MOD

ITEM 8B – Radiated power (dBW)

The radiated power expressed in dBW in one of the forms described in Nos. **S1.161** to **S1.163**.

ADD

ITEM 8BA – Range of power control

In the case of systems where automatic power control is applied, the range of power control (dB) above the nominal power indicated in 8B.

MOD

ITEM 8BH – Maximum effective radiated power (dBW) – horizontal

The maximum effective radiated power of the horizontally polarized component (for VHF sound broadcasting (BC) and VHF/UHF television broadcasting (BT) assignments).

MOD

ITEM 8BV – Maximum effective radiated power (dBW) – vertical

The maximum effective radiated power of the vertically polarized component (for VHF sound broadcasting (BC) and VHF/UHF television broadcasting (BT) assignments).

MOD

ITEM 8D – Vision/sound power ratio

Vision/sound carrier power ratio for VHF/UHF analogue television broadcasting (BT) assignments.

MOD

ITEM 9A – Azimuth of maximum radiation

For a directional transmitting antenna, the azimuth of maximum radiation of the transmitting antenna in degrees (clockwise) from True North.

MOD

ITEM 9AA – Central azimuth of augmentation

The central azimuth of the augmentation (centre of the span) in degrees for an assignment to an MF broadcasting station in Region 2.

MOD

ITEM 9CA – Total span of augmentation

The total span of the augmentation in degrees for an assignment to an MF broadcasting station in Region 2.

SUP

ITEM 9H

MOD

ITEM 9I – Maximum radiation or r.m.s. value of radiation

The maximum radiation, in dB, relative to a cymomotive force (c.m.f.) of 300 V or an effective monopole radiated power (e.m.r.p.) of 1 kW, determined from the nominal power of the transmitter and the theoretical gain of the antenna without allowing for miscellaneous losses.

For assignments to stations of the broadcasting service covered by the MF Broadcasting Agreement (Region 2) (Rio de Janeiro, 1981), the product of the r.m.s. characteristic field strength, calculated in the horizontal plane, and the square root of the power.

ADD

ITEM 9L – Maximum effective radiated power (dB(kW))

The maximum effective radiated power, expressed in dB relative to an e.r.p. of 1 kW on a short vertical antenna.

SUP

ITEM 9N

MOD

ITEM 9NH – Attenuation (dB) of the horizontally polarized component at different azimuths

The value of attenuation of the horizontally polarized component in the horizontal plane at different azimuths, with respect to the maximum e.r.p. of this component, expressed in dB.

MOD

ITEM 9NV – Attenuation (dB) of the vertically polarized component at different azimuths

The value of attenuation of the vertically polarized component in the horizontal plane at different azimuths, with respect to the maximum e.r.p. of this component, expressed in dB.

MOD

ITEM 9Q – Type of antenna

Symbol designating a simple vertical antenna or any other antenna.

MOD

ITEM 9R – Slew angle

For HF broadcasting stations in their exclusive bands, the slew angle represents the difference between the azimuth of maximum radiation and the direction of unslewed radiation.

MOD

ITEM 9T3 – Phase difference of the field

The positive or negative phase difference in the tower field with respect to the field of the reference tower, in degrees.

SUP

ITEM 9T6

MOD

ITEMS 9T9A to 9T9D – Description of top-loaded or sectionalized tower

Description of top-loaded or sectionalized towers, in accordance with the RJ81 Agreement.

SUP

ITEM 10A

MOD

ITEM 10CA – Start date

For HF broadcasting stations in their exclusive bands, this parameter is used in the case that the requirement starts after the start of the schedule.

MOD

ITEM 10CB – Stop date

For HF broadcasting stations in their exclusive bands, this parameter is used in the case that the requirement stops before the end of the schedule.

MOD

ITEM 10CC – Days of operation

For HF broadcasting stations in their exclusive bands, this parameter is used when the station does not transmit every day of the week.

MOD

ITEM 11 – Coordination with other administrations

Symbol of the administration with which coordination has been effected and the provision (No. of the Radio Regulations, regional agreement, or other arrangement) requiring such coordination.

