	40 to 50	0 to 2	2
	50 to 60	0 to 3	3
	60 to 90	0 to 5	5

*1 This case is illustrated with Curve (b) in Figure 3 as an example.

*2 These cases are identical to those given in Table I of Part II in the Final Acts of RARC-SAT-83.

XPI: cross-polarization discrimination

2.16 Earth station location

Planning should meet the requirements of administrations, but for feeder-link earth stations located outside the down-link service area it may be necessary to employ the methods of resolving incompatibilities in planning described in 2.21.

2.17 Propagation

The propagation model is based on rain attenuation for feeder-links, calculated for one per cent of the worst month.

2.17.1 Attenuation

For calculation, the following data are needed:

$R_{0.01}$: point rainfall rate for the location for 0.01% of an average year (mm/h)

h_o: The height above mean sea level of the earth station (km)

θ: the elevation angle (degrees)

f: frequency (GHz)

φ: latitude of earth station [°]

Mean frequencies will be used for calculations for the two bands, i.e. 17.7 GHz and 14.65 GHz.

Step 1 - The mean zero-degree isotherm height h_F is:

$$h_F = 5.1 - 2.15 \log \left(1 + 10^{\frac{(\varphi - 27)}{25}}\right) \text{ [km]}$$

Step 2 - The rain height h_R is:

$$h_R = C.h_F$$

where

$$C = 0.6 \text{ for } 0^\circ < /\varphi/ \leqslant 20^\circ$$

$$C = 0.6 + 0.02\ (/\varphi/ - 20) \text{ for } 20^\circ < /\varphi/ \leqslant 40^\circ$$

$$C = 1 \text{ for } /\varphi/ > 40^\circ$$

Step 3 - The slant-path length, L_s, below the rain height is:

$$L_s = \frac{2\ (h_R - h_o)}{\left(\sin^2 \theta + 2\ (\frac{h_R - h_o}{R_e})\right)^{1/2} + \sin \theta} \text{ [km]}$$

where

R_e is the effective radius of the Earth (8,500 km)

Step 4 - The horizontal projection, L_G, of the slant-path is:

$$L_G = L_s \cos\theta \ \ [\text{km}]$$

Step 5 - The rain path reduction factor $r_{0.01}$, for 0.01% of the time is:

$$r_{0.01} = \frac{90}{90 + 4\,L_G}$$

Step 6 - The specific attenuation, γ_R, is determined from:

$$\gamma_R = k\,(R_{0.01})^{\alpha} \ \ [\text{dB/km}]$$

where

$R_{0.01}$ is given in Table 4, frequency dependent coefficients in Table 5 and rain climatic zones in Figures 4 and 5, respectively.

TABLE 4

Rainfall intensity exceeded (mm/h) for 0.01% of an average year

Percentage of time	A	B	C	D	E	F	G	H	J	K	L	M	N	P
0.01	8	12	15	19	22	28	30	32	35	42	60	63	95	145

TABLE 5

Frequency dependent coefficients

Frequency	k	α
14.65	0.0327	1.149
17.7	0.0531	1.110

Frequency dependent coefficients are calculated for circular polarization using the following formulas and Table 6.

$$k = [k_H + k_V + (k_H - k_V)\cos^2\theta\cos 2\tau]/2$$

$$\alpha = [k_H\alpha_H + k_V\alpha_V + (k_H\alpha_H - k_V\alpha_V)\cos^2\theta\cos 2\tau]/2k$$

where θ is the path elevation angle and τ is the polarization tilt angle relative to the horizontal ($\tau = 45°$ for circular polarization).

The formulas for k and α are of general type. In the case of circular polarization the third terms in both equations are equal to zero, so, for circular polarization the formulas for k and α may be written:

$$k = (k_H + k_V)/2$$

$$\alpha = (k_H\alpha_H + k_V\alpha_V)/2k$$

TABLE 6

Regression coefficients for estimating specific attenuation

Frequency (GHZ)	k_H	k_V	α_H	α_V
12	0.0188	0.0168	1.217	1.200
15	0.0367	0.0335	1.154	1.128
20	0.0751	0.0691	1.099	1.065

Step 7 - The attenuation exceeded for 1% of the worst month is:

$$A_{1\%} = 0.223\ \gamma_R\ L_s\ r_{0.01}\ [dB]$$

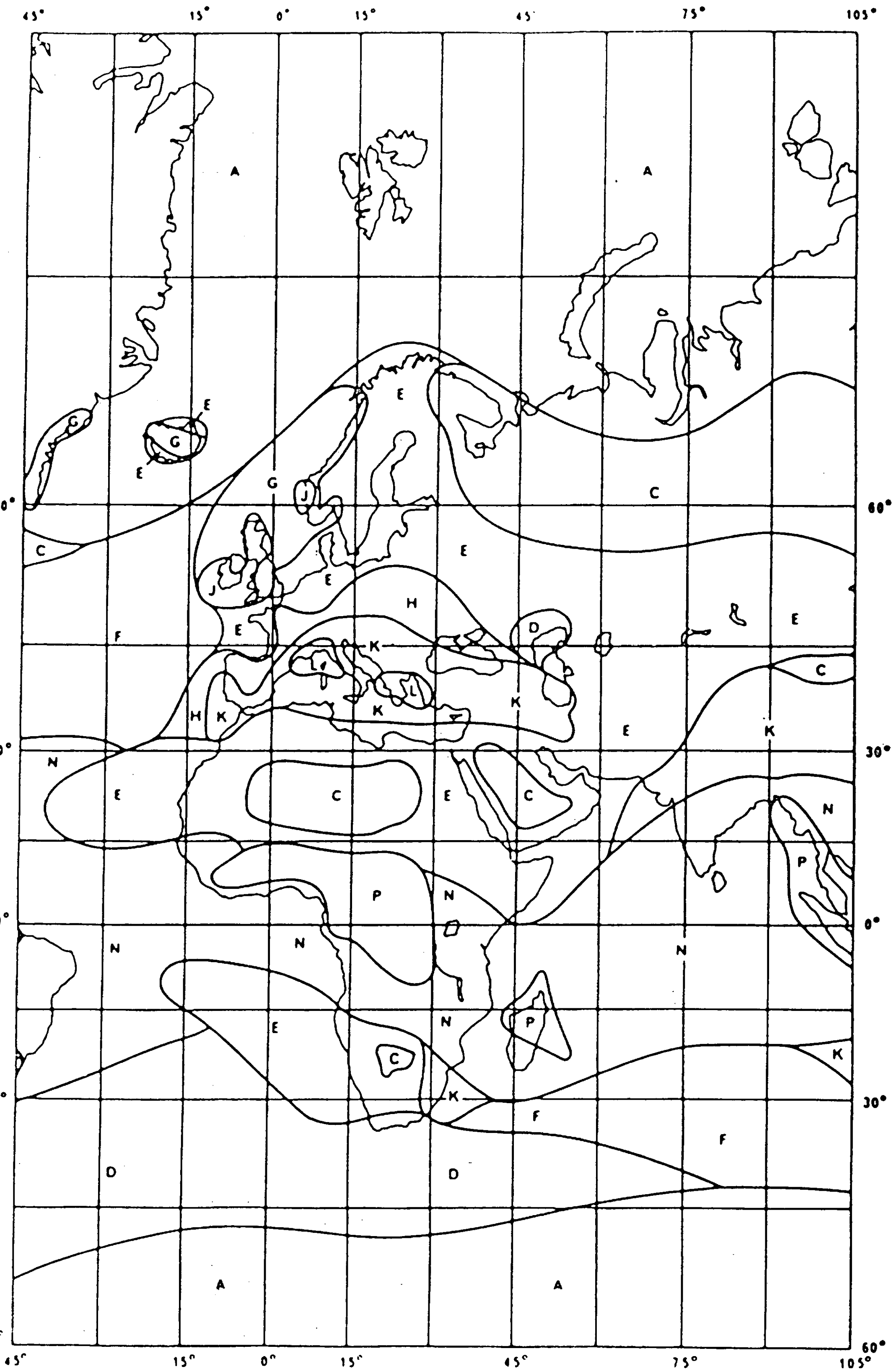


FIGURE 4

<u>Rain climatic zones (45°W - 105°E)</u>

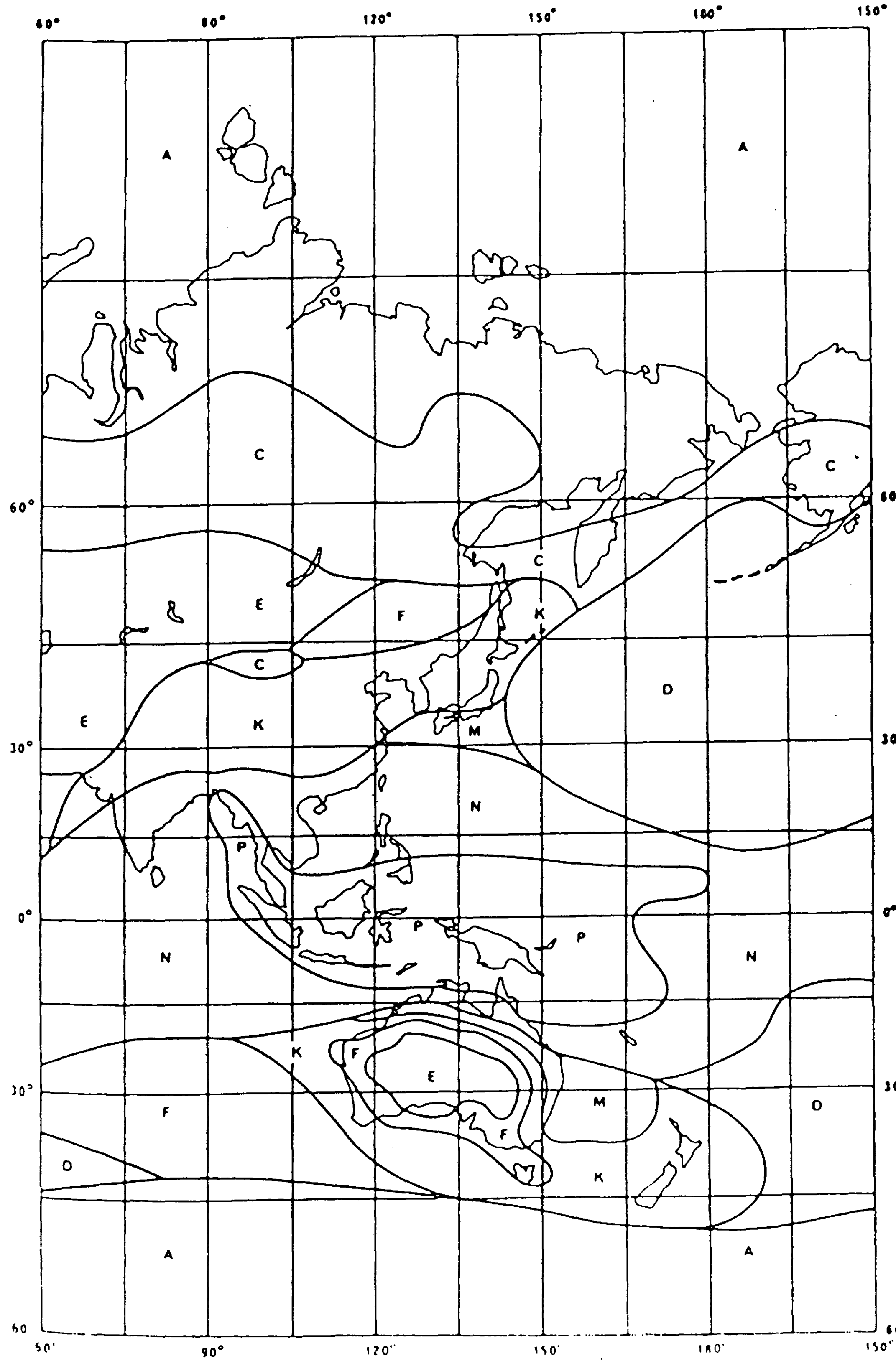


FIGURE 5

Rain climatic zones (60°E - 150°W)

2.17.2 Depolarization

Rain and ice can cause depolarization of radio frequency signals. The level of the co-polar component relative to the depolarized component is given by the cross-polarization discrimination (XPD) ratio. For the feeder link, the XPD ratio, in dB, not exceeded for 1% of the worst month is given by:

$$XPD = 30 \log f - 40 \log (\cos \theta) - V \log A_p \text{ (dB) for } 5^\circ < \theta < 60^\circ$$

where

$V = 20$ for 14.5 - 14.8 GHz

and

$V = 23$ for 17.3 - 18.1 GHz

where

A_p: co-polar rain attenuation exceeded for 1% of the worst month,

f: frequency (GHz),

θ: elevation angle. [°]

For values of θ greater than 60°, use $\theta = 60°$ in the above equation.

