Documents of the Regional Administrative Conference for the planning of the Broadcasting-Satellite Service in Region 2 (RARC SAT-83) (Geneva, 1983)

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INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/1-E
10 June 1983
Original : French

HEADS OF DELEGATIONS

AGENDA

OF THE

MEETING OF HEADS OF DELEGATIONS

Monday, 13 June 1983, at 1030 hrs

(Room 2)

		Document No.
1.	Opening by the Secretary-General and designation of the Chairman of the meeting	-
2.	Approval of the agenda of the meeting	-
3.	Proposals for the election of the Chairman of the Conference	-
4.	Proposals for the election of the Vice-Chairmen of the Conference	-
5.	Conference structure	DT/1
6.	Proposals for the election of the Chairmen and Vice-Chairmen of the Committees	-
7.	Draft agenda of the first Plenary Meeting	DT/2
8.	Allocation of documents to Committees (draft)	DT/3
9.	Other business	

R.E. BUTLER

Secretary-General

INTERNATIONAL TELECOMMUNICATION UNION
BROADCASTING-SATELLITE CONFERENCE (REGION 2)
GENEVA, 1983

Addendum No. 1 to
Document No. DL/2-E
15 June 1983
Original : English

WORKING GROUP 4B

TABLE II - Feeder Link Planning Elements

NUMBER	PARAMETER	CPM FINDING	CPM REF.	USA PROPOSAL Doc. 11 (Annex XX)	CANADIAN PROPOSAL Doc. 13 (Annex 5)	OTHER PROPOSALS	COMMITTEE 4 RECOMMENDATIONS
1	C/N as guideline for plan synthesis	(C/N) down + 11 dB for 99% of worst month	5.2.1.2	25 dB for 99% worst month (Guideline) (para. 3.3)	0.5 dB max. contribution to total C/N (para. 9)		
2	Satellite receiving antenna reference pattern	Same as transmitting pattern but with degraded cross-pol	5.2.5.2	Same as CPM fast roll-off 0.6° min. beamwidth (para. 3.13)	Revised pattern same as down-link (para. 8.4)		
3	Earth station minimum antenna diameter	5 m for planning but possible to implement 2.5 m	5.2.1.4, 5.2.1.5 and 5.3.2	5 m for planning 2.5 m minimum. No maximum (para. 3.5)	Same as CPM (para. 7.3)		Drafting Group
4	Earth station antenna reference pattern — Co-polar; Cross-polar	Co-polar: G= near on-axis value, $0 \le \theta < X$; $29-25 \log \theta$, $X \le \theta \le 36°$; -10, $\theta \ge 36°$; $X = f(D_{min})$ Cross-polar: G= $G_0 - 30$, $\theta \le 35\lambda/D$; $9-20 \log \theta$, $35\lambda/D < \theta \le 8.7°$; -10, $\theta > 8.7°$	5.2.5.1 Fig. 5 - 8	Same as CPM (para. 3.7) 65% Efficiency Same as CPM	Same as CPM (para. 7.6) Same as CPM		
5	Transmitter power at antenna input per TV channel (Maximum)	500 - 1000 W	5.2.1.2	500 - 1000 W for planning (para. 3.6)	Up to 1000 W can be exceeded under certain conditions (para. 7.4)		
6	Satellite receiving system noise temperature	1500 K	5.2.1.2	Same as CPM (para. 3.12)	Same as CPM (para. 8.2)		
7	Protection ratio (single-entry) C/I as guideline for plan synthesis	Co-channel: 40 dB 1st and 2nd adjacent channels : no current recommendation		Co-channel: 40 dB (Guideline). 1st and 2nd adjacent channels : from template (99% of worst month) (para. 3.4)	Guideline : feeder link contribute only 0.5 dB to total protection ratio (para. 10)		

NUMBER	PARAMETER	CPM FINDING	CPM REF.	USA PROPOSAL Doc. 11 (Annex XX)	CANADIAN PROPOSAL Doc. 13 (Annex 5)	OTHER PROPOSALS	COMMITTEE 4 RECOMMENDATIONS
8	Power control	$\leq$ 5 dB permitted at elevation angles > 60° in high zones	5.2.6.1	Same as CPM (para. 3.9)	Up to 5 dB for elevation angles between 40° and 90° (para. 6.1)		Deferred
9	Polarization	Need not be specified for satellite separations $\geq$ 10°	5.3.2	Need not be specified except under agreement (para. 3.15)	Circular (para. 2)		
10	Depolarization compensation	Use not recommended	5.3.2	Use not permitted if interference is increased (para 3.11)	Use not permitted if interference increases greater than 0.5 dB[1] (para. 6.4)		Deferred
11	Limit on satellite AGC range	10-15 dB (co-locate, cross, polarized satellites serving common or adjacent service areas	5.3.2	15 dB, under special circumstances (para 3.2)	15 dB under special circumstances (para. 6.2)		
12	Frequency translation between down-link and feeder link plan	Same for all allotments	5.3.2	Same as CPM (para. 3.1)	5.1 GHz (para. 3)		Simple translation 5.1 GHz
13	Separation between "co-located" satellites with same feeder link service areas operating on adjacent channels	0.3° - 0.5°	5.2 and 5.3.2	0.4° for adjacent and alternate channels. 1.2° of orbital arc used when all channels are assigned at a single orbital position (para. 3.16)	0.4° method of incorporating requirement into plan under review (para. 4)		

1. Use acceptable only when the increase in interference is insignificant.

NUMBER	PARAMETER	CPM FINDING	CPM REF.	USA PROPOSAL Doc. 11 (Annex XX)	CANADIAN PROPOSAL Doc. 13 (Annex 5)	OTHER PROPOSALS	COMMITTEE 4 RECOMMENDATIONS
14	Minimum separation between "co-located" satellites of different administrations	No recommendation		1° (para. 3.16.2)	No recommendation		
15	Frequency band	Related to recommended frequency translation	5.3.2	17.3 - 17.8 GHz (Title)	17.3 - 17.8 GHz (para.1.2)		
16	Propagation (Working Group 4A)						
17	Sat. Ant. Pointing Accuracy	± 0.1° on each axis ± 1.0° rotation	5.2.3.4	Same as CPM (para. 3.14)	Same as CPM (para. 8.3)		
18	Transportable feeder link stations	Minimum diameter 2.5 m	5.2.1.5 5.2.11	Only below 17.7 GHz (para. 3.8); otherwise same prov. as fixed	No comment		
19	E.I.R.P.	No limit		No comment	86.6 dBW (para. 7.5)		
20	Site diversity	Use permitted but not recommended for plan development		Same as CPM	Same as CPM (para. 6.3)		

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/2-E
15 June 1983
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WORKING GROUP 4B

SUMMARY TABLES OF TECHNICAL PARAMETERS FOR PLANNING (PROPOSALS AND RECOMMENDATIONS)

The attached table provides a summary of some of the technical parameters being considered by Committee 4. Proposed changes from the existing Radio Regulations (Annex 8 of Appendix 30) are shown. The last column will contain parameter values recommended by Committee 4.

This table is a compact way of representing the proposals and recommendations, and is useful to quickly notify Committee 5 of the status of Committee 4 work. The complete texts of Committee 4 recommendations will follow.

TABLE I

Draft changes to Annex 8 of Appendix 30 of the Radio Regulations (down-link planning elements)

RR §	PARAMETER	CPM FINDING	CPM REF.	USA PROPOSAL	CANADIAN PROPOSAL	BRAZILIAN PROPOSAL	OTHER PROPOSALS	COMMITTEE 4 RECOMMENDATIONS
1.3	Definition of Beam Area	Min. sat. dimension 0.8°		Same as CPM	Same as CPM			
3.1	Type of Modulation	FM or equivalent	5.	Same as Appx.30	Same as Appx.30 + 2 Audio subc.	Same as CPM		Same as Appx.30 + 2 Audio subcarriers
3.2.1	Polarization	Circular	5.1.12 + Table 5-IV	Same as CPM	Same as CPM	Same as CPM		Same as CPM
3.2.2	Polarization in same service area	-	-	-	Restrict to Regions 1 & 3	Same as WARC-77		Restrict to Regions 1 & 3
3.3	Carrier-to-noise ratio (99% of Worst Month)	12.5 - 14.5 dB	5.1.5.3 + Table 5-IV	14 dB(including feeder link)	12 dB (including feeder link)	14 dB (incl. feeder link)		
3.4	Protection Ratio (FMTV into FMTV)	Co-channel: CPM Eq.21 or Eq.22 with ΔQ given by CPM Fig. 5-1 Adjac. Chan: See CPM Fig. 5-3 and Eq.24	5.1.7.1 5.1.7.2	25 dB to be supplied	28 dB Upper:10.5 dB Lower:13.5 dB	-		
3.5.1	Channel spacing	Not specified	5.1.4	13 MHz	15 MHz	-		
3.6	Figure of Merit (G/T) (Individual Reception)	6 to 10 dB (K^{-1})	5.1.5.3 + Table 5-IV	8 dB(K^{-1}) (degraded)	10 db(K^{-1}) (degraded)	10 dB(K^{-1}) (degraded)		
3.7.1	Minimum diameter of receiving antenna (and half-power beamwidth)	0.75 m to 1 m (2.25° to 1.7°)	5.1.8 + Table 5-IV	0.9 m (1.9° at 12.5 GHz)	1 m (1.7° at 12.5 GHz)	1 m (1.8° at 12.2 GHz)		
3.7.2	Receiving antenna reference patterns	CPM Figs. 5-6 and 5-7	5.1.10.3	See attached Fig. 1	See attached Fig. 2	See attached Fig. 4		
3.8	Necessary bandwidth	18 to 24 MHz (27MHz for 625-line systems)	5.1.2 + Table 5-IV	24 MHz with provision for multi-channel assignments	24 MHz for systems M and N	24 MHz for Region 2		
3.9.2	Guard bands Lower band edge Upper band edge	no recommendation except should be similar to WARC-77 to accommodate TT&C	7.6	 11 MHz 9 MHz	 9 MHz 12 MHz	Same as WARC-77		
3.10	Orbital spacing	not specified	---	Irregular	Irregular	Irregular		Irregular
3.11	Satellite station keeping	± 0.1° N-S and E-W	5.1.11 + Table 5-IV	Same as CPM	± 0.1° E-W	± 0.1° N-S and E-W		± 0.1° E-W

TABLE I

Draft changes to Annex 8 of Appendix 30 of the Radio Regulations (cont.)
(down-link planning elements)

RR §	PARAMETER	CPM FINDINGS	CPM REF.	USA PROPOSAL	CANADIAN PROPOSAL	BRAZILIAN PROPOSAL	OTHER PROPOSALS	COMMITTEE 4 RECOMMENDATIONS
3.12	Minimum elevation angle of receiving antenna	To minimize weight and cost of satellite which provides acceptable signal strength during rain usually 20° to 30°	5.1.13	No change	No change	In some cases it will not be possible to fulfil the CPM or WARC-77 requirements		
3.13.1	Cross-section of transmitted beam	Elliptical (including circular)	5.1.9	Generally elliptical or circular	Same as Appx. 30	Elliptical single feed transmit antenna		
3.13.2	Minimum beamwidth of satellite transmitting antenna	0.8°	5.1.9 + Table 5-IV	Same as CPM	Same as CPM	-		0.8°
3.13.3	Transmitting antenna reference pattern	See CPM Figs. 5-4 and 5-5	5.1.10.1 + Table 5-IV	CPM Fig. 5-5	See attached Fig. 3	CPM Fig.5-4		
3.14.1	Pointing accuracy of satellite antenna	± 0.1° from beam axis and ± 1° rotation about beam axis	5.1.11 and Table 5 IV	Same as CPM	Same as CPM	Same as CPM		± 0.1° from beam axis ± 1° rotation about beam axis
3.15	Variation of output power in satellite transmitter	≤ 0.25 dB increase during satellite lifetime of + 0.25 dB / - 0.75 dB } over satellite lifetime	5.1.6	Same as Appx.30	Same as Appx.30	Same as CPM		
3.16	Power flux density at adge of coverage area for 99% of worst month	Corresponding to e.i.r.p. of 53 to 60 dBW plus rain attenuation for 99% of worst month	5.1.5.3 and 5.1.6	- 105 dB(W/m^2) per 24 MHz channel	- 109dB(W/m^2) for 24 MHz channel	- 107dB(W/m^2) for 24 MHz channel		
3.17	Difference between beam axis and edge-of-coverage e.i.r.p.s	3 dB (nominal)	5.1.9	Same as CPM	Same as CPM	Same as CPM		3 dB (nominal)
3.18	Use of energy dispersal	No recommendation	---	Not mandatory	Not required except where necessary to meet inter-Regional criteria	Not required unless absolutely necessary for sharing purposes		

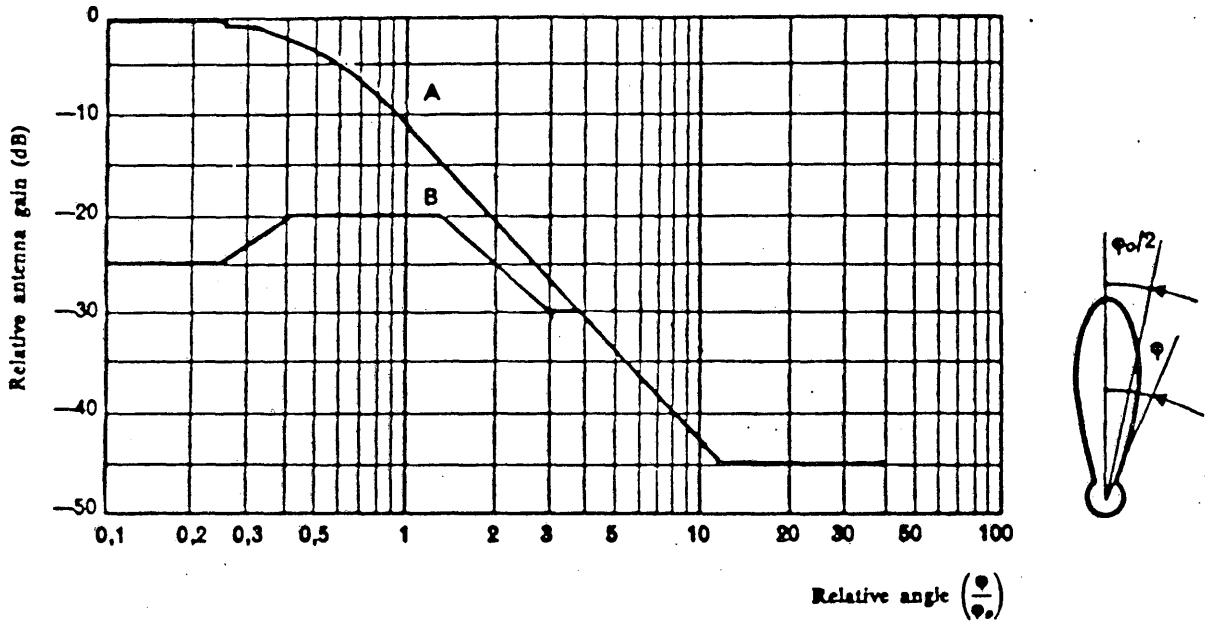


Figure 1

Reference patterns for co-polar and cross-polar components for receiving antennae for individual reception in Region 2

APP 30

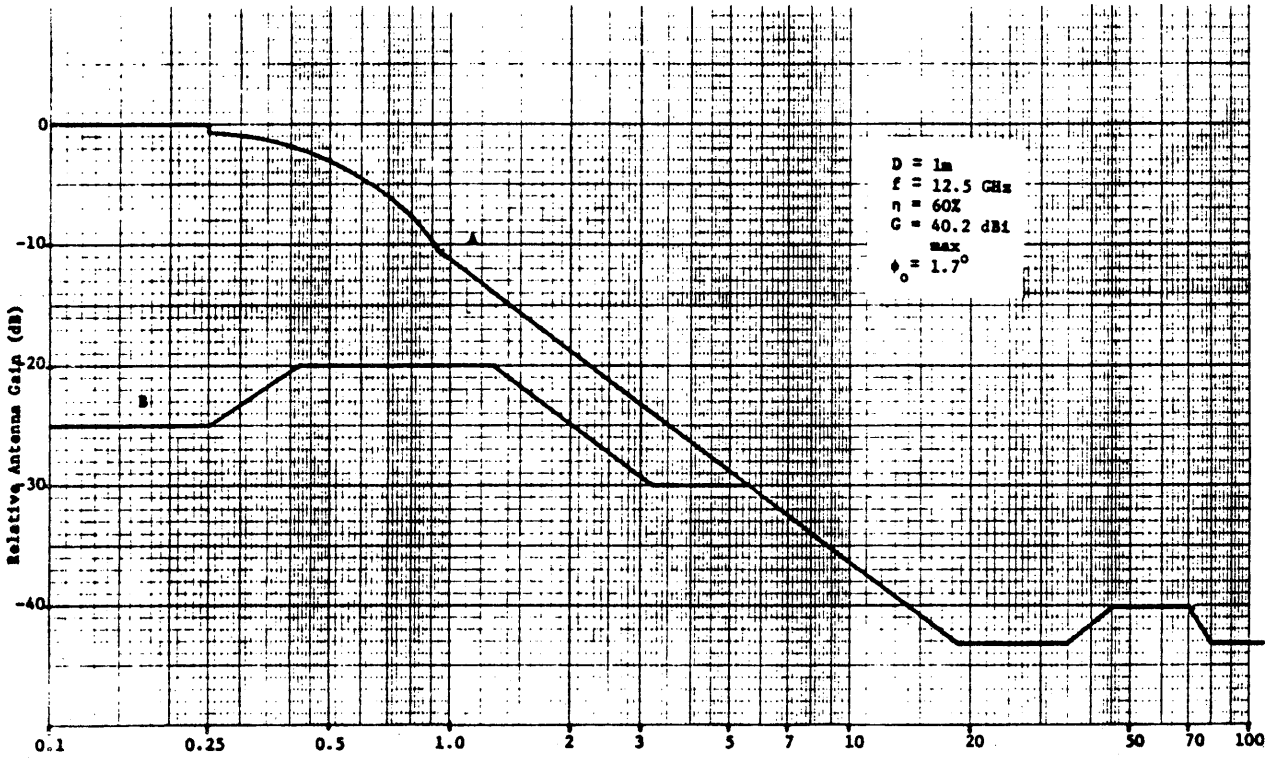


Figure 2

Reference patterns for co-polar and cross-polar components for earth station receiving antennae in Region 2

Curve A: Co-polar component (dB relative to main beam gain)

0	for $0 \leq \phi/\phi_o \leq 0.25$
$-12\ (\phi/\phi_o)^2$	for $0.25 < \phi/\phi_o \leq 0.94$
$-\{11.3+25 \log (\phi/\phi_o)\}$	for $0.94 < \phi/\phi_o \leq 18.88$
-43.2	for $18.88 < \phi/\phi_o \leq 35$
$-\{85.2-27.3 \log (\phi/\phi_o)\}$	for $35 < \phi/\phi_o \leq 45$
-40.2	for $45 < \phi/\phi_o \leq 70$
$-\{-55.2 + 51.7 \log (\phi/\phi_o)\}$	for $70 < \phi/\phi_o \leq 80$
-43.2	for $80 < \phi/\phi_o \leq 105.9$

Curve B: Cross-polar component (dB relative to main beam gain)

-25	for $0 \leq \phi/\phi_o \leq 0.25$
$-\{30+40 \log \lvert \phi/\phi_o-1 \rvert\}$	for $0.25 < \phi/\phi_o \leq 0.44$
-20	for $0.44 < \phi/\phi_o \leq 1.28$
$-\{17.3+25 \log (\phi/\phi_o)\}$	for $1.28 < \phi/\phi_o \leq 3.22$
-30	until the intersection with the co-polar component; then as the co-polar component.

Note 1: The flat portion of the curves up to $\phi/\phi_o = 0.25$ takes account of the pointing error of the antennae

Note 2: These patterns should determine the levels exceeded by 10% of the sidelobe peaks beyond the first sidelobe

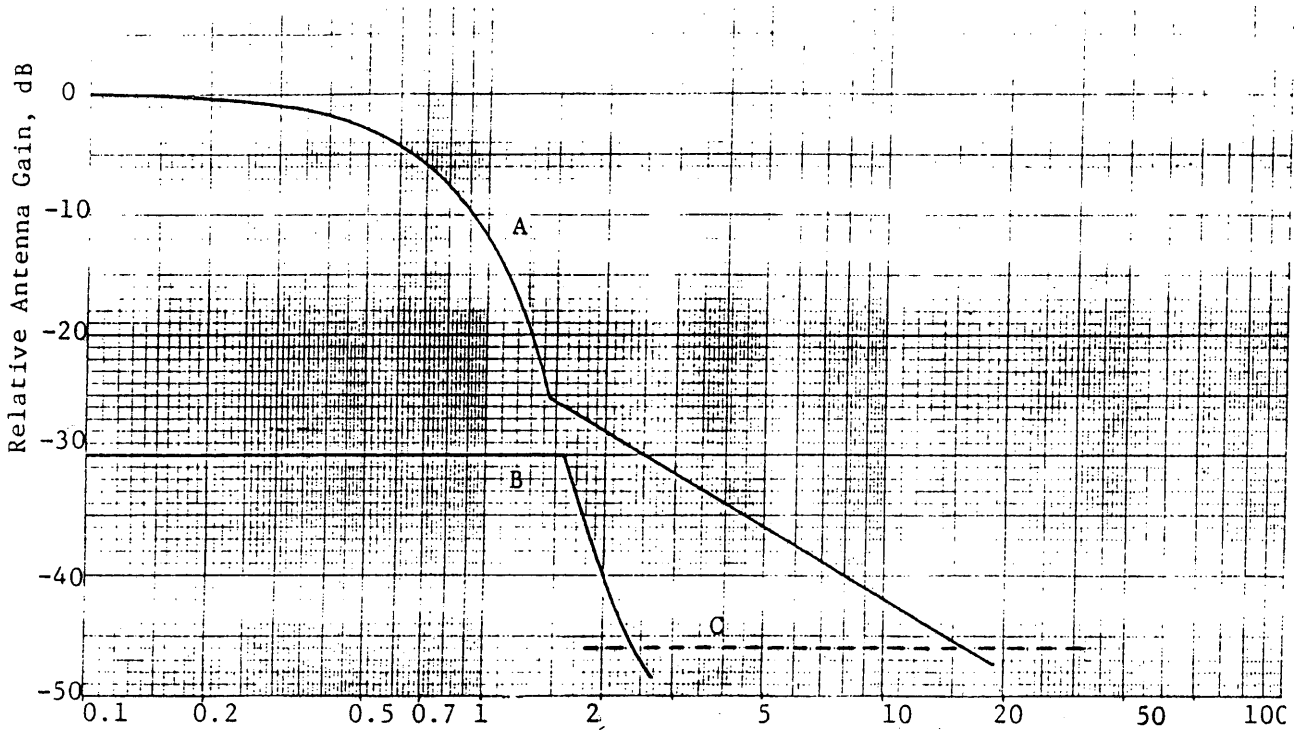


Figure 3

Reference patterns for co-polar and cross-polar components for satellite transmitting antenna in Region 2.

Curve A: Co-polar component (dB relative to main beam gain)

$- 12\ (\phi/\phi_o)^2$ for $0 \leq (\phi/\phi_o) \leq 1.45$
$- (22 + 20 \log\ (\phi/\phi_o)$ for $1.45 < (\phi/\phi_o)$

until the intersection with curve C, then curve C

Curve B: Cross-polar component (dB relative to main beam gain)

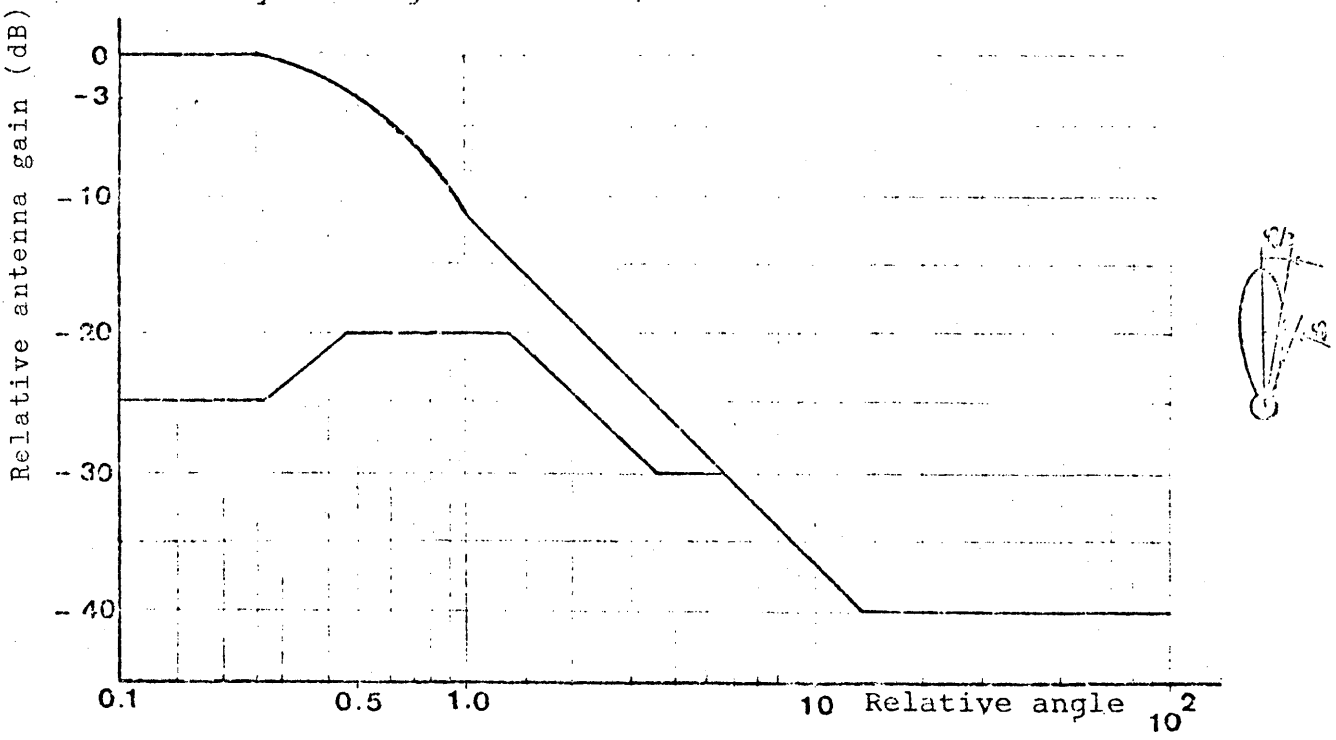
$- 30$ for $0 \leq (\phi/\phi_o) \leq 1.56$
$- (40 + 40 \log|\phi/\phi_o - 1|)$ for $1.56 < (\phi/\phi_o)$

until the intersection with curve C, then curve C

Curve C: - (on-axis gain)

where ϕ_o is the dimension of the minimum circle or ellipse fitted around the downlink service area in the direction of interest.

MOD Existing ~~Figure 5~~ and related equations should be replaced by new ~~Figure 5~~ and equations below



Reference patterns for co-polar and cross-polar components for receiving antennas for individual reception in Region 2.