SUP

ANNEX 1B

Table of characteristics to be submitted for stations in the terrestrial services

ADD

ANNEX 1B

Table of characteristics to be submitted for stations in the terrestrial services

Notice type	T01	T02	T03	T04	T11	T12			T13		T14	T15	T16	T17		AR S12	Notice type
Item No.	BC	BT	BC	BC	FX	AL, BC[1], FA, FB, FC, FL, FP, LR, OE, RN, SS	FD, FG, SM	NL	AM, MA, ML, MO, MR, MS, NR, OD, SA	RM	AL[2], FA[1], FB[3], FC[2], FD[2], FG[2], FL, FP, FX[1], LR, NL[2], OE, RN, SM, SS	FC[4]	AL[5], FC[5]	FX	FA, FB, FC[1], FD[1], FG[1], FL, FP	BC	Item No.
B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	B
SYNC			+	+													SYNC
1A	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	1A
1AA														X	X		1AA
1B					+	+	+	+	+	+	+		+	+	+		1B
1C						+						*[6]				O	1C
1E		*[7,13]															1E
1E1		*[7,13]															1E1
1G																O	1G
1X												*[6]	O				1X
1Y												O					1Y
1Z												+					1Z
2C	+	+	+	+	X	X	X	X	X	X	X	X		X	X		2C
3A	O	O	O	O	+	+	X	O						+	X	O	3A

X Mandatory * One of the items + Required in specific cases O Optional

Table of characteristics to be submitted for stations in the terrestrial services *(cont.)*

Notice type	T01	T02	T03	T04	T11	T12			T13		T14	T15	T16	T17		AR S12	Notice type
Item No.	BC	BT	BC	BC	FX	AL, BC[1], FA, FB, FC, FL, FP, LR, OE, RN, SS	FD, FG, SM	NL	AM, MA, ML, MO, MR, MS, NR, OD, SA	RM	AL[2], FA[3], FB[3], FC[2], FD[2], FG[2], FL, FP, FX[3], LR, NL[2], OE, RN, SM, SS	FC[4]	AL[5], FC[5]	FX	FA, FB, FC[2], FD[2], FG[2], FL, FP	BC	Item No.
4A	X	X	X	X	X	X	X	X				+	X	X	X	X	4A
4B	X	X	X	X	X	X	X	X					X	X	X		4B
4C	X	X	X	X	X	X	X	X	*[8]	X	*[8]	+	X	X	X	X	4C
4D									*[8]	X	*[8]						4D
4E									*[8]		*[8]	X					4E
4G			X														4G
5A					X[9]				X	X				X[9]			5A
5B					X[9]				X	X				X[9]			5B
5C					X[9]	*[10]	*[10]	*	X	X				X[9]	*[10]		5C
5D						*[10]	*[10]					X			*[10]	X	5D
5E						*[10]	*[10]	*					X		*[10]		5E
5F						*[10]	*[10]	*					X		*[10]		5F
5G					O	O	O	O				O		O	O		5G
6A					X	X	X	X	X	X	X	X	X	X	X		6A
6B					X	X	X	X	X	X	X	X	X	X	X		6B
7A	X[11]		X[11]	O	X	X	X	X	X	X	X	X	X	X	X		7A
7A1		+[7]															7A1
7AA																X	7AA
7B				X	+									+			7B
7B1			X														7B1
7C1		X															7C1
7C2		+[7]															7C2
7D	+																7D
7E					+[12]												7E

X Mandatory * One of the items + Required in specific cases O Optional

Table of characteristics to be submitted for stations in the terrestrial services *(cont.)*