2.18 AM to PM conversion

The degradation caused by AM to PM conversion should be taken into account when calculating the C/N of the feeder link. A figure of 2.0 dB should be allowed.

2.19 Depolarization compensation

Depolarization compensation is not taken into account in planning. It is permitted only to the extent that interference to other satellite systems does not increase by more than 0.5 dB relative to that calculated in the feeder-link plan.

2.20 Site diversity

The use of site diversity is not taken into account in planning. It is permitted and is considered to be an effective technique for maintaining high carrier-to-noise ratio and carrier-to-interference ratio during periods of moderate to severe rain attenuation.

2.21 Methods of resolving incompatibilities in planning feeder links during the second session of the Conference

Use of a common set of technical parameters for all feeder links in planning is desirable but preliminary studies by a number of administrations have indicated that there may be a difficulty in obtaining the required carrier-to-interference ratios on a small number of feeder links, particularly when certain administrations have special requirements to be met.

In order to overcome these difficulties, a certain amount of flexibility in the values of planning parameters used is proposed. Employment of one or more of the following techniques may be used, where necessary, in the planning process to attain the target values for interference protection.

2.21.1 Adjustments of the maximum level of e.i.r.p. of potential interfering feeder links or feeder links subject to excessive interference, subject to maintaining adequate carrier-to-noise and carrier-to-interference ratios on the adjusted feeder links.

2.21.2 In circumstances where independent planning of orbit positions is adversely affected, the off-axis co- and cross-polar side-lobe response patterns of the earth station transmitting antenna may be limitd to 29 - 25 log φ (dBi). For values of off-axis angle, φ, in the regions of the adjacent and next-but-one adjacent orbital positions in the plane of the geostationary orbit.

2.21.3 In circumstances where insufficient cross-polar isolation is achieved, the off-axis cross/polar side-lobe response pattern of the earth station transmitting antenna may be limited to 24 - 25 log φ (dBi) for $0.76^\circ \leqslant \varphi \leqslant 22.9^\circ$ and -10 (dBi) for $\varphi > 22.9^\circ$.

2.21.4 Adjustment of the feeder-link channel assigments, retaining the same translation frequency for all assignments associated with a given down-link beam.

2.21.5 Modifying the satellite receiving antenna beam pattern shape, size, and/or side-lobe response (for example, multiple beam or shaped beam antenna).

2.21.6 Off-setting the beam-pointing direction of the satellite receiving antenna subject to maintaining the target carrier-to-noise ratio.

2.21.7 Improving the beam-pointing accuracy of the satellite receiving antenna to 0.1°.

2.21.8 Setting an upper limit of 10 dB to the rain attenuation margin included in the feeder-link power budget.

2.21.9 Separating satellite orbit positions by $\pm 0.2^\circ$ from the nominal position and specifying the off-axis radiated power of the relevant earth station in the range 0° to 1° off-axis beam angles (note that this technique may require changes to Appendix 30).

For such cases, where E(dBW) is the earth station e.i.r.p., the radiated power of the earth station transmitting antenna for angles $0 < \varphi \leqslant 1^\circ$ should not be greater than:

for $0^\circ \leqslant \varphi \leqslant 0.1^\circ$, E (dBW)

for $0.1^\circ < \varphi \leqslant 0.32^\circ$, E - 21 - 20 log φ (dBW)

for $0.32^\circ < \varphi \leqslant 0.44^\circ$, E - 5.7 - 53.2 φ^2 (dBW)

for $0.44^\circ < \varphi \leqslant 1^\circ$, E - 25 - 25 log φ (dBW)

TABLE 7

2.22 Summary table of initial technical parameters for feeder-link planning in Regions 1 and 3 (Frequency bands 17.3 - 18.1 GHz and 14.5 14.8 GHz)

Item	Parameter	Value	Reference
1.	Carrier-to-noise ratio	24 dB	2.2
2.	Co-channel carrier-to-interference ratio	40 dB	2.3
3.	Adjacent channel carrier-to-interference	21 dB	2.4
4.	Feeder link e.i.r.p. initial planning value	17/18 GHz - 84 dBW 14 GHz - 82 dBW	2.5
5.	Transmitting antenna		2.6
a)	Diameter	17/18 GHz - 5 m 14 GHz - 6 m	2.6.1
b)	On-axis gain	57 dBi	2.6.2
6.	off-axis radiated power		2.7
a)	Co-polar off-axis radiated power	E-25-25 log φ (dBW) for $1^\circ \leqslant \varphi \leqslant 48^\circ$, E-67(dBW) for $\varphi > 48^\circ$	2.7.1
b)	Cross-polar off-axis radiated power	E-30(dBW) for $0^\circ \leqslant \varphi \leqslant 1.6^\circ$, E-25-25 log φ (dBW) for $1.6^\circ < \varphi \leqslant 48^\circ$, E-67(dBW) for $\varphi > 48^\circ$	2.7.2
7.	Earth station mispointing loss	1 dB	2.8

Item	Parameter	Value	Reference
8.	Satellite receiving antenna		2.9
a)	Cross section of beam	elliptical or circular	2.9.1
b)	Co-polar response pattern	relative gain (dB) $-12\left(\frac{\varphi}{\varphi_0}\right)^2$ for $0 \leq \frac{\varphi}{\varphi_0} < 1.30$ $-17.5 - 25 \log\left(\frac{\varphi}{\varphi_0}\right)$ for $\frac{\varphi}{\varphi_0} > 1.30$ After intersection with curve C: as curve C. (see Figure 2 - curve A)	2.9.2
c)	Cross-polar response pattern	relative gain (dB) $-30 - 12\left(\frac{\varphi}{\varphi_0}\right)^2$ for $0 \leq \frac{\varphi}{\varphi_0} \leq 0.5$ -33 for $0.5 < \frac{\varphi}{\varphi_0} \leq 1.67$ $\left[-40 + 40 \log\left\|\frac{\varphi}{\varphi_0} - 1\right\|\right]$ for $1.67 < \frac{\varphi}{\varphi_0}$ After intersection with curve C: as curve C. (see Figure 2 - curve B)	2.9.3
9.	Satellite receiving antenna pointing accuracy	0.2°	2.10
10.	Satellite system noise temperature	1800	2.11
11.	Type of polarization	Circular	2.12
12.	Sense of polarization	(see reference)	2.13
13.	Automatic gain control	Not taken into account	2.14
14.	Power control	Not taken into account	2.15

Item	Parameter	Value	Reference
15.	Earth station location	(see reference)	2.16
16.	Propagation	(see reference)	2.17
17.	AM-to-PM conversion	2.0 dB	2.18
18.	Depolarization compensation	Not taken into account	2.19
19.	Site diversity	Not taken into account	2.20

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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COMMITTEE 6

SECOND REPORT OF WORKING GROUP 6B TO COMMITTEE 6

1. Selection of centre frequencies for planning the broadcasting-satellite feeder-link channels in Regions 1 and 3 in frequency bands 14.5 - 14.8 and 17.3 - 18.1 GHz

The planning for both-feeder link bands shall use the general characteristics of the BSS R1,3 Plan, and as far as possible linear translation and one translation frequency for a set of transponders serving the channels assigned to the same beam and administration.

1.1 General characteristics of the BSS R1,3 Plan

	Region 1	Region 3	
Maximum allocated frequency band	11.7 - 12.5	11.7 - 12.2	GHz
Maximum available bandwidth	800	500	MHz
Necessary bandwidth of a channel	27	27	MHz
Channel separation	19.18	19.18	MHz
Number of channels	40	24	
Centre frequency of the lowest channel	11 727.48	11 727.48	MHz
Centre frequency of the highest channel	12 475.50	12 168.62	MHz
Lower guard band	14.00	14.00	MHz
Upper guard band	11.00	17.90	MHz

1.2 Centre frequencies for planning the broadcasting-satellite feeder links in the band 17.3 - 18.1 GHz

1.2.1 As the maximum available bandwidth of 800 MHz is the same for Region 1 BSS Plan and for the feeder-link band 17.3 - 18.1 GHz a translation frequency of 5.60 GHz can be used for a single frequency subtractive mixing. In Region 3 the same translation frequency of 5.6 GHz appears to be the optimum for single frequency subtractive mixing also in the case of the feeder-link band 17.3 - 17.8 GHz. This will produce a linear translation of all channels and preserve the same guard bands. This kind of conversion will produce down-link channels free from any spurious mixing products which might arise from combination of harmonic frequencies up to 10th order of any spectral line within the feeder-link channels and 10th order harmonic of the translation frequency.

1.2.2 In the case when a translation frequency other than 5.60 GHz is desirable for a single conversion mixing, then the ratio of the translation frequency to any frequency within the necessary bandwidth of a feeder-link channel must not be equal to 3/10 or 1/3.

1.2.3 Table 1 indicates channel numbers and corresponding centre frequencies of the BSS R1,3 Plan and the feeder links for the translation frequency of 5.60 GHz.

1.3 Centre frequencies for planning the broadcasting-satellite feeder links in the band 14.5 - 14.8 GHz

1.3.1 As the maximum available bandwidth for the feeder-link band 14.5 - 14.8 GHz is only 300 MHz in comparison to 800 and 500 MHz for Regions 1 and 3, respectively, several translation frequencies must be considered to allow any channel in the Plan to be used. Consequently, a particular feeder-link channel must be assigned to several BSS Plan channels simultaneously.

1.3.2 For the feeder-link band 14.5 - 14.8 GHz, 14 channels and two appropriate guard bands should be assumed.

1.3.3 Selection of translation frequencies for this purpose is a complex task due to two domains within the possible range of translation frequencies which would create spurious mixing products within certain channels. Therefore, it is necessary to optimize the translation frequencies. Ratios of translation frequency to any frequency within the necessary bandwidth of a feeder-link channel to be avoided are 1/6 and 2/11.

1.3.4 The following parameters shall be used for planning feeder links in the frequency band 14.5 - 14.8 GHz:

Necessary bandwidth of a channel	27 MHz
Channel separation	19.18 MHz
Number of channels	14
Centre frequency of the lowest channel (1)	14 525.30 MHz
Centre frequency of the highest channel (14)	14 774.64 MHz
Lower guard band	11.80 MHz
Upper guard band	11.83 MHz

Translation frequencies:

a)	for BSS channels 1 to 14	2 797.82 MHz
b)	for BSS channels 15 to 28	2 529.30 MHz
c)	for BSS channels 29 to 40	2 260.78 MHz

1.3.5 Table 2 indicates channel numbers and centre frequencies in the feeder-link band and the relationship to the BSS R1,3 Plan for the three translation frequencies.

1.4 Recommendations:

i) Recognizing the reduced channel capacity of the 14.5 - 14.8 GHz band administrations should be advised that if more than three channels are requested there may be difficulties in meeting all requirements. More than three channels in this band assigned to one administration would add to the complexity of the satellite.

ii) When certain channel families pertaining to a given beam and administration are split between two translation frequencies, that frequency which provides the greater number of channels should be chosen.

iii) There may be further complexity in a choice of channels if there is a requirement for a combination of 14 GHz and 17 GHz feeder links to a single satellite.

Such cases should be treated on an individual basis during the development of the Plan at the second session.

