

# TRACTATENBLAD

VAN HET

KONINKRIJK DER NEDERLANDEN

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JAARGANG 1972 Nr. 79

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A. TITEL

*Radioreglement behorende bij het Internationaal Verdrag betreffende  
de Verreberichtgeving van Genève van 21 december 1959,  
met bijlagen,*

*Aanvullend Radioreglement en Aanvullend Protocol;  
Genève, 21 december 1959*

B. TEKST

De Engelse tekst van het Reglement, cum annexis, is geplaatst in *Trb.* 1961, 115. Zie ook rubriek J van *Trb.* 1964, 106, rubriek J van *Trb.* 1967, 137, rubriek J van *Trb.* 1968, 135 en rubriek J hieronder.

G. INWERKINGTREDING

Zie *Trb.* 1961, 115.

J. GEGEVENS

Zie *Trb.* 1961, 115, *Trb.* 1964, 106, *Trb.* 1967, 137 en *Trb.* 1968, 135.

Voor het op 12 november 1965 te Montreux tot stand gekomen Verdrag betreffende de Verreberichtgeving zie ook *Trb.* 1971, 29.

Op 23 november 1970 is de Secretaris-Generaal van de Internationale Vereniging voor Verreberichtgeving in kennis gesteld van de goedkeuring door het *Koninkrijk der Nederlanden* van de op 3 november 1967 tot stand gekomen wijzigingen van het onderhavige Reglement.

Het onderhavige Reglement en de daarbij behorende bijlagen werden voor de vierde maal gewijzigd tijdens een administratieve Wereldradioconferentie, welke in 1971 te Genève werd gehouden. De vaststelling geschiedde bij de op 17 juli 1971 tot stand gekomen Slotakten der Conferentie. De wijzigingen zullen ingevolge het daartomtrent in de Slotakten bepaalde op 1 januari 1973 in werking treden. De Leden en geassocieerde Leden van de Internationale Vereniging voor Verreberichtgeving dienen de Secretaris-Generaal van hun goedkeuring van de wijzigingen in kennis te stellen. Een dergelijke kennisgeving is reeds verricht door:

Thailand .....	30 december 1971
Australië .....	21 april 1972

De Engelse tekst van de Slotakten luidt:

## **PARTIAL REVISION OF THE RADIO REGULATIONS<sup>1</sup>**

In its Recommendation No. Spa 9, the Extraordinary Administrative Radio Conference to allocate frequency bands for space radiocommunication purposes, held in Geneva in 1963, recommended that the Administrative Council of the Union should review annually the progress in space radiocommunications made by administrations and the available reports and recommendations of the permanent organs of the Union with respect thereto. The Conference also recommended that the Administrative Council should, in the light of its annual review and at a date which it would determine, recommend to administrations the convening of an Administrative Conference to work out further agreements for the international regulation of the use of radio frequency bands allocated for space radiocommunications by the 1963 Conference.

At its 23rd Session in 1968, the Administrative Council, in its Resolution No. 632, recommended that a World Administrative Radio Conference should be convened during the latter part of 1970 or early 1971 and invited Administrations to send to the Secretary-General their proposals for the agenda thereof.

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<sup>1</sup> Namely the Radio Regulations, Geneva, 1959, as partially revised by the Extraordinary Administrative Radio Conference to allocate frequency bands for Space Radiocommunication purposes (Geneva, 1963) by the Extraordinary Administrative Radio Conference for the preparation of a revised allotment plan for the Aeronautical Mobile (R) Service (Geneva, 1966) and, by the World Administrative Radio Conference to deal with matters relating to the Maritime Mobile Service (Geneva, 1967).

In accordance with Nos. 56 and 64 of the International Telecommunication Convention (Montreux, 1965), the Administrative Council, at its 1969 Session, with the concurrence of a majority of the Members of the Union, determined in its Resolution No. 653 the agenda of the World Administrative Radio Conference for Space Telecommunications and decided that it would meet in Geneva on 7 June, 1971 for a duration of six weeks, provision being made for one additional week if necessary.

However, in 1970, the Administrative Council, taking into account the provisions of Resolution No. 40 of the XIIth Plenary Assembly of the C.C.I.R. relative to the convening, prior to the Conference, of a Special Joint Meeting of C.C.I.R. Study Groups, decided in its Resolution No. 665 that the duration of the Conference would be six weeks.

\* \* \*

The World Administrative Radio Conference for Space Telecommunications, accordingly convened on the appointed date, considered and revised, in conformity with its agenda, the relevant parts of the Radio Regulations. Particulars of the revision of the Radio Regulations are given in Annexes 1 to 19 hereto.

The revised provisions of the Radio Regulations shall form an integral part of the Radio Regulations which are annexed to the International Telecommunication Convention. They shall come into force on 1 January, 1973, on which date the provisions of the Radio Regulations which are cancelled or modified by this revision shall be abrogated.

\* \* \*

The delegates signing this revision of the Radio Regulations hereby declare that, should an administration make reservations concerning the application of one or more of the revised provisions of the Radio Regulations, no other administration shall be obliged to observe that provision or those provisions in its relations with that particular administration.

\* \* \*

Members and Associate Members of the Union shall inform the Secretary-General of their approval of the revision of the Radio Regulations by the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971). The Secretary-General will inform Members and Associate Members of the Union regarding receipt of such notifications of approval as they are received.

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In witness whereof the delegates of the Members of the Union represented at the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971) have signed in the names of their respective countries this revision of the Radio Regulations in a single copy which will remain in the archives of the International Telecommunication Union and of which a certified copy will be delivered to each Member and Associate Member of the Union.

Done at Geneva, 17 July, 1971.

Pour l'Algérie (République Algérienne Démocratique et Populaire):

M. IBNOU-ZEKRI  
M. HARBI

Pour le Royaume de l'Arabie Saoudite:

A. ZAIDAN  
OBAID AL RAHMAN SAFFDAR

Pour la République Argentine:

N. J. MAZZARO  
R. SAIDMAN

Pour le Commonwealth de l'Australie:



L. M. HARRIS  
E. SANDBACH

Pour l'Autriche:



H. PANGRATZ

Pour la Belgique:



P. C. M. BOUCHIER

Pour la République Socialiste Soviétique de Biélorussie:

*T. Ogop*

Z. L. PODORSKI

Pour le Brésil:

*Antonio Jayme Alves Salgado*  
*Wilson Victorino da Silva*  
*Carlos Pees Quevedo*  
*Maria Inez Angela Picot*  
*Roberto Ribeiro Ramos*  
*Mario B. J. Marj*  
*Fredonhaury*  
*Sydano Carleial*  
*B. Himelgryn*  
*J. Santelli Jr.*

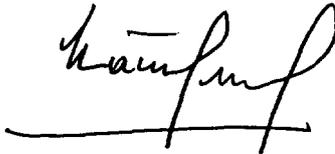
P. RIBENBOIM  
 J. V. PARETO NETO  
 A. J. A. SALGADO  
 N. V. DA SILVA  
 C. P. QUEVEDO  
 M. A. DE BIASE SILVA PICOT  
 R. R. RAMOS  
 M. B. MARSIAJ  
 L. C. BAHIANA  
 A. B. CARLEIAL  
 B. HIMELGRYN  
 J. SANTELLI JUNIOR

Pour la République Populaire de Bulgarie:



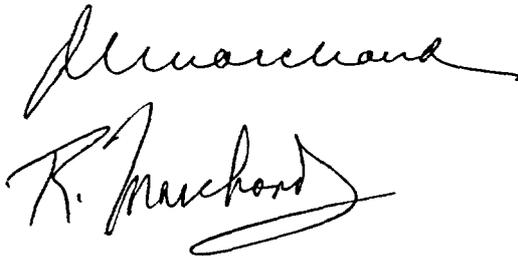
I. IGNATOV

Pour la République Fédérale du Cameroun:



P. N. KAMGA

Pour le Canada:



Pour la République Centrafricaine:



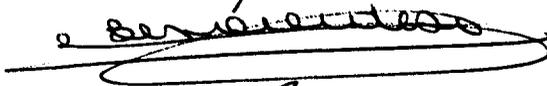
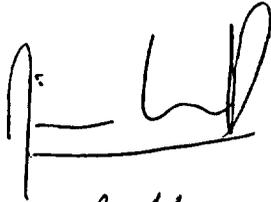
F. D. DIMA

Pour Ceylan:



M. B. RODRIGO

Pour le Chili:



J. S. SCHATZ  
S. H. MORALES  
R. ARAGAY  
R. B. E. BENAVIDES  
A. M. LUENGO  
J. B. SERRAT

Pour la Chine:

Cheng Pawan 鄭安南

T. V. Miao 繆廷鳳

Cheng Chen 陳勤

P. CHENG  
T. V. MIAO  
C. CHEN

Pour la République de Chypre:

R. Michaelides

R. MICHAELIDES

Pour l'Etat de la Cité du Vatican:

Herrn de Riedmatten O.P.  
Stefanizzi Antonio  
Giudici Pier Vincenzo

H. M. DE RIEDMATTEN  
A. STEFANIZZI  
P. V. GIUDICI

Pour la République de Colombie:





D. GARCES  
L. CHETHUAN  
H. ROMERO

Pour la République Démocratique du Congo:





A. BANANISA  
G. NKUBITO  
B. MVILAKANI

Pour la République Populaire du Congo:



F. BATOLA

Pour la République de Corée:

최 노 비	<i>C.S. Choy</i>
조 병 구	<i>B.K. Cho</i>
이 영 립	<i>Y.H. Lee</i>
김 재 업	<i>J.U. Kim</i>

J. S. CHOY  
 B. K. CHO  
 Y. H. LEE  
 J. U. KIM

Pour la République de Côte d'Ivoire:

*P. K. KOPIN*

*C. N. NOGBOU*

P. K. KOPOIN  
 C. N. NOGBOU

Pour Cuba:

*L. Solá Vila*

*J. A. Valladares Timoneda*

*J. Raurell Vidal*

L. SOLÁ VILA  
 J. A. VALLADARES TIMONEDA  
 J. RAURELL VIDAL

Pour le Danemark:

Gunnar Pedersen.  
 Børge Nielsen  
 J. Lønberg  
 P. V. Larsen

G. PEDERSEN  
 B. NIELSEN  
 I. LØNBERG  
 P. V. LARSEN

Pour l'Ensemble des Territoires représentés par l'Office français des postes  
 et télécommunications d'Outre-Mer:

*J. L. A. Constantin*

J. L. A. CONSTANTIN

Pour l'Espagne:

*Eugenio Pérez Hernández*

*F. Molina*  
*José M.º Artº*

*José M.º Saavedra*

*B. A. Durán Mingorance*

E. PÉREZ-HERNÁNDEZ  
 F. MOLINA NEGRO  
 J. M. ARTO MADRAZO  
 J. M. PAREDES QUEVEDO  
 B. A. DURÁN MINGORANCE

Pour les Etats-Unis d'Amérique:

Robert Tyson  
 W. Dean, Jr.  
 Gordon L. Huffcutt  
 Robert E. Lee

R. C. TYSON  
 W. DEAN, JR.  
 G. L. HUFFCUTT  
 R. E. LEE

Pour l'Ethiopie:

Bey Dest  
 1122-985  
 T. Sebhatu  
 1124-987 w n d t s

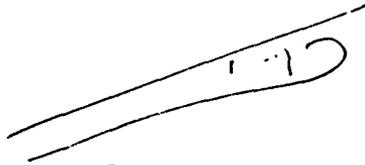
B. DESTA  
 T. SEBHATU

Pour la Finlande:

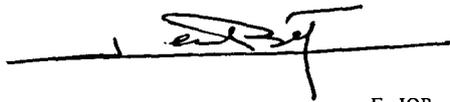
T. Kytöniemi  
 A. Sinkkonen

T. KYTÖNIEMI  
 A. SINKKONEN

Pour la France:



Marie Huët  
Chaspol



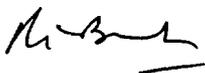
F. JOB  
M. HUET  
P. L. CHASPOUL  
J. B. BES

Pour la République Gabonaise:



S. EWORE  
T. SOUAH

Pour le Ghana:



R. K. BAFFOUR

Pour la Grèce:

Paravantis

Nicolaïdes

Debonos

L. PARAVANTIS  
E. NICOLAÏDES  
G. DEBONOS

Pour la République de Haute-Volta:

Ouedraogo

Guissou

J. M. OUEDRAOGO  
J. GUISSOU

Pour la République Populaire Hongroise:

Horn

D. HORN

Pour la République de l'Inde:



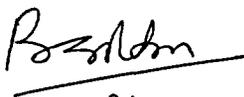
M. K. Basu.

र. ग. देवधर Raseodhar

M. V. Krishna Swamy

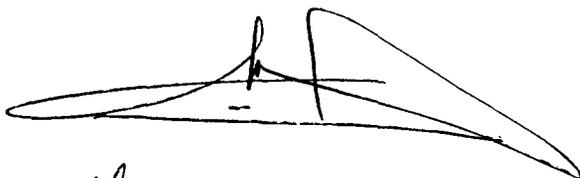


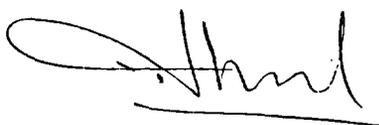
S. Thiruvengkatachari



N. C. SHRIVASTAVA  
M. K. BASU  
R. G. DEODHAR  
M. V. KRISHNASWAMY  
R. B. MUKHERJEE  
S. THIRUVENKATACHARI  
B. S. RAO

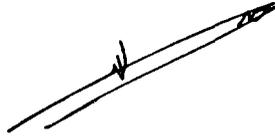
Pour la République d'Indonésie:





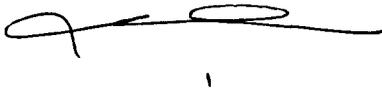
M. K. M. MANGOENDIPRODJO  
W. M. MANGOENDIPRODJO  
SOEGIHARTO

Pour l'Iran:

A handwritten signature consisting of two parallel diagonal lines with a small vertical tick mark between them.A handwritten signature consisting of a large loop followed by a smaller loop and a short horizontal stroke.A handwritten signature consisting of a small loop at the top, followed by a vertical line that curves to the right at the bottom.

A. MOTAMEDI  
H. ANSARI  
S. FATEMI

Pour la République d'Iraq:

A handwritten signature consisting of a long horizontal line with a large loop at the beginning and a small vertical tick mark below the end.

A. H. ALI

Pour l'Irlande:

A handwritten signature in cursive script that reads "J. Malone".

J. MALONE

Pour l'Islande:

S. Thorkelsson

S. Oskarsson

S. THORKESSON  
S. OSKARSSON

Pour l'Etat d'Israël:

M. Shakkéd

M. SHAKKÉD

Pour l'Italie:

A. Bigi

A. Petti

A. BIGI  
A. PETTI

Pour la Jamaïque:

G. A. Gauntlett  
T. O. Minott

G. A. GAUNTLETT  
T. O. MINOTT

Pour le Japon:

藤木 栄 Aekae Fujiki

大川 美雄 Y. Okawa

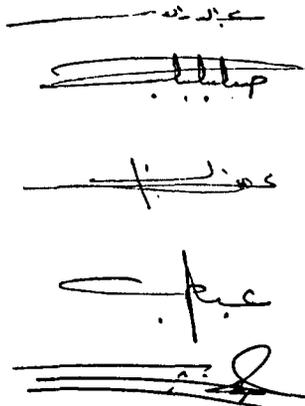
S. FUJIKI  
Y. OKAWA

Pour le Kenya:

R. M. Yusuf  
P. O. Okundi  
I. N. Odundo

R. M. YUSUF  
P. O. OKUNDI  
I. N. ODUNDO

Pour l'Etat de Koweït:



A. A. AL-SARÀWI  
A. A. ALSAADOON  
A. M. ALSABEJ  
A. A. ALAYOUB  
J. A. ALMAZEEDI

Pour la République du Libéria:



S. H. BUTLER

Pour la République Arabe Libyenne:



N. S. TULTI

Pour la Principauté de Liechtenstein:



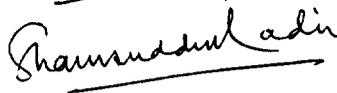
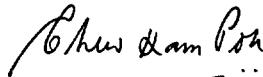
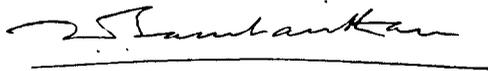
M. LEDEBUR

Pour le Luxembourg:



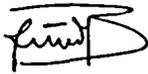
P. FABER

Pour la Malaisie:



Tun V. T. SAMBANTHAN  
K. P. CHEW  
S. bin ABDUL KADIR  
D. S. VARIYAN

Pour la République du Mali:


M. L. KANE  
M. M. KEITA

Pour le Royaume du Maroc:



M. MOUKITE

Pour la République Islamique de Mauritanie:



A. DUFFAU

Pour le Mexique:



J. HERNÁNDEZ

Pour Monaco:

A handwritten signature in black ink, appearing to be 'C. C. Solamito', written over a horizontal line.

C. C. SOLAMITO

Pour le Nicaragua:

A handwritten signature in black ink, appearing to be 'A. A. Mullhaupt', written in a cursive style.

A. A. MULLHAUPT

Pour la République du Niger:

A handwritten signature in black ink, appearing to be 'M. Abba', written in a stylized, bold cursive.

M. ABBA

Pour la République Fédérale de Nigeria:



A. A. BODEDE

Pour la Norvège:



H. NYMOEN  
A. BØE

Pour la Nouvelle-Zélande:



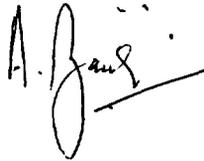
D. C. ROSE  
R. J. BUNDLE

Pour l'Ouganda:

A stylized handwritten signature in black ink, consisting of several overlapping loops and a long horizontal stroke at the bottom.

P. O. OKUNDI

Pour le Pakistan:

A handwritten signature in Urdu script, written in black ink.A handwritten signature that appears to be the name 'Samz' written in a cursive style.A handwritten signature that appears to be 'A. Aziz' written in a cursive style.

A. KHAN  
S. A. AZIZ  
A. ZAIDI

Pour le Paraguay:

A handwritten signature in black ink that reads 'Carlos María Gaona'.

C. M. GAONA VELAZCO

Pour le Royaume des Pays-Bas:

The image shows four handwritten signatures in cursive script, each underlined. From top to bottom, they correspond to the names listed in the adjacent block: F. R. Neubauber, P. E. Willems, K. J. Kerling, and F. S. Latour.

F. R. NEUBAUER  
P. E. WILLEMS  
K. J. KERLING  
F. S. LATOUR

Pour le Pérou:

The image shows three handwritten signatures in cursive script, each underlined. From top to bottom, they correspond to the names listed in the adjacent block: J. Estrada Gomez Sanchez, J. E. Barreda Delgado, and M. Colina-Marie.

J. ESTRADA GOMEZ SANCHEZ  
J. E. BARREDA DELGADO  
M. COLINA-MARIE

Pour la République des Philippines:

Fernando Llanes

C. S. CARREON  
L. A. GARCIA

Pour la République Populaire de Pologne:

K. KOZŁOWSKI

Pour le Portugal:

F. de Alcambar Pereira

João de Oliveira Leão

João de Oliveira Leão

Manuel José Lopes da Silva

Manuel José Lopes da Silva

F. DE ALCAMBAR PEREIRA  
D. A. PIRES FRANCO  
J. O. LEANDRO  
A. MARINI CASTANHEIRA  
M. J. LOPES DA SILVA

Pour les Provinces portugaises d'Outre-Mer:

F. de Alcambar Pereira

Ferraz de Carvalho

Juan de Oliveira Leandro

F. DE ALCAMBAR PEREIRA  
J. D. FERRAZ DE CARVALHO  
J. O. LEANDRO

Pour la République Arabe Syrienne:

N. Kisrawi

M. Hamoude

N. KISRAWI  
M. HAMMOUDE

Pour la République Arabe Unie:

Elgashi ElKashlan

Nabil Khodair

E. ELKASHLAN  
N. KHODAIR

Pour la République Fédérale d'Allemagne:

A handwritten signature in black ink, appearing to read 'J. Kupper'.

J. KUPPER

Pour la République Socialiste Soviétique de l'Ukraine:

A handwritten signature in black ink, appearing to read 'I. E. Timchenko'.

I. E. TIMCHENKO

Pour la République Socialiste de Roumanie:

A handwritten signature in black ink, appearing to read 'G. Airinei'.A handwritten signature in black ink, appearing to read 'L. Constantinescu'.

G. AIRINEI  
L. CONSTANTINESCU

Pour le Royaume-Uni de Grande-Bretagne et d'Irlande du Nord, les Iles Anglo-Normandes et l'Ile de Man:

*D. E. Baptiste*

*C. W. Sowton*

*S. G. Hicks*

D. E. BAPTISTE  
C. W. SOWTON  
S. G. HICKS

Pour la République Rwandaise:

*M. Bucyana*

M. BUCYANA

Pour la République du Sénégal:

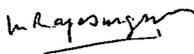
*A. M'bodji*

*L. Dia*

*I. N'doye*

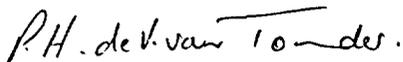
A. M'BODJI  
L. DIA I. N'DOYE

Pour la République de Singapour:



R. G. RAJASINGAM

Pour la République Sudafricaine:



A. BIRRELL  
P. H. de V. VAN TONDER

Pour la Suède:



B. BJUREL  
C.-G. ÅSDAL  
P. ÅKERLIND

Pour la Confédération Suisse:

*F. Locher*  
*L. R. Probst*  
*C. Steffen*  
*H. A. Kieffer*

F. LOCHER  
 H. R. PROBST  
 C. STEFFEN  
 H. A. KIEFFER

Pour la République Unie de Tanzanie:

*R. M. Yusuf*  
*P. O. Okundi*

R. M. YUSUF  
 P. O. OKUNDI

Pour la République Socialiste Tchécoslovaque:

*J. Maršiček*  
*M. Zahradníček*  
*J. Vrba*

J. MARŠIČEK  
 M. ZAHRADNÍČEK  
 J. VRBA

Pour les Territoires des Etats-Unis d'Amérique:

*William E. Denny*

W. E. DENNY

Pour les Territoires d'Outre-Mer dont les relations internationales sont assurées par le Gouvernement du Royaume-Uni de Grande-Bretagne et d'Irlande du Nord:

*T. F. H. Howarth*

T. F. H. HOWARTH

Pour la Thaïlande:

*P. Surasidhi*

*P. Kasemsri*

*C. Kanchanindu*

P. SURASIDHI  
P. KASEMSRI  
C. KANCHANINDU

Pour la République Togolaise:

*A. Aithnard*

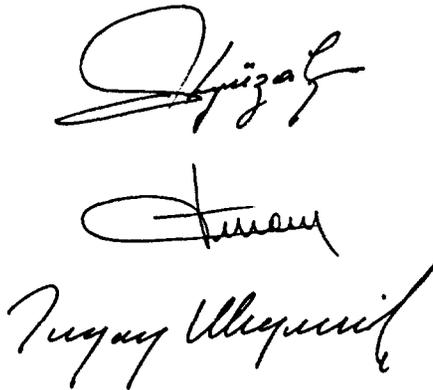
A. AITHNARD

Pour la Tunisie:



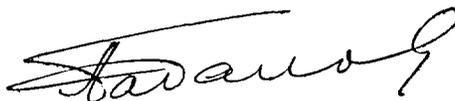
B. KHOUADJA

Pour la Turquie:



N. AKYÜZALP  
O. TURAN  
T. ULUÇEVİK

Pour l'Union des Républiques Socialistes Soviétiques:



A. L. BADALOV

Pour la République Orientale de l'Uruguay:



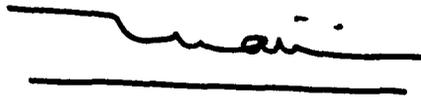
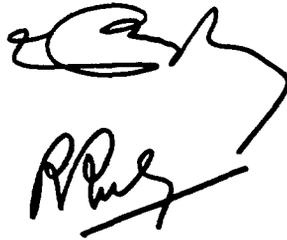
R. BOTTO

Pour la République de Venezuela:



C. J. MARTINEZ  
R. ZERPA

Pour la République du Viet-Nam:



VUONG QUANG NGHIA  
PHAM VAN TRINH  
NGUYEN CONG ANH-TUAN

Pour la République Socialiste Fédérative de Yougoslavie:



M. DAKIĆ

## ANNEX 1

## Revision of Article 1 of the Radio Regulations\*

Article 1 of the Radio Regulations shall be amended as follows:

## Section II. Radio Systems, Services and Stations

*After Regulation No. 21, add the following new Regulations:*

ADD 21A  
Spa2

*Space Station*

A station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere.

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\* *Note by the General Secretariat*

Certain definitions were rearranged and renumbered by the Conference; some were amended while others were maintained unchanged.

The definitions concerned are the following:

<i>New number</i>	<i>Definition</i>	<i>Old number</i>	<i>Remarks</i>
21A	Space Station	84AE	MOD
21B	Earth Station	84AD	MOD
21C	Space Radiocommunication	84AC	MOD
21D	Terrestrial Radiocommunication	84AA	MOD
21E	Terrestrial Station	84AB	MOD
84AFA	Satellite System	84AL	MOD
84ATD	Space Research Service	84AM	MOD
84ATE	Space Operation Service	84AC	MOD
84ATF	Inter-Satellite Service	84AC	MOD
84BAA	Spacecraft	84BH	MOD
84BAC	Active Satellite	84AJ	NOC
84BAD	Passive Satellite	84AK	NOC

ADD 21B *Earth Station*  
Spa2

A station located either on the Earth's surface or within the major portion of the Earth's atmosphere intended for communication:

- with one or more space stations; or
- with one or more stations of the same kind by means of one or more passive satellites or other objects in space.

ADD 21C *Space Radiocommunication*  
Spa2

Any radiocommunication involving the use of one or more space stations or the use of one or more passive satellites or other objects in space.

ADD 21D *Terrestrial Radiocommunication*<sup>1</sup>  
Spa2

Any radiocommunication other than space radiocommunication or radio astronomy.

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ADD 21D.1 <sup>1</sup> In these Regulations, unless otherwise stated, any radiocommunication  
Spa2 service relates to terrestrial radiocommunication.

ADD 21E *Terrestrial Station*<sup>1</sup>  
Spa2

A station effecting terrestrial radiocommunication.

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ADD 21E.1 <sup>1</sup> In these Regulations, unless otherwise stated, any station is a terrestrial  
Spa2 station.

*Replace Regulation No. 69 by the following new text:*

MOD 69 *Safety Service*  
Spa2

A radiocommunication service used permanently or temporarily for the safeguarding of human life and property on the Earth's surface, in the air or in space.

*Delete Regulations Nos. 84AA and 84AB.*

**Section IIA. Space Systems, Services and Stations**

*Delete Regulations Nos. 84AC, 84AD and 84AE.*

*Replace Regulation No. 84AF by the following new text:*

**MOD 84AF**                      *Space System*  
**Spa2**

Any group of co-operating earth and/or space stations employing space radiocommunication for specific purposes.

*After Regulation No. 84AF, add the following new Regulations:*

**ADD 84AFA**                      *Satellite System*  
**Spa2**

A space system using one or more artificial earth satellites.

**ADD 84AFB**                      *Satellite Network*  
**Spa2**

A satellite system or a part of a satellite system, consisting of only one satellite and the co-operating earth stations.

**ADD 84AFC**                      *Satellite Link*  
**Spa2**

A radio link between a transmitting earth station and a receiving earth station through one satellite.

A satellite link comprises one up-path and one down-path.

**ADD 84AFD**            *Multi-Satellite Link*  
**Spa2**

A radio link between a transmitting earth station and a receiving earth station through two or more satellites, without any intermediate earth station.

A multi-satellite link comprises one up-path, one or more satellite-to-satellite paths and one down-path.

*Replace Regulation No. 84AG by the following new text:*

**MOD 84AG**            *Fixed-Satellite Service*  
**Spa2**

A radiocommunication service:

- between earth stations at specified fixed points when one or more satellites are used; in some cases this service includes satellite to satellite links, which may also be effected in the inter-satellite service;
- for connection between one or more earth stations at specified fixed points and satellites used for a service other than the fixed-satellite service (for example, the mobile-satellite service, broadcasting-satellite service, etc.).

*After Regulation No. 84AG, add the following new Regulations:*

**ADD 84AGA**            *Mobile-Satellite Service*  
**Spa2**

A radiocommunication service:

- between mobile earth stations and one or more space stations; or between space stations used by this service;
- or between mobile earth stations by means of one or more space stations;
- and if the system so requires, for connection between these space stations and one or more earth stations at specified fixed points.

**ADD 84AGB**                    *Aeronautical Mobile-Satellite Service*  
 Spa2

A mobile-satellite service in which mobile earth stations are located on board aircraft. Survival craft stations and emergency position indicating radiobeacon stations may also participate in this service.

**ADD 84AGC**                    *Maritime Mobile-Satellite Service*  
 Spa2

A mobile-satellite service in which mobile earth stations are located on board ships. Survival craft stations and emergency position indicating radiobeacon stations may also participate in this service.

**ADD 84AGD**                    *Land Mobile-Satellite Service*  
 Spa2

A mobile-satellite service in which mobile earth stations are located on land.

*Delete Regulations Nos. 84AH to 84AO.*

*Replace Regulation No. 84AP by the following new text:*

**MOD 84AP**                    *Broadcasting-Satellite Service*  
 Spa2

A radiocommunication service in which signals transmitted or retransmitted by space stations are intended for direct reception<sup>1</sup> by the general public.

**ADD 84AP.1**                    <sup>1</sup>In the broadcasting-satellite service, the term "direct reception" shall  
 Spa2 encompass both individual reception and community reception.

*After Regulation No. 84AP, add the following new Regulations:*

**ADD 84APA**      *Individual reception (in the broadcasting-satellite service)*  
Spa2

The reception of emissions from a space station in the broadcasting-satellite service by simple domestic installations and in particular those possessing small antennae.

**ADD 84APB**      *Community reception (in the broadcasting-satellite service)*  
Spa2

The reception of emissions from a space station in the broadcasting-satellite service by receiving equipment, which in some cases may be complex and have antennae larger than those used for individual reception, and intended for use:

- by a group of the general public at one location; or
- through a distribution system covering a limited area.

**ADD 84APC**      *Radiodetermination-Satellite Service*  
Spa2

A radiocommunication service involving the use of radiodetermination and the use of one or more space stations.

*Replace Regulation No. 84AQ by the following new text:*

**MOD 84AQ**      *Radionavigation-Satellite Service*  
Spa2

A radiodetermination-satellite service used for the same purposes as the radionavigation service; in certain cases this service

includes transmission or retransmission of supplementary information necessary for the operation of radionavigation systems.

*After Regulation No. 84AQ, add the following new Regulations:*

**ADD 84AQA**      *Aeronautical Radionavigation-Satellite Service*  
**Spa2**  
A radionavigation-satellite service in which mobile earth stations are located on board aircraft.

**ADD 84AQB**      *Maritime Radionavigation-Satellite Service*  
**Spa2**  
A radionavigation-satellite service in which mobile earth stations are located on board ships.

*Delete Regulations Nos. 84AR and 84AS.*

*Before Regulation No. 84AT, add the following new Regulation:*

**ADD 84ASA**      *Earth Exploration-Satellite Service*  
**Spa2**  
A radiocommunication service between earth stations and one or more space stations in which:

- information relating to the characteristics of the Earth and its natural phenomena is obtained from instruments on earth satellites;
- similar information is collected from air-borne or earth-based platforms;
- such information may be distributed to earth stations within the system concerned;
- platform interrogation may be included.

*Replace Regulation No. 84AT by the following new text:*

**MOD 84AT**      *Meteorological-Satellite Service*  
**Spa2**  
 An earth exploration-satellite service for meteorological purposes.

*After Regulation No. 84AT, add the following new Regulations:*

**ADD 84ATA**      *Amateur-Satellite Service*  
**Spa2**  
 A radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur service.

**ADD 84ATB**      *Standard Frequency-Satellite Service*  
**Spa2**  
 A radiocommunication service using space stations on earth satellites for the same purposes as those of the standard frequency service.

**ADD 84ATC**      *Time Signal-Satellite Service*  
**Spa2**  
 A radiocommunication service using space stations on earth satellites for the same purposes as those of the time signal service.

**ADD 84ATD**      *Space Research Service*  
**Spa2**  
 A radiocommunication service in which spacecraft or other objects in space are used for scientific or technological research purposes.

**ADD 84ATE**      *Space Operation Service*  
**Spa2**  
 A radiocommunication service concerned exclusively with the operation of spacecraft, in particular tracking, telemetry and telecommand.

These functions will normally be provided within the service in which the space station is operating.

ADD 84ATF *Inter-Satellite Service*  
Spa2

A radiocommunication service providing links between artificial earth satellites.

*Delete Regulations Nos. 84AU and 84AV.*

**Section IIB. Space, Orbits and Types of Objects in Space**

*Replace Regulation No. 84BA by the following new text:*

MOD 84BA *Deep Space*  
Spa2

Space at distances from the Earth approximately equal to, or greater than, the distance between the Earth and the Moon.

*After Regulation No. 84BA, add the following new Regulations:*

ADD 84BAA *Spacecraft*  
Spa2

A man-made vehicle which is intended to go beyond the major portion of the Earth's atmosphere.

ADD 84BAB *Satellite*  
Spa2

A body<sup>1</sup> which revolves around another body of preponderant mass and which has a motion primarily and permanently determined by the force of attraction of that other body.

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ADD 84BAB.1 <sup>1</sup> A body so defined which revolves around the Sun is called a planet or planetoid.

ADD 84BAC *Active Satellite*  
Spa2

An earth satellite carrying a station intended to transmit or retransmit radiocommunication signals.

**ADD 84BAD**            *Passive Satellite*  
**Spa2**

An earth satellite intended to transmit radiocommunication signals by reflection.

*Replace Regulations Nos. 84BB to 84BE by the following new texts:*

**MOD 84BB**            *Orbit*  
**Spa2**

1.        The path, relative to a specified frame of reference, described by the centre of mass of a satellite or other object in space, subjected solely to natural forces, mainly the force of gravity.

2.        By extension, the path described by the centre of mass of an object in space subjected to natural forces and occasional low-energy corrective forces exerted by a propulsive device in order to achieve and maintain a desired path.

**MOD 84BC**            *Inclination of an Orbit (of an earth satellite)*  
**Spa2**

The angle determined by the plane containing an orbit and the plane of the Earth's equator.

**MOD 84BD**            *Period (of a satellite)*  
**Spa2**

The time elapsing between two consecutive passages of a satellite or planet through a characteristic point on its orbit.

**MOD 84BE**            *Altitude of the Apogee (Perigee)*  
**Spa2**

The altitude of the apogee (perigee) above a specified reference surface serving to represent the surface of the Earth.

*Delete Regulation No. 84BF.*

*Before Regulation No. 84BG, add the following new Regulation:*

**ADD 84BFA**            *Geosynchronous Satellite*  
Spa2

An earth satellite whose period of revolution is equal to the period of rotation of the Earth about its axis.

*Replace Regulation No. 84BG by the following new text:*

**MOD 84BG**            *Geostationary Satellite*  
Spa2

A satellite, the circular orbit of which lies in the plane of the Earth's equator and which turns about the polar axis of the Earth in the same direction and with the same period as those of the Earth's rotation.

The orbit on which a satellite should be placed to be a geostationary satellite is called the "geostationary satellite orbit".

*Delete Regulation No. 84BH.*

### Section III. Technical Characteristics

*After Regulation No. 98, add the following new Regulation:*

**ADD 98A**            *Equivalent Isotropically Radiated Power (e.i.r.p.)*  
Spa2

The product of the power of an emission as supplied to an antenna and the antenna gain in a given direction relative to an isotropic antenna.

*After Regulation No. 103, add the following new Regulations:*

**ADD 103A**           *Equivalent Satellite Link Noise Temperature*  
Spa2

The noise temperature at the input of the earth station receiver corresponding to the radio-frequency noise power which

produces the total observed noise at the output of the satellite link excluding noise due to interference coming from satellite links using other satellites and from terrestrial systems.

**ADD 103B**                      *Co-ordination Distance*  
**Spa2**

Distance from an earth station in a given azimuth within which a terrestrial station sharing the same frequency band may cause or be subject to more than a permissible level of interference.

**ADD 103C**                      *Co-ordination Contour*  
**Spa2**

The line joining the points which are on all azimuths around an earth station at a distance from this station equal to the co-ordination distance corresponding to each azimuth.

**ADD 103D**                      *Co-ordination Area*  
**Spa2**

Area around an earth station enclosed by the co-ordination contour.

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## ANNEX 2

### Revision of Article 2 of the Radio Regulations

Article 2 of the Radio Regulations shall be amended as follows:

#### Section III. Nomenclature of the Frequency and Wavelength Bands used in Radiocommunication

*Replace Regulation No. 112 by the following new text:*

- MOD 112 § 7. The radio spectrum shall be subdivided into nine frequency  
Spa2 bands, which shall be designated by progressive whole numbers in  
accordance with the following table. Frequencies shall be expressed:
- in kilohertz (kHz) up to and including 3000 kHz
  - in megahertz (MHz) thereafter up to and including 3000 MHz
  - in gigahertz (GHz) thereafter up to and including 3000 GHz.

However, where adherence to these provisions would introduce serious difficulties, for example in connection with the notification and registration of frequencies, the lists of frequencies and related matters, reasonable departures may be made.

Band Number	Frequency Range (lower limit exclusive, upper limit inclusive)	Corresponding Metric Subdivision
4	3 to 30 kHz	Myriametric waves
5	30 to 300 kHz	Kilometric waves
6	300 to 3000 kHz	Hectometric waves
7	3 to 30 MHz	Decametric waves
8	30 to 300 MHz	Metric waves
9	300 to 3000 MHz	Decimetric waves
10	3 to 30 GHz	Centimetric waves
11	30 to 300 GHz	Millimetric waves
12	300 to 3000 GHz or 3 THz	Decimillimetric waves

*Note 1:* "Band Number N" extends from  $0.3 \times 10^N$  to  $3 \times 10^N$  Hz.

*Note 2:* Symbols and prefixes:

Hz = hertz

k = kilo ( $10^3$ ), M = mega ( $10^6$ ), G = giga ( $10^9$ ), T = tera ( $10^{12}$ ).

*Note 3:* Abbreviations for adjectival band designations:

Band 4 = VLF

Band 8 = VHF

Band 5 = LF

Band 9 = UHF

Band 6 = MF

Band 10 = SHF

Band 7 = HF

Band 11 = EHF

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## ANNEX 3

### Revision of Article 5 of the Radio Regulations

Article 5 of the Radio Regulations shall be amended as follows:

*Replace the title of Article 5 by the following new title:*

MOD Spa2

#### **Frequency Allocations<sup>1</sup> 10 kHz to 275 GHz**

##### **Section I. Regions and Areas**

*Replace Regulation No. 125 by the following new text:*

(MOD) 125 § 1. For the allocation of frequencies the world has been  
Spa2 subdivided into three Regions<sup>2</sup> (see Appendix 24).

*Insert the following new foot-note:*

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ADD Spa2 <sup>1</sup> See Resolution No. 6.

*Replace Regulation 125.1 by the following new text:*

(MOD) 125.1 <sup>2</sup> It should be noted that where the words "regions" or "regional" are without  
Spa2 a capital "R" in these Regulations, they do not relate to the three Regions here defined for purposes of frequency allocation.

**MOD Spa2 Section IV. Table of Frequency Allocations – 10 kHz to 275 GHz**

*In the Table of Frequency Allocations, replace the provisions for the band 1 800 – 2 000 kHz in Regions 2 and 3 by the following:*

**kHz**

Allocation to Services		
Region 1	Region 2	Region 3
NOC	<b>1 800 – 2 000</b> AMATEUR FIXED MOBILE except aeronautical mobile RADIONAVIGATION 198	

NOC 198

SUP 199 199-1

*In the Table of Frequency Allocations, replace the provisions for the band 2 170 – 2 194 kHz by the following:*

**kHz**

Region 1	Region 2	Region 3
2 170 – 2 194	MOBILE (distress and calling) 201 201A	

NOC 201

**ADD 201A** The frequencies 2 182 kHz, 3 023.5 kHz, 5 680 kHz, 8 364 kHz, 121.5 MHz, 156.8 MHz and 243 MHz may also be used, in accordance with the procedures in force for terrestrial radiocommunication services, for search and rescue operations concerning manned space vehicles.

The same applies to the frequencies 10 003 kHz, 14 993 kHz and 19 993 kHz, but in each of these cases emissions must be confined in a band of  $\pm 3$  kHz about the frequency.

*In the Table of Frequency Allocations, replace the provisions for the band 2 498 – 2 502 kHz in Region 1 and for the band 2 495 – 2 505 kHz in Regions 2 and 3 by the following:*

**kHz**

Allocation to Services		
Region 1	Region 2	Region 3
2 300 – 2 498 NOC	2 300 – 2 495 NOC	
2 498 – 2 502 STANDARD FREQUENCY 203 203A	2 495 – 2 505 STANDARD FREQUENCY 203 203A	
2 502 – 2 625 NOC	2 505 – 2 625 NOC	

NOC 203

ADD 203A The bands 2 501 – 2 502 kHz, 5 003 – 5 005 kHz, 10 003 – 10 005 kHz,  
Spa2 15 005 – 15 010 kHz, 19 990 – 19 995 kHz, 20 005 – 20 010 kHz and 25 005 –  
25 010 kHz are also allocated, on a secondary basis, to the space research service.

SUP 204

*In the Table of Frequency Allocations, replace the provisions for the band 2 850 – 3 025 kHz by the following:*

**kHz**

Allocation to Services		
Region 1	Region 2	Region 3
2 850 – 3 025	AERONAUTICAL MOBILE (R)	
	201A	

*In the Table of Frequency Allocations, replace the provisions for the band 4 995 – 5 005 kHz by the following:*

**kHz**

Region 1	Region 2	Region 3
4 995 – 5 005	STANDARD FREQUENCY	
	203A 210	

*In the Table of Frequency Allocations, replace the provisions for the band 5 480 – 5 730 kHz by the following:*

### **kHz**

Allocation to Services		
Region 1	Region 2	Region 3
5 480 – 5 680	AERONAUTICAL MOBILE (R) 201A	
5 680 – 5 730	AERONAUTICAL MOBILE (OR) 201A	

*In the Table of Frequency Allocations, replace the provisions for the band 7 000 – 7 100 kHz by the following:*

### **kHz**

Region 1	Region 2	Region 3
7 000 – 7 100	AMATEUR AMATEUR-SATELLITE	

*In the Table of Frequency Allocations, replace the provisions for the band 8 195 – 8 815 kHz by the following:*

### **kHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>8 195 – 8 815</b>	MARITIME MOBILE	
	201A 213	

NOC 213

*In the Table of Frequency Allocations, replace the provisions for the band 9 995 – 10 100 kHz by the following:*

### **kHz**

Region 1	Region 2	Region 3
<b>9 995 – 10 005</b>	STANDARD FREQUENCY	
	201A 203A 214	
<b>10 005 – 10 100</b>	AERONAUTICAL MOBILE (R)	
	201A	

NOC 214

SUP 215 215A

*In the Table of Frequency Allocations, replace the provisions for the band 14 000 – 14 350 kHz by the following:*

**kHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>14 000 – 14 250</b>	AMATEUR AMATEUR-SATELLITE	
<b>14 250 – 14 350</b>	AMATEUR  218	

NOC 218

*In the Table of Frequency Allocations, replace the provisions for the band 14 990 – 15 010 kHz by the following:*

**kHz**

Region 1	Region 2	Region 3
<b>14 990 – 15 010</b>	STANDARD FREQUENCY  201A 203A 219	

NOC 219

*In the Table of Frequency Allocations, replace the provisions for the band 15 762 – 15 768 kHz by the following:*

**kHz**

Allocation to Services		
Region 1	Region 2	Region 3
15 762 – 15 768		
FIXED		

*In the Table of Frequency Allocations, replace the provisions for the band 18 030 – 20 010 kHz by the following:*

**kHz**

Region 1	Region 2	Region 3
18 030 – 18 052		
FIXED		
18 052 – 18 068		
FIXED		
<i>Space Research</i>		
18 068 – 19 990		
FIXED		
19 990 – 20 010		
STANDARD FREQUENCY		
201A 203A 220		

NOC 220

SUP 221 221A

*In the Table of Frequency Allocations, replace the provisions for the band 21 000 – 21 450 kHz by the following:*

### **kHz**

Allocation to Services		
Region 1	Region 2	Region 3
21 000 – 21 450		
AMATEUR		
AMATEUR-SATELLITE		

*In the Table of Frequency Allocations, replace the provisions for the band 21 850 – 22 000 kHz by the following:*

### **kHz**

Region 1	Region 2	Region 3
21 850 – 21 870		
RADIO ASTRONOMY		
221B		
21 870 – 22 000		
AERONAUTICAL FIXED		
AERONAUTICAL MOBILE (R)		

**ADD 221B** In Bulgaria, Hungary, Poland, Roumania, Czechoslovakia and the U.S.S.R.,  
**Spa2** the band 21 850 – 21 870 kHz is also allocated to the aeronautical fixed and the aeronautical mobile (R) services. The administrations concerned will take all practicable steps to protect radio astronomy observations in this band from harmful interference.

*In the Table of Frequency Allocations, replace the provisions for the band 23 350 – 25 010 kHz by the following:*

### **kHz**

Allocation to Services		
Region 1	Region 2	Region 3
23 350 – 24 990	FIXED LAND MOBILE 222 222A	
24 990 – 25 010	STANDARD FREQUENCY 203A 223	

NOC 222

ADD 222A In Argentina and Uruguay, the band 24 528 – 24 538 kHz may be used by  
Spa2 the space research service, subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.

NOC 223

*In the Table of Frequency Allocations, replace the provisions for the band 28 – 47 MHz in Region 1, for the band 28 – 50 MHz in Region 2 and for the band 28 – 44 MHz in Region 3 by the following:*

## MHz

Allocation to Services		
Region 1	Region 2	Region 3
28 – 29.7	AMATEUR AMATEUR-SATELLITE	
29.7 – 30.005	FIXED 228 229 231 232 MOBILE	
30.005 – 30.01	SPACE OPERATION (Satellite identification) FIXED 228 229 231 MOBILE SPACE RESEARCH	
30.01 – 37.75	FIXED 228 229 230 231 MOBILE  233A	

NOC 228 229 230 231 232

SUP 233

ADD 233A In Argentina and Uruguay, the bands 36.65 – 36.85 MHz, 41.15 – 41.35 MHz and 45.65 – 45.85 MHz, and in Argentina, Brazil and Uruguay, the band 170.55 – 170.95 MHz, are allocated to the radio astronomy service and no assignments shall be made to the fixed and mobile services in these bands.

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
37.75 – 38.25		
FIXED 228 229 231		
MOBILE		
<i>Radio Astronomy</i>		
233B		
38.25 – 41		
FIXED 228 229 230 231		
MOBILE		
235 236 236A		
41 – 47	41 – 50	41 – 44
BROADCASTING	FIXED 228 231 237	FIXED 228 237
<i>Fixed</i> 228 237	MOBILE	MOBILE
<i>Mobile</i>		236A
236A 238 239		44 – 50
240 241	233A 236A	NOC

- ADD 233B** In making assignments to stations of other services to which the bands  
**Spa2** 37.75 – 38.25 MHz, 150.05 – 153 MHz, 406.1 – 410 MHz, 2 690 – 2 700 MHz  
and 4 700 – 5 000 MHz are allocated, administrations are urged to take all  
practicable steps to protect radio astronomy observations from harmful inter-  
ference.
- MOD 235** The band 39.986 – 40.02 MHz is also allocated, on a secondary basis, to the  
**Spa2** space research service.
- NOC 236**
- ADD 236A** The band 40.98 – 41.015 MHz is also allocated, on a secondary basis, to the  
**Spa2** space research service, in particular for measurements of the differential Faraday  
effect.
- NOC 237 238 239 240 241**

*In the Table of Frequency Allocations, replace the provisions for the band 80 – 100 MHz in Region 3 by the following:*

## MHz

Allocation to Services		
Region 1	Region 2	Region 3
NOC	NOC	<b>80 – 87</b> FIXED MOBILE  254 255 256 257 261 266
NOC	NOC	<b>87 – 100</b> FIXED MOBILE BROADCASTING  254 267 268

NOC 254 255 256 257 261 266

MOD 267 In New Zealand, the bands 87 – 88 MHz and 94 – 108 MHz are allocated  
 Spa2 to the fixed and mobile services.

NOC 268

*In the Table of Frequency Allocations, replace the provisions for the band 117-975 – 174 MHz in Region 1, for the bands 117-975 – 146 MHz and 148 – 174 MHz in Region 2 and for the bands 117-975 – 146 MHz and 148 – 170 MHz in Region 3 by the following:*

## MHz

Allocation to Services		
Region 1	Region 2	Region 3
<b>117-975 – 132</b>	AERONAUTICAL MOBILE (R)  201A 273 273A	
<b>132 – 136</b>	AERONAUTICAL MOBILE (R)  273A 274 274A 274B 275	
<b>136 – 137</b>	SPACE RESEARCH (Space-to-Earth)  281A 281AA	
<b>137 – 138</b>	SPACE OPERATION (Telemetry and tracking) METEOROLOGICAL-SATELLITE SPACE RESEARCH (Space-to-Earth)  275A 279A 281C 281E	

**NOC** 273 273A

**MOD** 274 In Bulgaria, Japan, Poland, Portugal, Portuguese Oversea Provinces in  
**Spa2** Region 1 south of the equator, Roumania, Sweden, Czechoslovakia and the U.S.S.R., existing stations in the aeronautical mobile (OR) service in the band 132 – 136 MHz, may continue to operate for an unspecified period on a primary basis.

**ADD** 274A In Regions 2 and 3, stations of the fixed and mobile services may continue  
**Spa2** to use the band 132 – 136 MHz until 1 January 1976. Until that date, frequency assignments to stations of the aeronautical mobile (R) service shall be co-ordinated between the administrations concerned and shall be protected from harmful interference.

- ADD 274B** In Cuba and Mexico, the band 132 – 136 MHz is also allocated to the fixed  
**Spa2** and mobile services.
- MOD 275** In Burundi, Ethiopia, Gambia, Malawi, Nigeria, Portuguese Oversea Pro-  
**Spa2** vinces in Region 1 south of the equator, Rhodesia, Rwanda, Sierra Leone and  
in the Republic of South Africa, the band 138 – 144 MHz is allocated to the  
fixed and mobile services. In these countries, existing stations in the fixed and  
mobile services may continue to operate in the band 132 – 136 MHz until  
1 January 1976.
- NOC 275A**
- SUP 276 277**
- MOD 278** In New Zealand, the band 138 – 144 MHz is allocated to the aeronautical  
**Spa2** mobile (OR) service.
- SUP 279**
- NOC 279A 281A**
- ADD 281AA** In Bulgaria, China, Cyprus, Korea, Spain, Ethiopia, Ghana, Hungary,  
**Spa2** India, Indonesia, Iran, Iraq, Kenya, Kuwait, Malaysia, Uganda, Pakistan, Phi-  
lippines, Poland, Portugal, the United Arab Republic, Roumania, Senegal,  
Syria, Tanzania, Czechoslovakia and the U.S.S.R., the band 136 – 137 MHz is  
also allocated to the fixed and mobile services.
- SUP 281B**
- MOD 281C** In Bulgaria, Hungary, Kuwait, Lebanon, Poland, the United Arab Republic,  
**Spa2** Roumania, Czechoslovakia, the U.S.S.R. and in Yugoslavia, the band 137 – 138  
MHz is also allocated to the aeronautical mobile (OR) service.
- SUP 281D**
- MOD 281E** In Malaysia, Pakistan and the Philippines, the band 137 – 138 MHz is also  
**Spa2** allocated to the fixed and mobile services.
- SUP 281F**

**MHz**

Allocation to Services									
Region 1				Region 2			Region 3		
<b>138 – 143·6</b>				<b>138 – 143·6</b>			<b>138 – 143·6</b>		
AERONAUTICAL MOBILE (OR)				FIXED MOBILE Radiolocation <i>Space Research</i> (Space-to-Earth)			FIXED MOBILE <i>Space Research</i> (Space-to-Earth)		
275	281G	282A	283	283A			278	279A	284

**ADD 281G** In the F.R. of Germany, the band 138 – 140 MHz is also allocated, on a  
**Spa2** secondary basis, to the space research service (space-to-Earth).

**SUP 282**

**ADD 282A** In Belgium, France, Israel, Italy, Liechtenstein, Netherlands, the United  
**Spa2** Kingdom and Switzerland, the bands 138 – 143·6 MHz and 143·65 – 144 MHz  
are also allocated, on a secondary basis, to the space research service (space-to-  
Earth).

**MOD 283** In Austria, Denmark, Greece, Norway, Netherlands, Portugal, F.R. of  
**Spa2** Germany, United Kingdom, Sweden, Switzerland and Turkey, the band 138 –  
144 MHz is also allocated to the fixed and mobile, except aeronautical mobile  
(R), services.

**ADD 283A** In Argentina, the frequency 138·54 MHz  $\pm$  7·5 kHz and the band 143·6–  
**Spa2** 143·65 MHz may be used by the space research service (telecommand), subject  
to agreement between the administrations concerned and those having services,  
operating in accordance with the Table, which may be affected.