Notice type	T01	T02	T03	T04	T11	T12			T13		T14	T15	T16	T17		AR S12	Notice type
Item No.	BC	BT	BC	BC	FX	AL, BC[1], FA, FB, FC, FL, FP, LR, OE, RN, SS	FD, FG, SM	NL	AM, MA, ML, MO, MR, MS, NR, OD, SA	RM	AL[2], FA[3], FB[3], FC[2], FD[2], FG[2], FL, FP, FX[3], LR, NL[2], OE, RN, SM, SS	FC[4]	AL[5], FC[5]	FX	FA, FB, FC[2], FD[2], FG[2], FL, FP	BC	Item No.
7F					+[12]												7F
8					X	X	X	X	X	X	X	X		X	X		8
8A			X	X	*	*	X	*	*	*	*	X		X	X	X	8A
8AB					+[12]												8AB
8B					*	*	*	*	*	*	*			+	+		8B
8BA														O	O		8BA
8BH	X	X															8BH
8BV	X	X															8BV
8D		+[7]															8D
9	X	X			X	X	X	X				X		X	X		9
9A					+	+	+	+				+		+	+	X	9A
9AA				+													9AA
9AB					+	+	+	+				+		+	+		9AB
9B					+	+	+	+									9B
9C					+	+	+	+				+		+	+		9C
9CA				+													9CA
9D	X	X			+												9D
9E	X	+	X		+	+	+	+									9E
9EA	X	+			+	+	+	+									9EA
9EB	X	X															9EB
9EC	+	+															9EC
9F				+													9F
9G					+	+	+	+			+	+		+	+		9G
9GH			+														9GH
9GV			+														9GV

X Mandatory * One of the items + Required in specific cases O Optional

Table of characteristics to be submitted for stations in the terrestrial services *(cont.)*

Notice type	T01	T02	T03	T04	T11	T12			T13		T14	T15	T16	T17		AR S12	Notice type
Item No.	BC	BT	BC	BC	FX	AL, BC[1], FA, FB, FC, FL, FP, LR, OE, RN, SS	FD, FG, SM	NL	AM, MA, ML, MO, MR, MS, NR, OD, SA	RM	AL[2], FA[3], FB[3], FC[2], FD[2], FG[2], FL, FP, FX[3], LR, NL[2], OE, RN, SM, SS	FC[4]	AL[5], FC[5]	FX	FA, FB, FC[2], FD[2], FG[2], FL, FP	BC	Item No.
9I				X													9I
9IA				+													9IA
9J					O	O	O	O						O	O	X	9J
9K					+[12]												9K
9L			X														9L
9NA				+													9NA
9NH	+	+															9NH
9NV	+	+															9NV
9O				+													9O
9P				O													9P
9Q			X	X													9Q
9R																X	9R
9T1				+													9T1
9T2				+													9T2
9T3				+													9T3
9T4				+													9T4
9T5				+													9T5
9T7				+													9T7
9T8				+													9T8
9T9A				+													9T9A
9T9B				+													9T9B
9T9C				+													9T9C
9T9D				+													9T9D
10B	+	+	X	X	X	X	X	X	X	X	X	X	X	X	X		10B
10CA																+	10CA

X Mandatory * One of the items + Required in specific cases O Optional

Table of characteristics to be submitted for stations in the terrestrial services *(end)*

Notice type	T01	T02	T03	T04	T11	T12			T13		T14	T15	T16	T17		AR S12	Notice type
Item No.	BC	BT	BC	BC	FX	AL, BC[1], FA, FB, FC, FL, FP, LR, OE, RN, SS	FD, FG, SM	NL	AM, MA, ML, MO, MR, MS, NR, OD, SA	RM	AL[2], FA[3], FB[3], FC[2], FD[2], FG[2], FL, FP, FX[3], LR, NL[2], OE, RN, SM, SS	FC[4]	AL[5], FC[5]	FX	FA, FB, FC[2], FD[2], FG[2], FL, FP	BC	Item No.
10CB																+	10CB
10CC																+	10CC
10D												X					10D
10E												X					10E
11	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O		11
12A	O	O	O	O	O	O	O	O	O	O	O			O	O	+	12A
12B	+	+	+	+	X	X	X	X	X	X	X			X	X		12B

X Mandatory * One of the items + Required in specific cases O Optional

1 Outside the planned LF/MF bands and the VHF/UHF bands (up to 960 MHz), the HF bands that are governed by Article **S12**.

2 In the non-planned bands.

3 Outside the bands governed by the GE85M and GE89 Regional Agreements.

4 In the bands governed by Appendix **S25**.

5 In the bands governed by the GE85 Regional Agreement.

6 1C or 1X.

7 For analogue television only if the frequency stability is normal or precision.

8 (4C and 4D) or (4E).

9 (5A, 5B and 5C) or (minimum three sets of 5C).

10 (Minimum three sets of 5C) or (5D) or (5E and 5F).