TABLE 1

Table showing correspondence between channel numbers and assigned frequencies in the BSS R1,3 Plan and for the associated feeder links using the translation frequency of 5 600 MHz

Channel No.	Plan assignm. MHz	Feeder assignm. MHz	Channel No	Plan assignm. MHz	Feeder assignm. MHz
1	11 727.48	17 327.48	21	12 111.08	17 711.08
2	11 746.66	17 346.66	22	12 130.26	17 730.26
3	11 765.84	17 365.84	23	12 149.44	17 749.44
4	11 785.02	17 385.02	24	12 168.62	17 768.62
5	11 804.20	17 404.20	25	12 187.80	17 787.80
6	11 823.38	17 423.38	26	12 206.98	17 806.98
7	11 842.56	17 442.56	27	12 226.16	17 826.16
8	11 861.74	17 461.74	28	12 245.34	17 845.34
9	11 880.92	17 480.92	29	12 264.52	17 864.52
10	11 900.10	17 500.10	30	12 283.70	17 883.70
11	11 919.28	17 519.28	31	12 302.88	17 902.88
12	11 938.46	17 538.46	32	12 322.06	17 922.06
13	11 957.64	17 557.64	33	12 341.24	17 941.24
14	11 976.82	17 576.82	34	12 360.42	17 960.42
15	11 996.00	17 596.00	35	12 379.60	17 979.60
16	12 015.18	17 615.18	36	12 398.78	17 998.78
17	12 034.36	17 634.36	37	12 417.96	18 017.96
18	12 053.54	17 653.54	38	12 437.14	18 037.14
19	12 072.72	17 672.72	39	12 456.32	18 056.32
20	12 091.90	17 691.90	40	12 475.50	18 075.50

TABLE 2

Table showing correspondence between channel numbers and assigned frequencies for the feeder links in the frequency band 14.5 - 14.8 GHz and the relationship to the BSS R1,3 Plan assignments

Feeder-link assignments		Translation frequencies (MHz)					
		2 797.82		2 529.30		2 260.78	
		BSS R1,3 plan assignments					
Ch. No.	Frequency (MHz)	Ch. No.	Frequency (MHz)	Ch. No.	Frequency (MHz)	Ch. No.	Frequency (MHz)
1	14 525.30	1	11 727.48	15	11 996.00	29	12 264.52
2	14 544.48	2	11 746.66	16	12 015.18	30	12 283.70
3	14 563.66	3	11 765.84	17	12 034.36	31	12 302.88
4	14 582.84	4	11 785.02	18	12 053.54	32	12 322.06
5	14 602.02	5	11 804.20	19	12 072.72	33	12 341.24
6	14 621.20	6	11 823.38	20	12 091.90	34	12 360.42
7	14 640.38	7	11 842.56	21	12 111.08	35	12 379.60
8	14 659.56	8	11 861.74	22	12 130.26	36	12 398.78
9	14 678.74	9	11 880.92	23	12 149.44	37	12 417.96
10	14 697.92	10	11 900.10	24	12 168.62	38	12 437.14
11	14 717.10	11	11 919.28	25	12 187.80	39	12 456.32
12	14 736.28	12	11 938.46	26	12 206.98	40	12 475.50
13	14 755.46	13	11 957.64	27	12 226.16	--	---------
14	14 774.64	14	11 976.82	28	12 245.34	--	---------

2. Technical characterisitics for feeder-link planning

2.1 Overall performance

Assuming that there is no transponder output back-off, a 0.5 dB noise contribution of the feeder link to the overall link requires that:

$$(C/N)_u = (C/N)_{d(total)} + 10 \text{ dB} \qquad (1)$$

For down-links, the WARC-BS-77 has adopted a figure of C/N equal to 14.5 dB for 99% of the worst month at the edge of the service area. The up-link C/N required is 24 dB for 99% of the worst month, to produce an overall performance of 14 dB.

Where there are difficulties in planning feeder links, account should be taken of the protection ratio margin available on the space-to-Earth link in protection ratios at the earth station receiver input.

2.2 Carrier-to-noise ratio

The minimum $(C/N)_u$ required for planning of the feeder links in Regions 1 and 3 is 24 dB. It may be desirable for some administrations to achieve a significantly higher value of C/N, however, the use of any value higher than 24 dB should not prevent the interference conditions from being met in the plan.

2.3 Co-channel carrier-to-interference protection ratio

The protection ratio to be planned for co-channel interference is 40 dB.

2.4 Adjacent channel carrier-to-interference protection ratio

Tests carried out recently by one administration showed that the adjacent channel protection ratio in feeder links for just perceptible interference could be reduced to 19 dB, when signals are passed through a 12 GHz TWT amplifier operating at saturation with an AM-PM conversion factor of 2^{o}/dB and then received through an SAW filter with 27 MHz bandwidth before the demodulator.

These tests were carried out using a TWT with a low value of AM-PM conversion. It is believed that the effects of adjacent channel interference will be intensified by AM-PM conversion by the same mechanism as that reported for the intensification of noise. An additional margin of 2 dB above the 19 dB measured in laboratory tests is therefore recommended. It is recommended that an adjacent channel protection ratio of 21 dB be used in feeder-link planning.

Some administrations proposed that planning should use a value of 24 db but where this cannot be applied a value of 21 dB used.

2.5 Feeder link e.i.r.p.

A uniform value of e.i.r.p. for each band should be used for initial planning. For the 17.3 - 18.1 GHz band this should be 84 dBW and for the 14.5 to 14.8 GHz band 82 dBW.

These are initial values to be used in developing the plan. They will be adjusted, if necessary, during the plan development on a case-by-case basis to ensure that the minimum carrier-to-noise and carrier-to-interference criteria specified in the plan are met for the feeder-link systems of all administrations. Adjustments will also be made, if required to accommodate the requirements of particular administrations.

Some administrations consider that these initial planning values may not meet their requirements.

2.6 Transmitting antenna

2.6.1 Antenna diameter

For a given value of e.i.r.p. and a given relative antenna pattern, the off-axis radiation power depends on the diameter of the antenna. The larger the diameter of the antenna, the smaller is the off-axis radiation power which is a potential source of interference between adjacent orbital positions.

So for planning of feeder links it is necessary to define a reference antenna diameter. For the 17.3 - 18.1 GHz band the value adopted is 5 m and for the 14.5 to 14.8 GHz band 6 m.

Smaller antennas of for example 2.5 m, can also be used provided there is no degradation of the interference situation. In practice this means that the e.i.r.p. might need to be reduced or the antenna diagram improved so there is no increase in the off-axis radiation power, and hence no unacceptable interference to the adjacent orbital position and other services.

2.6.2 On-axis gain

The on-axis gain for the 5 m antenna at 17.3 - 18.1 GHz and for the 6 m antenna at 14.5 to 14.8 GHz is taken as 57 dBi.

[2.7] Off-axis radiated power

The following is based on a transmitting antenna side-lobe response pattern which follows the characteristics of 32-25 log φ.

The co-polar radiated power of the earth station for off-axis beam angles $\varphi > 1^o$* must not be more than:

for $1^o \leqslant \varphi \leqslant 48^o$, E - 25 - 25 log φ (dBW)

for $\varphi > 48^o$, E - 67 (dBW)

where

E (dBW) is the earth station on-axis e.i.r.p.

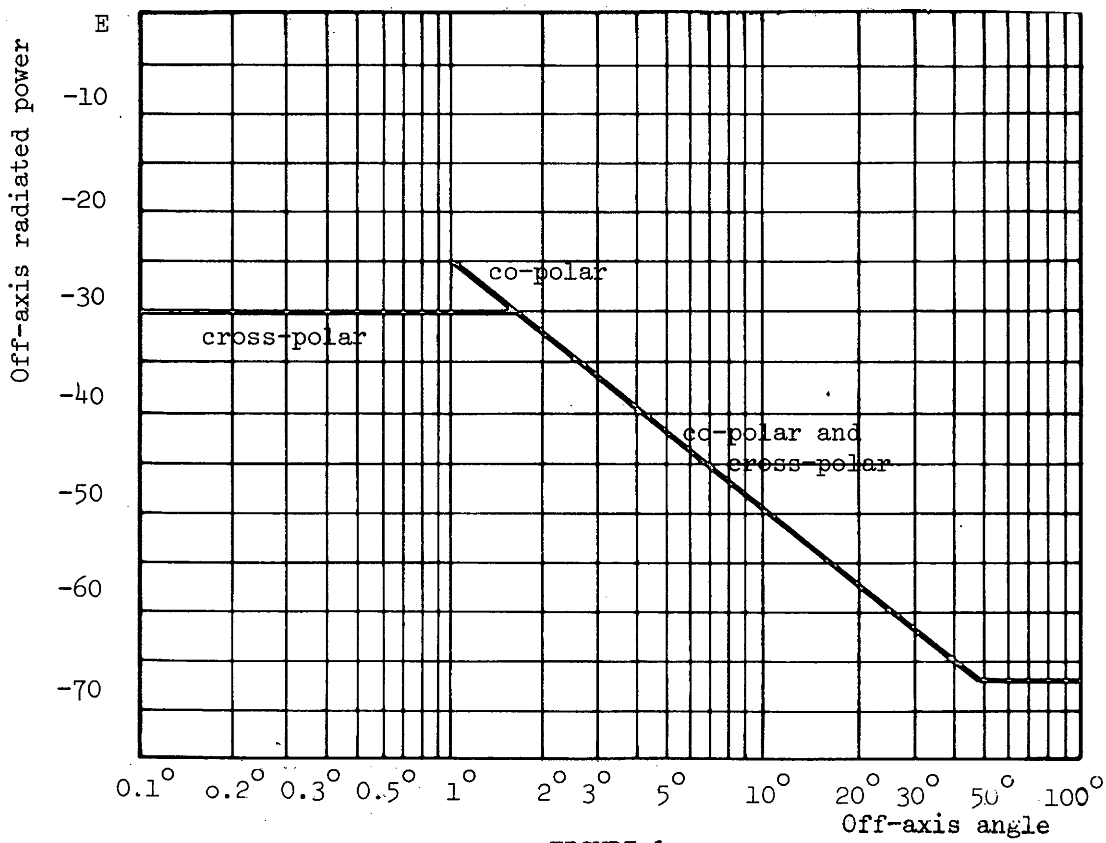

FIGURE 1

Earth station off-axis radiated power

Note - For $0 \leqslant \varphi \leqslant 1^o$ refer 2.21.9

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* Section 1.20.9 deals with co-polar radiated power of the earth station for off-axis beam angles $0^o \leqslant \varphi \leqslant 1^o$ which may be useful to resolve incompatibilities in planning feeder links.

In circumstances where independent planning of orbit positions is adversely affected, the off-axis co-polar radiated power of the earth station should be based on an antenna pattern of 29 - 25 log φ (dBi), for values of off-axis angle, φ, in the regions of the adjacent and next-but-one adjacent orbital positions in the plane of the geostationary orbit.

[2.7.2] Cross-polar off-axis radiated power

The cross-polar radiated power of the earth station must not be more than:

for $0^\circ \leqslant \varphi \leqslant 1.6^\circ$, E - 30 (dBW)

for $1.6^\circ < \varphi \leqslant 48^\circ$, E - 25 - 25 log φ (dBW)

For $\varphi > 48^\circ$, E - 67 (dBW)

where

E (dBW) is the earth station on-axis e.i.r.p.

In circumstances where insufficient cross-polar isolation is achieved, the off-axis cross-polar radiated power of the earth station should be based on an antenna pattern of 24 - 25 log φ (dBi) for $0.76^\circ \leqslant \varphi \leqslant 22.9^\circ$ and -10 (dBi) for $\varphi > 22{,}9^\circ$

2.8 Earth station mispointing loss

An allowance of 1 dB should be made for the loss in gain due to earth station antenna mispointing.

2.9 Satellite receiving antenna

If a common transmit/receive antenna is used, the cross-polar gain, beamwidth, pointing accuracy and the radiation pattern would be tied to the down-link antenna characteristics.

Where separate antennas are used for transmit and receive the parameters of the receiving antenna are given in the following. Separate receiving antennas offer greater flexibility in terms of independence of the feeder-link frequency, polarization and service area.

2.9.1 Cross-section of receiving antenna beam

Initial planning is to be based on beams of elliptical or circular cross-section. If the cross section of the receiving antenna beam is elliptical, the effective beamwidth φ_0 is a function of the angle of rotation q between the plane containing the satellite and the major axis of the beam cross-section and the plane in which the beamwidth is required.

The relationship between the maximum gain of an antenna and the half-power beamwidth can be derived from the expression:

$$Gm = 27843/ab$$

or

$$Gm(dB) = 44.44 - 10 \log a - 10 \log b$$

where a and b are the angles (in degrees) subtended at the satellite by the major and minor axes of the elliptical cross-section of the beam.

A minimum value of 0.6° for the half power beamwidth is adopted for planning, except where an administration requests a lower value for its own beams.