Figure 4

NEW EQUATIONS

Curve A: Co-polar component without side-lobe suppression

$$0 \qquad \text{for} \quad 0 < \frac{\phi}{\phi o} \leq 0.25$$

$$-12 \left(\frac{\phi}{\phi_o}\right)^2 \qquad \text{for} \quad 0.25 < \frac{\phi}{\phi o} \leq 0.94$$

$$-\left[11.3 + 25 \log \left(\frac{\phi}{\phi o}\right)\right] \qquad \text{for} \quad 0.94 < \frac{\phi}{\phi o} \leq 14.06$$

$$-40 \qquad \text{for} \quad \frac{\phi}{\phi o} > 14.06$$

Curve B: Cross-polar component

-25	for $0 \leq \frac{\phi}{\phi_0} \leq 0.25$
$-\left[30 + 40 \log \left\| \left(\frac{\phi}{\phi_0}\right) - 1 \right\|\right]$	for $0.25 < \frac{\phi}{\phi_0} \leq 0.44$
-20	for $0.44 < \frac{\phi}{\phi_0} \leq 1.28$
$-\left[17.3 + 25 \log \left(\frac{\phi}{\phi_0}\right)\right]$	for $1.28 < \frac{\phi}{\phi_0} \leq 3.22$
-30	until intersection with co-polar component curve then as for co-polar component.

Note 1. The flat portion of the curves up to $\frac{\phi}{\phi_0} = 0.25$ takes account of the pointing error of the antenna.

Note 2. These patterns should determine the levels exceeded by 10% of the side-lobe peaks beyond the first side-lobe of the antenna.

Reason : It is believed that the proposed curves represent a good compromise that can be achieved from a symmetrical structure composed of a paraboloid of 1 metre diameter fed by a simple primary radiator, compatible with a large scale production.

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17 June 1983
English only

REPORT OF AD HOC DRAFTING GROUP ON NECESSARY BANDWIDTH TO WORKING GROUP 4B

The Drafting Group met for the purpose of proposing a text for section 3.8 of Annex 8 to Appendix 30. The input documents were Documents Nos. 11, 13, 15, 20 and DT/7.

The necessary bandwidths considered are as follows for :

- 625 line systems in Regions 1 and 3 : 27 MHz;
- 525 line systems in Region 3 : 27 MHz.

In Region 2, the plan is based on a channel bandwidth of 24 MHz, /but different bandwidths may be implemented in accordance with the provisions of these Final Acts/.

(The Administration of France wishes to provide documentation to the Conference for planning purposes concerning the performance of their intended signals in a Region 2 environment.)

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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WORKING GROUP 4A

DRAFT PROPOSALS FOR DEPOLARIZATION

Appendix 30, Annex 8

Add the following new section to apply for Region 2 :

ADD 2.5 Depolarization

Rain and ice can cause depolarization of radio frequency signals. The level of the co-polar component relative to the depolarized component is given by the cross-polarization discrimination (XPD) ratio. For circularly polarized emissions, the XPD ratio not exceeded for 1% of the worst month is obtained from :

$$XPD = 30 \log f - 40 \log (\cos \theta) - 20 \log A_p \quad dB \quad 5^\circ \leq \theta \leq 60^\circ$$

where A_p (dB) is the co-polar rain attentuation exceeded for 1% of the worst month (calculated in section 2.4), f is the frequency in GHz and θ is the elevation angle. For angle of θ greater than 60°, use $\theta = 60^\circ$ in equation.

Appendix 30A (Feeder link)

Add the following sub-section :

- Depolarization

Rain and ice can cause depolarization of radio frequency signals. The level of the co-polar component relative to the depolarized component is given by the cross-polarization discrimination (XPD) ratio. For the feeder link, the XPD ratio, in dB, not exceeded for 1% of the worst month is given by :

$$XPD = 30 \log f - 40 \log (\cos \theta) - 23 \log A_p \quad dB \quad 5^\circ \leq \theta \leq 60^\circ$$

where A_p is the co-polar rain attentuation exceeded for 1% of the worst month, f is the frequeny in GHz and θ is the elevation angle. For values of θ greater than 60°, use $\theta = 60^\circ$ in equation.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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SUB-WORKING GROUP 6A-1

FINAL ACTS

of the Regional Administrative Radio Conference for the planning, in Region 2, of the broadcasting-satellite service in the frequency band 12.2 - 12.7 GHz and associated feeder links in the fixed-satellite service (Earth-to-space) in the frequency band [17.3 - 17.8] GHz

SECTION I

Provisions and Associated Plan for the broadcasting-satellite service in the frequency band 12.2 - 12.7 GHz in Region 2

ARTICLE 1

General Definitions

For the purposes of these Final Acts the following terms shall have the meanings defined below:

Union:	The International Telecommunication Union;
Secretary-General:	The Secretary-General of the Union;
IFRB (Board):	The International Frequency Registration Board;
CCIR:	The International Radio Consultative Committee;
Convention:	The International Telecommunication Convention ~~(Malaga-Torremolinos, 1973);~~ in force;
Radio Regulations:	The Radio Regulations ~~(1976 edition)~~ annexed to the Convention;
Regions 1, 2 and 3:	The geographical areas defined in Nos. ~~126~~ 393 to ~~132~~ 399 of the Radio Regulations;
Master Register:	The Master International Frequency Register;
IFRB weekly circular:	The publication referred to in No. ~~497~~ 1235 of the Radio Regulations;
Administration:	Any governmental department or service responsible for discharging the obligations undertaken in the Convention and the Radio Regulations.

WARC : World Administrative Radio Conference;

Geneva 1983 Conference : Regional Administrative Radio Conference (RARC) for the planning in Region 2 of the broadcasting-satellite service in the frequency band 12.2 - 12.7 GHz and associated feeder links in the frequency band /17.3 - 17.8/ GHz;

Regions 1 & 3 Plan : The Plan for the broadcasting-satellite service in the frequency bands 11.7 - 12.2 GHz in Region 3 and 11.7 - 12.5 GHz in Region 1 contained in Appendix 30 to the Radio Regulations, together with any modifications resulting from the successful application of the procedures contained in the said Appendix.

Region 2 Plan : The Plan for the broadcasting-satellite service in the frequency band 12.2 - 12.7 GHz in Region 2 contained in this section of the Final Acts, together with any modifications resulting from the successful application of the procedures contained in this section.

Frequency assignment in conformity with the Region 2 Plan : Any frequency assignment which appears in the Region 2 Plan or for which the procedure of Article 4 of this section has been successfully applied.

ARTICLE 2

Frequency Band

2.1 The provisions of this section apply to the broadcasting-satellite service in the frequency band 12.2 - 12.7 GHz in Region 2 and to the other services to which this band is allocated in any of these Regions, insofar as their relationship to the broadcasting-satellite service in this band in Region 2 is concerned.

ARTICLE 3

Execution of the Provisions and Associated Plan

3.1 The Members of the Union in Region 2 **shall adopt, for their broadcasting-satellite space stations operating in the frequency bands referred to in this Appendix, the characteristics specified in the Plan for** that Region.

CAN/13/8 ADD **3.2 An administration may implement its assignments in the Region 2 Plan using different characteristics but not different orbital positions than that of the Plan without applying the procedure of Article 4 and proceed directly with the application of Article 5 provided that the overall protection margin[1] associated with all assignments of other administrations are not consequently reduced. The use of this assignment will only be protected to the extent of the limits associated with that entry in the Plan.**

CAN/13/9 ADD [1]The expression "overall protection margin" is defined in Annex 1.

USA/19/8 ADL 3.2 An administration 2/ may bring into use its assignments in the Region 2 Plan using characteristics, including service areas, that are different from those of the Plan, but not different orbital positions, provided that the total protection margins associated with all assignments of other administrations appearing in the Plan are not consequently reduced. The Plan must be modified before any assignment may be brought into use that would consequently reduce the total protection margin of any assignment appearing in the Plan.

USA/19/9 ADD 2/ The use of the word "administration" in this Appendix does not preclude the application of these provisions to the case where more than one administration agrees to undertake a project jointly.

USA/19/10 MOD 3.3 The Members of the Union shall not otherwise change the characteristics specified in the Plans, or establish new broadcasting-satellite space stations or stations in the other services to which these frequency bands are allocated, except as provided for in the Radio Regulations and the appropriate Articles and Annexes of this Appendix.

3/ Such stations may also be used for transmissions in the fixed-satellite service (space-to-Earth) in accordance with RR 846.

Note : Relationship between RR 839 and RR 846.

ARTICLE 4

Procedure for Modifications to the Plan

4.1 When an administration intends to make a modification to the Plan, i.e. either:

a) to modify the characteristics of any of its frequency assignments to a space station[1] in the broadcasting-satellite service which are shown in the Plan, or for which the procedure in this Article has been successfully applied, whether or not the station has been brought into use; *or*

b) to include in the Plan a new frequency assignment to a space station in the broadcasting-satellite service; *or*

c) to cancel a frequency assignment to a space station in the broadcasting-satellite service;

the following procedure shall be applied before any notification of the frequency assignment is made to the International Frequency Registration Board (see Article 5 of this ~~Appendix~~ section).

[1] The expression "frequency assignment to a space station", wherever it appears in this Article, shall be understood to refer to a frequency assignment associated with a given orbital position. See Annex 10 for the orbital position limitations.

CAN/13/14 ADD 4.1.1 Before an administration proposes to include in the Region 2 Plan under the provisions of 4.1 b), a new frequency assignment to a space station or to include in the Plan new frequency assignments to a space station whose orbital position is not designated in the Plan to this administration, all of the assignments to the service area involved should normally have been brought into service or have been notified to the Board in accordance with Article 5 of this Appendix. The administration shall indicate in the information communicated to the Board under paragraph 4.3.2 the reasons for this addition to the Plan.

USA/19/16 ADD 4.1.2 An administration in proposing a modification of the Region 2 Plan may request that certain of its frequency assignments appearing in the Plan not be taken into account in determining when the limits shown in Annex 1 are exceeded. The assignment not taken into account shall not be brought into use until the conditions of paragraph 3.2 of Article 3 have been fulfilled.

CAN/13/15 ADD 4.1.2 An administration may also propose to modify under the provisions of 4.1 a) for a specified period[1], the characteristics of its frequency assignment(s) to a space station in the broadcasting-satellite service which are shown in the Region 2 Plan. During that specified period, the frequency assignment that has been modified shall not be available for use by that administration. At the end of this specified period, the modification shall lapse and the frequency assignment in the Plan shall be available for use by that administration.

CAN/13/19 ADD [1]In applying the provisions of 4.1.2 and 4.3.1.1 for Region 2 administrations, account shall be taken of the relevant effective period associated with assignments in the Region 2 Plan which have been modified or are being modified in accordance with this Article.

USA/19/14 ADD 4.1.1 An administration may also propose to modify temporarily the characteristics of one of its frequency assignments appearing in the Region 2 Plan. After the temporary period 3/, the modification shall lapse and the frequency assignment that had been modified may be brought into use subject to the conditions of paragraph 3.2A of Article 3.

USA/19/15 ADD 3/ In the event that no expiration date is given the temporary period shall expire when the modified assignment is cancelled under paragraph 4.4.

4.2 The term "frequency assignment in accordance with the Plan" used in this and the following Articles is defined in Article 1.

S. SELWYN
Chairman of Sub-Working Group 6A-1

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/5-E
21 June 1983
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SUB-WORKING GROUP 6A-1

FINAL ACTS

[of the regional administrative radio conference
for the planning, in Region 2, of the broadcasting-satellite service
in the frequency band 12.2 - 12.7 GHz and the planning of
associated feeder links for the fixed-satellite service
(Earth to-space) in the frequency band [ ]]

S. SILWYN
Chairman of Sub-Working Group 6A-1

SECTION I

Provisions and Associated Plan for the broadcasting-satellite service in the frequency band 12.2 - 12.7 GHz in Region 2

ARTICLE 1

General Definitions

For the purposes of these Final Acts the following terms shall have the meanings defined below:

Union: The International Telecommunication Union;

Secretary-General: The Secretary-General of the Union;

~~*WARC:*~~ RARC ~~World~~ Regional Administrative Radio Conference;

Geneva 1983 Conference : Regional Administrative Radio Conference (RARC) for the Planning of the broadcasting-satellite service in the 12.2 - 12.7 GHz band in Region 2 and associated feeder links in the 17.3 - 17.8 GHz band;

[Regions 1 and 3 Plan : The Plan for BSS in Regions 1 and 3 and the associated procedures contained in Appendix 30 to the Radio Regulations.]

IFRB (Board): The International Frequency Registration Board;

CCIR: The International Radio Consultative Committee;

Convention: The International Telecommunication Convention [(Malaga-Torremolinos, 1973)];

Radio Regulations: The Radio Regulations ~~(1976 edition)~~ annexed to the Convention;

Regions 1, 2 and 3: The geographical areas defined in Nos. ~~126~~ 393 to ~~132~~ 399 of the Radio Regulations;

Master Register: The Master International Frequency Register;

IFRB weekly circular: The publication referred to in No. ~~497~~ 1235 of the Radio Regulations;

[~~*Plan:*~~ Region 2 Plan : The Plan for ~~Regions 1 and 3 and its annexes;~~ broadcasting-satellite service in Region 2 and associated procedures contained in these Final Acts.]

Administration: Any governmental department or service responsible for discharging the obligations undertaken in the Convention and the Radio Regulations.

[CAN/13/2 **Frequency assignment in accordance with the Plans:** Any frequency assignment which appears in the Plans or for which the procedure of Article 4 of this Appendix has been successfully applied.]

[USA/19/2 **Frequency assignment ~~in accordance with~~ appearing in the a Plan:** Any frequency assignment which appears in the a Plan or for which the procedure of Article 4 of this Appendix has been successfully applied:

Frequency assignment in conformity with the Region 2 Plan: Any frequency assignment which employes a nominal orbital position designated in the Plan and does not as a result of the characteristics of the assignment reduce the total aggregate protection margin of any frequency assignment appearing in the Plan.]

ARTICLE 2

Frequency Bands

CAN/13/3 MOD 2.1 The provisions of this Appendix apply to the broadcasting-satellite service in the frequency bands between 11.7 GHz and 12.5 GHz in Region 1, ~~and~~ between 11.7 GHz and 12.2 GHz in Regions ~~2 and~~ 3[1] and between 12.2 and 12.7 GHz in Region 2 and to the other services to which these bands are allocated, so far as their relationship to the broadcasting-satellite service in these bands is concerned.

CAN/13/4 ADD [1]In the application of No. 847 of the Radio Regulations pertaining to the broadcasting-satellite service in the frequency band 12.5-12.75 GHz in Region 3, refer to Resolution No. 34 of the Radio Regulations.

USA/19/3 MOD 2.1 The provisions of this Appendix apply to the broadcasting-satellite service in the frequency bands between 11.7 GHz and 12.5 GHz in Region 1, and between 11 7 GHz and 12.2 GHz in Regions 2 and 3 and between 12.2 and 12.7 GHz in Region 2 and to the other services to which these bands are allocated, so far as their relationship to the broadcasting-satellite service in these bands is concerned.

VEN The provisions of these Final Acts apply to the broadcasting-satellite service in frequency band between 12.2 GHz and 12.7 GHz in Region 2 and the relationship with the BSS in the band 11.7 - 12.5 GHz in Region 1 and 11.7 - 12.2 GHz in Region 3 and to the other service to which these bands are allocated.

ARTICLE 3

Execution of the Provisions and Associated Plan

3.1 The Members of the Union in Region 2 **shall adopt, for their broadcasting-satellite space stations** 3 **operating in the frequency bands referred to in this Appendix, the characteristics specified in the Plan for** that Region.

CAN/13/8 ADD 3.2 An administration may implement its assignments in the Region 2 Plan using different characteristics but not different orbital positions than that of the Plan without applying the procedure of Article 4 and proceed directly with the application of Article 5 provided that the overall protection margin[1] associated with all assignments of other administrations are not consequently reduced. The use of this assignment will only be protected to the extent of the limits associated with that entry in the Plan.

CAN/13/9 ADD [1]The expression "overall protection margin" is defined in Annex 1.

USA/19/8 ADD 3.2 An administration 2/ may bring into use its assignments in the Region 2 Plan using characteristics, including service areas, that are different from those of the Plan, but not different orbital positions, provided that the total protection margins associated with all assignments of other administrations appearing in the Plan are not consequently reduced. The Plan must be modified before any assignment may be brought into use that would consequently reduce the total protection margin of any assignment appearing in the Plan.

USA/19/9 ADD 2/ The use of the word "administration" in this Appendix does not preclude the application of these provisions to the case where more than one administration agrees to undertake a project jointly.

USA/19/10 MOD 3.3 The Members of the Union shall not otherwise change the characteristics specified in the Plans, or establish new broadcasting-satellite space stations or stations in the other services to which these frequency bands are allocated, except as provided for in the Radio Regulations and the appropriate Articles and Annexes of this Appendix.

3/ Such stations may also be used for transmissions in the fixed-satellite service (space-to-Earth) in accordance with RR 846.

Note : Relationship between RR 839 and RR 846.

ARTICLE 4

Procedure for Modifications to the Plan

4.1 When an administration intends to make a modification to the Plan, i.e. either:

a) to modify the characteristics of any of its frequency assignments to a space station[1] in the broadcasting-satellite service which are shown in the Plan, or for which the procedure in this Article has been successfully applied, whether or not the station has been brought into use; *or*

b) to include in the Plan a new frequency assignment to a space station in the broadcasting-satellite service; *or*

c) to cancel a frequency assignment to a space station in the broadcasting-satellite service;

the following procedure shall be applied before any notification of the frequency assignment is made to the International Frequency Registration Board (see Article 5 of this Appendix).

[1] The expression "frequency assignment to a space station", wherever it appears in this Article, shall be understood to refer to a frequency assignment associated with a given orbital position. See Annex 10 for the orbital position limitations.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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WORKING GROUP 4C

Text requested by the Chairman of Working Group 4C
dealing with protection of FSS from modifications to the BSS Plans

NOC 4

ANNEX 1

ADD 5

Limits on the change in power flux-density of assignments in the Region 2 Plan to protect the fixed satellite service in the band 12.5-12.7 GHz in Regions 1 and 3.

With respect to paragraph 4.3.1.4, an administration in Region 1 or 3 shall be considered as being affected if the proposed modification to the Region 2 Plan would result in an increase in the power flux-density on its territory of 0.25 dB or more above that resulting from the frequency assignments in the Region 2 Plan at the time of entry into force of the Final Acts.

However, where an assignment in the Region 2 Plan or its subsequent modification give a power flux-density of less than $/$ -138 dBW/m^2/27 MHz$/$ anywhere in the territory of an administration of Region 1 or 3, that administration shall be considered as not affected.

J. Zamudio
Chairman of Working Group 4C

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4B3

Proposed modification to second paragraph of section 3.3 of Annex 8 of Appendix 30

In Regions 1 and 3, the reduction in quality in the down-link due to thermal noise in the up-link is taken as equivalent to a degradation in the down-link carrier-to-noise ratio not exceeding 0.5 dB for 99% of the worst month. In Region 2, as a guidance for the development of the Plan, the reduction in quality in the down-link due to thermal noise in the feeder link is taken as equivalent to a degradation in the down-link carrier-to-noise ratio of approximately 0.5 dB for 99% of the worst month but the plan is evaluated on the carrier-to-noise ratio of the combined down-link and feeder link contributions.

Proposed addition to section 3.4 of Annex 8 of Appendix 30

In Region 2, as a guidance to the development of the Plan, the reduction in the down-link co-channel interference due to co-channel interference in the feeder link is taken as equivalent to a degradation in the down-link co-channel carrier-to-interference ratio of approximately 0.5 dB for 99% of the worst month but the plan is evaluated on the overall equivalent co-channel protection margin of the combined down-link and feeder link contributions.

M. BOUCHARD
Chairman of Sub-Working Group 4B3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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WORKING GROUP 5A-1

LIST OF THE PARAMETERS ADOPTED FOR THE FIRST PLANNING EXERCISE

1. Earth station receive - antenna diameter : given with respect to the centre of the beam : 1.8°
2. Earth station receive - antenna reference pattern : WARC-77 pattern
3. Adjacent channel protection ratio : CPM template
4. Second adjacent channel protection ratio : CPM template
5. Channel bandwidth : 24 MHz
6. Channel spacing : 13.33 MHz
7. Guard bands : 10 MHz at each end of the total band
8. Minimum elevation angle : not adopted
9. Minimum satellite antenna beamwidth : 0.8°
10. Satellite antenna pattern : that used by the CPM
11. Satellite antenna pointing accuracy :

    ± 0.1° with respect to beam-axis

    ± 1° rotation about beam-axis
12. Delta-G : 3 dB
13. Rain model : that of the CPM
14. Maximum rain attenuation : no limit was fixed; its effects to be assessed
15. Percentage of worst month : not exceeding 1%

16. Co-channel protection ratio : 33 dB single entry and 28 dB aggregate

17. Satellite station-keeping error :

$\pm$ 0.1° E-W
no restriction N-S

For the purposes of this first exercise, the Plan will take requirements into account and will be carried out for down-links in the first stage.

The first run will be carried out without assigning polarizations.

The 36 channels will be distributed in four families of nine channels each with a spacing of four channels between those of the same family.

The carrier-to-noise ratio (C/N) for the down-link will be 14.5 dB and the frequency 12.45 GHz.

The figure of merit (G/T) will be 10 dBK^{-1}.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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APPENDIX 30A

WORKING GROUP 4C

ANNEX 1

Limits for determining whether a Service of an Administration is considered to be affected by a proposed Modification to the Plan /(Article 4, paragraph 4.3.1)/[1]

1. *Limits on the change in the wanted-to-interfering signal ratio with respect to frequency assignments in accordance with the Plan*

With respect to paragraph [4.3.1.1] an administration shall be considered as being affected if the effect of the proposed modification to the Plan would result in the overall protection margin[2] of its entry in the Plan falling below either 0 dB or the value resulting from the frequency assignments in the Plan at the date of entry into force the Final Acts[3], whichever is lower. This overall protection margin is calculated relative to the value of overall protection ratio[4].

Note: In performing the calculation, the effect at the receiver input of all the co-channel and adjacent channel signals is expressed in terms of one equivalent co-channel interfering signal. This value is usually expressed in decibels.

2. *Limits on the change in the power flux density to protect the broadcasting-satellite service in the band* 12.2 - 12.5 GHz in Region 1.

With respect to paragraph [4.3.1.2] an administration in Region 1 shall be considered as being affected if the proposed modification to the Plan would result in exceeding the following power flux densities at any point in the service area affected:

-147 dBW/m²/27 MHz	$0° \leqslant \theta < 0.48°$
$-139 + 25 \log \theta$ dBW/m²/27 MHz	$0.48° \leqslant \theta < 27.25°$
-103 dBW/m²/27 MHz	$\theta \geqslant 27.25°$

where θ is the difference in degrees between the longitudes of the broadcasting-satellite space station in Region 2 or 3 and the broadcasting-satellite space station affected in Region 1.

---

[1] The limits specified in this Annex relate to the power flux densities which would be obtained assuming /clear air/ propagation conditions, /including the effects of atmospheric absorption/.

[2] The overall protection margin includes the equivalent co-channel values for both the space-to-earth path and the earth-to-space (feeder link) path for all interfering sources in the Plan including interference from other channels in the same service area.

[3] Final Acts of the RARC-83-BSS, Geneva.

[4] The value of overall protection ratio is given in section 3.4 of Annex 8 and section 1.7 of Annex 9, both of this Appendix.

3. Limits on the change in the power flux-density to protect the terrestrial services of administrations in Region 1 or 3.

An administration in Region 1 or 3 shall be considered as being affected if the proposed modification to the Plan would result in exceeding a power flux-density, for any angle of arrival, at any point on its territories, of -125 dB(W/m^2/4 kHz) / when the broadcasting-satellite station uses circular polarization and -128 dB(W/m^2/4 kHz) when the broadcasting-satellite station uses linear polarization. /

4. (Document No. DL/6 refers)

J. ZAMUDIO
Chairman of Working Group 4C

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4C-1

Proposed texts to consider the use of reduced spectral density for Region 2 BSS transmissions

ANNEX 8

MOD 3.18 Use of energy dispersal

For planning in Region 1 and 3 an energy dispersal value... to a peak-to-peak deviation of 600 kHz.

In Region 2, for interregional sharing purposes the same reduction in spectral density in a 4 kHz band is required.

ANNEX 9

MOD 3.2 In Regions 1 and 3 such energy dispersal is achieved by... from 12.5 Hz to 30 Hz.

In Region 2 an equivalent spectral reduction may also be achieved using other spectral spreading techniques.

MOD 3.4 In Regions 1 and 3, the value of energy dispersal... to a peak-to-peak deviation of 600 kHz.

In Region 2, the value of equivalent spectral reduction for the broadcasting-satellite service has been determined such that the spectral power flux-density measured in a 4 kHz bandwidth is reduced by 22 dB relative to that measured in the entire bandwidth.

F. LEITE
Chairman of Sub-Working Group 4C-1

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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APPENDIX 30A

WORKING GROUP 4C

ANNEX 3

Method for Determining the Limiting Interfering Power Flux-Density at the Edge of a Broadcasting-Satellite Service Area and for Predicting the Power Flux-Density Produced There by a Terrestrial Station

1. *General*

1.1 This Annex describes a method of assessing the interference potential from terrestrial transmitters to broadcasting-satellite receivers.

1.2 The method is in two parts:

a) the calculation of the maximum permissible interfering power flux density at the edge of the broadcasting-satellite service area concerned;

b) the calculation of the likely power flux density produced at any point on the edge of the service area by the terrestrial transmitter of another administration.

1.3 The interference potential of the terrestrial transmitters must be considered case by case; the power flux density produced by each terrestrial transmitter is compared to the limiting power flux density at any point on the edge of the service area of a broadcasting-satellite station of another administration. If, for a given transmitter, the value of the power flux density produced is lower than the value of the limiting power flux density at any point on the edge of the service area, the interference caused to the broadcasting-satellite service by this transmitter is considered to be lower than the permissible value and no coordination is required between administrations before the terrestrial service is brought into use. Where this is not the case, coordination and further, more precise calculations derived from a mutually agreed basis are necessary.

1.4 It is emphasized that, should the calculation described in this Annex indicate that the maximum permissible power flux density is exceeded, it does not necessarily preclude the introduction of the terrestrial service since the calculations are necessarily based on worst-case assumptions for:

a) the nature of the terrain of the interference path;

b) the off-beam discrimination of the broadcasting-satellite receiving installations;

c) the necessary protection ratios for the broadcasting-satellite service;

d) the type of reception in the broadcasting-satellite service, i.e., assuming individual reception, this being more critical than community reception for the angles of elevation concerned;

e) the value of power flux density to be protected in the broadcasting-satellite service;

f) the propagation conditions between the terrestrial station and the broadcasting-satellite service area.