11 The necessary bandwidth only.

12 This information may be furnished for stations in the fixed service when the parameters are used as a basis for effecting coordination with another administration.

13 1E or 1E1.

ANNEX 2A

Characteristics of satellite networks or earth or radio astronomy stations[2]

A General characteristics to be provided for the satellite network or the earth or radio astronomy station

A.2 Date of bringing into use

MOD

a) The date (actual or foreseen, as appropriate) of bringing the frequency assignment (new or modified) into use. The date of bringing into use denotes the date at which the frequency assignment is brought into regular operation[2a] to provide the published radiocommunication service with the technical parameters within the technical characteristics notified to the Bureau. Whenever the assignment is changed in any of its basic characteristics (except in the case of a change in § A.1 *a)*), the date to be given shall be that of the latest change (actual or foreseen, as appropriate).

ADD

[2a] Pending further studies by ITU-R on the applicability of the term "regular operation" to non-GSO satellite networks, the condition of regular operation shall be limited to GSO satellite networks.

ADD

A.4 *b)*

In addition, if the stations operate in a frequency band subject to **S22.5C**, **S22.5D** or **S22.5F**:

6) new data elements required to characterize properly the orbital operation of the non-GSO satellite systems:

a) for each range of latitudes provide:

– the maximum number of non-GSO satellites transmitting with overlapping frequencies to a given location; and

– the associated latitude range;

b) the minimum altitude of the space station above the surface of the Earth at which any satellite transmits;

c) an indicator identifying if the space station uses station-keeping to maintain a repeating ground track;

d) where the space station uses station-keeping to maintain a repeating ground track, the time in seconds that it takes for the constellation to return to its starting position, i.e. such that all satellites are in the same location with respect to the Earth and each other;

e) an indicator identifying if the space station should be modelled with a specific precession rate of the ascending node of the orbit instead of the J_2 term;

f) for a space station that is to be modelled with a specific precession rate of the ascending node of the orbit instead of the J_2 term, the precession rate in degrees/day, measured counter-clockwise in the equatorial plane;

g) the longitude of the ascending node for the j-th orbital plane, measured counter-clockwise in the equatorial plane from the Greenwich meridian to the point where the satellite orbit makes its south-to-north crossing of the equatorial plane ($0° \leq \Omega_j < 360°$) (NOTE 1);

h) the time at which the satellite is at the location defined by Ω_j (NOTE 1);

i) the longitudinal tolerance of the longitude of the ascending node.

NOTE 1 – For the evaluation of epfd a reference to a point on the Earth is used and hence the "longitude of the ascending node" is required. All satellites in the constellation should use the same reference time.

7) new data elements required to characterize properly the performance of the non-GSO satellite systems:

a) the maximum number of non-GSO satellites receiving simultaneously with overlapping frequencies from the associated earth stations within a given cell;

b) the average number of associated earth stations with overlapping frequencies per square kilometre within a cell;

c) the average distance between co-frequency cells;

d) for the exclusion zone about the geostationary satellite orbit provide:

– the type of zone;

– the width of the zone in degrees.

A.7 Earth station site characteristics

MOD

a) The horizon elevation angle in degrees for each azimuth around the earth station.

SUP

b)

ADD

b) The distance in kilometres from the earth station to the horizon for each azimuth around the earth station.

SUP

c)

ADD

c) that is operating to an associated GSO space station, and having due regard to possible inclined-orbit operation of the associated space station:

1) the planned minimum angle of elevation of the antenna in the direction of maximum radiation in degrees from the horizontal plane;

2) the planned range of operating azimuthal angles for the direction of maximum radiation in degrees, clockwise from True North.

ADD

d) that is operating to associated non-GSO space stations, the minimum angle of elevation of the antenna in the direction of maximum radiation in degrees from the horizontal plane for each azimuth around the earth station.

(MOD)

e) The altitude (metres) of the antenna above mean sea level.