2.9.2 Co-polar response pattern

The reference co-polar response pattern is given by the formula:

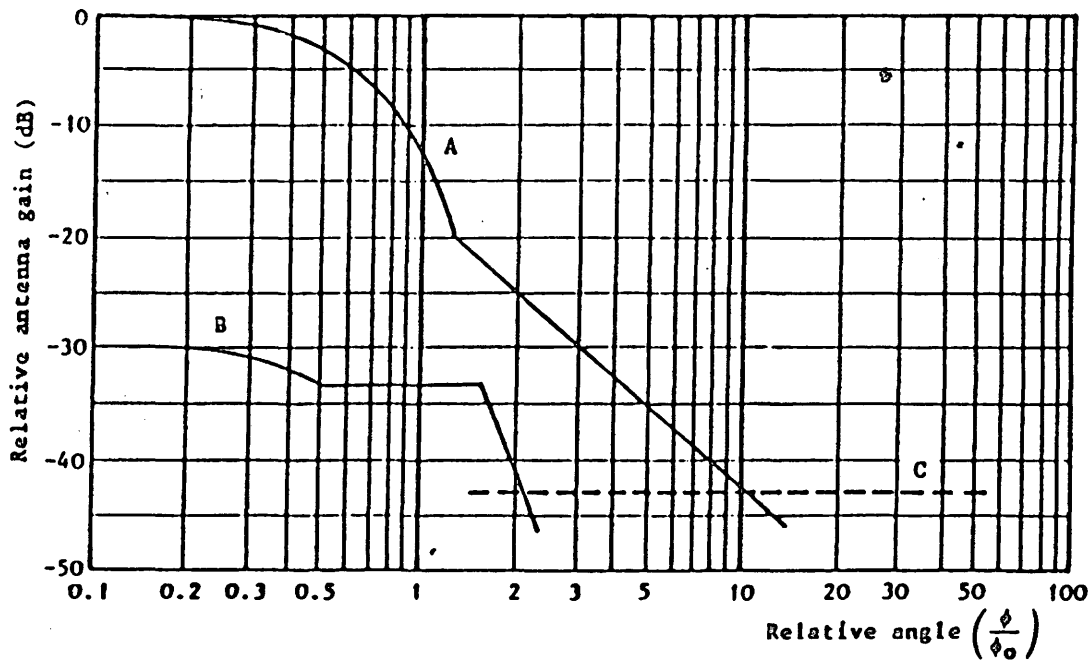
Co-polar relative gain (dB)

$$G = -12\left(\frac{\varphi}{\varphi_0}\right)^2 \text{ for } 0 \leq \frac{\varphi}{\varphi_0} < 1.30$$

$$G = -17.5 - 25 \log\left(\frac{\varphi}{\varphi_0}\right) \text{ for } \frac{\varphi}{\varphi_0} > 1.30$$

After intersection with curve C:

as curve C (see Figure 2 - curve A)



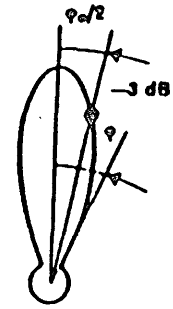


FIGURE 2

Satellite receive antenna pattern

Curve A - co-polar component (4.8.1)

Curve B - cross-polar component (4.8.2)

Curve C - minus the on-axis gain

2.9.3 Cross-polar response pattern

The reference cross-polar response pattern is given by the formula:

Cross-polar relative gain (dB)

$$G = -30 - 12\left(\frac{\varphi}{\varphi_0}\right)^2 \text{ for } 0 \leqslant \frac{\varphi}{\varphi_0} \leqslant 0.5$$

$$G = -33 \text{ for } 0.5 \leqslant \frac{\varphi}{\varphi_0} \leqslant 1.67$$

$$G = -\left[40 + 40 \log\left|\frac{\varphi}{\varphi_0} - 1\right|\right] \text{ for } 1.67 < \frac{\varphi}{\varphi_0}$$

After insersection with curve C:

as curve C (see Figure 2 - curve B).

2.10 Satellite receiving antenna pointing accuracy

The deviation of the receiving antenna beam from its nominal pointing direction should not exceed 0.2° in any direction. Moreover, the angular rotation of the receiving beam about its axis should not exceed ±1°; this latter limit is not necessary for beams of circular cross-section using circular polarization.

Should only one antenna be used for transmission and reception, the pointing accuracy for the receiving antenna is governed by, but not necessarily equal to, the transmitting antenna. Where two separate reflectors are used for transmission and reception, steering the transmitting antenna by using an automatic pointing mechanism operating by detection of a land radio-frequency beacon is possible. With this precise antenna pointing system, the receiving beam with slave control from the transmitting antenna may be stabilized to within 0.2°.

2.11 Satellite system noise temperature

The planning should be based on a satellite system noise temperature of 1800 K. One administration believes a figure of 1000 K would be more appropriate.

2.12 Type of polarization

Circular polarization is assumed in planning. Linear polarization may be used at a given orbit position subject to the agreement of all the affected administrations.

2.13 Sense of polarization

In the case of uniform frequency translation the polarization sense of the feeder link should be either:

all opposite to their corresponding down-links,

or

all the same sense as their corresponding down-links

for each orbit position.

In the case of a non-uniform frequency translation plan it is necessary to maintain a uniform polarization/frequency arrangement at each orbit position.

Choice of the sense of circular polarization when common transmit/receive antennas are used is influenced by the technology.

For simple elliptical beams, the opposite sense of polarization on the Earth-space and space-Earth links permits the use of a simple and economical orthomode transducer to provide isolation between transmit and receive signals.

For shaped beams employing multiple horns, the same sense of polarization permits the use of simple and economical satellite antenna configurations avoiding the complexity of a separate orthomode transducer for each feed horn in the case of the opposite sense. Isolation between transmit and receive signals is provided by filters.

It is necessary to have one choice of polarization within one orbit position. However, provided there is no interaction between feeder links to two adjacent orbital positions it does not appear to be essential to make the same choice for all orbital positions.

2.14 Automatic gain control

The plan should not take account of automatic gain control on-board satellites. Up to 15 dB of automatic gain control is permitted, subject to no increase in interference to other satellite systems.

2.15 Power control

The plan should not take account of power control. Power control is permitted only to the extent that interference to other satellites does not increase by more than 0.5 dB relative to that calculated in the feeder-link plan.

Guidelines should be developed for the use of power control based on the following information:

The allowable increase of earth-transmitter power applicable to earth-transmitting stations, without deteriorating the interference ratios in clear weather, is derived, taking into account the geographical locations of the earth stations and the feeder-link beam areas.

In line with this, Table 3 summarizes examples of probable combination of increase of transmitter power and rain attenuation for various values of cross-polarization discrimination (XPIsat) and elevation angle.

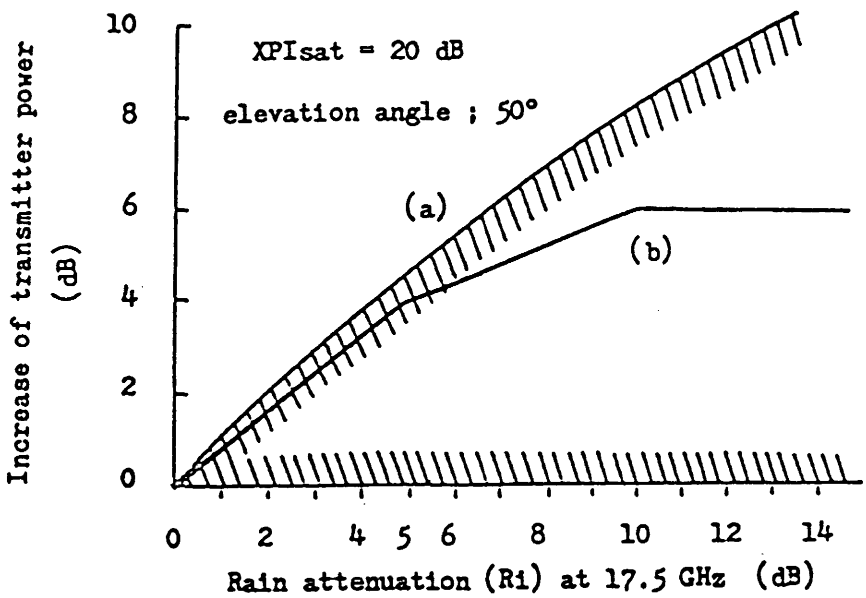


FIGURE 3

The possible increase of transmitter power for power control

Curve (a): upper limit for power control
Curve (b): an example of power control as illustrated in Table 1
XPI: cross-polarization discrimination

TABLE 3

Possible increase of earth-transmitter power for power control for various values of XPIsat and satellite elevation angle

XPIsat (dB)	Satellite elevation angle (degrees)	Increase of earth-transmitter power (dB)	
		For rain attenuation 0 dB to 5 dB	For rain attenuation 10 dB and more
10 to 15	0 to 10	0	0
	10 to 30	0 to 4	4 to 7
	30 to 50	0 to 4	4 to 8
	50 to 60	0 to 5	5 to 9
	60 to 90	0 to 5	5 to 10
15 to 20	0 to 10	0	0
	10 to 30	0 to 2	2 to 4
	30 to 40	0 to 3	3 to 4
	40 to 50	0 to 3	3 to 6
	50 to 60	0 to 4	4 to 8
	60 to 90	0 to 5	5 to 9
20 to 25*[1]	0 to 30	0	0
	30 to 40	0 to 2	2
	40 to 50	0 to 3	3 to 4
	50 to 60*[1]	0 to 4*[1]	4 to 6*[1]
	60 to 90	0 to 5	5 to 8
25 to 30*[2]	0 to 40	0	0
	40 to 50	0 to 2	2
	50 to 60	0 to 3	3
	60 to 90	0 to 5	5

*[1] This case is illustrated with Curve (b) in Figure 3 as an example.

*[2] These cases are identical to those given in Table I of Part II in the Final Acts of RARC-SAT-83.

XPI: cross-polarization discrimination

2.16 Earth station location

Planning should meet the requirements of administrations, but for feeder-link earth stations located outside the down-link service area it may be necessary to employ the methods of resolving incompatibilities in planning described in 2.21.

2.17 Propagation

The propagation model is based on rain attenuation for feeder-links, calculated for one per cent of the worst month.

2.17.1 Attenuation

For calculation, the following data are needed:

$R_{0.01}$: point rainfall rate for the location for 0.01% of an average year (mm/h)

h_o: The height above mean sea level of the earth station (km)

θ: the elevation angle (degrees)

f: frequency (GHz)

φ: latitude of earth station [°]

Mean frequencies will be used for calculations for the two bands, i.e. 17.7 GHz and 14.65 GHz.

Step 1 - The mean zero-degree isotherm height h_F is:

$$h_F = 5.1 - 2.15 \log \left(1 + 10^{\frac{(\varphi - 27)}{25}}\right) \quad [\text{km}]$$

Step 2 - The rain height h_R is:

$$h_R = C.h_F$$

where

$C = 0.6$ for $0° < |\varphi| \leq 20°$

$C = 0.6 + 0.02\,(|\varphi| - 20)$ for $20° < |\varphi| \leq 40°$

$C = 1$ for $|\varphi| > 40°$

Step 3 - The slant-path length, L_s, below the rain height is:

$$L_s = \frac{2\,(h_R - h_o)}{\left(\sin^2\theta + 2\,\frac{(h_R - h_o)}{R_e}\right)^{1/2} + \sin\theta} \quad [\text{km}]$$

where

R_e is the effective radius of the Earth (8,500 km)

Step 4 - The horizontal projection, L_G, of the slant-path is:

$$L_G = L_s \cos \theta \text{ [km]}$$

Step 5 - The rain path reduction factor $r_{0.01}$, for 0.01% of the time is:

$$r_{0.01} = \frac{90}{90 + 4 L_G}$$

Step 6 - The specific attenuation, γ_R, is determined from:

$$\gamma_R = k \, (R_{0.01})^{\alpha} \text{ [dB/km]}$$

where

$R_{0.01}$ is given in Table 4, frequency dependent coefficients in Table 5 and rain climatic zones in Figures 4 and 5, respectively.

TABLE 4

Rainfall intensity exceeded (mm/h) for 0.01% of an average year

Percentage of time	A	B	C	D	E	F	G	H	J	K	L	M	N	P
0.01	8	12	15	19	22	28	30	32	35	42	60	63	95	145

TABLE 5

Frequency dependent coefficients

Frequency	k	α
14.65	0.0327	1.149
17.7	0.0531	1.110

Frequency dependent coefficients are calculated for circular polarization using the following formulas and Table 6.

$$k = \left[k_H + k_V + (k_H - k_V) \cos^2 \theta \cos 2\tau\right]/2$$

$$\alpha = \left[k_H\alpha_H + k_V\alpha_V + (k_H\alpha_H - k_V\alpha_V) \cos^2 \theta \cos 2\tau\right]/2k$$

where θ is the path elevation angle and τ is the polarization tilt angle relative to the horizontal (τ = 45° for circular polarization).