2. *Limit of power flux density*

2.1 *General*

The limiting power flux density not to be exceeded at the edge of the service area in order to protect the broadcasting-satellite service of an administration is given by the formula:

$$F = F_o - R + D + P \qquad (1)$$

where F = the maximum permissible interfering power flux density (dBW/m^2) in the broadcasting-satellite necessary bandwidth

F_o = the wanted power flux density (dBW/m^2) at the edge of the service area

R = the protection ratio (dB) between the wanted and interfering signals

D = angular discrimination (dB) provided by the radiation pattern of the satellite broadcasting receiver antenna

P = polarization discrimination (dB) between the wanted and interfering signals

2.2 *Wanted power flux density (F_o)*

The value of F_o is equal to

$$[-105 \text{ dB(W/m}^2)]$$

2.3 *Protection ratio (R)*

2.3.1 The single entry protection ratio against all types of terrestrial transmissions, with the exception of amplitude-modulation multichannel television systems, is 35 dB for carrier frequency differences between the wanted and interfering signals of up to $\pm$10 MHz, decreasing linearly from 35 dB to 0 dB for carrier frequency differences between 10 MHz and 35 MHz, and is 0 dB for frequency differences in excess of 35 MHz (see Figure 1).

2.3.2 The carrier frequency difference should be determined by reference to the frequency assignments in the broadcasting-satellite Plan or, in the case of assignments not contained within a plan, by reference to the description of the characteristics of the proposed or operational system. For amplitude-modulation multichannel television systems which produce peaks of high power flux density spread over a wide range of their necessary bandwidth, the protection ratio R is 35 dB and is independent of the carrier frequency difference.

2.3.3 A signal from a terrestrial station should be considered only if its necessary bandwidth overlaps the necessary bandwidth of the broadcasting-satellite assignment.

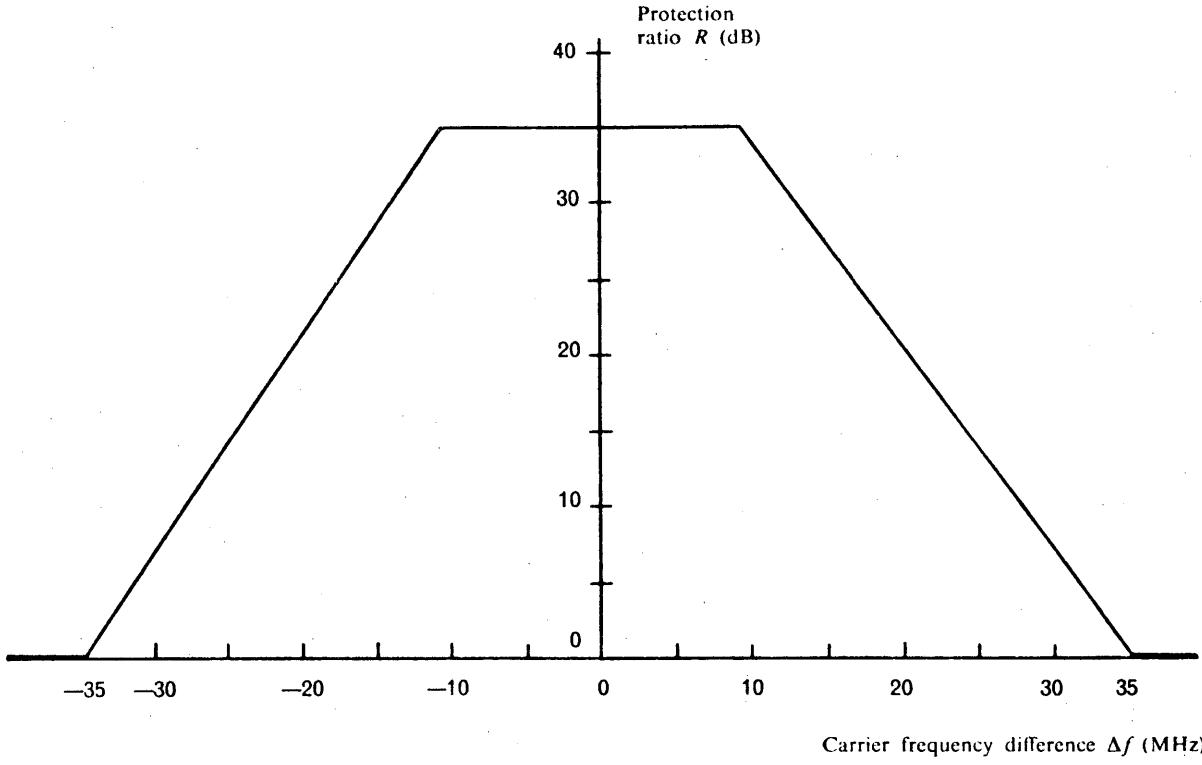

FIGURE 1

Protection ratio R (dB) for a broadcasting-satellite signal against a single entry of interference from a terrestrial service (except for AM multichannel TV systems)

2.4 *Angular discrimination (D)*

Pending outcome of results of Working Group 4B

Proposals
- B 20/23-24
- CAN 13/132-138
- USA 11/37-39

2.5 *Polarization discrimination (P)*

The value of P is equal to:

a) 3 dB when the interfering terrestrial service uses linear polarization.

b) 0 dB when the interfering terrestrial service uses circular polarization.

3. *Power flux-density produced by a terrestrial station (F_p)*

The power flux-density F_p (in dB(W/m^2)) produced at any point on the edge of the service area by the terrestrial station is determined from the following formula:

$$F_p = E - A + 43 \qquad (3)$$

where

E = the equivalent isotropically radiated power (dBW) of the terrestrial station in the direction of the point on the edge of the service area concerned;

A = the total path loss in dB.

3.1 *Evaluation of path loss A for a terrestrial station at a distance greater than 100 km from the edge of the service area of the broadcasting satellite*

For path lengths greater than 100 km, A is given by:

$$A = 137.6 + 0.2324\, d_t + 0.0814\, d_m \qquad (4)$$

where d_t and d_m are the overland and oversea path lengths respectively, in km.

3.2 *Evaluation of path loss A for a terrestrial station at a distance equal to or less than 100 km from the edge of the service area of the broadcasting satellite*

For path lengths equal to or less than 100 km, A is calculated using equations (4) and (5) and the lower value obtained is substituted in formula (3) to calculate the power flux-density produced at the point on the edge of the service area:

$$A = 109.5 + 20 \log (d_t + d_m) \qquad (5)$$

The variation in A for different path lengths and percentage of oversea path is shown in Fig. 3.

3.3 *Distance beyond which the method need not be applied*

The method need not be applied and coordination is unnecessary when the distance between the terrestrial station and the service area of the broadcasting satellite is greater than:

a) 400 km in the case of all overland paths, or

b) 1 200 km in the case of all oversea or mixed paths.

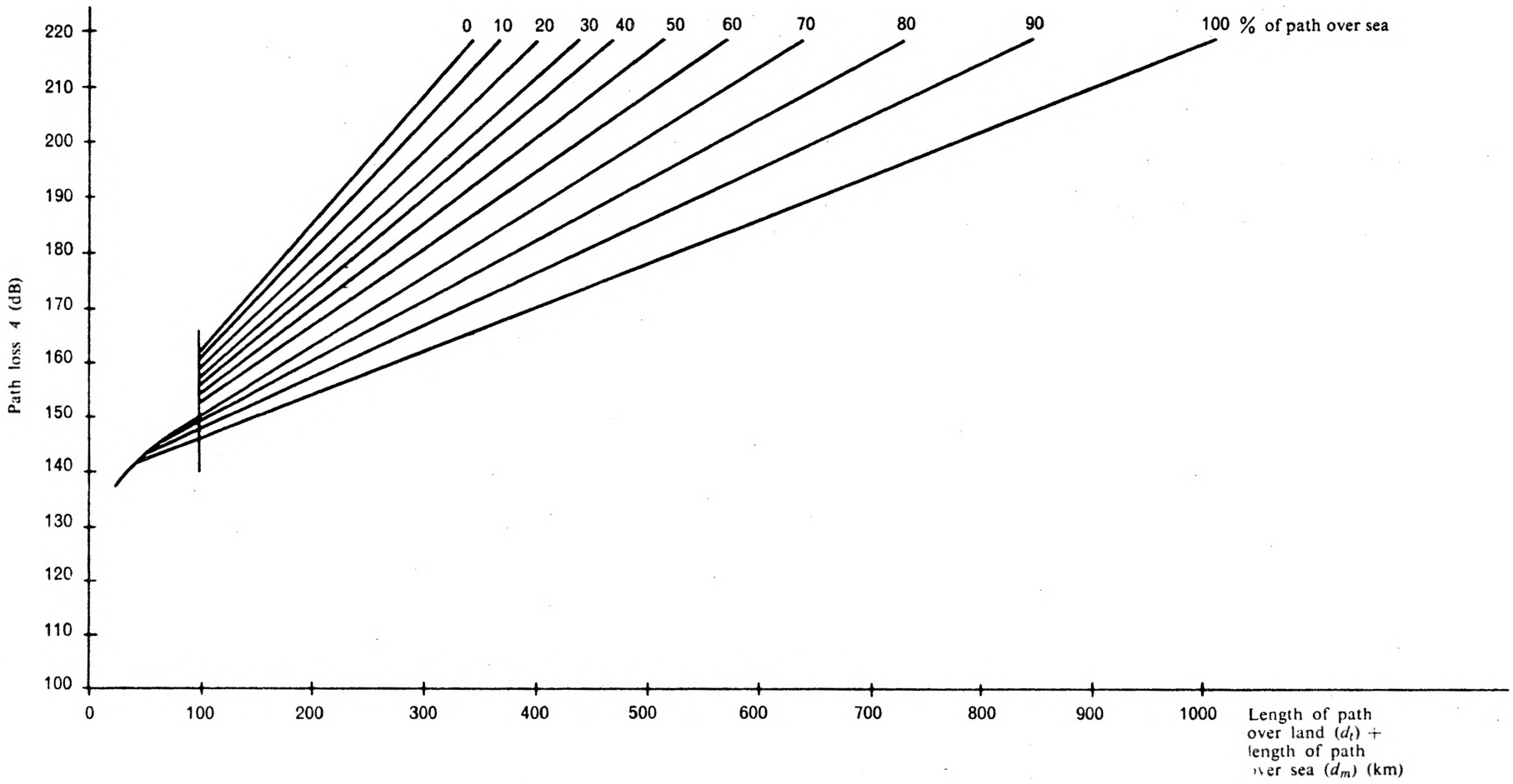

FIGURE 3

Total path loss A (dB) versus total path length ($d_t + d_m$)(km) and percentage of oversea path

INTERNATIONAL TELECOMMUNICATION UNION

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AD HOC GROUP 4A

Report to Working Group 4A

AD HOC GROUP ON LIMIT OF THE FEEDER LINK ATTENUATION

It was understood that the limit on feeder link attenuation is of the "a posteriori" type, not constraining the choice of orbital location and elevation angle, but rather limiting the rain attenuation to a specific value. The administrations would therefore be protected up to this value of attenuation by the plan. Larger rain attenuation would have to be handled by other mechanisms like "site diversity".

A value for this rain attenuation limit was not agreed upon but the following tentative wording was accepted :

"In the analysis of the plan, a maximum rain attenuation on the feeder link of X dB was considered assuming that other means would be used at the implementation stage to protect for larger rain attenuation on the feeder links."

G. CHOUINARD
Chairman of ad hoc Group 4A

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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WORKING GROUP 4A

PROPOSED MODIFICATION TO APPENDICES 30 AND 30A
CONCERNING RAIN ATTENUATION

Appendix 30, Annex 8

Add after section 3.1

ADD Radio propagation factors (Region 2)

2.4 The propagation loss on an earth-space path is equal to the free space path loss plus the atmospheric absorption loss plus the rain attenuation exceeded for 1% of the worst month.

2.4.1 Atmospheric absorption

(Ref. Document No. 52.)

2.4.2 Rain attenuation

The rain attenuation A of circularly polarized signals exceeded for 1% of the worst month at 12.5 GHz is given by

$$A = \lceil 0.24 \rceil \gamma L r \quad \text{dB} \qquad (2.1)$$

where

L = the slant path length through rain

$$= \frac{2(h_R - h_0)}{\left[\sin^2\theta + 2\frac{(h_R - h_0)}{8500}\right]^{\frac{1}{2}} + \sin\theta} \quad \text{km}$$

r = the rain path length reduction factor

$$= \frac{90}{90 + 4L\cos\theta}$$

h_r = rain height (km)

$$= c\left\{5.1 - 2.15 \log\left[1 + 10^{\left(\frac{\phi - 27}{25}\right)}\right]\right\} \quad \text{km}$$

$c = 0.6$ $\qquad \phi \leq 20^\circ$

$c = 0.6 + 0.02(\phi - 20)$ $\qquad 20^\circ < \phi \leq 40^\circ$

$c = 1.0$ $\qquad \phi > 40^\circ$

h_o = height (km) above mean sea level of the earth station

ϕ = earth station latitude (degrees)

θ = satellite elevation angle (degrees)

γ = specific rain attenuation

$= 0.0202\ R^{1.198}$ dB/km

R = rain intensity (mm/h) obtained from Table 2.1 for the rain climates identified in Figure 2.1.
Note : method is based on R exceeded for 0.01% of an average year.

TABLE 2.1

Rainfall intensity (R) for the rain climatic zones (Figure 2.1)

Zone	A	B	C	D	E	F	G	K	M	N	P
(mm/h)	8	12	15	19	22	28	30	42	63	95	145

Figure 2.2 presents plots of rain attenuation, as calculated using equation (2.1), of circularly polarized signals exceeded for 1% of the worst month at 12.5 GHz, as a function of earth station latitude and elevation angle for each of the rain climates shown in Figure 2.1.

2.4.3 Rain attenuation limit

In using equation (2.1) or Figure 2.2, the rain attenuation for 99% of the worst month should be limited to /X/ dB by appropriate choice of elevation angle.

2.4.4 Depolarization

(Ref. Document No. DT/18.)

. (Figure 2.2. to be provided.)

Appendix 30A (Feeder link)

Add the following :

2. Radio propagation factors

2.1 The propagation loss on an earth-space path is equal to the free space path loss plus the atmospheric absorption loss plus the rain attenuation exceeded for 1% of the worst month.

2.1.1 Atmospheric absorption

(Ref. Document No. 52.)

2.1.2 Rain attenuation

The rain attenuation A of circularly polarized signals exceeded for 1% of the worst month at 17.5 GHz is calculated using the method outlined in section 2.4.2 of Annex 8, Appendix 30, by substituting the relation

$$\gamma = 0.0520\ R^{1.114}$$

for the one given in that Appendix.

Figure ... presents plots of rain attenuation of circularly polarized signals exceeded for 1% of the worst month at 17.5 GHz, as a function of earth station latitude and elevation angle for each of the rain climates in Region 2.

2.1.3 Rain attenuation limit

The feeder link plan is based on a maximum rain attenuation of /_X_/ dB.

2.2 Depolarization

(Ref. Document No. DT/18.)

(Rain attenuation figures to be provided.)

INTERNATIONAL TELECOMMUNICATION UNION

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SUB-WORKING GROUP 4B-1

DEFINITIONS TO BE ADDED TO

SECTION 1 OF ANNEX 8 OF APPENDIX 30

(for use in Region 2 only)

1.5 Feeder link

In the Region 2 BSS Plan, the term Feeder Link, as defined in RR109, is further qualified to indicate a Fixed Satellite Service link in the /17.3 to 17.8 GHz/ allocation from any earth station within the feeder-link service area to the associated space station in the Broadcasting-Satellite Service.

1.6 Feeder-link service area

The area on the surface of the Earth in which the administration responsible for the service has the right to locate transmitting earth stations for the purpose of providing feeder links to broadcasting-satellite space stations.

1.7 Feeder-link beam area

The area delineated by the intersection of the half-power beam of the satellite receiving antenna with the surface of the Earth.

1.8 Adjacent channel

The RF channel in the Broadcasting-Satellite Service frequency plan, or in the associated feeder-link frequency plan, which is situated immediately higher or lower with respect to the frequency of the reference channel.

1.9 Second adjacent channel

The RF channel in the Broadcasting-Satellite Service frequency plan, or in the associated feeder-link frequency plan, which is situated immediately beyond either of the adjacent channels.

1.10 Overall carrier-to-interference ratio

The overall carrier-to-interference ratio in a given channel is the ratio of the wanted carrier power to the sum of all interfering RF powers, including both feeder links and down-links. The overall carrier-to-interference ratio is calculated as the reciprocal of the sum of the reciprocals of the feeder-link carrier-to-interference ratio and the down-link carrier-to-interference ratio referred to the satellite receiver input and earth station receiver input, respectively.

For the second adjacent channels, 10 dB improvement on the feeder-link carrier-to-interference ratio due to the satellite receiver filtering is assumed in the analysis of the Plan.

1.11 Overall co-channel protection margin

The overall co-channel protection margin in a given channel is the difference in dB between the overall co-channel carrier-to-interference ratio and the co-channel protection ratio.

1.12 Overall adjacent channel protection margins

The overall first adjacent and second adjacent channel protection margins are the difference, in dB, between the overall first or second adjacent channel carrier-to-interference ratio and the corresponding first or second channel protection ratio.

1.13 Overall equivalent protection margin

The overall equivalent protection margin M is given in dB by the expression :

$$M = -10 \text{ Log} \left(\sum_{i=1}^{5} 10^{(-M_i/10)} \right) \quad \text{in dB}$$

where,

M_1 = overall co-channel protection margin, in dB (as defined in 1.11)

M_2, M_3 = overall protection margins for the upper and lower first adjacent channels respectively, in dB (as defined in 1.12)

M_4, M_5 = overall protection margins for the upper and lower second adjacent channels respectively, in dB (as defined in 1.12)

The adjective "equivalent" indicates that the protection margins for all interference sources from the first and second adjacent channels as well as co-channel interference sources have been included.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/14(Rev.2)-E
23 June 1983
Original : English

SUB-WORKING GROUP 4B-1

DEFINITIONS TO BE ADDED TO

SECTION 1 OF ANNEX 8 OF APPENDIX 30

1.5 Feeder link

In the Region 2 BSS Plan, the term Feeder Link, as defined in RR109, is further qualified to indicate a Fixed Satellite Service link in the /17.3 to 17.8 GHz/ allocation from any earth station within the feeder-link service area to the associated space station in the Broadcasting-Satellite Service.

1.6 Feeder-link service area

The area on the surface of the Earth in which the administration responsible for the service has the right to locate transmitting earth stations for the purpose of providing feeder links to broadcasting-satellite space stations.

1.7 Feeder-link beam area

The area delineated by the intersection of the half-power beam of the satellite receiving antenna with the surface of the Earth.

1.8 Adjacent channel

The RF channel in the Broadcasting-Satellite Service frequency plan, or in the associated feeder-link frequency plan, which is situated immediately higher or lower with respect to the frequency of the reference channel.

1.9 Second adjacent or alternate channel

The RF channel in the Broadcasting-Satellite Service frequency plan, or in the associated feeder-link frequency plan, which is situated immediately beyond either of the adjacent channels.

1.10 Overall carrier-to-interference ratio

The overall carrier-to-interference ratio in a given channel is the ratio of the wanted carrier power to the sum of all interfering RF powers, including both feeder links and down-links. The overall carrier-to-interference ratio is calculated as the reciprocal of the sum of the reciprocals of the feeder-link carrier-to-interference ratio and the down-link carrier-to-interference ratio referred to the satellite receiver input and earth station receiver input, respectively.

1.11 Overall co-channel protection margin

The overall co-channel protection margin in a given channel is the difference in dB between the overall co-channel carrier-to-interference ratio and the co-channel protection ratio.

1.12 Overall adjacent channel protection margins

The overall first adjacent and second adjacent channel protection margins are as defined in 1.11 except that the protection ratios and the overall carrier-to-interference ratios only due to transmissions in the first and second adjacent channels are considered.

1.13 Overall equivalent protection margin

The overall equivalent protection margin is defined in footnote 2 to section 3.4 of this Annex. The adjective "equivalent" indicates that the protection margins for all interference sources from the first and second adjacent channels as well as co-channel interference sources have been included. The overall equivalent protection margin M is given in dB by the expression :

$$M = -10 \text{ Log} \left(\sum_{i=1}^{5} 10^{(-M_i/10)} \right) \quad \text{in dB}$$

where,

M_1 = overall co-channel protection margin in dB

M_2, M_3 = overall protection margins for the upper and lower first adjacent channels respectively in dB

M_4, M_5 = overall protection margins for the upper and lower second adjacent channels respectively in dB

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DEFINITIONS TO BE ADDED TO

SECTION 1 OF ANNEX 8 OF APPENDIX 30

1.5 Feeder link

In the Region 2 BSS Plan, the term Feeder Link, as defined in RR109, is further qualified to indicate a fixed satellite service link in the [17.3 to 17.8 GHz] allocations from any earth station within the feeder link service area to the associated space station in the broadcasting-satellite service.

1.6 Feeder link service area

The area on the surface of the Earth in which the administration responsible for the service has the right to locate transmitting earth stations for the purpose of providing feeder links to broadcasting-satellite space stations.

1.7 Feeder link beam area

The area delineated by the intersection of the half-power beam of the satellite receiving antenna with the surface of the Earth.

1.8 Adjacent channel

The RF channel in the broadcasting-satellite service frequency plan, or in the associated feeder link frequency plan, which is situated immediately higher or lower with respect to the frequency of the reference channel.

1.9 Alternate or second adjacent channel

The RF channel in the broadcasting-satellite service frequency plan, or in the associated feeder link frequency plan which is situated immediately beyond either of the adjacent channels.

1.10 Overall carrier-to-interference ratio

The overall carrier-to-interference ratio in a given channel is the ratio of the wanted carrier to the aggregate interference into that channel, including interference into both the feeder and down-links. The adjective "overall" is used to indicate that both feeder link and down-link are included.

1.11 Overall protection ratio

The overall protection ratio in a given channel is the minimum value of overall carrier-to-interference ratio, determined under specific conditions such that the stipulated quality of the wanted signal is achieved at the receiver output.

1.12 Overall co-channel protection margin

The overall co-channel protection margin in a given channel is the amount, in dB by which the overall co-channel carrier-to-interference ratio exceeds the overall co-channel protection ratio as defined in XX and XY.

1.13 Overall adjacent channel protection margins

The overall first adjacent and second adjacent channel protection margins are similar to that for the overall co-channel case except that the overall protection ratios and the overall carrier-to-interference ratios due to transmissions in the first and second adjacent channels are considered.

1.14 Overall equivalent protection margin

The overall equivalent protection margin is defined in footnote 2 to section 3.4 of this Annex. The adjective "equivalent" indicates that the protection margins for all interference sources from the first and second adjacent channels as well as co-channel interference sources have been included. The overall equivalent protection margin M is given in dB by the expression :

$$M = -10 \text{ Log} \left(\sum_{i=1}^{5} 10^{(-M_i/10)} \right)$$

where,

M_1 = overall co-channel protection margin

M_2, M_3 = overall protection margins for the upper and lower first adjacent channels respectively

M_4, M_5 = overall protection margins for the upper and lower second adjacent channels respectively

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SUB-WORKING GROUP 4B-1

DEFINITIONS

Feeder link service area

The area on the surface of the Earth in which the administration responsible for the service has the right to locate transmitting earth stations for the purpose of providing feeder links to broadcasting-satellite space stations.

Feeder link beam area

The area delineated by the intersection of the half-power beam of the satellite receiving antenna with the surface of the Earth.

Adjacent channel

The RF channel in the broadcasting-satellite service frequency plan, or in the associated feeder link frequency plan which is situated immediately higher or lower with respect to the frequency of the reference channel.

Alternate or second adjacent channel

The RF channel in the broadcasting-satellite service frequency plan, or in the associated feeder link frequency plan which is situated immediately beyond either of the adjacent channels.

Overall /~Equivalent_/ protection margin

The definition of equivalent protection margins, both co-channel and upper and lower adjacent channels is defined in footnote 1 to AP 30, section 3.4. The combined values of equivalent protection margins for both the space-to-Earth path and the Earth-to-space path (feeder links) for all interfering sources in the Plan, including interference from other channels in the same service area.

P.G. ACKERMAN
Chairman of Sub-Working Group 4B-1

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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WORKING GROUP 4C

COMPILATION OF PROPOSALS FOR SHARING BETWEEN FEEDER LINKS AND OTHER SERVICES IN THE BAND 17.7 - 17.8 GHz

1. Limits on a change in the feeder-link Plan in the band 17.3 - 17.8 GHz (of Region 2) to protect a frequency assignment to the fixed-satellite service (Earth-to-space) for feeder links to broadcasting satellites in Regions 1 and 3

USA, Addendum No. 1(Rev.1) to Document No. 19 (22 June 1983); Annex 1, Part 2 :

With respect to paragraph 4.3.1.2, an administration shall be considered as being affected if the proposed modification to the feeder link Plan would cause, to a feeder link to broadcasting-satellites in Regions 1 and 3, an increase in the noise temperature of the feeder link space station calculated in accordance with the method given in Appendix 29 of the Radio Regulations, which exceeds the threshold value defined therein.

2. Limits on a change in the feeder link Plan to protect a frequency assignment in the band 17.7 - 17.8 GHz to an earth station in the fixed-satellite service (space-to-Earth)

USA, Addendum No. 1(Rev.1) to Document No. 19 (22 June 1983); Annex 1, Part 3 :

Limits on a change in the feeder link Plan to protect a frequency assignment in the band 17.7-17.8 GHz to an earth station in the fixed-satellite service (space-to-earth)

With respect to paragraph 4.3.1.3, an administration shall be considered as being affected if, upon application of the procedure set form in Annex [...] of this Appendix, that administration is included in the coordination area of the frequency assignment to a transmitting feeder link earth station.

In such case, the interference shall be assessed with respect to frequency assignment(s) to a receiving earth station in the fixed-satellite service operating in the band 17.7-17.8 GHz, which has been recorded in the Master Register or is in the process of being coordinated under provision of Article 7 of this Appendix or No. 1060 of the Radio Regulations.

For the purpose of such a determination, the appropriate parameters of the transmitting feeder link earth station and the procedures given in Annex /Addendum No. 2, Document No. 19, 17 June 1983/ of this Appendix, shall be used.

CAN, Document No. 13, Part III, section 3, Annex 1, part 2 :

Limits on a change in the Plan as it affects a frequency assignment to a station in the Fixed Satellite Service.

With respect to paragraph 4.3.1.2 of this Appendix, an administration shall be considered as being affected if, upon application of the procedures of Appendix 28 as described in Annex 3, that administration is included in the coordination area of the frequency assignment to a transmitting feeder link earth station.

In such a case, the interference shall be assessed with respect to frequency assignment(s) to a receiving earth station in the Fixed Satellite Service operating in the band 17.7 - 17.8 GHz, which has been recorded in the Master Register or is in the process of being coordinated under provisions of No. 1060 of the Radio Regulations.

For the purpose of such a determination, the appropriate parameters of the transmitting feeder link earth station and the procedures given in Annex 3 of this Appendix, shall be used.

3. Limits on a change in the feeder-link Plan to protect a terrestrial station in the band 17.7 - 17.8 GHz

USA, Addendum No. 1(Rev.1) to Document No. 19 (22 June 1983); Annex 1, Part 4 :

Limits on a change in the feeder link Plan to protect a terrestrial station in the band 17.7-17.8 GHz

With respect to paragraph 4.3.1.4 of this Appendix, an administration shall be considered as being affected if, upon application of the procedures of Appendix 28 as described in Annex 4, that administration is included in the coordination area of the frequency assignment to a transmitting feeder link earth station.