SUP

A.9

ADD

A.14 Spectrum masks

For stations operating in a frequency band subject to **S22.5C**, **S22.5D** or **S22.5F**.

a) for each e.i.r.p. mask used by the non-GSO space station provide:

- the type of mask;
- the mask identification code;
- the mask pattern defined in terms of the power in the reference bandwidth for a series of off-axis angles with respect to a specified reference point;
- the lowest frequency for which the mask is valid;
- the highest frequency for which the mask is valid;

b) for each associated earth station e.i.r.p. mask provide:

- the type of mask;
- the mask identification code;
- the mask pattern defined in terms of the power in the reference bandwidth for a series of off-axis angles with respect to a specified reference point;
- the lowest frequency for which the mask is valid;
- the highest frequency for which the mask is valid;
- the minimum elevation angle at which any associated earth station can transmit to a non-GSO satellite;
- the minimum separation angle between the GSO arc and the associated earth station main beam-axis at which the associated earth station can transmit towards a non-GSO satellite;

c) for each pfd mask used by the non-GSO space station provide:

- the type of mask;
- the mask identification code;
- the mask pattern of the power flux-density defined in three dimensions;
- the lowest frequency for which the mask is valid;
- the highest frequency for which the mask is valid.

(The space-station pfd mask is defined by the maximum power flux-density generated by any space station in the interfering non-GSO system as seen from any point on the surface of the Earth.)

ADD

A.15 Commitment regarding compliance with additional operational epfd↓ limits

For non-GSO satellite systems operating in the fixed-satellite service in the bands 10.7-11.7 GHz (in all Regions), 11.7-12.2 GHz (Region 2), 12.2-12.5 GHz (Region 3), and 12.5-12.75 GHz (Regions 1 and 3), a commitment that the filed for system will meet the additional operational epfd↓ limits that are specified in Table **S22-4A1** under No. **S22.5I**.

ADD

A.16 Commitment regarding compliance with off-axis power limitations

A commitment that the earth stations operating with a GSO network in the FSS meet the off-axis power limitations given in **S22.26** to **S22.28** or **S22.32** (as appropriate) under the conditions specified in **S22.30**, **S22.31** and **S22.34** to **S22.39**, where the earth stations are subject to those power limitations.

ADD

A.17 Compliance with aggregate pfd limits

A.17 *a)*

For non-GSO satellite systems operating in the radionavigation-satellite service in the band 5 010-5 030 MHz, the aggregate power flux-density produced at the Earth's surface in the band 5 030-5 150 MHz in a 150 kHz bandwidth and in the band 4 990-5 000 MHz in a 10 MHz bandwidth, as defined in No. **S5.444C**.

A.17 *b)*

For non-GSO satellite systems operating in the FSS and BSS in the band 41.5-42.5 GHz the calculated aggregate power flux-density in any 1 MHz bandwidth produced at the site of a radio astronomy station for more than 2% of the time in the band 42.5-43.5 GHz, as defined in No. **S5.RAS**.

A.17 *c)*

For satellite systems operating in the radionavigation-satellite service in the band 1 164-1 215 MHz, the calculated aggregate power flux-density produced at the Earth's surface by all the space stations within all radionavigation-satellite systems, as defined in No. **S5.328A**.

ADD

A.17 *d)*

For non-GSO systems operating in the FSS (feeder links) in the band 15.43-15.63 GHz (space-to-Earth), the aggregate power flux-density produced at the Earth's surface in the band 15.35-15.4 GHz, as defined in No. **S5.511A**.

MOD

B.3 *g)*

1) co-polar gain of the antenna in the direction of maximum radiation referred to an isotropic radiator (dBi) and cross-polar gain of the antenna in the case of a beam of other than elliptical shape;

(MOD)

5) for beams of other than circular or elliptical shape:

– co-polar and cross-polar gain contours plotted on a map of the Earth's surface, preferably in a radial projection from the satellite on to a plane perpendicular to the line from the centre of the Earth to the satellite. The isotropic or absolute gain shall be indicated at each contour which corresponds to a decrease in gain of 2, 4, 6, 10 or 20 dB and thereafter at 10 dB intervals down to a value of 0 dB relative to an isotropic radiator. Whenever practicable, a numerical equation or table providing the necessary information to allow the gain contours to be plotted should be provided;

– beam aim point longitude and latitude;

– where a steerable beam (see No. **S1.191**) is used, the maximum antenna gain and the effective antenna gain contours (see No. **S1.176**); these contours shall be provided as defined above;

– for an assignment in the bands 14.5-14.8 GHz or 17.7-18.1 GHz, the isotropic gain in the direction of those parts of the geostationary-satellite orbit which are not obstructed by the Earth. Use a diagram to show estimated isotropic gain relative to orbit longitude;

SUP

6)

SUP

7)

C.8 Power characteristics of the transmission

MOD

h) In the case of a space station submitted in accordance with Appendix **S30**, the power supplied to the antenna (dBW) and the maximum power density per Hz supplied to the antenna (dB(W/Hz)), averaged over the worst 5 MHz and 27 MHz, and averaged over the worst 40 kHz in the case of Region 2.