The formulas for k and α are of general type. In the case of circular polarization the third terms in both equations are equal to zero, so, for circular polarization the formulas for k and α may be written:

$k = (k_H + k_V)/2$

$\alpha = (k_H\alpha_H + k_V\alpha_V)/2k$ "

TABLE 6

Regression coefficients for estimating specific attenuation

Frequency (GHZ)	k_H	k_V	α_H	A_1
12	0.0188	0.0168	1.217	1.200
15	0.0367	0.0335	1.154	1.128
20	0.0751	0.0691	1.099	1.065

Step 7 - The attenuation exceeded for 1% of the worst month is:

$A_{1\%} = 0.223\ \gamma_R\ L_s\ r_{0.01}$ [dB]

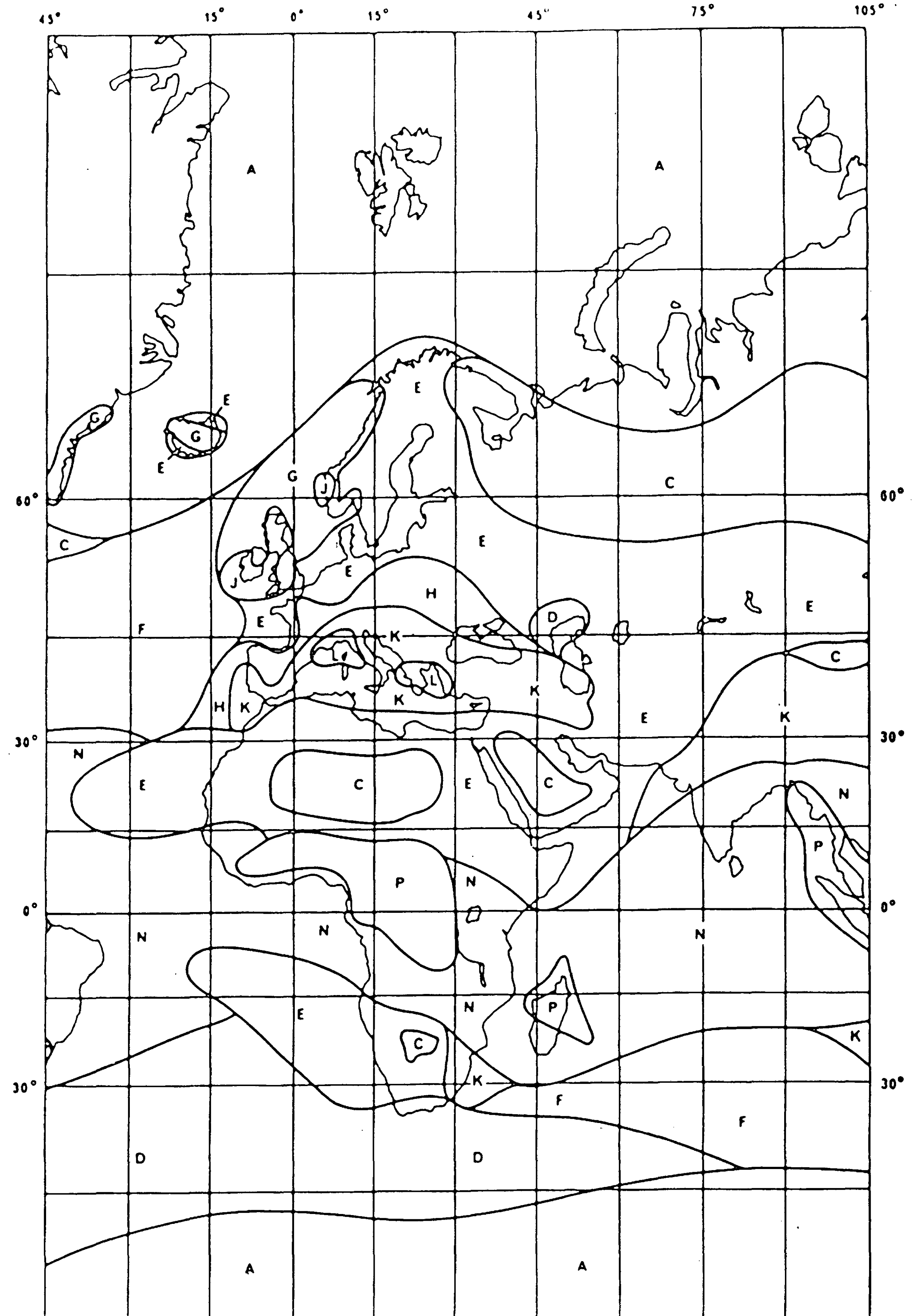


FIGURE 4

Rain climatic zones (45°W - 105°E)

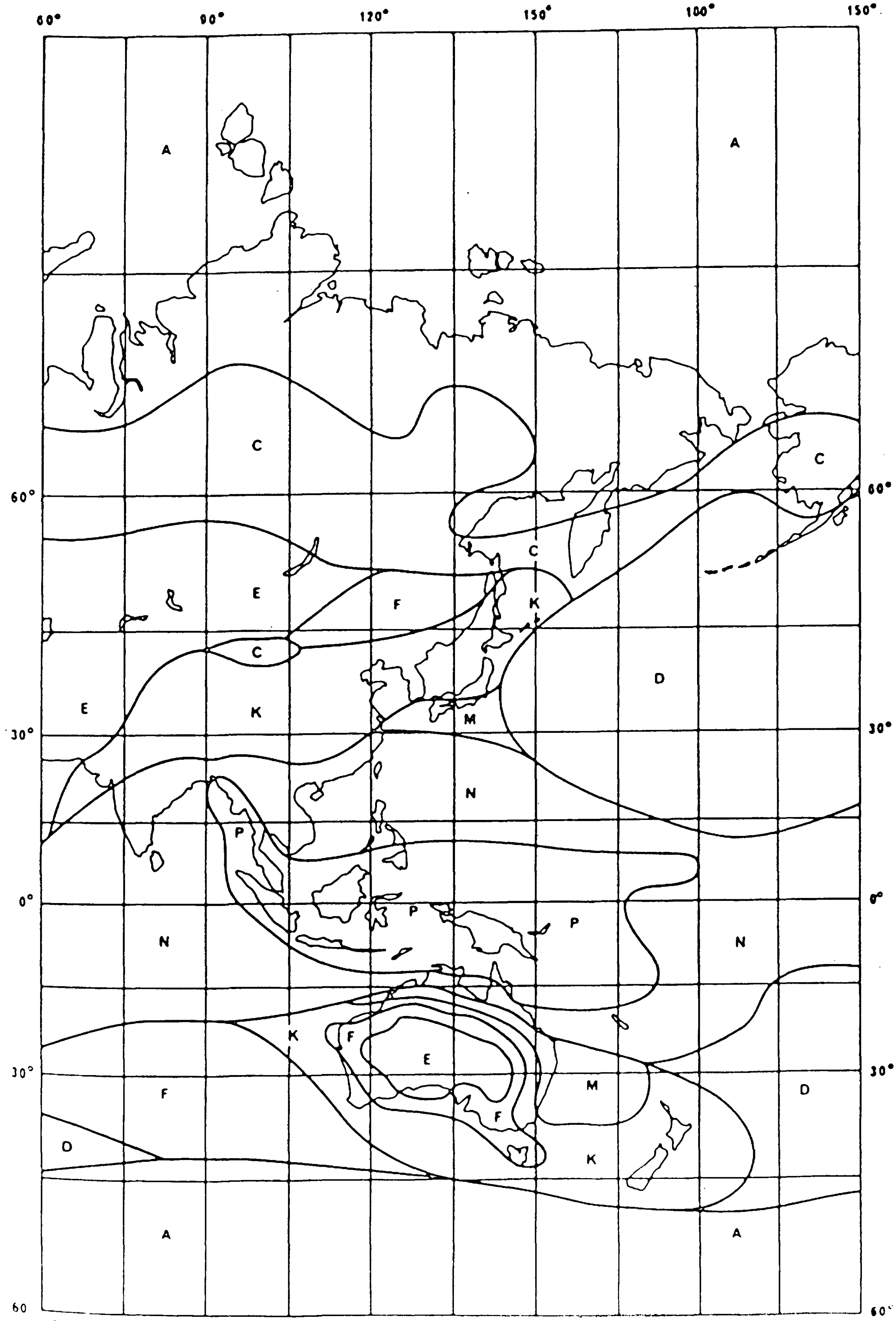


FIGURE 5

Rain climatic zones (60°E - 150°W)

2.17.2 Depolarization

Rain and ice can cause depolarization of radio frequency signals. The level of the co-polar component relative to the depolarized component is given by the cross-polarization discrimination (XPD) ratio. For the feeder link, the XPD ratio, in dB, not exceeded for 1% of the worst month is given by:

$$XPD = 30 \log f - 40 \log (\cos \theta) - V \log A_p \text{ (dB) for } 5^\circ < \theta < 60^\circ$$

where

$V = 20$ for 14.5 - 14.8 GHz

and

$V = 23$ for 17.3 - 18.1 GHz

where

A_p: co-polar rain attenuation exceeded for 1% of the worst month,

f: frequency (GHz),

θ: elevation angle. [°]

For values of θ greater than 60°, use $\theta = 60^\circ$ in the above equation.

2.18 AM to PM conversion

The degradation caused by AM to PM conversion should be taken into account when calculating the C/N of the feeder link. A figure of 2.0 dB should be allowed.

2.19 Depolarization compensation

Depolarization compensation is not taken into account in planning. It is permitted only to the extent that interference to other satellite systems does not increase by more than 0.5 dB relative to that calculated in the feeder-link plan.

2.20 Site diversity

The use of site diversity is not taken into account in planning. It is permitted and is considered to be an effective technique for maintaining high carrier-to-noise ratio and carrier-to-interference ratio during periods of moderate to severe rain attenuation.

2.21 Methods of resolving incompatibilities in planning feeder links during the second session of the Conference

Use of a common set of technical parameters for all feeder links in planning is desirable but preliminary studies by a number of administrations have indicated that there may be a difficulty in obtaining the required carrier-to-interference ratios on a small number of feeder links, particularly when certain administrations have special requirements to be met.

In order to overcome these difficulties, a certain amount of flexibility in the values of planning parameters used is proposed. Employment of one or more of the following techniques may be used, where necessary, in the planning process to attain the target values for interference protection.

2.21.1 Adjustments of the maximum level of e.i.r.p. of potential interfering feeder links or feeder links subject to excessive interference, subject to maintaining adequate carrier-to-noise and carrier-to-interference ratios on the adjusted feeder links.

2.21.2 In circumstances where independent planning of orbit positions is adversely affected, the off-axis co- and cross-polar side-lobe response patterns of the earth station transmitting antenna may be limitd to 29 - 25 log φ (dBi). For values of off-axis angle, φ, in the regions of the adjacent and next-but-one adjacent orbital positions in the plane of the geostationary orbit.

2.21.3 In circumstances where insufficient cross-polar isolation is achieved, the off-axis cross/polar side-lobe response pattern of the earth station transmitting antenna may be limited to 24 - 25 log φ (dBi) for $0.76^\circ \leqslant \varphi \leqslant 22.9^\circ$ and -10 (dBi) for $\varphi > 22.9^\circ$.

2.21.4 Adjustment of the feeder-link channel assigments, retaining the same translation frequency for all assignments associated with a given down-link beam.

2.21.5 Modifying the satellite receiving antenna beam pattern shape, size, and/or side-lobe response (for example, multiple beam or shaped beam antenna).

2.21.6 Off-setting the beam-pointing direction of the satellite receiving antenna subject to maintaining the target carrier-to-noise ratio.

2.21.7 Improving the beam-pointing accuracy of the satellite receiving antenna to 0.1°.

2.21.8 Setting an upper limit of 10 dB to the rain attenuation margin included in the feeder-link power budget.

2.21.9 Separating satellite orbit positions by $\pm 0.2^\circ$ from the nominal position and specifying the off-axis radiated power of the relevant earth station in the range 0° to 1° off-axis beam angles (note that this technique may require changes to Appendix 30).