**NOC 284**

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>143-6 – 143-65</b> AERONAUTICAL MOBILE (OR) SPACE RESEARCH (Space-to-Earth)  275 283	<b>143-6 – 143-65</b> FIXED MOBILE SPACE RESEARCH (Space-to-Earth) Radiolocation  283A	<b>143-6 – 143-65</b> FIXED MOBILE SPACE RESEARCH (Space-to-Earth)  278 279A 284
<b>143-65 – 144</b> AERONAUTICAL MOBILE (OR)  275 282A 283	<b>143-65 – 144</b> FIXED MOBILE Radiolocation <i>Space Research</i> (Space-to-Earth)	<b>143-65 – 144</b> FIXED MOBILE <i>Space Research</i> (Space-to-Earth)  278 279A 284
<b>144 – 146</b> AMATEUR AMATEUR-SATELLITE		
<b>146 – 149-9</b> FIXED MOBILE except aero- nautical mobile (R)  285 285A	<b>146 – 148</b> NOC	
	<b>148 – 149-9</b> FIXED MOBILE  285A 290	
<b>149-9 – 150-05</b> RADIONAVIGATION-SATELLITE  285B 285C		

**MHz**

Allocation to Services			
Region 1	Region 2	Region 3	
<b>150-05 – 151</b> FIXED MOBILE except aero- nautical mobile (R) RADIO ASTRONOMY 233B 285 286A	<b>150-05 – 174</b> FIXED MOBILE	<b>150-05 – 170</b> FIXED MOBILE	
<b>151 – 153</b> FIXED MOBILE except aero- nautical mobile (R) RADIO ASTRONOMY Meteorological Aids 233B 285 286A			
<b>153 – 154</b> FIXED MOBILE except aero- nautical mobile (R) Meteorological Aids 285			
<b>154 – 156</b> FIXED MOBILE except aero- nautical mobile (R) 285			201A 287 287A 290
<b>156 – 174</b> FIXED MOBILE except aero- nautical mobile 201A 285 287 287A 288		201A 233A 287 287A	<b>170 – 174</b>  NOC

SUP	284A	
NOC	285	
MOD	285A Spa2	The band 148 – 149.9 MHz may be authorized for space telecommand, subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected. The bandwidth of an individual transmission shall not exceed $\pm 15$ kHz.
MOD	285B Spa2	In Austria, Bulgaria, Cuba, Hungary, Iran, Kuwait, Pakistan, Poland, the United Arab Republic, Roumania and Yugoslavia, the band 149.9 – 150.05 MHz is also allocated to fixed and mobile services (see Recommendation No. Spa 8).
ADD	285C Spa2	Emissions of the radionavigation-satellite service in the bands 149.9 – 150.05 MHz and 399.9 – 400.05 MHz may also be used by receiving earth stations of the space research service.
SUP	286	(see ADD 233B)
NOC	286A	287
ADD	287A Spa2	In the frequency bands designated for the maritime mobile service in accordance with Appendix 18 to the Radio Regulations, the use of satellite systems for safety and distress may be authorized on certain channels on an exclusive basis in the band 157.3125 – 157.4125 MHz for transmissions from ships to satellites and in the band 161.9125 – 162.0125 MHz for transmissions from satellites to ships. The satellite systems shall not be brought into use before 1 January 1976 (see Resolution No. Spa2 – 5).
NOC	288	289 290

*In the Table of Frequency Allocations, replace the provisions for the bands 235 – 470 MHz and 582 – 790 MHz in Region 1; for the band 235 – 942 MHz in Region 2 and for the bands 235 – 470 MHz and 585 – 890 MHz in Region 3 by the following:*

## MHz

Allocation to Services		
Region 1	Region 2	Region 3
235 – 267	FIXED MOBILE  201A 305 305A 308A 309	
267 – 272	FIXED MOBILE <i>Space operation (Telemetry)</i> 309A 309B  308A	
272 – 273	SPACE OPERATION (Telemetry) 309A FIXED MOBILE  308A	
273 – 328.6	FIXED MOBILE  308A 310 310A	
328.6 – 335.4	AERONAUTICAL RADIONAVIGATION  311	

- NOC 305**
- ADD 305A Spa2** In New Zealand, the band 235 – 239.5 MHz is also allocated to the aeronautical radionavigation service.
- ADD 308A Spa2** The bands 240 – 328.6 MHz and 335.4 – 399.9 MHz may also be used by the mobile-satellite service. The use and development of this service shall be subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- NOC 309 309A 309B**
- MOD 310 Spa2** Radio astronomy observations in the band 322 – 328.6 MHz are carried out in a number of countries under national arrangements. Administrations should bear in mind the needs of the radio astronomy service in using this band.
- ADD 310A Spa2** In India, the band 322 – 328.6 MHz is also allocated to the radio astronomy service.
- NOC 311**

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
335.4 – 399.9	FIXED MOBILE 308A	
399.9 – 400.05	RADIONAVIGATION-SATELLITE 285C 311A	
400.05 – 400.15	STANDARD FREQUENCY-SATELLITE 312B 313 314	
400.15 – 401	METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (Maintenance telemetering) SPACE RESEARCH (Telemetering and tracking) 313 314	

**MOD 311A** In Bulgaria, Cuba, Greece, Hungary, Indonesia, Iran, Kuwait, Lebanon, the  
**Spa2** United Arab Republic, Syria and Yugoslavia, the band 399.9 – 400.05 MHz is  
also allocated to the fixed and mobile services (see Recommendation No. Spa 8).

**SUP 312A**

**ADD 312B** In this band the standard frequency is 400.1 MHz. Emissions shall be  
**Spa2** confined in a band of  $\pm 25$  kHz about this frequency.

**NOC 313 314**

**MHz**

Allocation to Services					
Region 1	Region 2			Region 3	
401 - 402	METEOROLOGICAL AIDS SPACE OPERATION (Telemetering) 315A <i>Fixed</i> <i>Meteorological-Satellite</i> (Earth-to-space) <i>Mobile</i> except aeronautical mobile  314 315 315B 315C 316				
402 - 403	METEOROLOGICAL AIDS <i>Fixed</i> <i>Meteorological-Satellite</i> (Earth-to-space) <i>Mobile</i> except aeronautical mobile  314 315 315C 316				
403 - 406	METEOROLOGICAL AIDS <i>Fixed</i> <i>Mobile</i> except aeronautical mobile  314 315 316				

NOC 315 315A 315B

ADD 315C In the band 401 - 403 MHz, earth exploration-satellite applications, other than the meteorological-satellite service, may also be used for Earth-to-space transmissions on condition that no harmful interference is caused to stations operating in accordance with the Table.

NOC 316

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
406 - 406.1	MOBILE-SATELLITE (Earth-to-space)	
	314 317A 317B	
406.1 - 410	FIXED	
	MOBILE except aeronautical mobile	
	RADIO ASTRONOMY	
	233B 314	
410 - 420	FIXED	
	MOBILE except aeronautical mobile	
	314	

**SUP 317** (see ADD 233B)

**ADD 317A** The band 406 - 406.1 MHz is reserved solely for the use and development  
**Spa2** of low-power (not to exceed 5 W) emergency position-indicating radiobeacon  
 (EPIRB) systems using space techniques.

**ADD 317B** In Austria, Bulgaria, Chile, Cuba, Ethiopia, Hungary, India, Iran, Kenya,  
**Spa2** Kuwait, Liechtenstein, Malaysia, Uganda, Poland, the United Arab Republic,  
 Rwanda, Sweden, Switzerland, Syria, Tanzania, Czechoslovakia and in the  
 U.S.S.R., the band 406 - 406.1 MHz is also allocated to the fixed service and the  
 mobile, except aeronautical mobile, service.



- MOD 318** Radio altimeters may also be used until 31 December 1974 in the band  
**Spa2** 420 - 460 MHz. However, after this date, they may be authorized to continue to operate on a secondary basis except in the U.S.S.R. where they will continue to operate on a primary basis.
- NOC 318A 319**
- MOD 319A** The band 449.75 - 450.25 MHz may be used for space telecommand and  
**Spa2** space research (Earth-to-space), subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- ADD 319B** In France and the French Department of Guyana (Region 2) the frequency  
**Spa2** 434 MHz  $\pm$  0.25 MHz may be used for space operation (Earth-to-space) subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- NOC 320**
- ADD 320A** In the band 435 - 438 MHz, the amateur-satellite service may be authorized,  
**Spa2** on condition that no harmful interference shall be caused to other services operating in accordance with the Table. Administrations authorizing such use shall ensure that any harmful interference caused by emissions from an amateur satellite is immediately eliminated in accordance with the provisions of No. 1567A.
- NOC 321**
- MOD 322** In Denmark, Norway and Sweden, the bands 430 - 432 MHz and 438 -  
**Spa2** 440 MHz are also allocated to the fixed and mobile services.
- NOC 323 324**
- (MOD) 324A** It is intended that meteorological-satellite space stations operating in the band  
**Spa2** 1 670 - 1 690 MHz shall transmit to selected earth stations. The location of such earth stations is subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- ADD 324B** Earth exploration-satellite service applications, other than the meteorological-satellite service, may also be used in the bands 460 - 470 MHz and 1 690 -  
**Spa2** 1 700 MHz for space-to-Earth transmissions on condition that no harmful interference is caused to stations operating in accordance with the Table.

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
470 - 582 NOC	470 - 890 BROADCASTING       329A 332 332A	470 - 585 NOC
582 - 606 BROADCASTING RADIONAVIGATION 325 327 328 329		585 - 610 RADIONAVIGATION  330B 336 337
606 - 790 BROADCASTING 329 330 330A 331 332 332A		610 - 890 FIXED MOBILE BROADCASTING  330B 332 332A 338 339
790 - 890 NOC		
890 - 942 NOC	890 - 942 FIXED RADIOLOCATION  339A 340	890 - 942 NOC

NOC 325

SUP 326

- NOC 327 328 329
- ADD 329A In Argentina and Uruguay, the band 602 – 608 MHz is allocated to the radio  
Spa2 astronomy service.
- NOC 330 330A
- ADD 330B In India, the band 608 – 614 MHz is also allocated to the radio astronomy  
Spa2 service.
- NOC 331 332
- ADD 332A Within the frequency band 620 – 790 MHz, assignments may be made to  
Spa2 television stations using frequency modulation in the broadcasting-satellite service  
subject to agreement between the administrations concerned and those having  
services, operating in accordance with the Table, which may be affected (see  
Resolutions Nos. Spa2 – 2 and Spa2 – 3). Such stations shall not produce a  
power flux density in excess of the value  $-129$  dBW/m<sup>2</sup> for angles of arrival  
less than 20° (see Recommendation No. Spa2 – 10) within the territories of  
other countries without the consent of the administrations of those countries.
- NOC 336 337 338 339 339A
- MOD 340 In Region 2, the frequency 915 MHz is designated for industrial, scientific  
Spa2 and medical purposes. Emissions must be confined within the limits of  $\pm 13$  MHz  
of that frequency. Radiocommunication services operating within these limits  
must accept any harmful interference that may be experienced from the opera-  
tion of industrial, scientific and medical equipment.

*In the Table of Frequency Allocations, replace the provisions for the band 1 350 – 1 400 MHz by the following:*

### MHz

Allocation to Services		
Region 1	Region 2	Region 3
1 350 – 1 400	1 350 – 1 400	
FIXED	RADIOLOCATION	
MOBILE		
RADIOLOCATION		
349 349A	349 349A	

NOC 349

ADD 349A Radio astronomy observations on the Hydrogen line displaced towards lower frequencies are carried out in a number of countries under national arrangements. Administrations should bear in mind the needs of the radio astronomy service in their future planning of the band 1 350 – 1 400 MHz.

Spa2

*In the Table of Frequency Allocations, replace the provisions for the band 1 427 – 1 429 MHz by the following:*

### MHz

Region 1	Region 2	Region 3
1 427 – 1 429	SPACE OPERATION (Telecommand)	
	FIXED	
	MOBILE except aeronautical mobile	

*In the Table of Frequency Allocations, replace the provisions for the band 1 525 – 2 300 MHz by the following:*

### MHz

Allocation to Services		
Region 1	Region 2	Region 3
<b>1 525 – 1 535</b> SPACE OPERATION (Telemetering) 350A FIXED 350B <i>Earth Exploration-Satellite</i> <i>Mobile except aeronautical mobile</i> 350C	<b>1 525 – 1 535</b> SPACE OPERATION (Telemetering) 350A <i>Earth Exploration-Satellite</i> <i>Fixed</i> <i>Mobile</i> 350D	<b>1 525 – 1 535</b> SPACE OPERATION (Telemetering) 350A FIXED 350B <i>Earth Exploration-Satellite</i> <i>Mobile</i>

MOD 350A Space stations employing frequencies in the band 1 525 – 1 535 MHz for  
 Spa2 telemetering purposes may also transmit tracking signals in this band.

NOC 350B 350C 350D

SUP 350E

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
1 535 - 1 542.5	MARITIME MOBILE-SATELLITE 352 352D 352E	
1 542.5 - 1 543.5	AERONAUTICAL MOBILE-SATELLITE (R) MARITIME MOBILE-SATELLITE 352 352D 352F	
1 543.5 - 1 558.5	AERONAUTICAL MOBILE-SATELLITE (R) 352 352D 352G	
1 558.5 - 1 636.5	AERONAUTICAL RADIONAVIGATION 352 352A 352B 352D 352K	
1 636.5 - 1 644	MARITIME MOBILE-SATELLITE 352 352D 352H	
1 644 - 1 645	AERONAUTICAL MOBILE-SATELLITE (R) MARITIME MOBILE-SATELLITE 352 352D 352I	
1 645 - 1 660	AERONAUTICAL MOBILE-SATELLITE (R) 352 352D 352J	

- SUP 351**
- NOC 352**
- MOD 352A Spa2** The bands 1 558.5 – 1 636.5 MHz, 4 200 – 4 400 MHz, 5 000 – 5 250 MHz and 15.4 – 15.7 GHz are reserved on a world-wide basis for the use and development of airborne electronic aids to air navigation and any directly associated ground-based or satellite-borne facilities.
- MOD 352B Spa2** The bands 1 558.5 – 1 636.5 MHz, 5 000 – 5 250 MHz and 15.4 – 15.7 GHz are also allocated to the aeronautical mobile (R) service for the use and development of systems using space radiocommunication techniques. Such use and development is subject to agreement and co-ordination between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- SUP 352C**
- NOC 352D**
- ADD 352E Spa2** The use of the band 1 535 – 1 542.5 MHz is limited to transmissions from space to earth stations in the maritime mobile-satellite service for communication and/or radiodetermination purposes. Transmissions from coast stations directly to ship stations, or between ship stations, are also authorized when such transmissions are used to extend or supplement the satellite-to-ship links.
- ADD 352F Spa2** The use of the band 1 542.5 – 1 543.5 MHz is limited to transmissions from space to earth stations in the aeronautical mobile-satellite (R) and maritime mobile-satellite services for communication and/or radiodetermination purposes. Transmissions from land stations directly to mobile stations, or between mobile stations, of the aeronautical mobile (R) and maritime mobile services, are also authorized. The utilization of this band is subject to prior operational co-ordination between the two services.
- ADD 352G Spa2** The use of the band 1 543.5 – 1 558.5 MHz is limited to transmissions from space to earth stations in the aeronautical mobile-satellite (R) service for communication and/or radiodetermination purposes. Transmissions from terrestrial aeronautical stations directly to aircraft stations, or between aircraft stations, in the aeronautical mobile (R) service are also authorized when such transmissions are used to extend or supplement the satellite-to-aircraft links.
- ADD 352H Spa2** The use of the band 1 636.5 – 1 644 MHz is limited to transmissions from earth to space stations in the maritime mobile-satellite service for communication and/or radiodetermination purposes. Transmissions from ship stations directly to coast stations, or between ship stations, are also authorized when such transmissions are used to extend or supplement the ship-to-satellite links.

- ADD 352I Spa2** The use of the band 1 644 – 1 645 MHz is limited to transmissions from earth to space stations in the aeronautical mobile-satellite (R) and maritime mobile-satellite services for communication and/or radiodetermination purposes. Transmissions from mobile stations directly to land stations, or between mobile stations, of the aeronautical mobile (R) and maritime mobile services, are also authorized. The utilization of this band is subject to prior operational coordination between the two services.
- ADD 352J Spa2** The use of the band 1 645 – 1 660 MHz is limited to transmissions from earth to space stations in the aeronautical mobile-satellite (R) service for communication and/or radiodetermination purposes. Transmissions from aircraft stations in the aeronautical mobile (R) service directly to terrestrial aeronautical stations, or between aircraft stations, are also authorized when such transmissions are used to extend or supplement the aircraft-to-satellite links.
- ADD 352K Spa2** Radio astronomy observations on important spectral lines due to the hydroxyl radicle OH at frequencies 1 612-231 MHz and 1 720-530 MHz are carried out in a number of countries under national arrangements; the bands observed being 1 611.5 – 1 612.5 MHz and 1 720 – 1 721 MHz respectively. Administrations should bear in mind the needs of radio astronomy service in their future planning of the bands 1 558.5 – 1 636.5 MHz and 1 710 – 1 770 MHz.

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>1 660 – 1 670</b>	METEOROLOGICAL AIDS RADIO ASTRONOMY 353A 354 354A 354B	
<b>1 670 – 1 690</b>	METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SATELLITE (Space-to-Earth) 324A MOBILE except aeronautical mobile 354	
<b>1 690 – 1 700</b> METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (Space-to-Earth) <i>Fixed</i> <i>Mobile except aeronautical mobile</i> 324B 354A	<b>1 690 – 1 700</b> METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (Space-to-Earth) 324B 354A 354C	
<b>1 700 – 1 710</b> FIXED SPACE RESEARCH (Space-to-Earth) <i>Mobile</i> 354D	<b>1 700 – 1 710</b> FIXED MOBILE SPACE RESEARCH (Space-to-Earth) 354D	

SUP 353

MOD 353A In view of the successful detection by astronomers of two hydroxyl spectral  
 Spa2 lines in the regions of 1 665 MHz and 1 667 MHz, administrations are urged to give all practicable protection in the band 1 660 – 1 670 MHz for future research in radio astronomy particularly by eliminating air-to-ground transmissions in the meteorological aids service in the band 1 664.4 – 1 668.4 MHz as soon as practicable.

NOC 354

MOD 354A In Bulgaria, Cuba, Ethiopia, Hungary, Israel, Jordan, Kenya, Kuwait,  
 Spa2 Lebanon, Uganda, Pakistan, Poland, the United Arab Republic, Roumania, Syria, Tanzania, Czechoslovakia, the U.S.S.R. and Yugoslavia, the bands 1 660 – 1 670 MHz and 1 690 – 1 700 MHz are also allocated to the fixed service and the mobile, except aeronautical mobile, service.

NOC 354B 354C

ADD 354D The band 1 700 – 1 700.2 MHz may be used, on a secondary basis, for the  
 Spa2 transmission from space stations on board satellites of frequencies harmonically related to those emitted in the bands 149.9 – 150.05 MHz and 399.9 – 400.05 MHz for the requirements of ionospheric investigation and geodesy.

SUP 355A

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>1 710 – 1 770</b> FIXED <i>Mobile</i> 352K 356	<b>1 710 – 1 770</b> FIXED MOBILE 352K 356A	
<b>1 770 – 1 790</b> FIXED <i>Meteorological-Satellite 356AA</i> <i>Mobile</i> 356	<b>1 770 – 1 790</b> FIXED MOBILE <i>Meteorological-Satellite 356AA</i> 356A	
<b>1 790 – 2 290</b> FIXED <i>Mobile</i> 356 356AB 356ABA 356AC	<b>1 790 – 2 290</b> FIXED MOBILE 356A 356AB 356ABA	
<b>2 290 – 2 300</b> FIXED SPACE RESEARCH (Space-to-Earth) <i>Mobile</i> 356C	<b>2 290 – 2 300</b> FIXED MOBILE SPACE RESEARCH (Space-to-Earth)	

- MOD 356** In Switzerland, the band 1 710 – 2 290 MHz is allocated to the fixed service and the mobile, except the aeronautical mobile, service and the band 1 770 – 1 790 MHz is also allocated, on a secondary basis, to the meteorological-satellite service.
- MOD 356A** In Region 2, in Australia and Japan, the band 1 750 – 1 850 MHz may also be used for Earth-to-space transmissions, and in Regions 2 and 3, the band 2 200 – 2 290 MHz may also be used for space-to-Earth transmissions in the space research service, subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- Spa2**
- NOC 356AA** [NOC 356AA is (MOD) 356AA in the French and Spanish version.]
- ADD 356AB** In Regions 2 and 3 and in Spain, in the band 2 025 – 2 120 MHz Earth-to-space transmissions in the earth exploration-satellite service may be authorized with equality of right to operate with stations of other space radiocommunication services in this band and subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- Spa2**
- ADD 356ABA** In Region 2, in Australia and Spain, in the band 2 025 – 2 120 MHz and in Regions 1 and 3, in the band 2 110 – 2 120 MHz Earth-to-space transmissions in the space research service may be authorized with equality of right to operate with other space radiocommunication services in these bands and subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- Spa2**
- ADD 356AC** In Region 1, in the band 2 096 – 2 120 MHz, Earth-to-space transmissions in the earth exploration-satellite service may be authorized with equality of right to operate with stations of other space radiocommunication services in this band and subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected (see No. 356AB).
- Spa2**
- SUP 356B**
- NOC 356C**

*In the Table of Frequency Allocations, replace the provisions for the band 2 450 – 2 700 MHz by the following:*

## MHz

Allocation to Services		
Region 1	Region 2	Region 3
<b>2 450 – 2 500</b> FIXED MOBILE <i>Radiolocation</i> 357 361	<b>2 450 – 2 500</b> FIXED MOBILE RADIOLOCATION 357	
<b>2 500 – 2 550</b> FIXED 364C MOBILE except aeronautical mobile BROADCASTING- SATELLITE 361B 361A 362 364F	<b>2 500 – 2 535</b> FIXED 364C FIXED-SATELLITE (Space-to-Earth) MOBILE except aeronautical mobile BROADCASTING-SATELLITE 361B 361A 364E 364F	
	<b>2 535 – 2 550</b> FIXED 364C MOBILE except aeronautical mobile BROADCASTING-SATELLITE 361B 361A 364F	
<b>2 550 – 2 655</b>	FIXED 364C MOBILE except aeronautical mobile BROADCASTING-SATELLITE 361B 362 363 364 364F	

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>2 655 – 2 690</b> FIXED 364C 364D MOBILE except aeronautical mobile BROADCASTING- SATELLITE 361B 364H  363 364 364F 364G	<b>2 655 – 2 690</b>  FIXED 364C 364D FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile BROADCASTING-SATELLITE 361B 364H  364E 364F 364G	
<b>2 690 – 2 700</b>  RADIO ASTRONOMY  233B 363 364A 364B		

NOC 357

MOD 361 In France and the United Kingdom, the band 2 450 – 2 500 MHz is allocated on a primary basis to the radiolocation service and, on a secondary basis, to the fixed and mobile services.

ADD 361A In France, the band 2 500 – 2 550 MHz is also allocated, on a primary basis, to the radiolocation service and, on a secondary basis, to the fixed and mobile services. In Canada, the band 2 500 – 2 550 MHz is also allocated on a primary basis to the radiolocation service.

ADD 361B The use of the band 2 500 – 2 690 MHz by the broadcasting-satellite service is limited to domestic and regional systems for community reception and such use is subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected (see Resolutions Nos. Spa2 – 2 and Spa2 – 3). The power flux density at the Earth's surface shall not exceed the values given in Nos. 470NH-470NK.

MOD 362 In the United Kingdom, the band 2 500 – 2 600 MHz is also allocated, on a secondary basis, to the radiolocation service.

NOC 363

- MOD 364** In Region 1, tropospheric scatter systems may operate in the band 2 550 –  
**Spa2** 2 690 MHz, subject to agreement between the administrations concerned and those having terrestrial radiocommunication services, operating in accordance with the Table, which may be affected.
- MOD 364A** In Bulgaria, Cuba, Hungary, India, Israel, Kuwait, Lebanon, Morocco,  
**Spa2** Pakistan, the Philippines, Poland, the United Arab Republic, Roumania, Czechoslovakia, the U.S.S.R. and Yugoslavia, the band 2 690 – 2 700 MHz is also allocated to the fixed and mobile services.
- NOC 364B**
- ADD 364C** When planning new tropospheric scatter radio-relay links in the band 2 500 –  
**Spa2** 2 690 MHz, all possible measures shall be taken to avoid directing the antennae of these links towards the geostationary satellite orbit.
- ADD 364D** Administrations shall make all practicable effort to avoid developing new  
**Spa2** tropospheric scatter systems in the band 2 655 – 2 690 MHz.
- ADD 364E** The use of the bands 2 500 – 2 535 MHz and 2 655 – 2 690 MHz by the  
**Spa2** fixed-satellite service is limited to domestic and regional systems and such use is subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected (see Article 9A). In the direction space-to-Earth, the power flux density at the Earth's surface shall not exceed the values given in No. 470NE.
- ADD 364F** In Bulgaria, Iran, Portugal and the U.S.S.R., the band 2 500 – 2 690 MHz  
**Spa2** is allocated to the fixed service and the mobile, except aeronautical mobile, service.
- ADD 364G** Radio astronomy observations in the band 2 670 – 2 690 MHz are carried  
**Spa2** out in a number of countries under national arrangements. Administrations should bear in mind the needs of the radio astronomy service in their future planning of this band.
- ADD 364H** In the design of systems in the broadcasting-satellite service, administrations  
**Spa2** are urged to take all necessary steps to protect the radio astronomy service in the band 2 690 – 2 700 MHz.
- SUP 365** (*see* ADD 233B)

*In the Table of Frequency Allocations, replace the provisions for the band 3 400 – 5 250 MHz by the following:*

## MHz

Allocation to Services		
Region 1	Region 2	Region 3
<b>3 400 – 3 600</b> FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE <i>Radiolocation</i> 372 373 374 375	<b>3 400 – 3 500</b> FIXED-SATELLITE (Space-to-Earth) RADIOLOCATION <i>Amateur</i> 376	
<b>3 600 – 4 200</b> FIXED FIXED-SATELLITE (Space-to-Earth) <i>Mobile</i>	<b>3 500 – 3 700</b> FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE RADIOLOCATION	<b>3 500 – 3 700</b> FIXED-SATELLITE (Space-to-Earth) RADIOLOCATION <i>Fixed</i> <i>Mobile</i> 377 378
	<b>3 700 – 4 200</b> FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE 379	
<b>4 200 – 4 400</b> AERONAUTICAL RADIONAVIGATION 352A 379A 381 382 383		
<b>4 400 – 4 700</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE		

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>4 700 – 4 990</b> FIXED MOBILE 233B 354 382A 382B		
<b>4 990 – 5 000</b> FIXED MOBILE RADIO ASTRONOMY 233B	<b>4 990 – 5 000</b> RADIO ASTRONOMY 383A	<b>4 990 – 5 000</b> FIXED MOBILE RADIO ASTRONOMY 233B
<b>5 000 – 5 250</b> AERONAUTICAL RADIONAVIGATION 352A 352B 383B		

NOC 372

(MOD) 373 In Denmark, Norway, Sweden and Switzerland, the fixed, mobile, radio-  
 Spa2 location and fixed-satellite services operate on a basis of equality of rights in the  
 band 3 400 – 3 600 MHz.

NOC 374

SUP 374A

NOC 375 376

MOD 377 In China and Japan, the band 3 500 – 3 700 MHz is also allocated to the  
 Spa2 fixed and mobile services.

NOC 378

(MOD) 379 In Australia, the band 3 700 – 3 770 MHz is allocated to the radiolocation  
 Spa2 and fixed-satellite services.

- ADD 379A**      The standard frequency-satellite service and the time signal-satellite service  
**Spa2**      may be authorized to use the frequency 4 202 MHz for space-to-Earth transmissions and the frequency 6 427 MHz for Earth-to-space transmissions. Such transmissions shall be confined within the limits of  $\pm 2$  MHz of these frequencies and shall be subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- NOC 381 382**
- ADD 382A**      Radio astronomy observations on the formaldehyde line (rest frequency  
**Spa2**      4 829-649 MHz) are being carried out in a number of countries under national arrangements. Administrations should bear in mind the needs of the radio astronomy service in their future planning of the band 4 825 – 4 835 MHz.
- ADD 382B**      Radio astronomy observations in the band 4 950 – 4 990 MHz are being  
**Spa2**      carried out in a number of countries under national arrangements. Administrations should bear in mind the needs of the radio astronomy service in their future planning of this band.
- NOC 383**
- (MOD) 383A**      In Cuba, the band 4 990 – 5 000 MHz is also allocated to the fixed and mobile  
**Spa2**      services, and the provisions of No. 233B apply.
- ADD 383B**      The band 5 000 – 5 250 MHz is also allocated to the fixed-satellite service for  
**Spa2**      connection between one or more earth stations at specified fixed points on the Earth and satellites used by the aeronautical mobile (R) service and/or the radio-determination service. Such use and development shall be subject to agreement and co-ordination between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.

*In the Table of Frequency Allocations, replace the provisions for the band 5 725 – 7 750 MHz in Regions 1 and 3 and for the bands 5 725 – 5 850 MHz and 5 925 – 7 750 MHz in Region 2 by the following:*

## MHz

Allocation to Services		
Region 1	Region 2	Region 3
<b>5 725 – 5 850</b> FIXED-SATELLITE (Earth-to-space) RADIOLOCATION <i>Amateur</i>  354 388 390 391 391A	<b>5 725 – 5 850</b>  RADIOLOCATION <i>Amateur</i>   389 391 391A	

NOC 388 389

(MOD) 390 In Albania, Bulgaria, Hungary, Poland, Roumania, Czechoslovakia and the  
 Spa2 U.S.S.R., the band 5 800 – 5 850 MHz is allocated to the fixed, mobile and fixed-satellite services.

NOC 391

ADD 391A Radio astronomy observations are being carried out in the bands 5 750 –  
 Spa2 5 770 MHz and 36.458 – 36.488 GHz in a number of countries under national arrangements. Administrations are urged to take all practicable steps to protect radio astronomy observations in these bands from harmful interference.

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>5 850 – 5 925</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE  391	<b>5 850 – 5 925</b>   NOC	<b>5 850 – 5 925</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE <i>Radiolocation</i>  391
<b>5 925 – 6 425</b>  FIXED FIXED-SATELLITE (Earth-to-space) MOBILE		
<b>6 425 – 7 250</b>  FIXED MOBILE  379A 392AA 392B 393		
<b>7 250 – 7 300</b>  FIXED-SATELLITE (Space-to-Earth)  392D 392G		

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>7 300 – 7 450</b>	FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE 392D	
<b>7 450 – 7 550</b>	FIXED FIXED-SATELLITE (Space-to-Earth) METEOROLOGICAL-SATELLITE (Space-to-Earth) MOBILE 392D	
<b>7 550 – 7 750</b>	FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE 392D	

SUP 392A

ADD 392A In Brazil, Canada and the United States of America, the band 6 625 -

Spa2 7 125 MHz is also allocated, on a secondary basis, to the fixed-satellite service for space-to-Earth transmissions. In Region 2, the power flux density produced by space stations in this band shall be in accordance with the provisions of No. 470NM. In Regions 1 and 3, it shall be at least 6 dB lower. Receiving earth stations in this band may not impose restrictions on the locations or technical parameters of existing or future terrestrial stations of other countries.

MOD 392B The band 7 145 - 7 235 MHz may be used for Earth-to-space transmissions  
Spa2 in the space research service, subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.

SUP 392C

MOD 392D As an exception, passive fixed-satellite systems also may be accommodated  
Spa2 in the band 7 250 - 7 750 MHz subject to:

- a) agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected;
- b) the co-ordination procedures laid down in Articles 9 and 9A.

Such systems shall not cause any more interference at active earth station receivers than would be caused by the fixed or mobile service. Power flux density limitations at the Earth's surface after reflection from the passive fixed-satellites shall not exceed those prescribed in the present Regulations for active fixed-satellite systems.

SUP 392F

NOC 392G 392H 393

*In the Table of Frequency Allocations, replace the provisions for the band 7 900 – 8 500 MHz by the following:*

### MHz

Allocation to Services		
Region 1	Region 2	Region 3
<b>7 900 – 7 975</b>	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE	
<b>7 975 – 8 025</b>	FIXED-SATELLITE (Earth-to-space)  392H	

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>8 025 – 8 175</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE <i>Earth Exploration-Satellite</i> (Space-to-Earth)  394B	<b>8 025 – 8 175</b> EARTH EXPLORATION-SATELLITE (Space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) MOBILE	<b>8 025 – 8 175</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE <i>Earth Exploration-Satellite</i> (Space-to-Earth)
<b>8 175 – 8 215</b> FIXED FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) MOBILE <i>Earth Exploration-Satellite</i> (Space-to-Earth)  394B	<b>8 175 – 8 215</b> EARTH EXPLORATION-SATELLITE (Space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) MOBILE	<b>8 175 – 8 215</b> FIXED FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) MOBILE <i>Earth Exploration-Satellite</i> (Space-to-Earth)
<b>8 215 – 8 400</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE <i>Earth Exploration-Satellite</i> (Space-to-Earth)  394 394B	<b>8 215 – 8 400</b> EARTH EXPLORATION-SATELLITE (Space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) MOBILE	<b>8 215 – 8 400</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE <i>Earth Exploration-Satellite</i> (Space-to-Earth)  394

**MHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>8 400 – 8 500</b>	FIXED MOBILE SPACE RESEARCH (Space-to-Earth)  394A 394D	

- (MOD) **394 Spa2** In Australia and the United Kingdom, the band 8 250 – 8 400 MHz is allocated to the radiolocation and fixed-satellite services.
- MOD **394A Spa2** In the United Kingdom, the band 8 400 – 8 500 MHz is allocated to the radiolocation and space research services.
- (MOD) **394B Spa2** In Israel, the band 8 025 – 8 400 MHz is allocated, on a primary basis, to the fixed and mobile services and, on a secondary basis, to the fixed-satellite service.
- SUP **394C**
- NOC **394D**

*In the Table of Frequency Allocations, replace the provisions for the band 10.55 – 15.35 GHz by the following:*

## GHz

Allocation to Services		
Region 1	Region 2	Region 3
<b>10.55 – 10.6</b>	NOC	
<b>10.6 – 10.68</b>	FIXED MOBILE RADIO ASTRONOMY <i>Radiolocation</i> 404A	
<b>10.68 – 10.7</b>	RADIO ASTRONOMY 405B	

**ADD 404A** In the F.R. of Germany, in the band 10.6 – 10.68 GHz, the radio astronomy  
**Spa2** service is a secondary service.

**SUP 405A**

**NOC 405B**

**GHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>10·7 – 10·95</b> FIXED MOBILE		
<b>10·95 – 11·2</b> FIXED FIXED-SATELLITE (Space-to-Earth) (Earth-to-space) MOBILE	<b>10·95 – 11·2</b> FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE	
<b>11·2 – 11·45</b> FIXED MOBILE		
<b>11·45 – 11·7</b> FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE		

**GHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>11·7 – 12·5</b> FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE  405BA	<b>11·7 – 12·2</b> FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE  405BB 405BC	<b>11·7 – 12·2</b> FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE  405BA
	<b>12·2 – 12·5</b> FIXED MOBILE except aeronautical mobile BROADCASTING	
<b>12·5 – 12·75</b> FIXED-SATELLITE (Space-to-Earth) (Earth-to-space)  405BD 405BE	<b>12·5 – 12·75</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile	<b>12·5 – 12·75</b> FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE except aeronautical mobile
<b>12·75 – 13·25</b> FIXED MOBILE		
<b>13·25 – 13·4</b> AERONAUTICAL RADIONAVIGATION  406 407 407A		
<b>13·4 – 14</b> RADIOLOCATION  407 407A 408 409		

**GHz**

Allocation to Services		
Region 1	Region 2	Region 3
14 - 14.3	FIXED-SATELLITE (Earth-to-space) RADIONAVIGATION 408A  407 407A	
14.3 - 14.4	FIXED-SATELLITE (Earth-to-space) RADIONAVIGATION-SATELLITE 408A	
14.4 - 14.5	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE  408B 408C	
14.5 - 15.35	FIXED MOBILE  408B 408C	

- ADD 405BA** In the band 11.7 - 12.2 GHz in Region 3 and in the band 11.7 - 12.5 GHz **Spa2** in Region 1, existing and future fixed, mobile and broadcasting services shall not cause harmful interference to broadcasting-satellite stations operating in accordance with the decisions of the appropriate broadcasting frequency assignment planning conference (see Resolution No. **Spa2 - 2**) and this requirement shall be taken into account in the decisions of that conference.
- ADD 405BB** Terrestrial radiocommunication services in the band 11.7 - 12.2 GHz in **Spa2** Region 2 shall be introduced only after the elaboration and approval of plans for the space radiocommunication services, so as to ensure compatibility between the uses that each country decides for this band.
- ADD 405BC** The use of the band 11.7 - 12.2 GHz in Region 2 by the broadcasting-satellite **Spa2** and fixed-satellite services is limited to domestic systems and is subject to previous agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected (see Article 9A and Resolution No. **Spa2 - 3**).

- ADD 405BD** In Bulgaria, Cameroon, Congo (Brazzaville), the Ivory Coast, Gabon, Ghana, Hungary, Iraq, Israel, Jordan, Kuwait, Libya, Mali, Niger, Poland, Syria, United Arab Republic, Roumania, Senegal, Czechoslovakia, Togo and the U.S.S.R., the band 12.5 – 12.75 GHz is also allocated to the fixed service and the mobile, except aeronautical mobile, service.
- ADD 405BE** In Algeria, Belgium, Denmark, Spain, Ethiopia, Finland, France, Greece, Kenya, Liechtenstein, Luxembourg, Monaco, Norway, Uganda, Netherlands, Portugal, the F. R. of Germany, Sweden, Switzerland, Tanzania and Tunisia, the band 12.5 – 12.75 GHz is also allocated, on a secondary basis, to the fixed service and the mobile, except aeronautical mobile, service.
- NOC 406**
- MOD 407** In Albania, Bulgaria, Hungary, Poland, Roumania, Czechoslovakia and the U.S.S.R., the bands 13.25 – 13.5 GHz, 14.175 – 14.3 GHz, 15.4 – 17.7 GHz, 23.6 – 24 GHz, 24.05 – 24.25 GHz and 33.4 – 36 GHz are also allocated to the fixed and mobile services.
- ADD 407A** The band 13.25 – 14.2 GHz may also be used, on a secondary basis, for Earth-to-space transmissions in the space research service, subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- MOD 408** In Sweden, the bands 13.4 – 14 GHz, 15.7 – 17.7 GHz and 33.4 – 36 GHz are also allocated to the fixed and mobile services.
- ADD 408A** The use of the bands 14 – 14.3 GHz and 14.3 – 14.4 GHz by the radionavigation service and radionavigation-satellite service respectively, shall be such as to provide sufficient protection to space stations of the fixed-satellite service (see Recommendation No. **Spa2** – 15, paragraph 2.14).
- ADD 408B** The band 14.4 – 15.35 GHz may also be used, on a secondary basis, for space-to-Earth transmissions in the space research service, subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.
- ADD 408C** Radio astronomy observations on the formaldehyde line (rest frequency 14.489 GHz) are being carried out in a number of countries under national arrangements. In making assignments to stations in the fixed and mobile services, administrations are urged to take all practicable steps to protect radio astronomy observations from harmful interference in the band 14.485 – 14.515 GHz.
- NOC 409**
- SUP 409A 409B**

*In the Table of Frequency Allocations, replace the provisions for the band 17.7-24.25 GHz by the following:*

## GHz

Allocation to Services		
Region 1	Region 2	Region 3
17.7 - 19.7	FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE	
19.7 - 21.2	FIXED-SATELLITE (Space-to-Earth) 409E	
21.2 - 22	EARTH EXPLORATION-SATELLITE (Space-to-Earth) FIXED MOBILE	
22 - 22.5	FIXED MOBILE 410A	
22.5 - 23	FIXED MOBILE	22.5 - 23 FIXED MOBILE BROADCASTING-SATELLITE 410B
23 - 23.6	FIXED MOBILE	

**GHz**

Allocation to Services		
Region 1	Region 2	Region 3
23.6 – 24	RADIO ASTRONOMY 407	
24 – 24.05	AMATEUR AMATEUR-SATELLITE 410C	
24.05 – 24.25	RADIOLOCATION <i>Amateur</i> 407 410C	

- UP 409D
- ADD 409E In Japan, the bands 19.7 – 21.2 GHz and 29.5 – 31 GHz are also allocated to the fixed and mobile services. This additional use shall not impose any limitation on the power flux density of space stations in the fixed-satellite service.  
Spa2
- SUP 410
- ADD 410A The band 22.21 – 22.26 GHz is also allocated to the radio astronomy service for observations of a spectral line due to water vapour (rest frequency 22.235 GHz). Administrations are urged to give all practicable protection in this band for future research in radio astronomy.  
Spa2
- ADD 410B In Region 3, the broadcasting-satellite service is authorized in the band 22.5 – 23.0 GHz, subject to power flux density limits for the protection of the terrestrial services in this band.  
Spa2
- ADD 410C The frequency 24.125 GHz is designated for industrial, scientific and medical purposes. Emissions must be confined within the limits of  $\pm 125$  MHz of that frequency. Radiocommunication services operating within those limits must accept any harmful interference that may be experienced from the operation of industrial, scientific and medical equipment.  
Spa2

In the Table of Frequency Allocations, replace the provisions for the band 25.25 – 31.3 GHz by the following:

GHz		
Allocation to Services		
Region 1	Region 2	Region 3
25.25 – 27.5	FIXED MOBILE	
27.5 – 29.5	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE	
29.5 – 31	FIXED-SATELLITE (Earth-to-space) 409E	
31 – 31.3	FIXED MOBILE <i>Space Research</i> 412H 412I	

NOC 412E 412H

ADD 412I Radio astronomy observations in the band 31.2 – 31.3 GHz are carried out in a number of countries under national arrangements. Administrations are urged to take all practicable steps to protect radio astronomy observations in this band from harmful interference.

In the Table of Frequency Allocations, replace the provisions for the band 36 – 40 GHz by the following:

GHz		
Region 1	Region 2	Region 3
36 – 40	FIXED MOBILE 391A 412E	

*In the Table of Frequency Allocations, replace the indication "above 40 (Not allocated)" by the following new Table:*

## GHz

Allocation to Services		
Region 1	Region 2	Region 3
40 – 41	FIXED-SATELLITE (Space-to-Earth)	
41 – 43	BROADCASTING-SATELLITE	
43 – 48	AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION-SATELLITE	
48 – 50	(Not allocated)	
50 – 51	FIXED-SATELLITE (Earth-to-space)	
51 – 52	EARTH EXPLORATION-SATELLITE SPACE RESEARCH	
52 – 54.25	SPACE RESEARCH (Passive)  412J	
54.25 – 58.2	INTER-SATELLITE	

**ADD** 412J All emissions in the bands 52 – 54.25 GHz, 58.2 – 59 GHz, 64 – 65 GHz, Spa2 86 – 92 GHz, 101 – 102 GHz, 130 – 140 GHz, 182 – 185 GHz and 230 – 240 GHz are prohibited. The use of passive sensors by other services is also authorized.

**GHz**

Allocation to Services		
Region 1	Region 2	Region 3
58.2 - 59	SPACE RESEARCH (Passive) 412J	
59 - 64	INTER-SATELLITE	
64 - 65	SPACE RESEARCH (Passive) 412J	
65 - 66	EARTH EXPLORATION-SATELLITE SPACE RESEARCH	
66 - 71	AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION-SATELLITE	
71 - 84	(Not allocated)	
84 - 86	BROADCASTING-SATELLITE	
86 - 92	RADIO ASTRONOMY SPACE RESEARCH (Passive) 412J	

**GHz**

Allocation to Services		
Region 1	Region 2	Region 3
92 - 95	FIXED-SATELLITE (Earth-to-space)	
95 - 101	AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION-SATELLITE	
101 - 102	SPACE RESEARCH (Passive)  412J	
102 - 105	FIXED-SATELLITE (Space-to-Earth)	
105 - 130	INTER-SATELLITE  412K	
130 - 140	RADIO ASTRONOMY SPACE RESEARCH (Passive)  412J	
140 - 142	FIXED-SATELLITE (Earth-to-space)	

**ADD** 412K Radio astronomy observations on the carbon monoxide line at 115.271 GHz  
 Spa2 are carried out in a number of countries under national arrangements. In making assignments to other services in the Table, administrations should bear in mind the need to protect radio astronomy observations from harmful interference in the band 115.16 - 115.38 GHz.

**GHz**

Allocation to Services		
Region 1	Region 2	Region 3
<b>142 – 150</b>	AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION-SATELLITE	
<b>150 – 152</b>	FIXED-SATELLITE (Space-to-Earth)	
<b>152 – 170</b>	(Not allocated)	
<b>170 – 182</b>	INTER-SATELLITE	
<b>182 – 185</b>	SPACE RESEARCH (Passive) 412J	
<b>185 – 190</b>	INTER-SATELLITE	
<b>190 – 200</b>	AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION-SATELLITE	
<b>200 – 220</b>	(Not allocated)	
<b>220 – 230</b>	FIXED-SATELLITE	

**GHz**

Allocation to Services		
Region 1	Region 2	Region 3
230 - 240	RADIO ASTRONOMY SPACE RESEARCH (Passive)  412J	
240 - 250	(Not allocated)	
250 - 265	AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION-SATELLITE	
265 - 275	FIXED-SATELLITE	
Above 275	(Not allocated)	

## ANNEX 4

## Revision of Article 6 of the Radio Regulations

Article 6 of the Radio Regulations shall be amended as follows:

*Replace Regulation No. 415 by the following new text:*

- MOD 415 § 2. (1) When special circumstances make it indispensable to do so, an administration may, as an exception to the normal methods of working authorized by these Regulations, have recourse to the special methods of working enumerated below, on the sole condition that the characteristics of the stations still conform to those inserted in the Master International Frequency Register:
- Spa2
- a) a fixed station in the terrestrial radiocommunication service or an earth station in the fixed-satellite service may, on a secondary basis, transmit to mobile stations on its normal frequencies;
  - b) a land station may communicate, on a secondary basis, with fixed stations in the terrestrial radiocommunication service or earth stations in the fixed-satellite service or other land stations of the same category.

*Replace Regulation No. 417 by the following new text:*

- MOD 417 § 3. Any administration may assign a frequency in a band allocated to the fixed service or allocated to the fixed-satellite service to a station authorized to transmit, unilaterally, from one specified fixed point to one or more specified fixed points provided that such transmissions are not intended to be received directly by the general public.
- Spa2

*Add the following new text after Regulation No. 419:*

**ADD 419A § 5A.** Earth stations on board aircraft are authorized to use frequencies in the bands allocated to the maritime mobile-satellite service for the purpose of communicating, via the stations of that service, with the public telegraph and telephone networks.

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## ANNEX 5

## Revision of Article 7 of the Radio Regulations

Article 7 of the Radio Regulations shall be amended as follows:

*Add the following new sub-title and text after Section I:*

**ADD Spa2 Section IA. Broadcasting-Satellite Service**

**ADD 428A § 2A.** In devising the characteristics of a space station in the  
**Spa2** broadcasting-satellite service, all technical means available shall be used to reduce, to the maximum extent practicable, the radiation over the territory of other countries unless an agreement has been previously reached with such countries.

*Replace the title of Section VII by the following new title:*

**MOD Spa2 Section VII. Terrestrial Radiocommunication Services sharing  
 Frequency Bands with Space Radiocommunication  
 Services above 1 GHz**

*Choice of Sites and Frequencies*

*Replace Regulation No. 470A by the following new text:*

**(MOD) 470A § 18.** Sites and frequencies for terrestrial stations, operating in  
**Spa2** frequency bands shared with equal rights between terrestrial radiocommunication and space radiocommunication services shall be selected having regard to the relevant Recommendations of the C.C.I.R. with respect to geographical separation from earth stations.

*After Regulation No. 470A, add the following new Regulations:*

- ADD 470AA § 18A.** (1) As far as practicable, sites for transmitting<sup>1</sup> stations, **Spa2** in the fixed or mobile service, employing maximum values of equivalent isotropically radiated power exceeding +35 dBW in the frequency bands between 1 and 10 GHz, should be selected so that the direction of maximum radiation of any antenna will be at least 2° away from the geostationary satellite orbit, taking into account the effect of atmospheric refraction<sup>2</sup>.
- ADD 470AB** (2) As far as practicable, sites for transmitting<sup>3</sup> stations, in **Spa2** the fixed or mobile service, employing maximum values of equivalent isotropically radiated power exceeding +45 dBW in the frequency bands between 10 and 15 GHz, should be selected so that the direction of maximum radiation of any antenna will be at least 1-5° away from the geostationary satellite orbit, taking into account the effect of atmospheric refraction<sup>4</sup>.
- ADD 470AC** (3) In the frequency bands above 15 GHz there shall be no **Spa2** restriction as to the direction of maximum radiation for stations in the fixed or mobile service.
- 
- ADD 470AA.1** <sup>1</sup> For their own protection receiving stations in the fixed or mobile services **Spa2** operating in bands shared with space radiocommunication services (space-to Earth) should also avoid directing their antennae towards the geostationary satellite orbit if their sensitivity is sufficiently high that interference from space station transmissions may be significant.
- ADD 470AA.2** <sup>2</sup> Information on this subject is given in the most recent version of C.C.I.R. **Spa2** Report No. 393.
- ADD 470AB.1** <sup>3</sup> See No. 470AA.1. **Spa2**
- ADD 470AB.2** <sup>4</sup> See No. 470AA.2. **Spa2**

*Power Limits*

*Replace Regulation No. 470B by the following new text:*

- MOD 470B § 19. (1) The maximum equivalent isotropically radiated power of  
Spa2 a station in the fixed or mobile service shall not exceed +55 dBW.

*After Regulation No. 470B, add the following new Regulations:*

- ADD 470BA (1A) Where compliance with No. 470AA is impracticable the  
Spa2 maximum equivalent isotropically radiated power of a station in the fixed or mobile service shall not exceed:

+47 dBW in any direction within 0.5° of the geostationary satellite orbit; or

+47 dBW to +55 dBW, on a linear decibel scale (8 dB per degree), in any direction between 0.5° and 1.5° of the geostationary satellite orbit, taking into account the effect of atmospheric refraction<sup>1</sup>.

*Replace Regulation No. 470C by the following new text:*

- MOD 470C (2) The power delivered by a transmitter to the antenna of  
Spa2 a station in the fixed or mobile service in frequency bands between 1 and 10 GHz, shall not exceed +13 dBW.

*After Regulation No. 470C, add the following new Regulation:*

- ADD 470CA (2A) The power delivered by a transmitter to the antenna of a  
Spa2 station in the fixed or mobile service in frequency bands above 10 GHz shall not exceed +10 dBW.

- ADD 470BA.1 <sup>1</sup> See No. 470AA.2.  
Spa2

*Replace Regulation No. 470D by the following new text:*

**MOD 470D** (3) The limits given in Nos. **470AA**, **470B**, **470BA** and **470C**  
**Spa2** apply in the following frequency bands allocated to the fixed-satellite service and the meteorological-satellite service for reception by space stations, where these bands are shared with equal rights with the fixed or mobile service:

- 2 655 - 2 690 MHz (for Regions 2 and 3)
- 5 800 - 5 850 MHz (for the countries mentioned in No. **390**)
- 5 850 - 5 925 MHz (for Regions 1 and 3)
- 5 925 - 6 425 MHz
- 7 900 - 7 975 MHz
- 7 975 - 8 025 MHz (for the countries mentioned in No. **392H**)
- 8 025 - 8 400 MHz

*After Regulation No. 470D, add the following new Regulations:*

**ADD 470DA** (4) The limits given in Nos. **470AB**, **470B** and **470CA** apply  
**Spa2** in the following frequency bands allocated to the fixed-satellite service for reception by space stations, where these bands are shared with equal rights with the fixed or mobile service:

- 10.95 - 11.20 GHz (Region 1)
- 12.50 - 12.75 GHz (Regions 1 and 2)
- 14.175 - 14.300 GHz (for the countries mentioned in No. **407**)
- 14.4 - 14.5 GHz

**ADD 470DB** (5) The limits given in Nos. **470B** and **470CA** apply in the  
**Spa2** following frequency bands allocated to the fixed-satellite service for

reception by space stations, where these bands are shared with equal rights with the fixed or mobile service:

27.5 - 29.5 GHz

29.5 - 31.0 GHz (for the country mentioned in No. 409E)

*Replace the title of Section VIII by the following new title:*

**MOD Spa2 Section VIII. Space Radiocommunication Services sharing Frequency Bands with Terrestrial Radiocommunication Services above 1 GHz**

*Choice of Sites and Frequencies*

*Replace Regulation No. 470E by the following new text:*

(MOD) **470E** § 20. Sites and frequencies for earth stations, operating in frequency bands shared with equal rights between terrestrial radiocommunication and space radiocommunication services, shall be selected having regard to the relevant Recommendations of the C.C.I.R. with respect to geographical separation from terrestrial stations.

**Spa2**

*Power Limits*

*Replace Regulations Nos. 470F and 470G by the following new texts:*

**MOD 470F** § 21. (1) Earth stations.

**Spa2**

**MOD 470G** (2) The equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits except as provided in Nos. 470H or 470GC:

**Spa2**

+40 dBW in any 4 kHz band for  $\theta \leq 0^\circ$

+40 + 3  $\theta$  dBW in any 4 kHz band for  $0^\circ < \theta \leq 5^\circ$

where  $\theta$  is the angle of elevation of the horizon viewed from the centre of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

*After Regulation No. 470G, add the following new Regulations:*

**ADD 470GA** (2A) The equivalent isotropically radiated power transmitted in  
Spa2 any direction towards the horizon by an earth station operating in frequency bands above 15 GHz shall not exceed the following limits except as provided in Nos. 470H or 470GD:

+ 64 dBW in any 1 MHz band for  $\theta \leq 0^\circ$

+ 64 + 3  $\theta$  dBW in any 1 MHz band for  $0^\circ < \theta \leq 5^\circ$

where  $\theta$  is as defined in No. 470G.

**ADD 470GB** (2B) For angles of elevation of the horizon greater than  $5^\circ$  there  
Spa2 shall be no restriction as to the equivalent isotropically radiated power transmitted by an earth station towards the horizon.

**ADD 470GC** (2C) As an exception to the limits given in No. 470G, the  
Spa2 equivalent isotropically radiated power towards the horizon for an earth station in the space research service (deep-space) shall not exceed +55 dBW in any 4 kHz band.

**ADD 470GD** (2D) As an exception to the limits given in No. 470GA, the equi-  
Spa2 valent isotropically radiated power towards the horizon for an

earth station in the space research service (deep-space) shall not exceed +79 dBW in any 1 MHz band.