In such a case, the interference shall be assessed with respect to terrestrial stations operning in the band 17.7-17.8 GHz.

For the purpose of such a determination, the parameters of the transmitting feeder link earth station, as modified from those parameters given in Annex 5 of this Appendix, shall be used.

CAN, Document No. 13; Part III, section 3, Annex 4, Part 1 :

Coordination of earth stations and space stations providing feeder links, with stations in the terrestrial Fixed and Mobile Services (See Article 6)

With respect to 4.3.1.3 of this Appendix, a feeder link earth station shall be co-ordinated with terrestrial stations of another Administration which

are within the coordination area calculated by the procedures of Appendix 28 of the Radio Regulations, in the situation where:

(1) the necessary bandwidth of the proposed frequency assignment(s) of the feeder link earth station falls in whole, or in part, in the 17.7-17.8 GHz band; and

(2) the proposed location is not one of those specifically identified in Article 8 of this Appendix.

Reason: The band 17.7-17.8 GHz is shared by the FSS (earth-to-space) with terrestrial services in Region 2 and hence, the coordination procedures of Appendix 28 would apply. Administrations will be able to identify the probability of receiving interference from those feederlink earth stations specifically identified in the Plan in this band. It would seem unnecessary to regulate such coordination. On the other hand, addition of a new feeder link earth station beyond those identified in the original plan must be coordinated with the terrestrial services of another administration to the extent defined by the coordination area of Appendix 28.

CAN, Document No. 13; Part III, section 3, Annex 1, Part 3 :

Limits on a change to the Plan as it affects a frequency assignment to a terrestrial station

With respect to paragraph 4.3.1.3 of this Appendix, an administration shall be considered as being affected if, upon application of the procedures of Appendix 28 as described in Annex 4, that administration is included in the coordination area of the frequency assignment to a transmitting feeder link earth station.

In such a case, the interference shall be assessed with respect to terrestrial stations operating in the band 17.7 - 17.8 GHz.

For the purpose of such a determination, the parameters of the transmitting feeder link earth station, as modified from those parameters given in Annex 5 of this Appendix, shall be used.

4. Coordination of fixed-satellite space station transmitters with broadcasting-satellite space station receivers

USA, Addendum No. 1(Rev.1) to Document No. 19; Annex 3, Part 1 :

1. Threshold values for determining when coordination is required between a transmitting space station in the fixed-satellite service and a receiving space station in the feeder link Plan in the band 17.7-17.8 GHz

With respect to paragraph 7.2.1 of this Appendix, coordination of a transmitting space station in the fixed-satellite service is required when the power flux-density arriving at the receiving space station of a broadcasting satellite feeder link station of another administration exceeds the value of:

-101 dB$(W/m^2/MHz)$ for $0 \leq \theta \leq 10^0$

where θ is the difference in degrees between the longitude of the transmitting space station in the fixed-satellite service and the longitude of the receiving space station of a feeder link station in the Plan, or when the pfd arriving at either equatorial earth limb under assumed free space conditions exceeds: -124 dB(W/m^2/MHz).

CAN, Addendum No. 1 to Document No. 13; Annex 3, Part 2 (CAN 13/145) :

Interference from a transmitting fixed-satellite space station into a feeder link space station receiver.

In 6.2 of this Appendix, an administration which intends to establish a Fixed Satellite Service space station in the band 17.7 to 17.8 GHz (space-to-earth) shall effect co-ordination with Administrations whose assignments in the Plan are affected according to the provisions contained in No. 1060 of the Radio Regulations.

Reason: The provisions of No. 1060 of the Radio Regulations would still apply, including the interference noise threshold calculations given in Appendix 29. It should be noted that the Master Register would include the feeder link plan once it is adopted by the conference.

An analysis was carried out where a typical feeder link to a BSS space station was interfered by a fixed-satellite space station transmitting in the 17.7 to 17.8 GHz band. C/I and $\Delta T/T$ were calculated for various fixed-satellite and feeder link antennas beamwidths and earth station elevation angles. The assumptions used are given below:

a) Feeder link (Earth to space) parameters

- worst case assumption that the feeder links service area is on the equator, and the earth station lies on the -3 dB gain contour;
- maximum feeder link earth station EIRP = 86.6 dBW (1000 Watts TWT, 5 meter antenna);
- satellite receiver noise temperature of 1500 K;
- feeder link channel bandwidth of 24 MHz;
- satellite receive antenna beamwidth of 6^o; and
- feeder link earth station antenna elevation angles of 10^o, 20^o and 30^o.

b) Fixed-Satellite (Space to Earth) Parameters

- assumes the fixed-satellite service area is on the equator and the receive earth station lies on the - 3 dB gain contour;

- fixed-satellite transmitter power = 200 watts with a bandwidth of 100 MHz (digital modulation);
- transmitting antenna radiation pattern per CCIR Report 558-2
- FSS transmitter antenna beamwidths of 6°, 3° and 1°; and;
- FSS earth station elevation angles of 10°, 20°, and 30°.

From the analysis, it was seen that interference from a fixed satellite will only be critical at the close-in and antipodal situations, and even in these instances the interference shall be minimal. In both these cases, where the noise threshold of 4% was exceeded, it still corresponded to an equivalent C/I of 39 to 40 dB depending on the exact antenna beamwidths used.

5. Interference from earth stations in the fixed-satellite service (Earth-to-space) in Regions 1 and 3 to broadcasting-satellite space station receivers in Region 2

USA, Addendum No. 1(Rev.1) to Document No. 19; Annex 3, Part 2 :

Limits for earth stations in the fixed-satellite service (Earth-to-space) to protect feeder links to broadcasting satellites

With respect to paragraph 7.2.1 an administration shall be considered as being affected by a frequency assignment in the fixed-satellite service (Earth-to-space) in Regions 1 and 3 if that assignment would result in an increase in the noise temperature of the feeder link space station in Region 2 Plan calculated in accordance with the method given in Appendix 29 of the Radio Regulations, which exceeds the threshold value defined therein.

6. Coordination of a fixed-satellite service receiving earth station and a broadcasting-satellite service feeder-link earth station (17.7 - 17.8 GHz)

USA, Addendum No. 1(Rev.1) to Document No. 19; Annex 3, Part 3 :

3. Limits for earth stations in the fixed-satellite service (space-to-Earth) with respect to the feeder link Plan in the band 17.7-17.8 GHz

With respect to paragraph 7.2.1 of this Appendix, coordination of a receiving earth station in the fixed-satellite service (space-to-Earth) in the band 17.7-17.8 GHz is required if, upon application of the method set forth in Annex [Addendum No. 2 to Document No. 19] of this Appendix, the coordination area of the receiving earth station overlaps the coordination area of a feeder link earth station in the Plan.

CAN, Addendum No. 1 to Document No. 13; Annex 3, Part 1 (CAN 13/144):

Interference from a transmitting feeder link earth station into a fixed-satellite service earth station receiver.

With respect to 4.3.1.2 of this Appendix an administration proposing a modification or new assignment of a feeder link earth station in the band 17.7 to 17.8 GHz shall, except in the cases described in Nos. 1108 to 1111 of the Radio Regulations, effect coordination of the assignment with each administration whose territory lies wholly or partially within the co-ordination area.

The co-ordination area shall be calculated according to the procedures in Appendix 28, with the actual parameters for the transmitting feeder link earth station replacing the fixed service parameters given in Table II.

Reason: The band 17.7 - 17.8 GHz will also be utilized by the fixed-satellite service in the space to earth direction. Appendix 28 is intended for co-ordination between the fixed-satellite and fixed services; however, it could also be applicable to bi-directional frequency sharing between fixed satellite services.

Explanation re. to CAN 13/144

In co-ordinating feeder link earth stations according to section 4.3.1.2 of the Appendix, administrations must follow the procedures given in Appendix 28. However, since Appendix 28 was intended for co-ordination between fixed-satellite earth stations and fixed (terrestrial) stations, some parameters must be changed. In Table II of Appendix 28 the terrestrial station parameters should be replaced by the appropriate feeder link earth station parameters.

Typical Table II parameters which could be used for this co-ordination are:

a) P_o (%) or P (%) = 0.003%

b) E (dBW)* = 41.5 dBW

c) P_t = 30 dBW

d) ΔG** = -30 dBW

* The parameter E (dBW) would be the feeder link earth station EIRP in the direction of the horizon which would be a function of the input power and the antenna gain as shown in Annex II of Appendix 28, e.g. at 5° elevation the gain to the horizon would be equal to 11.5 dB with the feeder link antenna sidelobe pattern of 29-25 log Θ dBi.

** ΔG, the adjusted antenna gain in the transmission loss equation of Appendix 28 assumed a terrestrial station antenna gain of 42 dB, therefore, at a 5° elevation $\Delta G = 11.5 - 42 \simeq -30$ dB.
Tables III and V would remain valid for the maximum co-ordination distances for propagation mode (1) and rain scatter respectively.

USA, Addendum No. 1(Rev.1) to Document No. 19; Annex 4 :

Need for coordination of earth stations in the fixed-satellite service (space-to-Earth) with respect to the feeder link Plan for Region 2

Conditions for determining when coordination is required between a receiving earth station in the fixed-satellite service and transmitting feeder link earth station in the Plan [in the band 17.7-18.1 GHz].

With respect to paragraph 7.2.1 of this Appendix, coordination of a receiving earth station in the fixed-satellite service with a transmitting feeder link earth station is required when the coordination contours of the two stations as determined by the procedures of [Addendum No. 2, Document No. 19] overlap and the great circle line connecting the two stations is contained entirely in either or both of these contours, or when the beam axis penetration points of either earth station is contained within the discrimination contour of the other, as determined by the procedures of [.....][1].

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[1] A discussion of the proposed procedures is contained in Attachment A to this Annex.

ATTACHMENT A

(Relevant to Annex 1, Part 3, Annex 3, Part 3 and Annex 4)

Determination of coordination contours for inter-Earth station interference in the frequency band 17.7-17.8 GHz

1. Introduction

The frequency band 17.7-18.1 GHz may be used, with equal rights, by transmitting feeder earth stations to broadcasting satellites and by receiving earth stations in the fixed-satellite service. A possibility for interference from feeder earth stations to receiving earth stations exists, and coordination may be required.

It is proposed that, to determine whether coordination between the two classes of earth station is required, the concept of the coordination area be used (Appendix 28 of the Radio Regulations). It is specifically proposed that both types of earth station provide complementary coordination contours whose overlap would indicate a need for coordination.

The following will describe, for each propagation mode, how coordination contours may be developed under this approach.

2. Propagation mode (1)

Combining equations (2) and (6) from Appendix 28 of the Radio Regulations, the coordination distance is calculated from :

$$d_1 = (P_{t'} + G_{t'} + G_r - P_r(p) - A_o - A_h)/\beta \quad \text{km} \qquad (1)$$

with all parameters as defined in RR Appendix 28.

The principle is to split equation (1) into two equations :

$$d_{1t'} = (P_{t'} + G_{t'} - A_{ht'})/\beta \quad \text{km} \qquad (2)$$

for a feeder link earth station, and

$$d_{1r} = (G_r - P_r(p) - A_o - A_{hr})/\beta \quad \text{km} \qquad (3)$$

for a fixed-satellite service receiving earth station. Common knowledge required to draw both types of contour pertains to the parameter $P_{t'}$ which is needed to determine $P_r(p)$, and to p which is used for β in both contours. Note that both types of station can make use of their respective site shielding A_h which is not otherwise possible. The horizon antenna gain $G_{t'}$ **and G_r are determined independently for each earth station type as described in RR Appendix 28 for their true local azimuths. Where either equation (2) or equation (3) yields a distance less than zero, the distance zero should be assumed for that azimuth.**

For the frequency band 17.7-18.1 GHz, the following specific values may be assumed:

A_o = 145.1 dB (f = 17.9 GHz);

β(Zone A) = $0.2355(1 + 0.0538 \log p)^2 + 0.0136$ dB/km;

β(Zone B) = $(0.272 + 0.047 \log p)^2 + 0.01874$ dB/km;

β(Zone C) = $(0.272 + 0.047 \log p)^2 + 0.0341$ dB/km.

Further, P_t', the carrier power of the feeder earth station, will be constrained; current proposals set it at not to exceed 30 dBW. It may also be subject to artificial energy dispersal; current value is 600 kHz peak-to-peak.

With P_t' bounded to 30 dBW, one may nevertheless choose among several different "operating" assumptions for P_t', as follows:

i. P_t' = 30 dBW per carrier;

ii. $\overline{P_t'}$ = 30 dBW/B_c, where B_c is the channel (carrier) spacing in the feeder earth station; it may be known for each country;

iii. $\overline{P_t'}$ = 30 + 10 log (B_r/B_s), where B_s is the assumed peak-to-peak energy dispersal and B_r is a reference bandwidth $\leq B_s$; e.g., 4 kHz.

Which of the three forms of P_t' is used may be chosen by the administration determining the coordination contour for the fixed-satellite service receiving earth station, giving due recognition to the need for defining the value for the maximally permissible RF interference power $P_r(p)$ in the same terms as P_t', and observing further that the value of p used in β is the same for which $P_r(p)$ is chosen.

For each actual or planned feeder earth station and for each actual or planned fixed-satellite service earth station a coordination contour is to be provided. Coordination between two earth stations of different type is only required when their respective coordination contours overlap and the great circle connection between sites is, in its entirety, contained within either or both contours, or when earth stations are separated by less than 100 km.

Since this method allows both sites to use available information on site shielding, the requirement for coordination may be much rarer than with any other approach. However, it is not possible to establish whether two stations need to coordinate until coordination contours for both have been prepared.

Mixed-Zone Paths

If a contour includes more than one climatic zone, the mixed-path procedure of Section 3.3 of RR Appendix 28 is applicable.

Graphical Procedure

For this approach it is readily possible to develop curves equivalent to the graphs of Figures 2, 4 and 5 of RR Appendix 28 for a graphical procedure. This is facilitated by having to consider only one frequency band.

3. Propagation Mode (2)

The method for the determination of the "rain scatter distance" of Appendix 28 of the Radio Regulations is not suitable for use with two interfering earth stations. For one, it has no provision for taking into account the complex geometry that will exist between two earth station radiation patterns and, secondly, it is valid only as long as the "remote" station (nominally the terrestrial station) has a main beam which includes most or all of the "scatter volume" which is defined as the common volume generated by the intersection of a narrow earth station beam and the cylindrical rain cell.

Moreover, the procedure of Appendix 28 is based on the assumption that the highest rain rates observed for very small percentages of the time would produce the greatest coupling between interfering antennas. This has since been shown to be incorrect for frequencies well above 10 GHz, certainly around 18 GHz.

Although CCIR Report 382-4 has taken this last problem into account, it also is not suitable as a basis for the determination of the coordination distance between two earth stations, for the first two reasons given above.

It is therefore recommended here to divorce the procedure of determining coordination distance between two earth stations from calculations of available and required transmission loss and to base it entirely on geometric considerations. Specifically, it is proposed to determine the coordination distance between two earth stations as that distance beyond which the main beam axes of two earth stations will avoid each other by a minimum discrimination angle δ up to maximum rain bearing altitudes.

Figure 1 shows the applicable geometry. Let R1 and R2, in Figure 1a, be the main beam axes of two earth station antennas in a side view. They will penetrate a predetermined altitude (the maximum rain bearing height) at points C1 and C2. Let each of the two beam axes be surrounded by "discrimination cones" of half-aperture δ, originating at the two earth stations. These discrimination cones will penetrate the rain bearing height "shell" over what generally is an ellipsoidal surface. The beam axis penetration points C1 and C2, as well as the cone penetration ellipsoids, can be projected geocentrically on the earth surface; e.g., on a map of suitable scale, as shown in Figure 1b.

Coordination between two earth stations would then only be required when either or both of the beam penetration projections, C1 or C2, would appear within the projected ellipsoid(s) associated with the other beam; i.e., C1 would appear within E2, or C2 within E1, or both. Otherwise, no coordination would be required.

In practice it is awkward to construct the penetration ellipses. It is therefore suggested to construct rectangular areas which fully contain the penetration ellipses, such as shown in Figure 2. Note that the beam axis penetration point is an important element of these rectangular "discrimination contours" while the actual earth station location itself is not, although it is useful to show it also.

3.1 Construction of the Discrimination Contour

The rectangular discrimination contour for an earth station can be constructed as follows:

a. Determine the elevation angle ε and the azimuth α of the satellite as seen from the earth satation. The satellite is to be one with which the earth station is intended to operate.

b. With δ given, calculate $\varepsilon + \delta$ and $\varepsilon - \delta$. If the latter difference is less than the horizon elevation angle on the azimuth to the satellite, set $\varepsilon - \delta$ equal to that horizon elevation angle.

c. Determine the maximum rain bearing height h_r at the earth station from:

$$h_R = 5.1 - 2.15 \log \left[1 + 10^{(\phi-27)/25}\right] \quad \text{km} \tag{4}$$

where ϕ is the latitude (North or South) of the earth station site, in degrees.

d. Calculate the distances:

$$d_1 = 8500 \left[\sqrt{\tan^2 (\varepsilon-\delta) + h_R/4250} - \tan (\varepsilon-\delta)\right] \quad \text{km} \tag{5a}$$

$$d_2 = h_R/\tan (\varepsilon) \quad \text{km} \tag{5b}$$

$$d_3 = h_R/\tan (\varepsilon + \delta) \quad \text{km} \tag{5c}$$

$$d_4 = h_R \tan \delta/\sin \varepsilon \quad \text{km} \tag{5d}$$

e. Draw, on a map of suitable scale, the azimuth line from the earth station to the satellite up to the distance d_1 from the earth station site.

f. Draw parallels on both sides of the azimuth line at distance d_4.

g. Draw lines normal to the azimuth line at distances d_1 and d_3. When $\varepsilon + \delta > 90°$, the normal at distance d_3 must be drawn on an extension of the azimuth line through the earth station site (i.e., on the azimuth $\alpha + 180°$ for $0° < \alpha < 180°$, and on the azimuth $\alpha - 180°$ for $180° < \alpha < 360°$).

h. Mark, on the azimuth line, the distance d_2. This represents the beam axis penetration point through the rain bearing height.

The rectangle formed by the two parallels of step f. and the two parallels of step g. constitutes the discrimination contour for the earth station.

When the earth station is intended to operate with more than one satellite, such a contour must be drawn for each satellite position. When the earth station is intended to operate with satellites of unknown location within a given satellite arc, the discrimination contour becomes the envelope of all possible single-orbit location contours, and the beam axis penetration becomes a curve, both to be constructed for all possible azimuths at suitable azimuth increments (e.g., 5°).

3.2 Determination of the Angle δ

To estimate the required discrimination angle δ we postulate a required transmission loss given by:

$$P_t/P_r = L = P_t - 10 \log (kT_\ell B) + N/I \quad dB \qquad (6)$$

where P_t = feeder earth station transmit power in bandwidth B (dBW);

T_ℓ = fixed-satellite service receiving earth station link noise temperature;

N/I = required link noise to interference noise ratio.

It is suggested to use P_t = 30 dBW with B = 600 kHz, T_ℓ = 300 K, and N/I = 10 dB. With these assumptions:

$$P_t/P_r = L = 186 \quad dB \qquad (7)$$

Referring to Figure 14 of CCIR Report 382-4 we find that the strongest coupling at 18 GHz occurs for a rain fall rate of about 5 mm/hr. The curves of Figure 14 of Report 382-4 assume an antenna gain of 42 dB at the remote station. Given that 100 km is the smallest coordination distance, the minimum available transmission loss for a 42 dB remote station antenna gain is about 143 dB. Since we need 186 dB of transmission loss, an additional 43 dB of discrimination is required; i.e., the remote site should have an antenna gain towards the scatter volume of no more than about -1 dB. With the familiar earth station antenna reference pattern 32 - 25 log θ dB, this antenna gain is realized for θ = 20°. Hence, the discrimination angle δ should be chosen as not much less than δ = 20°.

3.3 Use of the Discrimination Contours

It is quite apparent that the construction of the (rectangular) discrimination contours is readily possible for each earth station (either a feeder-link earth station or a fixed-satellite service receiving earth station). Coordination between the two types of earth station would be required when either earth station's beam axis penetration point is contained within the other earth station's discrimination contour.

4. Conclusions

We have described a method by which contours can be determined for feeder link and/or fixed-satellite service receiving earth stations, operating around 18 GHz, suitable to determine whether coordination between the two types of earth station is required.

Considering two interference propagation modes : great circle propagation (1) and rain scatter (2), we have described an approach for the determination of coordination contours : by which both types of earth station would provide complementary contours.

This approach gives the smallest coordination contours in propagation mode (1) and is also very simple to apply for both propagation modes. Its only drawback is that, to determine whether two earch stations need to be coordinated with each other, coordination contours for both must be available.

Accordingly, it is recommended to develop, at RARC-83 SAT-R2, methods for the determination of coordination contours based on this approach, i.e. the determination of complementary contours for both types of earth station.

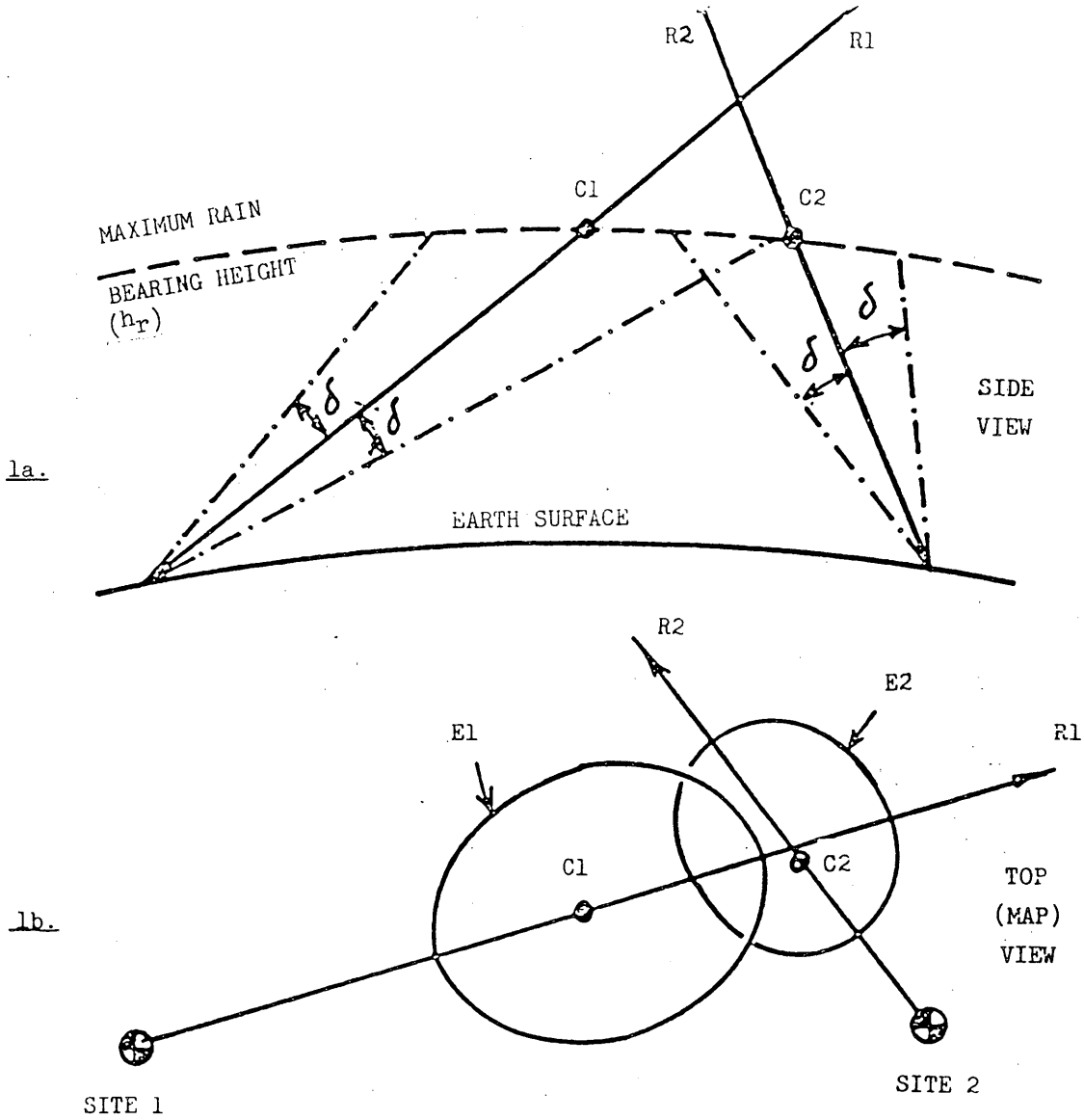

Figure 1 - Two-Earth Station Geometry

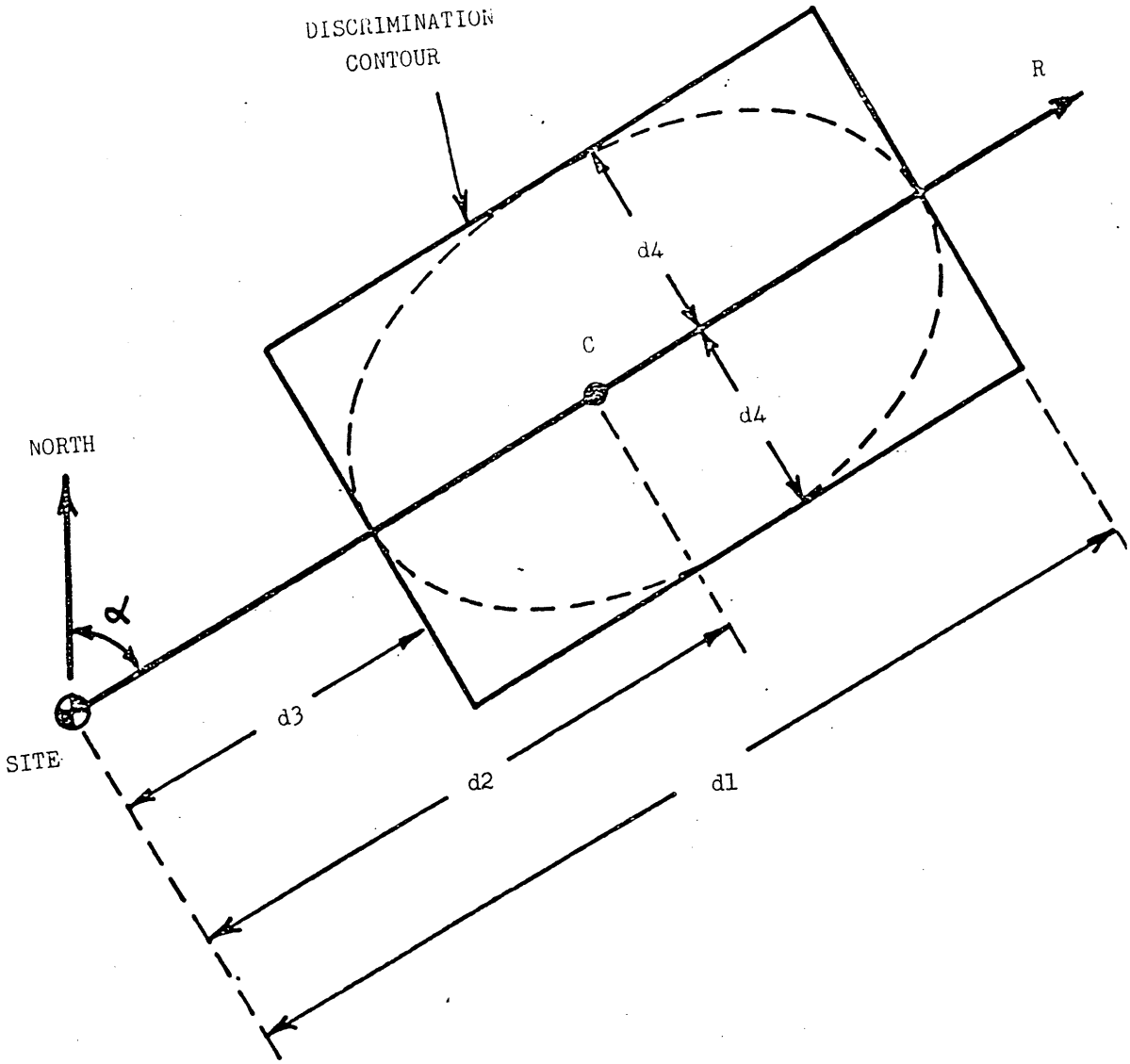

Figure 2 - Construction of the Discrimination Contour

7. Interference into feeder link span stations from terrestrial stations

CAN, Document No. 13, Part III, section 3, Annex 4, part 2.