For such cases, where E(dBW) is the earth station e.i.r.p., the radiated power of the earth station transmitting antenna for angles $0 < \varphi \leqslant 1^\circ$ should not be greater than:

for $0^\circ \leqslant \varphi \leqslant 0.1^\circ$, E (dBW)

for $0.1^\circ \leqslant \varphi \leqslant 0.32^\circ$, E - 21 - 20 log φ (dBW)

for $0.32^\circ \leqslant \varphi \leqslant 0.44^\circ$, E - 5.7 - 53.2 φ^2 (dBW)

for $0.44^\circ \leqslant \varphi \leqslant 1^\circ$, E - 25 - 25 log φ (dBW)

2.22 Summary table of initial technical parameters for feeder-link planning in Regions 1 and 3 (Frequency bands 17.3 - 18.1 GHz and 14.5 14.8 GHz)

Item	Parameter	Value	Reference
1.	Carrier-to-noise ratio	24 dB	2.2
2.	Co-channel carrier-to-interference ratio	40 dB	2.3
3.	Adjacent channel carrier-to-interference	21 dB	2.4
4.	Feeder link e.i.r.p. initial planning value	17/18 GHz - 84 dBW 14 GHz - 82 dBW	2.5
5.	Transmitting antenna		2.6
a)	Diameter	17/18 GHz - 5 m 14 GHz - 6 m	2.6.1
b)	On-axis gain	57 dBi	2.6.2
c)	Co-polar off-axis radiated power	E-25-25 log φ (dBW) for $1^\circ \leqslant \varphi \leqslant 48^\circ$, E-67(dBW) for $\varphi > 48^\circ$	2.7.1
d)	Cross-polar off-axis radiated power	E-30(dBW) for $0^\circ \leqslant \varphi \leqslant 1.6^\circ$, E-25-25 log φ (dBW) for $1.6^\circ < \varphi \leqslant 48^\circ$, E-67(dBW) for $\varphi > 48^\circ$	2.7.2
6.	Earth station mispointing loss	1 dB	2.8

Item	Parameter	Value	Reference
7.	Satellite receiving antenna		2.9
a)	Cross section of beam	elliptical or circular	2.9.1
b)	Co-polar response pattern	relative gain (dB) $-12\left(\frac{\varphi}{\varphi_0}\right)^2$ for $0 \leqslant \frac{\varphi}{\varphi_0} < 1.30$ $-17.5 - 25 \log\left(\frac{\varphi}{\varphi_0}\right)$ for $\frac{\varphi}{\varphi_0} > 1.30$ After intersection with curve C: as curve C. (see Figure 2 - curve A)	2.9.2
c)	Cross-polar response pattern	relative gain (dB) $-30 - 12\left(\frac{\varphi}{\varphi_0}\right)^2$ for $0 \leqslant \frac{\varphi}{\varphi_0} \leqslant 0.5$ -33 for $0.5 \leqslant \frac{\varphi}{\varphi_0} \leqslant 1.67$ $-\left[40 + 40 \log\left\lvert\frac{\varphi}{\varphi_0} - 1\right\rvert\right]$ for $1.67 < \frac{\varphi}{\varphi_0}$ After intersection with curve C: as curve C. (see Figure 2 - curve B)	2.9.3
8.	Satellite receiving antenna pointing accuracy	0.2°	2.10
9.	Satellite system noise temperature	1800	2.11
10.	Type of polarization	Circular	2.12
11.	Sense of polarization	(see reference)	2.13
12.	Automatic gain control	Not taken into account	2.14
13.	Power control	Not taken into account	2.15

Item	Parameter	Value	Reference
14.	Earth station location	(see reference)	2.16
15.	Propagation	(see reference)	2.17
16.	AM-to-PM conversion	2.0 dB	2.18
17.	Depolarization compensation	Not taken into account	2.19
18.	Site diversity	Not taken into account	2.20

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ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 194-E
4 September 1985
Original: English

PLENARY MEETING

MINUTES

OF THE

FOURTH PLENARY MEETING

Thursday, 29 August 1985, at 1410 hrs

Chairman: Dr. I. STOJANOVIĆ (Socialist Federal Republic of Yugoslavia)

Subjects discussed:		Documents
1.	Approval of the minutes of the third Plenary Meeting	154
2.	Report by the Chairman of Committee 4	188
3.	Report by the Chairman of Committee 6	187
4.	Oral reports by the Chairmen of other Committees	-
5.	Other business	-

1. Approval of the minutes of the third Plenary Meeting (Document 154)

The minutes of the third Plenary Meeting were approved, as amended by the delegate of Algeria and the Chairmen of Committees 4 and 5 (see Corrigendum 1 to Document 154).

2. Report by the Chairman of Committee 4 (Document 188)

2.1 The Chairman of Committee 4 said that Document 188 represented his own appreciation of the current state of the Committee's work, which was progressing quite well although Working Group 4A had not yet completed its task as scheduled.

Of the two main obstacles to completing the Committee's work which he identified, the uncertainties about the report of the first session were now being satisfactorily resolved in Committee 1. However, Committee 4 would be put in a very difficult situation if decisions by Committee 5, and by Working Group 5A in particular, concerning the bands and services to be planned were delayed much longer. But despite the numerous problems remaining, there was still room for optimism that Committee 4 could cope satisfactorily with any demands placed upon it.

2.2 The Chairman of Working Group 5A said that its task was a very difficult one. A first round of discussions on planning methods had now been succeeded by discussions on planning principles. The Group would revert to the subject of planning methods as soon as possible in an effort to reach agreement. He hoped to have some conclusion ready for presentation to Committee 5 and to the Plenary by Wednesday, 4 September 1985.

2.3 The Chairman of Committee 5 added that Working Group 5A had been given almost all the time available in an effort to make the speediest progress possible. Although no concrete results were yet to hand, he had appealed to delegates to cooperate in finding solutions to problems and was hopeful of producing them during the following week. He regretted that the work of Committee 4 and the ad hoc Working Group of the Plenary was being made more difficult by the delay.

3. Report by the Chairman of Committee 6 (Document 187)

3.1 The Chairman of Committee 6 presented his report (Document 187) as a personal assessment of the progress made to date at Working Group level. He emphasized that the document had not been discussed or approved by the Committee itself. In addition to the information which it contained, a further ad hoc Working Group had been established to tackle the problem of incompatibilities between the Region 2 broadcasting-satellite service plan and the fixed-satellite service systems in Regions 1 and 2. The Committee was making every effort to complete its work by the date set by Committee 1.

3.2 The Chairman thanked the Chairman of Committee 6 for his very clear report which had encouraged him to feel more optimistic than at the beginning of the meeting.

4. Oral reports by the Chairmen of other Committees

4.1 The Chairman of Committee 2 said that a second meeting of its Working Group on 27 August 1985 had examined the credentials of a further 15 delegations and found them all to be in order, making a total of 95 to date. He invited delegations which had not so far submitted credentials to do so as soon as possible, either to the Secretariat or to himself (Box No. 293).

4.2 The Chairman of Committee 3 said that at its second meeting on 28 August 1985, it had reviewed the Conference accounts and considered the question of the financial impact of intersessional work by ITU organs arising out of Resolution No. 931 of the Administrative Council. The Committee had taken note of the budget funds available for such work in 1986 and might soon address a document to the Chairmen of other Committees drawing attention to relevant aspects of the problem.

4.3 The Chairman of Committee 5 said that it had held only one short meeting since the last Plenary, so as to allow Working Group 5A the maximum time for general discussion of planning methods on the basis of Documents DT/32 and DT/34. The Group's discussion of planning principles had also been begun on the basis of Document DT/48 and Addendum 1. He hoped that those discussions would soon be completed and that the Working Group would be able to produce texts on the two subjects for approval by the Committee in the course of the following week.

Working Group 5B had continued its consideration of guidelines for regulatory procedures for services which were not to be planned. Sub-Working Groups 5B-1 and 5B-2 had completed their tasks and submitted Documents DT/55 and 174 respectively to the Working Group, which hoped to produce a text for approval by Committee 5 during the following week. The end of that week would be very busy for the Working Group since it still had to establish guidelines for the procedures for services which were to be planned, a task which could not be tackled until decisions had been reached by Working Group 5A.

The Committee had received Documents 135(Rev.1) and 184 from Committee 4 as contributions to assisting its work. It had also received a request from the ad hoc Working Group of the Plenary in Document 163 but had no suggestions to make in response to that request at the present time. He hoped that the Committee would be able to produce documents of use to the ad hoc Working Group of the Plenary and other Committees during the coming week.

4.4 The Chairman of the ad hoc Working Group of the Plenary said that Sub-Groups 1 and 2 had each met once since the third Plenary Meeting. On the basis of a request from Committee 4, Sub-Group 2 had decided to set up an even smaller group (comprising the representatives of the United Kingdom, the Netherlands, the Federal Republic of Germany, the USSR, Sweden and France) to consider the question of high-definition television.

4.5 The Chairman of Committee 7 (Editorial) said that no meetings had been held since the third Plenary but that the Committee was growing concerned at the lack of texts for it to consider and it appealed to the Chairmen of other Committees to forward as soon as possible any texts which might be produced.

4.6 The delegate of Indonesia, commenting on the progress made by the Conference, said that crucial problems were obviously being faced, particularly in Committee 5, but his Delegation strongly believed that administrations would find a satisfactory solution. Indonesia, for its part, would cooperate closely in that effort, and hoped that its contribution to the Conference would help speed up the deliberations in the Working Groups and in the Committees so that the goal of universal access to telephones in the next century could be reached.

He had noted from Document 172 that the Administrative Council had decided to allocate 900,000 Swiss francs for intersessional work but had made no provision for computer resources. He therefore enquired of the Secretary-General whether computer resources would be needed and, if so, what they would cost.

4.7 The Secretary-General said that Document 44 explained that the Administrative Council had made a lump sum allocation for intersessional work on the understanding that if that were not done at the 40th session, intersessional work would have to wait until after the following session in June 1986. The resources approved by the Council had been placed in a Reserve Account to be used only by a decision of the Conference through the Budget Control Committee.

The necessary computer facilities could not be calculated until a decision was adopted on planning requirements and the IFRB and the Secretary had made the necessary studies; he estimated that the calculations might be completed in the second quarter of 1986 and in time for the next session of the Administrative Council. In the meantime, short-term requirements could be accommodated from existing facilities, but in order for the facilities to be augmented, additional programming analysis and scheduling information was needed.

4.8 The Chairman of the IFRB said that intersessional activities could take two forms: those relating to the Feeder Link Plan for Regions 1 and 3 and those arising from decisions on planning taken by Committee 5. At present, it was difficult to predict what the decisions taken by Committee 5 might imply, but once the planning methods had been determined, software requirements could be estimated and, on that basis, hardware requirements be worked out.

4.9 The representative of the IFRB added that the lump sum had been approved by the Administrative Council for 1986 alone, pending the submission of a detailed report by the IFRB on the intersessional work that would be required. The IFRB had clearly indicated in its report to the Administrative Council that computing needs could be estimated only in 1986.

4.10 The delegate of Algeria said that it was exceedingly important for delegates to be kept apprised of the financial implications of the current session and of the work to be done by the IFRB on the basis of decisions adopted by Committees.

4.11 The Secretary-General assured the delegate of Algeria that provision would be made for the consequences of decisions adopted by the Conference to be assessed from the financial point of view and on the basis of priorities. Referring to Documents 44 and 172 and to the discussions held within the ad hoc Group of the Plenary and Committee 3, he noted that it might be difficult to remain within the ceilings set by the Plenipotentiary Conference.

5. Other business

5.1 The delegate of Canada drew attention to the successful launching into the transfer orbit of Australia's first domestic satellite system. He invited the Plenary Meeting to join him in congratulating the Australian Administration and in wishing it success in completing the manoeuvres which would place the satellite in position in the geostationary orbit.

5.2 The Chairman said he was sure he spoke for all delegates in expressing to the Australian Administration his best wishes for the successful commissioning of its satellite.

5.3 The delegate of Australia thanked the Canadian Delegation, the Chairman and delegates to the Conference. He was sure that all administrations, whether they had a domestic satellite system or not, would experience satisfaction at witnessing the achievement of a goal after many years of planning. The Australian satellite system included telecommunication facilities as well as community broadcast services which would augment the terrestrial services and beam television broadcasts to areas of the country which had never received them. Despite initial difficulties, the satellite was now functioning well and was expected to reach its final orbit soon.

5.4 The Chairman said he was sure he was speaking for all delegates in thanking most cordially the Delegation of Norway for its gift of the Radio Regulations, which constituted an essential working tool for all participants in the Conference.

The meeting rose at 1510 hours.