*Replace Regulation No. 470H by the following new text:*

- MOD 470H** (3) The limits given in No. **470G**, No. **470GA**, No. **470GC** and  
**Spa2** No. **470GD**, as applicable, may be exceeded by not more than 10 dB. However, when the resulting co-ordination area extends into the territory of another country, such increase shall be subject to agreement by the administration of that country.

*Delete Regulation No. 470I.*

*Replace Regulation No. 470J by the following new text:*

- MOD 470J** (3A) The limits given in No. **470G** apply in the following fre-  
**Spa2** quency bands allocated to transmission by earth stations in the fixed-satellite service and earth exploration-satellite service, and in particular the meteorological-satellite service, where these bands are shared with equal rights with the fixed or mobile service:

2 655 - 2 690 MHz (Regions 2 and 3)

4 400 - 4 700 MHz

5 800 - 5 850 MHz (for the countries mentioned in No. 390)

5 850 - 5 925 MHz (Regions 1 and 3)

5 925 - 6 425 MHz

7 900 - 7 975 MHz

7 975 - 8 025 MHz (for the countries mentioned in No. 392H)

8 025 - 8 400 MHz

10.95 - 11.20 GHz (Region 1)

12.50 - 12.75 GHz (Regions 2 and 3 and for the countries mentioned in No. 405BD)

14.175 - 14.300 GHz (for the countries mentioned in No. 407)

14.4 - 14.5 GHz

*After Regulation No. 470J, add the following new Regulation:*

- ADD 470JA (3B) The limits given in No. 470GA apply in the following frequency band allocated to transmission by earth stations in the fixed-satellite service, where this is shared with equal rights with the fixed or mobile service:

27.5 - 29.5 GHz

*Minimum Angle of Elevation*

*Replace Regulations Nos. 470K and 470L by the following new texts:*

- MOD 470K § 22. (1) Earth stations.  
Spa2

- MOD 470L (2) Earth station antennae shall not be employed for transmission at elevation angles of less than 3 degrees measured from the horizontal plane to the direction of maximum radiation, except when agreed to by administrations concerned or those whose services may be affected. In case of reception by an earth station, the above value shall be used for co-ordination purposes if the operating angle of elevation is less than that value.

*After Regulation No. 470L, add the following new Regulation:*

- ADD 470LA (2A) As an exception to No. 470L, earth station antennae in the space research service (near-earth) shall not be employed for transmission at elevation angles of less than 5 degrees, and earth station antennae in the space research service (deep-space) shall not be employed for transmission at elevation angles of less than 10 degrees, both angles being those measured from the horizontal plane to the direction of maximum radiation. In case of reception by an earth

station, the above values shall be used for co-ordination purposes if the operating angle of elevation is less than those values.

*Delete Regulation No. 470M.*

*Replace the sub-title "Power Flux Density Limits" as well as Regulation No. 470N by the following new sub-title and text:*

MOD Spa2 *Limits of Power Flux Density from Space Stations*

MOD 470N § 23. (1) Power flux density limits between 1 690 MHz and 1 700 MHz.  
Spa2

*After Regulation No. 470N, add the following new Regulations:*

ADD 470NA a) The power flux density at the Earth's surface produced by emissions from a space station or reflected from a passive satellite for all conditions and for all methods of modulation shall not exceed  $-133$  dBW/m<sup>2</sup> in any 1.5 MHz band. This limit relates to the power flux density which would be obtained under assumed free-space propagation conditions.  
Spa2

ADD 470NB b) The limit given in No. 470NA applies in the frequency band listed in No. 470NC which is allocated to transmission by space stations in the earth exploration-satellite service and in particular the meteorological-satellite service where this band is shared with equal rights with the meteorological aids service.  
Spa2

ADD 470NC 1 690 - 1 700 MHz  
Spa2

ADD **470ND** (2) Power flux density limits between 1 670 MHz and 2 535  
Spa2 MHz.

ADD **470NE** a) The power flux density at the Earth's surface produced  
Spa2 by emissions from a space station or reflected from a passive satellite for all conditions and for all methods of modulation shall not exceed the following values:

— 154 dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

—  $154 + \frac{\delta - 5}{2}$  dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival  $\delta$  (in degrees) between 5 and 25 degrees above the horizontal plane;

— 144 dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These limits relate to the power flux density which would be obtained under assumed free-space propagation conditions.

ADD **470NF** b) The limits given in No. **470NE** apply in the frequency  
Spa2 bands listed in No. **470NG** which are allocated to transmission by space stations in the following space radiocommunication services:

— Earth exploration-satellite service and in particular meteorological-satellite service (space-to-Earth)

— space research service (space-to-Earth)

— fixed-satellite service (space-to-Earth)

where these bands are shared with equal rights with the fixed or mobile service:

ADD 470NG 1 670 - 1 690 MHz  
 Spa2 1 690 - 1 700 MHz (for the countries mentioned in No. 354A)  
 1 700 - 1 710 MHz  
 1 770 - 1 790 MHz (for the countries mentioned in No. 356AA)  
 2 200 - 2 290 MHz  
 2 290 - 2 300 MHz  
 2 500 - 2 535 MHz

ADD 470NGA c) The power flux density values given in No. 470NE are  
 Spa2 derived on the basis of protecting the fixed service using line-of-sight techniques. Where a fixed service using tropospheric scatter operates in the bands listed in No. 470NG and where there is insufficient frequency separation, there must be sufficient angular separation between the direction to the space station and the direction of maximum radiation of the antenna of the receiving station of the fixed service using tropospheric scatter to ensure that the interference power at the receiver input of the station of the fixed service does not exceed  $-168$  dBW in any 4 kHz band.

ADD 470NH (3) Power flux density limits between 2 500 MHz and  
 Spa2 2 690 MHz.

ADD 470NI a) The power flux density at the Earth's surface produced  
 Spa2 by emissions from a space station in the broadcasting-satellite service for all conditions and for all methods of modulation shall not exceed the following values:  
 $-152$  dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

—  $152 + \frac{3(\delta - 5)}{4}$  dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival  $\delta$  (in degrees) between 5 and 25 degrees above the horizontal plane;

— 137 dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These limits relate to the power flux density which would be obtained under assumed free-space propagation conditions.

- ADD 470NJ  
Spa2      b) The limits given in No. 470NI apply in the frequency band:
- 2 500 - 2 690 MHz
- which is shared by the broadcasting-satellite service with the fixed or mobile service.
- ADD 470NK  
Spa2      c) The power flux density values given in No. 470NI are derived on the basis of protecting the fixed service using line-of-sight techniques. Where a fixed service using tropospheric scatter operates in the band mentioned in No. 470NJ and where there is insufficient frequency separation, there must be sufficient angular separation between the direction to the space station and the direction of maximum radiation of the antenna of the receiving station of the fixed service using tropospheric scatter to ensure that the interference power at the receiver input of the station of the fixed service does not exceed —168 dBW in any 4 kHz band.
- ADD 470NL      (4) Power flux density limits between 3 400 MHz and 7 750  
Spa2      MHz.
- ADD 470NM      a) The power flux density at the Earth's surface produced  
Spa2      by emissions from a space station or reflected from a

passive satellite for all conditions and for all methods of modulation shall not exceed the following values:

— 152 dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

—  $152 + \frac{\delta - 5}{2}$  dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival  $\delta$  (in degrees) between 5 and 25 degrees above the horizontal plane;

— 142 dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These limits relate to the power flux density which would be obtained under assumed free-space propagation conditions.

ADD 470NN  
Spa2

b) The limits given in No. 470NM apply in the frequency bands listed in No. 470NO which are allocated to transmission by space stations in the following space radiocommunication services:

— fixed-satellite service (space-to-Earth)

— meteorological-satellite service (space-to-Earth)

where these bands are shared with equal rights with the fixed or mobile service:

ADD 470NO  
Spa2

3 400 - 4 200 MHz

7 250 - 7 300 MHz (for the countries mentioned in No. 392G)

7 300 - 7 750 MHz

ADD 470NP (5) Power flux density limits between 8 025 MHz and 11.7 GHz.  
Spa2

ADD 470NQ a) The power flux density at the Earth's surface, produced by emissions from a space station, or reflected from a passive satellite for all conditions and for all methods of modulation shall not exceed the following values:  
Spa2

—150 dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

—150 +  $\frac{\delta - 5}{2}$  dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival  $\delta$  (in degrees) between 5 and 25 degrees above the horizontal plane;

—140 dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These limits relate to the power flux density which would be obtained under assumed free-space propagation conditions.

ADD 470NR b) The limits given in No. 470NQ apply in the frequency bands listed in No. 470NS which are allocated to transmission by space stations in the following space radiocommunication services:  
Spa2

- earth exploration-satellite service (space-to-Earth)
- space research service (space-to-Earth)
- fixed-satellite service (space-to-Earth)

where these bands are shared with equal rights with the fixed or mobile service:

- |     |               |   |
|-----|---------------|---|
| ADD | 470NS<br>Spa2 | 8 025 - 8 400 MHz<br>8 400 - 8 500 MHz<br>10.95 - 11.20 GHz<br>11.45 - 11.70 GHz  |
| ADD | 470NT<br>Spa2 | (6) Power flux density limits between 12.50 GHz and 12.75 GHz.  |
| ADD | 470NU<br>Spa2 | <p>a) The power flux density at the Earth's surface, produced by emissions from a space station or reflected from a passive satellite for all conditions and for all methods of modulation shall not exceed the following values:</p> <p style="padding-left: 40px;">—148 dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;</p> <p style="padding-left: 40px;">—148 + <math>\frac{\delta - 5}{2}</math> dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival <math>\delta</math> (in degrees) between 5 and 25 degrees above the horizontal plane;</p> <p style="padding-left: 40px;">—138 dBW/m<sup>2</sup> in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.</p> <p style="padding-left: 40px;">These limits relate to the power flux density which would be obtained under assumed free-space propagation conditions.</p> |
| ADD | 470NV<br>Spa2 | b) The limits given in No. 470NU apply in the frequency band indicated in No. 470NW which is allocated to the fixed-satellite service for transmission by space stations where this band is shared with equal rights with the fixed or mobile service:  |
| ADD | 470NW<br>Spa2 | 12.50 - 12.75 GHz (Region 3 and for the countries mentioned in No. 405BD)   |

ADD 470NX (7) Power flux density limits between 17.7 GHz and 22.0 GHz.  
Spa2

ADD 470NY a) The power flux density at the Earth's surface produced by emissions from a space station or reflected from a passive satellite for all conditions and for all methods of modulation shall not exceed the following values:

— 115 dBW/m<sup>2</sup> in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

—  $115 + \frac{\delta - 5}{2}$  dBW/m<sup>2</sup> in any 1 MHz band for angles of arrival  $\delta$  (in degrees) between 5 and 25 degrees above the horizontal plane;

— 105 dBW/m<sup>2</sup> in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These limits relate to the power flux density which would be obtained under assumed free-space propagation conditions.

ADD 470NZ b) The limits given in No. 470NY apply in the frequency bands listed in No. 470NZA which are allocated to transmission by space stations in the following space radiocommunication services:

— fixed-satellite service (space-to-Earth)

— earth exploration-satellite service (space-to-Earth)

where these bands are shared with equal rights with the fixed or mobile service:

ADD 470NZA	17.7 - 19.7 GHz
Spa2	21.2 - 22.0 GHz

ADD 470NZB (8) The limits given in Nos. 470NA, 470NE, 470NI,  
Spa2 470NM, 470NQ, 470NU and 470NY may be exceeded on the territory  
of any country the administration of which has so agreed.

*Delete Regulations No. 470O to 470U.*

*Delete note <sup>1</sup> on the foot of page 140 (Radio Regulations—1968 edition).*

*Replace Section IX by the following new text:*

MOD Spa2                    **Section IX. Space Radiocommunication Services**

*Cessation of Emissions*

MOD 470V § 24. Space stations shall be fitted with devices to ensure im-  
Spa2 mediate cessation of their radio emissions by telecommand, whenever  
such cessation is required under the provisions of these Regulations.

ADD Spa2 *Control of Interference between Geostationary-Satellite Systems  
and non-synchronous inclined Orbit-Satellite Systems*

ADD 470VA § 25. Non-geostationary space stations in the fixed-satellite  
Spa2 service shall cease or reduce to a negligible level radio emissions,  
and their associated earth stations shall not transmit to them whenever  
there is insufficient angular separation between the non-geostationary  
satellite and geostationary satellites and unacceptable interference <sup>1</sup>  
to geostationary satellite space systems operating in accordance  
with these Regulations.

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ADD 470VA.1 <sup>1</sup> The level of unacceptable interference shall be fixed by agreement between  
Spa2 the administrations concerned, using the relevant C.C.I.R. Recommendations as  
a guide.

ADD Spa2 *Station Keeping of Space Stations*<sup>1</sup>

ADD 470VB § 26. Space stations on geostationary satellites:  
Spa2

ADD 470VC — shall have the capability of maintaining their positions  
Spa2 within  $\pm 1$  degree of the longitude of their nominal positions, but efforts should be made to achieve a capability of maintaining their positions at least within  $\pm 0.5$  degree of the longitude of their nominal positions;

ADD 470VD — shall maintain their positions within  $\pm 1$  degree of lon-  
Spa2 gitude of their nominal positions irrespective of the cause of variation; but

ADD 470VE — need not comply with No. 470VD as long as the satellite  
Spa2 network to which the space station belongs does not produce an unacceptable level of interference<sup>2</sup> into any other satellite network whose space station complies with the limits given in No. 470VD.

ADD Spa2 *Pointing Accuracy of Antennae on Geostationary Satellites*

ADD 470VF § 27. The pointing direction of maximum radiation of any earth-  
Spa2 ward beam of antennae on geostationary satellites shall be capable of being maintained within:

10% of the half power beamwidth relative to the nominal pointing direction, or

0.5 degree relative to the nominal pointing direction,

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ADD Spa2 <sup>1</sup> In the case of space stations on geosynchronous satellites with orbits having an angle of inclination greater than 5 degrees the positional tolerance shall relate to the nodal point.

ADD 470VE.1 <sup>2</sup> The level of unacceptable interference shall be fixed by agreement between  
Spa2 the administrations concerned, using the relevant C.C.I.R. Recommendations as a guide.

whichever is greater. This provision applies only when such a beam is intended for less than global coverage.

In the event that the beam is not rotationally symmetrical about the axis of maximum radiation, the tolerance in any plane containing this axis shall be related to the half power beamwidth in that plane.

This accuracy shall be maintained only if it is required to avoid unacceptable interference<sup>1</sup> to other systems.

**ADD Spa2** *Power Flux Density at the Geostationary Satellite Orbit*

**ADD 470VG§ 28.** In the frequency band 8 025 to 8 400 MHz, which the Earth  
**Spa2** exploration-satellite service using non-geostationary satellites shares with the fixed-satellite service (Earth-to-space) or the meteorological-satellite service (Earth-to-space), the maximum power flux density produced at the geostationary satellite orbit by any earth exploration-satellite service space station shall not exceed  $-174$  dBW/m<sup>2</sup> in any 4 kHz band.

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**ADD 470VF.1** <sup>1</sup> The level of unacceptable interference shall be fixed by agreement between  
**Spa2** the administrations concerned, using the relevant C.C.I.R. Recommendations as a guide.

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## ANNEX 6

**Revision of Article 8 of the Radio Regulations**

Article 8 of the Radio Regulations shall be amended as follows:

*Replace Regulation No. 477 by the following new text:*

- MOD 477  
Spa2
- e) the study, on a long-term basis, of the usage of the radio spectrum, with a view to making recommendations for its more effective use;
-

## ANNEX 7

### Revision of Article 9 of the Radio Regulations

Article 9 of the Radio Regulations shall be amended as follows:

*The title of the article as well as the text of footnote<sup>o</sup> shown on page 143 of the Radio Regulations (1968 edition) are replaced by the following new title and notes:*

[OD Spa2 **Notification and Recording in the Master International Frequency Register of Frequency Assignments<sup>1</sup> to Terrestrial Radiocommunication Stations<sup>2</sup>**

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<sup>1</sup> The expression *frequency assignment*, wherever it appears in this Article, shall be understood to refer either to a new frequency assignment or to a change in an assignment already recorded in the Master International Frequency Register (hereinafter called *Master Register*).

<sup>2</sup> For the notification and recording in the Master International Frequency Register of frequency assignments to radio astronomy and space radiocommunication stations, see Article 9A.

**Section I. Notification of Frequency Assignments and Co-ordination  
Procedure to be Applied in Appropriate Cases**

*Delete Regulation No. 486.1.*

*Replace Regulations Nos. 486, 486.2, 486.3 and  
486.4 by the following new texts:*

- (MOD) 486 § 1. (1) Any frequency assignment<sup>1</sup> to a fixed, land, broadcasting<sup>2</sup>,  
Spa2 radionavigation land, radiolocation land or standard frequency  
station, or to a ground-based station in the meteorological aids  
service, shall be notified to the International Frequency Registra-  
tion Board:
- a) if the use of the frequency concerned is capable of causing harmful interference to any service of another administration<sup>3</sup>; or
  - b) if the frequency is to be used for international radio-communication; or
  - c) if it is desired to obtain international recognition of the use of the frequency<sup>3</sup>.

.....

[(MOD) 487 only concerns the French text]

- .....
- (MOD) 486.1 <sup>1</sup> In the case where a frequency is used by numerous stations under the juris-  
Spa2 diction of the same administration, see Appendix 1 (Section E, II, Column 5a, paragraphs 2c and 2d).
- (MOD) 486.2 <sup>2</sup> With respect to assignments to broadcasting stations in the bands allocated  
Spa2 exclusively to the broadcasting service between 5 950 kHz and 26 100 kHz, see Article 10.
- MOD 486.3 <sup>3</sup> The attention of administrations is specifically drawn to the application of the  
Spa2 provisions of Nos. 486 a) and 486 c) in those cases where they make a frequency assignment to a terrestrial station, located within co-ordination area of an earth station (see No. 492A), in a band which terrestrial radiocommunication services share with equal rights with space radiocommunication services in the frequency spectrum above 1 GHz.

*Replace Regulations Nos. 490, 491, 492, 492A, 492A.1, 492B, 492B.1, 492C, 492D, 492E and 492F by the following new texts:*

- MOD 490** (2) When stations of the same service, such as the land mobile  
**Spa2** service, use a band of frequencies above 28 000 kHz in a specific area or areas, an individual notice should be drawn up, as prescribed in Section C of Appendix 1, which specifies the basic characteristics to be furnished, for each frequency on which there are assignments within the band; however, the particulars should relate only to a typical station. This does not apply to broadcasting stations or to other terrestrial stations to which the provisions of Sub-Section IIB of this article apply or to other stations of the fixed or mobile service which operate in frequency bands listed in Table II of Appendix 28 with equivalent isotropically radiated power exceeding the corresponding values listed in the table.
- MOD 491** § 3. (1) Whenever practicable, each notice should reach the Board  
**Spa2** before the date on which the assignment is brought into use. It must reach the Board not earlier than ninety days before the date on which it is to be brought into use, but in any case not later than thirty days after the date it is actually brought into use. However, for a frequency assignment to one of the terrestrial stations mentioned in Sub-Section IIB of this article or in No. 639A Q, the notice must reach the Board not earlier than three years and not later than ninety days before the date on which the assignment is to be brought into use.
- MOD 492** (2) Any frequency assignment, the notice of which reaches the  
**Spa2** Board more than thirty days after the notified date of bringing into use, or in the case of a terrestrial station mentioned in Sub-Section IIB of this article, any frequency assignment, the notice of which

reaches the Board less than ninety days 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 No. 491.

- MOD 492A § 3A. (1) Before an administration notifies to the Board, or brings  
Spa2 into use any frequency assignment to a terrestrial station <sup>1</sup> for transmitting in a band allocated with equal rights to terrestrial radio-communication services and space radiocommunication services (space-to-Earth) in the frequency spectrum above 1 GHz, it shall initiate co-ordination of the proposed assignment with the administration responsible for the receiving earth station concerned if the assignment is for use within the co-ordination area of an existing receiving earth station or of one for which the co-ordination procedure referred to in No. 639AN has been initiated. For the purpose of effecting co-ordination, it shall send to any other such administration, 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 pertinent details of the proposed frequency assignment, and the approximate date on which it is planned to bring the station into use.
- MOD 492B (2) An administration with which co-ordination is sought  
Spa2 under No. 492A shall acknowledge receipt of the co-ordination data immediately by telegram. If no acknowledgement is received within
- MOD 492A.1 <sup>1</sup> Appendix 28 contains criteria relating only to co-ordination between earth  
Spa2 stations and stations in the fixed or the mobile service. Until the C.C.I.R., in accordance with Recommendation No. Spa2-9 provides criteria for other terrestrial radiocommunication services, the criteria to be used in effecting co-ordination between earth stations and terrestrial stations other than those of the fixed or the mobile service, shall be agreed between the administrations concerned.

fifteen days of dispatch, the administration seeking co-ordination may dispatch a telegram requesting acknowledgement of receipt of the co-ordination data, to which the receiving administration shall reply. Upon receipt of the co-ordination data an administration shall promptly examine the matter with regard to interference<sup>1</sup> which would be caused to the services rendered by its earth stations operating in accordance with the Convention and these Regulations, or to be so operated within the next three years, with the proviso that in this latter case co-ordination specified in No. 639AN has been effected or that the co-ordination procedure has already been initiated; and shall, within an overall period of sixty days from dispatch of the co-ordination data, either notify the administration requesting co-ordination of its agreement to the proposals 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.

MOD 492C (3) No co-ordination under No. 492A is required when an  
Spa2 administration proposes:

- a) to bring into use a terrestrial station which is located, in relation to an earth station, outside the co-ordination area; or
- b) to change the characteristics of an existing assignment in such a way as not to increase the level of interference to the earth stations of other administrations.

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ADD 492B.1 <sup>1</sup> The criteria to be employed in evaluating interference levels shall be based  
Spa2 upon relevant C.C.I.R. Recommendations or, in the absence of such Recommendations, shall be agreed between the administrations concerned.

- MOD 492D (4) An administration seeking co-ordination may request the  
Spa2 Board to endeavour to effect co-ordination, in those cases where:
- a) an administration with which co-ordination is sought under No. 492A fails to acknowledge receipt under No. 492B within thirty days of dispatch of the co-ordination data;
  - b) an administration which has acknowledged receipt under No. 492B but fails to give a decision within ninety days of dispatch of the co-ordination data;
  - c) there is disagreement between the administration seeking co-ordination and an administration with which co-ordination is sought as to the acceptable level of interference; or
  - d) co-ordination 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 co-ordination.

- MOD 492E (5) Either the administration seeking co-ordination or an  
Spa2 administration with which co-ordination is sought, or the Board, may request additional information which they may require to assess the level of interference to the services concerned.
- MOD 492F (6) Where the Board receives a request under No. 492D a),  
Spa2 it shall forthwith send a telegram to the administration concerned requesting immediate acknowledgement.

*After Regulation No. 492F, add the following new Regulations:*

- ADD 492FA** (7) Where the Board receives an acknowledgement following  
**Spa2** its action under No. 492F, or where the Board receives a request under No. 492D b), it shall forthwith send a telegram to the administration concerned requesting an early decision in the matter.
- ADD 492FB** (8) Where the Board receives a request under No. 492D d),  
**Spa2** it shall endeavour to effect co-ordination in accordance with the provisions of No. 492A. Where the Board receives no acknowledgement of its request for co-ordination within the period specified in No. 492B, it shall act in accordance with No. 492F.
- ADD 492FC** (9) Where an administration fails to reply within thirty days  
**Spa2** of dispatch of the Board's telegram sent under No. 492F requesting an acknowledgement, or fails to give a decision in the matter within sixty days of dispatch of the Board's telegram of request sent under No. 492FA, it shall be deemed that the administration with which co-ordination was sought has undertaken that no complaint will be made in respect of any harmful interference which may be caused by the terrestrial station being co-ordinated to the service rendered by its earth station.

*Replace Regulation No. 492G by the following new text:*

- MOD 492G** (10) Where necessary, as part of the procedure under No. 492D,  
**Spa2** the Board shall assess the level of interference. In any case, the Board shall inform the administrations concerned of the results obtained.

*After Regulation No. 492G, add the following new Regulations:*

- ADD 492GA** (11) In the event of continuing disagreement between one administration seeking to effect co-ordination and one with which co-ordination has been sought, provided that the assistance of the Board has been requested, the administration seeking co-ordination may, after sixty days from the date of the request for the assistance of the Board, taking into consideration the provisions of No. 491, send its notice concerning the proposed assignment to the Board.
- ADD 492GB § 3B.** Where the Board receives information from an administration in accordance with the provisions of No. 639AQ in reply to a request for co-ordination for an earth station, it shall consider as notifications under this Section, only that information relating to assignments to existing terrestrial stations or to those to be brought into use within the time limits defined in No. 491. Such notifications shall be examined by the Board with respect to the provisions of Nos. 570AB and 570AD, as appropriate, and shall be treated accordingly.

*Replace No. 493 by the following new text:*

- (MOD) 493** § 3C. (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 those appropriate basic characteristics specified in Appendix 1.

*Replace the title of Sub-Section IIA by the following new title:*

- MOD Spa2** **Sub-Section IIA. Procedure to be followed in cases not covered by Sub-Section IIB of this Article**

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[(MOD) 501 only concerns the French and the Spanish texts]

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*Replace the title of Sub-Section IIB by the following new title:*

**MOD Spa2 Sub-Section IIB. Procedure to be followed in cases where terrestrial stations are in the same frequency band as, and within the co-ordination area of, an existing earth station or one for which co-ordination has been effected or initiated**

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[(MOD) 570AB only concerns the French and the Spanish texts]

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*Replace Regulation No. 570AD by the following new text:*

**(MOD) 570AD Spa2** c) where appropriate, with respect to the probability of harmful interference to the service rendered by an earth receiving station for which a frequency assignment already recorded in the Master Register is in conformity with the provisions of No. 639BM, and if the corresponding frequency assignment to the space trans-

mitting station has not, in fact, caused harmful interference to any frequency assignment in conformity with No. 501 or 570AB, as appropriate, previously recorded in the Master Register.

*Replace Regulation No. 570AG by the following new text:*

**MOD 570AG** (2) Where the notice includes a specific reference to the fact that  
**Spa2** the station will be operated in accordance with the provisions of No. 115, it shall be examined immediately with respect to Nos. 570AC and 570AD.

*After Regulation No. 570AG, add the following new Regulations:*

**ADD 570AGA** (3) If the finding is favourable with respect to No. 570AC or  
**Spa2 570AD**, 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.

**ADD 570AGB** (4) If the finding is unfavourable with respect to No. 570AC or  
**Spa2 570AD**, as appropriate, the notice shall be returned immediately by airmail to the notifying administration with the reasons of the Board for this finding. Should the administration insist upon reconsideration of the notice, the assignment shall be recorded in the Master Register. However, this entry shall be made only if the notifying administration informs the Board that the assignment has been in use for at least one hundred and twenty days without any complaint of harmful interference having been received. 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 advice that no complaint of harmful interference has been received shall be indicated in the Remarks Column.

**ADD 570AGC** (5) The period of one hundred and twenty days mentioned in **Spa2** Nos. 570AGB and 570AX shall count:

- from the date when the assignment to the terrestrial station which received an unfavourable finding is brought into use, if the assignment to the earth station is then in use;
- otherwise, from the date when the assignment to the earth station is brought into use.

But if the assignment to the earth station has not been brought into use by the notified date, the period of one hundred and twenty days shall be counted from that date. Allowance, if necessary, may be made for the additional period mentioned in No. 570BF.

*Replace Regulations Nos. 570AH to 570AK by the following new texts:*

- (MOD) **570AH** (6) Where the notice does not include a specific reference to **Spa2** the fact that the station will be operated in accordance with the provisions of No. 115, 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.
- (MOD) **570AI** (7) If the notifying administration resubmits the notice un-  
**Spa2** changed, it shall be treated in accordance with the provisions of No. 570AH.
- MOD **570AJ** (8) If the notifying administration resubmits the notice with a  
**Spa2** specific reference to the fact that the station will be operated in accordance with the provisions of No. 115, it shall be treated in accordance with the provisions of Nos. 570AG and 570AGA or No. 570AGB, as appropriate.

**(MOD) 570AK** (9) If the notifying administration resubmits the notice with <sup>Spa2</sup> modifications which, after re-examination, result in a favourable finding by the Board with respect to No. **570AB**, the notice shall be treated under the provisions of Nos. **570AL** to **570AX**. 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.

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**[(MOD) 570AM, (MOD) 570AN, (MOD) 570AO and (MOD) 570AP  
only concerns the Spanish text]**

[(MOD) 570AV *only concerns the Spanish text*]

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*Replace Regulation No. 570AX by the following new text:*

**MOD 570AX** (4) Should the notifying administration resubmit the notice, **Spa2** either unchanged, or with modifications which decrease the probability of harmful interference, but not sufficiently to permit the provisions of No. 570AW to be applied, and should that administration insist upon reconsideration of the notice, but should the Board's finding remain unchanged, the assignment shall be recorded in the Master Register. However, this entry shall be made only if the notifying administration informs the Board that the assignment has been in use for at least one hundred and twenty days without any complaint of harmful interference having been received. 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 advice that no complaint of harmful interference has been received shall be indicated in the Remarks Column. The period of one hundred and twenty days shall count from the date indicated in No. 570AGC.

*Delete Regulation No. 570AY.*

*Replace Regulation No. 570BA by the following new text:*

- MOD 570BA** (2) A notice of a change in the basic characteristics of an assignment already recorded, as specified in Appendix 1 (except those entered in Columns 3 and 4a of the Master Register), shall be examined by the Board according to Nos. **570AB** and **570AC** and, where appropriate, No. **570AD**, and the provisions of Nos. **570AF** to **570AX** inclusive applied. Where the change should be recorded, the original assignment shall be amended according to the notice.

*Replace Regulation No. 570BC by the following new text:*

- (MOD) 570BC § 23H.** In applying the provisions of this Sub-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.

*Replace Regulations Nos. 570BF, 570BG and 570BH by the following new texts:*

- (MOD) 570BF** (3) If, within the period of thirty days after the projected date of bringing into use, the Board receives confirmation from the notifying administration of the date of bringing into use, the special symbol shall be deleted from the Remarks Column. In the case where the Board, in the light of a request from the notifying administration received before the end of the thirty-day period, finds that exceptional circumstances warrant an extension of this period, the extension shall in no case exceed one hundred and fifty days.

**MOD 570BG** (4) In the circumstances described in No. **570AX**, and as long as  
**Spa2** an assignment which received an unfavourable finding cannot be re-submitted as a consequence of the provisions of No. **570AGC**, the notifying administration may ask the Board to enter the assignment provisionally in the Master Register, in which event a special symbol to denote the provisional nature of the entry shall be entered in the Remarks Column. The Board shall delete this symbol when it receives from the notifying administration, at the end of the period specified in No. **570AX**, the information relating to the absence of complaint of harmful interference.

**MOD 570BH** (5) If the Board does not receive this confirmation within the  
**Spa2** period referred to in No. **570BF** or at the end of the period referred to in No. **570BG**, as appropriate, the entry concerned shall be cancelled. The Board shall advise the notifying administration before taking such action.

*Replace Regulation No. 611A by the following new text:*

**(MOD) 611A** (6) If harmful interference to the reception of any station whose  
**Spa2** assignment is in accordance with No. **639BM** is actually caused by the use of a frequency assignment which is not in conformity with No. **501** or **570AB**, the station using the latter frequency assignment must, upon receipt of advice thereof, immediately eliminate this harmful interference.

**Section VIII. Miscellaneous Provisions**

*After Regulation No. 635, add the following new Regulations:*

- ADD 635A** § 47A. (1) If it is requested by any administration, particularly by an  
**Spa2** administration of a country in need of special assistance, and if the circumstances appear to warrant, the Board using such means at its disposal as are appropriate in the circumstances, shall render the following assistance:
- a) verification of the diagram showing the co-ordination area referred to in No. 639AN;
  - b) computation of the interference level, as referred to in No. 492B;
  - c) any other assistance of a technical nature for completion of the procedures in this Article.
- ADD 635B** (2) In making a request to the Board under No. 635A, the admi-  
**Spa2** nistration shall furnish the Board with the necessary information.
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# ANNEX 8

## Revision of Article 9A of the Radio Regulations

Article 9A of the Radio Regulations shall be amended as follows:

*The entire Article 9A is replaced by the following new text:*

MOD Spa2

### ARTICLE 9A

#### **Co-ordination, Notification and Recording in the Master International Frequency Register of Frequency Assignments<sup>1</sup> to Radio Astronomy and Space Radiocommunication Stations except Stations in the Broadcasting-Satellite Service**

##### **Section I. Procedure for the Advance Publication of Information on Planned Satellite Systems**

**639AA § 1. (1)** An administration (or one acting on behalf of a group of named administrations) which intends to establish a satellite system shall, prior to the co-ordination procedure in accordance with No. 639AJ where applicable, send to the International Frequency Registration Board not earlier than five years before the date of bringing into service each satellite network of the planned system, the information listed in Appendix 1B.

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<sup>1</sup> The expression *frequency assignment*, wherever it appears in this Article, shall be understood to refer either to a new frequency assignment or to a change in an assignment already recorded in the Master International Frequency Register (hereinafter called *Master Register*).

136

ANN 8 (ART 9A)

**639AB** (2) Any amendments to the information sent concerning a  
**Spa2** planned satellite system in accordance with No. **639AA** shall also be  
sent to the Board as soon as they become available.

**639AC** (3) The Board shall publish the information sent under  
**Spa2** Nos. **639AA** and **639AB** in a special section of its weekly circular and  
shall also, when the weekly circular contains such information, so  
advise all administrations by circular telegram.

**639AD** (4) If, after studying the information published under  
**Spa2** No. **639AC**, any administration is of the opinion that interference,  
which may be unacceptable, may be caused to its existing or planned  
space radiocommunication services, it shall within ninety days after  
the date of the weekly circular publishing the information listed in  
Appendix 1B, send its comments to the administration concerned.  
A copy of these comments shall also be sent to the Board. If no such  
comments are received from an administration within the period  
mentioned above, it may be assumed that that administration has no  
basic objections to the planned satellite network(s) of that system  
on which details have been published.

**639AE** (5) An administration receiving comments sent in accordance  
**Spa2** with No. **639AD** shall endeavour to resolve any difficulties that may  
arise.

**639AF** (6) In case of difficulties arising when any planned satellite  
**Spa2** network of a system is intended to use the geostationary satellite  
orbit:

- a) the administration responsible for the planned system shall first explore all possible means of meeting its requirements, taking into account the characteristics of the geostationary satellite networks of other systems, and without considering the possibility of adjustment

to systems of other administrations. If no such means can be found, the administration concerned is then free to apply to other administrations concerned to solve these difficulties;

- b)* an administration receiving a request under *a)* above shall, in consultation with the requesting administration, explore all possible means of meeting the requirements of the requesting administration, for example, by relocating one or more of its own geostationary space stations involved, or by changing the emissions, frequency usage (including changes in frequency bands) or other technical or operational characteristics;
- c)* if after following the procedure outlined in *a)* and *b)* above there are unresolved difficulties, the administrations concerned shall together make every possible effort to resolve these difficulties by means of mutually acceptable adjustments, for example, to geostationary space station locations and to other characteristics of the systems involved in order to provide for the normal operation of both the planned and existing systems.

**639AG** (7) In their attempts to resolve the difficulties mentioned above  
**Spa2** administrations may seek the assistance of the Board.

**639AH** (8) In complying with the provisions of Nos. **639AE** to **639AG**,  
**Spa2** an administration responsible for a planned satellite system shall, if necessary, defer its commencement of the co-ordination procedure, or where this is not applicable, the sending of its notices to the Board, until one hundred and fifty days after the date of the weekly circular containing the information listed in Appendix 1B on the relevant satellite network. However, in respect of those administrations with

whom difficulties have been resolved or who have responded favourably, the co-ordination procedure, where applicable, may be commenced prior to the expiry of the one hundred and fifty days mentioned above.

**639AI** (9) An administration on behalf of which details of planned  
**Spa2** satellite networks in its system have been published, in accordance with the provisions of Nos. 639AA to 639AC, shall periodically inform the Board whether or not comments have been received and of the progress made, with other administrations, in resolving any difficulties. The Board shall publish this information in a special section of its weekly circular and shall also, when the weekly circular contains such information, so inform all administrations by circular telegram.

#### **Section II. Co-ordination Procedures to be applied in appropriate Cases**

**639AJ § 2.** (1) Before an administration notifies to the Board or brings  
**Spa2** into use any frequency assignment to a space station on a geostationary satellite or to an earth station that is to communicate with a space station on a geostationary satellite, it shall effect co-ordination of the assignment with any other administration whose assignment in the same band for a space station on a geostationary satellite or for an earth station that communicates with a space station on a geostationary satellite is recorded in the Master Register, or has been co-ordinated or is being co-ordinated under the provisions of this paragraph. For this purpose, the administration requesting co-ordination shall send to any other such administration the information listed in Appendix 1A.

**639AK** (2) No co-ordination under No. 639AJ is required:  
**Spa2**

- a) when the use of a new frequency assignment will cause, to any service of another administration, an increase in the noise temperature of any space station receiver or earth station receiver, or an increase in the equiv-

alent satellite link noise temperature, as appropriate, not exceeding the predetermined increase of noise temperature calculated in accordance with the method given in Appendix 29; or

- b)* when an administration proposes to change the characteristics of an existing assignment in such a way as will, in respect of any service of another administration, meet the requirements of sub-paragraph *a)* above, or, where this assignment has previously been coordinated, will cause an increase in noise temperature not exceeding the value agreed during co-ordination.

**639AL** (3) An administration initiating the co-ordination procedure referred to in No. **639AJ** shall at the same time send to the Board **Spa2** a copy of the request for co-ordination, with the information listed in Appendix 1A and the name(s) of the administration(s) with which co-ordination is sought. The Board shall publish this information in a special section of its weekly circular, together with a reference to the weekly circular in which details of the satellite system were published in accordance with Section I of this Article. When the weekly circular contains such information, the Board shall so inform all administrations by circular telegram.

**639AM** (4) An administration believing that it should have been **Spa2** included in the co-ordination procedure under No. **639AJ** shall have the right to request that it be brought into the co-ordination procedure.

**639AN**§ 3. (1) Before an administration notifies to the Board or brings **Spa2** into use any frequency assignment to an earth station, whether for transmitting or receiving, in a particular band allocated with equal

rights to space and terrestrial <sup>1</sup> radiocommunication services in the frequency spectrum above 1 GHz, it shall effect co-ordination of the assignment with any other administration whose territory lies wholly or partly within the co-ordination area <sup>2</sup> of the planned earth station. For this purpose it shall send to any other such administration a copy of a diagram drawn to an appropriate scale indicating the location of the earth station and showing the co-ordination areas <sup>2</sup> of the earth station for the cases of transmission and reception by the earth station and the data on which they are based, including all pertinent details of the proposed frequency assignment, as listed in Appendix 1A, and an indication of the approximate date on which it is planned to begin operations.

**639AO** (2) An administration with which co-ordination is sought **Spa2** under No. 639AJ shall acknowledge receipt of the co-ordination data immediately by telegram. If no acknowledgement is received within thirty days after the date of the weekly circular publishing the information under No. 639AL, the administration seeking co-ordination shall dispatch a telegram requesting acknowledgement, to which the receiving administration shall reply within a further period of thirty days. Upon receipt of the co-ordination data, an administration shall, having regard to the proposed date of bringing into use of the assignment for which co-ordination was requested,

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**639AN.1** <sup>1</sup> Appendix 28 contains criteria relating only to co-ordination between **Spa2** earth stations and stations in the fixed or mobile service. Until the C.C.I.R., in accordance with Recommendation No. Spa2-9 provides criteria relating to other terrestrial radiocommunication services, the criteria to be employed in effecting co-ordination between earth stations and terrestrial radiocommunication stations, other than those of the fixed or mobile service, shall be agreed between the administrations concerned.

**639AN.2** <sup>2</sup> Calculated, in relation to the fixed or inobile service, in accordance with **Spa2** the procedures described in Appendix 28.

promptly examine the matter with regard to interference <sup>1</sup> which would be caused to the service rendered by its stations in respect of which co-ordination is sought under No. 639AJ; and shall, within ninety days from the date of the relevant weekly circular, notify the administration requesting co-ordination of its agreement. If the administration with which co-ordination is sought does not agree, it shall, within the same period, send to the administration seeking co-ordination the technical details upon which its disagreement is based, and make such suggestions as it may be able to offer with a view to a satisfactory solution of the problem. A copy of these comments shall also be sent to the Board.

**639AP** (3) An administration with which co-ordination is sought under  
**Spa2** No. 639AN shall acknowledge receipt of the co-ordination data immediately by telegram. If no acknowledgement is received within fifteen days of dispatch of the co-ordination data, the administration seeking co-ordination shall dispatch a telegram requesting acknowledgement, to which the receiving administration shall reply within a further period of fifteen days. Upon receipt of the co-ordination data an administration shall, having regard to the proposed date of bringing into use of the assignment for which co-ordination was requested, promptly examine the matter with regard both to:

- a) interference <sup>2</sup> which would be caused to the service rendered by its terrestrial radiocommunication stations operating in accordance with the Convention and these Regulations, or to be so operated prior to the planned date of bringing the earth station assignment into service, or within the next three years, whichever is the longer; and to

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**639AO.1** <sup>1</sup> The criteria to be employed in evaluating interference levels shall be based  
**Spa2** upon relevant C.C.I.R. Recommendations or, in the absence of such Recommendations, shall be agreed between the administrations concerned.

**639AP.1** <sup>2</sup> The criteria to be employed in evaluating interference levels shall be based  
**Spa2** upon relevant C.C.I.R. Recommendations or, in the absence of such Recommendations, shall be agreed between the administrations concerned.

- b)* interference <sup>1</sup> which would be caused to reception at the earth station by the service rendered by its terrestrial radiocommunication stations operating in accordance with the Convention and these Regulations, or to be so operated prior to the planned date of bringing the earth station assignment into service, or within the next three years, whichever is the longer.

The administration with which co-ordination is sought shall then, within sixty days from dispatch of the co-ordination data, notify the administration requesting co-ordination of its agreement. If the administration with which co-ordination is sought does not agree it shall, within the same period, send to the administration seeking co-ordination a copy of a diagram drawn to an appropriate scale showing the location of its terrestrial radiocommunication stations which are or will be within the co-ordination area of the earth transmitting or receiving station, as appropriate, together with all other relevant basic characteristics, and make such suggestions as it may be able to offer with a view to a satisfactory solution of the problem.

**639AQ** (4) When the administration with which co-ordination is sought  
**Spa2** sends to the administration seeking co-ordination the information mentioned in No. **639AP**, a copy thereof shall also be sent to the Board. The Board shall consider as notifications in accordance with Section I of Article 9, only that information relating to existing terrestrial radiocommunication stations or to those to be brought into use within the next three years.

**639AR** (5) No co-ordination under No. **639AN** is required when an  
**Spa2** administration proposes:

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**639AP.1** <sup>1</sup> The criteria to be employed in evaluating interference levels shall be based  
**Spa2** upon relevant C.C.I.R. Recommendations or, in the absence of such Recommendations, shall be agreed between the administrations concerned.

- a)* to bring into use an earth station, the co-ordination area of which does not include any of the territory of any other country;
- b)* to change the characteristics of an existing assignment in such a way as not to increase the level of interference to or from the terrestrial radiocommunication stations of other administrations;
- c)* to operate a mobile earth station. However, if the co-ordination area associated with the operation of such a mobile earth station, in a frequency band referred to in No. 639AN, includes any of the territory of another country, it shall be subject to prior agreement between the administrations concerned in order to avoid harmful interference to existing terrestrial radiocommunication stations of that country. This agreement shall apply to the characteristics of the mobile earth station(s), or to the characteristics of a typical mobile earth station, and shall apply to a specified service area; unless otherwise stipulated in the agreement, it shall apply to any mobile earth stations in the specified service area provided that the probability of harmful interference caused by them shall not be greater than that caused by the typical earth station.

**639AS § 4. (1)** An administration seeking co-ordination may request the **Spa2** Board to endeavour to effect co-ordination in those cases where:

- a)* an administration with which co-ordination is sought under No. 639AJ fails to acknowledge receipt, under

No. 639AO, within sixty days after the date of the weekly circular publishing the information relating to the request for co-ordination;

- b)* an administration with which co-ordination is sought under No. 639AN fails to acknowledge receipt, under No. 639AP, within thirty days of dispatch of the co-ordination data;
- c)* an administration has acknowledged receipt under No. 639AO, but fails to give a decision within ninety days from the date of the relevant weekly circular;
- d)* an administration has acknowledged receipt under No. 639AP, but fails to give a decision within sixty days from dispatch of the co-ordination data;
- e)* there is disagreement between the administration seeking co-ordination and an administration with which co-ordination is sought as to the acceptable level of interference;
- f)* co-ordination 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 co-ordination.

**639AT** (2) Either the administration seeking co-ordination or an administration with which co-ordination is sought, or the Board, may request additional information which they may require to assess the level of interference to the services concerned.

**639AU** (3) Where the Board receives a request under No. **639AS a)**  
**Spa2** or *b)*, it shall forthwith send a telegram to the administration  
concerned requesting immediate acknowledgement.

**639AV** (4) Where the Board receives an acknowledgement following  
**Spa2** its action under No. **639AU**, or where the Board receives a request  
under No. **639AS c)** or *d)*, it shall forthwith send a telegram to the  
administration concerned requesting an early decision in the matter.

**639AW** (5) Where the Board receives a request under No. **639AS f)**,  
**Spa2** it shall endeavour to effect co-ordination in accordance with the  
provisions of Nos. **639AJ** and **639AN**, as appropriate. The Board  
shall also, where appropriate, act in accordance with No. **639AL**.  
Where the Board receives no acknowledgement to its request for  
co-ordination within the periods specified in No. **639AO** or **639AP**,  
as appropriate, it shall act in accordance with No. **639AU**.

**639AX** (6) Where an administration fails to reply within thirty days  
**Spa2** of dispatch of the Board's telegram requesting an acknowledgement  
sent under No. **639AU**, or fails to give a decision in the matter within  
thirty days of dispatch of the Board's telegram of request under  
No. **639AV**, it shall be deemed that the administration with which co-  
ordination was sought has undertaken:

- a)* that no complaint will be made in respect of any harmful interference which may be caused to the services rendered by its space or terrestrial radiocommunication stations by the use of the assignment for which co-ordination was requested;
- b)* that its space or terrestrial radiocommunication stations will not cause harmful interference to the use

of the assignment for which co-ordination was requested.

**639AY** (7) Where necessary, as part of the procedure under No. **639AS**,  
**Spa2** the Board shall assess the level of interference. In any case, the Board shall inform the administrations concerned of the results obtained.

**639AZ § 5.** In the event of continuing disagreement between one  
**Spa2** administration seeking to effect co-ordination and one with which co-ordination has been sought, provided that the assistance of the Board has been requested, the administration seeking co-ordination may, after one hundred and fifty days from the date of the request for co-ordination, taking into consideration the provisions of No. **639BF**, send its notice concerning the proposed assignment to the Board.

### Section III. Notification of Frequency Assignments

**639BA § 6.** (1) Any frequency assignment to an earth or space station shall  
**Spa2** be notified to the Board:

- a) if the use of the frequency concerned is capable of causing harmful interference to any service of another administration; or
- b) if the frequency is to be used for international radio-communications; or
- c) if it is desired to obtain international recognition of the use of the frequency.

**639BB** (2) Similar notice shall be given for any frequency to be used for  
**Spa2** the reception of transmissions from earth or space stations by a particular space or earth station in each case where one or more of the conditions specified in No. **639BA** are applicable.

**639BC** (3) Similar notice may be given for any frequency or frequency  
**Spa2** band to be used for reception by a particular radio astronomy station, if it is desired that such data should be included in the Master Register.

**639BD** (4) A notice submitted in accordance with No. **639BA** or  
**Spa2** **639BB** and relating to a frequency assignment to mobile earth stations in a satellite system shall include the technical characteristics either of each mobile earth station, or of a typical mobile earth station, and an indication of the service area within which these stations are to be operated.

**639BE** § 7. For any notification under No. **639BA**, **639BB**, **639BC**, or  
**Spa2** **639BD**, an individual notice for each frequency assignment shall be drawn up as prescribed in Appendix 1A, the various Sections of which specify the basic characteristics to be furnished according to the case. It is recommended that the notifying administration should also supply the additional data called for in Section A of that Appendix, together with such further data as it may consider appropriate.

**639BF** § 8. (1) For a frequency assignment to an earth or space station,  
**Spa2** each notice must reach the Board not earlier than three years before the date on which the assignment is to be brought into use. The notice must reach the Board in any case not later than ninety days <sup>1</sup> before this date, except in the case of assignments in the space research service in bands allocated exclusively to this service or in shared bands in which this service is the sole primary service. In the case of such an assignment in the space research service, the notice should, whenever practicable, reach the Board before the date on which the assignment is brought into use, but it must in any case reach the Board not later than thirty days after the date it is actually brought into use.

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**639BF.1** <sup>1</sup> The notifying administration shall take this limit into account when decid-  
**Spa2** ing, where appropriate, to initiate the co-ordination procedure(s).

**639BG** (2) Any frequency assignment to an earth or space station, the  
**Spa2** notice of which reaches the Board after the applicable period specified  
 in No. 639BF, shall, where it is to be recorded, bear a mark in the  
 Master Register to indicate that it is not in conformity with  
 No. 639BF.

**Section IV. Procedure for the Examination of Notices and the Recording  
 of Frequency Assignments in the Master Register**

**639BH § 9.** Any notice which does not contain at least those basic  
**Spa2** characteristics specified in Appendix 1A shall be returned by the  
 Board immediately, by airmail, to the notifying administration with  
 the reasons therefor.

**639BI § 10.** Upon receipt of a complete notice, the Board shall include  
**Spa2** the particulars thereof, with the date of receipt, in the weekly cir-  
 cular referred to in No. 497, which shall contain the particulars of  
 all such notices received since the publication of the previous circular.

**639BJ § 11.** The circular shall constitute the acknowledgement to the  
**Spa2** notifying administration of the receipt of a complete notice.

**639BK § 12.** Complete notices shall be considered by the Board in the  
**Spa2** order of their receipt. The Board shall not postpone the formula-  
 tion of a finding unless it lacks sufficient data to render a decision  
 in connection therewith; 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.

**639BL § 13.** The Board shall examine each notice:  
**Spa2**

**639BM** a) with respect to its conformity with the Convention,  
**Spa2** the Table of Frequency Allocations and the other pro-

visions of the Radio Regulations (with the exception of those relating to the co-ordination procedures and the probability of harmful interference);

**639BN**  
Spa2

*b)* where appropriate, with respect to its conformity with the provisions of No. 639AJ, relating to the co-ordination of the use of the frequency assignment with the other administrations concerned vis-à-vis space radiocommunication stations;

**639BO**  
Spa2

*c)* where appropriate, with respect to its conformity with the provisions of No. 639AN relating to the co-ordination of the use of the frequency assignment with the other administrations concerned vis-à-vis terrestrial radiocommunication stations;

**639BP**  
Spa2

*d)* where appropriate, with respect to the probability of harmful interference to the service rendered by a space radiocommunication station for which a frequency assignment already recorded in the Master Register is in conformity with the provisions of No. 639BM if this frequency assignment has not in fact caused harmful interference to any frequency assignment in conformity with No. 639BM previously recorded in the Master Register;

**639BQ**  
Spa2

*e)* where appropriate, with respect to the probability of harmful interference to the service rendered by a terrestrial radiocommunication station for which a frequency assignment already recorded in the Master Register is in conformity with the provisions of No. 501 or 570AB, as appropriate, if this frequency assignment has not, in fact, caused harmful interference to any frequency assignment in conformity with No. 639BM previously recorded in the Master Register;

**639BR**            *f)* where appropriate, with respect to the probability of  
**Spa2**                harmful interference caused to the receiving earth  
                          station by a terrestrial radiocommunication station for  
                          which a frequency assignment already recorded in the  
                          Master Register is in conformity with No. 501 or  
                          570AB, as appropriate.

**639BS** § 14.    When, following an examination of a notice with respect  
**Spa2**    to No. 639BP, the Board reaches an unfavourable finding based  
           upon the probability of harmful interference to a recorded assign-  
           ment for a space station which the Board has reason to believe may  
           not be in regular use, the Board shall forthwith consult the admini-  
           stration responsible for the registered assignment. If it is estab-  
           lished, after such consultation and on the basis of the information  
           available, that the recorded assignment has not been in use for two  
           years, it shall not be taken into account for the purposes of the  
           examination in progress or any other further examination under  
           No. 639BP conducted before the date on which the assignment is  
           brought back into use. Before the assignment is brought back into  
           use, it shall be subject to further co-ordination in accordance with  
           the provisions of No. 639AJ or further examination by the Board  
           with respect to No. 639BP, as appropriate. The date on which the  
           assignment is brought back into use shall then be entered in the  
           Master Register.

**639BT** § 15.    Depending upon the findings of the Board subsequent to  
**Spa2**    the examination prescribed in Nos. 639BM, 639BN, 639BO, 639BP,  
           639BQ and 639BR, as appropriate, further action shall be as follows:

**639BU** § 16. (1) *Finding favourable with respect to No. 639BM in cases where*  
**Spa2**    *the provisions of Nos. 639BN and 639BO are not applicable.*

**639BV**            (2) The assignment shall be recorded in the Master Register.  
**Spa2**    The date of receipt by the Board of the notice shall be entered in  
           Column 2d.

**639BW** § 17. (1) *Finding unfavourable with respect to No. 639BM.*

**Spa2**

**639BX** (2) Where the notice includes a specific reference to the fact  
**Spa2** that the station will be operated in accordance with the provisions of No. 115, and the finding is favourable with respect to Nos. 639BN, 639BO, 639BP, 639BQ and 639BR, 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.