Interference into feeder link space stations from terrestrial stations.

To overcome a significant probability of interference into the space station receiver of a feeder link from terrestrial stations pointed at or near the geostationary satellite orbit, the calculated power flux density at any position on the orbit shall not exceed -121 dB (W/m^2. 24 MHz) calculated using the equation:

$$pfd = E_t - 148.5 - 10 \log B_t - L_{ca}$$

where pfd = calculated power flux density at the geostationary satellite orbit (dB (W/m^2. 24 MHz)) which is to be compared to the value -121 dB (W/m^2. 24 MHz)

E_t = e.i.r.p. of the terrestrial transmitter in the direction of the orbit (dB)

B_t = RF bandwidth of the terrestrial transmitter in MHz if greater than 24 MHz; otherwise, B_t is to be assumed equal to 24 MHz for the purpose of this calculation.

L_{ca} = clear air attentuation loss (dB)

Reason: To ensure that interference to the feeder link is at a sufficiently low level to have a minimum impact on the Plan. The CCIR/CPM report (section 7.5.3.1) recognizes that there is need to re-examine the question of orbit avoidance by terrestrial transmitters sharing this band. However, specifying a permissible pfd at the orbit is considered preferable to a general restriction on pointing at the orbit as is currently required in shared bands below 15 GHz. The pfd approach provides the terrestrial services operators with more flexability in achieving the same goal, ie. meeting a minimum C/I at the space station receiver. See Attachment A to this Annex for further analysis. See also Article 27 of the Radio Regulations (para. 2511 and 2511.1) as well as Resolution 101.

Attachment A to ANNEX 4 , Appendix 30A *

Protection of Feeder Link Space Stations from Stations in the Fixed Service in the Band 17.7-17.8 GHz

1. Introduction

This background paper derives power flux density criteria for the protection of feeder link space stations from stations in the Fixed Service in the 17.7-17.8 GHz band.

2. Assumptions

The following assumptions are made:

(a) The terrestrial system uses digital modulation and hence the interference is noise-like;

(b) The feeder link earth station parameters based upon the technical annexes are as follows:

- transmitter power P_T = 30 dBW
- minimum antenna diameter = 5 meter
- antenna gain G_E at 55% efficiency = 56.7 dB
- CCIR atmospheric absorption model as in Rep.719-1
- Country-wide feeder links are assumed to be at the -3dB points on the antenna coverage pattern
- maximum rain fade of 10 dB for 99% worst month (wm)
- $(C/N)_{TOT}$ = 12 dB, and $(C/N)_{DN}$ of 12.5 dB (both 99% worst month)

(c) The polarization of the terrestrial system is assumed to be linear and feeder link circular, therefore only 3 dB discrimination would be available.

3. Protection Criteria

The total carrier-to-noise ratio, $(C/N)_{TOT}$, and the uplink contribution which consists of thermal noise and interference can be calculated in the following fashion:

$$\left(\frac{C}{N}\right)_{TOT} = \left(\frac{C}{N}\right)_{UP} \oplus \left(\frac{C}{N}\right)_{DN}$$

$$\left(\frac{C}{N}\right)_{UP} = \left(\frac{C}{N_{TH}}\right)_{UP} \oplus \left(\frac{C}{I}\right)_{UP}$$

where $\oplus$ denotes power addition
$(C/N)_{UP}$ is feeder link carrier to noise ratio
$(C/N)_{DN}$ is downlink carrier-to-noise ratio
$(C/N_{TM})_{UP}$ is the thermal noise component of the feeder link C/N
$(C/I)_{UP}$ is the feeder link carrier-to-interference ratio

* This background paper is provided for information only and should not be included in this Appendix.

APP 30A

In order that degradation of the feeder link C/N due to interference be restricted to 0.5 dB, and allowing 3 dB for multiple entry, the following

$$\left(\frac{C}{I}\right)_{UP} = \left(\frac{C}{N}_{TH}\right)_{UP} + 10 + 3 \text{ dB} = \left(\frac{C}{N}_{TH}\right)_{UP} + 13 \text{ dB}$$

In addition, if the value of $(C/N_{TH})_{UP}$ cannot contribute more than 0.5 dB to the overall $(C/N)_{TOT}$, i.e. $\left(\frac{C}{N}_{TH.\ UP}\right) = \left(\frac{C}{N}\right)_{DN} + 10\text{dB}$; then $\left(\frac{C}{I}\right)_{UP} = \left(\frac{C}{N}\right)_{DN} + 23$ dB

Hence, the value of $\frac{C}{N}_{UP}$ to be used in the analysis is 35.5 dB for 99% worst month for a $(C/N)_{DN}$ of 12.5 dB (1)

It is desirable to express the levels of orbital protection in terms of power flux density (pfd). The wanted and unwanted pfd's are given by:

$$p_W = C - G_S(\phi_o) + G_1$$
$$p_I = I - G_S(\phi_S) + G_1 + L_P$$
thus $$p_I = p_W - (C/I) + G_S(\phi_o) - G_S(\phi_S) + L_P \quad (2)$$

where $G_S(\phi)$ = space station antenna gain in the direction of the Fixed Station

$$= G_o - 12\left(\frac{\phi_S}{\phi_o}\right)^2 \quad \left(\text{for } \frac{\phi_S}{\phi_o} \text{ less than } 1.58\right)$$

G_o = space station antenna gain, dBi
G_1 = Gain of a unit (1^2) antenna at 17 GHz = 46.5 dBi
ϕ_o = Space station antenna half-power beamwidth
ϕ_S = Angle subtended at the satellite by the boresight and the Fixed Station
L_P = polarization discrimination 3 dB

The pfd of the wanted signal at the space station is given by:

$$P_W = P_T + G_E - L_F - L_A - L_R + G_I$$

where L_F is the path loss (208.5 dB), L_A is the atmospheric absorption loss per Report 719-1 (0.25 dB) and L_R is the rain margin for 99% worst month (assumed 10 dB). P_T = 30 dBW and G_E = 56.5 dB are the earth station power and antenna gain respectively.

This yields:

P_W = -85.6 dB(W/m^2) for 99% worst month

From equation (2), the maximum interference pdf is:

$$P_I = 121.1 + 12\left(\frac{\phi_S}{\phi_o}\right)^2 \quad \text{dB}(W/m^2) \quad (3)$$

The satellite angle ϕ_S can be shown geometrically to be greater than 0.52 degrees with a boresight whose elevation angle is 20 deg. and a fixed station of 0 degree elevation. In order to accommodate country-wide feeder links, assume $\phi_o = 5^o$. Then permissible pfd is:

$$P_I = -121 \text{ dB}(W/m^2) \quad (4)$$

3. Impact on Terrestrial Systems

Article 27 of the Radio Regulations permits a maximum e.i.r.p. of 55 dBW with a maximum antenna input power of 10 dBW for terrestrial systems in shared bands. This would produce a clear-air pfd at the orbit of -111 dB(W/m^2) over an r.f. channel bandwidth, including a conservative 4 dB loss due to atmospheric gases. Therefore, to meet the criteria established in section 2 above, the terrestrial station must provide 10 dB descrimination. This can be readily obtained in practice because systems will use lower power or have wide bandwidths than that used these calculations. Failing this, a 0.8 degree orbital avoidance will be required.

4. Method of Regulation

A key element in the BSS plan is flexibility. Thus, although -121 dBW/m^2 could be used as a trigger level for coordination, any excessive pfd would preclude further changes. Therefore, a general orbital protection formula is required. Strict adherence to orbital avoidance of 0.8 to 1 degree, in the manner of Article 27 for the bands below 15 GHz is not warranted largely because the portion of the band affected is only a small part of the total bandwidth used by the fixed station. Therefore, it is recommended that the most suitable means for orbital protection in this case is the specification of a maximum pfd.

The appropriate limit of power flux density at the geostationary orbit due to a terrestrial fixed or mobile station, has been shown to be -121 dB(W/m^2 . 24 MHz).

J.M. ZAMUDIO ZEA
Chairman of Working Group 4C

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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SUB-WORKING GROUP 4B-2

PROPOSED CHANGES TO THE RADIO REGULATIONS

Sub-Working Group 4B-2 submits for approval the following proposed revisions of the Radio Regulations (Annex 8, Appendix 30, section 3.13.3).

MOD 3.13.3 Spacecraft transmitting antenna reference patterns

The reference patterns for the co-polar and cross-polar components of satellite transmitting antenna used in preparing the Plan for Regions 1 and 3 are given in Figure 6.

NOC Figure 6

NOC Curve A :

NOC Curve B :

NOC Curve C :

ADD The reference patterns for the co-polar and cross-polar components of the satellite transmitting antenna used in preparing the Plan for Region 2 are given by the equations below. The co-polar reference pattern given in Figure 7 includes a number of examples for the main beam for values of φ_o 20.8 degrees. Note that for $\varphi_o = 0.8^o$ the main beam co-polar pattern coincides with the WARC-BS-1977 pattern (to the -25 dB relative gain level).

Curve A - Co-polar component

$$G(\varphi/\varphi_o) = G_c - f$$

$$f = 12(\varphi/\varphi_o)^2 \text{ for } 0 \leq \varphi/\varphi_o \leq 0.5$$

$$f = 18.75\ \varphi_o^2 \left[\varphi/\varphi_o - x\right]^2 \text{ for } 0.5 < \varphi/\varphi_o \leq \frac{1.16}{\varphi_o} + x$$

$$f = 25.23 \text{ for } \frac{1.16}{\varphi_o} + x < \varphi/\varphi_o < 1.45$$

$$f = \left[22 + 20 \log \varphi/\varphi_o\right] \text{ for } 1.45 < \varphi/\varphi_o$$

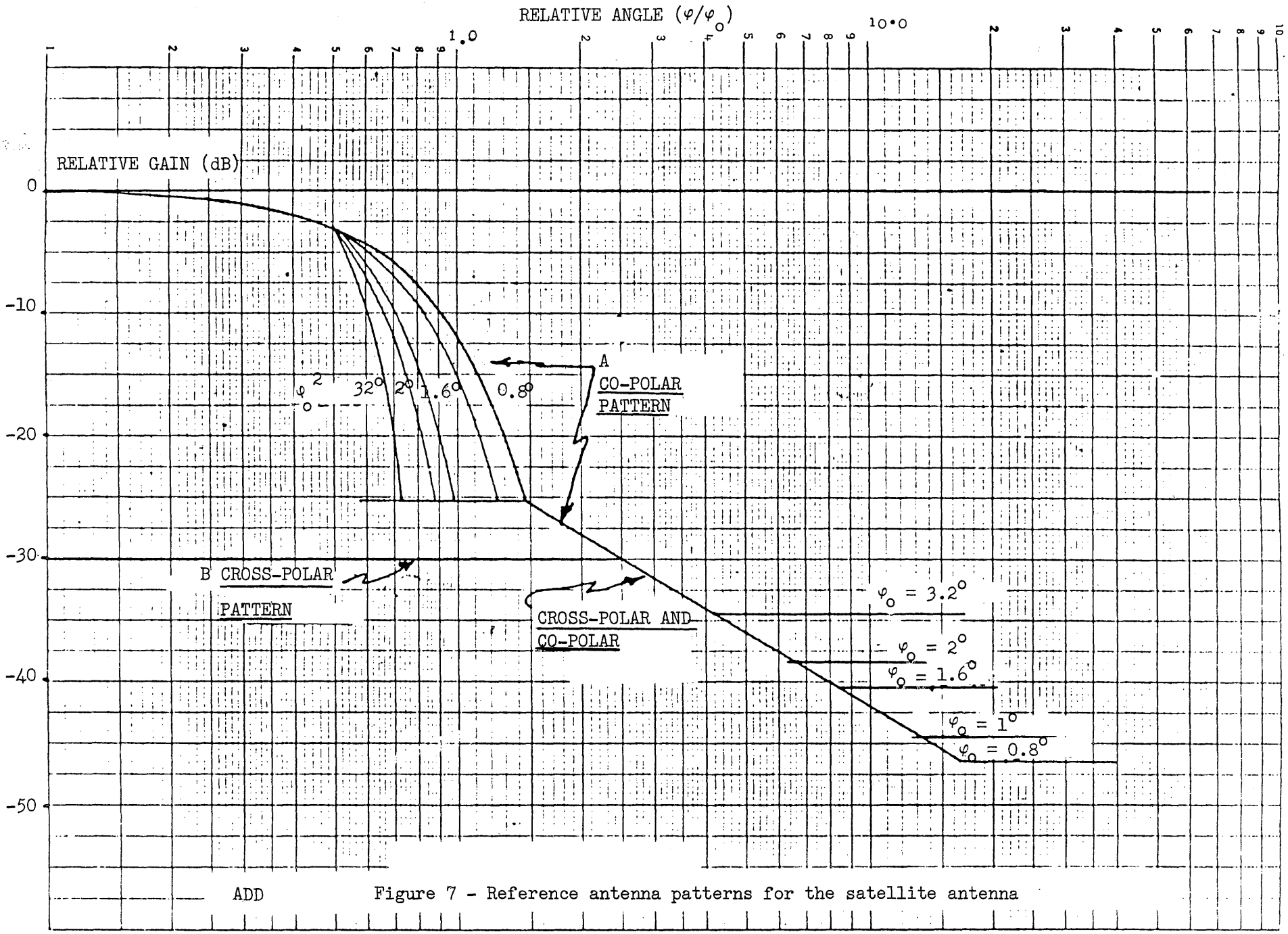
$$f = G_o \text{ for } f > G_o$$

Curve B - Cross-polar component

$$-30 \text{ for } o \leq \varphi/\varphi_o < 2.51$$

$$-\left[22 + 20 \log \varphi/\varphi_o\right] \text{ for } 2.51 < \varphi/\varphi_o$$

$-G_o$ after intersection with G_o



ADD

Figure 7 - Reference antenna patterns for the satellite antenna

where :

φ = off-axis angle (degrees)

φ_o = half-power beamwidth of main lobe (degrees) ($\varphi_o \geq 0.8$)

$G\ (\varphi/\varphi_o)$ = gain as function of off-axis angle (dB)

G_o = on-axis gain (dB)

f = relative gain (dB below on-axis gain)

x = by definition $x = 0.5 \left[1 - \frac{0.8}{\varphi_o} \right]$

ADD For those situations where the patterns given in Figure 7 are not appropriate because of interregional sharing requirements, the co-polar pattern given by Curve A of Figure 6 may be used for planning.

C. PEREZ VEGA
Chairman of Sub-Working Group 4B-2

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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SUB-WORKING GROUP 4B-3

FIGURE OF MERIT AND G/T

Considerable discussions took place in Sub-Working Group 4B-3 on the values of G/T and PFD used for planning the broadcasting-satellite service in Region 2 with the common understanding of the relationship that ties these parameters together.

There were three sets of values for these parameters that were proposed.

The three proposals were :

- G/T = 10 db/k and

  PFD = -107 db(w/m^2)

  made by Brazil and supported by France, Peru, Colombia, Cuba, Ecuador and Canada;

- G/T = 8 db/k and

  PFD = -105 db(w/m^2)

  made by the United States;

- G/T = 9 db/k

  PFD = -106 db(w/m^2)

  made in the spirit of compromise by the United Kingdom and supported by the United States.

The set of values that received the support of the largest number of administrations is given below in the proposed modifications for paragraphs 3.6 and 3.16 of Annex 8 of Appendix 30 with the understanding that a single set of values is desirable for planning purposes.

Proposed modifications to paragraphs 3.6 and 3.16 of Annex 8 of Appendix 30

3.6 Figure of merit (G/T) of a receiving installation in the broadcasting-satellite service

In planning the broadcasting-satellite service, the values of the figure of merit G/T used is :

for Regions 1 and 3 :

6 db/k for individual reception;

14 db/k for community reception, and

for Region 2 :

10 db/k for individual reception.

3.16 Power flux-density at edge of coverage area

The value of the power flux-density at the edge of the coverage area for 99% of the worst month is :

- 103 db(w/m^2) for individual reception in Regions 1 and 3;
- 107 db(w/m^2) for individual reception in Region 2, and
- 111 db(w/m^2) for community reception in Regions 1 and 3.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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SUB-WORKING GROUP 4B-3

PROPOSED MODIFICATIONS TO PARAGRAPH 3.3
OF ANNEX 8 OF APPENDIX 30

3.3 Carrier-to-noise ratio

For the purpose of planning the broadcasting-satellite service in Regions 1, 2 and 3, the carrier-to-noise ratio is equal to 14 dB for 99% of the worst month.

The above proposed change has been agreed under the following conditions; the administrations of Canada and Columbia agree to initiate the planning of the broadcasting-satellite service using a carrier-to-noise ratio of 14 dB for 99% of the worst month but they wish to reserve their right to reconsider the proposed modification of paragraph 3.3 following the analysis of the first draft plan.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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SUB-WORKING GROUP 4B-2

Sub-Working Group 4B-2 proposes the following text for polarization of the feeder links :

Polarization

1. In Region 2, for the purpose of planning the feeder links, circular polarization is used. However, in the cases where an administration has been allotted all channels of both senses of polarization at a single orbital location, the type of polarization need not be specified.

2. In the cases where an administration has not been allotted all channels of both senses of polarization at a single orbital location, use of polarization other than circular is permitted only upon agreement of administrations that may be affected.

C. PEREZ VEGA
Chairman of Study-Working Group 4B-2

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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WORKING GROUP 4A

PROPOSED MODIFICATION TO APPENDIX 30

CONCERNING ANNEX 11

In order to take account of atmospheric absorption, which may amount to 3 dB at low elevation angles, for the calculation of PFD required for interregional interference calculations, make the following modification to Appendix 30, Annex 11 :

ANNEX 11

Method of Calculating the Power Flux-Density Produced in the Territories of Region ~~2~~ 1 and 3 by Space Stations in the Broadcasting-Satellite Service in Region 2

Method of calculation

1. The power flux-density produced, under conditions of free-space propagation, at a given point P on the surface of the Earth, by a satellite in the geostationary orbit, can be calculated from the following data:

1.1 nominal orbital position;

1.2 e.i.r.p., in dBW;

1.3 characteristics of the antenna beam at half-power points (i.e. the major and minor axes together with the orientation of the corresponding ellipse);

1.4 geographical coordinates of the boresight (B);

1.5 geographical coordinates of the point P.

AP30-149

2. The values relevant to items 1.1 to 1.4 are indicated in the Plan. The point P can be chosen with reference to the objective of calculation. For the calculations which follow, the coordinates of point P have been taken as 35° W and 8° S.

3. To obtain the power flux-density [dB(W/m^2)] produced at P, calculate:

- the distance, d (m), between the satellite and the point P;
- the spreading attenuation, A for the distance d:

$$A = 10 \log \frac{1}{4 \pi d^2}$$

- the elevation angle θ, from point P to the satellite;
- the atmospheric absorption A_a at elevation angle θ

$$A_a = \frac{0.1168}{(\sin^2 \theta + 0.0018)^{\frac{1}{2}} + \sin \theta}$$

- the angle φ, as seen from the satellite, between points B and P;
- φ_o, the half-power beamwidth, in the direction of P (in the case of a circular beam φ_o will be independent of direction);
- the relative antenna gain, δG in dB, for the calculated values of φ and φ_o using the reference pattern for the co-polar component of the satellite transmitting antenna.

Then apply the expression:

$$pfd\ [\text{dB(W/m}^2)] = \text{e.i.r.p.} + \delta G + A + A_a$$

to obtain the power flux-density produced at P.

Note: In this expression, e.i.r.p. refers to boresight. The relative antenna gain δG is with respect to boresight antenna gain, therefore δG is negative.

(The remainder of Appendix 30, Annex 11 does apply for Region 2.)

INTERNATIONAL TELECOMMUNICATION UNION

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SUB-WORKING GROUP 4C-3

APPENDIX 30A

1. Revise Appendix 30 Annex 5 as follows :

a) Change title to :

"**Power Flux Density Limits between ~~11.7~~ 12.2 and ~~12.2~~ 12.7 GHz to protect the terrestrial services in Regions 1 and 3 from Interference from Region 2 Broadcasting-Satellite Space Stations (Article 9)**"

b) Modify 2) as follows :

2) in the band 12.2 - 12.5 GHz, for territories of administrations in Region 3 and those in the western part of Region 1, West of longitude 30°E :

2. Replace Annex to Document No. DL/21 with the attached Annex.

V. SAHAY
Chairman of Sub-Working Group 4C-3

Annex : 1

ANNEX

NOTE FROM CHAIRMAN OF COMMITTEE 4

Committee 4 considered the proposal of some administrations to include, in Annex 5 of Appendix 30A, the limits set forth by the Report of the Conference Preparatory Meetings (CPM) of the CCIR to protect fixed service AM/VSB reception in the eastern part of Region 1, East of 30°E.

It was decided that at the present time the Final Acts of the Conference should not include the recommended values for the following reasons :

1) the CPM Report suggests that some problem areas still remain and can be resolved on a bilateral basis;

2) the resolution of the matter requires the participation of the parties most directly affected and such was not the case at this conference.

3) the Region 2 administrations most directly involved seek the opportunity to explore the several alternatives identified by the CPM for ameliorating the inferference situations on a bilateral basis; as well as other opportunities offered by the ITU, such as the CPM for WARC 85 and the Interim Meetings of the CCIR.

A resolution of this problem can more easily be reached once the satellite locations and beam parameters are known.

It was also decided to include a Recommendation on this subject in the Final Acts of RARC-83. A draft of such a Recommendation is given below.

DRAFT

RECOMMENDATION . . .

Relating to Interregional Sharing Problems
from Region 2 Broadcasting-Satellite Space Stations
into certain Terrestrial Services in Region 1

The RARC-BSS, 1983

considering

a) that the present Conference considered the matter of interregional sharing criteria and adopted appropriate values where possible;

b) that regarding the sharing possibilities between Region 2 BSS and certain fixed terrestrial services in the eastern part of Region 1, the CCIR Report to the Conference included proposed PFD limits, identified geographic areas where these limits could not be met without the use of special techniques and recommended that bilateral discussions be held between the administrations most directly concerned;

c) that since the resolution of the matter requires the participation of the parties most directly affected and such was not the case at this Conference;

requests the CCIR

to continue its study of this matter on an urgent basis with a view to including appropriate conclusions in the CPM Report to the Space Services WARC;

recommends

1. that administrations concerned initiate and continue discussions of the problems on a bilateral basis on the resolution of problems;

2. that the first session of the Space Services WARC take appropriate action on the matter.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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SUB-WORKING GROUP 4C-3

APPENDIX 30A

ANNEX 5[1]

Power Flux Density Limits between ~~11.7~~ 12.2 and ~~12.2~~ 12.7 GHz to protect the terrestrial services in Regions 1 and 3 from Interference from Region 2 Broadcasting-Satellite Space Stations (Article 9)

The power flux density limits are as follows:

1) for all the territories of administrations in Regions 1 and 3:

-125 dBW/m^2/4 kHz	for broadcasting-satellite space stations using circular polarization;
-128 dBW/m^2/4 kHz	for broadcasting-satellite space stations using linear polarization;

for all angles of arrival; and

2) in the band 12.2 - 12.5 GHz, for territories of administrations in Region 3 and those in the western part of Region 1, West of longitude 30°E :

-132 dBW/m^2/5 MHz	for angles of arrival between 0° and 10° above the horizontal plane;
$-132 + 4.2(\gamma - 10)$ dBW/m^2/5 MHz	for angles of arrival γ (in degrees) between 10° and 15° above the horizontal plane;
-111 dBW/m^2/5 MHz	for angles of arrival between 15° and 90° above the horizontal plane.

[1] Please see Annex

ANNEX

NOTE TO CHAIRMAN OF CONFERENCE

Committee 4 considered the proposal of some administrations to include, in Annex 5 of Appendix 30A, the limits set forth by the Report of the Conference Preparatory Meetings (CPM) of the CCIR to protect fixed service AM/VSB reception in the eastern part of Region 1, East of 30°E.

It was decided that at the present time the Final Acts of the conference should not include the recommended values for the following reasons :

1) the CPM Report suggests that some problem areas still remain and can be resolved on a bilateral basis;

2) the resolution of the matter requires the participation of the parties most directly affected and such was not the case at this conference.

3) the Region 2 administrations most directly involved seek the opportunity to explore the several alternatives identified by the CPM for ameliorating the interference situations on a bilateral basis; as well as other opportunities offered by the ITU, such as the CPM for WARC 85 and the Interim Meetings of the CCIR. A resolution will be the best possible once the satellite locations are known and prior to the incorporation of the Final Acts into the Radio Regulations.

V. SAHAY
Chairman of Sub-Working Group 4C-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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SUB-WORKING GROUP 4C-2

TEXTS RELATING TO ENERGY DISPERSAL PROPOSED FOR INCLUSION IN THE FINAL ACTS

The following texts are proposed to replace the texts contained in Document No. DL/10, for inclusion in the Final Acts.

/ ANNEX 8 /[1]

Add new paragraph to / 3.18 /[1] as follows :

"In Region 2, for interregional sharing purposes, spectral densities equivalent to those realized in Regions 1 and 3 have to be maintained, but only as required and by whatever means administrations elect to utilize."

/ ANNEX 9 /[1]

Add new paragraph to / 3.4 /[1] as follows :

"In Region 2, when the emission from a broadcasting satellite produces a power flux-density equal to or greater than / - dBW/m^2/24 MHz /[2] within the territory of an administration of Region 1 or 3, the administration responsible should maintain a spectral dispersion of such an emission which would produce a spectral power density in any 40 kHz band 12 dB below the unmodulated carrier power. Where such an emission produces a power flux-density of less than / - dBW/m^2/24 MHz /, spectral dispersion needs only be maintained to the extent that a spectral power flux-density of / - dBW/m^2/40 kHz /[3] is not exceeded."

V. SAHAY
Chairman of Sub-Working Group 4C-2

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1 References are to Appendix 30 to the Radio Regulations.