The Secretary-General: R.E. BUTLER

The Chairman: Dr. I. STOJANOVIĆ

INTERNATIONAL TELECOMMUNICATION UNION

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FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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COMMITTEE 4

ANNEX YY

(relevant to chapter 8)

TECHNICAL AND OPERATIONAL INFORMATION RELATING TO SATELLITE SOUND-BROADCASTING SYSTEMS FOR INDIVIDUAL RECEPTION BY PORTABLE AND AUTOMOBILE RECEIVERS

(Agenda item 4)

Annex 7 of the CPM Report is the text of this Annex.

Modify title to the title as given in this document.

Change numerical designation of Annex from 7 to YY, throughout the text.

Modify last paragraph of 7.2.2 (YY.2.2) to correct typographical errors.

"In the case of the digital model, the quality objective at the edge of the coverage area is equivalent to a subjective quality of grade 4 on the 5 point CCIR quality scale. This will translate into an allowed bit error-ratio depending on the level of protection against errors, and into a required carrier-to-noise ratio depending on the channel coding used. In this case, interference is considered as additive noise and the protection ratios are set such that the noise contribution ~~additive-noise-and-the-protection-ratios-are-set-such-that-the-noise-contribution~~ from the co-channel interference is 1 dB and each adjacent channel contributes 0.5 dB.".

E.F. MILLER
Chairman of Working Group 4A

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FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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Information Paper

DRAFT STRUCTURE OF THE REPORT OF THE FIRST SESSION TO THE SECOND SESSION

(As a guideline to the Committees, following discussions in the Steering Committee)

CHAPTER 1: INTRODUCTION

CHAPTER 2: PREVAILING SITUATION FOR THE FREQUENCY BANDS ALLOCATED TO SPACE SERVICES

CHAPTER 3: PLANNING

3.1 Frequency bands and space services identified for planning

3.2 Planning principles

3.3 Planning method[s]

3.4 Technical parameters and criteria

3.5 Guidelines for associated regulatory procedures

CHAPTER 4: GUIDELINES FOR REGULATORY PROCEDURES FOR SPACE SERVICES AND FREQUENCY BANDS NOT IDENTIFIED FOR PLANNING

CHAPTER 5: BANDS FOR WHICH SHARING CRITERIA BETWEEN SERVICES (SPACE OR TERRESTRIAL) NEED TO BE DEVELOPED

CHAPTER 6: FEEDER LINKS FOR THE 12 GHz BROADCASTING-SATELLITE SERVICE IN REGIONS 1 AND 3

6.1 Bands for which frequency plans should be established

6.2 Planning method, technical parameters and criteria

CHAPTER 7: BROADCASTING-SATELLITE SERVICE (SOUND) (WARC-79 RESOLUTION No. 505)

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FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

Document 197-E
29 August 1985
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Note by the Secretary-General

TRANSFER OF POWERS

Belgium-Netherlands

The Government of Belgium has informed me that its Delegation will be present at the Conference from 2 to 14 September 1985.

Under No. 391 of the Convention, it has therefore vested in the Delegation of the Netherlands the authority to represent it for the period from 8 August to 2 September 1985.

The appropriate instruments have been deposited with the Secretariat of the Credentials Committee.

R.E. BUTLER

Secretary-General

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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WORKING GROUP 6A2

Note by the Secretary-General

REPORT BY THE IFRB TO THE WARC-ORB(1)
ON
THE INTERREGIONAL ASPECTS OF THE APPLICATION
OF RESOLUTION No. 2 (SAT-R2)

At the request of the IFRB, I transmit the attached report on the Interregional Aspects of the Application of Resolution No. 2 (SAT-R2), prepared at the request of Working Group 6A2.

R.E. BUTLER

Secretary-General

Annex: 1

REPORT BY THE IFRB TO THE WARC-ORB(1) ON
THE INTERREGIONAL ASPECTS OF THE APPLICATION
OF RESOLUTION No. 2 (SAT-R2)

Working Group 6A2 has been discussing the question for this Conference of adopting Resolution No. 2 (SAT-R2) as a WARC Resolution.

During the discussions, the IFRB was requested to prepare a document on the interregional sharing aspects o this Resolution.

Working Group 6A2 is now reviewing and revising Annex 1 to Appendix 30 to ensure that adequate criteria are included in it to provide protection to the various services of Regions 1 and 3 from proposed modifications to the Region 2 Plan. Within Working Group 6A, criteria are being considered to protect the BSS, FSS and terrestrial services of Regions 1 and 3.

Assuming that these criteria in Annex 1 are accepted by the Conference and assuming that these same criteria are used by a revised Resolution No. 2 (SAT-R2) to determine when an administration of Regions 1 and 3 is considered to be affected by a proposed interim system of Region 2, it is the view of the Board that administrations of Regions 1 and 3 will receive the same protection from Region 2 interim systems as from proposed modifications to the Region 2 BSS Plan.

The other aspect of this question is the protection that interim systems of Region 2 will receive. Under Article 4 of Appendix 30 and paragraph 7.2.1 of Article 7 of Appendix 30 (Document 16), proposed modifications to the Regions 1 and 3 Plan and planned FSS systems of Regions 1 and 3 do not have to coordinate with interim systems of Region 2; they must coordinate only with Region 2 BSS assignments that are in the Region 2 Plan and considerd as affected in accordance with Annex 1.

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COMMITTEE 4

Report of Working Group 4B

INTERSERVICE SHARING

1. Introduction

[Committee 4] has reviewed those portions of the Report of the Conference Preparatory Meeting (CPM) of the CCIR (Document 3) relevant to its terms of reference: specifically, Chapters 8 and 10 of the report, and all of Annex 5 and section 6.1.3.4 of Annex 6. The [Committee] also reviewed the following contributions to ORB-85: 4 (the report of the IFRB), 8 (New Zealand), 18 (United Kingdom), 27 (China), 35 (Canada) and 37 (Brazil).

This is an interim report, describing the work of the [Committee] to date on item a) of its terms of reference set forth in Document DT/7: under agenda item 2.6, "Analyze current sharing situations in frequency bands to be discussed in Committee 5 under agenda item 2.2, based on input from administrations and results of studies in the CCIR, identifying the current availability of sharing information and areas requiring further study". Both down-link and feeder-link sharing situations have been considered.

2. The Report of the CPM

The [Committee] has decided not to summarize here, these relevant sections of the CPM Report, knowing that such an effort would probably not do justice to a report which itself summarizes source documents of the CCIR. Rather, the [Committee] incorporates in this report, by reference, the pertinent sections of the Report of the CPM cited above.

[Committee 4] endorses the material contained in those chapters and annexes, including the sharing principles, the discussion of performance requirements and interference criteria, the available sharing criteria for sharing between services and the conclusions set forth. The CPM Report is referred to other Committees of this Conference for the information and guidance it offers, particularly to Committee 5 in its consideration of bands and services to be planned, planning principles and criteria.

Among the principles and conclusions of particular importance in the CPM Report are the following:

2.1 Interference and sharing criteria are necessary to permit the equitable sharing of a band by services having primary allocations in that band. Such criteria have been developed for many bands and services, and are responsible for the successful and intensive use now being made of shared bands. [CPM 8.3.]

2.2 Services, whether space or terrestrial, having primary allocations in a particular band, have equal rights with respect to the use of the spectrum. The requirements of both services must be taken into account while planning a space service, without changing their existing sharing status, taking into account in specific bands, Article 8 of the Radio Regulations - regardless of the planning method or approach employed. [CPM 8.2.]

2.3 In order for the development of terrestrial services in shared bands to continue, as a corollary or consequence of the principle set forth immediately above, earth station locations should not be included in the planning of bands shared on a primary basis with terrestrial services. [CPM 8.2.]

2.4 Techniques that may be necessary or desirable to facilitate sharing, also bring about the more efficient use of the spectrum by all services. [CPM Annex 5, 5.3.1.3.]

2.5 The planning of bands shared by space services operating in different directions of transmission (i.e. "Reverse-Band Working"), could well impose additional constraints on both services, particularly when a terrestrial fixed service is also a primary service in those bands. Further study is required on the extent of these constraints. [CPM Annex 5, 5.3.1.9.]

2.6 The report of the CPM indicates that further study may be needed for a number of combinations of services which may share a band or bands. These combinations include:

a) BSS/FSS at 2.5 GHz;
b) BSS/FSS at 12 GHz - Interregional;
c) FSS/EESS (passive) at 18.6 - 18.8 GHz;
d) FSS/MetSS at around 7/8 GHz and at 18 GHz;
e) ISS/BSS at 22.5 - 23 GHz;
f) FSS/FS in bidirectional bands;
g) MSS/FS at 1.6/1.5 GHz;
h) BSS/FS at 22 GHz;
i) FSS/EES at 8 GHz.

3. <u>Other views on interservice Sharing Situations</u>

3.1 Interference limits and sharing criteria must permit a continuation of at least the same level of sharing between services in a particular band. However, certain planning methods could adversely affect the ability of these sharing criteria to ensure the same level of sharing.

3.2 It may be possible in some operational environments to increase the overall use of some FSS/FS shared bands through Reverse Band Working (RBW), without significantly affecting terrestrial services or significantly reducing the capacity in the forward-band working, if the initial indications can be confirmed that the favourable geometry associated with the high elevation angles (above 40° was proposed by one administration) significantly ameliorates the constraints outlined in section 2.5 above. It is recommended that such studies be conducted during the intersessional period. It would, however, be necessary, while considering RBW at 4 and 6 GHz in particular, to restrict satellite pfd and require adequate satellite antenna discrimination towards the limb of the Earth, taking into account existing terrestrial stations (whether they employ analogue or digital techniques) and where the main beam of the satellite antenna is directed within two degrees of the Earth's limb. The limits on pfd and the required satellite antenna discrimination should also be determined during the intersessional period.

3.3 Criteria have not yet been adopted for certain sharing situations. While they will eventually be necessary in any event, a decision to plan one or more space services in a band implies that relevant criteria must be developed and adopted and then employed in the planning process.

3.4 WARC-79 by Recommendation No. 66, recommended that the CCIR study (as a matter of urgency) the question of spurious emissions from space stations. It is important that intersessional studies provide the second session of the Conference with information to be able to take appropriate action at that time.

3.5 Once ORB-85 has identified bands and services to be planned, new sharing criteria must be developed for situations where no criteria exist, and existing criteria should be reviewed for their adequacy in light of the particular planning method to be employed. It is contemplated that those criteria requiring further study should be identified for consideration during the intersessional period.

3.6 [Committee 4] is of the opinion that the CCIR can provide a knowledgeable and efficient forum for the development of new criteria and the examination of existing ones; however, special arrangements may be necessary to enable the CCIR to provide the information required within the limited available time.

3.7 A review of the Report of the IFRB (Document 4, supplemented by Document DT/21), indicates that, in situations where interference and sharing criteria had not been incorporated in the Radio Regulations, the Board, acting in accordance with the Regulations, developed and applied such criteria to Article 14 procedures on a provisional basis to space services. The [Committee] urges review of these sharing criteria during the intersessional period, and that appropriate recommendations be made to the second session of WARC-ORB.

3.7.1 With regard to Table I of Appendix 28, the [Committee] notes that several services and bands in which sharing could take place under current [footnote] allocations, employing the provisions of Article 14, are not included in the Table. These instances are summarized in Table [A], which also gives the number of such cases that have been received by the IFRB during the period 1 January, 1982 to 31 October, 1984.

The [Committee] noted that the first three columns of Table II of Appendix 28 do not contain values of certain interference parameters and criteria (p_o%, n, J(dB), $M_o(P_o)$, W, B or $P_r(p)$). Other columns should be added to Table II of Appendix 28 for the bands and services marked in Table [B] with a plus sign (+).

3.7.2 With regard to Appendix 29, the [Committee] notes that the value of 4% triggering the requirement for coordination between space systems, was adopted some years ago for the FSS, taking into account the sharing situations that could arise at the time, and assuming technical characteristics of FSS then envisaged.

This level of 4% may not be appropriate for space services other than the FSS, and may even be in need of revision for application to the FSS (many, or even most, FSS systems whose system temperature is increased by 4% may still not experience unacceptable interference). Study of this matter should be undertaken by the CCIR during the intersessional period and the results made available to the second session.

3.7.3 The sharing situations which are the subject of many such communications would appear to be in greatest need of having sharing criteria studied by the CCIR during the intersessional period, for consideration by the second session, but other bands may have equal or greater need, because of the narrower bandwidth available, or the technical characteristics of systems likely to be employed.