**639BY** (3) Where the notice includes a specific reference to the fact  
**Spa2** that the station will be operated in accordance with the provisions of No. 115 and the finding is unfavourable with respect to No. 639BN, 639BO, 639BP, 639BQ or 639BR, as appropriate, the notice shall be returned immediately by airmail to the notifying administration with the reasons of the Board for this finding. Should the administration insist upon reconsideration of the notice, the assignment shall be recorded in the Master Register. However, this entry shall be made only if the notifying administration informs the Board that the assignment has been in use for at least one hundred and twenty days without any complaint of harmful interference having been received. 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 advice that no complaint of harmful interference has been received shall be indicated in the Remarks Column.

**639BZ** (4) The period of one hundred and twenty days mentioned in

**Spa2** {Nos. 639BY and 639CP shall count:

- from the date when the assignment to the space radio-communication station which received an unfavourable finding is brought into use, if the assignment to the station which was the basis for the unfavourable finding is then in use;
- otherwise, from the date when the assignment to the station which was the basis for the unfavourable finding is brought into use.

But if the assignment to the station which was the basis for the unfavourable finding has not been brought into use by the notified date, the period of one hundred and twenty days shall be counted from this date. Allowance shall, if necessary, be made for the additional period mentioned in No. 639CY.

**639CA** (5) 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. 115, 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.

**639CB** (6) If the notifying administration resubmits the notice unchanged, it shall be treated in accordance with the provisions of No. 639CA. If it is resubmitted with a specific reference to the fact that the station will be operated in accordance with the provisions of No. 115, it shall be treated in accordance with the provisions of No. 639BX or 639BY, as appropriate. If it is resubmitted with modifications which, after re-examination, result in a favourable finding by the Board with respect to No. 639BM, it shall be treated as a new notice.

**639CC** § 18. (1) *Finding favourable with respect to No. 639BM in cases where the provisions of No. 639BN or 639BO are applicable.*

**639CD** (2) Where the Board finds that the co-ordination procedures mentioned in No. 639BN or 639BO have been successfully completed with all administrations whose space or terrestrial radio-communication stations 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.

**639CE** (3) Where the Board finds that either of the co-ordination  
**Spa2** procedures mentioned in Nos. **639BN** and **639BO** has not been applied, and the notifying administration requests the Board to effect the required co-ordination, the Board shall take appropriate action 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 No. **639CD**. If the Board's efforts are unsuccessful, the notice shall be examined by the Board with respect to the provisions of Nos. **639BP**, **639BQ** and **639BR**, as appropriate.

**639CF** (4) Where the Board finds that either of the co-ordination  
**Spa2** procedures mentioned in Nos. **639BN** and **639BO** has not been applied, and the notifying administration does not request the Board to effect the required co-ordination, 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.

**639CG** (5) Where the notifying administration resubmits the notice  
**Spa2** and the Board finds that the co-ordination procedures mentioned in Nos. **639BN** and **639BO** have been successfully completed with all administrations whose space or terrestrial radiocommunication stations 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 receipt by the Board of the resubmitted notice shall be entered in the Remarks Column.

**639CH** (6) Where the notifying administration resubmits the notice  
**Spa2** with a request that the Board effect the required co-ordination under No. **639AJ** or **639AN**, it shall be treated in accordance with the provisions of No. **639CE**. 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.

**639CI** (7) Where the notifying administration resubmits the notice and  
**Spa2** states it has been unsuccessful in effecting the co-ordination, the Board shall inform the administrations concerned thereof. The notice shall be examined by the Board with respect to the provisions of Nos. 639BP, 639BQ and 639BR, as appropriate. 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.

**639CJ § 19.** (1) *Finding favourable with respect to Nos. 639BM, 639BP, Spa2 639BQ and 639BR, as appropriate.*

**639CK** (2) The assignment shall be recorded in the Master Register.  
**Spa2** The date of receipt by the Board of the notice shall be entered in Column 2d.

**639CL** (3) However, should the examination show that the level of  
**Spa2** the interference noise and the percentage of time during which it is likely to occur have values slightly greater than those used for assessing the probability of harmful interference (extreme propagation conditions, abnormal atmospheric humidity, etc.), a remark shall be included in the Master Register to show that there may be a slight risk of harmful interference and hence additional precautions must be taken in the use of the assignment to avoid harmful interference to assignments already recorded in the Master Register.

**639CM § 20.** (1) *Finding favourable with respect to No. 639BM but un- Spa2 favourable with respect to No. 639BP, 639BQ or 639BR, as appropriate.*

**639CN** (2) The notice shall be returned immediately by airmail to the  
**Spa2** 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.

**639CO** (3) Should the notifying administration resubmit the notice  
**Spa2** with modifications which result, after re-examination, in a favourable finding by the Board with respect to Nos. **639BP**, **639BQ** and **639BR**, as appropriate, 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.

**639CP** (4) Should the notifying administration resubmit the notice,  
**Spa2** either unchanged, or with modifications which decrease the probability of harmful interference, but not sufficiently to permit the provisions of No. **639CO** to be applied, and should that administration insist upon reconsideration of the notice, but should the Board's finding remain unchanged, the assignment shall be recorded in the Master Register. However, this entry shall be made only if the notifying administration informs the Board that the assignment has been in use for at least one hundred and twenty days without any complaint of harmful interference having been received. 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 advice that no complaint of harmful interference has been received shall be indicated in the Remarks Column. The period of one hundred and twenty days shall count from the date indicated in No. **639BZ**.

**639CQ** § 21. (1) *Notices relating to radio astronomy stations.*

**Spa2**

**639CR** (2) A notice relating to a radio astronomy station shall not  
**Spa2** be examined by the Board with respect to Nos. **639BN**, **639BO**, **639BP**, **639BQ** and **639BR**. Whatever the finding, the assignment

shall be recorded in the Master Register with a date in Column 2c. The date of receipt by the Board of the notice shall be recorded in the Remarks Column.

**639CS § 22.** (1) *Change in the basic characteristics of assignments already recorded in the Master Register.*

**639CT** (2) A notice of a change in the basic characteristics of an assignment already recorded, as specified in Appendix 1A (except the name of the station or the name of the locality in which it is situated) shall be examined by the Board according to No. **639BM**, and, where appropriate, Nos. **639BN**, **639BO**, **639BP**, **639BQ** and **639BR**, and the provisions of Nos. **639BU** to **639CR** inclusive shall apply. Where the change should be recorded, the original assignment shall be amended according to the notice.

**639CU** (3) However, in the case of a change in the characteristics of an assignment which is in conformity with No. **639BM**, should the Board reach a favourable finding with respect to Nos. **639BN**, **639BO**, **639BP**, **639BQ** and **639BR**, where appropriate, or find that the changes do not increase the probability of harmful interference to assignments already recorded, the amended assignment shall retain the original date in Column 2d. The date of receipt by the Board of the notice relating to the change shall be entered in the Remarks Column.

**639CV § 23.** 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.

**639CW § 24.** (1) *Recording of frequency assignments notified before being brought into use.*

**639CX** (2) If a frequency assignment notified in advance of bringing  
**Spa2** into use has received a favourable finding by the Board with respect to No. **639BM** and, where appropriate, Nos. **639BN**, **639BO**, **639BP**, **639BQ** and **639BR**, it shall be entered provisionally in the Master Register with a special symbol in the Remarks Column indicating the provisional nature of that entry.

**639CY** (3) If, within thirty days after the projected date of bringing  
**Spa2** into use, the Board receives confirmation from the notifying administration of the date of putting into use, the special symbol shall be deleted from the Remarks Column. In the case where the Board, in the light of a request from the notifying administration received before the end of the thirty-day period, finds that exceptional circumstances warrant an extension of this period, the extension shall in no case exceed one hundred and fifty days.

**639CZ** (4) In the circumstances described in Nos. **639BY** and **639CP**,  
**Spa2** and as long as an assignment which received an unfavourable finding cannot be resubmitted as a consequence of the provisions of No. **639BZ**, the notifying administration may ask the Board to enter the assignment provisionally in the Master Register, in which event a special symbol to denote the provisional nature of the entry shall be entered in the Remarks Column. The Board shall delete this symbol when it receives from the notifying administration, at the end of the period specified in No. **639BY** or **639CP**, as appropriate, the information relating to the absence of complaint of harmful interference.

**639DA** (5) If the Board does not receive this confirmation within the  
**Spa2** period referred to in No. **639CY** or at the end of the period referred to in No. **639BY** or **639CP**, as appropriate, the entry concerned shall be cancelled. The Board shall advise the administration concerned before taking such action.

#### Section V. Recording of Findings in the Master Register

**639DB** § 25. In any case where a frequency assignment is recorded in the  
**Spa2** Master Register, the finding reached by the Board shall be indicated

by a symbol in Column 13a. In addition, a remark indicating the reasons for any unfavourable finding shall be inserted in the Remarks Column.

#### Section VI. Categories of Frequency Assignments

**639DC § 26.** (1) The date in Column 2c shall be the date of putting into use notified by the administration concerned. It is given for information only.

**639DD** (2) If harmful interference is actually caused to the reception of any space radiocommunication station whose frequency assignment has been recorded in the Master Register as a result of a favourable finding with respect to Nos. **639BM**, **639BN**, **639BO**, **639BP**, **639BQ** and **639BR**, as appropriate, by the use of a frequency assignment to a space radiocommunication station subsequently recorded in the Master Register in accordance with the provisions of No. **639CP**, the station using the latter frequency assignment must, upon receipt of advice thereof, immediately eliminate this harmful interference.

**639DE** (3) If harmful interference to the reception of any station whose assignment is in accordance with No. **501**, **570AB** or **639BM**, as appropriate, is actually caused by the use of a frequency assignment which is not in conformity with No. **639BM**, the station using the latter frequency assignment must, upon receipt of advice thereof, immediately eliminate this harmful interference.

#### Section VII. Review of Findings

**639DF § 27.** (1) The review of a finding by the Board may be undertaken:

— at the request of the notifying administration;

- at the request of any other administration interested in the question, but only on the grounds of actual harmful interference;
- on the initiative of the Board itself when it considers this is justified.

**639DG** (2) The Board, in the light of all the data at its disposal shall  
**Spa2** review the matter, taking into account No. 639BM and, where appropriate, Nos. 639BN, 639BO, 639BP, 639BQ and 639BR and shall render an appropriate finding, informing the notifying administration prior either to the promulgation of its finding or to any recording action.

**639DH** § 28. (1) After actual use for a reasonable period of an assignment  
**Spa2** which has been entered in the Master Register on the insistence of the notifying administration, following an unfavourable finding with respect to No. 639BP, 639BQ or 639BR, this administration may request the Board to review the finding. Thereupon, the Board shall review the matter, having first consulted the administrations concerned.

**639DI** (2) If the finding of the Board is then favourable it shall enter  
**Spa2** in the Master Register the changes that are required so that the entry shall appear in the future as if the original finding had been favourable.

**639DJ** (3) If the finding with regard to the probability of harmful  
**Spa2** interference remains unfavourable, no change shall be made in the original entry.

#### **Section VIII. Modification, Cancellation and Review of Entries in the Master Register**

**639DK** § 29. (1) Where the use of a recorded assignment to a space station  
**Spa2** is suspended for a period of eighteen months, the notifying administration shall, within this eighteen-month period, inform the Board

of the date on which such use was suspended and of the date on which the assignment is to be brought back into regular use.

**639DL** (2) Whenever it appears to the Board, whether or not as a  
**Spa2** result of action under No. **639DK**, that a recorded assignment to a space station has not been in regular use for more than eighteen months, the Board shall inquire of the notifying administration as to when the assignment is to be brought back into regular use.

**639DM** (3) If no reply is received within six months of action by the  
**Spa2** Board under No. **639DL**, or if the reply does not confirm that the assignment to a space station is to be brought back into regular use within this six-month limit, a mark shall be applied against the entry in the Master Register. Thereafter, the assignment shall be treated in accordance with No. **639BS** as one which has been established as having been out of regular use for two years.

**639DN** § 30. In case of permanent discontinuance of the use of any  
**Spa2** recorded frequency assignment, the notifying administration shall inform the Board within ninety days of such discontinuance, whereupon the entry shall be removed from the Master Register.

**639DO** § 31. Whenever it appears to the Board from the information  
**Spa2** available that a recorded assignment has not been brought into regular operation in accordance with the notified basic characteristics, or is not being used in accordance with those basic characteristics, the Board shall consult the notifying administration and, subject to its agreement, shall either cancel or suitably modify the entry.

**639DP** § 32. If, in connection with an inquiry by the Board under  
**Spa2** No. **639DO**, the notifying administration has failed to supply the

Board within forty-five days with the necessary or pertinent information, the Board shall make suitable entries in the Remarks Column of the Master Register to indicate the situation.

#### Section IX. Studies and Recommendations

**639DQ § 33.** (1) If it is requested by any administration, and if the circumstances appear to warrant, 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 Regulations, or of harmful interference.

**639DR** (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.

**639DS § 34.** 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 ninety days, 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.

#### Section X. Miscellaneous Provisions

**639DT § 35.** (1) If it is requested by any administration, particularly by an administration of a country in need of special assistance, and if the circumstances appear to warrant, the Board, using such means at its disposal as are appropriate in the circumstances, shall render the following assistance:

- a) computation of the increases in noise temperatures in accordance with No. **639AK**;

- b) preparation of diagrams showing the co-ordination areas as in No. 639AN;
- c) any other assistance of a technical nature for completion of the procedures in this Article.

**639DU** (2) In making a request to the Board under No. 639DT, the  
Spa2 administration shall furnish the Board with the necessary information.

**639DV § 36.** The technical standards of the Board shall be based upon  
Spa2 the relevant provisions of these Regulations and the Appendices thereto, the decisions of Administrative Conferences of the Union, as appropriate, the Recommendations of the C.C.I.R., the state of the radio art and the development of new transmission techniques.

**639DW § 37.** The Board shall promulgate to administrations its findings  
Spa2 and reasons therefor, together with all changes made to the Master Register, through the weekly circular referred to in No. 497.

**639DX § 38.** In case a Member or Associate Member of the Union avails  
Spa2 itself of the provisions of Article 28 of the Convention, the Board shall, upon request, make its records available for such proceedings as are prescribed in the Convention for the settlement of international disputes.

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## ANNEX 9

**Revision of Article 14 of the Radio Regulations**

Article 14 of the Radio Regulations shall be amended as follows:

*Replace Regulation No. 695 by the following new text:*

- MOD 695** § 3. In order to avoid interference:
- Spa2**
- locations of transmitting stations and, where the nature of the service permits, locations of receiving stations shall be selected with particular care;
  - radiation in and reception from unnecessary directions shall be minimized, where the nature of the service permits, by taking the maximum practical advantage of the properties of directional antennae;
  - the choice and use of transmitters and receivers shall be in accordance with the provisions of Article 12;
  - the conditions specified under No. 470V shall be fulfilled.
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## ANNEX 10

### Revision of Article 15 of the Radio Regulations

Article 15 of the Radio Regulations shall be amended as follows:

*Replace Regulation No. 717 by the following new text:*

**MOD 717**           (2) In such a case, the administration concerned may also  
**Spa2** request the Board to act in accordance with the provisions of Sections VII and VIII of Article 9 and Sections IX and X of Article 9A; but it shall then supply the Board with the full facts of the case, including all the technical and operational details and copies of the correspondence.

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## ANNEX 11

**Revision of Article 27 of the Radio Regulations**

Article 27 of the Radio Regulations shall be amended as follows:

*Replace Nos. 951 and 952 by the following new texts:*

**MOD 951** § 3. (1) Stations on board aircraft may communicate with stations  
**Spa2** of the maritime mobile or maritime mobile-satellite services. They shall conform to those provisions of these Regulations which relate to these services.

**MOD 952** (2) For this purpose stations on board aircraft should use the  
**Spa2** frequencies allocated to the maritime mobile or maritime mobile-satellite services. However, having regard to interference which may be caused by aircraft stations at high altitudes, maritime mobile frequencies in the bands above 30 MHz shall not be used by aircraft stations in any specific area without the prior agreement of all the administrations of the area in which interference is likely to be caused. In particular, aircraft stations operating in Region I should not use frequencies in the bands above 30 MHz allocated to the maritime mobile service by virtue of any agreement between administrations in that Region.

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## ANNEX 12

## Revision of Article 41 of the Radio Regulations

Article 41 of the Radio Regulations shall be amended as follows:

*After Regulation No. 1567, add the following new Regulation:*

ADD 1567A § 6. Space stations in the amateur-satellite service operating in  
Spa2 bands shared with other services shall be fitted with appropriate devices for controlling emissions in the event that harmful interference is reported in accordance with the procedure laid down in Article 15. Administrations authorizing such space stations shall inform the I.F.R.B., and shall insure that sufficient earth command stations are established before launch to guarantee that any harmful interference that might be reported can be terminated by the authorizing Administration (see No. 470V).

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## ANNEX 13

### Revision of Appendix 1 to the Radio Regulations

Appendix 1 to the Radio Regulations shall be amended as follows:

#### Section A. Basic Characteristics to be furnished for Notification under No. 486 of the Regulations

*Replace the paragraph "Supplementary information" by the following:*

MOD Spa2 Supplementary information:

- a) reference frequency, if any, and any co-ordination required by No. 492A;
- b) the name of any administration with which an agreement has been effected to exceed the limits prescribed in these Regulations and the contents of such agreement.

#### Section B. Basic Characteristics to be furnished for Notification under No. 487 of the Regulations

*Replace the paragraph "Supplementary information" by the following:*

MOD Spa2 Supplementary information:

- a) any co-ordination required by No. 492A;
- b) the name of any administration with which an agreement has been effected to exceed the limits prescribed in these Regulations and the contents of such agreement.

**Section C. Basic Characteristics to be furnished for Notification  
under No. 490 of the Regulations**

*Replace the paragraph "Supplementary information" by the following:*

**MOD Spa2** Supplementary information:

- a)* any co-ordination required by No. 492A;
  - b)* the name of any administration with which an agreement has been effected to exceed the limits prescribed in these Regulations and the contents of such agreement.
-

## ANNEX 14

### Revision of Appendix 1A to the Radio Regulations

Appendix 1A to the Radio Regulations shall be amended as follows:

*The entire Appendix 1A is replaced by the following new text:*

MOD Spa2

### APPENDIX 1A

#### Notices relating to Space Radiocommunication and Radio Astronomy Stations

(See Article 9A)

##### Section A. General Instructions

1. A separate notice shall be sent to the International Frequency Registration Board for notifying:
  - each new frequency assignment;
  - any change in the characteristics of a frequency assignment recorded in the Master International Frequency Register (hereinafter called the *Master Register*);
  - any total deletion of a frequency assignment recorded in the Master Register.
2. When submitting notices under No. 639BA for earth and space transmitting assignments and under No. 639BB for space and earth receiving assignments, separate notices shall be submitted to the Board for each assignment to an earth or space station. In the case of a passive satellite system, only earth transmitting and receiving assignments shall be notified.
3. In the case of a satellite system employing multiple space stations with the same general characteristics, a separate notice shall be submitted for each space station:

- when it is aboard a geostationary satellite; or
- when it is aboard a non-geostationary satellite except when a number of satellites have the same radio frequency characteristics and orbital characteristics (excluding the ascending node position); in the latter case, one notice covering all such space stations may be submitted.

4. The following basic information shall be shown on the notice:

- a)* the serial number of the notice and the date on which the notice is sent to the Board;
- b)* the name of the notifying administration;
- c)* sufficient data to identify the particular satellite network in which the earth or space station will operate;
- d)* whether the notice reflects:
  - 1) the first use of a frequency by a station;
  - 2) a change in the characteristics of a frequency assignment recorded in the Master Register (indicate whether the change is a replacement, addition or deletion of existing characteristics); or
  - 3) a deletion of an assignment in all of its notified characteristics;
- e)* reference to the I.F.R.B. weekly circular providing the advance publication information required in accordance with No. 639AA;
- f)* basic characteristics as outlined in Section B, C, D, E, or F as appropriate;
- g)* any other information which the administration considers to be relevant, e.g., any factors taken into account when applying Appendix 28 for determination of the co-ordination area and also any indication that the assignment concerned would be operating

in accordance with No. 115, information concerning the use of the notified frequency if such use is restricted, or, in the case of notices pertaining to space stations, if the transmissions of the station are to be permanently switched off after a certain period.

**Section B. Basic Characteristics to be furnished in Notices relating to Frequencies used by earth Stations for Transmitting**

*Item 1* Assigned frequency

Indicate the assigned frequency as defined in Article 1, in kHz up to 30000 kHz inclusive, and in MHz above 30000 kHz (see No. 85).

*Item 2* Assigned frequency band

Indicate the bandwidth of the assigned frequency band in kHz (see No. 89).

*Item 3* Date of bringing into use

*a)* In the case of a new assignment, indicate the date (actual or foreseen, as appropriate) of bringing the frequency assignment into use.

*b)* Whenever the assignment is changed in any of its basic characteristics, as shown in this Section (except in the case of a change in Item 4 *a)*), the date to be given shall be that of the latest change (actual or foreseen, as appropriate).

*Item 4* Identity and location of the transmitting earth station

*a)* Indicate the name by which the station is known or the name of the locality in which it is situated.

*b)* Indicate the country in which the station is located. Symbols from the Preface to the International Frequency List should be used.

*c)* Indicate the geographical co-ordinates (in degrees and minutes) of the transmitter site.

**Item 5** Station(s) with which communication is to be established

Identify the associated receiving space station(s) by reference to the notification thereof or in any other appropriate manner, or, in the case of a passive satellite, the identity of the satellite and the location of the associated receiving earth station(s).

**Item 6** Class of station and nature of service

Indicate the class of station and nature of service performed, using the symbols shown in Appendix 10.

**Item 7** Class of emission, necessary bandwidth and description of transmission

In accordance with Article 2 and Appendix 5:

*a)* indicate the class of emission;

*b)*<sup>1</sup> indicate the carrier frequency or frequencies of the emission(s);

*c)*<sup>1</sup> indicate for each carrier, the class of emission, necessary bandwidth and description of transmission.

**Item 8** Power characteristics of the transmission

*a)*<sup>1</sup> Indicate for each carrier, the peak power supplied to the input of the antenna.

*b)* Indicate the total peak power and the maximum power density per Hz supplied to the input of the antenna averaged over the worst 4 kHz band for carriers below 15 GHz, or averaged over the worst 1 MHz band for carriers above 15 GHz.

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<sup>1</sup> This information need only be furnished when such information has been used as a basis to effect co-ordination with another administration.

*Item 9* Transmitting antenna characteristics

*a)* Indicate the isotropic gain (dB) of the antenna in the direction of maximum radiation (see No. 100).

*b)* Indicate the beamwidth in degrees between the half power points (describe in detail if not symmetrical).

*c)* Either attach the measured radiation diagram of the antenna (taking as a reference the direction of maximum radiation) or indicate the reference radiation diagram to be used for co-ordination.

*d)* Indicate graphically the horizon elevation angle for each azimuth around the earth station.

*e)* Indicate in degrees from the horizontal plane the planned minimum operating angle of elevation of the antenna in the direction of maximum radiation.

*f)* Indicate in degrees, clockwise from true north, the planned range of operating azimuthal angles for the direction of maximum radiation.

*g)*<sup>1</sup> Indicate the type of polarization of the transmitted wave in the direction of maximum radiation; also indicate the sense in the case of circular polarization and the plane in the case of linear polarization.

*h)* Indicate the altitude (metres) of the antenna above mean sea level.

*Item 10*<sup>1</sup> Modulation characteristics

For each carrier, according to the nature of the signal modulating the carrier and the type of modulation, indicate the following characteristics:

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<sup>1</sup> This information need only be furnished when such information has been used as a basis to effect co-ordination with another administration.

- a) carrier frequency modulated by a frequency-division multi-channel telephony baseband (FDM-FM) or by a signal that can be represented by a multichannel telephony baseband: indicate the lowest and highest frequencies of the baseband and the r.m.s. frequency deviation of the test tone as a function of baseband frequency;
- b) carrier frequency modulated by a television signal: indicate the standard of the television signal (including, where appropriate, the standard used for colour), the frequency deviation for the reference frequency of the pre-emphasis characteristic and the pre-emphasis characteristic itself. Also indicate, where applicable, the characteristics of the multiplexing of the video signal with the sound signal(s) or other signals;
- c) carrier phase-shift modulated by a pulse code modulation signal (PCM/PSK): indicate the bit rate and the number of phases;
- d) amplitude modulated carrier (including single sideband): indicate as precisely as possible the nature of the modulating signal and the kind of amplitude modulation used;
- e) for all other types of modulation, provide such particulars as may be useful for an interference study;
- f) for any type of modulation as applicable, indicate the characteristics of energy dispersal.

*Item 11* Maximum hours of operation

Indicate in G.M.T. the maximum hours of operation on the frequency of each carrier.

*Item 12* Co-ordination

Give the name of any administration with which the use of this frequency has been successfully co-ordinated in accordance

with Nos. 639AJ and 639AN and, if appropriate, the name of any administration with which co-ordination has been sought but not effected.

*Item 13* Agreements

Give, if appropriate, the name of any administration with which agreement has been effected to exceed the limits prescribed in these Regulations, and the contents of such agreement.

*Item 14* Operating administration or company

Give the name of the operating administration or company and the postal and telegraphic address of the administration to which communications should be sent on urgent matters regarding interference, quality of emissions and questions referring to the technical operation of stations (see Article 15).

**Section C. Basic Characteristics to be furnished in Notices relating to Frequencies to be received by Earth Stations**

*Item 1* Assigned frequency

Indicate the assigned frequency of the emission to be received, as defined in Article 1, in kHz up to 30 000 kHz inclusive, and in MHz above 30 000 kHz (see No. 85).

*Item 2* Assigned frequency band

Indicate the bandwidth of the assigned frequency band in kHz (see No. 89).

*Item 3* Date of bringing into use

*a)* In the case of a new assignment, indicate the date (actual or foreseen, as appropriate) when reception of the assigned frequency begins.

*b)* Whenever the assignment is changed in any of its basic characteristics, as shown in this Section (except in the case of a change in Item 4 *a)*), the date to be given shall be that of the latest change (actual or foreseen, as appropriate).

*Item 4* Identity and location of the receiving earth station

*a)* Indicate the name by which the receiving earth station is known or the name of the locality in which it is situated.

*b)* Indicate the country in which the receiving earth station is located. Symbols from the Preface to the International Frequency List should be used.

*c)* Indicate the geographical co-ordinates (in degrees and minutes) of the receiver site.

*Item 5* Station(s) with which communication is to be established

Identify the associated transmitting space station(s) by reference to the notification thereof or in any other appropriate manner, or, in the case of a passive satellite, the identity of the satellite and the associated transmitting earth station(s).

*Item 6* Class of station and nature of service

Indicate the class of station and nature of service performed, using the symbols shown in Appendix 10.

*Item 7* Class of emission, necessary bandwidth and description of the transmission to be received

In accordance with Article 2 and Appendix 5:

*a)* indicate the class of emission of the transmission to be received;

- b)* <sup>1</sup> indicate the carrier frequency or frequencies of the transmission to be received;
- c)* <sup>1</sup> indicate, for each carrier to be received, the class of emission, necessary bandwidth and description of the transmission.

*Item 8* Earth station receiving antenna characteristics

*a)* Indicate the isotropic gain (dB) of the antenna in the direction of maximum radiation (see No. 100).

*b)* Indicate the beamwidth in degrees between the half power points (describe in detail if not symmetrical).

*c)* Either attach the measured radiation diagram of the antenna (taking as a reference the direction of maximum radiation) or indicate the reference radiation diagram to be used for co-ordination.

*d)* Indicate graphically the horizon elevation angle for each azimuth around the earth station.

*e)* Indicate in degrees from the horizontal plane the planned minimum operating angle of elevation of the antenna in the direction of maximum radiation.

*f)* Indicate in degrees, clockwise, from True North, the planned range of operating azimuthal angles for the direction of maximum radiation.

*g)* Indicate the altitude (metres) of the antenna above mean sea level.

*Item 9* Noise temperature

Indicate the lowest equivalent satellite link noise temperature in kelvins (see No. 103A) under "quiet sky conditions". This

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<sup>1</sup> This information need only be furnished when such information has been used as a basis to effect co-ordination with another administration.

value shall be indicated for the nominal value of the angle of elevation when the associated transmitting station is aboard a geostationary satellite and, in other cases, for the minimum value of angle of elevation.

*Item 10* Maximum hours of reception

Indicate in G.M.T. the maximum hours of reception of the frequency of each carrier.

*Item 11* Co-ordination

Give the name of any administration with which the use of this frequency has been successfully co-ordinated in accordance with Nos. 639AJ and 639AN and, if appropriate, the name of any administration with which co-ordination has been sought but not effected.

*Item 12* Agreements

Give also, if appropriate, the name of any administration with which agreement has been effected to exceed the limits prescribed in these Regulations, and the contents of such agreement.

*Item 13* Operating administration or company

Give the name of the operating administration or company and the postal and telegraphic addresses of the administration to which communications should be sent on urgent matters regarding interference and questions referring to the technical operation of stations (see Article 15).

**Section D. Basic Characteristics to be furnished in Notices relating to Frequencies used by Space Stations for Transmitting**

*Item 1* Assigned frequency

Indicate the assigned frequency as defined in Article 1, in kHz up to 30 000 kHz inclusive, and in MHz above 30 000 kHz (see

No. 85). At least one separate assignment notice should be made out for each antenna radiation beam.

*Item 2* Assigned frequency band

Indicate the bandwidth of the assigned frequency band in kHz (see No. 89).

*Item 3* Date of bringing into use

*a)* In the case of a new assignment, indicate the date (actual or foreseen, as appropriate) of bringing the frequency assignment into use.

*b)* Whenever the assignment is changed in any of its basic characteristics as shown in this Section (except in the case of a change in Item 4), the date to be given shall be that of the latest change (actual or foreseen, as appropriate).

*Item 4* Identity of the space station(s)

Indicate the identity of the space station(s).

*Item 5* Orbital information

*a)* In the case of a space station aboard a geostationary satellite indicate the nominal geographical longitude on the geostationary satellite orbit and the longitudinal and inclination tolerances. Indicate also:

- 1) the arc of the geostationary satellite orbit over which the space station is visible, at a minimum angle of elevation of  $10^\circ$  at the Earth's surface, from its associated earth stations or service areas; and
- 2) the arc of the geostationary satellite orbit within which the space station could provide the required service to its associated earth stations or service areas; and

- 3) in the event that the arc defined in paragraph 2) above is less than the arc defined in paragraph 1) above, provide the reasons therefor.

*Note:* The arcs specified in 1) and 2) will be indicated by the geographical longitude of the extremes of these arcs on the geostationary satellite orbit.

*b)* In the case of space station(s) aboard non-geostationary satellite(s), indicate the angle of inclination of the orbit, the period, the altitudes in kilometres of the apogee and perigee of the space station(s) and the number of satellites used.

*Item 6* Service area

Indicate the service area or areas on the Earth or the name of the locality and country in which the associated receiving station(s) is (are) located.

*Item 7* Class of station and nature of service

Indicate the class of station and nature of service performed, using the symbols shown in Appendix 10.

*Item 8* Class of emission, necessary bandwidth and description of transmission

In accordance with Article 2 and Appendix 5:

- a)* indicate the class of emission of the transmission;
- b)*<sup>1</sup> indicate the carrier frequency or frequencies of the transmission;
- c)*<sup>1</sup> indicate, for each carrier, the class of emission, necessary bandwidth and description of transmission.

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<sup>1</sup> This information need only be furnished when such information has been used as a basis to effect co-ordination with another administration.

*Item 9* Power characteristics of the transmission

- a)*<sup>1</sup> Indicate for each carrier the peak power supplied to the input of the antenna.
- b)* Indicate the total peak power and the maximum power density per Hz at the input of the antenna averaged over the worst 4 kHz band for carriers below 15 GHz or averaged over the worst 1 MHz band for carriers above 15 GHz.

*Item 10* Space station transmitting antenna characteristics

For each service area:

- a)* in the case of a space station aboard a geostationary satellite, indicate the gain of the space station transmitting antenna by means of gain contours plotted on a map of the Earth's surface. The isotropic gain at each contour which corresponds to a gain of 2, 4, 6, 10 and 20 dB and at 10 dB intervals thereafter as necessary, below the maximum gain, shall be indicated;
- b)* in the case of a space station aboard a non-geostationary satellite, indicate the isotropic gain of the space station transmitting antenna in the main direction of radiation and indicate the antenna radiation pattern in those directions which can intersect with the Earth's surface, taking the gain in the main direction of radiation as a reference;
- c)*<sup>1</sup> indicate the type of polarization of the antenna, the sense in the case of circular polarization, and the plane in the case of linear polarization; also indicate the worst case axial ratio in the half power beam;
- d)* for a geostationary satellite, indicate the pointing accuracy of the antenna.

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<sup>1</sup> This information need only be furnished when such information has been used as a basis to effect co-ordination with another administration.

*Item 11*<sup>1</sup> Modulation characteristics

For each carrier, according to the nature of the signal modulating the carrier and the type of modulation, indicate the following characteristics:

- a) carrier frequency modulated by a frequency-division multi-channel telephony baseband (FDM-FM) or by a signal that can be represented by a multichannel telephony baseband: indicate the lowest and highest frequencies of the baseband and the r.m.s. frequency deviation of the test tone as a function of baseband frequency;
- b) carrier frequency modulated by a television signal: indicate the standard of the television signal (including, where appropriate, the standard used for colour), the frequency deviation for the reference frequency of the pre-emphasis characteristic and the pre-emphasis characteristic itself. Also indicate, where applicable, the characteristics of the multiplexing of the video signal with the sound signal(s) or other signals;
- c) carrier phase-shift-modulated by a pulse code modulation signal (PCM/PSK): indicate the bit rate and the number of phases;
- d) amplitude modulated carrier (including single sideband): indicate as precisely as possible the nature of the modulating signal and the kind of amplitude modulation used;
- e) for all other types of modulation, provide such particulars as may be useful for an interference study;
- f) for any type of modulation as applicable, indicate the characteristics of energy dispersal.

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<sup>1</sup> This information need only be furnished when such information has been used as a basis to effect co-ordination with another administration.

*Item 12* Maximum hours of operation

Indicate in G.M.T. the maximum hours of operation on the frequency of each carrier.

*Item 13* Co-ordination

Give the name of any administration or group of administrations with which the use of the satellite network to which the space station belongs has been successfully co-ordinated in accordance with No. 639AJ.

*Item 14* Agreements

Give also, if appropriate, the name of any administration with which agreement has been effected to exceed the limits prescribed in these Regulations and the contents of such agreement.

*Item 15* Operating administration or company

Give the name of the operating administration or company and the postal and telegraphic addresses of the administration to which communications should be sent on urgent matters regarding interference, quality of emissions and questions referring to the technical operation of stations (see Article 15).

**Section E. Basic Characteristics to be furnished in Notices relating to Frequencies to be received by Space Stations**

*Item 1* Assigned frequency

Indicate the assigned frequency of the emission to be received, as defined in Article 1, in kHz up to 30 000 kHz inclusive, and in MHz above 30 000 kHz (see No. 85). At least one separate assignment notice should be made out for each antenna radiation beam.

**Item 2** Assigned frequency band

Indicate the bandwidth of the assigned frequency band in kHz (see No. 89).

**Item 3** Date of bringing into use

*a)* In the case of a new assignment, indicate the date (actual or foreseen, as appropriate) when reception of the assigned frequency begins.

*b)* Whenever the assignment is changed in any of its basic characteristics, as shown in this Section (except in the case of a change in Item 4, the date to be given shall be that of the latest change (actual or foreseen, as appropriate).

**Item 4** Identity of the receiving space station(s)

Indicate the identity of the receiving space station(s).

**Item 5** Orbital information

*a)* In the case of a space station aboard a geostationary satellite, indicate the planned nominal geographical longitude on the geostationary satellite orbit and the planned longitudinal and inclination tolerances. Indicate also:

- 1) the arc of the geostationary satellite orbit over which the space station is visible, at a minimum angle of elevation of  $10^\circ$  at the Earth's surface, from its associated earth stations or service areas; and
- 2) the arc of the geostationary satellite orbit within which the space station could provide the required service to its associated earth stations or service areas; and
- 3) in the event that the arc defined in paragraph 2) above is less than the arc defined in paragraph 1) above, provide the reasons therefor.

*Note:* The arcs specified in 1) and 2) will be indicated by the geographical longitude of the extremes of these arcs on the geostationary satellite orbit.

*b)* In the case of space station(s) aboard non-geostationary satellite(s), indicate the angle of inclination of the orbit, the period, the altitudes in kilometres of the apogee and perigee of the space station(s) and the number of satellites used.

*Item 6* Associated transmitting earth station(s)

Identify the associated transmitting earth station(s) by reference to the notification thereof or in any other appropriate manner.

*Item 7* Class of station and nature of service

Indicate the class of station and nature of service performed, using the symbols shown in Appendix 10.

*Item 8* Class of emission, necessary bandwidth and description of the transmission(s) to be received

In accordance with Article 2 and Appendix 5:

*a)* indicate the class of emission of the transmission(s) to be received;

*b)*<sup>1</sup> indicate the carrier frequency or frequencies of the transmission(s) to be received;

*c)*<sup>1</sup> indicate, for each carrier to be received, the class of emission, necessary bandwidth and description of the transmission(s) to be received.

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<sup>1</sup> This information need only be furnished when such information has been used as a basis to effect co-ordination with another administration.

*Item 9* Space station receiving antenna characteristics

For each receiving beam:

- a) in the case of a space station aboard a geostationary satellite, indicate the gain of the space station receiving antenna by means of gain contours plotted on a map of the Earth's surface. The isotropic gain at each contour which corresponds to a gain of 2, 4, 6, 10 and 20 dB and at 10 dB intervals thereafter as necessary, below the maximum gain, shall be indicated;
- b) in the case of a space station aboard a non-geostationary satellite, indicate the isotropic gain of the space station receiving antenna in the main direction of radiation and indicate the antenna radiation pattern in those directions which can intersect with the Earth's surface, taking the gain in the main direction of radiation as a reference;
- c)<sup>1</sup> indicate the type of polarization of the antenna, the sense in the case of circular polarization, and the plane in the case of linear polarization, also indicate the worst case axial ratio in the half power beam;
- d) indicate, for a geostationary satellite, the pointing accuracy of the antenna.

*Item 10* Noise temperature

Indicate the total receiving system noise temperature (in kelvins) at the input of the space station receiver.

*Item 11* Maximum hours of reception

Indicate in G.M.T. the maximum hours of reception of the frequency of each carrier.

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<sup>1</sup>This information need only be furnished when such information has been used as a basis to effect co-ordination with another administration.

*Item 12* Co-ordination

Give the name of any administration or group of administrations with which the use of the satellite network to which the space station belongs has been successfully co-ordinated in accordance with No. 639AJ.

*Item 13* Agreements

Give also, if appropriate, the name of any administration with which agreement has been effected to exceed the limits prescribed in these Regulations and the contents of such agreement.

*Item 14* Operating administration or company

Give the name of the operating administration or company and the postal and telegraphic addresses of the administration to which communications should be sent on urgent matters regarding interference and questions referring to the technical operation of stations (see Article 15).

**Section F. Basic Characteristics to be furnished in Notices relating to Frequencies to be received by Radio Astronomy Stations**

*Item 1* Observed frequency

Indicate the centre of the frequency band observed, in kHz up to 30 000 kHz inclusive, and in MHz above 30 000 kHz.

*Item 2* Date of bringing into use

*a)* Indicate the date (actual or foreseen, as appropriate) when reception of the frequency band begins.

*b)* Whenever there is a change in any of the basic characteristics, as shown in this Section (except in the case of a change in Item 3 *b*)), the date to be given shall be that of the latest change (actual or foreseen, as appropriate).

*Item 3* Name and location of the station

*a)* Indicate the letters "RA".

*b)* Indicate the name by which the station is known or the name of the locality in which it is situated or both.

*c)* Indicate the country in which the station is located. Symbols from the Preface to the International Frequency List should be used.

*d)* Indicate the geographical co-ordinates (in degrees and minutes) of the station site.

*Item 4* Bandwidth

Indicate the width of the frequency band (in kHz) observed by the station.

*Item 5* Antenna characteristics

Indicate the antenna type and dimensions, effective area and angular coverage in azimuth and elevation.

*Item 6* Maximum hours of reception

Indicate in G.M.T. the maximum hours of reception of the frequency band shown in Item 4.

*Item 7* Noise temperature

Indicate the over-all receiving system noise temperature (in kelvins).

*Item 8* Class of observations

Indicate the class of observations to be taken on the frequency band shown in Item 4. Class A observations are those in which the sensitivity of the equipment is not a primary factor. Class B

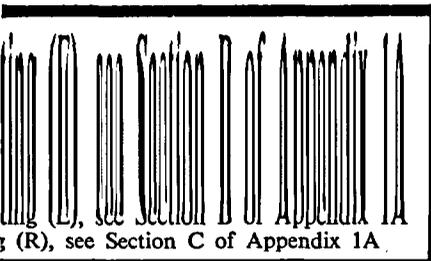
observations are those of such a nature that they can be made only with advanced low-noise receivers using the best techniques.

*Item 9* Operating administration or company

Indicate the identity of the operating administration or company and the postal and telegraphic addresses of the administration to which communication should be sent on urgent matters regarding interference and questions referring to the technical operation of stations (see Article 15).

Notice (1)

Frequency Registration Board a Frequency Assignment  
 the Master International Frequency Register  
 (Article 9A)



(R), see Section C of Appendix 1A



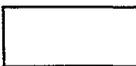
(a) Notice .....  
 Date .....

(c) .....  
 Identity of satellite network

(e) .....  
 Reference of weekly circular relating to No. 639AA



change



(d3) Deletion of an assignment

	For I.F.R.B. use
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Antenna characteristics (3)					Modulation characteristics (2)	Lowest equivalent satellite link noise temperature	Maximum hours of operation on each carrier (G.M.T.)	(g) Supplementary information
Half power beam-width	Minimum angle of elevation	Azimuthal limits	Polarization (3)	Altitude (m)				
8b(R) 9b(E)	8c(R) 9c(E)	8f(R) 9f(E)	(3) 9g(E)	8g(R) 9h(E)	10(E)	9(R)	10(R) 11(E)	

Information furnished when such information has been used with another administration.

8c(R), 9c(E) and horizon elevation angle diagram relevant information to this form.

11(R), 12(E) COORD/ .....

12(R), 13(E) Agreements/ .....

(g) Other information:

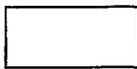
Space Station)

Registration Board a Frequency Assignment  
 the Master International Frequency Register  
 (9A)

ing (E), see Section D of Appendix 1A  
 g (R), see Section E of Appendix 1A



range



(d3) Deletion of an assignment

(a) Notice No. ....  
 Date .....

(c) .....  
 Identity of satellite network

(e) .....  
 Reference of weekly circular relating to No. 639AA

	For I.F.R.B. use
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	5b	Period of object in space 5b	Altitudes of apogee and perigee (km) 5b	Number of space stations 5b
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Characteristics		Antenna characteristics (4)		Modulation characteristics (2) 11(E)	Receiving system noise temperature 10(R)	Maximum hours of operation on each carrier (G.M.T.) 11(R) 12(E)	(g) Supplementary information
Total peak power 9b(E)	Maximum power density 9b(E)	Polarization (2) 9c(R) 10c(E)	Geo-stationary satellite pointing accuracy 9d(R) 10d(E)				

furnished when such information has been used  
 tion with another administration.

ice arc and reasons if service arc is less than  
 1, 5a.2, 5a.3).

tics 10a(E) or 10b(E) and 9a(R) or 9b(R), attach the  
 this form.

12(R), 13(E) COORD/ .....

13(R), 14(E) Agreements/ .....

(g) Other information:

Form of N

for use when notifying to the International Frequency  
or a Change to an Assignment recorded in  
(see Article

(b) .....  
Notifying administration

**SPACE STATION** { for transm  
for receivi

..... kHz
..... MHz

1 Assigned frequency

.....
-------

(d1) New assignment

.....
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(d2) C

2 .....  
Assigned frequency band in kHz

4 .....  
Name of space station

3 .....  
Date of bringing into use

5 Orbital information		Angle of inclination of
Satellite's nominal longitude and longitudinal and inclination tolerances 5a (3)		
Longitude	Tolerances	
.....	.....	

6 Service area(s) or station(s) with which communication is to be established	7 Class of station and nature of service performed	8a Class of emission of assignment	8b Carrier frequency (frequencies) (2)	8c Class of emission, necessary bandwidth and description of transmission (2)	Power cha
					Peak power (2) 9a(E)
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....

14(R), 15(E) { .....  
Operating administration or company  
.....  
Name and address of administration

(3) This information need only b as a basis to effect co-ordin  
(3) Information on visible arc, ser visible arc to be attached (3a  
(4) NOTE: For antenna character relevant information (

(1) The actual size of the notice is a matter for individual administrations.

Form of

for use when notifying to the International Frequency Registration Bureau of a Change to an Assignment recorded in the International Frequency Register (see Annex 1)

(b) .....  
Notifying administration

**EARTH STATION** { for transmission  
for reception

..... kHz
..... MHz

.....
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.....
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(d1) New assignment

(d2) .....

1 Assigned frequency

4a .....  
Name of earth station

2 Assigned frequency band in kHz

4b .....  
Country

3 Date of bringing into use

4c .....  
Longitude and latitude of earth station site

Space station(s) with which communication is to be established  5	Class of station and nature of service performed  6	Class of emission of assignment  7a	Carrier frequency (frequencies) ( <sup>2</sup> )  7b	Class of emission, necessary bandwidth and description of transmission ( <sup>2</sup> )  7c	Power characteristics			Isotropic gain  8a(R) 9a(E)
					Peak power ( <sup>3</sup> )  8a(E)	Total peak power  8b(E)	Maximum power density  8b(E)	
.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....

13(R), 14(E) { .....  
Operating administration or company  
.....  
Name and address of administration

(<sup>2</sup>) This information need only be provided as a basis to effect co-ordination.  
(<sup>3</sup>) NOTE: For radiation diagrams 8d(R), 9d(E), attach

(1) The actual size of the notice is a matter for individual administrations.

## ANNEX 15

### **Addition of a new Appendix (Appendix 1B) to the Radio Regulations**

The following new Appendix 1A shall be added to the Radio Regulations after Appendix 1A:

**ADD Spa2 APPENDIX 1B**

### **Advance Publication Information to be furnished for a Satellite Network**

(see Article 9A)

#### **Section A. General Instructions**

*Item 1* Information shall be provided separately for each satellite network.

*Item 2* Information to be furnished for each satellite network shall include general characteristics (Section B), and, as applicable, characteristics in the Earth-to-space direction (Section C), characteristics in the space-to-Earth direction (Section D), and characteristics for space-to-space relay (Section E).

#### **Section B. General Characteristics to be furnished for a Satellite Network**

*Item 1* Identity of the satellite network

Clearly identify the satellite network and, if applicable, identify the satellite system of which it will form a part.

*Item 2* Date of bringing into use

Indicate the date by which the satellite network is expected to be brought initially into use.

**Item 3 Administration or group of administrations submitting the advance information**

Give the name of the administration or the names of the administrations in the group submitting the advance information on the satellite network and the postal and telegraphic addresses of the administration(s) to which any communication should be sent.

**Item 4 Orbital information relating to the space station(s)**

**a)** In the case of a space station aboard a geostationary satellite, give the planned nominal geographical longitude on the geostationary satellite orbit and the planned longitudinal and inclination tolerances. Indicate also:

- 1) the arc of the geostationary satellite orbit over which the space station is visible, at a minimum angle of elevation of  $10^\circ$  at the Earth's surface, from its associated earth stations or service areas;
- 2) the arc of the geostationary satellite orbit within which the space station could provide the required service to its associated earth stations or service areas; and
- 3) in the event that the arc defined in paragraph 2) above is less than the arc defined in paragraph 1) above, provide the reasons therefor.

*Note:* The arcs specified in 1) and 2) will be indicated by the geographical longitude of the extremes of these arcs on the geostationary satellite orbit.

**b)** In the case of space station(s) aboard non-geostationary satellite(s), indicate the angle of inclination of the orbit, the period, the altitudes in kilometres of the apogee and perigee

of the space station(s) and the number of satellites used having the same characteristics.

**Section C. Characteristics of the Satellite Network in the Earth-to-Space direction**

*Item 1* Earth-to-space service area(s)

Indicate the service area(s) on the Earth associated with each receiving antenna of the space station.

*Item 2* Class of stations and nature of service

For each Earth-to-space service area, indicate the class of the stations in the satellite network and the nature of the service to be performed, using the symbols shown in Appendix 10.

*Item 3* Frequency range

For each Earth-to-space service area, indicate the frequency range within which the carriers will be located.

*Item 4* Power characteristics of the transmitted wave

*a)* For each Earth-to-space service area indicate the maximum spectral power density (W/Hz) to be delivered to the antenna of the transmitting earth stations (the bandwidth over which this is averaged depends on the nature of the service concerned).

*b)* If available, indicate, for each Earth-to-space service area, the actual radiation pattern (relative to isotropic) of the transmitting earth station antenna having the highest offbeam equivalent isotropically radiated spectral power density.

*Item 5* Characteristics of space station receiving antennae

For each Earth-to-space service area:

- a) in the case of a space station aboard a geostationary satellite, indicate the estimated gain of the space station receiving antenna by means of gain contours plotted on a map of the Earth's surface; the isotropic gain at each contour which corresponds to a gain of 2, 4, 6, 10 and 20 dB and at 10 dB intervals thereafter as necessary, below the maximum gain, shall be indicated;
- b) in the case of a space station aboard a non-geostationary satellite, indicate the estimated isotropic gain of the space station receiving antenna in the main direction of reception and indicate the antenna radiation pattern in those directions which can intersect with the Earth's surface, taking the gain in the main direction of radiation as a reference.

*Item 6* Noise temperature of the receiving space station

For each Earth-to-space service area, when other than a simple frequency changing transponder is used aboard the space station indicate the lowest total receiving system noise temperature.

**Section D. Characteristics of the Satellite Network in the Space-to-Earth Direction**

*Item 1* Space-to-Earth service area(s)

Indicate the service area(s) on the Earth associated with each transmitting antenna of the space station.

*Item 2* Class of stations and nature of service

For each space-to-Earth service area, indicate the class of the stations in the satellite network and the nature of the service to be performed, using the symbols shown in Appendix 10.

*Item 3* Frequency range

For each space-to-Earth service area, indicate the frequency range within which the carriers will be located.

*Item 4* Power characteristics of the transmission

For each space-to-Earth service area, indicate the maximum spectral power density (W/Hz) to be delivered to the transmitting antenna of the space station (the bandwidth over which this is averaged depends on the nature of the service concerned).

*Item 5* Characteristics of space station transmitting antennae

For each space-to-Earth service area:

- a)* in the case of a space station aboard a geostationary satellite, indicate the estimated gain of the space station transmitting antenna by means of gain contours plotted on a map of the Earth's surface; the isotropic gain at each contour which corresponds to a gain of 2, 4, 6, 10 and 20 dB and at 10 dB intervals thereafter as necessary, below the maximum gain, shall be indicated;
- b)* in the case of space station aboard a non-geostationary satellite, indicate the estimated isotropic gain of the space station transmitting antenna in the main direction of transmission and indicate the antenna radiation pattern in those directions which can intersect with the Earth's surface, taking the gain in the main direction of transmission as a reference.

*Item 6* Characteristics of receiving earth stations

- a)* For each space-to-Earth service area, when other than a simple frequency changing transponder is used aboard the space station, indicate the lowest total receiving system noise temperature of the earth stations.

For each space-to-Earth service area and for each projected usage <sup>1</sup>, when simple frequency changing transponders are used on the space station, indicate the lowest equivalent satellite link noise temperature and the associated value of transmission gain evaluated from the output of the receiving antenna of the space station to the output of the receiving antenna of the earth station. For each projected usage, indicate also the receiving antenna(e) of the space station to which each simple frequency changing transponder will be connected.

- b)* If available, indicate for each space-to-Earth service area the actual radiation pattern (relative to isotropic) of the receiving earth station antenna having the highest off beam level. When simple frequency changing transponders are used on the space station, indicate also, if available, the pattern associated with each equivalent satellite link noise temperature indicated above.

#### **Section E. Characteristics to be furnished for Space-to-Space Relay**

Where the satellite network is connected to one or more satellite networks by means of space-to-space relay, indicate the following:

- a)* identity or identities of the other satellite network(s) to which the satellite network is connected;
- b)* transmit and receive frequency bands;
- c)* classes of emission;
- d)* nominal equivalent isotropically radiated power(s) on the beam axis.

---

<sup>1</sup> A different usage will be considered to take place when different types of carriers are employed (different by virtue of maximum power spectral density), or when different types of receiving earth stations are employed (different by virtue of receiving antenna gain).

## ANNEX 16

### Revision of Appendix 9 to the Radio Regulations

Appendix 9 to the Radio Regulations shall be amended as follows:

*Replace the title of Appendix 9 by the following:*

### APPENDIX 9

MOD Spa2

#### Service Documents

(See Articles 8, 9, 9A, 10 and 20)

#### List I. International Frequency List

*Replace footnotes 1 to 8 by the following (footnotes 3 and 5 are unchanged):*

**MOD Spa2** <sup>1</sup> In the case of television broadcasting stations in Region 1, the frequency in this column is that of the sound and vision carriers (See Appendix 1 to the Radio Regulations). <sup>2</sup> See Nos. 607 and 608 of the Radio Regulations. <sup>3</sup> A symbol instead of a date indicates an assignment notified pursuant to No. 272 of the Extraordinary Administrative Radio Conference Agreement (Geneva, 1951), or, in the frequency bands above 27 500 kHz, an assignment for which the notice was received by the I.F.R.B. before 1st April 1952. <sup>4</sup> See Appendix 1 to the Radio Regulations. <sup>5</sup> Columns 12a and 12b contain numbers or letters which are explained in the Preface to the International Frequency List. <sup>6</sup> See Article 9, Section II and Article 9A, Section IV, of the Radio Regulations. <sup>7</sup> See Nos. 516, 517, 621, 622, 639BS, 639DM, 639DO and 639DP of the Radio Regulations. <sup>8</sup> Including dates referred to in Section II of Article 9 and Section IV of Article 9A of the Radio Regulations.