2 See Annex 1, paragraph 4, for the explanation of the basis of this value, (Document No. 75 refers).

3 This value is 12 dB below the numerical value of the trigger power flux-density per 24 MHz / - dBW/m^2/24 MHz /, stated above.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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27 June 1983
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SUB-WORKING GROUP 6A-1

ARTICLE 4A

Interim Systems

4A.1 An administration may use its assignments in the Region 2 Plan with characteristics different from those appearing in the Plan as an interim system without applying the procedure of modification prescribed in Article 4 in the following cases :

- the use is intended for a specified maximum period; and
- no administration is affected in accordance with [ ]; or otherwise
- the agreement of the affected administration has been obtained in accordance with the provisions of this Article.

4A.2 When an administration proposes to use an assignment in accordance with paragraph 4A.1, it shall communicate to the Board the information listed in [ ]. The administration shall also indicate :

a) the maximum specified period during which the modified assignment is intended to remain in use;

b) the assignment(s) in the Plan the use of which will remain suspended for the duration of the use of the interim assignment;

c) the names of the administrations with which an agreement for the use of the interim assignment has been reached; or

d) that an agreement is not required.

4A.3 The Board shall identify the administrations whose services may be affected by the proposed use of the interim assignment. An administration is considered affected if :

a) any reference protection margin of one of its assignments in the Region 2 Plan, calculated in accordance with Annex [ ] but excluding the corresponding suspended assignment(s) (paragraph 4A.2 b)), becomes negative or its former negative value is increased;

b) it has an assignment in the fixed-satellite service which is recorded in the Master Register or which has been coordinated or is being coordinated under the provisions of RR 1060, or those of paragraph 7.2.1 of this Section;

c) due to a modification of area covered by the interim assignment, there is an increase in the portion of its territory which falls within the coverage area;

(Note : One participant noted that the subject of this sub-paragraph 3 d) involves consequential national and international policy issues of a political nature, and questioned the appropriateness of this matter being addressed by this sub-working group before definitive consideration and the provision of guidance by an appropriate body of this Conference.)

d) in countries of Regions 1 and 3 having a frequency assignment to a space station in the broadcasting-satellite service with the necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment, which is in accordance with the Plan contained in Appendix 30 or in respect of which modifications have been published by the Board in accordance with the provisions of that Appendix;

(Note : This provision is to be considered together with paragraph .... of Annex ...)

e) having a frequency assignment to a space station in the broadcasting-satellite service in the band 12.5 to 12.7 GHz in Region 3 with the necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment and which

- is recorded in the Master Register; or
- has been coordinated or is being coordinated under the provisions of Resolution No. 33; or
- appears in a Region 3 Plan to be adopted at a future administrative radio conference, taking account of modifications which may be introduced subsequently in accordance with the Final Acts of that Conference.

4A.4 The Board shall publish in a special section of its weekly circular the information received under paragraph 4A.2, together with the names of the administrations identified in application of paragraph 4A.3.

4A.5 Any administration not listed in the special section which considers that its assignments in the Plan may be affected due to the cumulative effects of all interim assignments shall so inform the Board within a period of _____. The Board shall calculate the cumulative effects of all interim assignments on the assignment in the Plan and, if the reference margins of the concerned assignments are deteriorated, shall include the name of this administration in the special section. Otherwise, the administrations shall endeavor to resolve the difficulty before the proposed date of bringing the interim assignment into use.

4A.6 At the expiry of _____, the Board shall review the matter and, according to the results obtained, inform the administration proposing the interim assignment that :

a) it may notify its proposed use in accordance with Article 5 if no agreement is required or the required agreement was obtained from the administrations concerned. In this case the Board shall update the Interim List;

b) it may apply the procedure of Article 4, without modifying the Plan, with respect to the administrations with which the agreement to the use of the interim assignment could not be reached.

4A.7 Six months prior to the expiry of the interim period, the Board shall draw the attention of the administration concerned to this fact.

4A.8 If an administration wishes to extend the maximum specified period, it shall apply again the provisions of this Article.

4A.9 Except in cases where the interim use is extended as a sucessful result of the application of paragraph .... the Board shall, at the termination of the use of the interim assignment, delete it from the Interim List. The corresponding assignment in the Plan, suspended earlier, may then be brought into use.

4A.10 In the application of the provisions of RR 844, the assignments in the Interim List shall be treated as if they were part of the Plan.

4A.11 The Board shall include all the interim assignments in an Interim List and shall update it in accordance with this article. The Interim List shall be published together with the Plan, it does not constitute part of the Plan except in cases referred to in paragraph 4A.10.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4B-3

PROTECTION RATIOS AND NUMBER OF CHANNELS

The results of discussions on protection ratios and the number of channels for planning the broadcasting-satellite service in Region 2 are summarized below. Proposed modifications to sections 3.4 and 3.5.1 of Annex 8 of Appendix 30 are also given. A new section 3.4.1 is added to Annex 8 on the adjacent channel protection ratio template for Region 2 planning.

Number of channels

The proposed number of channels is 32. However it is understood that this number may be reviewed following the analysis of the first draft plans.

Channel spacing

On the basis of 32 channels and

- 500 MHz spectrum allocation
- 20 MHz total guardbands
- 24 MHz channel necessary bandwidth

the frequency separation between a given carrier and carriers in the first and second adjacent channels are 14.71 MHz and 29.42 MHz respectively. These values may need to be adjusted if a different value for total guardband bandwidth is adopted.

Protection ratios

The proposed value for the co-channel protection ratio between FMTV signals is 28 dB. This is the value with which the overall co-channel carrier-to-interference ratio is to be compared in calculating the overall co-channel protection margin.

The adjacent channel protection ratios for the first and second adjacent channels are 13.4 dB and -10.5 dB respectively.

The values for the adjacent channels were derived from the template given in Figure /X 7. The template was obtained on the basis of data provided in Document No. 29. The template was made symmetrical and gives the protection ratio in dB by choosing for a given frequency offset in MHz, F_o, the larger of the protection ratio values shown in Figure 1 of Document No. 29 for F_o and $-F_o$.

The template was obtained by joining the segments for the adjacent channels to the horizontal extension of the co-channel value.

The adjacent channel values of protection ratio are independent of the frequency deviation of the TV channel.

This template is intended for inclusion in Annex 8 of Appendix 30 for the purpose of evaluating intra-system interference where called for in the modification procedures.

The template is given by the following expressions :

$$PR = \begin{cases} 28 \text{ dB} & \text{for } |F_o| \leq 8.36 \text{ MHz} \\ -2.762\,|F_o| + 51.09 \text{ dB} & \text{for } 8.36 < |F_o| \leq 12.87 \text{ MHz} \\ -1.154\,|F_o| + 30.4 \text{ dB} & \text{for } 12.87 < |F_o| \leq 21.25 \text{ MHz} \\ -2.00\,|F_o| + 48.38 \text{ dB} & \text{for } |F_o| > 21.25 \text{ MHz} \end{cases}$$

where

PR is the protection ratio in dB and,

$|F_o|$ is the absolute value of the carrier spacing between the interfering and wanted signals in MHz.

Proposed modifications to section 3.4, Annex 8 of Appendix 30

3.4 ***Protection ratio between two FM television signals***

For planning in Regions 1 and 3 the following protection ratios have been adopted for the purpose of calculating equivalent protection margins [1]:

– 31 dB for co-channel signals;
– 15 dB for adjacent-channel signals.

In Region 2 the following protection ratios have been adopted for the purpose of calculating the overall equivalent protection margin[2] :

28 dB for co-channel signals;

13.4 dB for first adjacent channel signals;

-10.5 dB for second adjacent channel signals;

Add the following footnote 2 to section 3.4 :

---

[2] The overall equivalent protection margin M is given in dB by the expression :

$$M = -10 \log\left(\sum_{i=1}^{5} 10^{(-M_i/10)} \right)$$

where

M_1 = overall co-channel protection margin

M_2, M_3 = overall protection margins for the upper and lower first adjacent channels respectively

M_4, M_5 = overall protection margin for the upper and lower second adjacent channels respectively.

The overall co-channel protection margin is the amount in dB by which the overall co-channel carrier-to-interference ratio exceeds the co-channel protection ratio as defined in 1.9 and 1.10 of Annex 8.

The definition for the first adjacent and the second adjacent channel overall protection margins are similar to that for the co-channel case except that the protection ratios and the overall carrier-to-interference ratios due to transmissions in the first and second adjacent channels are considered.

Add the following new section to Annex 8 of Appendix 30.

3.4.1 Adjacent channels protection ratio template for Region 2 (FMTV into FMTV)

The protection ratios for adjacent channels are derived from the template given in Figure / X /. The template is symmetrical and is given in terms of absolute levels for the carrier-to-interference ratios.

The template is obtained by joining the segment for adjacent channels to the horizontal extension of the co-channel protection ratio value. The adjacent channel protection ratios can not be adjusted relative to the co-channel value.

The template is given by the following expressions :

$$PR = \begin{cases} 28 \text{ dB} & \text{for } |F_o| \leq 8.36 \text{ MHz} \\ -2.762\,|F_o| + 51.09 \text{ dB} & \text{for } 8.36 \leq |F_o| \leq 12.87 \text{ MHz} \\ -1.154\,|F_o| + 30.4 \text{ dB} & \text{for } 12.87 \leq |F_o| \leq 21.25 \text{ MHz} \\ -2.00\,|F_o| + 48.38 \text{ dB} & \text{for } |F_o| \geq 21.25 \text{ MHz} \end{cases}$$

where,

PR is the protection ratio in dB and, $|F_o|$ is the carrier spacing between the interfering and wanted signals in MHz.

Proposed modification to section 3.5.1, Annex 8 of Appendix 30

3.5.1 ***Channel spacing in the Plan***

In Regions 1 and 3, the ~~The~~ **spacing between the assigned frequencies of two adjacent channels is 19.18 MHz. The Plan gives the assigned frequencies for each channel.**

In Region 2, the spacing between the assigned frequencies of two adjacent channels is 14.71 MHz.

Add the following figure :

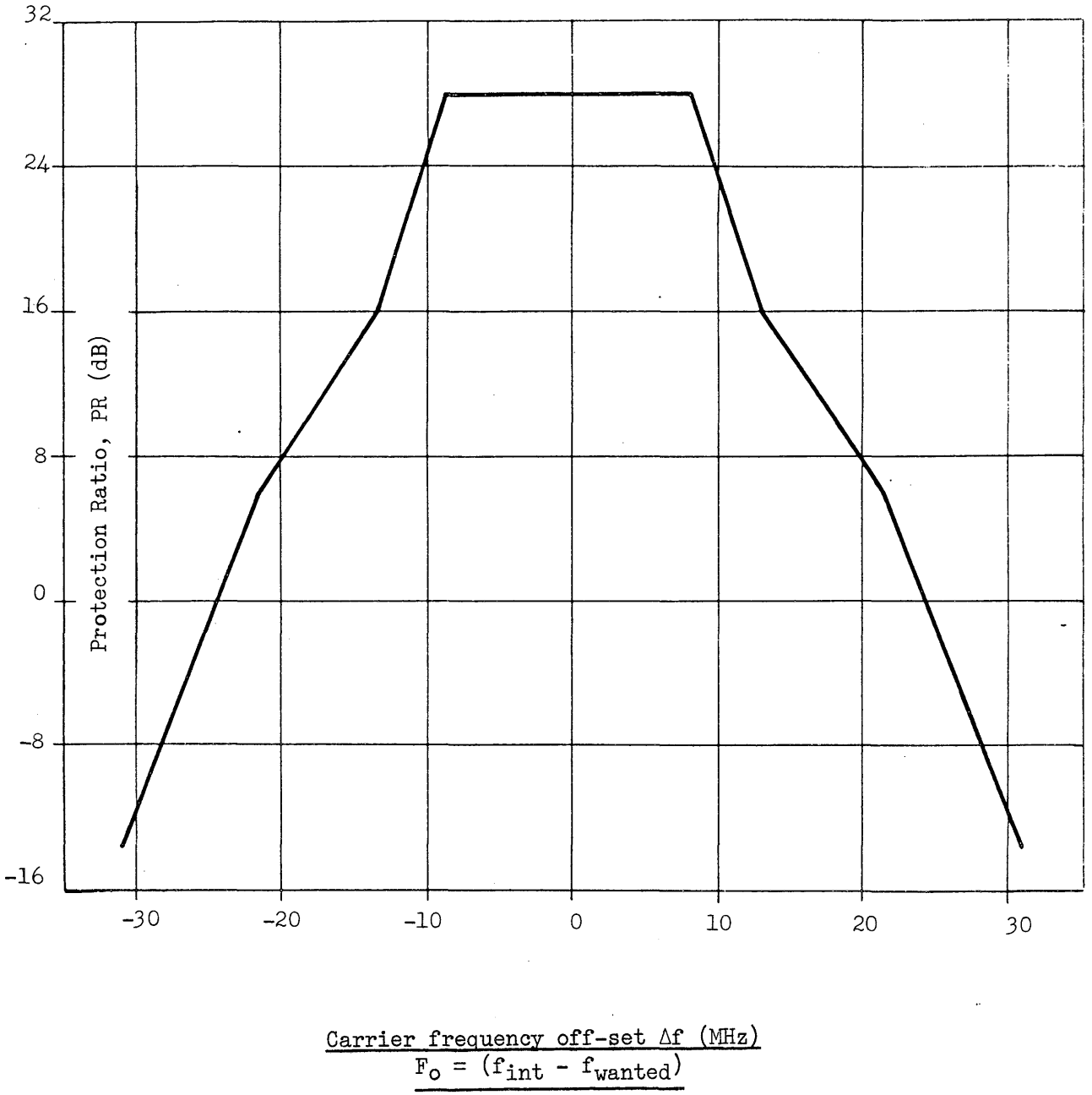

Figure [X] - Adjacent channel protection ratio template (FMTV)
(for Region 2 intra-system planning)

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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WORKING GROUP 4C

A. The following text is proposed for inclusion as Annex 1 of Section I of the Final Acts of RARC-83 (Document No. 74 refers) :

ANNEX 1

Limits for determining whether a Service of an Administration is considered to be affected by a proposed Modification to the Plan /(Article 4, paragraph 4.3.1)/[1]

/1. Pending output of Working Group 4B./

2. ***Limits on the change in the power flux density to protect the broadcasting-satellite service in the band*** 12.2 - 12.5 GHz in Region 1.

with an assignment in the Plan (Article 11 of Appendix 30)

With respect to paragraph [4.3.1.2] an administration in Region 1 shall be considered as being affected if the proposed modification to the Plan would result in exceeding the following power flux densities at any point in the service area affected:

-147 dBW/m²/27 MHz	$0° \leqslant \theta < 0.48°$
$-139 + 25 \log \theta$ dBW/m²/27 MHz	$0.48° \leqslant \theta < 27.25°$
-103 dBW/m²/27 MHz	$\theta \geqslant 27.25°$

where θ is the difference in degrees between the longitudes of the broadcasting-satellite space station in Region 2 or 3 and the broadcasting-satellite space station affected in Region 1.

3. Limits on the change in the power flux-density to protect the terrestrial services of administrations in Regions 1 and 3.

The terrestrial services of administrations in Regions 1 and 3 are protected by the provisions of Article 9 and Annex 5 of Appendix 30.

[1] The limits specified in Appendix 30 for modifications to the Regions 1 and 3 Plan relate to the power flux-densities which would be obtained assuming free space conditions. However, /RARC-83/ recommends that the power flux-density should take into account the effects of atmospheric absorption as given in paragraph / / of Annex / /.

4. Limits on the change in power flux-density of assignments in the Region 2 Plan to protect the fixed satellite service in the band 12.5-12.7 GHz in Region 1 and in the band [12.2] - 12.7 GHz in Region 3.

With respect to paragraph [4.3.1.4], an administration in Region 1 or 3 shall be considered as being affected if the proposed modification to the Region 2 Plan would result in an increase in the power flux-density on its territory of 0.25 dB or more above that resulting from the frequency assignments in the Region 2 Plan at the time of entry into force of the Final Acts.

However, where an assignment in the Region 2 Plan or its subsequent modification give a spectral power flux-density of less than [ ] dBW/m^2 [] anywhere in the territory of an administration of Region 1 or 3, that administration shall be considered as not affected.

B. The only consequential change to Annex 1 of Appendix 30 is an update of the title of section 2 to reflect the change in frequency band allocation. The title should be modified as follows :

2. ***Limits on the change in the power flux density to protect the broadcasting-satellite service in the band ~~11.7-12.2~~ GHz in Region 2***
12.2-12.5

J.M. ZAMUDIO ZEA
Chairman of Working Group 4C

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/26-E
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Source : Documents Nos. DT/30 and 51(Rev.2)

SUB-WORKING GROUP 4B-2

DRAFT

INFORMATION DOCUMENT

FROM COMMITTEE 4 TO COMMITTEE 5

SATELLITE TRANSMIT ANTENNA PATTERNS

Working Group 4B has discussed and agreed that the following three antenna patterns can be used for planning :

1. The pattern shown in Figure 1, derived from an antenna producing an elliptical beam with a Gaussian main lobe, is generally preferred for reasons of simplicity of implementation.

2. The pattern shown in Figure 2, derived from an antenna producing an elliptical beam with fast roll-off in the main lobe, is suggested to improve or reduce intra-service interference.

3. The patterns shown in Figure 3 (co-polar) and Figure 1 (cross-polar) are suggested to improve some special cases of interregional sharing.

Working Group 4B recommends that Committee 5 evaluate the relative merits of the patterns in Figures 1 and 2. The specific text for 3.13.3 of the Final Acts (Radio Regulations) will be prepared after Committee 5 has completed this evaluation.

C. PÉREZ VEGA
Chairman of Sub-Working Group 4B-2

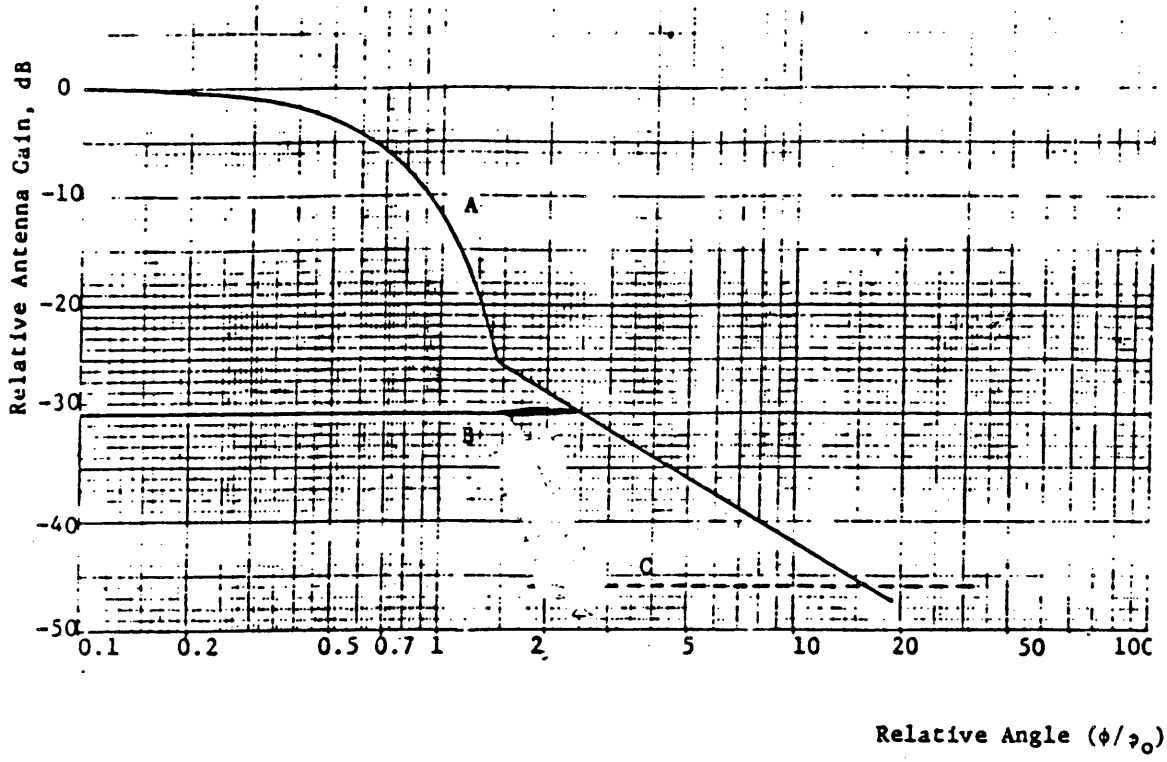

Figure 1 - Reference patterns for co-polar and cross-polar components for satellite transmitting antenna in Region 2

Figure 1 :

Curve A: Co-polar component (dB relative to main beam gain)

$- 12\ (\phi/\phi_o)^2$ for $0 \leq (\phi/\phi_o) \leq 1.45$
$- (22 + 20 \log\ (\phi/\phi_o)$ for $1.45 < (\phi/\phi_o)$

after intersection with curve C : as curve C

Curve B: Cross-polar component (dB relative to main beam gain)

$- 30$ for $0 \leq (\phi/\phi_o) \leq 2.51$

after intersection with co-polar pattern : as co-polar pattern

Curve C: minus the non-axis gain

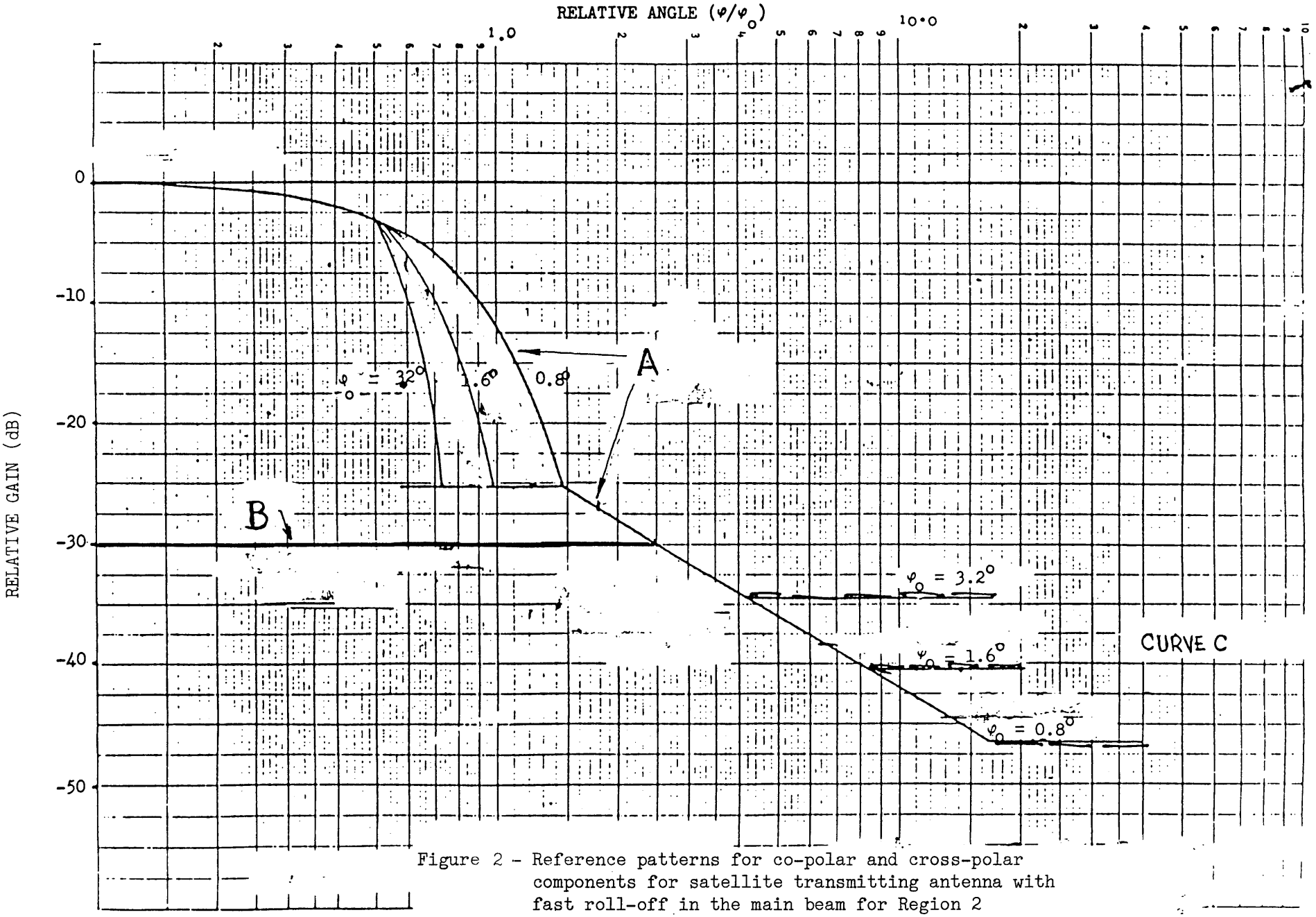

Figure 2 - Reference patterns for co-polar and cross-polar components for satellite transmitting antenna with fast roll-off in the main beam for Region 2

Figure 2 (continued)

Curve A - Co-Polar component

$-12(\varphi/\varphi_o)^2$ for $0 \leq \varphi/\varphi_o \leq 0.5$

$-18.75\ \varphi_o^2 [\varphi/\varphi_o - x]^2$ for $0.5 < \varphi/\varphi_o \leq \frac{1.16}{\varphi_o} + x$

-25.23 for $\frac{1.16}{\varphi_o} + x < \varphi/\varphi_o < 1.45$

$-[22 + 20 \log \varphi/\varphi_o]$ for $1.45 < \varphi/\varphi_o$

after intersection with Curve C : as Curve C

Curve B - Cross-polar component

-30 for $0 \leq \varphi/\varphi_o < 2.51$

after intersection with co-polar pattern : as co-polar pattern

Curve C - Minus the on-axis gain

where :

φ = off-axis angle (degrees)

φ_o = dimension of the minimum ellipse fitted around the down-link service area in the direction of interest

$x = 0.5 [1 - \frac{0.8}{\varphi_o}]$

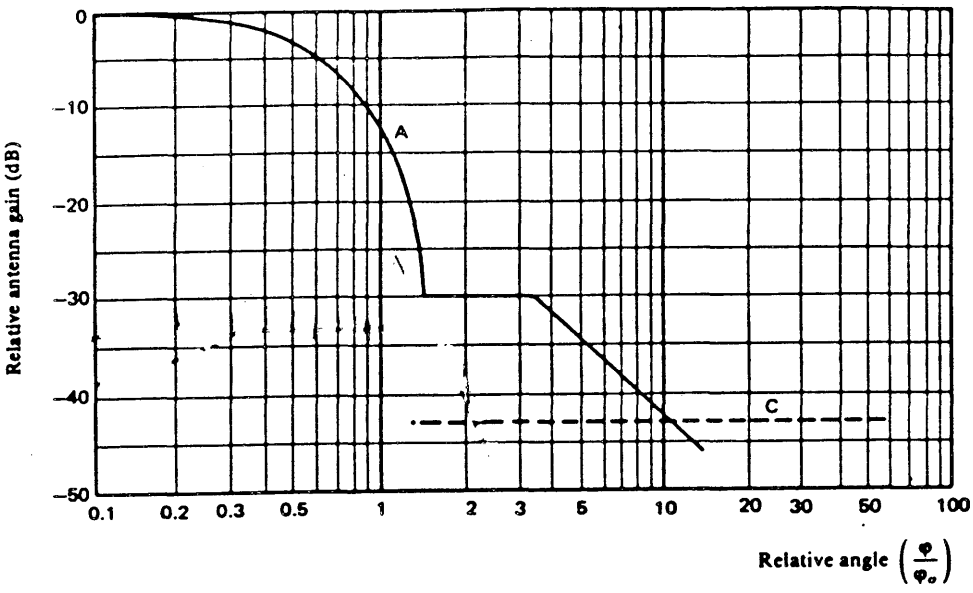

Figure 3 - Reference patterns for co-polar component for satellite transmitting antennas

Curve A: Co-polar component

$-12\left(\frac{\varphi}{\varphi_o}\right)^2$ for $0 \leq \varphi \leq 1.58\,\varphi_o$

-30 for $1.58\,\varphi_o < \varphi \leq 3.16\,\varphi_o$

$-\left[17.5 + 25\log_{10}\left(\frac{\varphi}{\varphi_o}\right)\right]$ for $3.16\,\varphi_o < \varphi$

after intersection with Curve C: as Curve C

Curve C: Minus the on-axis gain.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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WORKING GROUP 4B

DRAFT OUTLINE

ANNEX 3

TECHNICAL DATA USED IN ESTABLISHING THE PROVISIONS AND ASSOCIATED PLAN AND WHICH SHOULD BE USED FOR THEIR APPLICATION

1. Definitions

2. Radio Propagation factors

   2.1 Atmospheric absorption
   2.2 Rain attenuation
   2.3 Rain attenuation limit
   2.4 Depolarization

3. Basic technical characteristics

   3.1 Translation frequency
   3.2 Carrier-to-noise ratio
   3.3 Protection ratio
   3.4 Transmitting antenna

      3.4.1 Antenna diameters
      3.4.2 Reference patterns
      3.4.3 Antenna efficiency
      3.4.4 Pointing accuracy

   3.5 Transmitted power
   3.6 Receiving antenna

      3.6.1 Cross-section of receive beam
      3.6.2 Minimum beamwidth
      3.6.3 Reference patterns
      3.6.4 Pointing accuracy

   3.7 System noise temperature
   3.8 Polarization
   3.9 Automatic gain control
   3.10 Power control
   3.11 Site diversity
   3.12 Depolarization compensation
   3.13 Minimum separation between satellites

4B-Drafting Group

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

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WORKING GROUP 4C

DRAFT NOTE ON THE APPLICABILITY OF INTERREGIONAL CRITERIA

The following draft note is proposed for consideration of Working Group 4C as a note to be forwarded from Committee 4 to Committees 5 and 6 :

The attention of Committees 5 and 6 are drawn to the following :

Committee 4 has developed interregional criteria in Annexes 1 and 4 of Section I of the Final Acts of RARC-83 based upon reciprocity and the needs of the services likely to be affected in Regions 1 and 3. In addition, the criteria for the protection of terrestrial services in Regions 1 and 3 given in Annex 5 of Appendix 30 are noted. It is also noted that it is stipulated in Article 4 of Appendix 30 to the Radio Regulations that the Plan for Region 2 to be adopted by the present Conference shall not degrade the protection afforded to the frequency assignments in the Plan below the limits specified in that Appendix.