The [Committee] invites the IFRB to identify early in the intersessional period, those services which, in its opinion, are in greatest need of formally adopted sharing criteria, or of review and revision of existing criteria.

It should be borne in mind during the intersessional period, when considering changes to the technical provisions of coordination (such as those set forth in Appendix 28), that Resolution No. 703 offers a possible means for those administrations wishing to amend these provisions within their particular geographic area, without imposing these amendments on other administrations, and without causing unacceptable interference to any administration.

4. Agenda item 2.2, sharing criteria for bands and services to be planned.

In view of the [provisional] decision of [Committee 5] [this Conference] to select the service[s] and bands listed below for planning at the second session, [Committee 4] [the Conference] provides the following information both for guidance during the intersessional period, and to the second session.

Service selected: FSS,

Bands selected: 4 and 6 GHz
11-12 and 14 GHz.

4.1 The [Committee] has reviewed the existing sharing criteria for the service[s] and bands selected for planning. In the case of the FSS in the 4 and 6 GHz bands, these criteria include the pfd limits set forth in Radio Regulations 2565-2568, the restrictions on the pointing of antennas in the FS at or near the orbit contained in Radio Regulations 2502-2547, and certain other provisions of the Regulations.

It is the view of the [Committee] that these criteria, which have enabled extensive sharing between the fixed, mobile (except aeronautical mobile) and fixed-satellite services for many years, are adequate to permit the continuation of sharing in the 4 and 6 GHz bands (3 700 - 4 200 MHz (space-to-Earth) and 5 925 - 6 425 MHz (Earth-to-space)). Based on more limited experience, the present criteria are also deemed adequate for the bands (3 400 - 3 700 MHz (space-to-Earth), 4 500 - 4 800 MHz (space-to-Earth) and 6 425 - 7 025 MHz (Earth-to-space)). These conclusions are valid regardless of which of the possible planning methods is selected by the Conference, unless the planning method violates principle of [sections 2.2 and 2.3 of this document] by specifying nominal earth station locations.

4.2 Regarding the 11-12 and 14 GHz bands, the [Committee] has reviewed the sharing criteria for these bands, including the pfd limits set forth in Radio Regulations 2572-2576, and the restrictions on the pointing of antennas in the FS at or near the orbit contained in Radio Regulations 2502-2547, and certain other provisions of the Regulations.

It is the view of the [Committee] that these criteria, which have enabled sharing between the fixed, mobile (except aeronautical mobile) and fixed-satellite services to develop in recent years, are adequate to permit the continuation of sharing in these bands. This conclusion is valid, regardless of which of the possible planning methods is selected by the Conference, unless the planning method violates the principle of [sections 2.2 and 2.3 of this document] by specifying nominal earth station locations.

4.3 It should be noted that sharing criteria for bands below 15 GHz are generally restricted to analogue-modulated terrestrial systems, so that parameters for digital systems need to be developed.

K. KOSAKA
Chairman of Working Group 4B

TABLE A(Rev.)

Services and frequency bands subject to the procedure of Article 14 and not included in Table I of Appendix 28 (between 1 and 40 GHz)

Frequency bands	Ref. No.	Services concerned	Status of services	Direction of links	Number of cases received by the IFRB during the period 1.1.82 to 31.10.84
1 610 - 1 626.5 MHz	732	Radionavigation-satellite	Not mentioned	Not mentioned	
1 610 - 1 626.5 MHz	733	Aeronautical mobile-satellite (R)	Not mentioned	Not mentioned	1
1 750 - 1 850 MHz	745	Space operation	Not mentioned	Up-link	4
1 750 - 1 850 MHz	745	Space research	Not mentioned	Up-link	
1 770 - 1 790 MHz	746	Meteorological-satellite	Primary	Not mentioned	
2 025 - 2 110 MHz	747	Space research	Not mentioned	Up-link and intersatellite	
2 025 - 2 110 MHz	747	Space operation	Not mentioned	Up-link and intersatellite	44
2 025 - 2 110 MHz	747	Earth exploration-satellite	Not mentioned	Up-link and intersatellite	
2 110 - 2 120 MHz	748/ 749	Space research	Not mentioned	Up-link	5
2 110 - 2 120 MHz	749	Space operation	Not mentioned	Up-link	
2 655 - 2 690 MHz	761	Fixed-satellite	Primary	Up-link, down-link	2
5 000 - 5 250 MHz	797	Fixed-satellite	Not mentioned	Not mentioned	
5 000 - 5 250 MHz	797	Intersatellite	Not mentioned	Intersatellite	
7 125 - 7 155 MHz	810	Space operation	Not mentioned	Up-link	
7 145 - 7 235 MHz	811	Space research	Not mentioned	Up-link	
7 900 - 8 025 MHz	812	Mobile-satellite	Not mentioned	Up-link	8
13.25 - 13.4 GHz	852	Space research	Secondary*	Up-link	
15.4 - 15.7 GHz	797	Fixed-satellite	Not mentioned	Not mentioned	
15.4 - 15.7 GHz	797	Intersatellite	Not mentioned	Intersatellite	
37 - 39 GHz	899	Fixed-satellite	Not mentioned	Up-link	

* Because of its secondary status, [Committee 4] does not propose inclusion of the space research service in this band in Table I of Appendix 28.

TABLE B

Services and frequency bands subject to Article 14 procedure not included in Section IV of Article 28 (between 1 and 40 GHz)

Frequency bands	Ref. No.	Services concerned	Status of services	Direction of links	Number of cases received by the IFRB during the period 1.1.82 to 31.10.84
1 610 - 1 626.5 MHz+	732	Radionavigation-satellite	Not mentioned	Not mentioned	
1 610 - 1 626.5 MHz+	733	Aeronautical mobile-satellite (R)	Not mentioned	Not mentioned	1
1 770 - 1 790 MHz	746	Meteorological-satellite	Primary	Not mentioned	
2 025 - 2 110 MHz*	747	Space research	Not mentioned	Up-link and intersatellite	
2 025 - 2 110 MHz*	747	Space operation	Not mentioned	Up-link and intersatellite	44
2 025 - 2 110 MHz*	747	Earth exploration-satellite	Not mentioned	Up-link and intersatellite	
2 200 - 2 290 MHz*+	750	Space research	Not mentioned	Down-link and intersatellite	
2 200 - 2 290 MHz+*	750	Space operation	Not mentioned	Down-link and intersatellite	49
2 200 - 2 290 MHz+*	750	Earth-exploration satellite	Not mentioned	Down-link and intersatellite	
2 500 - 2 535 MHz+	754	Mobile-satellite	Not mentioned	Down-link	
5 000 - 5 250 MHz+	797	Fixed-satellite	Not mentioned	Not mentioned	
5 000 - 5 250 MHz+	797	Intersatellite	Not mentioned	Intersatellite	
8 025 - 8 400 MHz*	815	Earth exploration-satellite	Primary	Down-link	4
11.7 - 12.7 GHz+	839	Broadcasting-satellite	Primary	Down-link	18
11.7 - 12.7 GHz	839	Fixed-satellite	Primary	Down-link	
22.5 - 23 GHz+	877	Broadcasting-satellite	Primary	Down-link	
31.8 - 33.8 GHz	892	Fixed-satellite	Not mentioned	Down-link	

Note 1 - In bands marked with an asterisk (*) Table references specify that the service concerned is subject to power flux-density limits under Article 28, Section IV.

Note 2 - Bands and services marked with a plus (+) sign are also missing in Table II of Appendix 28.

INTERNATIONAL TELECOMMUNICATION UNION

ORB-85 WARC ON THE USE OF THE GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT

FIRST SESSION, GENEVA, AUGUST/SEPTEMBER 1985

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Original : English
French
Spanish

PL = Plenary Meeting
C = Committee
WG = Working Group

LIST OF DOCUMENTS

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No.	Origin	Title	Destination
151	SMR	Study of the implication of using hybrid satellites	C.4, C.5, Ad Hoc WG
152	C.5	Summary record of the third meeting of Committee 5	C.5
153	SG	Sharing criteria between the feeder links and other radiocommunication services sharing the same frequency band with equal rights	WG 4B
154	PL	Minutes of the third plenary meeting	PL
155	B	Proposal	WG 5B
156 +Corr.1	INS	Some elements on planning principles	C.5
157 +Corr.1	J	Parameters suited for the planning exercise	C.4, C.5
158	C.5	Note from Chairman of Committee 5	C.4
159	WG 4C	Pairing of frequency bands for networks of the fixed-satellite service	C.4
160	B	Revision of the existing procedures	C.5, WG 5B
161	SG	Use of the terms "assignment" and "allotment" as pertaining to the frequency plans	WG 5A
162	WG 6B	Selection of frequency bands for which the frequency plan should be established for feeder links	C.6

No.	Origin	Title	Destination
163	Ad Hoc WG/PL	Note by the Chairman of the ad hoc Working Group of the Plenary	Ad Hoc PL C.3, C.4, C.5, C.6
164	USA	Two real problems with a priori planning	C.4, C.5
165	F	Proposal	Ad Hoc PL C.5, C.6
166 +Add.1	ALG D AUT BFA CME CHL CTI ETH GHA GRC KRN LBR MWI MLI MEX PRG POR SYR SMR SEN SUI TZA TCD TUN YUG GAB MRC NIG TUR	Consideration of the requirements of the international multilateral Intergovernmental Organizations	C.5, WG 5A
167	SG	Report by the IFRB to the WARC-ORB(1) on interregional sharing between the broadcasting-satellite services of Region 2 and the services of Regions 1 and 3 (Energy dispersal requirement)	WG 6A
168	SG	Report by the IFRB to the WARC-ORB(1) on interregional sharing between the broadcasting-satellite services in Region 2 and the services of Regions 1 and 3 (pfd limits)	WG 6A
169	YUG	Feeder link service area of BSS	WG 6B
170	YUG	Intersessional activities relating to the planning of feeder links for BSS in Regions 1 and 3	WG 6B
171	SG	Position of the conference accounts on 23 August 1985	C.3
172	SG	Work between the first and second sessions of WARC-ORB	C.3
173	INS	Some views on planning method	C.5, WG 5A

No.	Origin	Title	Destination
174	WG 5B-2	Possible modification of sections I and II of Article 11	WG 5B
175	D	Proposal	C.4
176	I	Economical comparison between satellite and terrestrial broadcasting	WG 4A
177 +Corr.1	SG	Note by the Secretary-General	C.5, WG 5A
178	C.4	Summary Record of the sixth meeting of Committee 4	C.4
179	USA	Moratorium on use of the 4/6 GHz expansion bands	C.5
180 +Corr.1	WG 6A2	First Report of Subworking Group 6A2 to Working Group 6A	WG 6A
181	GT 2A	Second report of the Working Group of Committee 2 (Credentials)	C.2
182	ARG, URG, VEN	Consideration of the requirements of the international multilateral intergovernmental organizations	C.5, WG 5A
183	BOL, CLM, EQA, PRU, VEN	Structure of the planning method	C.5
184 +Corr.1 +Corr.2	C.4	Note from the Chairman of Committee 4	C.5
185	C.3	Summary record of the second meeting of Committee 3	C.3
186	C.5	Summary record of the fourth meeting of Committee 5	C.5
187	C.6	Report of the Chairman of Committee 6	PL
188	C.4	Report from the Chairman of Committee 4 to the fourth plenary meeting	PL
189 +Corr.1	URS	Agenda items 2.2 and 2.3	C.5

No.	Origin	Title	Destination
190	J	Proposals concerning agenda items 2.2, 2.3, 2.4 and 2.5	C.5
191	SG	Supplemental Report by the IFRB to the WARC-ORB(1) on interregional sharing between the broadcasting-satellite services of Region 2 and the services of Regions 1 and 3	WG 6A
192	SG	Report by the IFRB to the WARC-ORB(1) on notification of frequency assignments to stations in the space radiocommunication services	WG 5B2
193	WG 6B	Second report of Working Group 6B to Committee 6	C.6
194	PL	Minutes of the fourth Plenary Meeting	PL
195	WG 4A	Technical and operational information relating to satellite sound-broadcasting systems for individual reception by portable and automobile receivers	C.4
196	-	Information paper - Draft Structure of the Report of the first session to the second session	-
197	SG	Transfer of powers - Belgium-Netherlands	-
198	SG	Report by the IFRB to the WARC-ORB(1) on the interregional aspects of the application of Resolution No.2 (SAT-R2)	WG 6A2
199	WG 4B	Interservice sharing	C.4
200	SG	List of documents published (151 to 200)	-