*Replace the title of List VIIIA by the following:*

**MOD Spa2**

**List VIIIA. — List of Space Radiocommunication Stations and  
Radio Astronomy Stations <sup>1</sup>**

Replace the title of Section 1 by the following:

1 — Earth stations in the fixed-satellite service

Replace the column heads of Section 1 by the following:

MOD Spa2

MOD Spa2

1	2	Transmission			Reception			8	9	10	
		3a	3b	3c	4a	4b	4c				5a
Name by which the station is known or the name of the locality in which it is situated											
Geographical co-ordinates (in degrees and minutes) of the transmitter site											
Transmission											
Reception											
Identity of the associated space station(s) with which communication is to be established											
Operating administration or company											
Remarks											
1. Special channelling arrangements for: a) telegraphy; b) telephony; c) other types of communication, as appropriate.											
2. Special methods of modulation.											

<sup>1</sup> For the cases where these data must be supplied, see Nos. 639BA, 639BB and 639BC.

Replace the title of Section 2 by the following:

MOD Spaz

2 — Space stations in the fixed-satellite service

Replace the column heads of Section 2 by the following:

MOD Spaz

1	Identity of the station	
2a	Frequency (MHz or GHz)	Telemetry
2b	Class of emission, necessary bandwidth and description of transmission	
2c	Power (watts)	
3a	Frequency (MHz or GHz)	Tracking
3b	Class of emission, necessary bandwidth and description of transmission	
3c	Power (watts)	
4a	Frequency (MHz or GHz)	Communications
4b	Class of emission, necessary bandwidth and description of transmission	
4c	Power (watts)	
5a	Frequency (MHz or GHz)	Reception where appropriate
5b	Class of emission, necessary bandwidth and description of transmission	
6a	Frequency (MHz or GHz)	Communications
6b	Class of emission, necessary bandwidth and description of transmission	
7	Service area or areas on the Earth or the name of the locality and country in which the associated earth station(s) is (are) located	
8	Operating administration or company	
9	<p>Remarks</p> <p>1. Orbital information:  <i>a)</i> angle of inclination of the orbit;  <i>b)</i> period of the object in space;  <i>c)</i> altitude of apogee (km)  <i>d)</i> altitude of perigee (km)  <i>e)</i> number of satellites used, if appropriate;  <i>f)</i> in the case of geostationary satellite:                      — nominal geographical longitude on the geostationary satellite orbit;                      — arc of the geostationary satellite orbit within which the space station could provide the required service to its associated earth stations or service areas.                      2. Special channeling arrangements for:  <i>a)</i> telegraphy;  <i>b)</i> telephony;  <i>c)</i> other types of communication, as appropriate.                      3. Special methods of modulation.</p>	

Replace the title of Section 3 by the following:

3 — Earth stations in the earth exploration-satellite service

Replace the column heads of Section 3 by the following:

ANN 16 (APP 9)

229

MOD Spa2

MOD Spa2

1	Name by which the station is known or the name of the locality in which it is situated		Geographical co-ordinates (in degrees and minutes) of the transmitter site			Transmission		Reception			7	8	9	Remarks
	2	3a	3b	3c	4a	4b	5a	5b	6a	6b				
		Frequency (MHz or GHz)	Class of emission, necessary bandwidth and description of transmission	Power (kW)	Frequency (MHz or GHz)	Class of emission, necessary bandwidth and description of transmission	Telecommand where appropriate	Telemetry	Tracking	Reception of earth exploration information				Special methods of modulation.
		Frequency (MHz or GHz)	Class of emission, necessary bandwidth and description of transmission	Frequency (MHz or GHz)	Class of emission, necessary bandwidth and description of transmission	Frequency (MHz or GHz)	Class of emission, necessary bandwidth and description of transmission	Identity of the associated space station(s) with which communication is to be established	Operating administration or company					

Replace the title of Section 4 by the following:

MOD Spa2

4 — Space stations in the earth exploration-satellite service

Replace the column heads of Section 4 by the following:

MOD Spa2

		Transmission			Reception	Remarks
1	Identity of the station					
2a	Frequency (MHz or GHz)		Telemetry			
2b	Class of emission, necessary bandwidth and description of transmission					
2c	Power (watts)					
3a	Frequency (MHz or GHz)		Tracking			
3b	Class of emission, necessary bandwidth and description of transmission					
3c	Power (watts)					
4a	Frequency (MHz or GHz)		Transmission of earth exploration information			
4b	Class of emission, necessary bandwidth and description of transmission					
4c	Power (watts)					
5a	Frequency (MHz or GHz)		Telecommand where appropriate			
5b	Class of emission, necessary bandwidth and description of transmission					
6	Service area or areas on the Earth or the name of the locality and country in which the associated earth station(s) is (are) located					
7	Operating administration or company					
8						

Replace the title of Section 5 by the following:

MOD Spa2

5 — Earth stations in the radiodetermination-satellite service

Replace the column heads of Section 5 by the following:

MOD Spa2

1	Name by which the station is known or the name of the locality in which it is situated	
2	Geographical co-ordinates (in degrees and minutes) of the transmitter site	
3a	Frequency (MHz or GHz)	Transmission Telecommand where appropriate
3b	Class of emission, necessary bandwidth and description of transmission	
3c	Power (kW)	
4a	Frequency (MHz or GHz)	Reception Telemetry
4b	Class of emission, necessary bandwidth and description of transmission	
5a	Frequency (MHz or GHz)	Tracking
5b	Class of emission, necessary bandwidth and description of transmission	
6a	Frequency (MHz or GHz)	
6b	Class of emission, necessary bandwidth and description of transmission	
7	Identity of the associated space station(s) with which communication is to be established	
8	Operating administration or company	
9	Remarks Special methods of modulation.	

Replace the title of Section 6 by the following:

MOD Spaz

6 — Space stations in the radiodetermination-satellite service

Replace the column heads of Section 6 by the following:

MOD Spaz

		Transmission			Reception		Remarks
1	Identity of the station						
2a	Frequency (MHz or GHz)	Telemetry					1. Orbital information: <i>a)</i> angle of inclination of the orbit; <i>b)</i> period of the object in space; <i>c)</i> altitude of apogee (km); <i>d)</i> altitude of perigee (km); <i>e)</i> number of satellites used, if appropriate; <i>f)</i> in the case of a geostationary satellite: — nominal geographical longitude on the geostationary satellite orbit; — arc of the geostationary satellite orbit within which the space station could provide the required service to its associated earth stations or service areas. 2. Special channelling arrangements for: <i>a)</i> telegraphy; <i>b)</i> telephony; <i>c)</i> other types of communication, as appropriate. 3. Special methods of modulation.
2b	Class of emission, necessary bandwidth and description of transmission						
2c	Power (watts)						
3a	Frequency (MHz or GHz)	Tracking					
3b	Class of emission, necessary bandwidth and description of transmission						
3c	Power (watts)						
4a	Frequency (MHz or GHz)	Transmission of radiodetermination information					
4b	Class of emission, necessary bandwidth and description of transmission						
4c	Power (watts)						
5a	Frequency (MHz or GHz)	Telecommand where appropriate					
5b	Class of emission, necessary bandwidth and description of transmission						
6	Service area or areas on the Earth or the name of the locality and country in which the associated earth station(s) is (are) located						
7	Operating administration or company						
8							

7 — Earth stations in the space research service

Replace the title of Section 7 by the following:

Replace the column heads of Section 7 by the following:

Name by which the station is known or the name of the locality in which it is situated		Geographical co-ordinates (in degrees and minutes) of the transmitter site			Transmission		Reception		Identity of the associated space station(s) with which communication is to be established	Operating administration or company	Remarks		
					Frequency (MHz or GHz)	Class of emission, necessary bandwidth and description of transmission	Power (kW)	Telecommand where appropriate				Telemetry	Tracking
1	2	3a	3b	3c	4a	4b	5a	5b	6a	6b	7	8	9
													Any special characteristics of the station and scope of research.

8 — Space stations in the space research service

Replace the column heads of Section 8 by the following:

Replace the title of Section 8 by the following:

		Transmission			Reception		Remarks
		Telemetry	Tracking	Transmission of information	Telecommand where appropriate		
1	Identity of the station						
2a	Frequency (MHz or GHz)						
2b	Class of emission, necessary bandwidth and description of transmission						
2c	Power (watts)						
3a	Frequency (MHz or GHz)						
3b	Class of emission, necessary bandwidth and description of transmission						
3c	Power (watts)						
4a	Frequency (MHz or GHz)						
4b	Class of emission, necessary bandwidth and description of transmission						
4c	Power (watts)						
5a	Frequency (MHz or GHz)						
5b	Class of emission, necessary bandwidth and description of transmission						
6	Service area or areas on the Earth or the name of the locality and country in which the associated earth station(s) is (are) located						
7	Operating administration or company						
8	<ol style="list-style-type: none"> <li>1. In the case of an earth satellite, orbital information:                             <ol style="list-style-type: none"> <li>a) angle of inclination of the orbit;</li> <li>b) period of the object in space;</li> <li>c) altitude of apogee (km);</li> <li>d) altitude of perigee (km);</li> <li>e) number of satellites used, if appropriate;</li> <li>f) In the case of geostationary satellite:                                     <ul style="list-style-type: none"> <li>— nominal geographical longitude on the geostationary satellite orbit;</li> <li>— arc of the geostationary satellite orbit within which the space station could provide the required service to its associated earth stations or service areas.</li> </ul> </li> </ol> </li> <li>2. In the case of a space probe, general indication of its trajectory.</li> <li>3. Special methods of modulation.</li> </ol>						

Replace the title of Section 9 by the following:

9 — Stations in the radio astronomy service

## ANNEX 17

## Revision of Appendix 10 to the Radio Regulations

Appendix 10 to the Radio Regulations shall be amended as follows:

*Delete the symbol FE.*

*Replace the symbols EC, TC, TH, TM and TN by the following:*

MOD	EC	Space station in the fixed-satellite service
MOD	TC	Earth station in the fixed-satellite service
MOD	TH	Earth station in the space research service
MOD	TM	Earth station in the meteorological-satellite service
MOD	TN	Earth station in the radionavigation-satellite service

*Add, in alphabetical order, the following new symbols:*

ADD	EA	Space station in the amateur-satellite service
ADD	EB	Space station in the broadcasting-satellite service (sound broadcasting)
ADD	EV	Space station in the broadcasting-satellite service (television)
ADD	TA	Space operation earth station in the amateur-satellite service
ADD	TE	Transmitting earth station
ADD	TF	Fixed earth station in the radiodetermination-satellite service
ADD	TL	Mobile earth station in the radiodetermination-satellite service
ADD	TP	Receiving earth station
ADD	TT	Earth station in the space operation service

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## ANNEX 18

### Addition of a new Appendix (Appendix 28) to the Radio Regulations

The following new Appendix 28 shall be added to the Radio Regulations after Appendix 27:

#### APPENDIX 28

##### **Procedure for Determination of the Co-ordination Area around an Earth Station in Frequency Bands between 1 and 40 GHz shared between Space and Terrestrial Radiocommunication Services**

###### 1. Objectives

The co-ordination area (see No. 103D) is determined by calculating, in all directions of azimuth from the earth station, the co-ordination distances (see No. 103B), and drawing to scale on an appropriate map the co-ordination contour (see No. 103C).

*It must be emphasized that the presence or installation of a terrestrial station within the co-ordination area of an earth station would not necessarily preclude the successful operation of either the earth station or that terrestrial station, since the procedure is based on the most unfavourable case assumptions as regards interference.*

For the determination of the co-ordination area two cases may have to be considered:

- 1) for the earth station when it is receiving (and hence capable of being interfered with by terrestrial stations);
- 2) for the earth station when it is transmitting (and hence capable of interfering with terrestrial stations).

Where an earth station is intended to operate with a variety of classes of emissions, the earth station parameters to be used in the determination of the co-ordination contour shall be those which lead to the greatest co-ordination distances, for each earth station antenna beam and in each allocated frequency band which the earth station proposes to share with the terrestrial services.

The procedure given in this Appendix for the determination of the co-ordination area is fairly complex. For this reason, it is considered useful to present in Annex A a simplified version of this procedure which will assist a user in following the necessary steps to produce co-ordination contours. The simplified presentation is given for certain allocated frequency bands.

It is suggested to draw, together with the co-ordination contour, auxiliary contours based on less unfavourable assumptions than those chosen for determination of the co-ordination contour. These auxiliary contours may be used during subsequent negotiations between the administrations concerned with a view to eliminating from the discussions (without the need for more precise calculations) the case of certain existing or planned stations located within the co-ordination area. The determination and use of these auxiliary contours is explained in Annex B to this Appendix.

## 2. Permissible values of interference

The permissible interference power (in dBW) in the reference bandwidth to be exceeded for no more than  $p$  percent of the time at the receiver input of a station suffering interference, from each source of interference, is given by the general formula below:

$$P_r(p) = 10 \log_{10} (kT_r B) + J + M(p) - W \quad (1)$$

where

$$\text{with} \quad M(p) \equiv M(p_0/n) = M_0(p_0) \quad (1a)$$

- $k$  = Boltzmann's constant ( $1.38 \times 10^{-23}$  joule per K);
- $T_r$  = thermal noise temperature of the receiving system (K);
- $B$  = reference bandwidth (in Hz) (bandwidth, of concern to the interfered with system, over which the interference power can be averaged);
- $J$  = ratio (in dB) of the permissible long term (20% of the time) interfering power to the thermal noise power in the receiving system (1);

---

(1) see note (1) on following page.

$p_0$  = percentage of the time during which the interference from all sources may exceed the permissible value;

$n$  = number of expected entries of interference, assumed to be uncorrelated;

$p$  = percentage of the time during which the interference from one source may exceed the permissible value; since the entries are not likely to occur simultaneously  
 $p = p_0/n$ ;

$M_0(p_0)$  = ratio (in dB) between the permissible interference powers during  $p_0\%$  and 20% of the time respectively, for all entries of interference <sup>(2)</sup>;

$M(p)$  = ratio (in dB) between the permissible interference powers during  $p\%$  of the time for one entry of interference, and during 20% of the time for all entries of interference, respectively;

---

#### Notes

<sup>(1)</sup> The factor  $J$  (in dB) is defined as the ratio of total permissible long-term (20% of the time) interference power in the system, to the long-term thermal noise power in a single receiver. For example, in a 50-hop terrestrial line-of-sight radio relay hypothetical reference circuit, the total allowable additive interference power is 1 000 pW0p (C.C.I.R. Recommendation 357-1) and the mean thermal noise power in a single hop may be assumed to be 25 pW0p. Therefore, since in a FDM/FM system the ratio of the interference noise power to the thermal noise power in a 4 kHz band is the same before and after demodulation,  $J = 16$  dB. In a satellite link in the fixed-satellite service, the total allowable interference power is also 1 000 pW0p (C.C.I.R. Recommendation 356-2), but the thermal noise contribution of the down path is not likely to exceed 7 000 pW0p, hence  $J \geq -8.5$  dB. In digital systems it may be necessary to protect each communication path individually, and in that case, long term interference power may be of the same order of magnitude as long-term thermal noise, hence  $J = 0$  dB.

<sup>(2)</sup>  $M_0(p_0)$  (in dB) is the "interference margin" between the long-term (20%) and the short-term ( $p_0\%$ ) allowable interference powers. For analogue radio-relay and fixed-satellite systems in bands between 1 and 15 GHz, this is the ratio (in dB) between 50 000 and 1 000 pW0p (17 dB). In the case of digital systems,  $M_0(p_0)$  may tentatively be set equal to the fading margin which depends, inter alia, on the local rain climate.

$W$  = equivalence factor (in dB) relating the effect of interference to that of thermal noise of equal power in the reference bandwidth <sup>(1)</sup>.

Tables I and II list values for the above parameters.

### 3. Determination of co-ordination distance for near great circle propagation mechanisms

When determining the co-ordination distance for an earth station, a number of mechanisms of radio-wave propagation need to be considered. This section deals with the determination of co-ordination distance in conditions associated with super-refraction, ducting, scattering and reflection due to irregularities in the refractive index of the lower atmosphere in the absence of precipitation. The determination of the co-ordination distance associated with propagation due to scattering from hydrometeors is discussed in Section 4.

- <sup>(1)</sup> The factor  $W$  (in dB) is the ratio of thermal noise power to interference power, in the reference bandwidth, producing the same interference effect after demodulation (e.g. in a FDM/FM system it would be expressed for equal voice channel performance; in a digital system it would be expressed for equal bit error probabilities). For FM signals, it is defined as follows:

$$W = 10 \log_{10} \left\{ \frac{\text{Interfering power in the receiving system after demodulation}}{\text{Thermal noise power in the receiving system after demodulation}} \times \frac{\text{Thermal noise power at the receiver input in the reference bandwidth}}{\text{Interfering power at the radio frequency in the reference bandwidth}} \right\}$$

Also, when the wanted signal uses FM modulation with r.m.s. modulation indices which are greater than unity,  $W$  is approximately 4 dB, regardless of the characteristics of the interfering signal. For low-index FDM/FM systems a very small reference bandwidth (4 kHz) has been used in order to avoid the necessity of dealing with a large range of characteristics of both wanted and unwanted signals upon which, for greater reference bandwidths, the value of  $W$  would depend.

When the wanted signal is digital,  $W$  is usually equal to or less than 0 dB, regardless of the characteristics of the interfering signal.

### 3.1 Normalized basic transmission loss $L_o(0.01)$

To facilitate the graphical determination of the co-ordination distance, it is convenient to normalize the percentage of time to 0.01% and the frequency to 4 GHz.

The first step in the determination of the co-ordination distance is the calculation of a normalized basic transmission loss  $L_o(0.01)$  given by:

$$L_o(0.01) = P_t' + G_t' + G_r - P_r(p) - F(p) - 20 \log_{10} (f/4) \quad (2)$$

where

- $P_t'$  = maximum available transmitting power (in dBW) in reference bandwidth  $B$  at the input to the antenna of an interfering station \*;
- $G_t'$  = gain (in dB relative to isotropic) of the transmitting antenna of the interfering station. If the interfering station is an earth station, this is the isotropic gain in the pertinent direction. If it is a terrestrial station,  $P_t'$  and  $G_t'$  are combined in the main beam equivalent isotropically radiated power  $E$ , for which the values given in Table II shall be used. When  $G_t'$  is the gain in the main direction of radiation it is denoted  $G_t',max.$ ;
- $G_r$  = gain (in dB relative to isotropic) of the receiving antenna of the station suffering interference. If that station is an earth station, this is the isotropic gain in the pertinent direction; in the case of a terrestrial station, the maximum antenna gain is to be used. When  $G_r$  is the main beam gain, it is denoted  $G_r,max.$  (In the case of terrestrial stations, see Table I);
- $F(p)$  = correction factor in dB to relate the effective percentage of the time  $p$  to 0.01% (see Figure 1);
- $f$  = operating frequency in GHz.

The "pertinent direction" referred to in the definitions of  $G_t'$  and  $G_r$  is usually the direction toward the physical horizon on the azimuth

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\* Primes refer to the parameters associated with the interfering station.

considered (see Section 3.2) except when an earth station points its main beam at elevation angles below  $12^\circ$ . In the latter case, the path of minimum transmission loss may not be the horizon path but rather the main beam path (see Section 3.6).

When considering moving satellites,  $G_t$ , or  $G_r$  (whichever pertains to the earth station antenna) is variable with time. In such cases, it is suggested that an equivalent time-invariant earth station antenna gain\* should be used. This equivalent gain is either 10 dB less than the maximum horizon antenna gain or is that value of horizon antenna gain exceeded for no more than 10% of the time, whichever is the greater.

### 3.2 *Antenna gain at the earth station horizon for geostationary satellites*

The gain component of the earth station antenna in the direction of the physical horizon around an earth station is a function of the angular separation  $\varphi$  between the antenna main beam direction and the horizon direction under consideration. Therefore, knowledge of the angle  $\varphi$  is required for each azimuth.

The elevation  $\varepsilon$  and azimuth  $\alpha$  of geostationary satellites as seen from an earth station at a latitude  $\lambda$  are uniquely related. Figure 2 shows the "permissible" location arcs of geostationary satellites in a rectangular *elevation/azimuth* plot, each arc corresponding to an earth station latitude.

Specific relative satellite longitudes may not be known beforehand, but even when they are, the possibility of the addition of a new satellite, or the repositioning of an existing one suggests that all or a portion of the applicable arc be considered to hold satellites.

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\* This equivalent antenna gain should not be used when the earth station antenna points in the same direction for appreciable periods of time (e.g., when working to deep space probes or to satellites which are almost geostationary).

With the correct arc or segment of arc chosen and suitably marked, the horizon profile  $\theta(\alpha)$  is superimposed on the plot of Figure 3, which shows an example for an earth station located at  $45^\circ\text{N}$  latitude for a satellite expected to be located somewhere between relative longitudes of  $10^\circ\text{E}$  and  $45^\circ\text{W}$ , with the site horizon profile drawn as shown.

For each point on the local horizon  $\theta(\alpha)$ , the smallest distance to the arc is determined and measured on the elevation scale. The example of Figure 3 shows the determination of the off-beam angle  $\varphi$  at an azimuth  $\alpha_0 = 210^\circ$  with a horizon elevation  $\theta = 4^\circ$ .

If this is done for all azimuths (in suitable increments, e.g.  $5^\circ$ ), a relationship  $\varphi(\alpha)$  results. The relationship  $\varphi(\alpha)$  may be used to derive a function for the horizon antenna gain,  $G(\alpha)$ , by using the actual earth station antenna pattern, or a formula giving a good approximation; for example, in cases where the ratio between the antenna diameter and the wavelength exceeds 100, the following equation should be used:

$$\begin{aligned} G(\varphi) &= 32 - 25 \log_{10} \varphi \text{ (dB)} && (1^\circ \leq \varphi < 48^\circ) \\ &= -10 \text{ dB} && (48^\circ \leq \varphi \leq 180^\circ) \end{aligned}$$

The application of this gain equation to the  $\varphi(\alpha)$  plot yields the desired horizon antenna gain as a function of azimuth.

The parameters used above are defined as follows:

- $\alpha$  = azimuthal angle under consideration, east of True North;
- $\varphi$  = the smaller angle in degrees between the main beam direction of the earth station antenna and the straight line connecting the earth station to the physical horizon on azimuth  $\alpha$ ;
- $\epsilon$  = earth station main beam elevation angle above horizontal plane;
- $\lambda$  = latitude of earth station;
- $\theta$  = elevation angle of the physical horizon above the horizontal plane on azimuth  $\alpha$ .

### 3.3 *Radio-climatic Zones*

The world has been divided into three basic radio-climatic regions termed Zones A, B and C, respectively.

These zones are defined as follows:

- Zone A: land, with the exception of a coastal strip the width of which is either 100 km or that distance from the actual coast at which the terrain begins to exceed an altitude of 1000 m, whichever is the lesser distance;
- Zone B: sea, at latitudes greater than  $23.5^\circ$  (North or South), excluding the Mediterranean and Black Seas, but including the coastal strip defined above wherever land borders on sea at latitudes greater than  $23.5^\circ$ ;
- Zone C: sea, at latitudes smaller than  $23.5^\circ$  (North or South), including the Mediterranean and Black Seas, and the coastal strip defined above wherever land borders on sea at latitudes smaller than  $23.5^\circ$ .

### 3.4 *Procedure for the determination of the co-ordination distance for propagation mode (a)*

To obtain the co-ordination distance for Zone A, it is necessary to subtract from  $L_0(0.01)$  a correction  $\Delta L$  which accounts for the difference in basic transmission loss over paths that have different horizon elevation angles at the earth station.  $\Delta L$  is computed in two steps. First a correction  $\Delta L_0$  for unit elevation angle (i.e., for a  $1^\circ$  elevation angle) is obtained from Figure 4 as a function of the normalized basic transmission loss and the frequency. Linear interpolation should be used between the curves of Figure 4 for frequencies not shown.

For any other horizon elevation angle  $\theta$ , the horizon angle correction  $\Delta L$  (in dB) is obtained from Figure 5 using the value of  $\Delta L_0$  previously obtained from Figure 4. If values are required at elevation angles

other than those indicated, linear interpolation should again be used. In cases where the elevation angle is less than  $0.2^\circ$ ,  $\Delta L$  is always 0 dB.

The horizon angle correction  $\Delta L$  so obtained should be subtracted from the normalized basic transmission loss to result in a "co-ordination loss"  $L_c$  :

$$L_c = L_o(0.01) - \Delta L \quad (3)$$

This co-ordination loss, used with the appropriate frequency in Figure 6, yields the co-ordination distance.

In a similar manner, the Zone B and Zone C co-ordination distance can be determined using Figures 7, 8 and 9 for Zone B and Figures 10, 11 and 12 for Zone C.

Distances so obtained are, for reference purposes, to be labelled  $d_{aA}$ ,  $d_{aB}$  and  $d_{aC}$  for Zones A, B and C, respectively.

### 3.5 Co-ordination distance for mixed paths

#### 3.5.1 Two Zones

The procedure to be followed in the case of a mixed path involving two zones is illustrated by the example shown in Figure 13b. The earth station is situated in Zone A at a distance of 75 km from Zone B. The graphical presentation described below is particularly useful where more than one boundary between zones may be involved, as in this example.

It is assumed that, at a frequency of 4 GHz, the normalized basic transmission loss  $L_o(0.01)$  is 200 dB, and that the horizon elevation angle is zero degrees. This results in identical values of 200 dB for  $L_c$  in any zone (which would, of course, not be the case if the horizon elevation angle were greater than  $0.2^\circ$ ). The procedure is as follows:

- i) determine the distance entirely in Zone A that would give the co-ordination loss. Mark this distance (in this case it is 350 km) from the origin along the abscissa axis of linear graph paper as indicated by the point A (Figure 13a);

- ii) determine the distance entirely in Zone B that would give the same co-ordination loss. Mark this distance (in this case it is 530 km) from the origin along the ordinate axis of the chart as indicated by the point B;
- iii) draw a straight line between points A and B representing these distances from the origin;
- iv) starting from the origin, the distance of 75 km from the earth station to Zone B is set off along the abscissa axis of the chart as indicated by the point A<sub>1</sub>;
- v) starting from point A<sub>1</sub> the Zone B path length of 375 km is then set off parallel to the ordinate axis of the chart as indicated by the point B<sub>1</sub>;
- vi) the further distance in the next Zone A region is then measured parallel to the abscissa axis from the point B<sub>1</sub> to the point of intersection of the mixed path curve as indicated by X. On Figure 13a, this distance is 30 km;
- vii) the co-ordination distance is the sum of the distances OA<sub>1</sub>, A<sub>1</sub>B<sub>1</sub> and B<sub>1</sub>X and is equal to

$$75 + 375 + 30 = 480 \text{ km}$$

The distance B<sub>1</sub>X can also, more precisely, be found numerically from the total distance of the two parts in Zone A, OA<sub>1</sub> + B<sub>1</sub>X given by

$$OA_1 + B_1X = OA \left( 1 - \frac{A_1B_1}{OB} \right)$$

whence:

$$B_1X = OA \left( 1 - \frac{A_1B_1}{OB} \right) - OA_1$$

hence,

$$B_1X = 350 \left( 1 - \frac{375}{530} \right) - 75 = 27 \text{ km}$$

### 3.5.2 Three Zones

In some special cases, the mixed path involves all three radio-climatic Zones A, B and C. A solution to this problem can be found in adding a third dimension to the procedure to be followed for mixed paths involving only two zones. Theoretically, it means that the third coordinate has to be determined for a point having coordinates corresponding to the known distances in the first two zones and lying in a plane defined by three points on the axes X, Y and Z, corresponding to distances in Zones A, B and C, respectively, that would give the required basic transmission loss.

In practice, the procedure can be reduced to a simple graphical method shown in Figure 14, assuming for example a co-ordination loss ( $L_c$ ) of 200 dB at a frequency of 4 GHz. It is required to find the co-ordination distance from the earth station in the direction given in Figure 14a. Here an earth station is situated in Zone A at a distance of 75 km in a given azimuthal direction from Zone B. In the same azimuthal direction Zone B is 375 km long and followed by an unknown portion in Zone C (Figure 14a).

In this case, the procedure to be applied should be as follows (Figure 14b):

- i) repeat the same procedure as for mixed paths involving only two zones, given in steps (i) to (v) above, and continue as follows:
- ii) from the point  $B_1$  draw a line parallel to the line AB to intersect the abscissa axis as indicated by the point D;
- iii) determine the distance entirely in Zone C that would give the co-ordination loss. Mark this distance (in this case it is 930 km) from the origin along the ordinate axis of the chart as indicated by the point C. Draw a straight line between the points C and A;
- iv) at the point D, draw a line parallel to the ordinate axis to intersect the line CA as indicated by X;
- v) the distance between the points D and X, which is the unknown distance in Zone C, is found to be 75 km;

vi) the co-ordination distance is then the sum of the distances  $OA_1 + A_1B_1 + DX$  and in this example is equal to

$$75 + 375 + 75 = 525 \text{ km}$$

The distance  $DX$  can also, more precisely, be found numerically from the formula:

$$DX = OC \left( 1 - \frac{OA_1}{OA} - \frac{A_1B_1}{OB} \right)$$

hence,

$$DX = 930 \left( 1 - \frac{75}{350} - \frac{375}{530} \right) = 73 \text{ km}$$

The distance obtained from either the single zone case (Section 3.4), or the multi-zone case (Section 3.5), whichever is applicable, is to be labelled  $d_a$ .

### 3.6 *Determination of the co-ordination distance for propagation mode (b)*

If the main beam of the earth station antenna is elevated less than  $12^\circ$  for long periods of time, as may be the case in operation with geostationary satellites, the co-ordination distance in the azimuthal direction of the main beam is determined in the same manner as above but the antenna elevation angle  $\epsilon$  is used instead of the horizon elevation angle  $\theta$ , and the antenna main beam gain is used instead of the gain towards the horizon. *In all such cases, the Zone A curves should be used irrespective of the actual zone involved.*

This procedure yields a distance for propagation mode (b), to be labelled  $d_b$ .

When considering non-geostationary satellites, interference via the main beam path should only be considered when the earth station antenna points in the same direction for appreciable periods of time (e.g., when working to deep space probes or to satellites which are almost geostationary).

### 3.7 *Evaluation of results from propagation modes (a) and (b)*

If propagation mode (b) is applicable, then the distance obtained for propagation mode (b) is compared with that of propagation mode (a) and where the co-ordination distance resulting from the main beam calculation exceeds that from the horizon path calculation, the procedure illustrated in Figure 15 should be used as follows to obtain the co-ordination contour for great circle propagation mechanisms:

- i) draw two straight lines from the earth station at azimuthal angles of  $\pm 5^\circ$  relative to the azimuth of the main beam till they intersect the co-ordination contour obtained according to propagation mode (a);
- ii) from the point corresponding to the co-ordination distance derived according to propagation mode (b) in the azimuthal direction of the main beam, draw two straight lines to join these two intersections;
- iii) these two lines so drawn constitute the part of the co-ordination contour to be used in the sector  $\pm 5^\circ$  relative to the azimuthal direction of the main beam;
- iv) outside the preceding sector  $\pm 5^\circ$  the co-ordination contour for the great circle propagation mechanisms is the one obtained for propagation mode (a).

For reference purposes, the distances obtained after application of procedures set forth in Sections 3.4 to 3.7 are to be labelled  $d_{ab}$ .

### 4. *Determination of co-ordination distance for propagation mode (c) (scattering from hydrometeors)*

The determination of co-ordination distance for scattering from hydrometeors (rain scatter) is predicated on a path geometry which is substantially different from that of the great circle propagation mechanisms.

#### 4.1 *Normalized transmission loss $L_1(0.01)$*

To determine the co-ordination distance associated with rain scatter, it is necessary to calculate a "normalized transmission loss", given by:

$$L_1(0.01) = P_{t'} + \Delta G - P_r(p) - F_1(p, f) \quad (4)$$

where:

$\Delta G$  = difference (in dB) between the maximum gain of terrestrial station antennae in the frequency band under investigation and the value of 42 dB. When the earth station is a transmitting station, the values shown in Table I should be used; when it is a receiving station, the values shown in Table II should be used.

$F_1(p, f)$  = correction factor (in dB) to relate the effective percentage of the time  $p$  to 0.01%, in the frequency band under consideration (see Figure 16).

All other parameters have been defined in Section 2. For terrestrial stations, values of  $P_{t'}$  are listed in Table II.

#### 4.2 *Rain-climatic Zones*

The world has been divided into five basic rain-climatic zones numbered 1 to 5 as shown in Figure 17.

#### 4.3 *Procedure for the determination of rain scatter co-ordination distance*

To obtain the rain scatter co-ordination distance for rain-climatic Zone 1, the normalized transmission loss (obtained by solving equation (4)), is used together with the appropriate frequency in Figure 18 to yield the rain scatter distance  $d_{cr}$ .

Figures 19 to 21 show corresponding curves for rain-climatic Zones 2 to 5. In all cases that rain climate is to be chosen which corresponds to the location of the earth station. Due to the peculiar geometry associated with rain scatter propagation, the centre of the rain scatter co-ordination contour does not coincide with the location of the earth station by a distance  $\Delta d$ .

The rain scatter distance  $d_{cr}$ , together with the elevation angle  $\epsilon$  of the main beam of the earth station antenna are used in Figure 22 to obtain the distance denoted  $\Delta d$ . The distance  $\Delta d$  is measured from the earth station location along the azimuth of the main beam of the earth station antenna; a circle of radius  $d_{cr}$  is drawn around the point so reached. The circle is the rain scatter contour.

The rain scatter co-ordination distance, to be labelled  $d_c$ , is the distance from the earth station site to the rain scatter co-ordination contour on the azimuth under consideration.

##### 5. *Minimum value of co-ordination distance*

In the process of determining the co-ordination distance for propagation mode (a) or (b), if values result which would require the co-ordination distance curves to be extended to distances of less than 100 km, the co-ordination distance ( $d_a$  or  $d_b$ ) for the propagation mode under consideration shall be 100 km.

In the process of determining the co-ordination distance for propagation mode (c), if values result which would require the rain scatter distance curves to be extended to distances of less than 100 km, the rain scatter distance ( $d_{cr}$ ) shall be 100 km, used with the appropriate value of  $\Delta d$ .

##### 6. *The co-ordination distance*

On any azimuth, the greatest of the co-ordination distances  $d_a$ ,  $d_b$  or  $d_c$ , for any of the three propagation modes, represents the co-ordination

distance and is to be used for the co-ordination procedure.

An example of a co-ordination contour is shown in Figure 23.

### 7. Parameters for calculation

The values of parameters necessary for the determination of the co-ordination contour are given in Table I in the case of a transmitting earth station, and in Table II in the case of a receiving earth station.

In certain cases, an administration may have reason to believe that, for its specific earth station, a departure from the values associated with the earth station, as listed in Table II, may be justified. Attention is drawn to the fact that for specific systems the bandwidths  $B$  or, as for instance in the case of demand assignment systems, the percentages of the time  $p$  and  $p_0$  may have to be changed from the values given in Table II.

To aid in subsequent negotiations between administrations (as discussed in Annex B), it has been found useful to isolate from equation (2) two composite parameters associated only with terrestrial stations, an interference sensitivity factor  $S = G_r - P_r(p)$  for the case of transmitting earth stations, and the e.i.r.p.  $E = P_t + G_t$  for the case of receiving earth stations. The values to be used for  $S$  and  $E$  are given in Tables I and II, respectively.

If it becomes necessary to calculate the co-ordination distance in a band not shown in Table I or II, the values associated with the nearest allocated frequency band for the same service should be used.

and criteria	$J$ (dB)	16	9	9	16	16	16	16	16	0
	$M_o(p_o)$ (dB)	17	17	17	17	17	17	17	17	30
	$W$ (dB)	0	0	0	0	0	0	0	0	0
Terrestrial station parameters	$B$ (Hz)	$4 \times 10^3$	$4 \times 10^3$	$4 \times 10^3$	$4 \times 10^3$	$4 \times 10^3$	$4 \times 10^3$	$4 \times 10^3$	$4 \times 10^3$	$1 \times 10^6$
	$G_r$ (dB) <sup>(2)</sup>	35	52 <sup>(3)</sup>	52 <sup>(3)</sup>	45	47	50	50	50	50
	$\Delta G$ (dB)	-7	10 <sup>(3)</sup>	10 <sup>(3)</sup>	3	5	8	8	8	8
	$T_r$ (K)	750	500 <sup>(3)</sup>	500 <sup>(3)</sup>	750	750	1500	1500	1500	3200
Auxiliary parameters	$S$ (dBW)	166	192	192	176	178	178	178	178	154
	$P_r(p)$ (dBW) in $B$	-131	-140	-140	-131	-131	-128	-128	-128	-104

<sup>(1)</sup> A = analogue modulation; N = digital modulation.

<sup>(2)</sup> Feeder losses are not included in the values for  $G_r$ .

<sup>(3)</sup> In these bands the parameters for the terrestrial station associated with transhorizon systems have been used.

## ation Distance for a Receiving Earth Station

	Fixed-Satellite		Fixed-Satellite		Earth Exploration-Satellite (1)	Space Research		Fixed-Satellite	Fixed-Satellite	Fixed-Satellite	Earth Exploration-Satellite (2)	
	Near Earth	Deep Space										
	3-400- 4-200	7-300- 7-750	8-025- 8-400	8-400- 8-500		10-95- 11-20	11-70- 12-20	17-7- 19-7	21-2- 22-0			
						11-45- 11-70	12-50- 12-75					
N	A	N	A	N		—	—	A	N	A	N	N
	0-03	0-003	0-03	0-003		0-1	0-001	0-03	0-003	0-03	0-003	0-003
	3	3	3	3		2	1	2	1	2	1	1
	0-01	0-001	0-01	0-001		0-05	0-001	0-015	0-003	0-015	0-003	0-003
	-8	0	-8	0		—	—	-8	0	-8	0	0
	17	5 <sup>(3)</sup>	17	5 <sup>(3)</sup>		—	—	17	5 <sup>(3)</sup>	17	5 <sup>(3)</sup>	5 <sup>(3)</sup>
	4	0	4	0		—	—	4	0	4	0	0
	55	55	55	55		25 <sup>(4)</sup>	25 <sup>(4)</sup>	55	55	55	55	35 <sup>(6)</sup>
	13	13	13	13		-17 <sup>(4)</sup>	-17 <sup>(4)</sup>	5	5	5	5	-15 <sup>(6)</sup>
	0	0	0	0		0	0	0	0	0	0	0
	10 <sup>6</sup>	10 <sup>6</sup>	10 <sup>6</sup>	10 <sup>6</sup>		1	1	10 <sup>6</sup>	10 <sup>6</sup>	10 <sup>6</sup>	10 <sup>6</sup>	10 <sup>6</sup>
	—	—	—	—		-220	-220	—	—	—	—	—

quired before representative values become available.

ncy, rain-climatic zone and system design.

mission.

assumed per emission.

re been used.

Table 1  
Parameters required for the Determination of Co-ord

Space Radiocommunication Service designation		Space Operation (Telemetry) <sup>(1)</sup>	Meteorological- Satellite <sup>(1)</sup>	Space Research		Fixed-Satellite
				Near Earth	Deep Space; Manned	
Frequency band (GHz)		1-525- 1-535	1-670- 1-690	1-700- 1-710	2-290- 2-300	2-50 2-53
Modulation at earth station <sup>(2)</sup>				—	—	A
Interference parameters and criteria	$p_o$ (%)			0.1	0.001	0.03
	$n$			2	1	3
	$p$ (%)			0.05	0.001	0.01
	$J$ (dB)			—	—	-8
	$M_o(p_o)$ (dB)			—	—	17
	$W$ (dB)			—	—	4
Terrestrial station parameters	$E$ (dBW) in $B$	55	55	62 <sup>(4)</sup> (6)	62 <sup>(4)</sup> (6)	92 <sup>(6)</sup>
	$P_t'$ (dBW) in $B$	13	13	10 <sup>(4)</sup> (6)	10 <sup>(4)</sup> (6)	40 <sup>(6)</sup>
	$\Delta G$ (dB)	0	0	10 <sup>(6)</sup>	10 <sup>(6)</sup>	10 <sup>(6)</sup>
Reference bandwidth	$B$ (Hz)			1	1	10 <sup>6</sup>
Permissible interference power	$P_T(p)$ (dBW) in $B$			-220	-220	—

(1) Parameters associated with these services may vary over a rather wide range. Further study is r

(2) A = analogue modulation; N = digital modulation.

(3) See note (2) in Section 2.  $M_o(p_o)$  may assume values between 5 and 40 dB, depending on frequ

(4) These values are estimated for 1 Hz bandwidth and are 30 dB below the total power assumed for

(5) These values assume an r.f. bandwidth of no less than 100 MHz, and are 20 dB below total power

(6) In these bands, the parameters for the terrestrial stations associated with transhorizon systems ha



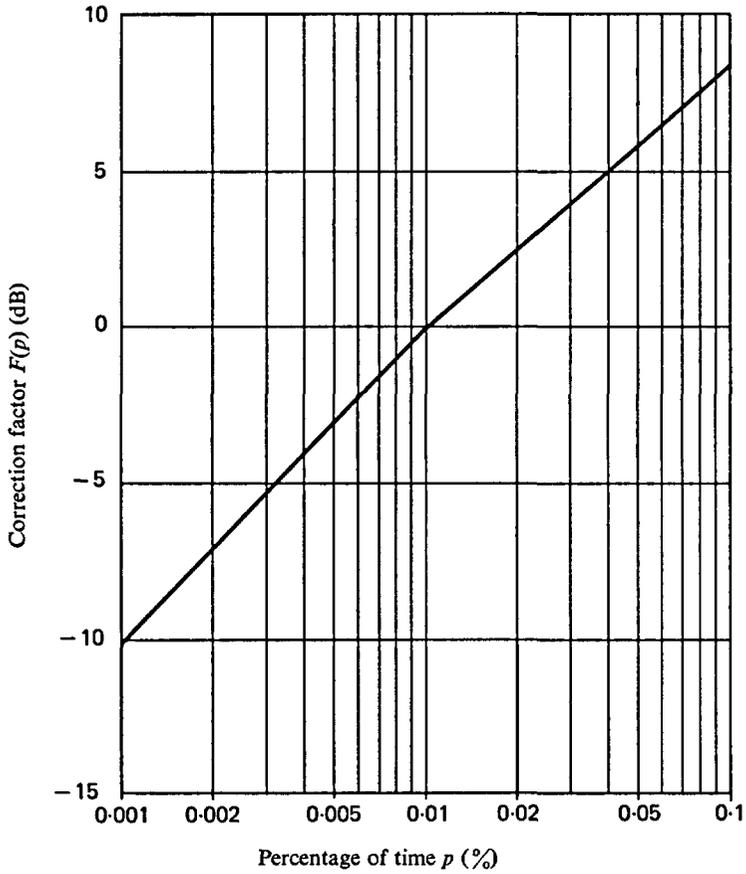
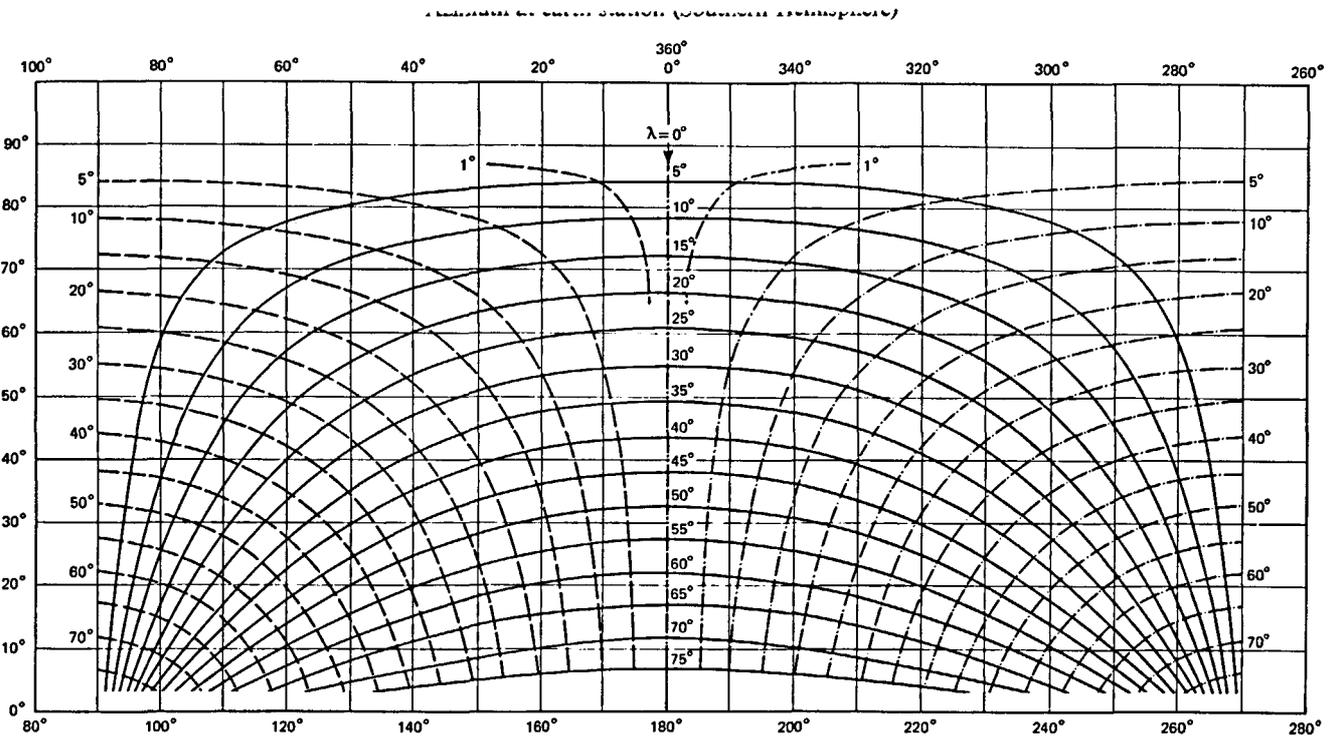


FIGURE 1

*Correction factor  $F(p)$  for percentages of the time  $p$  other than 0.01%*

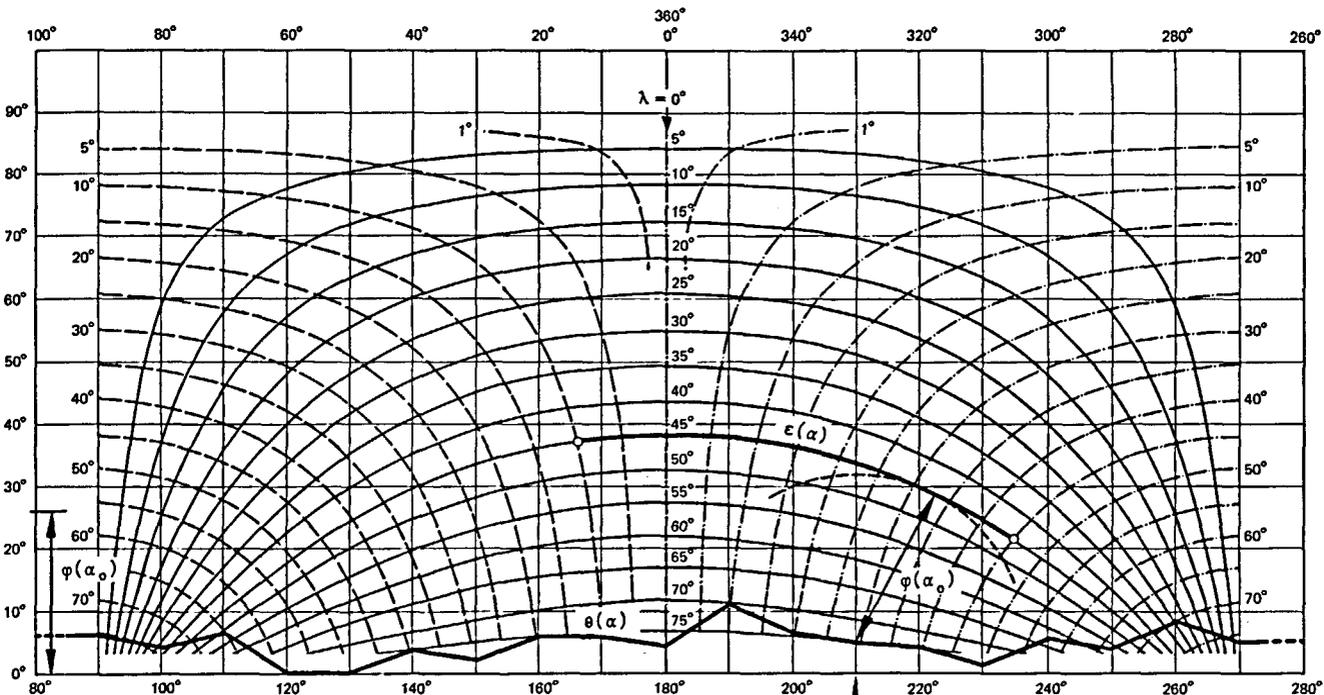


Azimuth at earth station (Northern Hemisphere)

**FIGURE 2 - Position arcs of geostationary satellites**

- Arc of geostationary satellite orbit visible from earth station at terrestrial latitude  $\lambda$
- Difference in longitude between earth station and the sub-satellite point:
- Satellite longitude E of earth station longitude
- Satellite longitude W of earth station longitude
- Satellite longitude equal to the earth station longitude

Azimuth at earth station (Southern Hemisphere)



Azimuth at earth station (Northern Hemisphere)  $\alpha_0$

FIGURE 3 - Example of derivation of  $\varphi$

- ——— ○ Arc of geostationary satellite orbit visible from earth station at terrestrial latitude  $\lambda$
- — — — — Horizon profile  $\theta(\alpha)$
- — — — — Difference in longitude between earth station and the sub-satellite point:
- — — — — Satellite longitude E of earth station longitude
- — — — — Satellite longitude W of earth station longitude
- — — — — Satellite longitude equal to the earth station longitude

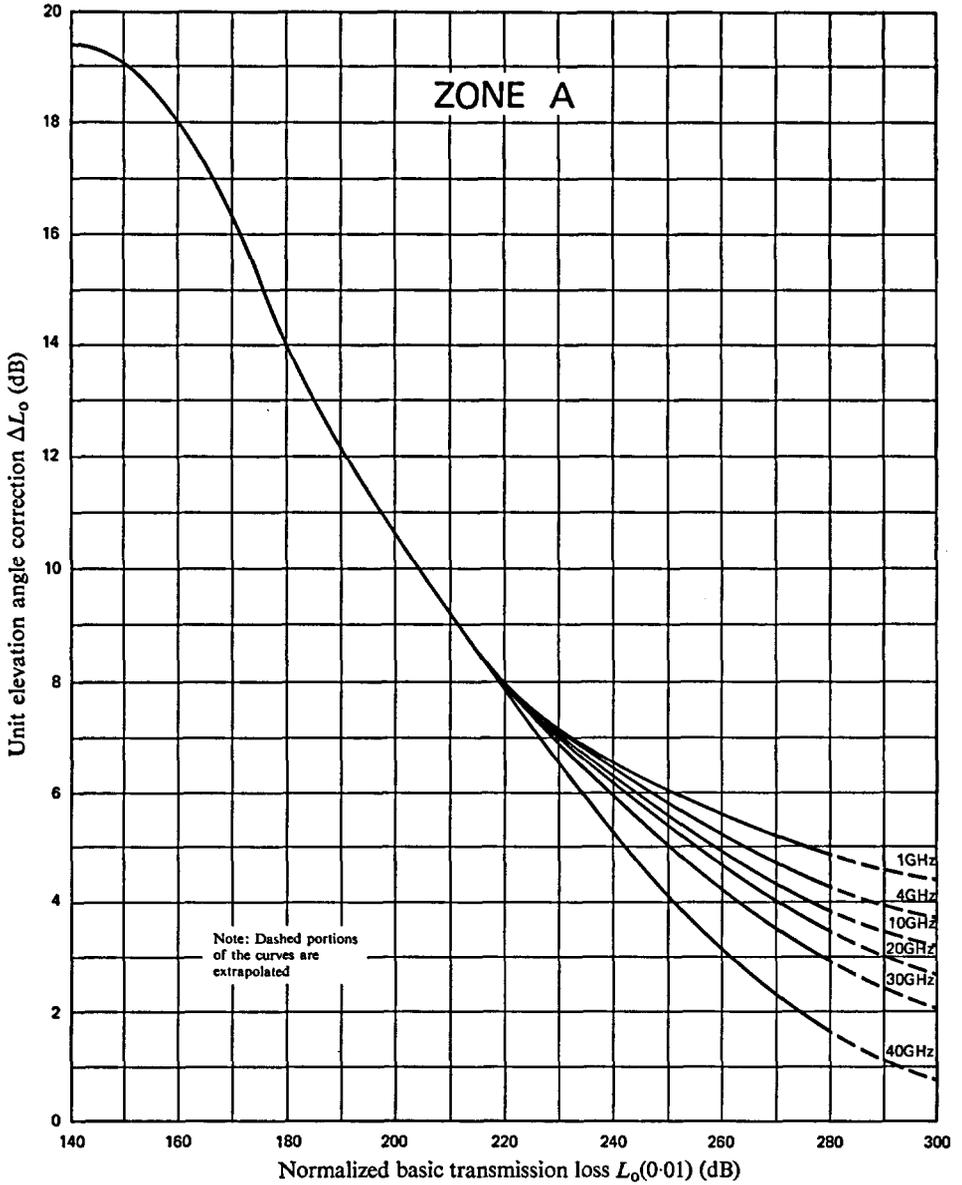


FIGURE 4

Unit elevation angle correction as a function of normalized basic transmission loss and frequency — Zone A