It is the intent of this Committee that these criteria are mainly for application when systems are being implemented or modified. During the Plan development stages, the possibility of meeting interregional criteria using the standard reference parameters of Annex /8/ should first be considered. However, where these criteria cannot be met, using these standard parameters, orbital positions along with their related beam parameters should not be disqualified from the Plan due to such causes alone. If the orbital position is otherwise acceptable to the Region 2 Administration(s) most directly concerned, the systems occupying this position may be notated as requiring special considerations. For example, systems so notated may only be implemented if :

a) the affected administrations in Region 1 or 3 agree to exceeding the interregional criteria in the Plan;

b) the technical parameters proposed satisfy the IFRB that the interregional criteria will be met.

Committees 5 and 6 are urged to take the above into account in the course of their deliberations. In particular, appropriate provisions for such systems may be required in Article /5/.

V. SAHAY
Sub-Working Group 4C-3

INTERNATIONAL TELECOMMUNICATION UNION

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WORKING GROUP 4C

DRAFT NOTE ON THE APPLICABILITY OF INTERREGIONAL CRITERIA

The following draft note is proposed for consideration of Working Group 4C as a note to be forwarded from Committee 4 to Committees 5 and 6 :

The attention of Committees 5 and 6 are drawn to the following :

Committee 4 has developed interregional criteria in Annexes 1 and 4 of Section I of the Final Acts of RARC-83 based upon the principle of reciprocity and the needs of the services likely to be affected in Regions 1 and 3.

It is the intent of Committee 4 that these criteria are to be applied only at the time that systems are implemented. At the time of plan development, this means that no orbital position along with its related beam parameters should be disqualified from the plan due to interregional causes alone, when the parameters summarized in Document No. 51 are utilized. If the orbital position is otherwise acceptable to the Region 2 Administration(s) most directly concerned, the systems occupying this position may be notated as requiring specially shaped beams, energy dispersal or other measures.

Committees 5 and 6 are urged to take the above into account in the course of their deliberations.

V. SAHAY
Chairman of Sub-Working Group 4C-3

Conférence de radiodiffusion par satellite - Région 2. Genève, 1983.
Broadcasting Satellite Conference - Region 2. Geneva, 1983.
Conferencia de radiodifusión por satelite. Región 2. Ginebra, 1983.

Doc. No. DL/29 : non publié
not published

July 1984

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SUB-WORKING GROUP 4B-2

ADD 3.4.4 Earth station antenna pointing tolerance

The plan has been developed to accommodate a loss due to earth station antenna mis-pointing of 1 dB. Under no circumstances shall the plan allow for a mis-pointing angle greater than 0.1°.

INTERNATIONAL TELECOMMUNICATION UNION

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WORKING GROUP 4C

The following is proposed for inclusion as Annex /7 of Section I of the Final Acts of RARC-83 :

ANNEX /7

Criteria for Sharing between Services

1. *Protection requirements for sharing between services in the 12 GHz band*

1.1 **The establishment of sharing criteria for the different services using the 12 GHz band should be based on the protection requirements listed in the table below:**

Wanted Service[1]	Interfering Service[1]	Protection requirements[2]	
		Total acceptable[3]	Single entry
BSS (Region 2)	BSS (Region 2)	See Annex /8/ § ____	
BSS (Region 2)	BSS, FSS, FS, BS (Regions 1 and 3)	C/I = 30.5 dB[4]	C/I = 35 dB

Notes: [1] **BSS** = broadcasting-satellite service
FSS = fixed-satellite service
BS = broadcasting service
FS = fixed service
TV = television
FM = frequency modulation

[2] These limits include down-link contributions only.

[3] Values in dB are protection ratios for the sum of interfering signals.

[4] C/I = ratio of carrier-to-interfering signal

1.2 The values given as "total acceptable" are those necessary to protect the wanted signal. The "single entry" values are those which should be used as a guide for determining sharing criteria. The total interference from all sources must be calculated, since satisfying the "single entry" criteria for each source may not guarantee that the total interference meets the above protection requirements. A "single entry" is defined as the aggregate of emissions from any one station entering any receiver in the wanted service within the channel to be protected.

1.3 The term *C/I* refers to the ratio of the wanted-to-interfering power at the interfered-with Earth station. The value given shall be exceeded for all but 1% of the worst month for the broadcasting-satellite service (BSS).

1.4 The specified values of protection ratio (i.e., the carrier-to-interference power ratio corresponding to a specified picture quality) are applicable, for planning purposes, to television signals of any of the several television standards.

1.5 When carriers are offset in frequency, condition *c)* does not apply and the adjacent channel protection ratios should be adjusted according to the frequency offset as shown in Figure ____ of Annex /8/ /Fig. X of Document No. 98/.

3. ***Use of energy dispersal in the broadcasting-satellite service***

3.1 When the emission from a broadcasting satellite produces a power flux-density equal to or greater than -138 dBW/m^2/24 MHz within the territory of an administration of Region 1 or 3, the administration responsible shall maintain a spectral dispersion of such an emission which would produce a spectral power density in any 40 kHz band 12 dB below the unmodulated carrier power. Where such an emission produces a power flux-density of less than -138 dBW/m^2/24 MHz, spectral dispersion needs only be maintained to the extent that a spectral power flux-density of -150 dBW/m^2/40 kHz is not exceeded.

3.2 The table below gives the relative reduction in spectral power flux density as a function of the peak-to-peak deviation due to the energy dispersal signal. This table is based on the following equation:

$$\left.\begin{array}{l}\text{Relative reduction (in dB)}\\ \text{in a } B_r \text{ kHz band}\end{array}\right\} = 10 \log \frac{\Delta F_{pp} + \delta f_{rms}}{B_r}$$

where ΔF_{pp} = peak-to-peak deviation due to the energy dispersal signal (kHz)

δf_{rms} = rms deviation due to "natural" energy dispersal (kHz)

B_r = reference bandwidth (kHz)

In compiling the table below, a value of 40 kHz has been assumed for δf_{rms}, on the basis of the value of 10 dB for "natural" dispersion given in Table 4 of CCIR draft Report 631-2.

Reduction of spectral power flux density

Peak-to-peak deviation (kHz)	Relative reduction (dB) (4 kHz reference bandwidth)	Relative reduction (dB) (40 kHz reference bandwidth)
0	10	0
100	15.44	5.4
200	17.78	7.8
300	19.29	9.3
400	20.41	10.4
500	21.30	11.3
600	22.04	12.0

V. SAHAY
Chairman of Sub-Working Group 4C-3

INTERNATIONAL TELECOMMUNICATION UNION

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SUB-WORKING GROUP 4B-2

DRAFT

INFORMATION DOCUMENT

FROM COMMITTEE 4 TO COMMITTEE 5

SATELLITE RECEIVE ANTENNA PATTERNS

Working Group 4B has discussed and agreed that the following two antenna patterns can be used for planning :

1. The pattern shown in Figure 1, derived from an antenna producing an elliptical beam with a Gaussian main lobe, is generally preferred for reasons of simplicity of implementation.

2. The pattern shown in Figure 2, derived from an antenna producing an elliptical beam with fast roll-off in the main lobe, is suggested when necessary to improve or reduce intra-service interference.

Working Group 4B recommends that Committee 5 evaluate the relative merits of the patterns in Figures 1 and 2, bearing in mind that the pattern shown in Figure 1 is generally preferred for reasons of simplicity of implementation. The specific text for [3.6.3] of the Final Acts (Radio Regulations) will be prepared after Committee 5 has completed this evaluation.

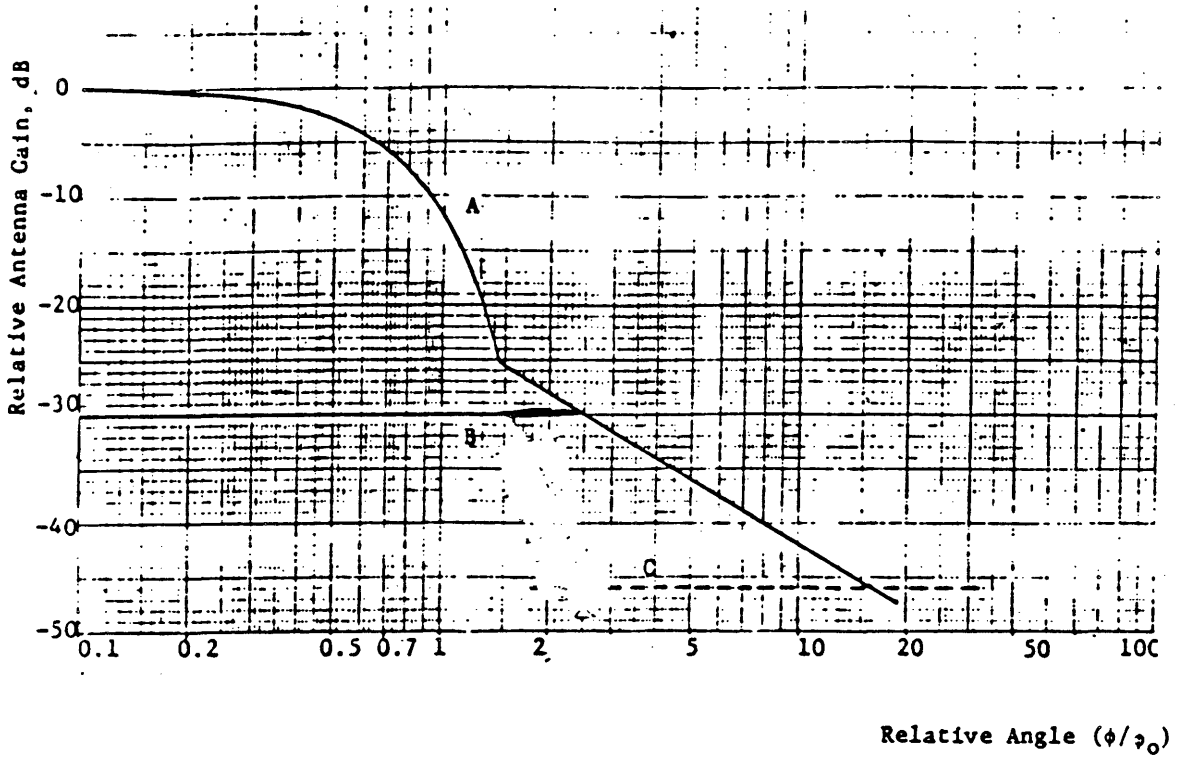

Figure 1 - Reference patterns for co-polar and cross-polar components for satellite receiving antenna in Region 2

Figure 1 :

Curve A: Co-polar component (dB relative to main beam gain)

$-12\ (\phi/\phi_o)^2$ for $0 \leq (\phi/\phi_o) \leq 1.45$
$-(22 + 20 \log (\phi/\phi_o)$ for $1.45 < (\phi/\phi_o)$

after intersection with curve C : as curve C

Curve B: Cross-polar component (dB relative to main beam gain)

-30 for $0 \leq (\phi/\phi_o) \leq 2.51$

after intersection with co-polar pattern : as co-polar pattern

Curve C: minus the non-axis gain

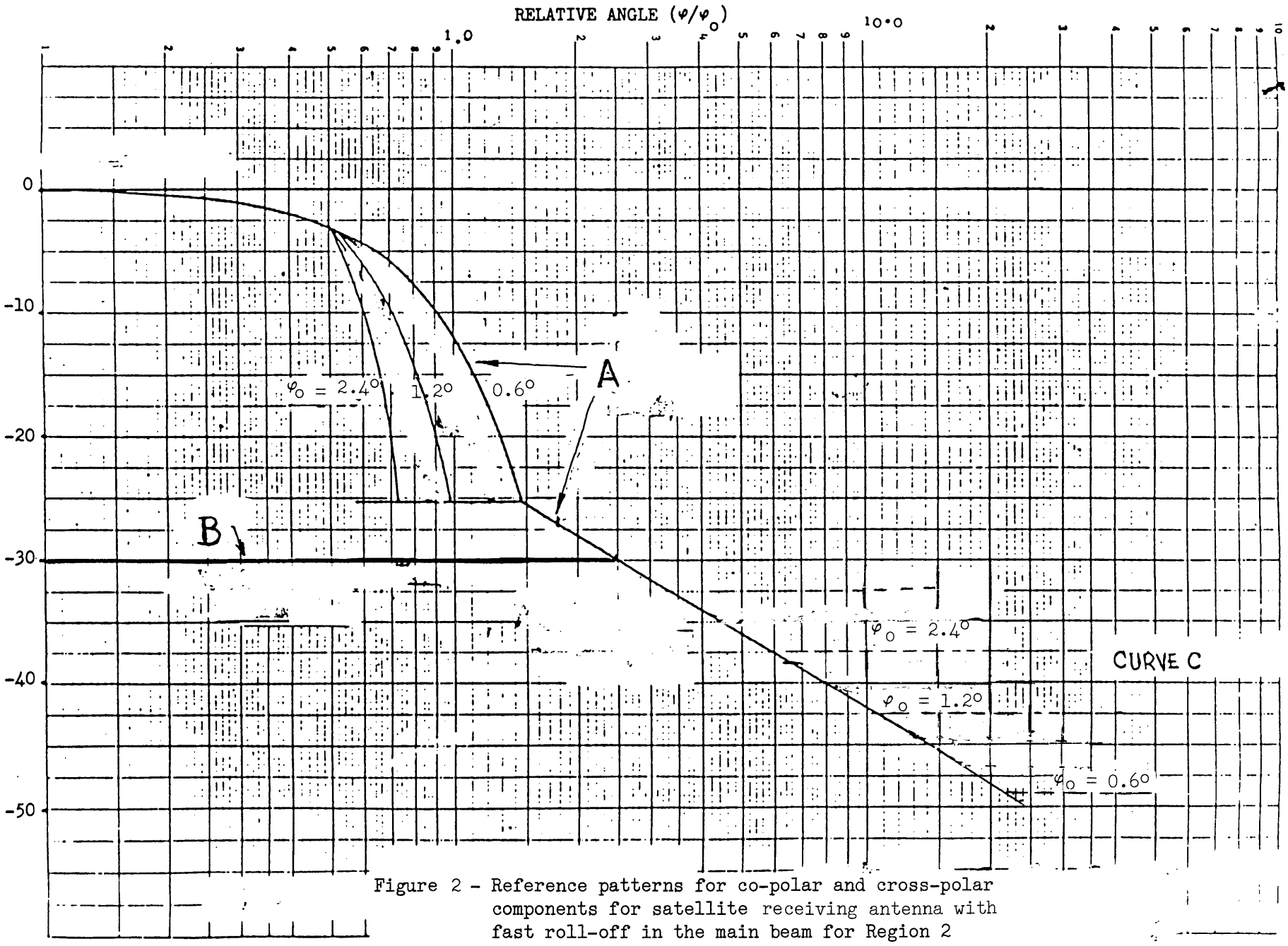

Figure 2 - Reference patterns for co-polar and cross-polar components for satellite receiving antenna with fast roll-off in the main beam for Region 2

Figure 2 (continued)

Curve A - Co-Polar component

$-12(\varphi/\varphi_o)^2$ for $0 \leq \varphi/\varphi_o \leq 0.5$

$-33.33\ \varphi_o^2 [\varphi/\varphi_o - x]^2$ for $0.5 < \varphi/\varphi_o \leq \frac{0.866}{\varphi_o} + x$

-25.23 for $\frac{0.866}{\varphi_o} + x < \varphi/\varphi_o < 1.413$

$-[22 + 20 \log \varphi/\varphi_o]$ for $1.413 < \varphi/\varphi_o$

after intersection with Curve C : as Curve C

Curve B - Cross-polar component

-30 for $0 \leq \varphi/\varphi_o < 2.51$

after intersection with co-polar pattern : as co-polar pattern

Curve C - Minus the on-axis gain

where :

φ = off-axis angle (degrees)

φ_o = dimension of the minimum ellipse fitted around the down-link service area in the direction of interest

$x = 0.5 [1 - \frac{0.6}{\varphi_o}]$

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/33-E
1 July 1983
Original : English

WORKING GROUP 6A

4.A.1 An administration or a group of administrations, bearing in mind the duration of validity of the Plan, may, after successful application of the procedure contained in this Article, use an interim system during a specified maximum period not exceeding 12 years in order :

a) to use an increased e.i.r.p. in any direction;

b) to use different modulation characteristics, resulting in an increase of the probability of harmful interference or in wider assigned bandwidth;

c) to change the coverage area by displacing boresight, or by increasing the major or minor axis;

d) to use a coverage area appearing in the Plan from an orbital position other than the corresponding orbital position appearing in the Plan;

e) to use a coverage area englobing two or more coverage areas appearing in the Plan from an orbital position corresponding to one of the above coverage areas.

4.A.2 An interim system shall in all cases correspond to assignments in the Region 2 Plan; it shall not permit an administration to increase its use of the spectrum/orbit resources. During the use of an interim system, the use of the corresponding assignments in the Plan is suspended, they shall not be brought into the use before the cessation of use of the interim system. However, when other administrations apply the procedure of Article 4 in order to modify the Plan or the procedure of Article 4A in order to bring into use an interim system, their corresponding suspended assignments shall be taken into account.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4B-3

PROPOSED NEW FEEDER LINK SECTION 3.4.3 OF SECTION 2 OF THE FINAL ACTS

The Plan is based on an antenna diameter of 5 meters and an antenna efficiency of 65%. The corresponding on-axis gain at 17.55 GHz is 57.4 dBi, relative to an isotropic source and the corresponding value of e.i.r.p. used for planning purposes is 87.4 dB(W).

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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Source : Document No. 102

SUB-WORKING GROUP 4B-3

PROPOSED NEW FEEDER LINK SECTION 3.2 OF ANNEX 3, SECTION 2 OF THE FINAL ACTS

3.2 Carrier-to-noise ratio

Section 3.3 of Annex 8 of Appendix 30 indicates a guidance for planning and the basis for the evaluation of the carrier-to-noise ratios of the feeder link and down-link plans.

As a guidance for planning, a feeder link carrier-to-noise ratio of 24.5 dB for 99% of the worst month is assumed.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4B-3

Draft

Note from Committee 4 to Committee 5 on satellite receive filtering

Committee 4 wishes to bring to the attention of Committee 5 the necessity of including the effect of satellite receive filtering on the calculation of the carrier-to-interference ratio of the second adjacent channels in the analysis of the Plan.

For the second adjacent channel, a /~10~/ dB improvement on the feeder link carrier-to-interference ratio due to satellite receive filtering is needed to alleviate the problem of rain attenuation on feeder links.

The value of /~10~/ dB is consistant with the /~13~/ dB limit on the calculated rain attenuation in the Plan (see Document No. 80). A corresponding change to the analysis software may be required to incorporate the 10 dB improvement into the planning process.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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Source : Documents Nos. 98(Rev.1), DL/14(Rev.3), DL/14(Rev.4)

SUB-WORKING GROUP 4B-3

PROPOSED NEW FEEDER LINK SECTION 3.3 OF ANNEX 3 OF SECTION 2 OF THE FINAL ACTS

3.3 Protection ratio

Section 3.4 of Annex 8 of Appendix 30 indicates a guidance for planning for the reduction of the down-link co-channel interference due to co-channel interference in the feeder link of 10%, in dB, for 99% of the worst month. However, the feeder link plan is not evaluated separately but the feeder link and down-link plans are evaluated on the overall equivalent protection margin of the combined down-link and feeder link contributions. Definitions 1.10, 1.11, 1.12, 1.13 and 1.14 of /section 1 of Annex 8 of Appendix 30/ and the protection ratios given in section 3.4 of Annex 8 of Appendix 30 are used in the analysis of the plans.

For the /first/ adjacent channels, the Plan is based on a minimum orbital separation of 0.4 degrees between nominally co-located satellites having cross-polarized /first/ adjacent channel assignments.

For the second adjacent channels, the Plan is based on a /10/ dB improvement on the feeder link carrier-to-interference ratio due to the satellite receive filtering.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4B-3

PROPOSED NEW FEEDER LINK SECTION 3.4.1

OF ANNEX 3 OF SECTION 2 OF THE FINAL ACTS

3.4 Transmitting antenna

3.4.1 Antenna diameters

The feeder link plan is based on an antenna diameter of 5 meters.

The minimum antenna diameter which can be used in the plan is 2.5 meters. However, the feeder link carrier-to-noise ratio and carrier-to-interference ratio resulting from the use of antennas with diameters smaller than 5 meters would generally be less than those calculated in the plan.

Antennas with diameters larger than 5 meters can be used in the plan if the orbital separation between the assigned orbital location of the administration and the assigned orbital location of any other administration is greater than 0.8 degrees.

Antennas with diameters larger than 5 meters can also be used if the above orbital separation is less than 0.8 degrees and if the e.i.r.p. of the desired feeder link earth station does not exceed the planned value of e.i.r.p.

If the above orbital separation is less than 0.8 degrees and if the e.i.r.p. of the desired feeder link earth station exceeds the planned value, coordination is required in accordance with [ ].

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4B-3

PROPOSED NEW FEEDER LINK PARAGRAPH 3.5 OF SECTION 2 OF THE FINAL ACTS

3.5 Transmitted power

The maximum peak envelope power delivered to the input of the feeder link earth station is 1,000 Watts for any antenna diameter larger than 2.5 meters. This level of power can only be exceeded under certain conditions specified in paragraph 3.10 of section 2 of the Final Acts.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4B-3

PROPOSED NEW PARAGRAPH 3.13 OF SECTION 2 OF THE FINAL ACTS

3.13 Minimum separation between satellites

In the plan, the orbital separation between space stations assigned to different administrations is greater than 0.8 degrees unless the space stations of the administrations are specifically intended to be co-located. The value of 0.8 degrees is also the minimum orbital separation to provide the flexibility in the implementation of feeder links indicated in paragraph 3.4.1 of section 2 of the Final Acts without the need for coordination. For orbital separation less than 0.8 degrees, coordination in accordance with / _ / is required but a modification of the plan is not required for feeder link e.i.r.p. exceeding the planned value indicated in paragraph 3.4.3 of section 2 of the Final Acts.

In the broadcasting-satellite service, multiple frequencies are assigned to the same nominal orbital position for the efficient use of spectrum and orbit resources. Several satellites may be needed to implement the co-located frequency assignments. The orbital positions of satellites which belong to a multiple frequency assignment having cross polarized adjacent channels can be implemented at any orbital position located within ± 0.2 degrees of the nominal orbital position recorded in the plan. This is needed to alleviate the effect of feeder link rain attenuation on the / first / adjacent channel overall protection ratio and the value of ± 0.2 degrees is optimal for a feeder link earth station transmit antenna of 5 metres. The plan is based on an orbital separation of 0.4 degrees between satellites having cross-polarized adjacent channels. The satellite station-keeping tolerance of ± 0.1 degrees indicated in paragraph 3.11 of section 2 of the Final Acts applies to the orbital positions of the satellites.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/41-E
1 July 1983
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SUB-WORKING GROUP 4B-3

DRAFT NOTE FROM WORKING GROUP 4B TO WORKING GROUP 4C ON THE USE OF POWER CONTROL FOR FEEDER LINKS

Working Group 4B wishes to bring to the attention of Working Group 4C that power control is permitted in the feeder-link plan as indicated in the proposed new paragraph 3.10 of section 2 of the Final Acts.

The proposed new paragraph is given in Document No. DL/43.

Working Group 4B considers that the use of power control may or may not affect the interservice sharing depending on the differential rain statistics between the wanted and the interfering radio frequency paths with respect to the clear sky conditions.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/42-E
1 July 1983
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SUB-WORKING GROUP 4B-3

PROPOSED NEW PARAGRAPH 3.1 OF SECTION 2 OF THE FINAL ACTS

3.1 Translation frequency

The feeder link plan is based on the use of a single common frequency translation of 5.1 GHz between the 12 GHz down-link channels and the 17 GHz channels.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4B-3

PROPOSED NEW PARAGRAPH 3.10 OF SECTION 2 OF THE FINAL ACTS

3.10 Power control

The maximum peak envelope radio frequency power delivered to the input of the feeder link earth station is 1,000 watts as indicated in paragraph 3.5 of section 2 of the Final Acts. However, the use of power levels higher than the planned maximum is only permitted under all of the following conditions :

- for elevation angles exceeding 40 degrees. The value of transmitted power in excess of the planned value given in paragraph 3.5 of section 2 of the Final Acts is given in Table I.