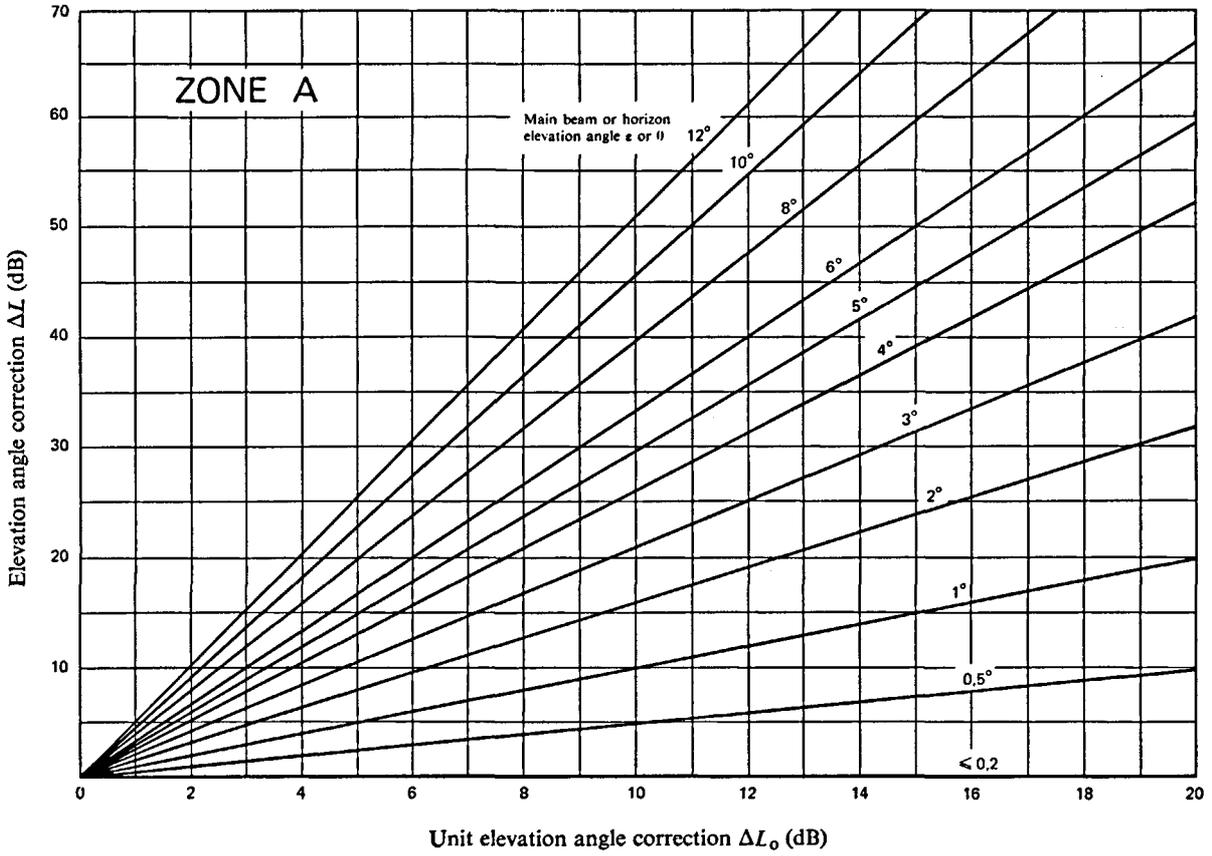


FIGURE 5  
Elevation angle correction — Zone A

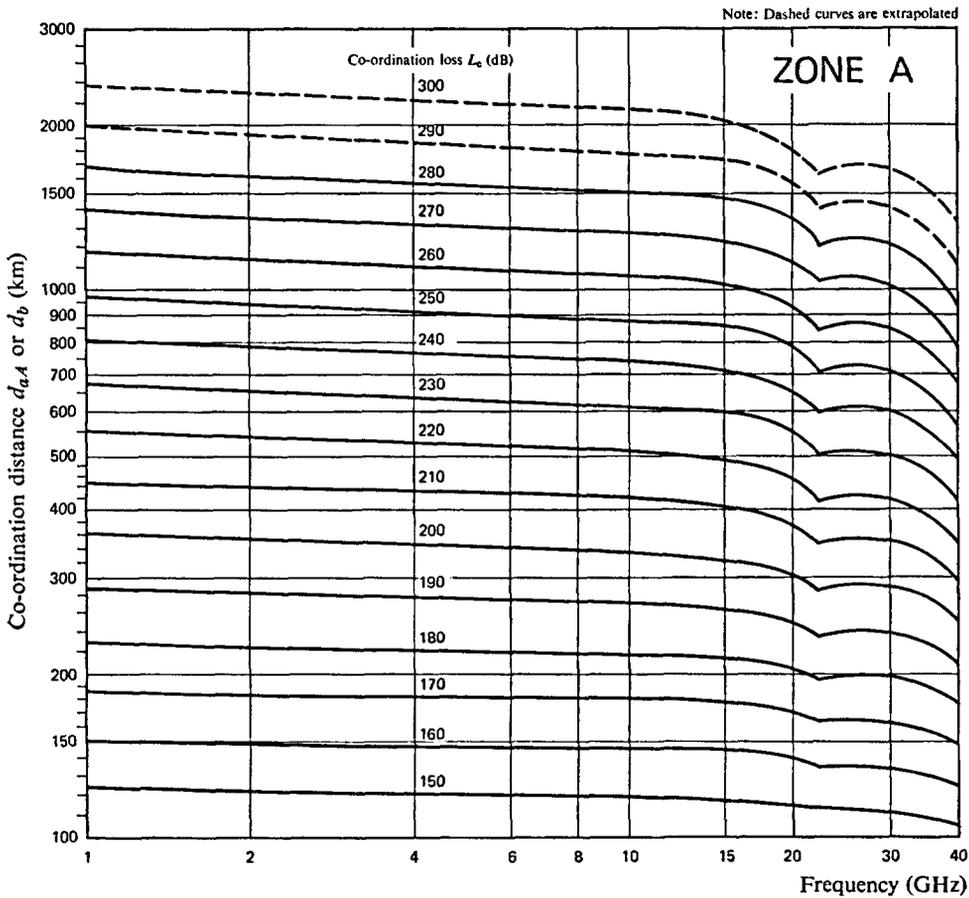


FIGURE 6

Co-ordination distance  $d_{aA}$  or  $d_b$  as a function of frequency and co-ordination loss — Zone A

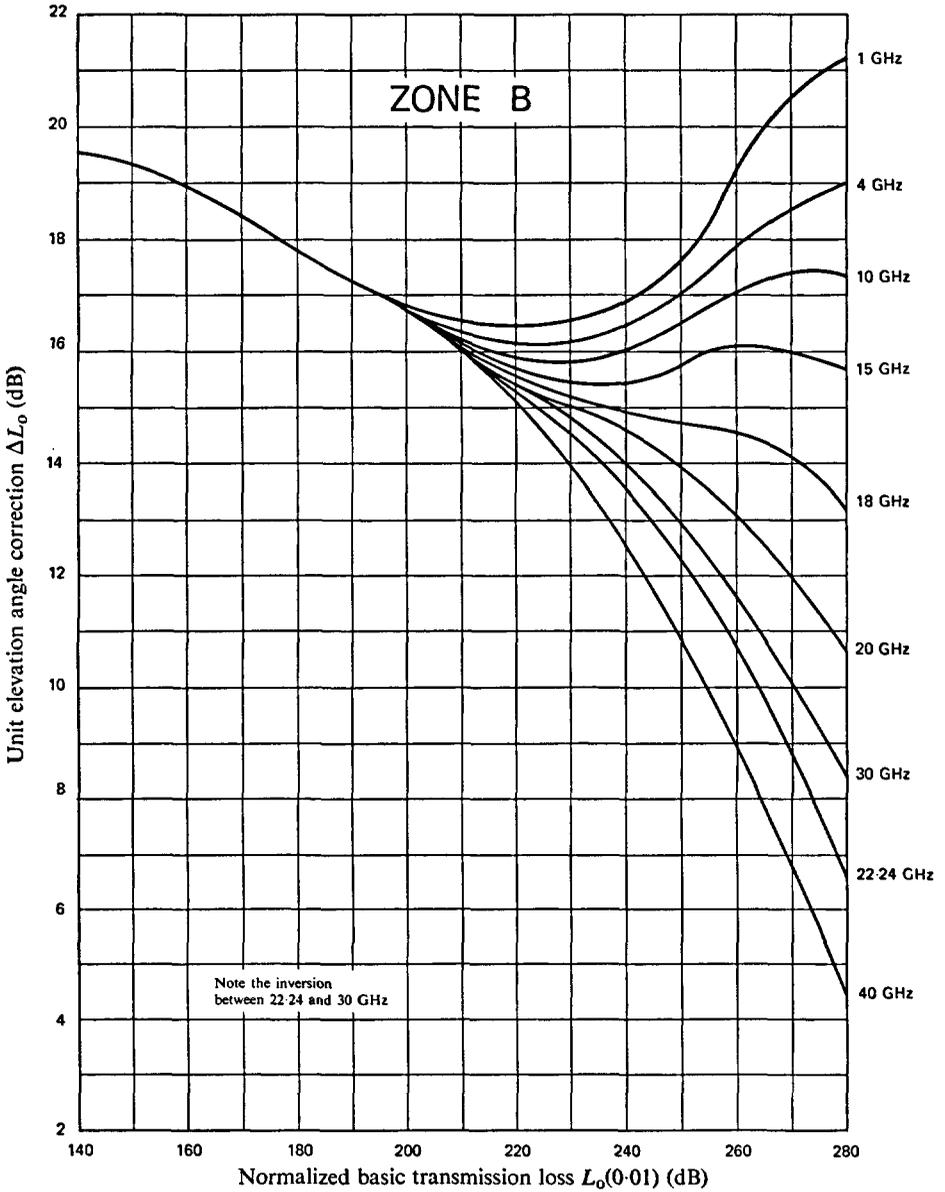


FIGURE 7

Unit elevation angle correction as a function of normalized basic transmission loss and frequency — Zone B

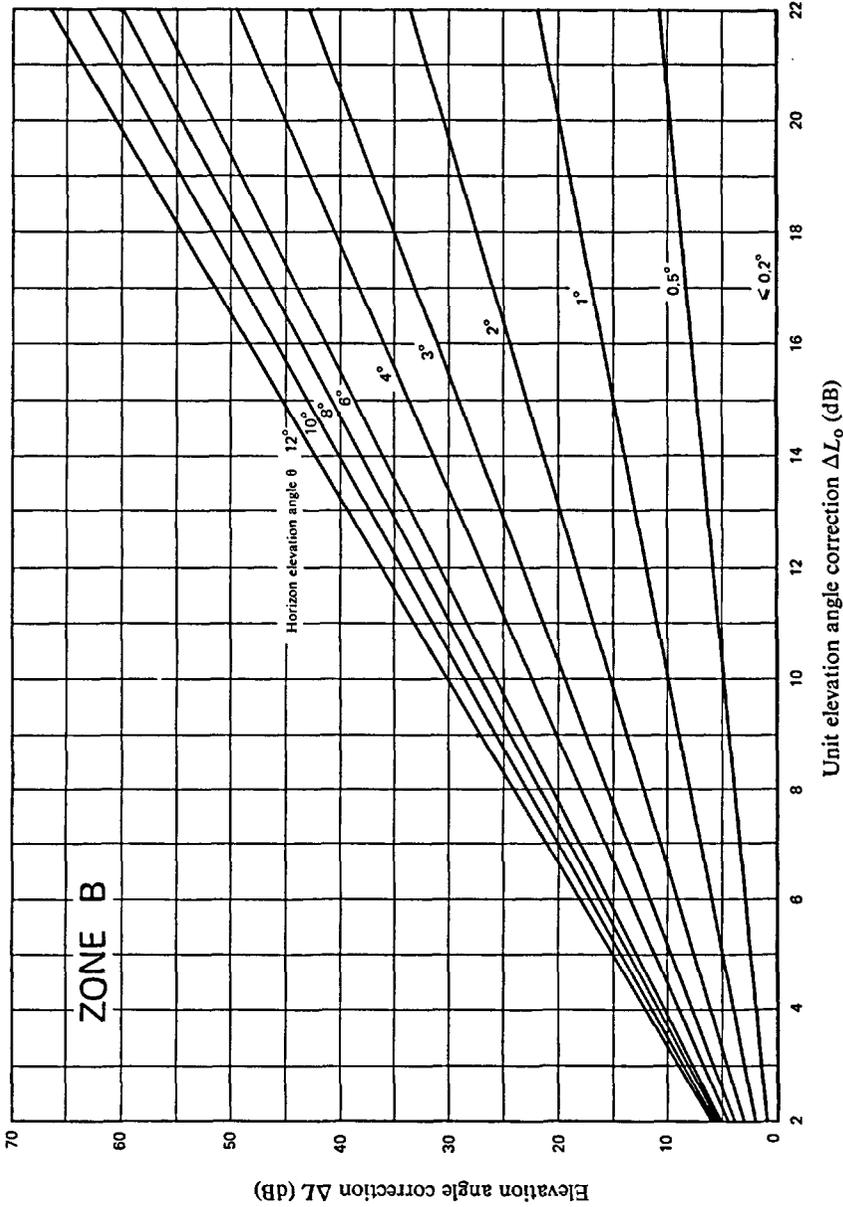


FIGURE 8  
Elevation angle correction — Zone B

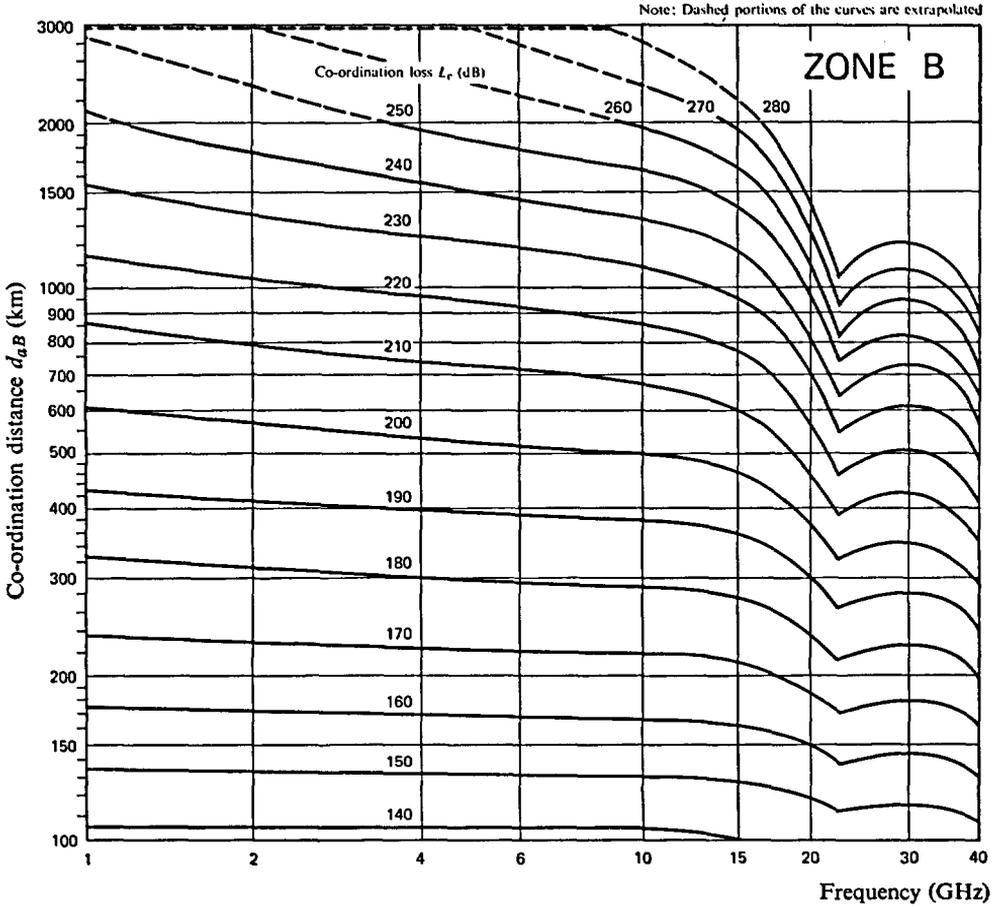


FIGURE 9

Co-ordination distance  $d_{aB}$  as a function of frequency and co-ordination loss — Zone B

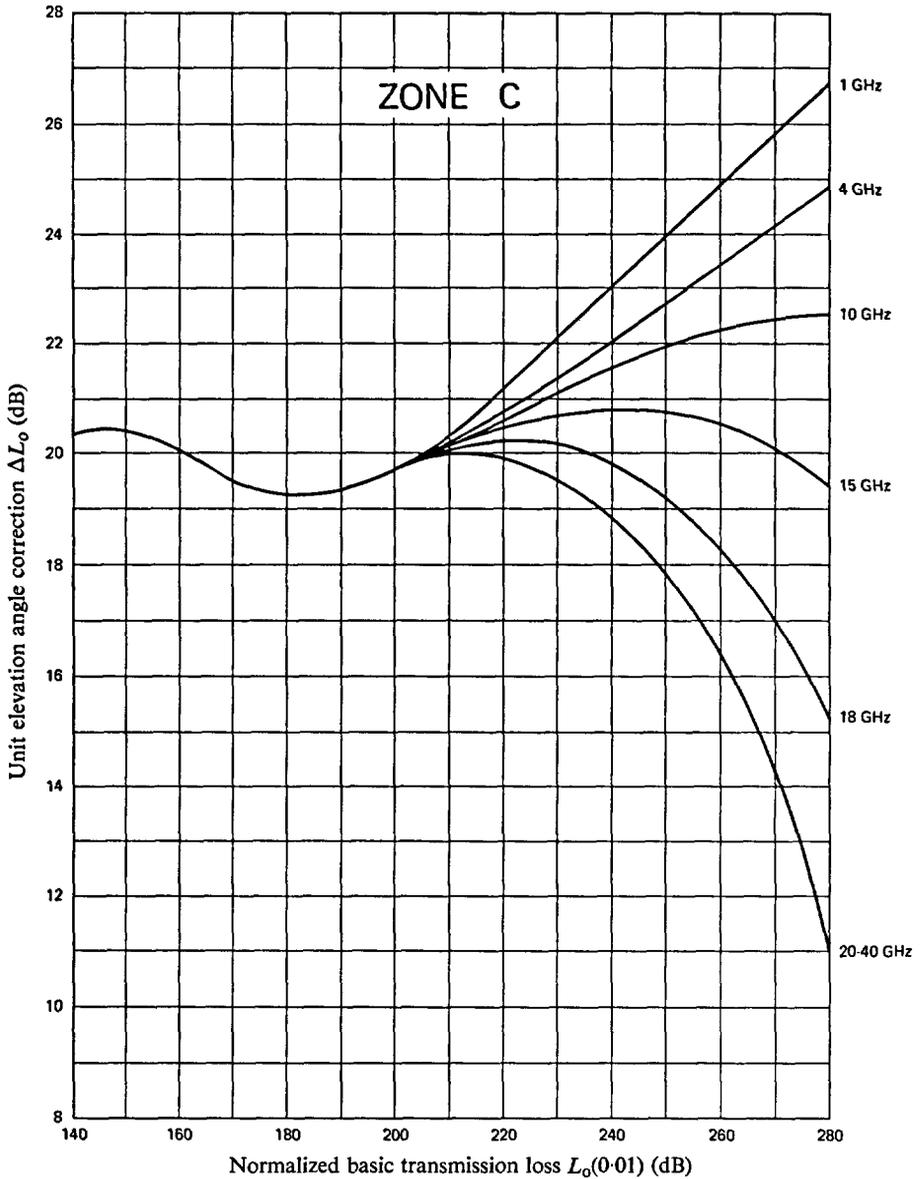


FIGURE 10

*Unit elevation angle correction as a function of normalized basic transmission loss and frequency — Zone C*

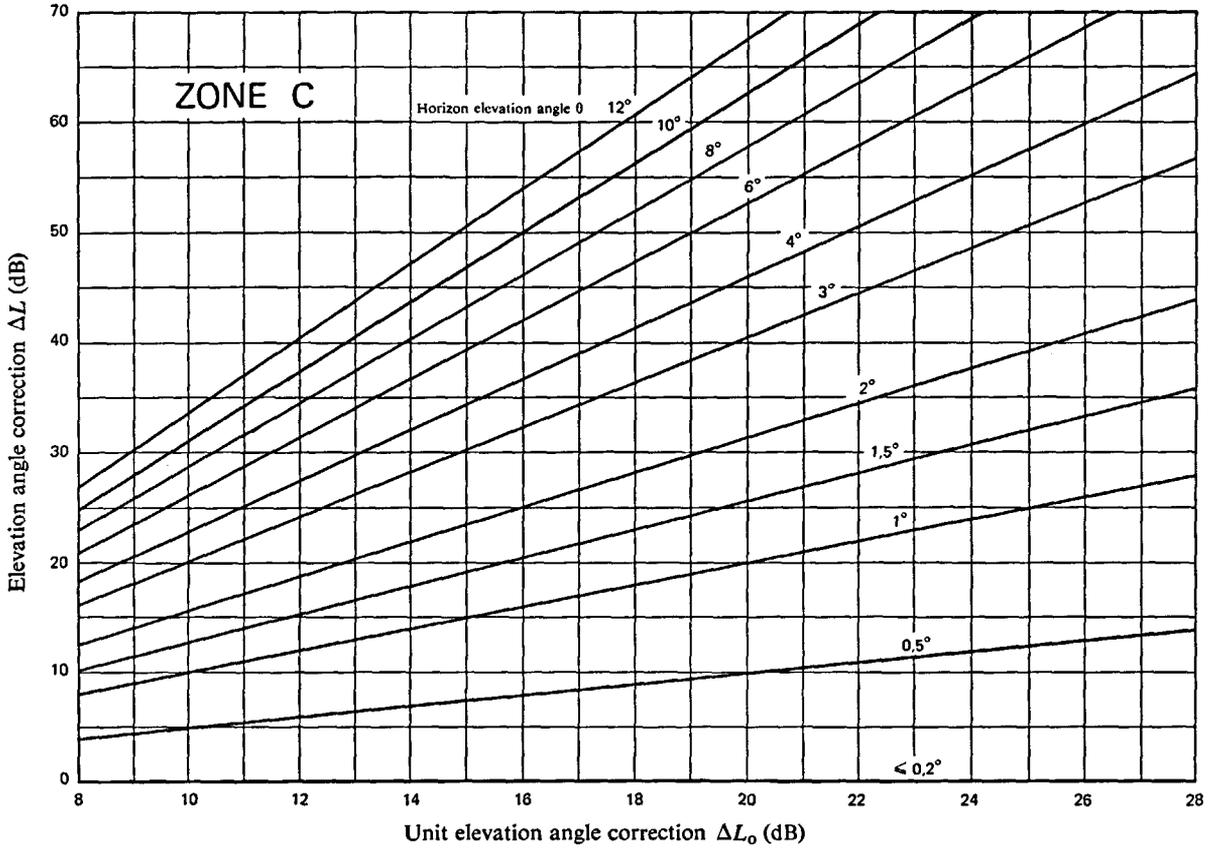


FIGURE 11

Elevation angle correction — Zone C

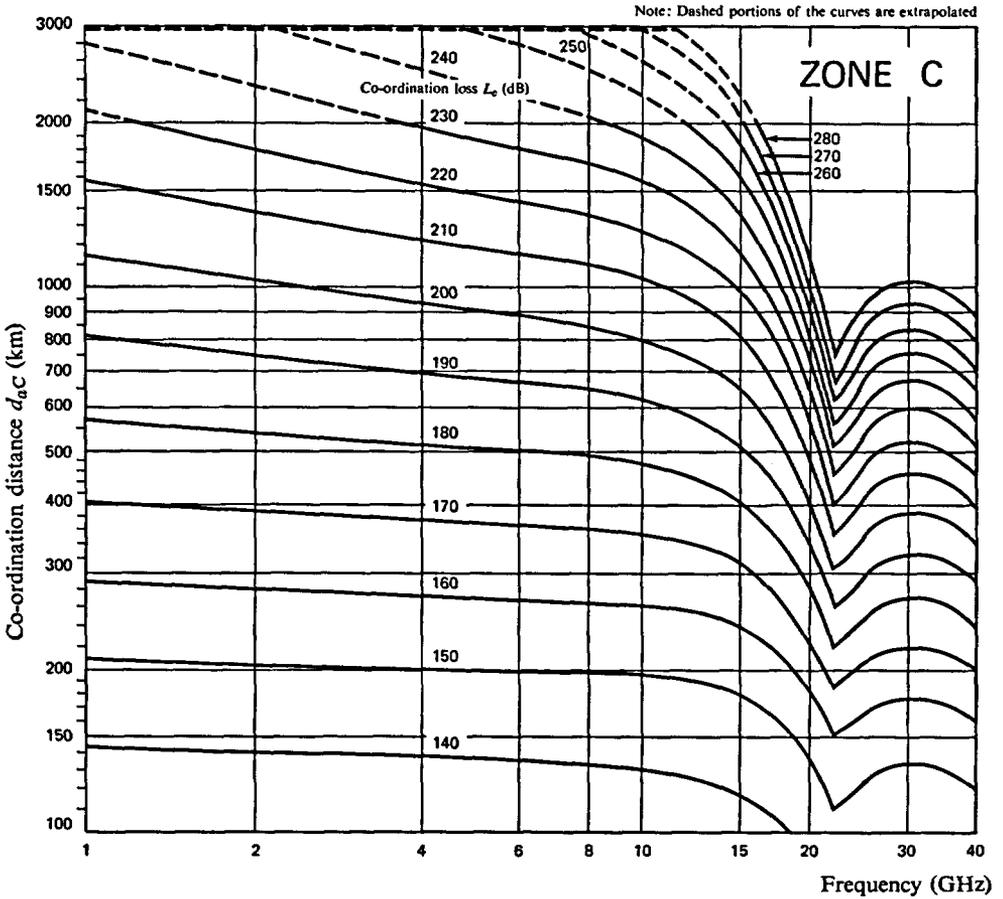
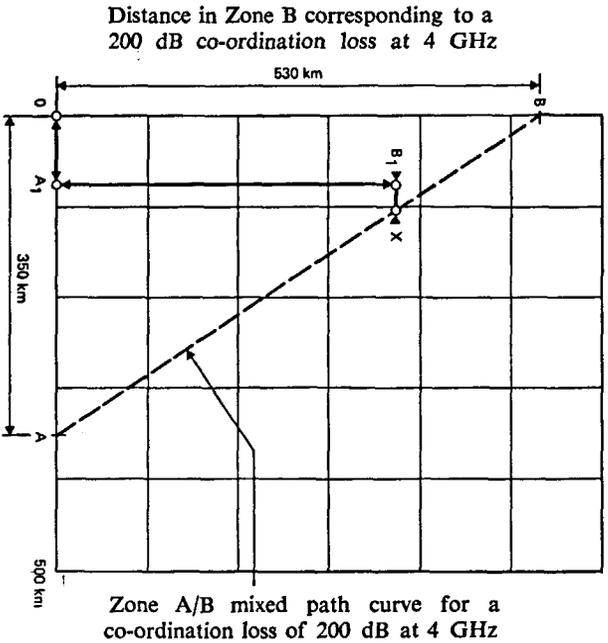


FIGURE 12

Co-ordination distance  $d_{aC}$  as a function of frequency and co-ordination loss — Zone C



Distance in Zone A corresponding to a  
co-ordination loss of 200 dB at 4 GHz

FIGURE 13a

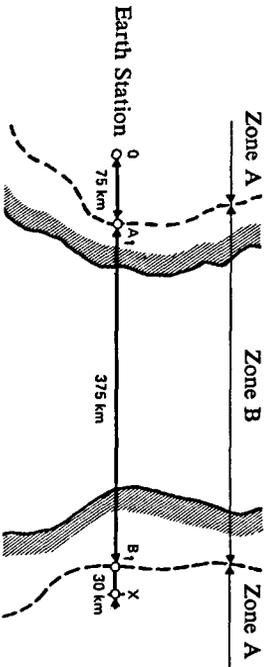


FIGURE 13b

FIGURE 13

*Example of the determination of co-ordination distance for a mixed path involving two zones*

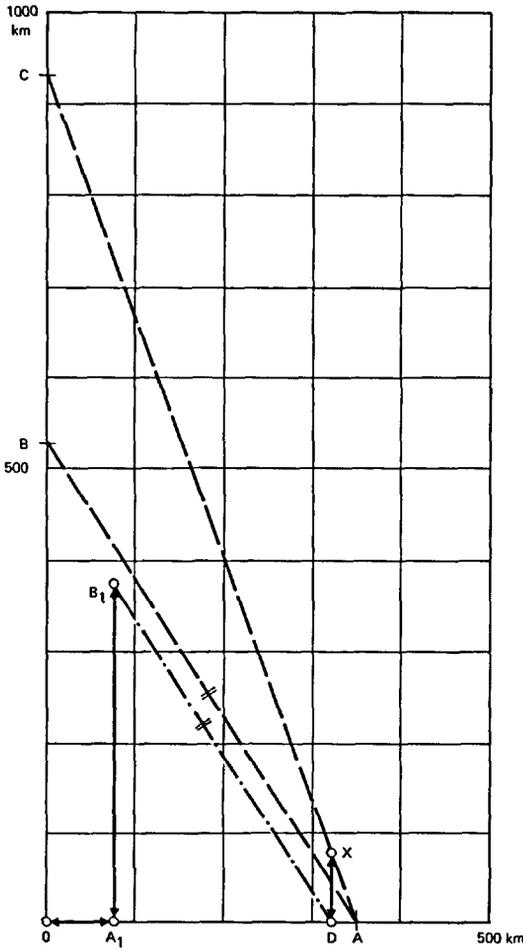


FIGURE 14b

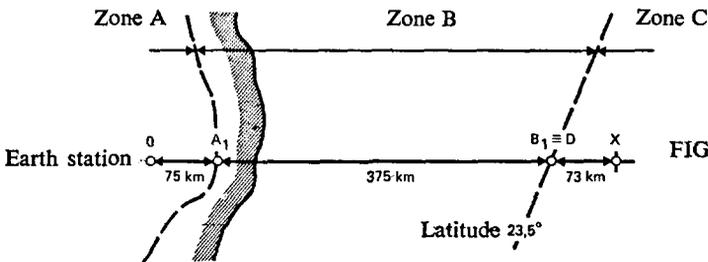


FIGURE 14a

FIGURE 14

*Example of the determination of co-ordination distance for a mixed path in involving the three zones*

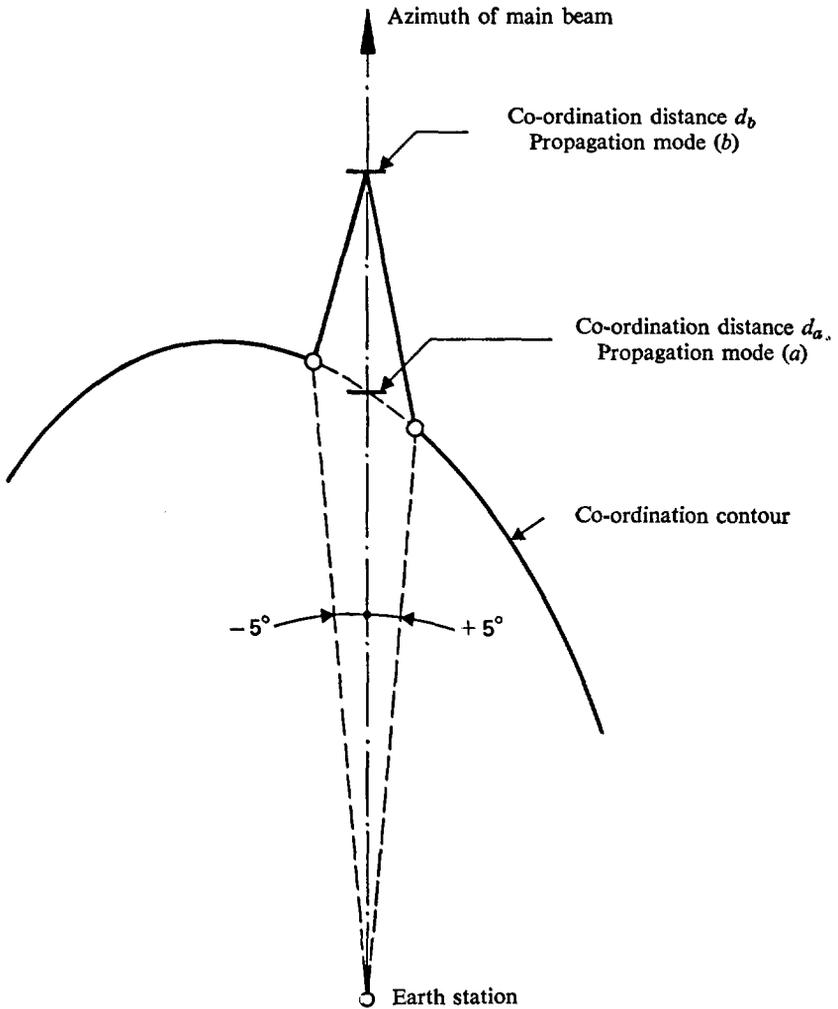
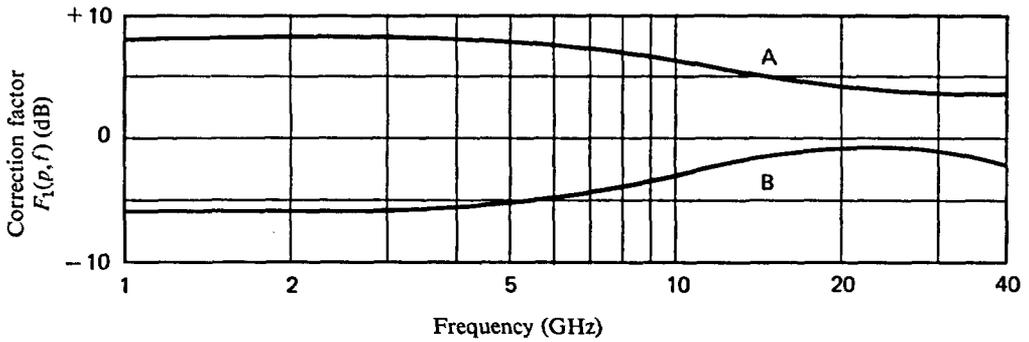


FIGURE 15

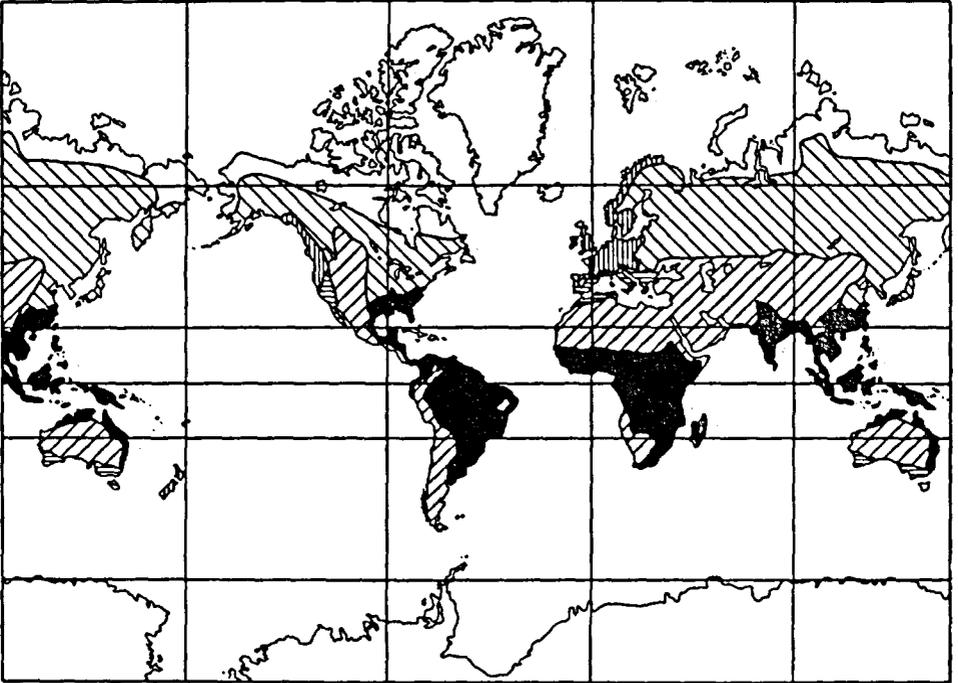
*Example of the determination of the co-ordination distance in the case where the elevation of the earth station main beam is less than  $12^\circ$*



A: Correction for 0.1% of the time } for all rain climatic zones  
 B: Correction for 0.001% of the time }

FIGURE 16

*Correction factor  $F_1(p, f)$  to relate the effective percentage of time to 0.01%, as a function of frequency for propagation mode (c)*



- Zone 1
- ▨ Zone 2
- ▤ Zone 3
- ▥ Zone 4
- ▧ Zone 5

FIGURE 17  
*Rain-climatic zones of the world*

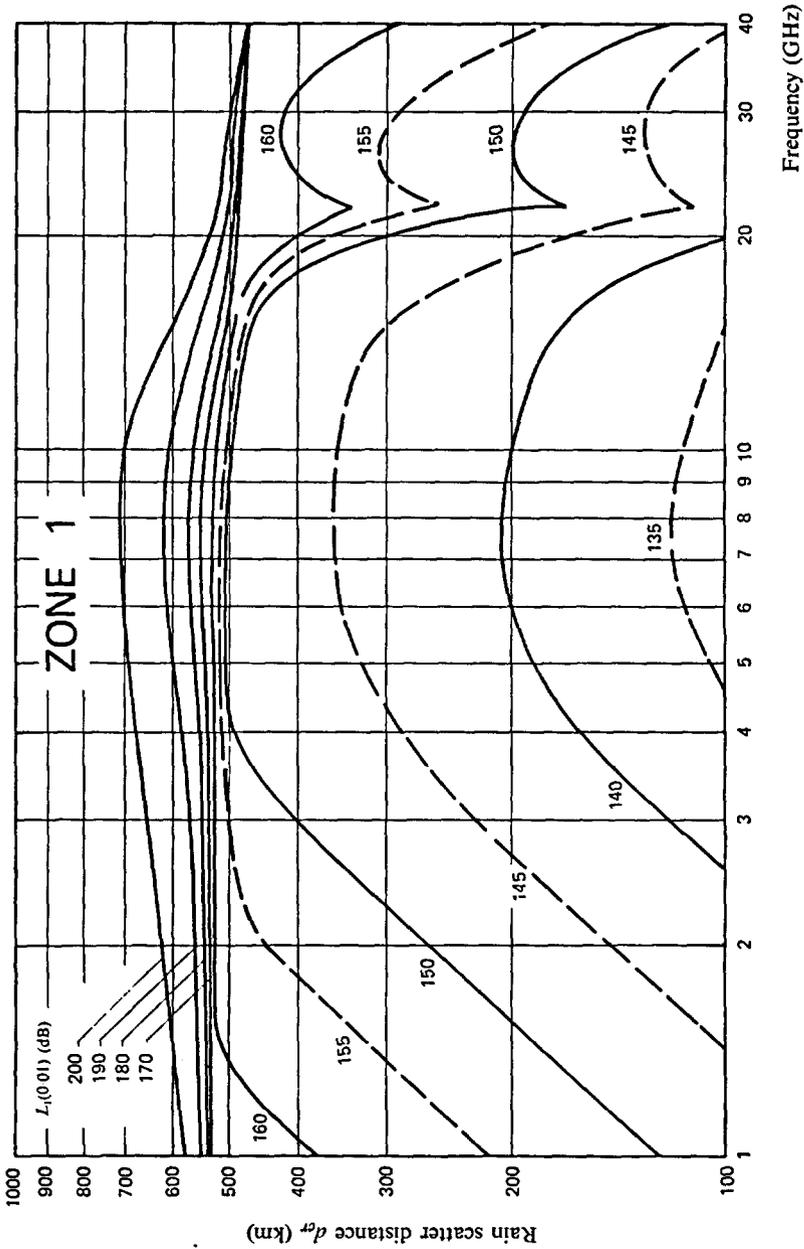


FIGURE 18

*Rain scatter distance as a function of frequency and normalized transmission loss — Rain climatic Zone 1 (see figure 17)*

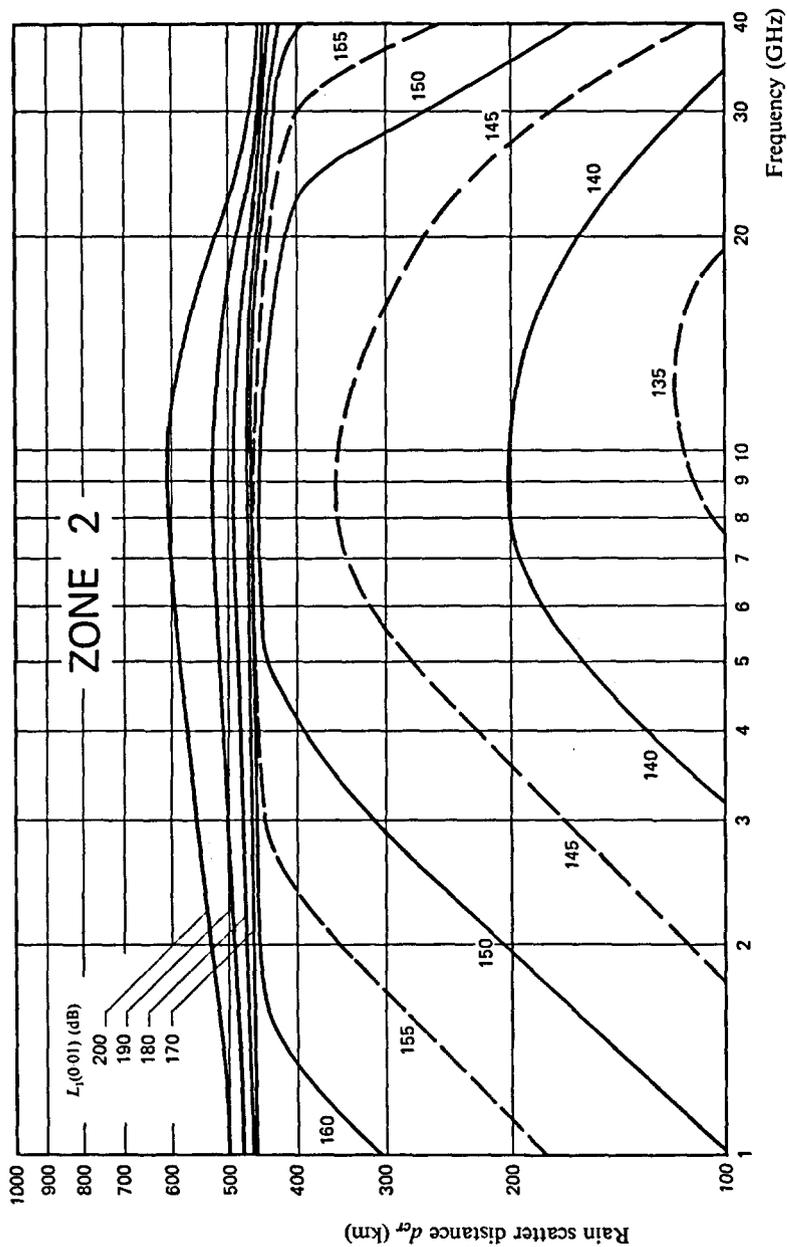


FIGURE 19  
 Rain scatter distance as a function of frequency and normalized transmission loss — Rain climatic Zone 2 (see figure 17)

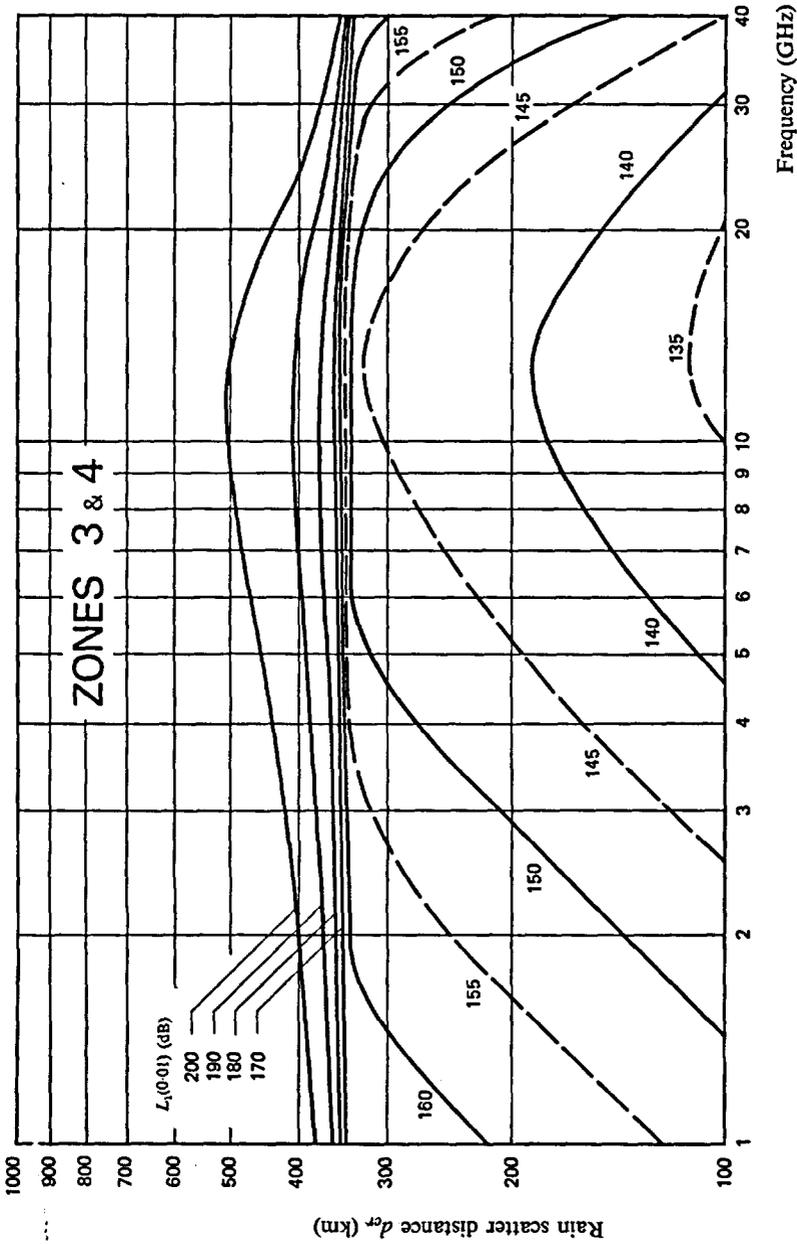


FIGURE 20

*Rain scatter distance as a function of frequency and normalized transmission loss — Rain climatic Zones 3 and 4 (see figure 17)*

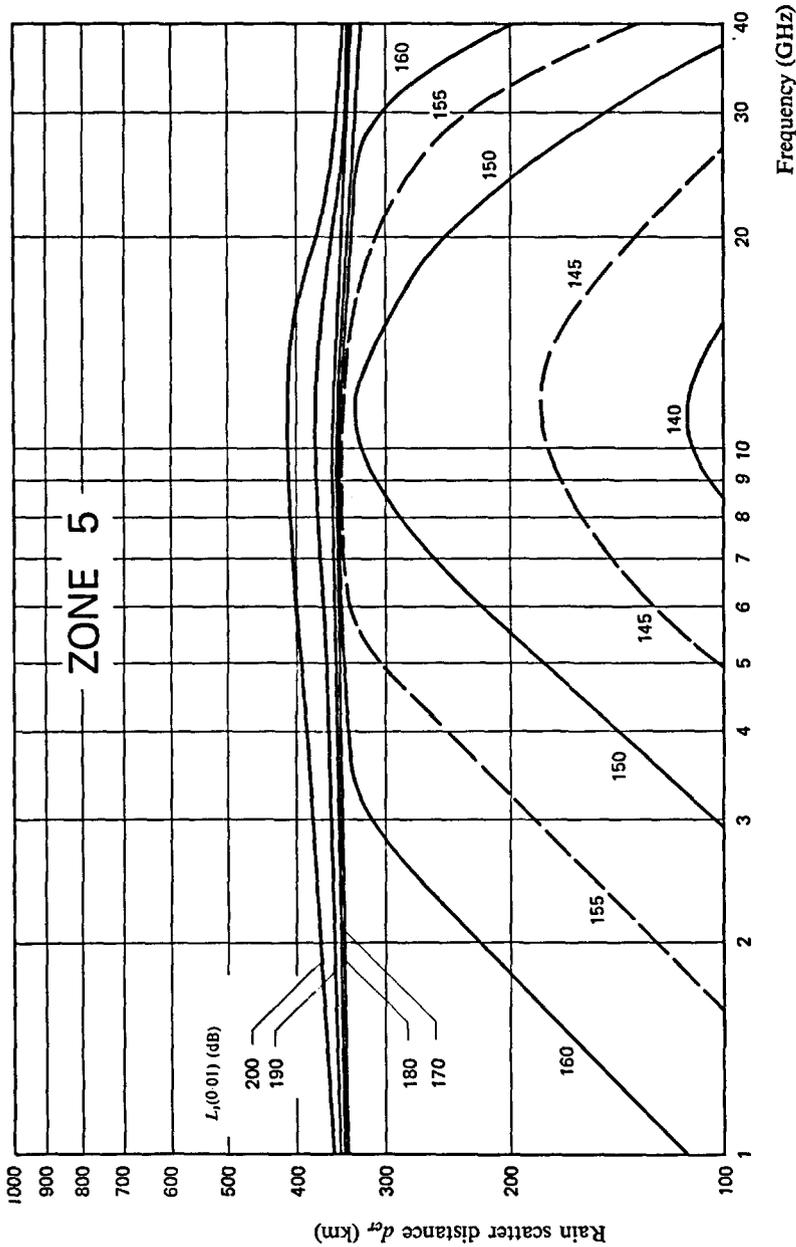


FIGURE 21  
Rain scatter distance as a function of frequency and normalized transmission loss — Rain climatic Zone 5 (see figure 17)

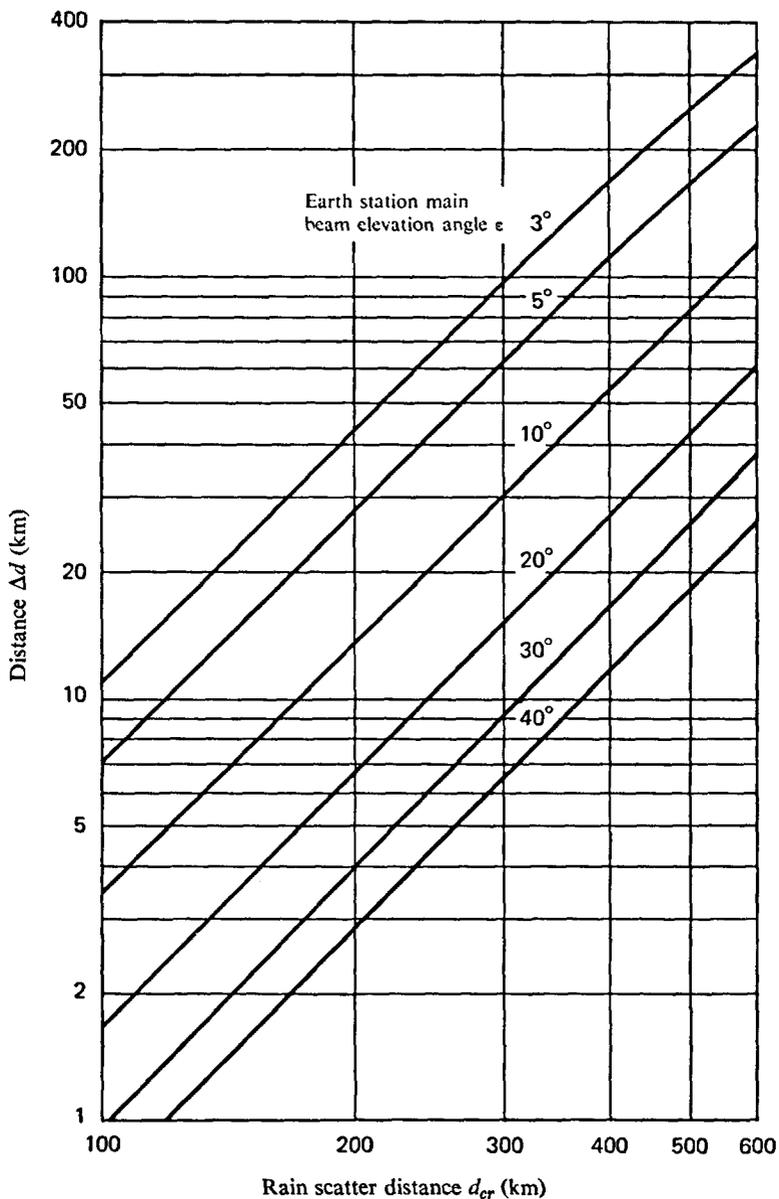
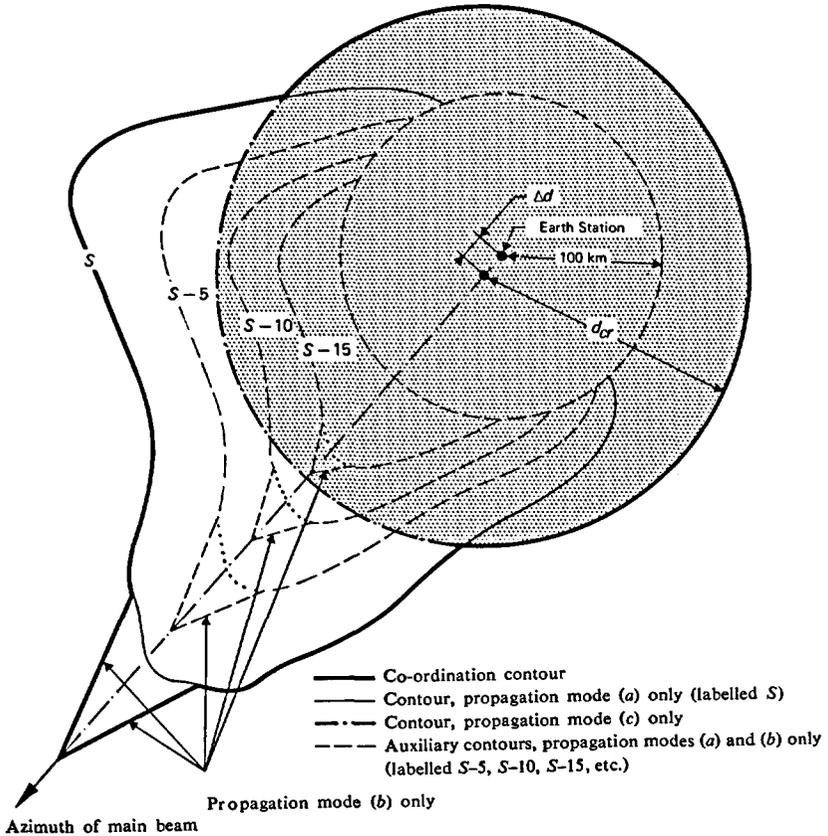


FIGURE 22

*Distance  $\Delta d$  as a function of rain scatter distance  $d_{cr}$  and earth station main beam elevation angle  $\epsilon$*

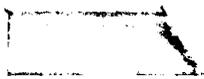


If by using the auxiliary contours it is seen that a terrestrial station can be eliminated with respect to the great circle propagation mechanism then:

- i) if that terrestrial station is outside of the shaded area (rain-scatter mode), it may be eliminated from any further consideration;
- ii) if that terrestrial station is within the shaded area (rain-scatter mode), it must still be considered, but simply for the rain-scatter propagation mode only.

FIGURE 23

*Example of contours for a transmitting earth station*



## ANNEX A TO APPENDIX 28

**Determination of Co-ordination Distance  
in allocated Frequency Bands**

1. Article 9A of the Radio Regulations requires co-ordination distances to be determined only in the particular frequency bands given in Article 5 of these Regulations and listed in Tables III and IV of this Annex. For each of these frequency bands it is convenient to combine those parameters which depend only upon the frequency and types of system using the band. The resulting value of the combined parameters is then a given constant for a particular allocated frequency band and type of earth station.

*Earth station transmission*

2. In the bands allocated for earth station transmission (Table III), use is made of constants  $C_1$  and  $C_2$  derived in the following manner:

For propagation by modes (a) and (b):

$$\begin{aligned} C_1 &= G_r - P_r(p) - 20 \log_{10}(f/4) - F(p) \\ &= S - 20 \log_{10}(f/4) - F(p) \end{aligned}$$

For propagation by mode (c):

$$C_2 = -P_r(p) - F_1(p, f) + \Delta G$$

The normalized basic transmission loss  $L_o(0.01)$  and the normalized transmission loss  $L_1(0.01)$  are given by:

$$\begin{aligned} L_o(0.01) &= P_r + G_r + C_1 \\ L_1(0.01) &= P_r + C_2 \end{aligned}$$

The values of  $C_1$  and  $C_2$  for bands allocated for earth station transmission are given in Table III, together with the reference bandwidth (B) which is used in calculating  $P_r$ .

*Earth station reception*

3. In the bands allocated for earth station reception (see Table IV) use is made of constants  $C_3$  and  $C_4$  which are derived in the following manner:

For propagation by modes (a) and (b):

$$C_3 = E - (10 \log_{10} kB + J - W) - F(p) - 20 \log_{10} (f/4)$$

For propagation by mode (c):

$$C_4 = P_r - (10 \log_{10} kB + J - W) - F_1(p, f) + \Delta G$$

The normalized basic transmission loss  $L_0(0.01)$  and the normalized transmission loss  $L_1(0.01)$  are given by:

$$L_0(0.01) = G_r + C_3 - 10 \log_{10} T_r - M(p)$$

$$L_1(0.01) = C_4 - 10 \log_{10} T_r - M(p)$$

The values of  $C_3$  and  $C_4$  for bands allocated for earth station reception are given in Table IV.

*Flow Diagrams*

4. The procedure for determining co-ordination distance is illustrated by Flow Diagrams 1 and 2 in this Annex. The steps required to determine co-ordination distances for a transmitting earth station are shown in Flow Diagram 1, and those for a receiving earth station are shown in Flow Diagram 2. The symbols used in these diagrams are defined in the main text of Appendix 28.

TABLE III

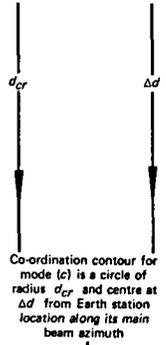
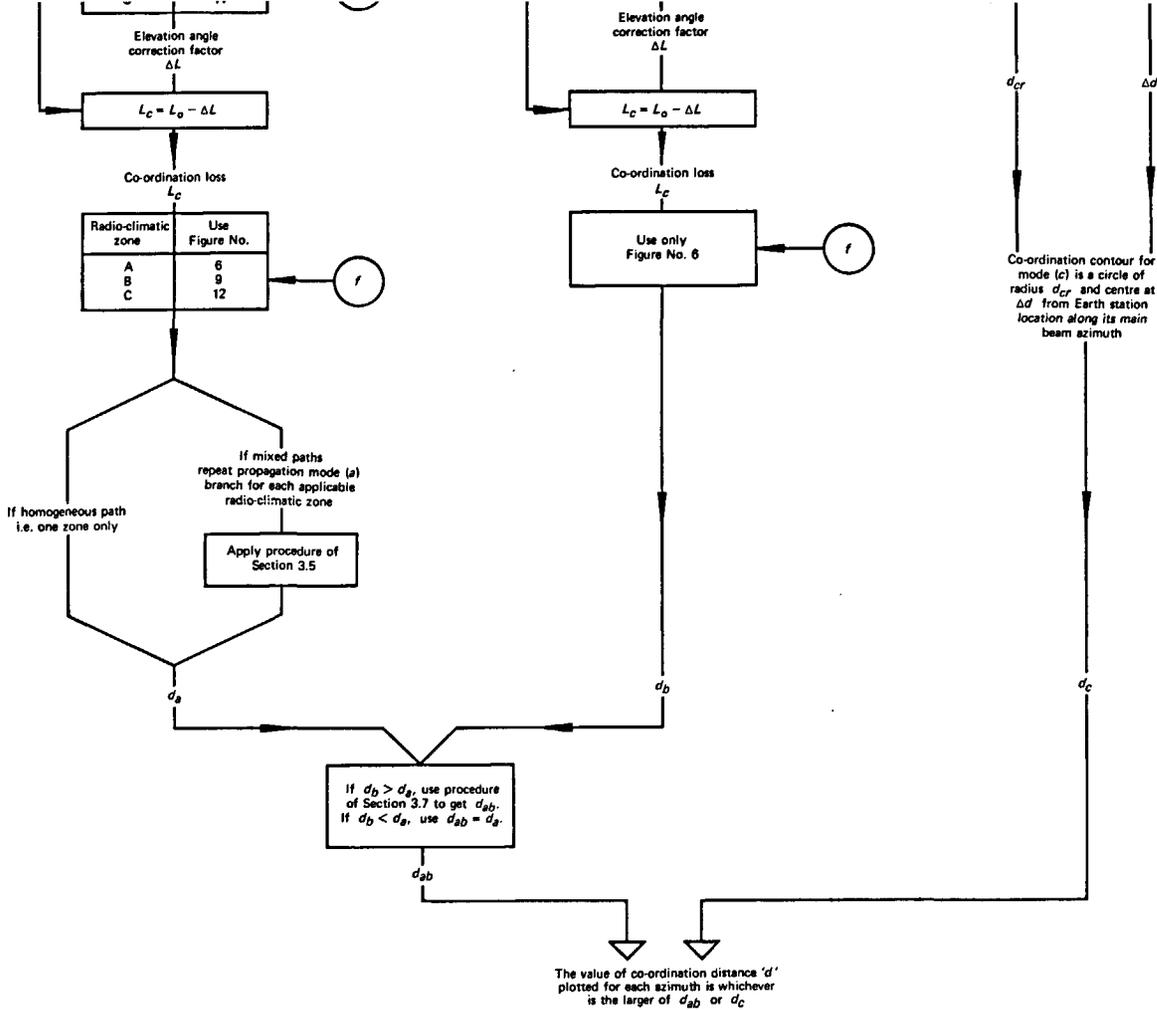
Earth station Transmission (See Flow Diagram 1)

Allocated Frequency Bands (GHz)	$C_1$ (dBW)	$C_2$ (dBW)	Reference Bandwidth $B$ (Hz)
1.427 - 1.429	178	127	$4 \times 10^8$
2.655 - 2.690	196	150	$4 \times 10^8$
4.400 - 4.700	191	150	$4 \times 10^8$
5.850 - 6.425	175	136	$4 \times 10^8$
7.900 - 7.975 } 8.025 - 8.400 }	175	138	$4 \times 10^8$
10.95 - 11.20	172	137	$4 \times 10^8$
12.50 - 12.75	171	137	$4 \times 10^8$
14.40 - 14.50	170	137	$4 \times 10^8$
27.5 - 29.5	142	112	$1 \times 10^6$

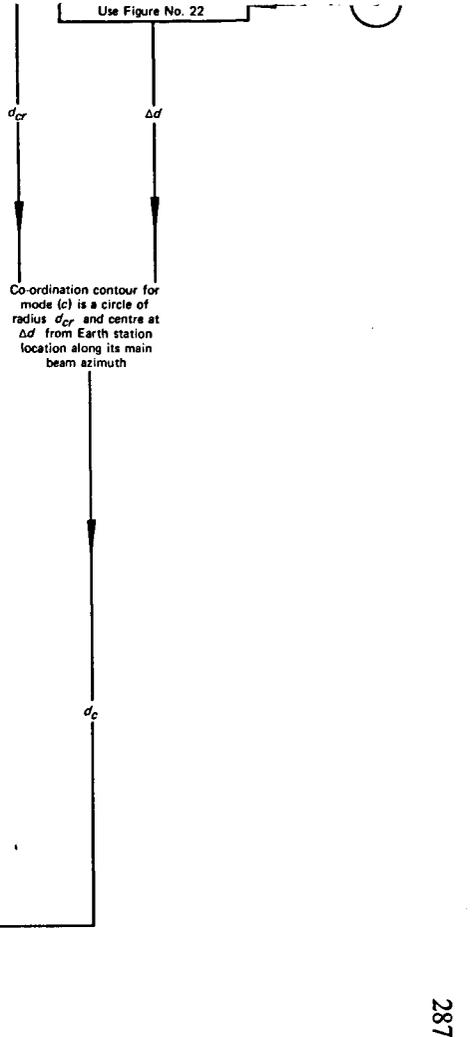
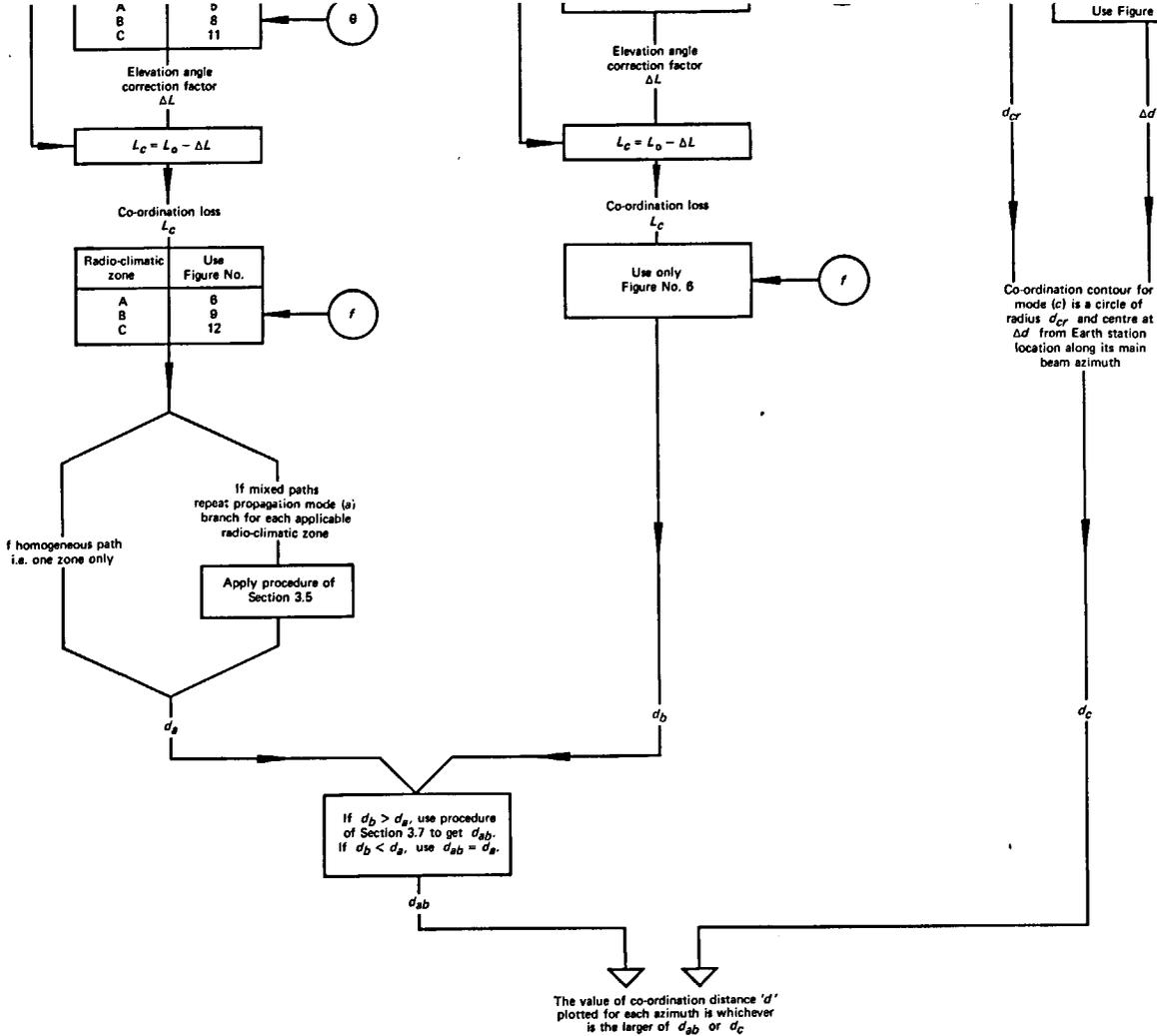
**TABLE IV**  
**Earth Station Reception (see Flow Diagram 2)**

Allocated frequency Bands (GHz)	Designation of space radiocommunication service		Type of modulating signal (†)	C <sub>3</sub> (dBW)	C <sub>4</sub> (dBW)
1.525 - 1.535	Space operation (Telemetry)				
1.670 - 1.690	Meteorological-satellite				
1.700 - 1.710 } 2.290 - 2.300 }	Space research	Near Earth			
		Deep space, manned			
2.500 - 2.535	Fixed-satellite		A	277	231
3.400 - 4.200	Fixed-satellite		A	236	194
			N	234	188
7.300 - 7.750	Fixed-satellite		A	230	194
			N	228	186
8.025 - 8.400	Earth exploration-satellite				
8.400 - 8.500	Space research	Near Earth			
		Deep space			
10.95 - 11.20 } 11.45 - 11.70 }	Fixed-satellite		A	225	184
			N	220	176
11.70 - 12.20 } 12.50 - 12.75 }	Fixed-satellite		A	224	184
			N	219	176
17.7 - 19.7	Fixed-satellite		N	196	154
21.2 - 22.0	Earth exploration-satellite				

(†) A = Analogue Modulation; N = Digital Modulation.



The value of co-ordination distance 'd' plotted for each azimuth is whichever is the larger of  $d_{ab}$  or  $d_c$

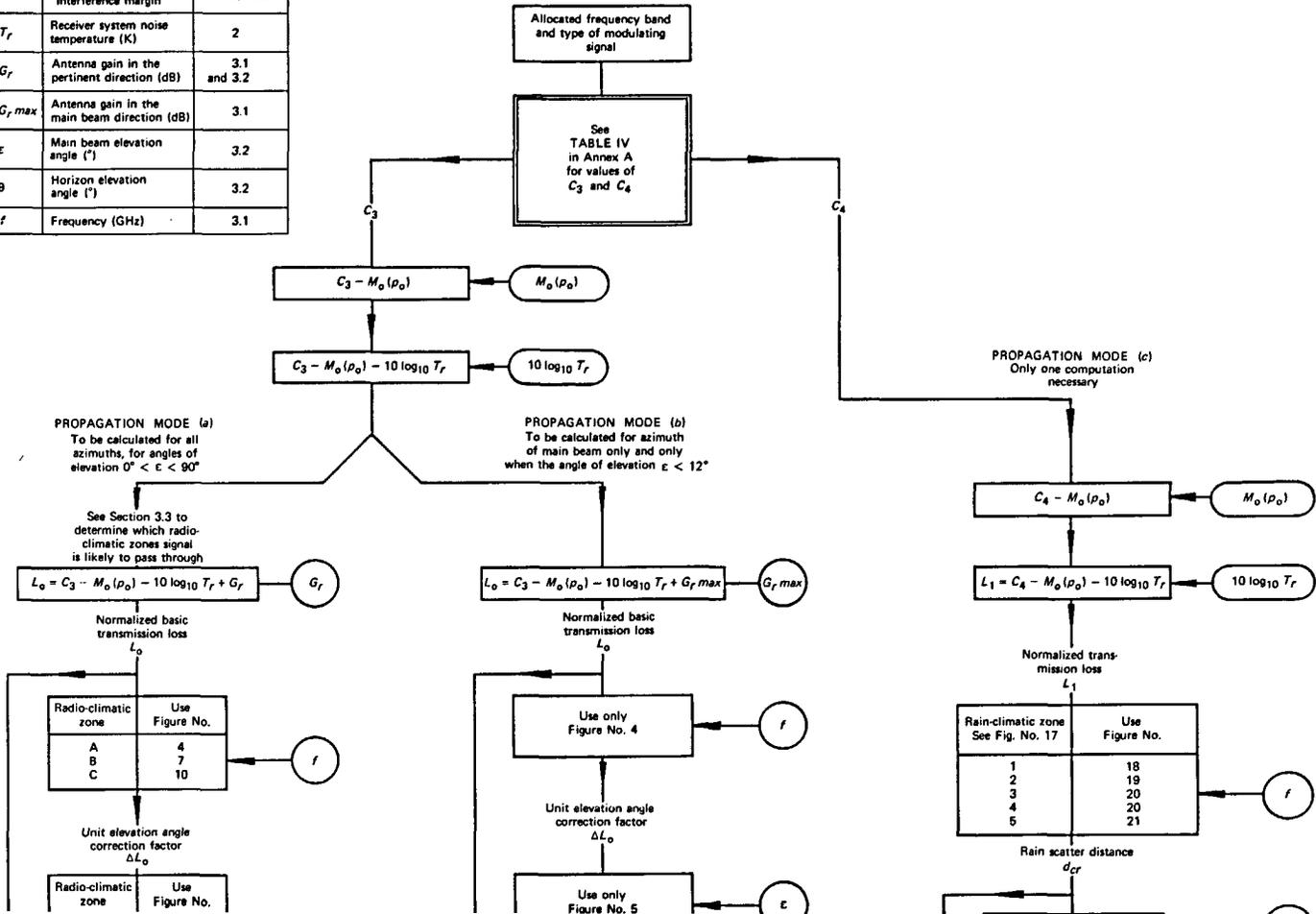


DEFINITIONS OF SYMBOLS

Symbol	Description	Reference in Appendix 28
$M_o(\rho_o)$	Long term/short term "interference margin"	2, Note 2
$T_r$	Receiver system noise temperature (K)	2
$G_r$	Antenna gain in the pertinent direction (dB)	3.1 and 3.2
$G_r \text{ max}$	Antenna gain in the main beam direction (dB)	3.1
$\epsilon$	Main beam elevation angle (°)	3.2
$\theta$	Horizon elevation angle (°)	3.2
$f$	Frequency (GHz)	3.1

FLOW DIAGRAM TO PRODUCE CO-ORDINATION CONTOUR FOR A RECEIVING EARTH STATION

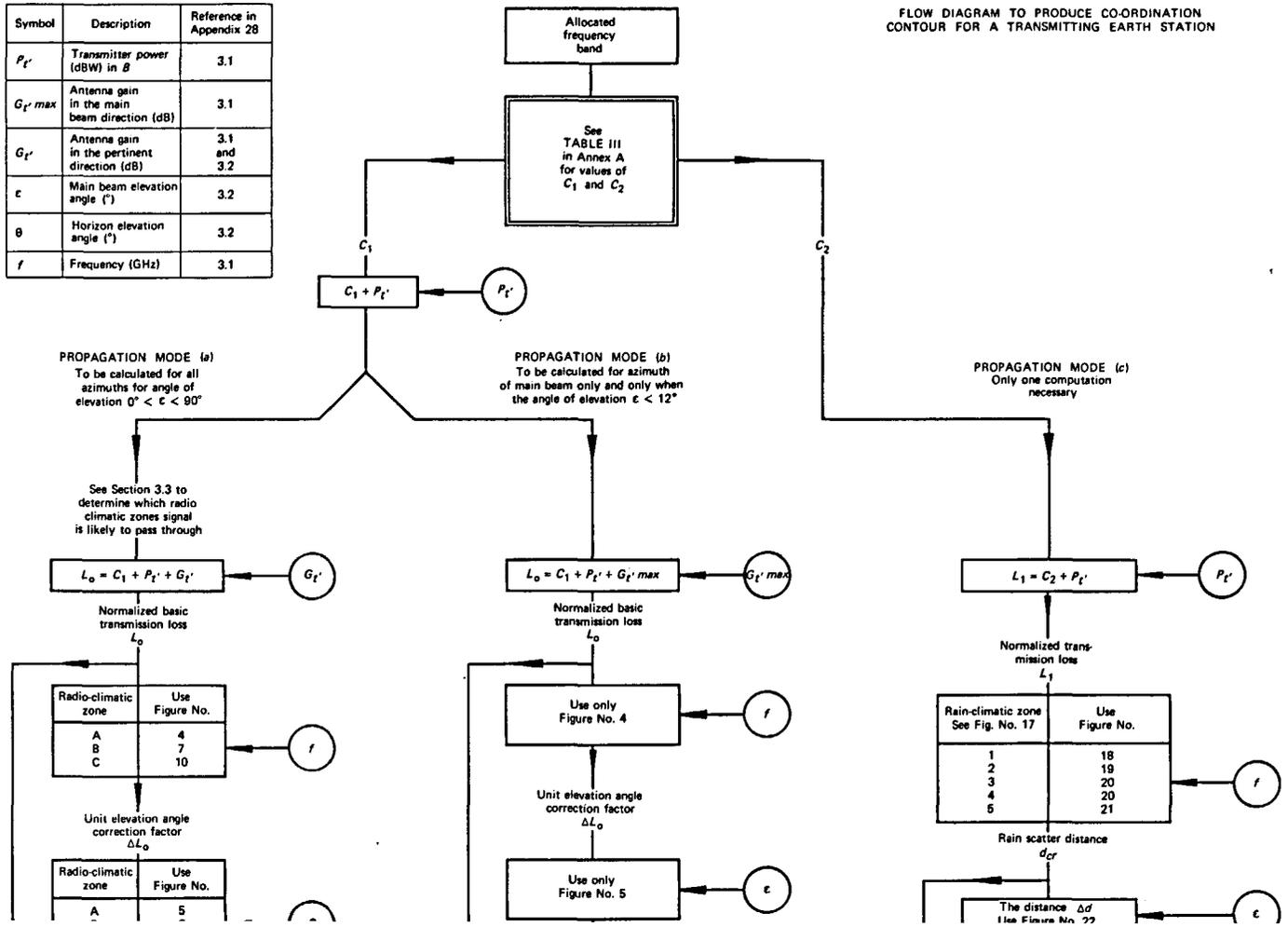
FLOW DIAGRAM 2



DEFINITIONS OF SYMBOLS

Symbol	Description	Reference in Appendix 28
$P_t'$	Transmitter power (dBW) in $B$	3.1
$G_t', max$	Antenna gain in the main beam direction (dB)	3.1
$G_t'$	Antenna gain in the pertinent direction (dB)	3.1 and 3.2
$\epsilon$	Main beam elevation angle ( $^\circ$ )	3.2
$\theta$	Horizon elevation angle ( $^\circ$ )	3.2
$f$	Frequency (GHz)	3.1

FLOW DIAGRAM 1  
FLOW DIAGRAM TO PRODUCE CO-ORDINATION CONTOUR FOR A TRANSMITTING EARTH STATION



PROPAGATION MODE (a)  
To be calculated for all azimuths for angle of elevation  $0^\circ < \epsilon < 90^\circ$

PROPAGATION MODE (b)  
To be calculated for azimuth of main beam only and only when the angle of elevation  $\epsilon < 12^\circ$

PROPAGATION MODE (c)  
Only one computation necessary

See Section 3.3 to determine which radio climatic zones signal is likely to pass through

$L_0 = C_1 + P_t' + G_t'$

Normalized basic transmission loss

Radio-climatic zone	Use Figure No.
A	4
B	7
C	10

Unit elevation angle correction factor  $\Delta L_0$

Radio-climatic zone	Use Figure No.
A	5

$L_0 = C_1 + P_t' + G_t', max$

Normalized basic transmission loss

Use only Figure No. 4

Unit elevation angle correction factor  $\Delta L_0$

Use only Figure No. 5

$L_1 = C_2 + P_t'$

Normalized transmission loss

Rain-climatic zone See Fig. No. 17	Use Figure No.
1	18
2	19
3	20
4	20
5	21

Rain scatter distance

The distance  $\Delta d$  Use Figure No. 22

## ANNEX B TO APPENDIX 28

**Determination and Use of auxiliary Contours****1. Introduction**

For great circle propagation mechanisms, modes (a) and (b), auxiliary contours are of great value in eliminating certain existing or planned terrestrial stations falling within the co-ordination area without recourse to precise and arduous calculations. The work of both the earth station administration and the affected administrations is therefore eased during subsequent negotiations if these auxiliary contours are supplied.

**2. Determination of the auxiliary contours**

Two types of contours can be determined, depending on whether the earth station is used for transmission or reception.

**2.1 Transmitting earth station**

The contours are determined in the same way as the corresponding co-ordination contour for propagation modes (a) and (b), but using terrestrial station interference sensitivity factor  $S$  values (in dBW) which are 5, 10, 15, 20 dB, etc. lower than the value (given in Table I of Appendix 28) corresponding to the co-ordination contour.

**2.2 Receiving earth station**

The contours are determined in the same way as the corresponding co-ordination contour, for propagation modes (a) and (b), but using terrestrial station e.i.r.p. values  $E$  (in dBW) which are 5, 10, 15, 20 dB, etc. lower than the value (given in Table II of Appendix 28) corresponding to the co-ordination contour.

**3. Use of auxiliary contours**

The auxiliary contours, the co-ordination contour for great circle propagation (modes (a) and (b)) and the co-ordination contour for

rain scatter (mode (c)) are all plotted on the same diagram for a given shared band. An illustrated example is given in Figure 23 of Appendix 28 for a transmitting earth station.

For each terrestrial station situated within the co-ordination area, a two-stage procedure may be applied, one for the great circle propagation mechanism and the other for rain scatter.

### 3.1 *Great circle propagation mechanism (modes (a) and (b))*

If a transmitting terrestrial station is outside the co-ordination area corresponding to modes (a) and (b), it need not be considered further with respect to modes (a) and (b).

For each transmitting terrestrial station situated within the co-ordination area corresponding to modes (a) and (b), the e.i.r.p. value in the direction of the earth station is determined. If this value is less than the value associated with the nearest contour defining an area outside of which the station is situated, the station may be considered not to cause more than a permissible level of interference and therefore may be eliminated from further considerations with respect to modes (a) and (b).

For each receiving terrestrial station, the analogous procedure may be applied, using the interference sensitivity factor instead of the e.i.r.p. value.

### 3.2 *Elimination of a terrestrial station and rain scatter mechanism (mode (c))*

Terrestrial stations eliminated by the above procedure from further consideration with regard to propagation modes (a) and (b) need, nevertheless, be further considered with regard to propagation mode (c) when they lie within the rain scatter co-ordination area.

---

## ANNEX 19

### Addition of a new Appendix (Appendix 29) to the Radio Regulations

The following new Appendix shall be added to the Radio Regulations after the new Appendix 28:

#### APPENDIX 29

##### Method of Calculation to evaluate the Degree of Interference between geostationary Satellite Networks Sharing the same Frequency Bands

###### 1. *Introduction*

The method of calculating interference is based on the concept that the noise temperature of the system receiving interference increases as the level of the interference increases. It can, therefore, be applied irrespective of the modulation characteristics of these satellite networks, and of the precise frequencies used.

In this method, the apparent increase in the equivalent satellite link noise temperature<sup>(1)</sup> resulting from interference caused by a given system is calculated and this value is compared with a predetermined increase in the noise temperature (see section 3 below).

###### 2. *Calculation of the increase in noise temperature of the satellite link receiving interference*

Let A and A' be the satellite links<sup>(2)</sup> of the two satellite networks considered. Primes indicate the parameters of satellite link A'; the notation without primes is used for the parameters of satellite link A.

The parameters are defined as follows (for satellite link A):

$\Delta T_s$  = increase in the receiver noise temperature of the satellite S caused by interference in the receiver of this satellite (K);

---

<sup>(1)</sup> See No. 103A.

<sup>(2)</sup> See No. 84AFC.

$\Delta T_e$  = increase in the receiver noise temperature of the earth station  $e_r$  caused by interference in the receiver of this station (K);

$p_s$  = maximum power density per Hz delivered to the antenna of satellite S (averaged over the worst 4 kHz band for a carrier frequency below 15 GHz or over the worst 1 MHz band above 15 GHz) (W/Hz);

$g_s(\eta_{e'})$  = transmitting antenna gain of satellite S in the direction of the receiving earth station  $e'_r$  of satellite link A' (numerical power ratio);

*Note:* the product  $p_s g_s(\eta_{e'})$  is the maximum equivalent isotropically radiated power per Hz of satellite S in the direction of the receiving earth station  $e'_r$  of satellite link A' ;

$p_e$  = maximum power density per Hz delivered to the antenna of the transmitting earth station  $e_t$  (averaged over the worst 4 kHz band for a carrier frequency below 15 GHz or over the worst 1 MHz band above 15 GHz) (W/Hz);

$g_s(\delta_{e'})$  = receiving antenna gain of satellite S in the direction of the transmitting earth station  $e'_t$  (numerical power ratio);

$g_1(\theta)$  = transmitting antenna gain of the earth station  $e_t$  in the direction of satellite S' (numerical power ratio);

$g_e(\theta)$  = receiving antenna gain of the earth station  $e_r$  in the direction of satellite S' (numerical power ratio);

$k$  = Boltzmann's constant (J/K);

$l_d$  = free-space transmission loss on the down-path (numerical power ratio)(\*);

$l_u$  = free-space transmission loss on the up-path (numerical power ratio)(\*);

---

(\*) To simplify the calculation it was assumed that:

- basic transmission loss on the down-path is the same regardless of the satellite and earth station considered;
- basic transmission loss on the up-path is the same regardless of the earth station and satellite considered.

- $\gamma$  = transmission gain of the satellite link evaluated from the output of the receiving antenna of the space station S to the output of the receiving antenna of the earth station  $e_r$  (numerical power ratio, usually less than 1);
- $\theta$  = geocentric angular separation between two satellites (degrees) (\*).

The parameters  $\Delta T_s$  and  $\Delta T_e$  are given by the following equations:

$$\Delta T_s = \frac{P'_e g'_1(\theta) g_2(\delta_{e'})}{k l_u} \quad (1)$$

$$\Delta T_e = \frac{P'_s g'_3(\gamma_e) g_4(\theta)}{k l_d} \quad (2)$$

The symbol  $\Delta T$  will be used to denote the apparent increase in the equivalent noise temperature for the entire satellite link at the receiver input of the receiving station  $e_r$  due to interference from link A'.

This increase is the result of interference entering at both the satellite and earth station receiver of link A and can accordingly be expressed as:

$$\Delta T = \gamma \Delta T_s + \Delta T_e \quad (3)$$

Hence,

$$\Delta T = \gamma \frac{P'_e g'_1(\theta) g_2(\delta_{e'})}{k l_u} + \frac{P'_s g'_3(\gamma_e) g_4(\theta)}{k l_d} \quad (4)$$

Equation (4) combines both the up-path and the down-path interference. If there is a change of modulation in the satellite or if the translation frequencies of the wanted and interfering satellites are different then it may be necessary to treat up and down paths separately using equations (1) and (2).

---

(\* ) To simplify the calculation it was assumed that the topocentric angular separation between the two satellites as seen from any earth station is identical to the geocentric angular separation between the two satellites.

In the foregoing equations, the gains  $g'_1(\theta)$  and  $g_d(\theta)$  are those of the earth stations concerned. Unless more precise actual data are available, an appropriate reference radiation pattern may be used to express the gain  $g'_1(\theta)$  and  $g_d(\theta)$  in a direction forming an angle  $\theta$  with the direction of maximum radiation. In the event that precise numerical data are not available, the reference radiation pattern  $32 - 25 \log_{10} \theta$  shall be used for earth station antennae for which the ratio *diameter/wavelength* exceeds 100.

In the same way, the increase  $\Delta T'$  in the equivalent noise temperature for the entire satellite link at the receiver input of the receiving earth station  $e'_r$  under the effect of the interference caused by satellite link A is given by the following equations:

$$\Delta T'_{s'} = \frac{P_e g_1(\theta) g'_2(\delta_e)}{kl_u} \quad (5)$$

$$\Delta T'_{e'} = \frac{P_s g_3(\gamma_{e'}) g'_4(\theta)}{kl_d} \quad (6)$$

$$\Delta T' = \gamma' \frac{P_e g_1(\theta) g'_2(\delta_e)}{kl_u} + \frac{P_s g_3(\gamma_{e'}) g'_4(\theta)}{kl_d} \quad (7)$$

For two multiple-access satellites this calculation must be made for each of the satellite links established via one satellite in relation to each of the satellite links established via the other satellite.

### 3. Comparison between calculated and predetermined percentage increase in equivalent satellite link noise temperature

The calculated values of  $\Delta T$  and  $\Delta T'$  shall be compared with the corresponding predetermined values. These predetermined values are taken as 2% of the appropriate equivalent satellite link noise temperatures:

— if the calculated value of  $\Delta T$  is less than the predetermined one, the interference level from satellite link A' to satellite link A is permissible irrespective of the modulation characteristics of the two satellite links and of the precise frequencies used;

— if the calculated value of  $\Delta T$  is more than the predetermined one, a detailed calculation shall be carried out following the methods and techniques set out in the relevant C.C.I.R. Reports and Recommendations.

The comparison of  $\Delta T'$  with the predetermined value shall be carried out in a similar manner.

As an example, it can be seen that in the case of a satellite link operating in accordance with current C.C.I.R. Recommendations, using FM telephony and having a total noise in a telephone channel of 10 000 pW0p including 1 000 pW0p interference noise from terrestrial radio-relay systems and 1 000 pW0p interference noise from other satellite links, a 2% increase in equivalent noise temperature would correspond to 160 pW0p of interference noise.

The list of basic characteristics to be furnished for each network is given in Appendix 1B to the Radio Regulations. A detailed illustration of the interference calculation in the case of two geostationary satellite links is given in the Annex to this Appendix.

*4. Determination of the satellite links to be considered in calculating the increase in equivalent satellite link noise temperature from the data furnished for the advance publication of a satellite network*

The greatest increase in equivalent satellite link noise temperature caused to any link of another satellite network, existing or planned, by interference produced by the proposed satellite network must be determined.

The most unfavourably sited transmitting earth station of the interfering satellite network should be determined for each satellite receiving antenna of the network suffering interference by superimposing the "Earth-to-space" service areas of the interfering network on the space station receiving antenna gain contours plotted on a map of the Earth's surface. The most unfavourably sited transmitting earth station is the one in the direction of which the satellite receiving antenna gain of the network interfered with is the greatest.

The most unfavourably sited receiving earth station of the network suffering interference should be determined in an analogous manner for each "space-to-Earth" service area of that network. The most unfavourably sited receiving earth station is the one in the direction of which the satellite transmitting antenna gain of the interfering network is the greatest.

When the satellite of the network suffering interference is equipped with simple frequency-translating transponders the above determinations are made in pairs, one for the receiving antenna of a particular transponder and one for the "space-to-Earth" service area associated with the transmitting antenna of that transponder.

The calculation procedure described above may be used to determine the greatest increase in equivalent noise temperature caused to any satellite link in a proposed satellite network by interference produced by any other satellite network.

## ANNEX TO APPENDIX 29

**Example of an Interference Calculation between two geostationary  
Satellite Links Sharing the same Frequency Band**

*A. General*

In this example, for simplicity, two identical satellite networks are assumed with  $\theta = 6^\circ$  geocentric angular spacing between the satellites. For this angular separation the reference radiation pattern of the earth station antenna ( $32 - 25 \log_{10}\theta$ ) gives a gain of 12.5 dB in the direction of the satellite of the other network.

The calculations have been performed in dB, which means that numerical multiplications thus become dB additions and numerical divisions become dB subtractions. In each step, the contributing factors have been introduced in a sequence corresponding to the propagation direction. The first three steps define the system parameters for each link. Steps 4, 5 and 6 perform the actual interference calculations.

To determine the equivalent link noise temperature it is necessary to know the ratio between the total internal link noise and the thermal noise of the down-path. The noise budget for this example is assumed as follows:

*Noise budget*

Internal noise 8 000 pW0p	{	Thermal noise (down-path)	5 000 pW0p
		Thermal noise (up-path)	1 000 pW0p
		Intermodulation noise	2 000 pW0p
External noise 2 000 pW0p	{	Interference noise from links using other satellites	1 000 pW0p
		Interference noise from terrestrial systems	1 000 pW0p
		<hr style="width: 100%; border: 0.5px solid black;"/>	<hr style="width: 100%; border: 0.5px solid black;"/>
		Total noise	10 000 pW0p

It may be noted that since both satellites use global beams, essentially no antenna discrimination between wanted and unwanted signals is obtained at the satellite and that this constitutes a worst case.

### B. System parameters

	Symbol	Link A or A'	Unit
Step 1) <i>Up-path at 6 175 MHz</i>			
Maximum power density per Hz delivered to the antenna of the transmitting earth station in the worst 4 kHz band . . . . .	$p_e$	-37	dBW/Hz
Earth station antenna gain	$g_1$	62.5	dB
Free space loss 38 500 km at 6 175 MHz	$l_u$	200	dB
Satellite antenna gain (using global beam)	$g_2$	15.5	dB
Receiver input at satellite $p_e + g_1 - l_u + g_2$		-159	dBW/Hz
Step 2) <i>Down-path at 3 950 MHz</i>			
Maximum power density per Hz delivered to the satellite antenna in the worst 4 kHz band	$p_s$	-57	dBW/Hz
Satellite transmitting antenna gain	$g_3$	15.5	dB
Free space loss for 38 500 km at 3 950 MHz	$l_d$	196	dB
Earth station receiv. antenna gain	$g_4$	58.5	dB
Receiver input at earth station $p_s + g_3 - l_d + g_4$		-179	dBW/Hz
Step 3) <i>Link calculations</i>			
Transmission gain from satellite receiver input to earth station receiver input 159 dB - 179 dB	$\gamma$	-20	dB

	Symbol	Link A or A'	Unit
Earth station noise temperature (giving $G/T = 40.7$ dB)		60	K
Thermal noise down-path (see noise budget)		5 000	pW0p
Total internal link noise (see noise budget)		8 000	pW0p
Equivalent link noise temperature $\frac{8\ 000}{5\ 000} \times 60$	$T$	96	K

### C. Interference calculation

Step 4) <i>Up-path interference</i>			
Interfering earth station power density (as in Step 1)	$p_e'$	-37	dBW/Hz
Interfering earth station antenna gain towards interfered satellite (6° off beam)	$g_1'(\theta)$	12.5	dB
Free space loss for 38 500 km at 6 175 MHz (see Step 1)	$l_u$	200	dB
Satellite antenna gain in the direction of the interfering earth station	$g_2(\delta_e')$	15.5	dB
Boltzmann's constant $1.38 \times 10^{-23}$ J/K	$k$	-228.6	dBW/K
Increase in receiver noise temperature of the satellite $p_e' + g_1'(\theta) - l_u + g_2(\delta_e') - k$ (in logarithmic units)		19.6	
Increase in receiver noise temperature of the satellite	$\Delta T_s$	91	K
Step 5) <i>Down-path interference</i>			
Interfering satellite transmitter power density (as in Step 2)	$p_s'$	-57	dBW/Hz

	Symbol	Link A or A'	Unit
Interfering satellite antenna gain towards interfered earth station	$g'_s(\eta_e)$	15.5	dB
Free space loss for 38 500 km at 3 950 MHz (see Step 2)	$l_d$	196	dB
Earth station antenna gain in the direction of the interfering satellite ( $6^\circ$ off beam)	$g_d(\theta)$	12.5	dB
Boltzmann's constant $1.38 \times 10^{-23}$ J/K	$k$	-228.6	dBW/K
Increase in receiver noise temperature of the earth station $p'_s + g'(\eta_e) - l_d + g_d(\theta) - k$ (in logarithmic units)		3.6	
Increase in receiver noise temperature of the earth station	$\Delta T_e$	2.29	K
Step 6) <i>Total link interference</i>			
Increase in satellite noise temperature (from Step 4)	$\Delta T_s$	91	K
Numerical value for $\gamma$ (from Step 3)	$\gamma$	0.01	numerical
Increase in receiver noise temperature of the earth station (from Step 5)	$\Delta T_e$	2.29	K
Increase in equivalent link noise temperature $\gamma \Delta T_s + \Delta T_e = 0.01 \times 91 + 2.29$	$\Delta T$	3.2	K
Percentage increase $\frac{3.2}{96} \times 100\%$	$(\Delta T/T) \times 100\%$	3.33	%
Increase in link noise due to interference $(3.33/100) \times 8\ 000$ pW0p		266	pW0p

#### D. Conclusions

In the example shown, the increase in equivalent satellite link noise temperature is 3.33%. Since it exceeds the predetermined value of 2%, the amount of noise introduced can no longer be considered permissible and therefore co-ordination between the two networks is required. More precise calculations should now be made using, in particular, the actual

antenna patterns of the earth stations, the topocentric angular separation of the satellites, and the precise basic transmission losses. There may be additional factors such as polarization discrimination, frequency interleaving, spectral distribution of the interference which all reduce the calculated interference.

It can be shown that for this example a larger satellite spacing of  $7.4^\circ$  would have caused only 2% increase in equivalent link noise temperature and thus obviated the need for any co-ordination.

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## FINAL PROTOCOL

At the time of signing the Final Acts of the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971) the undersigned delegates take note of the following statements made by signatory delegations:

### GENERAL

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971) decided that the following statement by India should be included in the Final Protocol forming part of the Final Acts of the Conference:

*“In India, the band 845-935 MHz is also used in the experimentation of satellite broadcasting of television with frequency modulation including energy dispersal, subject to agreement with the administrations having services operating in accordance with the Table of Frequency Allocations which may be affected.*

For the protection of terrestrial television services the power flux-density limit given in Radio Regulation 332A will apply; and for the protection of fixed and mobile services operating in this band, the power flux-density limit given in Radio Regulation 470NI and the power flux-density limit in Radio Regulation 470NK will apply.”

### FEDERAL REPUBLIC OF CAMEROON

The Delegation of the Federal Republic of Cameroon to the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971), unable at the present state of its development to make pertinent comments on the proposed allocation of frequency bands between 40 and 275 GHz yet earnestly wishing to encourage technological progress,

*signs the Final Acts of the present Conference but reserves for its Government the right to take such action as it may consider necessary to safeguard its interests, and to protect its telecommunication network*

should certain Members or Associate Members fail to comply with the provisions of the Radio Regulations thus revised and amplified.

#### CENTRAL AFRICAN REPUBLIC

The Delegation of the Central African Republic to the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971) signs the Final Acts of the present Conference but reserves for the Government of the Central African Republic the right to take such action as it may consider necessary to safeguard its interests should certain Members or Associate Members fail in any way to comply with the decisions of the present Conference or should action resulting from the reservations made by other countries jeopardize the efficient operation of its telecommunication services.

#### CEYLON

The Delegation of Ceylon reserves for its Government the right to take such action as it may consider necessary to safeguard its interests should certain Members fail in any way to comply with the decisions of the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971), or should reservations by other countries jeopardize its telecommunication services.

#### CHILE

The Chilean Delegation reserves the right for the Republic of Chile to take, in cooperation with the International Telecommunication Union, such action as it may consider legitimate to safeguard its sovereignty and interests should any Member or Associate Member fail to comply with any or all of the provisions of the revised Radio Regulations (Geneva, 1971) and the Montreux Convention (1965) or should reservations made by other countries affect directly or indirectly the interests and/or telecommunication systems of the Republic of Chile.

## DEMOCRATIC REPUBLIC OF THE CONGO

The Delegation of the Democratic Republic of the Congo to the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971) reserves for its Government the right, in co-operation with the International Telecommunication Union, to take such action as it may consider necessary to safeguard its interests should certain Members or Associate Members fail to comply with the provisions of the revised Radio Regulations, or should reservations made by other countries jeopardize the efficient operation of its telecommunication services.

## REPUBLIC OF THE IVORY COAST

The Delegation of the Ivory Coast wishes to declare that, by virtue of the powers conferred on it, it reserves for its Government the right to take such action as it may consider necessary, in co-operation with the International Telecommunication Union, to safeguard its interests should certain Members or Associate Members fail in any way whatever to comply with the provisions in the revised version of the Radio Regulations (Geneva, 1959), prepared by the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971), or should reservations made by other countries jeopardize the efficient operation of its telecommunication services.

## REPUBLIC OF INDONESIA

*The Indonesian Delegation is of the firm belief that only through close international co-operation on as broad a basis as possible could the tremendous potential of satellite communications be realized.*

Indonesia being an archipelago with a vast land and sea area looks forward with great hope to the expansion of satellite communications as to help solving its tremendous communication problems.

The great importance of satellite communications in helping to diffuse education, information, and other public services to the people in places far away from the capitals is being fully recognized by the developing countries.

There is, however, great need for the developing countries to fully participate in the discussions and in important decisions concerning the future of the satellite systems. They need to be continuously informed with regard to its further progress and development.

Furthermore, the developing countries should not be left with a feeling as being dependent on the goodwill of a small group in order to enjoy the progress of this technology. The use of the satellite system should not be limited to a few rich; assistance measures have therefore to be devised so as to allow even the poorest among the developing countries to take advantage of the progress in the satellite communication systems.

If the progress of this technology is to benefit mankind as a whole and if it is to become a substantial contribution towards the success of the Second Development Decade, then it is necessary that more attention be given to the interest of the developing countries.

Indonesia is grateful to the I.T.U. and the U.N.D.P. for the assistance given so far in the improvement of its communication system. There are, however, projects which are still to be completed such as: the regional telecommunication network in South East Asia, educational projects, telecommunication projects in West Irian in the framework of the Funds for Development for West Irian and others for which further assistance is being required. It is the sincere hope of Indonesia that it could be given technical assistance in developing its own national satellite communication system.

#### IRAN

The Imperial Government of Iran reserves the right to take such action as it may consider necessary to protect and use its services as operated at present or to be brought into operation in the future should they be affected by the services of other countries.

It also reserves the right not to accept the I.F.R.B. procedures for registering the frequencies now used or to be used in the future in respect of its equipment and on its territory.

The Delegation of Iran therefore reserves for its country the right to take such action as may be necessary to meet its requirements in telecommunications and to protect its existing and future services without restriction

of any sort as to the equipment used or to be used in the future in all frequency bands.

#### JAMAICA

The Delegation of Jamaica reserves for its Government the right to take such action as it may consider necessary to safeguard its interests should any Member fail in any way to comply with the decisions of the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971) and in so doing jeopardize the telecommunication services of Jamaica.

#### ISLAMIC REPUBLIC OF MAURITANIA

The Delegation of the Islamic Republic of Mauritania to the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971), in signing the Final Acts of this Conference, reserves for its Government the right, in co-operation with the International Telecommunication Union, to take such action as it may consider necessary to:

- safeguard its interests, or
- protect, in all the frequency bands concerned, its existing, projected or future telecommunication network, should certain Members or Associate Members fail in any way to comply with the revised and supplemented provisions of the Radio Regulations, or should reservations made by other countries jeopardize the normal operation of its telecommunication services.

#### REPUBLIC OF THE NIGER

The Delegation of the Republic of the Niger reserves for its Government the right to take any steps it may deem fit and adequate to safeguard its interests should any country fail in any way to comply with the provisions contained in the Final Acts of this Conference or should reservations made by any country jeopardize the efficient operation of its telecommunications.

## PAKISTAN

In signing the Final Acts of the World Administrative Radio Conference for Space Telecommunications, (Geneva, 1971), the Delegation of Pakistan reserves the right of its Government to adhere to all or to some of the provisions of the revised Radio Regulations (Geneva, 1959).

The Delegation of Pakistan further declares that it reserves the right of its Government in accepting implications that may arise through the non-adherence by any other country Member of the Union to the provisions of these revised Radio Regulations.

## REPUBLIC OF RWANDA

The Delegation of the Republic of Rwanda, in signing the Final Acts of the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971), reserves for its Government the right to take such action as it may consider necessary to safeguard its interests, should any Members or Associate Members fail in any way to comply with the provisions of the Radio Regulations (Geneva, 1959) as revised by this Conference or should reservations made by other countries jeopardize the efficient operation of its telecommunication services.

## REPUBLIC OF THE SENEGAL

The Delegation of the Republic of the Senegal to the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971), in signing the Final Acts of this Conference, reserves for its Government the right to take such action as it may consider useful or necessary:

- to safeguard its interests in the use of the frequency bands above 40 GHz;
- or should certain Members fail in any way to comply with the decisions of this Conference or should acts deriving from reservations made by other Members jeopardize the efficient operation of its telecommunication services.

## REPUBLIC OF SINGAPORE

In signing the Final Acts of the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971), the Delegation of the Republic of Singapore reserves for its Government the right to take such action as it may consider necessary to safeguard its interests should any country fail in any way to comply with the requirements of the Final Acts of this Conference or should reservations made by any country jeopardize the telecommunication services of the Republic of Singapore.

## REPUBLIC OF VENEZUELA

The Delegation of the Republic of Venezuela to the World Administrative Radio Conference for Space Telecommunications (Geneva, 1971), declares that, in signing the Final Acts of the Conference, it expressly reserves the right for its Government to adopt or not to adopt the conclusions of the Conference and to take any steps that it may deem fit to safeguard its interests and to protect its telecommunication networks should any Member or Associate Member fail to comply with the provisions of the Radio Regulations as amended or supplemented at the date mentioned above.

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*(The signatures follow)*

*(The signatures which follow the Final Protocol are the same as those reproduced on pages 5 to 36 of this volume.)*

## RESOLUTION No. Spa2-1

**Relating to the Use by all Countries, with equal Rights, of Frequency Bands for Space Radiocommunication Services**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*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 requirements and readiness of technical facilities of countries;

*resolves*

1. that the registration with the I.T.U. 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 I.T.U. 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;
3. that the provisions contained in paragraphs 1 and 2 of this Resolution should be taken into account by the administrations and the permanent organs of the Union.

### RESOLUTION No. Spa2-2

#### **Relating to the Establishment of Agreements and Associated Plans for the Broadcasting-Satellite Service**

The World Administrative Radio Conference for Space Telecommunication (Geneva, 1971),

*considering*

- a)* that it is important to make the best possible use of the geostationary-satellite orbit and of the frequency bands allocated to the broadcasting-satellite service;
- b)* that the great number of receiving installations using such directional antennae as could be set up for a broadcasting-satellite service may be an obstacle to changing the location of space stations in that service on the geostationary-satellite orbit, from the date of their bringing into use;
- c)* that satellite broadcasts may create harmful interference over a large area of the Earth's surface;
- d)* that the other services with allocations in the same band need to use the band before the broadcasting-satellite service is set up;

*resolves*

1. that stations in the broadcasting-satellite service shall be established and operated in accordance with agreements and associated plans adopted by World or Regional Administrative Conferences, as the case may be, in which all the administrations concerned and the administrations whose services are liable to be affected may participate;
2. that the Administrative Council be requested to examine as soon as possible the question of a World Administrative Conference, and/or Regional Administrative Conferences as required, with a view to fixing suitable dates, places and agenda;
3. that during the period before the entry into force of such agreements and associated plans the administrations and the I.F.R.B. shall apply the procedure contained in Resolution No. Spa2-3.

## RESOLUTION No. Spa2-3

**Relating to the Bringing into Use of Space Stations in the Broadcasting-Satellite Service, prior to the Entry into Force of Agreements and Associated Plans for the Broadcasting-Satellite Service**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a) that while Resolution No. Spa2-2 has been adopted by this Conference, envisaging plans for the broadcasting-satellite service, some administrations might nevertheless feel the need to bring stations in that service into use prior to such plans being established;
- b) that administrations should, as far as possible, avoid proliferation of space stations in the broadcasting-satellite service before such plans have been established;
- c) that a space station in the broadcasting-satellite service may cause harmful interference to terrestrial stations operating in the same frequency

band, even if the latter are outside the service area of the space station;

*d)* that the procedure specified in Article 9A of the Radio Regulations contains no provisions for co-ordination between space stations in the broadcasting-satellite service and terrestrial stations and between space stations in that service and space systems of other administrations;

*resolves*

1. that the following procedure shall be applied until agreements and associated plans pursuant to Resolution No. Spa2-2 enter into force:

### **Section A: Co-ordination Procedure between Space Stations in the Broadcasting-Satellite Service and Terrestrial Stations**

2.1 Before an administration notifies to the I.F.R.B. or brings into use any frequency assignment to a space station in the broadcasting-satellite service in a frequency band where this frequency band is allocated, with equal rights, to the broadcasting-satellite service and to a terrestrial radio-communication service, either in the same Region or sub-Region or in different Regions or sub-Regions, it shall co-ordinate the use of this assignment with any other administration whose terrestrial radiocommunication services may be affected. For this purpose, it shall inform the Board of all the technical characteristics of the station, as listed in the relevant sections of Appendix 1A to the Radio Regulations, which are necessary to assess the risk of interference to a terrestrial radiocommunication service<sup>1</sup>.

2.2 The Board shall publish this information in a special section of

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<sup>1</sup> The technical data to be used in effecting co-ordination should be based on the most recent C.C.I.R. Recommendations as accepted by the administrations concerned under the terms of Resolution No. Spa2-6. In the absence of relevant C.C.I.R. Recommendations, the technical data to be used in effecting co-ordination shall be determined by agreement among the administrations concerned.

its weekly circular and shall also, when the weekly circular contains such information, so advise all administrations by circular telegram.