TABLE I

Transmitted radio frequency power of the feeder link earth station permitted in excess of 1,000 watts as a function of elevation angle

Elevation angle of feeder link earth station antennas, degrees	Transmitted power permitted in excess of 1,000 watts, dB
0 to 40	0
40 to 50	2
50 to 60	3
60 to 90	5

- during rain and for a power level in excess of 1,000 watts which does not exceed the instantaneous rain attenuation at 17 GHz;
- for carrier-to-noise ratio in the plan not exceeding 24.5 dB for 99% of the worst month.

However, the feeder link plan is not based on the use of radio frequency powers higher than 1,000 watts delivered at the input of feeder link earth station.

Power levels lower than the planned value of 1,000 watts are permitted in the plan but the carrier-to-noise and carrier-to-interference ratios for 99% of the worst month may or may not be less than those calculated in the plan.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4B-3

PROPOSED NEW PARAGRAPH 3.11 OF SECTION 2 OF THE FINAL ACTS

3.11 Site diversity

Site diversity refers to the alternate use during rain of two or more transmitting earth stations which may be separated by a distance larger than about 10 km.

The use of site diversity is permitted in the plan and is considered to be an effective technique for maintaining high carrier-to-noise ratio and carrier-to-interference ratio during periods of moderate to severe rain attenuation. However, the plan is not based on the use of site diversity.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/45-E
4 July 1983
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WORKING GROUP 4C

This document from Working Group 4C ad hoc group is in response to the request of Committee 4 to reconsider Document No. 75(Rev.2).

The following modifications to Document No. 75(Rev.2) are proposed :

1) Add Footnote 2 identifier to title.

2) Modify note at bottom of page 1 as follows :

   1. The limits specified in this Annex relate ....
   ... paragraph ( ) of Annex ( ).

3) Add new footnote 2 :

   2. See Resolution No. (XYZ) in the Annex to this document.

V. SAHAY
Chairman of Working Group 4C ad hoc

Annex : 1

A N N E X

RESOLUTION No. (XYZ)

RARC-83 BS,

considering,

- that Annexes 1 and 4 of Appendix 30 contain criteria for inter-Regional coordination which are to be met assuming free space attenuation;
- that at this Conference, inter-Regional criteria has been developed based upon the principle of reciprocity, in particular, Annexes 1 and 4 of the Final Acts;
- that these Annexes specify that calculations should be based on clear air atmospheric conditions;
- that the CCIR Report 719-1 provides information on atmospheric absorption;

and noting

- that the atmospheric absorption can provide additional inter-Regional protection in the direction Regions 1 and 3 to Region 2;
- that this Conference is not competent to amend Appendix 30 of the Radio Regulations;

resolves

1. that the next WARC competent to deal with modifications to Appendix 30 should consider the matter of including the effects of atmospheric absorption:

2. that until then, in Annexes 1 and 4 of the Final Acts of this Conference, free space attenuation should be assumed as a general rule;

3. that until then, the IFRB seek the agreement of countries in Regions 1 and 3 to the use of atmospheric absorption on a reciprocal basis with Region 2 countries for calculations related to inter-Regional coordination.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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SUB-WORKING GROUP 4B-3

DRAFT NOTE FROM COMMITTEE 4 TO COMMITTEE 6 ON THE NEED FOR COORDINATION BETWEEN NOMINALLY CO-LOCATED SPACE STATIONS OF DIFFERENT ADMINISTRATIONS

Committee 4 wishes to bring to the attention of Committee 6 that there may be a need for the coordination of nominally co-located space stations of different administrations when the assignments include cross-polarized first adjacent channels. This need arises from the requirement of a small orbital separation of less than 0.4 degrees between the satellites as indicated in paragraph 3.13.2 of Annex 3 of Section II of the Final Acts (see Document No. 136).

Committee 6 may wish to consider the mechanism for coordination when the above conditions indicate that coordination is required.

M. BOUCHARD
Chairman of Sub-Working Group 4B-3

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/47-E
6 July 1983
Original : English

Source : Document No. 89(Rev.1)

SUB-WORKING GROUP 4C-3

PROPOSALS FOR REVISION OF DOCUMENT Nos. 89(REV.1) AND 157

A. Modify Document No. 89(Rev.1) :

TEXTS RELATING TO ENERGY DISPERSAL PROPOSED FOR INCLUSION IN THE FINAL ACTS

Working Group 4C proposes the following text for inclusion in Section I of the Final Acts of RARC-83 :

1. Add new paragraph /3.18/ in Annex /6/[1] as follows :

In Region 2, for interregional sharing purposes, spectral densities equivalent to those realized in Regions 1 and 3 have to be maintained as specified below, but only as required and by whatever means administrations elect to utilize.

When the emission from a broadcasting satellite produces a power flux-density equal to or greater than -138 dBW/m^2/24 MHz within the territory of an administration of Region 1 or 3, the administration responsible shall maintain an energy dispersion of such an emission which produces a spectral power density in any 40 kHz band 12 dB below the unmodulated carrier power. Where such an emission produces a power flux-density of less than -138 dBW/m^2/24 MHz, spectral dispersion need only be maintained to the extent that a spectral power flux-density of -150 dBW/m^2/40 kHz is not exceeded.

B. Delete Annex /9/ as in Document No. 157 in its entirety by issuing Document No. 157(Corr.1) in which the words to appear are :

"Working Group 4C reconsidered the material in this annex and decided that it would be more appropriate in other annexes - see Document No. 89(Rev.2)."

V. SAHAY
Chairman of Sub-Working Group 4C-3

[1] References are to Document No. 74.

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/48(Rev.1)-E
7 July 1983
Original : English

WORKING GROUP 4C

RESOLUTION No. [7

Relating to the coordination between feeder-link earth stations to the broadcasting-satellite service and receiving fixed-satellite earth stations in the band 17.7 - 17.8 GHz

The Regional Administrative Radio Conference for the planning of the Broadcasting-Satellite Service in Region 2, Geneva, 1983,

considering

a) that the band 17.7 - 18.1 GHz is allocated to the fixed-satellite service in both the Earth-to-space (feeder links for broadcasting-satellite service) and the space-to-Earth directions (bi-directional use);

b) that Annex 4 of these Final Acts has utilized the latest CCIR studies along with Appendix 28 to the Radio Regulations in establishing a coordination area around a feeder-link earth station;

c) that the latest CCIR propagation data was used in the development of Annex 3 (Part I) and Annex 6 (Part II) of these Final Acts;

noting

a) that Resolution No. 60 of the 1979 WARC invited the CCIR to study the propagation data in Appendix 28 and to propose to the next World Administrative Radio Conference a revision to Appendix 28;

b) that neither Appendix 28 nor the related CCIR texts deal with the bi-directional sharing of a frequency band by earth stations in the fixed-satellite service;

c) that only a WARC dealing with the fixed-satellite service is likely to be competent to revise the sharing procedures in Appendix 28;

invites

the CCIR to study the sharing between earth stations of the fixed-satellite service in those bands which are allocated on a bi-directional basis;

resolves

1. Annex 4 of these Final Acts should be revised wherever Appendix 28 is revised under noting a);

2. Annex 4 of these Final Acts should also be revised wherever Appendix 28 is revised under noting c);

requests

that the Administrative Council then place, as an extraordinary item, on the agendas of the WARCs, considering revisions to Appendix 28 under the notings a) and c), the consequential revisions to Annex 4 of these Final Acts.

J. ZAMUDIO ZEA
Chairman of Working Group 4C

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

Document No. DL/48-E
6 July 1983
Original : English

WORKING GROUP 4C

RESOLUTION No. [7

Relating to the coordination of feeder-link earth stations to the broadcasting-satellite service with receiving fixed-satellite earth stations in the band 17.7 - 17.8 GHz

The Regional Administrative Radio Conference for the planning of the Broadcasting-Satellite Service in Region 2, Geneva, 1983,

considering

a) that the band 17.7 - 17.8 GHz is allocated to the fixed-satellite service in the Earth-to-space (feeder links for broadcasting-satellite service) and the space-to-Earth directions (bi-directional use);

b) that Annex 4 of these Final Acts has utilized the latest CCIR studies along with Appendix 28 to the Radio Regulations in establishing a coordination area around a feeder-link earth station;

c) that the latest CCIR propagation data was used in the development of Annex 3 (Part I) and Annex 6 (Part II) of these Final Acts;

noting

a) that Resolution No. 60 of the 1979 WARC invited the CCIR to study the propagation data in Appendix 28 and to recommend to the next competent World Administrative Radio Conference a revision to Appendix 28;

b) that neither Appendix 28 nor the related CCIR texts deal with the bi-directional sharing of a frequency band by earth stations in the fixed-satellite service;

invites

the CCIR to study the sharing between earth stations of the fixed-satellite service in those bands which are allocated on a bi-directional basis;

requests

the Secretary-General in consultation with the IFRB to update those sections of these Final Acts which would be consequential to any future revision of Appendix 28.

J. ZAMUDIO ZEA
Chairman of Working Group 4C

INTERNATIONAL TELECOMMUNICATION UNION

BROADCASTING-SATELLITE CONFERENCE (REGION 2)

GENEVA, 1983

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Original : English

WORKING GROUP 4C

CRITERIA FOR PLAN MODIFICATION

Working Group 4C has considered the need for establishing limits to determine when an administration will be affected by modifications to the Plan and propose the following text for inclusion in the Final Acts.

A. The following text is proposed for inclusion in paragraph 1, Annex 1 in Section I of the Final Acts (reference Document No. 75(Rev.4)) :

1. Limits on the change in the overall equivalent protection margin with respect to frequency assignments in accordance with the Plan

With respect to paragraph [4.3.1.1] an administration shall be considered as being affected if the effect of the proposed modification to the Plan would result in the overall protection margin[3] of its entry in the Plan, including the cumulative effect of any previous modifications to the Plan, falling either below 0 dB, or, if already negative, more than 0.25 dB below the value resulting from the frequency assignments in the Plan at the date of entry into force of the Final Acts of the RARC-83-BSS, Geneva.

---

[3] For definition of overall equivalent protection margin, see item 1.1.4 Annex [5] of these Final Acts.

B. The following text is proposed for inclusion as Annex 1 of Section II of the Final Acts (feeder links) :

ANNEX 1

Limits for determining whether a service of an administration is considered to be affected by a proposed modification to the feeder link Plan (Article 4, paragraph [ ])[1]

1. Limits on the change in the overall equivalent protection margin with respect to frequency assignments in accordance with the Plan

With respect to paragraph [ ] an administration shall be considered as affected if the effect of the proposed modification to the feeder link Plan would result in the overall protection margin[2] of its entry in the Plan, including the cumulative effect of any previous modifications to the Plan, falling either below 0 dB or if already negative, more than 0.25 dB below the value resulting from the frequency assignments on the Plan at the date of entry into force of the Final Acts of the RARC-83-BSS, Geneva.

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[1] The limits specified in this Annex relate to the power flux-densities, which would be obtained assuming clear air propagation conditions, including the effects of atmospheric absorption.

[2] For definition of overall equivalent protection margin, see item 1.1.4, Annex [5] of these Final Acts.

R. GOULD
Chairman of ad hoc Group 2 of Working Group 4C

UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS

CONFÉRENCE DE RADIODIFFUSION PAR SATELLITE (RÉGION 2)

GENÈVE, 1983

Document N° DL/50(Rév.)-F/E/S
9 juillet 1983
Original : français
anglais
espagnol

COMMISSION 6
COMMITTEE 6
COMISION 6

PARTIE II

Article 7

Procédures préliminaires, notification et inscription dans le Fichier de référence international des fréquences d'assignations de fréquence aux stations du service fixe par satellite (espace vers Terre) dans la Région 2 dans la bande 17,7 - 17,8 GHz, lorsque des assignations de fréquence à des stations de liaison de connexion du service de radiodiffusion par satellite figurant dans le Plan sont impliquées.

7.1 Les dispositions des articles 11 et 13 et de l'appendice 29 du Règlement des radiocommunications, ainsi que les dispositions de l'annexe 4 à la présente Partie, sont applicables aux stations spatiales d'émission du service fixe par satellite de la Région 2 dans la bande 17,7 - 17,8 GHz mais, en ce qui concerne les stations de liaison de connexion de la Région 2, la valeur de seuil indiquée dans l'appendice 29 au Règlement des radiocommunications est remplacée par celles spécifiées dans l'annexe 4 à la présente Partie.

7.2 Dans la planification administrative pour la mise en oeuvre des assignations aux stations terriennes de réception dans la bande 17,7 - 17,8 GHz du service fixe par satellite (espace vers Terre), il convient de supposer que les stations terriennes de liaison de connexion utilisées par d'autres pays peuvent être situées à la frontière de leurs territoires. Si l'administration en question estime qu'un brouillage peut être causé par les stations terriennes de liaison de connexion à sa station terrienne en projet du service fixe par satellite, elle peut demander à l'administration responsable de la station terrienne de liaison de connexion d'indiquer les emplacements réels prévus des stations terriennes de liaison de connexion.

7.3 Une administration qui reçoit une demande aux termes du paragraphe 7.2 doit, dans un délai de /_7, indiquer les emplacements réels de ses stations terriennes et les communiquer au Comité afin de mettre le Plan à jour.

7.4 Si, à l'expiration du délai de /_7, l'administration responsable de la station terrienne du service fixe par satellite ne reçoit pas de réponse, elle peut demander l'assistance du Comité.

7.5 Si l'administration responsable des stations terriennes de liaison de connexion ne communique pas au Comité, dans un délai de /_7, les emplacements réels de ses stations terriennes de liaison de connexion, cette administration peut mettre en oeuvre sa station terrienne de liaison de connexion, à condition qu'elle ne cause pas de brouillage préjudiciable à la station terrienne du service fixe par satellite faisant l'objet de l'examen.

PART II

Article 7

Preliminary Procedure, Notification and Recording in the Master Register of Frequency Assignments to stations in the Fixed-Satellite Service (space-to-Earth) in Region 2 in the band 17.7 - 17.8 GHz, when frequency assignments to feeder link for broadcasting-satellite stations appearing in the Region 2 Plan are involved.

7.1 The provisions of Articles 11 and 13 and Appendix 29 of the Radio Regulations are applicable to transmitting space stations in the Fixed-Satellite Service of Region 2 in the band 17.7 - 17.8 GHz together with the provisions of Annex 4 of this Part, except that in relationship with feeder link stations in Region 2, the threshold value mentioned in Appendix 29 of the Radio Regulations is replaced by those given in Annex 4 of this Part.

7.2 Administrations planning to implement assignments for receiving earth stations in the 17.7 - 17.8 GHz band in the Fixed-Satellite Service (space-to-Earth) should assume that feeder link earth stations used by other countries may be located on the border of their territories. Should this administration find that an interference may be caused by the feeder link earth stations to its planned fixed-satellite earth station, it may request the administration responsible for the feeder link earth station to indicate the planned actual locations of the feeder link earth stations.

7.3 An administration which receives a request under 7.2 shall, within a period of [ ] indicate the actual locations of its earth stations and communicate it to the Board in order to update the Plan.

7.4 If, at the end of the period of [ ], the administration responsible for the fixed-satellite earth station does not receive a reply, it may request the assistance of the Board in this matter.

7.5 If the administration responsible for the feeder link earth stations does not communicate to the Board, within a period of [ ], the actual locations of its feeder link earth stations, this administration may implement its feeder link earth station provided it does not cause harmful interference to the fixed-satellite earth station under consideration.

PARTE II

Artículo 7

Procedimientos preliminares, notificación e inscripción en el Registro Internacional de Frecuencias de las asignaciones de frecuencia a estaciones del servicio fijo por satélite (espacio-Tierra) en la Región 2 en la banda 17,7 - 17,8 GHz, cuando están implicadas asignaciones de frecuencia a estaciones de enlace de conexión del servicio de radiodifusión por satélite que figuran en el Plan de la Región 2.

7.1 Son aplicables en la banda 17,7 - 17, 8 GHz a las estaciones espaciales transmisoras del servicio fijo por satélite en la Región 2 las disposiciones de los artículos 11 y 13 y del apéndice 29 del Reglamento de Radiocomunicaciones junto con las del anexo 4 de esta Parte, salvo que, en relación con las estaciones de enlace de conexión en la Región 2, el valor umbral mencionado en el apéndice 29 al Reglamento de Radiocomunicaciones se sustituye por los valores indicados en el anexo 4 de esta Parte.

7.2 Las administraciones que se propongan utilizar las asignaciones a estaciones receptoras en la banda 17,7 - 17,8 GHz del servicio fijo por satélite (espacio-Tierra) deberán suponer que las estaciones terrenas de enlace de conexión utilizadas por otros países pueden estar ubicadas en la frontera de sus territorios. Si esta administración concluye que las estaciones terrenas de enlace de conexión pueden causar interferencia a su estación terrena prevista del servicio fijo por satélite podrá solicitar a las administraciones de las que depende la estación terrena de enlace de conexión que indiquen la ubicación efectiva prevista de las estaciones terrenas de enlace de conexión.

7.3 Toda administración que reciba una petición en virtud del punto 7.2, deberá, en un periodo de / _/, indicar la ubicación efectiva de sus estaciones terrenas y comunicarla a la Junta para la actualización del Plan.

7.4 Si, al término del periodo de / _/ la administración encargada de la estación terrena del servicio fijo por satélite no recibe una respuesta, puede solicitar a este respecto la asistencia de la Junta.

7.5 Si la administración encargada de las estaciones terrenas de enlace de conexión no comunica a la Junta, dentro de un periodo de / _/, la posición efectiva de sus estaciones terrenas de enlace de conexión, podrá poner en servicio su estación terrena de enlace de conexión siempre que no cause interferencia perjudicial a la estación terrena del servicio fijo por satélite de que se trate.

El Presidente de la Comisión 6

J.A. ZAVATTIERO

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PARTIE II

Article 7

Procédures préliminaires, notification et inscription dans le Fichier de référence international des fréquences d'assignations de fréquence aux stations du service fixe par satellite (espace vers Terre) dans toutes les Régions et (Terre vers espace) dans les Régions 1 et 3 dans la bande 17,7 - 17,8 GHz, lorsque des assignations de fréquence à des stations sur liaisons de connexion figurant dans le Plan sont impliquées.

7.1 Les dispositions des articles 11 et 13 du Règlement des radiocommunications sont applicables au service fixe par satellite dans cette bande excepté que, en ce qui concerne les stations des liaisons de connexion de la Région 2, la valeur de seuil indiquée dans l'appendice 29 au Règlement des radiocommunications est remplacée par celles qui sont indiquées dans l'annexe 4 à la présente partie.

7.2 Il convient de tenir dûment compte, dans la planification administrative pour la mise en oeuvre des assignations aux stations de réception dans la bande 17,7 - 17,8 GHz du service fixe par satellite (espace vers Terre) de l'emplacement des stations terriennes des liaisons de connexion associées au service de radiodiffusion par satellite dans la même bande.

(La méthode indiquées à l'annexe 4, section 5, de la présente Partie permet de déterminer quand une situation incompatible risque éventuellement de se présenter.)

Le Président de la Commission 6
J.A. ZAVATTIERO

PART II

Article 7

Preliminary Procedure, Notification and Recording in the Master Register of Frequency Assignments to stations in the Fixed-Satellite Service (space-to-Earth) in all Regions and (Earth-to-space) in Regions 1 and 3 in the band 17.7 - 17.8 GHz, when frequency assignments to feeder link stations appearing in the Region 2 Plan are involved.

7.1 The provisions of Article 11 and 13 of the Radio Regulations are applicable to the Fixed-Satellite Service in this band except that in relationship with feeder link stations in Region 2, the threshold value mentioned in Appendix 29 of the Radio Regulations is replaced by those given in Annex 4 of this Part.

7.2 Administrations planning to implement assignments for receiving earth stations in the 17.7 - 17.8 GHz band in the Fixed-Sat lite Service (space-to-Earth) should take due account of the locations of feeder link earth stations associated with the Broadcasting-Satellite Service in the same band. (The method given in Annex 4, Section 5 of this Part provides a means of determining when a potential incompatible situation could occur).

J.A. ZAVATTIERO
Chairman of Committee 6

PARTE II

Artículo 7

Procedimientos preliminares, notificación e inscripción en el Registro Internacional de Frecuencias de las asignaciones de frecuencia a estaciones del servicio fijo por satélite (espacio-Tierra) en todas las Regiones y (Tierra-espacio) en las Regiones 1 y 3 en la banda 17.7 - 17.8 GHz, cuando están implicadas asignaciones de frecuencia a estaciones de enlace de conexión que figuran en el Plan de la Región 2.

7.1 Son aplicables en esta banda al servicio fijo por satélite las disposiciones de los Artículos 11 y 13 del Reglamento de Radiocomunicaciones, salvo que en relación con las estaciones de enlace de conexión en la Región 2, el valor umbral mencionado en el Apéndice 29 al Reglamento de Radiocomunicaciones se sustituye por los valores indicados en el Anexo 4 de esta Parte.

La planificación administrativa para utilizar las asignaciones a estaciones receptoras en la banda 17,7 - 17,8 GHz del servicio fijo por satélite (espacio-Tierra) debe tener en cuenta debidamente los emplazamientos de las estaciones terrenas de enlace de conexión asociadas con el servicio de radiodifusión por satélite en la misma banda.

(El método indicado en el anexo 4, sección 5 de esta Parte proporciona un medio para determinar cuándo puede presentarse una situación potencialmente incompatible.)

El Presidente de la Comisión 6
J.A. ZAVATTIERO

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Paragraphe à ajouter à l'article 3 (Partie I)

3.3 Le Plan étant fondé sur le groupement des stations spatiales occupant des positions orbitales nominales de ± 0,2° de chaque côté du centre d'un groupe de satellites, une administration peut utiliser n'importe quelle position orbitale plus proche de ce centre, sous réserve d'obtenir l'accord des administrations qui ont des assignations à des stations spatiales faisant partie du même groupe et qui se trouvent affectées.

A paragraph to be added to Article 3 (Part I)

3.3 The Plan being based on the grouping of space stations in nominal orbital positions of ±0.2° on both sides of the centre of a cluster of satellites, an administration may use any orbital position closer to this centre provided it obtains the agreement of administrations having assignments to space stations pertaining to the same cluster and which are affected.

Párrafo para incluir en el artículo 3 (Parte I)

3.3 Al basarse el Plan en la agrupación de estaciones espaciales en posiciones orbitales nominales de ±0,2° a ambos lados del centro de un grupo de satélites, una administración podrá utilizar cualquier posición orbital más próxima a este centro siempre que obtenga el acuerdo de las administraciones afectadas que tengan asignaciones a estaciones espaciales pertenecientes al mismo grupo.

Paragraphe à ajouter à l'article 3 (Partie II)

3.3 Le Plan étant fondé sur le groupement de stations spatiales occupant des positions orbitales nominales de ± 0,2° de chaque côté du groupe de satellites ainsi que sur l'utilisation d'une antenne de station terrienne ayant un diamètre de 5 mètres, une administration peut utiliser une antenne d'un diamètre supérieur sous réserve d'obtenir l'accord des administrations ayant des assignations à des stations spatiales du même groupe qui sont susceptibles d'être affectées et de toute autre administration ayant une station spatiale avec laquelle la séparation orbitale est inférieure à 0,8°.

A paragraph to be added to Article 3 (Part II)

3.3 The Plan being based on the grouping of space stations in nominal orbital positions of ±0.2° on both sides of the cluster of satellites and on the use of an earth station antenna diameter of 5 metres, an administration may use a greater antenna diameter provided it obtains the agreement of administrations having assignments to space stations in the same cluster which may be affected, and of any other administration having a space station separated by less than 0.8°.

Párrafo para incluir en el artículo 3 (Parte II)

3.3 Al basarse el Plan en la agrupación de estaciones espaciales en posiciones orbitales nominales de ±0,2° a ambos lados del grupo de satélites y en la utilización de antenas de estación terrena de un diámetro de 5 m, una administración podrá utilizar una antena de diámetro mayor siempre que obtenga el acuerdo de las administraciones que tengan asignaciones a estaciones espaciales del mismo grupo que puedan ser afectadas, y de cualquier otra administración que tenga una estación espacial a una separación inferior a 0,8°.

Le Président de la Commission 6
J.A. ZAVATTIERO

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RESUME DE LA SITUATION ACTUELLE

		Document No.
Préambule	Com 7	216
Définitions générales	bleu	186
Partie I - Articles 1 - 2	bleu	186
Article 3 - para 3.1	bleu	186
para 3.2		156
para 3.3		DL/51
Article 4 à 8 et 10	Com 7	218
Partie II - Articles 1 à 5 et 8 à 10		205
Article 7		DL/50
Partie III - Articles 8 à 15A	bleu	186
AP 30 - adopté sur DT/54 pourrait être envoyé directement à Com. 7		
Partie V - Résolution Com 6/		156 DT/51 DT/52
Résolution Com 6/3 (Terre)	Com 7	216
Recommandation Com 6/1 (Assignations Allotissements	bleu	186
Récommendation Com 6/2	Com 7	216
Résolution Com 6/ (Terre-puissance)		DT/53
Résolutions Com 6/ (Compatibilité)		DT/55

J.A. ZAVATTIERO
Président de la Commission 6

RESUMEN OF THE PRESENT SITUATION

		Document N°
Preamble	Com 7	216
General Definitions	Blue	186
Part I - Articles 1 - 2	Blue	186
Article 3 - para. 3.1	Blue	186
para. 3.2		156
para. 3.3		DL/51
Article 4 to 8 and 10	Com 7	218
Part II - Articles 1 to 5 and 8 to 10		205
Article 7		DL/50
Part III - Articles 8 to 15A	Blue	186
AP 30 - adopted on DT/54 could be sent directly to Co. 7		
Part V - Res. COM/6		156 DT/51 DT/52
Res. COM 6/3 (Terrestrial)	Com 7	216
Rec. COM 6/1 (Assignations, Allottments)	Blue	186
Rec. COM 6/2	Com 7	216
Res. COM 6/ (Terrestrial-power)		DT/53
Res. COM 6/ (Compatibility)		DT/55

J.A. ZAVATTIERO
Chairman of Committee 6

RESUMEN DE LA SITUACIÓN ACTUAL

		Documento N.°
Preámbulo	Com 7	216
Definiciones generales	azul	186
Parte I - Artículos 1 y 2	azul	186
Artículo 3 - punto 3.1	azul	186
punto 3.2		156
punto 3.3	DL/51	
Artículos 4 a 8 y 10	Com 7	218
Parte II - Artículos 1 a 5 y 8 a 10		205
Artículo 7		DL/50
Parte III - Artículos 8 a 15A	azul	186
AP 30 - Adoptado en el DT/54, podría enviarse directamente a la Com 7		
Parte V - Resolución COM6/		156 DT/51 DT/52
Resolución COM6/3 (Terrenal)	Com 7	216
Recomendación COM(/1 (Asignaciones Adjudicaciones	azul	186
Recomendación COM6/2	Com 7	216
Resolución COM6/ (Terrenal - potencia)		DT/53
Resoluciones COM6/ (Compatibilidad)		DT/55

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Presidente de la Comisión 6