2.3 Any administration which considers that its terrestrial radio-communication services may be affected shall forward its comments to the administration seeking co-ordination and, in any case, to the Board. These comments must be forwarded within one hundred and twenty days from the date of the relevant I.F.R.B. weekly circular. It shall be deemed that any administration which has not forwarded comments within that period considers that its terrestrial radiocommunication services are unlikely to be affected.

2.4 Any administration which has forwarded comments on the projected station shall either give its agreement or, if this is not possible, send to the administration seeking co-ordination all the data on which its comments are based as well as any such suggestions as it may be able to offer with a view to a satisfactory solution of the problem.

2.5 The administration which plans to bring into use a space station in the broadcasting-satellite service as well as any other administration which believes that its terrestrial radiocommunication services are likely to be affected by the station in question may request the assistance of the Board at any time during the co-ordination procedure.

2.6 If the assistance of the Board has been sought and there is a continuing disagreement between the administration seeking co-ordination and the administration which has forwarded its comments, the administration seeking co-ordination may, after a total period of one hundred and eighty days, from the date of the relevant I.F.R.B. weekly circular, send to the Board its notice concerning the frequency assignment in question..

**Section B: Co-ordination Procedure between Space Stations in the  
Broadcasting-Satellite Service and Space Systems of  
other Administrations**

3. An administration intending to bring into use a space station in the broadcasting-satellite service shall, for the purpose of co-ordination

with space systems of other administrations, apply the following provisions of Article 9A of the Radio Regulations:

3.1 Nos. 639AA to 639AI inclusive.

3.2.1 No. 639AJ<sup>1</sup>.

3.2.2 No co-ordination under paragraph 3.2.1 is required when an administration proposes to change the characteristics of an existing assignment in such a way as not to increase the probability of harmful interference to stations in the space radiocommunication service of other administrations.

3.2.3 Nos. 639AL, 639AM, 639AO, 639AS a), c), e), f), 639AT, 639AU, 639AV, 639AW, 639AX, 639AY, 639AZ.

**Section C: Notification, Examination and Recording in the  
Master Register of Assignments to Space Stations in  
the Broadcasting-Satellite Service dealt with under  
this Resolution**

4.1 Any frequency assignment<sup>2</sup> to a space station in the broadcasting-satellite service shall be notified to the Board. The notifying administration shall apply for this purpose the provisions of Nos. 639BE, 639BF and 639BG of the Radio Regulations.

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<sup>1</sup> The technical data to be used in effecting co-ordination should be based on the most recent C.C.I.R. Recommendations as accepted by the administrations concerned under the terms of Resolutions No. Spa2-6. In the absence of relevant C.C.I.R. Recommendations, the technical data to be used in effecting co-ordination shall be determined by agreement among the administrations concerned.

<sup>2</sup> The expression *frequency assignment*, wherever it appears in this Resolution, shall be understood to refer either to a new frequency assignment or to a change in an assignment already recorded in the Master International Frequency Register (hereinafter called *Master Register*).

4.2 Notices made under paragraph 4.1 shall initially be treated in accordance with No. 639BH of the Radio Regulations.

5.1 The Board shall examine each notice with respect to:

5.2 a) its conformity with the Convention, the Table of Frequency Allocations and the other provisions of the Radio Regulations (with the exception of those relating to the co-ordination procedures and to the probability of harmful interference);

5.3 b) its conformity, where applicable, with the provisions of paragraph 2.1 of Section A above, relating to co-ordination of the use of the frequency assignment with the other administrations concerned;

5.4 c) its conformity, where applicable, with the provisions of paragraph 3.2.1 of Section B above, relating to co-ordination of the use of the frequency assignment with the other administrations concerned;

5.5 d) where appropriate, the probability of harmful interference to the service rendered by a station in a space or terrestrial radiocommunication service for which a frequency assignment has already been recorded in the Master Register in conformity with the provisions of No. 501 or 639BM of the Radio Regulations as appropriate, if that assignment has not, in fact, caused harmful interference to the service rendered by a station for which an assignment has been previously recorded in the Master Register and which itself is in conformity with No. 501 or 639BM as appropriate.

6.1 Depending upon the findings of the Board subsequent to the examination prescribed in paragraphs 5.2, 5.3, 5.4 and 5.5, further action shall be as follows:

6.2 Where the Board reaches an unfavourable finding with respect to paragraph 5.2 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 a satisfactory solution of the problem.

6.3 Where the Board reaches a favourable finding with respect to paragraph 5.2, or where it reaches the same finding after resubmission of the notice, it shall examine the notice with respect to the provisions of paragraphs 5.3 and 5.4.

6.4 Where the Board finds that the co-ordination procedures mentioned in paragraphs 5.3 and 5.4 have been successfully completed with all administrations whose 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 of the Master Register with an entry in the Remarks column indicating that such recording does not prejudice in any way the decisions to be included in the agreements and associated plans referred to in Resolution No. Spa2-2.

6.5 Where the Board finds that the co-ordination procedures mentioned in paragraph 5.3 or 5.4 have not, as appropriate, been applied or have been unsuccessfully applied, the notice shall be returned immediately by airmail to the notifying administration with the reason for its return and with such suggestions as the Board may be able to offer with a view to a satisfactory solution of the problem.

6.6 Where the notifying administration resubmits the notice and the Board finds that the co-ordination procedures have been successfully completed with all administrations whose services may be affected, the assignment shall be treated as indicated in paragraph 6.4.

6.7 Where the notifying administration resubmits the notice and states that it has been unsuccessful in endeavouring to effect the co-ordination, the notice shall be examined by the Board with respect to paragraph 5.5

6.8 Where the Board reaches a favourable finding with respect to paragraph 5.5, the assignment shall be recorded in the Master Register. The appropriate symbol indicating the finding by the Board shall indicate that the co-ordination procedures, as appropriate, referred to in paragraph 2.1 or 3.2.1 were not successfully completed. The date of receipt by the Board of the notice shall be entered in Column 2d of the Master Register, with the remark mentioned in paragraph 6.4.

6.9 Where the Board reaches an unfavourable finding with respect to paragraph 5.5, the notice shall be returned immediately by airmail to the notifying administration with the reasons for the Board's finding and with such suggestions as the Board may be able to offer with a view to a satisfactory solution of the problem.

6.10 If the administration resubmits the notice unchanged with the insistence that it be reconsidered, but should the Board's unfavourable finding under paragraph 5.5 remain unchanged, the assignment shall be recorded in the Master Register. However, this entry shall be made only if the notifying administration informs the Board that the assignment has been in use for at least one hundred and twenty days without any complaint of harmful interference having been received. The date of receipt by the Board of the original notice shall be entered in Column 2d of the Master Register, with the remark mentioned in paragraph 6.4. An appropriate remark shall be placed in Column 13 to indicate that the assignment is not in conformity with the provisions of paragraphs 5.2, 5.3, 5.4 or 5.5, as appropriate. In the event that the administration concerned receives no complaint of harmful interference concerning the operation of the station in question for a period of one year from the commencement of operation, the Board shall review its finding.

6.11 If harmful interference is actually caused to the reception of any space station in the broadcasting-satellite service whose frequency assignment has been recorded in the Master Register as a result of a favourable finding with respect to paragraphs 5.2, 5.3, 5.4 and 5.5 of this Resolution, as appropriate, by the use of a frequency assignment to a space station which has been subsequently recorded in the Master Register in accordance with the provisions of paragraph 6.10 of this Resolution or of No. 639CP

of the Radio Regulations, the station using the latter frequency assignment must, upon receipt of advice thereof, immediately eliminate this harmful interference.

6.12 If harmful interference is actually caused to the reception of any space radiocommunication station using an assignment recorded in the Master Register as a result of a favourable finding with respect to Nos. 639BM, 639BN, 639BO, 639BP, 639BQ and 639BR of the Radio Regulations, as appropriate, by the use of an assignment to a space station in the broadcasting-satellite service which has been subsequently recorded in the Master Register in accordance with the provisions of paragraph 6.10 of this Resolution, the station using the latter assignment must, on receipt of advice thereof, immediately eliminate this harmful interference.

6.13 If harmful interference is actually caused to the reception of any terrestrial station using an assignment recorded in the Master Register as a result of a favourable finding with respect to No. 501 of the Radio Regulations, by the use of an assignment to a space station in the broadcasting-satellite service which has been subsequently recorded in the Master Register in accordance with the provisions of paragraph 6.10 of this Resolution, the station using the latter assignment must, on receipt of advice thereof, immediately eliminate this harmful interference.

6.14 If harmful interference to the reception of any station whose assignment is in accordance with paragraph 5.2 of this Resolution, is actually caused by the use of a frequency assignment which is not in conformity with paragraph 5.2 of this Resolution, or with No. 501, 570AB or 639BM<sup>a</sup> of the Radio Regulations, the station using the latter frequency assignment must, upon receipt of advice thereof, immediately eliminate this harmful interference.

## RESOLUTION No. Spa2-4

Relating to the experimental Use of Radio Waves by Ionospheric  
Research Satellites

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a) that research into the Earth's ionosphere is very important in the study of the relationship between the Sun and the Earth and also for the effective use of radio-wave transmission via the ionosphere;
- b) that successful research has been conducted with satellites such as Alouette 1 and 2 and ISIS 1 and 2 in which top-side sounding equipment is installed;
- c) that similar ionospheric research satellites will be used for further research into the ionosphere and beyond;
- d) that top-side sounding equipment is operated mostly in a frequency-sweeping pulse mode;
- e) that these types of satellite are usually operated intermittently during a limited period each day according to the orbital characteristics;
- f) that operation of the sounder can be accurately commanded at will by the earth station concerned;

*resolves*

that administrations may continue to permit the transmission of radio waves from ionospheric research satellites in orbit above the ionosphere in the MF and HF bands provided that suitable means are available for controlling the transmission from these satellites as required by No. 470V of the Radio Regulations to prevent harmful interference to other services.

## RESOLUTION No. Spa2-5

**Relating to the Use of the Band 156-174 MHz by the Maritime Mobile-Satellite Service**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a) that there is a need to develop the use of space radiocommunication techniques to meet the future requirements of the maritime mobile service;
- b) that, of the bands used at present by the maritime mobile service, there may be advantages in using for the maritime mobile-satellite service narrow channels between 156 and 174 MHz for safety and distress;

*recognizing*

- a) that the maritime mobile bands between 156 and 174 MHz are also used for other services;
- b) that the power flux densities laid down by maritime satellites in this band may cause harmful interference to terrestrial receivers and that the satellite receiver may suffer harmful interference from terrestrial radio-communication transmissions;
- c) that the terrestrial maritime mobile service makes extensive use of the channels given in Appendix 18 to the Radio Regulations;

*is of the opinion*

that it is important for the maritime mobile satellite service to be able to use some narrow channels, on an exclusive basis, for safety and distress as soon as practicable;

*having provided for*

the possible use of narrow channels for safety and distress by the maritime mobile-satellite service in bands 157-3125 - 157-4125 MHz and 161-9125 - 162-0125 MHz not earlier than 1 January 1976 (see No. 287A of the Radio Regulations);

*resolves*

that the World Administrative Radio Conference for Maritime Mobile Telecommunications to be held in 1974 be invited to consider this matter further and to decide if and to what extent the maritime mobile-satellite service should be introduced in the above bands on an exclusive basis and to make any consequential changes in the Radio Regulations and in the provisions governing the use of the channels in Appendix 18 to the Radio Regulations;

*requests the Secretary-General*

to transmit this Resolution to Members and Associate Members and to the Administrative Council for inclusion in the draft agenda for the 1974 Maritime Conference.

#### RESOLUTION No. Spa2-6

**Relating to the Technical Criteria recommended by the C.C.I.R.  
for Sharing Frequency Bands between Space Radiocommunication and  
Terrestrial Radiocommunication Services or between Space  
Radiocommunication Services**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a)* that, in frequency bands shared with equal rights by space radiocommunication and terrestrial radiocommunication services, it is necessary to impose certain technical limitations and co-ordination procedures on each of the sharing services in the interest of controlling mutual interference;
- b)* that, in frequency bands shared by space stations located on geostationary satellites, it is necessary to impose co-ordination procedures in the interest of controlling mutual interference;
- c)* that the technical criteria and co-ordination procedures referred to in *a)* and *b)* above, and as set out in the Radio Regulations, are mainly based upon Recommendations of the C.C.I.R.;
- d)* that, in recognition of the successful sharing of frequency bands by space radiocommunication and terrestrial radiocommunication services, and the continuing improvements in space technology, each Plenary Assembly of the C.C.I.R. subsequent to the Xth Plenary Assembly, Geneva, 1963, has improved upon some of the technical criteria recommended by the preceding Plenary Assembly;
- e)* that Plenary Assemblies of the C.C.I.R. are held triennially whereas Administrative Radio Conferences, which are empowered to modify the Radio Regulations making substantial use of the Recommendations of the C.C.I.R., are in practice held less frequently and with much less regularity;
- f)* that the International Telecommunication Convention (Montreux, 1965) recognizes the right of Members and Associate Members of the Union to make special agreements on telecommunication matters; however, such agreements shall not be in conflict with the terms of the Convention or of the Regulations annexed thereto, so far as concerns the harmful interference to the radio services of other countries;

*is of the opinion*

- a) that subsequent Plenary Assemblies of the C.C.I.R. are likely to make further changes in the recommended technical criteria; and
- b) that administrations should be afforded the opportunity to take advantage of the current C.C.I.R. Recommendations on sharing criteria when planning systems for use in frequency bands shared with equal rights by space radiocommunication and terrestrial radiocommunication services, or between radiocommunication services;

*therefore resolves that*

1. each Plenary Assembly of the C.C.I.R. should arrange for the Secretary-General of the I.T.U. to be informed of those Recommendations of the C.C.I.R. affecting the technical criteria relating to sharing between space radiocommunication and terrestrial radiocommunication services or between space radiocommunication services;
2. following the distribution to administrations of the relevant C.C.I.R. texts, the Secretary-General shall write to administrations asking them to indicate within one hundred and twenty days, to which of the C.C.I.R. Recommendations or to which specific technical criteria defined in the Recommendations referred to in 1 above they agree for use in the application of the pertinent provisions of the Radio Regulations;
3. the administrations which do not respond to the Secretary-General's consultation within one hundred and twenty days shall be deemed to wish the specific technical criteria referred to in the current Radio Regulations to be applied for the time being;
4. in those cases where an administration, in its reply to the Secretary-General's consultation, indicates that a specific C.C.I.R. Recommendation or a specific technical criterion defined in those Recommendations is not

acceptable to it, or where an administration has not replied to the Secretary-General's consultation as in paragraph 3 above, the relevant technical criteria defined in the Radio Regulations shall continue to apply with respect to cases involving that administration;

5. the Secretary-General shall publish, for the information of all administrations, a consolidated list prepared by the I.F.R.B. on the basis of the replies to the enquiry, of the C.C.I.R. Recommendations or of the specific relevant technical criteria defined in those Recommendations, and to which administrations each of those Recommendations or specific relevant technical criteria are acceptable or are not acceptable. This list shall also include those administrations mentioned in paragraph 3 above;

6. the I.F.R.B. be directed to take into account:

- a) the applicability of the C.C.I.R. technical criteria in accordance with the list referred to in 5 above, when making technical examinations with respect to cases involving only administrations to which such criteria are acceptable;
- b) the applicability of the technical criteria defined in the Radio Regulations in accordance with the list referred to in 5 above, when making technical examinations with respect to cases involving an administration which does not accept the relevant C.C.I.R. technical criteria;

7. if, at a later date, questions arise concerning the application of the relevant technical criterion or criteria to a case involving administrations described in paragraph 3 above, the I.F.R.B. shall enquire of the administrations concerned whether or not they would agree to the application of the technical criterion or criteria defined in the relevant C.C.I.R. Recommendations referred to in paragraph 1 above. The list published pursuant to paragraph 5 above shall be updated on the basis of the reply of the administration or of the absence of reply.

## RESOLUTION No. Spa2-7

**Relating to the Inclusion of additional Sections  
in List VIII A (Article 20, Appendix 9)**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a) that it has modified the definitions which appeared in the Radio Regulations and has adopted a series of new definitions for the services;
- b) that, within the framework of these modifications, it has changed, in Appendix 9 to Radio Regulations, the headings and the contents of the existing nine Sections of List VIII A (List of Space Radiocommunication Stations and Radio Astronomy Stations);
- c) that however, in List VIII A so modified, it is not possible to include all the categories of earth and space stations notified to the I.F.R.B. for inclusion in the Master International Frequency Register;
- d) that the Conference has not had the time to make the required modifications;

*decides*

to invite the Secretary-General, in collaboration with the I.F.R.B., to take the necessary steps, on the basis of the existing Sections of List VIII A, to have additional Sections added to this List, so that the particulars of all the earth and space stations notified to the I.F.R.B. under Article 9A of the Radio Regulations, for recording in the Master International Frequency Register, be included.

**RESOLUTION No. Spa2 - 8****Relating to the Abrogation of obsolete Resolutions and Recommendations of the Extraordinary Administrative Radio Conference to allocate Frequency Bands for Space Radiocommunication Purposes, Geneva, 1963 and a Recommendation of the Administrative Radio Conference, Geneva, 1959**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

a) that all necessary action has been taken on the following Resolutions and Recommendations of the Extraordinary Administrative Radio Conference (Geneva, 1963):

Resolution No. Spa 1 Relating to the Provision and Use of Information regarding International Satellite Systems;

Resolution No. Spa 2 Relating to Space Vehicles in Distress and Emergency;

Resolution No. Spa 3 Relating to the Category of the Fixed and Mobile Services in the Band 1 525 - 1 540 Mc/s;

Recommendation No. Spa 1 Relating to the Calculation of Co-ordination Distance for Earth Stations;

Recommendation No. Spa 2 to the C.C.I.R. and to Administrations Relating to the Calculation of the Probability of Interference between Stations within Co-ordination Distance;

b) that Recommendation No. Spa 6 of the Extraordinary Administrative Radio Conference (Geneva, 1963) Relating to the Frequency Requirements in the HF Bands Exclusively Allocated to the Aeronautical Mobile (R) Service, is now obsolete;

- c) that paragraphs 3 and 4 of Recommendation No. Spa 9 of the Extraordinary Administrative Radio Conference (Geneva, 1963) Relating to the Review of Progress in the Field of Space Radiocommunications, are now obsolete;
- d) that Recommendation No. Spa 3 of the Extraordinary Administrative Radio Conference (Geneva, 1963) to the C.C.I.R. and to Administrations Relating to Frequency Bands shared between Space and Terrestrial Services has been replaced by Recommendation No. Spa2-15 of the present Conference;
- e) that Recommendation No. 36 of the Administrative Radio Conference (Geneva, 1959) Relating to the Convening of an Extraordinary Administrative Radio Conference to allocate Frequency Bands for Space Radiocommunication Purposes, is no longer necessary;

*resolves*

that the said Resolutions and Recommendations or parts of Recommendation are abrogated.

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**RECOMMENDATION No. Spa2-1****Relating to the Examination by World Administrative Radio Conferences  
of the Situation with Regard to Occupation  
of the Frequency Spectrum in Space Radiocommunications**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a)* that the frequency bands available for space applications are limited in number and size;
- b)* that the possible positions for a satellite whose main purpose is to establish telecommunication links are limited in number and that certain positions are more favourable than others for certain links;
- c)* that all administrations should be enabled to establish the space links which they deem necessary;
- d)* that the scale and cost of space networks or systems are such that their operation and development must be hindered as little as possible;
- e)* that technology is steadily and rapidly evolving and that the best possible use should be made of resources in space radiocommunications;
- f)* that administrations should ensure that frequency assignments for space applications are utilized in the most efficient manner possible consistent with developing technology and that such assignments are relinquished when no longer in use;
- g)* that despite the provisions of Article 9A of the Radio Regulations and the principles adopted by this Conference, which provide for full consultation and co-ordination between administrations with a view to the optimum accommodation of all space systems, it is possible that as the use of frequencies and orbital positions increases, administrations may encounter

undue difficulty in one or more frequency bands in meeting their requirements for space radiocommunication;

*recommends*

that the next appropriate World Administrative Radio Conference be empowered to deal with the situation described in Considering g), if it arises;

*invites*

the Administrative Council, in the event of such a situation arising, to include in the agenda for the next appropriate World Administrative Radio Conference specific provisions enabling it to examine all aspects of the use of the frequency band(s) concerned including, *inter alia*, the relevant frequency assignments recorded in the Master International Frequency Register and to find a solution to the problem.

RECOMMENDATION No. Spa2-2

**Relating to the preferred Frequency  
Bands for Tropospheric Scatter Systems**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

the technical and operational difficulties pointed out by the C.C.I.R., particularly in the Report of the Special Joint Meeting (Geneva, 1971) in bands shared by tropospheric scatter systems and space systems;

*recognizing, however,*

that administrations will wish to continue to use tropospheric scatter systems in order to satisfy certain telecommunication requirements;

*noting*

that the proliferation of such systems in all frequency bands, particularly those shared with space systems, will only serve to aggravate an already difficult situation;

*requests*

that the C.C.I.R. urgently study the radio-frequency requirements for tropospheric scatter systems and recommend the preferred radio frequencies for such systems;

*invites the Administrative Council*

to arrange that a future World Administrative Radio Conference consider which frequency bands of the fixed service shall be preferably used by new tropospheric scatter systems, taking into account the allocations to the space radiocommunication services.

### RECOMMENDATION No. Spa2-3

#### Relating to the future Use of Bands allocated to the Inter-Satellite Service

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

a) that the bands 54.25 - 58.2 GHz, 59 - 64 GHz, 105 - 130 GHz, 170 - 182 GHz and 185 - 190 GHz have been allocated to the inter-satellite service;

b) that all the foregoing bands are located in parts of the radio-frequency spectrum close to peaks of atmospheric absorption;

*and recognizing*

that the inter-satellite and terrestrial radiocommunication services are protected from mutual interference by the attenuation due to atmospheric absorption;

*recommends*

that a future World Administrative Radio Conference should consider allocating these bands also to terrestrial radiocommunication (except the aeronautical mobile) services.

**RECOMMENDATION No. Spa2-4**

**Relating to the future Use of certain Frequency Bands  
between 40 and 275 GHz**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

that the 43-48 GHz, 66-71 GHz, 95-101 GHz, 142-150 GHz, 190-200 GHz and 250-265 GHz bands have been allocated to the following services:

- aeronautical mobile-satellite
- maritime mobile-satellite
- aeronautical radionavigation-satellite
- maritime radionavigation-satellite;

*recognizing*

that it is not desirable for compatibility considerations that at a later date these bands should be shared with terrestrial radiocommunications.

tion services other than the aeronautical and maritime mobile services and/or the aeronautical and maritime radionavigation services;

*recommends*

that a future competent World Administrative Radio Conference should consider allocating, in addition, the 43-48 GHz, 66-71 GHz, 95-101 GHz, 142-150 GHz, 190-200 GHz and 250-265 GHz bands to the following services:

- aeronautical mobile
- maritime mobile
- aeronautical radionavigation
- maritime radionavigation

in an appropriate manner.

RECOMMENDATION No. Spa2-5

**Relating to the future Use of the 41-43 GHz Band by  
the Fixed and Mobile Services**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

that the 41-43 GHz band has been allocated to the broadcasting-satellite service;

*recognizing*

that it is possible, by appropriate co-ordination, for a frequency band to be shared by the broadcasting-satellite service, on the one hand, and the fixed and mobile services, on the other;

*recommends*

that a future competent World Administrative Radio Conference should consider allocating, in addition, the 41-43 GHz band to the fixed and mobile services.

## RECOMMENDATION No. Spa2-6

**Relating to future Frequency Allocation Requirements for the Maritime Mobile-Satellite Service**

The World Administrative Radio Conference for Space Telecommunications, (Geneva, 1971),

*having noted*

that the Inter-Governmental Maritime Consultative Organization (I.M.C.O.) has stated a requirement for frequencies of the order of 400 MHz, believing that small vessels in particular may be unable to use satellite radiocommunications if such frequencies are not made available;

*further noting*

that the C.C.I.R. Special Joint Meeting (Geneva, 1971) concluded that the present Conference should be invited to examine the possibility of providing exclusive channels for the maritime mobile-satellite service at about 400 MHz and that provision of such channels is desirable;

*considering*

- a) that ship stations and survival craft stations are completely dependent upon the use of radio for communication;
- b) that the use of space techniques will provide the maritime mobile service with a reliable and more efficient method of communication;

- c) that reliable maritime mobile-satellite service communications will greatly assist in the saving of lives and property;
- d) that although the Conference has made certain provisions for the maritime mobile-satellite service, there is some uncertainty with respect to the adequacy and usefulness of these provisions, particularly insofar as small ships and survival craft are concerned;
- e) that general participation of small ships in a service using space techniques would not only benefit the efficient and safe operation of these ships but would also improve the safety service for larger ships and survival craft;
- f) that future conferences might find it necessary to make additional allocations for such uses nearer to the optimum portions of the spectrum;
- g) that for some communications functions, such as certain broadcasting and fixed applications, other means than radio could be used, thereby making portions of the spectrum available for services which are dependent on radio;

*recommends*

1. that administrations and appropriate international organizations continue to review the requirements for the maritime mobile-satellite service and the suitability of current frequency allocations in meeting those requirements;
2. that the C.C.I.R. continue its studies to determine the optimum portions of the frequency spectrum and related sharing conditions to accommodate maritime mobile-satellite service requirements, taking into consideration advances in space radiocommunication technology;
3. that a competent World Administrative Radio Conference review the requirements of the maritime mobile-satellite and safety services, and if necessary, provide the frequency allocations to satisfy these requirements.

## RECOMMENDATION No. Spa2-7

Relating to the future Provision of a Band near 10 MHz  
for the Radio Astronomy Service

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a) the requirements of the radio astronomy service, as expressed by the Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (I.U.C.A.F.), for a frequency allocation near 10 MHz;
- b) that the use of the standard frequency guard bands has not satisfied the needs of the radio astronomy service at a frequency near 10 MHz;
- c) that propagation conditions at a frequency near 10 MHz are such that a transmitter operating anywhere on the Earth might cause interference to the radio astronomy service and as a consequence an exclusive world-wide allocation is necessary for long term observations;
- d) that successful radio astronomy measurements have, at times, been made at frequencies near 10 MHz;
- e) that I.U.C.A.F. is co-ordinating the needs of radio astronomers for frequency allocations;

*recommends*

1. that administrations keep under review the possibility of releasing a band of frequencies 50 kHz wide for the use of the radio astronomy service between 10 MHz and 15 MHz;
2. that administrations give close attention to any future recommendation of the I.U.C.A.F. concerning the specific frequency band between 10 MHz and 15 MHz required by the radio astronomy service;
3. that a future World Administrative Radio Conference consider granting to the radio astronomy service an exclusive allocation in this region of the spectrum.

## RECOMMENDATION No. Spa2-8

**Relating to the Protection of Radio Astronomy Observations on the Shielded Area of the Moon**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a) that radio astronomy observations at frequencies below the ionospheric critical frequencies and above 100 GHz are hampered or prevented by absorption in the Earth's atmosphere;
- b) that successful radio astronomy observations require complete freedom from harmful interference;
- c) that the shielded area of the Moon offers unique opportunities for observations which are not affected by such absorption;
- d) that the shielded area of the Moon appears to be the potentially most useful area accessible to man which is completely free from interference from terrestrial transmissions;
- e) that the shielded area of the Moon refers to the area of the Moon which is more than  $23.2^\circ$  beyond the mean limb of the Moon as seen from the centre of the Earth;
- f) that the transmissions by radio of data from observation stations to collection points will be in the frequency bands allocated for this purpose;

*noting*

the desirability of maintaining the shielded area of the Moon as an area of maximum value for observations by the radio astronomy service and by passive space research and consequently as free as possible from transmissions;

*recommends*

1. that the C.C.I.R. study the frequency bands most suitable for radio astronomy observations on the shielded area of the Moon and work out recommendations concerning these bands as well as criteria for their application and protection;
2. that in the meantime, administrations, in accordance with the intent of this Recommendation, take all practicable steps to ensure that there will be no interference to radio astronomy observations on the shielded area of the Moon; and
3. that administrations apply such Recommendations as may be provided on this matter by the C.C.I.R. pending the convening of the next World Administrative Radio Conference.

**RECOMMENDATION No. Spa2-9****Relating to the Co-Ordination of Earth Stations**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a) that under the terms of Article 9A of the Radio Regulations, frequency assignments to earth stations in certain bands shared with equal rights between terrestrial radiocommunication services and space radiocommunication services must be co-ordinated with a view to preventing mutual harmful interference;

- b) that the calculation [method described in Appendix 28 to the Radio Regulations applies solely to frequencies in the 1-40 GHz range;
- c) that Tables I and II of this Appendix do not show numerical values for all the necessary parameters of certain space radiocommunication services and terrestrial radiocommunication services sharing frequency bands with equal rights;

*invites the C.C.I.R.*

to continue as a matter of urgency its study:

- of data not included in Tables I and II of Appendix 28 to the Radio Regulations, relating to the space radiocommunication services and terrestrial radiocommunication services sharing frequency bands with equal rights;
- of the formulation of calculation methods for determining the co-ordination area of earth stations at frequencies below 1 GHz and above 40 GHz;

*recommends to administrations*

that until the next competent World Administrative Radio Conference they should use:

- any C.C.I.R. Recommendation, if applicable, for the values missing from Tables I and II of Appendix 28 to the Radio Regulations;
- the methods of determining the co-ordination area for frequencies below 1 GHz and above 40 GHz, which may be the subject of a C.C.I.R. Recommendation.

## RECOMMENDATION No. Spa2-10

### Relating to the Criteria to be applied for Frequency Sharing between the Broadcasting-Satellite Service and the Terrestrial Broadcasting Service in the Band 620 - 790 MHz

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a)* that, within the band 620-790 MHz, assignments may be made to television stations using frequency modulation in the broadcasting-satellite service;
- b)* that it is necessary to have a power flux density limit which will provide adequate protection to the terrestrial broadcasting service;

*taking into account*

- a)* that the conclusions of the Special Joint Meeting of the C.C.I.R. (Geneva, 1971), indicated that the following power flux density limits are necessary to protect the terrestrial broadcasting service:

-121 dBW/m <sup>2</sup>	$\delta \leq 20^\circ$
-121 + 0.4 ( $\delta - 20$ ) dBW/m <sup>2</sup>	$20^\circ < \delta \leq 60^\circ$
-105 dBW/m <sup>2</sup>	$60^\circ < \delta \leq 90^\circ$

where  $\delta$  is the angle of arrival above the horizontal plane (in degrees);

- b)* that additional tests carried out by one administration after the Special Joint Meeting of the C.C.I.R., indicated that the following more conservative power flux density limits may be necessary:

-130 dBW/m <sup>2</sup>	$\delta \leq 20^\circ$
-130 + 0.4 ( $\delta - 20$ ) dBW/m <sup>2</sup>	$20^\circ < \delta \leq 60^\circ$
-114 dBW/m <sup>2</sup>	$60^\circ < \delta \leq 90^\circ$

where  $\delta$  is the angle of arrival above the horizontal plane (in degrees);

- c) that additional information is required on the protection ratio for interference from an FM television signal into a VSB television signal for both the 625- and 525-line systems;
- d) that with terrestrial television receiving systems using current technology, the minimum field strength to be protected may in some cases be less than the values included in C.C.I.R. Recommendation 417-2;
- e) that account may have to be taken of ground reflections;
- f) that energy dispersal techniques may reduce the required protection ratio and should be used if shown to be effective;

*recommends*

1. that in view of the absence of sufficient information on tests under operational conditions and in order to provide sharing criteria, on a provisional basis, the maximum power flux density produced at the surface of the Earth within the service area of a terrestrial broadcasting station (see C.C.I.R. Recommendation 417-2), by a space station in the broadcasting-satellite service in the band 620 - 790 MHz should not exceed:

$-129 \text{ dBW/m}^2$	$\delta \leq 20^\circ$
$-129 + 0.4(\delta - 20) \text{ dBW/m}^2$	$20^\circ < \delta \leq 60^\circ$
$-113 \text{ dBW/m}^2$	$60^\circ < \delta \leq 90^\circ$

where  $\delta$  is the angle of arrival above the horizontal plane (in degrees);

2. that these limits be not exceeded on the territory of a country except with the agreement of its administration;
3. that the transmission of unmodulated carriers should be avoided;
4. that the C.C.I.R. urgently study the sharing criteria to be applied to frequency sharing between the broadcasting-satellite service and the terrestrial broadcasting service in the band 620-790 MHz and prepare a Recommendation on power flux densities to be used in lieu of the above provisional limits;

- b) that the use of such techniques can result in a substantial reduction in the level of interference between systems in the fixed-satellite service operating in the same frequency bands;
- c) that such techniques are being regularly and successfully employed in systems in the fixed-satellite service without noticeable deterioration of the quality of operation;

*recommends*

1. that systems in the fixed-satellite service employing angle modulation by analogue signals should use carrier energy dispersal techniques as far as is practicable with a view to spreading energy at all times and in a manner consistent with the satisfactory operation of the systems;
2. that systems in the fixed-satellite service employing digital modulation should use carrier energy dispersal techniques when this becomes technically feasible and is practical.

**RECOMMENDATION No. Spa2-12**

**Relating to Technical Standards for the Assessment  
of harmful Interference in the Frequency Bands above 28 MHz**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a) that the definition of harmful interference (No. 93 of the Radio Regulations), being of a qualitative nature, leads to a purely subjective estimation of the nuisance;

- b)* that, for the accomplishment of its regulatory tasks, the I.F.R.B. has adopted in its technical standards, for the frequency bands below 28 MHz, values for the ratio between the wanted signal and the interfering signal, below which harmful interference may be expected;
- c)* that "harmful interference" implies a considerable degree, or probability, of interference;
- d)* that, as a consequence, it is desirable to determine the level of interference by which any emission, radiation or induction affects a radio-communication service beyond specific limits established to ensure the quality and reliability of performance required by the nature of the service;
- e)* that the assessment of interference levels is related to various factors such as the nature of the services concerned, number of interference sources, percentages of time during which the interfering signal affects the wanted signal;

*and noting*

- a)* that the I.F.R.B. has been considering the maximum allowable values of interference given in the pertinent C.C.I.R. Recommendations to be values which ensure a satisfactory service;
- b)* that, however, the I.F.R.B. does not possess data on the extent to which these recommended values and the associated percentages of time may be exceeded without affecting a service beyond the specific limits established to ensure the quality and reliability of performance required by the nature of the service;

*invites the C.C.I.R.*

to study this subject and to recommend the technical criteria for the frequency bands above 28 MHz, allocated to space radiocommunication, radio astronomy, and the terrestrial radiocommunication services concerned, in order to enable the I.F.R.B. and administrations to apply such criteria for these bands;

*and invites the I.F.R.B.*

to publish, for the information of administrations, its technical standards based upon the relevant provisions of the Radio Regulations and Appendices thereto, the decisions of Administrative Conferences of the Union as appropriate, the Recommendations of the C.C.I.R., the state of the radio art, and the development of transmission techniques.

### RECOMMENDATION No. Spa2-13

#### **Relating to the Use of Space Radiocommunication Systems in the Event of natural Disasters, Epidemics, Famines and similar Emergencies**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*considering*

- a)* that in the case of natural disasters, epidemics, famines and similar emergencies lives can be saved by prompt and effective relief;
- b)* that rapid and reliable telecommunications are essential for relief operations;
- c)* that, through damage or from other causes, the normal telecommunications facilities in disaster areas are often inadequate for relief operations and cannot be restored or supplemented quickly through local resources;
- d)* that use of space radiocommunication systems is one of the means by which rapid and reliable telecommunications could be provided for relief operations;

*noting*

- a) that known planning of space radiocommunication systems makes no provision for specific frequencies or channels for emergency communications;
- b) that in the absence of such planning it is not feasible to proceed with specifications for rapidly transportable, universally operable earth stations;

*recommends*

1. that administrations, individually or in collaboration, provide for the needs of eventual relief operations in planning their space radiocommunication systems and identify for this purpose preferred radio-frequency channels and facilities which could quickly be made available for relief operations;
2. that administrations concerned waive the coordination procedures provided for in the Radio Regulations in the case of transportable earth stations used for relief operations;

*invites*

the C.C.I.R. to study standard specifications and preferred frequencies for transportable earth stations and for compatible mobile and transportable fixed radiocommunications equipment for relief operations;

*requests*

the Secretary-General to bring this Recommendation to the attention of the United Nations, the Specialized Agencies, and other International Organizations concerned, in order to ensure full cooperation in the implementation of this Recommendation.

## RECOMMENDATION No. Spa2-14

**Relating to a revised Presentation of the Sections of Article 1  
of the Radio Regulations**

The World Administrative Radio Conference for Space Telecommunications, (Geneva, 1971),

*considering*

- a) that, as a result of the amendments made to Article 1 of the Radio Regulations, the terms specified in that Article are no longer arranged in logical order;
- b) that it would therefore be desirable to rearrange Article 1 of the Radio Regulations in a more appropriate form;

*recognizing*

that this Conference was unable to perform this task;

*recommends*

that the next World Administrative Radio Conference which is competent to revise Article 1 of the Radio Regulations should consider the rearrangement of Article 1 in a more logical manner, for example, on the lines of the Annex to this Recommendation, and further amendments to this Article, as necessary.

\* \* \*

## ANNEX TO RECOMMENDATION No. Spa2-14

## ARTICLE 1

Section I. General Terms

Section II. Radio Systems

Section III. Radio Services and Stations

Sub-Section IIIA. Terrestrial Radiocommunication

Sub-Section IIIB. Space Radiocommunication

Sub-Section IIIC. Radio Astronomy

Section IV. Technical Characteristics

RECOMMENDATION No. Spa2-15

**To the C.C.I.R. and to Administrations relating to Frequency Bands  
shared between Space Radiocommunication Services and between  
Space and Terrestrial Radiocommunication Services**

The World Administrative Radio Conference for Space Telecommunications (Geneva, 1971),

*recognizing*

a) the value to the Conference of the material contained in Document No. 64 (results of C.C.I.R. studies relating to space telecommunications concluded at its Special Joint Meeting, Geneva, 1971);

b) that further studies on a wide range of problems dealing with space radiocommunications form the subject of C.C.I.R. Questions and Study Programmes approved by the XIIth Plenary Assembly;

*considering however*

a) that certain C.C.I.R. Recommendations, listed below, call for further work and study:

- Recommendation 355-1* "FREQUENCY SHARING BETWEEN ACTIVE COMMUNICATION-SATELLITE SYSTEMS AND TERRESTRIAL RADIO SERVICES IN THE SAME FREQUENCY BANDS"
- Recommendation 465* "GENERALIZED EARTH-STATION ANTENNA RADIATION PATTERN FOR USE IN INTERFERENCE CALCULATIONS, INCLUDING COORDINATION PROCEDURES, IN THE FREQUENCY RANGE 2-10 GHz"
- Recommendation 466* "COMMUNICATION-SATELLITE SYSTEMS FOR TELEPHONY USING FREQUENCY-DIVISION MULTIPLEX. MAXIMUM ALLOWABLE VALUES OF INTERFERENCE IN A TELEPHONE CHANNEL OF A GEOSTATIONARY COMMUNICATION-SATELLITE SYSTEM EMPLOYING FREQUENCY MODULATION, CAUSED BY OTHER GEOSTATIONARY COMMUNICATION-SATELLITE SYSTEMS"

b) that as a result of the deliberations of this Conference, particularly in relation to the provisions of Article 7, Sections VII, VIII and IX, and to other relevant Articles of the Radio Regulations, further information is required to reply to the following current Questions and Study Programmes of the C.C.I.R.:

- Question 1-1/4* "ANTENNAE FOR SPACE SYSTEMS"
- under Decides 2: the state of development in antenna design and fabrication;
- under Decides 3: the state of development of antennae with improved side- and back-lobe characteristics;
- under Decides 4: the polarization characteristics of antennae, particularly in the side-lobe regions and in planes other than the principal planes.

*Question 2-1/4*

“TECHNICAL CHARACTERISTICS OF COMMUNICATION-SATELLITE SYSTEMS FOR FIXED AND MOBILE, EXCLUDING AERONAUTICAL AND MARITIME MOBILE, SERVICES”

under Decides 3:

under what conditions and to what extent would it be feasible for communication-satellites, operating in the same system or operating in different systems, to share preferred frequency bands;

under Decides 4:

under what conditions and to what extent would it be feasible for communication-satellite systems to share preferred frequency bands with terrestrial services.

*Study Programme 2-1A-1/4*

“FEASIBILITY OF FREQUENCY SHARING BETWEEN COMMUNICATION-SATELLITE SYSTEMS AND TERRESTRIAL SERVICES”

under Decides 2:

the determination of the preferred technical characteristics of transmitting and receiving antennae for earth stations at fixed locations, from the standpoint of spectrum sharing with other radio services.

*Study Programme 2-1C/4*

“COMMUNICATION-SATELLITE SYSTEMS. FEASIBILITY OF FREQUENCY SHARING AMONG COMMUNICATION-SATELLITE SYSTEMS”

under Decides 1:

the criteria which affect interference among communication-satellites in a given system and between communication-satellite systems, taking into account the two directions of transmission;

under Decides 2:

the preferred technical characteristics of transmitting and receiving antennae for earth stations, from the standpoint of frequency sharing

within the same system and with other communication-satellite systems.

*Study Programme 2-1J/4*

“COMMUNICATION-SATELLITE SYSTEMS. TECHNICAL FACTORS INFLUENCING THE EFFICIENCY OF USE OF THE GEOSTATIONARY SATELLITE ORBIT BY COMMUNICATION-SATELLITES SHARING THE SAME FREQUENCY BANDS”

under Decides 1:

the technical characteristics of communication-satellite systems which affect the utilization of the geostationary satellite orbit, and the inter-relationships between them;

under Decides 3:

the extent to which it may be feasible and desirable to adopt preferred technical characteristics for different geostationary communication-satellites and earth stations;

under Note 1:

Some of the factors which should be taken into account in carrying out these studies:

- the tolerable levels of interference noise in different communication-satellite systems;
- the radiation patterns of the earth station and satellite antennae;
- factors affecting the multiple use of the same frequencies within a single communication satellite;
- polarization discrimination;

*c)* that it would be useful to have a clear definition of the term “system noise temperature”;

*d)* that it would be useful to have clear definitions of the terms “acceptable (or unacceptable) interference” and “harmful interference” for the space radiocommunication, radio astronomy, and terrestrial radiocommunication services;

e) that it would be useful to have specific numerical values of power flux density from space stations of the broadcasting-satellite service which would permit differentiation between "individual reception" and "community reception" in the broadcasting-satellite service;

f) that frequency sharing between the radionavigation service and the fixed-satellite service (Earth-to-space) has been adopted in the frequency band 14.0 to 14.3 GHz, and between the radionavigation-satellite service and the fixed-satellite service (Earth-to-space) in the frequency band 14.3 to 14.4 GHz;

*recommends*

1. that administrations, recognized private operating agencies, and other participants in the work of the C.C.I.R., consider as a matter of priority, the submission of contributions on these subjects, so that draft Recommendations on them can be prepared at the meetings of the relevant Study Groups for consideration by the Plenary Assembly of the C.C.I.R.;

2. that the C.C.I.R. study or, as appropriate, continue to study:

2.1 the reference antenna patterns for earth station antennae, which may be appropriate for setting minimum standards of performance with a view to recommending specific patterns for this purpose, in order to improve utilization of the bands shared between the fixed-satellite service and terrestrial radiocommunication services, and of the bands shared by space radiocommunication services, and to improve the utilization of the geostationary satellite orbit;

2.2 the reference antenna patterns for satellite antennae, which may be appropriate for setting minimum standards of performance, particularly outside the main beam, in order to improve the utilization of the geostationary satellite orbit and to increase the possibilities for frequency re-use;

2.3 the reference cross-polarization antenna patterns which may be

appropriate for setting minimum standards of performance and, in this connection, further study:

- 2.3.1 the portions of the spectrum within which linear-orthogonal or circular-orthogonal polarizations might be most appropriate;
- 2.3.2 the relative desirability, taking into account technical and orbit utilization factors, of using orthogonal polarizations within a single satellite as against with two satellites;
- 2.4 the necessary limitation of spurious emissions and the frequency tolerances to be observed in both the terrestrial and space radio-communication services insofar as they may affect sharing of frequency bands;
- 2.5 the criteria of permissible interference for the various space radio-communication services and terrestrial radiocommunication services sharing the frequency bands allocated by the present Conference, in order to permit the determination of:
  - 2.5.1 the co-ordination distance and the probability of interference between stations within that distance;
  - 2.5.2 the necessary limits of power flux density set up at the Earth's surface by space stations;
- 2.6 the maximum permissible level of interference into a geostationary satellite link from any other single interfering geostationary satellite network and from the aggregate of all other geostationary satellite networks, particularly in the case of:
  - 2.6.1 frequency-modulated telephony signals;
  - 2.6.2 frequency-modulated television signals;
  - 2.6.3 digitally-modulated signals

and the most appropriate manner in which permissible interference should be specified in these and other cases;

- 2.7 the interference criteria applicable to frequency sharing between non-geostationary satellite networks and geostationary satellite networks;
- 2.8 the possibility of establishing a technical criterion for expressing the efficiency of use of the geostationary satellite orbit;
- 2.9 the possibility of improving and simplifying the method of determining the co-ordination area as described in Appendix 28 to the Radio Regulations;
- 2.10 the conditions for frequency sharing in those bands allocated to the broadcasting-satellite service by the present Conference with a view to issuing appropriate Recommendations as soon as possible so that administrations and the International Frequency Registration Board shall have the necessary technical data required to carry out examination procedures, in particular regarding Articles 9 and 9A of the Radio Regulations and those in Resolution No. Spa2-3;
- 2.11 the term "system noise temperature" with a view to formulating a clear definition of this term applicable to space radiocommunication systems;
- 2.12 the terms "acceptable (or unacceptable) interference" and "harmful interference" with a view to formulating clear definitions appropriate to the radio astronomy service and to the various space radiocommunication and terrestrial radiocommunication services;
- 2.13 the power flux densities required for individual and community reception in the broadcasting-satellite service, with a view to specifying numerical values which will differentiate between these types of reception;

- 2.14 the criteria for frequency sharing between the radionavigation service and the fixed-satellite service (Earth-to-space) in the frequency band 14.0 to 14.3 GHz and between the radionavigation-satellite service and the fixed-satellite service (Earth-to-space) in the frequency band 14.3 to 14.4 GHz.
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**ABBREVIATIONS**

The following abbreviations are used in the Annexes, to indicate the nature of amendments made in the partial revision of the Radio Regulations.

Symbol	Meaning
MOD	Modification
SUP	Suppression
ADD	Addition
NOC	No change

*Note:* If a modification affects only the drafting of a number, without changing the substance, the following symbol is used:

(MOD)

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Uitgegeven de tweeëntwintigste augustus 1972.

*De Minister van Buitenlandse Zaken,*  
W. K. N. SCHMELZER.

## INHOUDSOPGAVE

## SLOTAKTEN

van de Administratieve Wereldconferentie voor Verreberichtgeving  
via de ruimte, Genève 1971

	Blz.
<i>Gedeeltelijke Wijziging van het Radioreglement van Genève</i> (uitgave 1968) .....	1
<i>Bijlage 1: Wijziging van artikel 1 van het Radioreglement ..</i>	37
<i>Bijlage 2: Wijziging van artikel 2 van het Radioreglement ..</i>	49
<i>Bijlage 3: Wijziging van artikel 5 van het Radioreglement ..</i>	51
<i>Bijlage 4: Wijziging van artikel 6 van het Radioreglement ..</i>	115
<i>Bijlage 5: Wijziging van artikel 7 van het Radioreglement ..</i>	117
<i>Bijlage 6: Wijziging van artikel 8 van het Radioreglement ..</i>	137
<i>Bijlage 7: Wijziging van artikel 9 van het Radioreglement ..</i>	139
<i>Bijlage 8: Wijziging van artikel 9A van het Radioreglement</i>	155
<i>Bijlage 9: Wijziging van artikel 14 van het Radioreglement</i>	183
<i>Bijlage 10: Wijziging van artikel 15 van het Radioreglement ..</i>	185
<i>Bijlage 11: Wijziging van artikel 27 van het Radioreglement ..</i>	187
<i>Bijlage 12: Wijziging van artikel 41 van het Radioreglement ..</i>	189
<i>Bijlage 13: Wijziging van aanhangsel I van het Radioreglement</i>	191
<i>Bijlage 14: Wijziging van aanhangsel 1A van het Radioreg-</i> <i>lement</i> .....	193
<i>Bijlage 15: Wijziging van aanhangsel 1B van het Radioreg-</i> <i>lement</i> .....	219
<i>Bijlage 16: Wijziging van aanhangsel 9 van het Radioreglement</i>	225
<i>Bijlage 17: Wijziging van aanhangsel 10 van het Radioreg-</i> <i>lement</i> .....	235
<i>Bijlage 18: Toevoeging van een nieuw aanhangsel (aanhangsel</i> <i>28) aan het Radioreglement</i> .....	237
<i>Bijlage 19: Toevoeging van een nieuw aanhangsel (aanhangsel</i> <i>29) aan het Radioreglement</i> .....	291
<i>Slotprotocol</i> .....	303

## RESOLUTIES

	Blz.
<i>Resolutie nr. Spa2</i> – 1 betreffende het gebruik van frequentiebanden die zijn toegewezen aan diensten voor radioverbindingen via de ruimte . . . . .	311
<i>Resolutie nr. Spa2</i> – 2 betreffende het aangaan van overeenkomsten en het opstellen van gezamenlijke plannen voor radio-omroep via satellieten . . . . .	312
<i>Resolutie nr. Spa2</i> – 3 betreffende de inwerkingstelling van ruimtestations voor radio-omroep vóór de inwerkingtreding van overeenkomsten en gezamenlijke plannen voor radio-omroep via satellieten . . . . .	313
<i>Resolutie nr. Spa2</i> – 4 betreffende het experimenteel gebruik van radiogolven door satellieten voor onderzoek van de ionosfeer . . . . .	321
<i>Resolutie nr. Spa2</i> – 5 betreffende het gebruik van de 156–174 MHz-band voor de mobiele maritieme dienst per satelliet . .	322
<i>Resolutie nr. Spa2</i> – 6 betreffende de door de C.C.I.R. aanbevolen technische criteria inzake de verdeling van de frequentiebanden tussen diensten voor radioverbindingen via de ruimte en diensten voor radioverbindingen op aarde of tussen diensten voor radioverbindingen via de ruimte onderling . . . .	323
<i>Resolutie nr. Spa2</i> – 7 betreffende de toevoeging van aanvullende Delen aan Lijst VIII A (artikel 20, aanhangsel 9) . .	327
<i>Resolutie nr. Spa2</i> – 8 houdende intrekking van verouderde Resoluties en Aanbevelingen van de Buitengewone Administratieve Radioconferentie voor de toewijzing van frequentiebanden voor radioverbindingen via de ruimte, Genève 1963, en van een Aanbeveling van de Administratieve Radioconferentie, Genève 1959 . . . . .	328

## AANBEVELINGEN

<i>Aanbeveling nr. Spa2</i> – 1 betreffende het onderzoek, ingesteld door de Administratieve Wereld Radioconferentie inzake de bezettingsgraad van het frequentiespectrum voor radioverbindingen via de ruimte . . . . .	331
<i>Aanbeveling nr. Spa2</i> – 2 betreffende frequentiebanden die de voorkeur genieten voor troposferische diffusiestelsels . . . . .	332
<i>Aanbeveling nr. Spa2</i> – 3 betreffende het toekomstig gebruik van frequentiebanden die zijn toegewezen aan het verkeer tussen satellieten onderling . . . . .	333

	Blz.
<i>Aanbeveling nr. Spa2</i> – 4 betreffende het toekomstig gebruik van bepaalde frequentiebanden tussen 40 en 275 GHz . . . .	334
<i>Aanbeveling nr. Spa2</i> – 5 betreffende het toekomstig gebruik van de 41 – 43 GHz-band voor vaste en mobiele diensten . .	335
<i>Aanbeveling nr. Spa2</i> – 6 betreffende de toekomstige behoeften van de mobiele maritieme dienst per satelliet aan toewijzing van frequentiebanden . . . . .	336
<i>Aanbeveling nr. Spa2</i> – 7 betreffende de toekomstige toewijzing aan de diensten voor radioastronomie van een frequentieband in de buurt van 10 MHz . . . . .	338
<i>Aanbeveling nr. Spa2</i> – 8 betreffende de bescherming van radio-astronomische waarnemingen op de achterzijde van de maan	339
<i>Aanbeveling nr. Spa2</i> – 9 betreffende de coördinatie van aardstations . . . . .	340
<i>Aanbeveling nr. Spa2</i> – 10 betreffende de criteria voor het verdelen der frequenties tussen diensten voor radio-omroep via satellieten en radiodiensten op aarde in de 620– 790 MHz-band . . . . .	342
<i>Aanbeveling nr. Spa2</i> – 11 betreffende de energiespreiding van draaggolven bij diensten via vaste satellieten . . . . .	344
<i>Aanbeveling nr. Spa2</i> – 12 betreffende de noodzakelijke technische normen voor de beoordeling van hinderlijke storing op frequentiebanden van meer dan 28 MHz . . . . .	345
<i>Aanbeveling nr. Spa2</i> – 13 betreffende het gebruik van stelsels voor radioverbindingen via de ruimte bij natuurrampen, epidemieën, gevallen van hongersnood en andere soortgelijke rampen . . . . .	347
<i>Aanbeveling nr. Spa2</i> – 14 betreffende een herziene presentatie van de verschillende Delen van artikel 1 van het Radioreglement . . . . .	349
<i>Aanbeveling nr. Spa2</i> – 15, aan de C.C.I.R. en overheidsinstanties, betreffende de frequentiebanden verdeeld tussen de diensten voor radioverbindingen via de ruimte onderling en tussen diensten voor radioverbindingen via de ruimte en de diensten voor radioverbindingen op aarde . . . . .	350