C.9 *b)*

ADD

9) in the case of a digital modulation, the effective and transmitted bit rate (Mbits/s) and symbol rate (Msymbols/s);

ADD

10) roll-off factor of the filter of the receiver

ADD

d) For stations operating in a frequency band subject to Nos. **S22.5C**, **S22.5D** or **S22.5F**, provide:

– the type of mask;

– the mask identification code.

C.11 Service area

MOD

b) In the case of a space station submitted in accordance with Appendix **S30A**:

– a set of a maximum of twenty feeder-link test points; and

– a service area contour on the surface of the Earth or a service area defined by a minimum elevation angle in degrees.

c) In the case of a space station submitted in accordance with Appendix **S30** or Appendix **S30B**, the service area identified by a set of a maximum of twenty test points and by a service area contour on the surface of the Earth or a service area defined by a minimum elevation angle in degrees.

SUP

C.14

ADD

C.15 Description of the group(s) required in the case of non-simultaneous emissions

MOD

D Overall link characteristics

To be provided only when simple frequency-changing transponders are used on the space station onboard a geostationary satellite.

In the case of FSS networks using the frequency bands specified in No. **S9.7** (GSO/GSO) of Appendix **S5**, Table **S5-1** (items 1, 2 and 3 of the frequency band column), the data specified in this section of the Appendix is not mandatory and should not be submitted to the Bureau.

ANNEX 2B

Table of characteristics to be submitted for space and radio astronomy services

MOD

A – General characteristics of the satellite network or the earth station

Items in Appendix	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article S9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article S9	Notification or coordination of a geostationary-satellite network (including Appendix S30B)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station	Notice for space stations in the broadcasting-satellite service under Appendix S30	Notice for feeder-link stations under Appendix S30A	Notice for stations in the fixed-satellite service under Appendix S30B	Items in Appendix	Radio astronomy
A.1.a	X	X	X	X	X		X	X	X	A.1.a	
A.1.b							X			A.1.b	
A.1.c								X		A.1.c	
A.1.d									X	A.1.d	
A.1.e.1						X				A.1.e.1	
A.1.e.2						X				A.1.e.2	X
A.1.e.3						X				A.1.e.3	
A.1.e.4										A.1.e.4	X
A.1.f	X	X	X	X	X	X[11]	X	X	X	A.1.f	X
A.2.a	X	X	X	X	X	X	X	X	X	A.2.a	
A.2.b	X			X						A.2.b	
A.2.c										A.2.c	X
A.3			X	X	X	X	X	X		A.3	X
A.4.a.1	X			X			X	X	X	A.4.a.1	
A.4.a.2				X			X	X		A.4.a.2	
A.4.a.3				X						A.4.a.3	
A.4.a.4				X						A.4.a.4	
A.4.a.5				X						A.4.a.5	
A.4.b.1		X	X		X					A.4.b.1	
A.4.b.2		X	X		X					A.4.b.2	
A.4.b.3		X	X		X					A.4.b.3	
A.4.b.4		X	X		X					A.4.b.4	
A.4.b.5					X					A.4.b.5	
A.4.b.6					X[13]					A.4.b.6	
A.4.b.7					X[13]					A.4.b.7	
A.4.c						X				A.4.c	
A.5				X	X	X[11]	X	X	X	A.5	
A.6				X	X	X[11]	X	X	X	A.6	
A.7.a						X[11]		X		A.7.a	
A.7.b						O				A.7.b	
A.7.c 1)						X[11]		X		A.7.c 1)	
A.7.c 2)						X[11]				A.7.c 2)	
A.7.d						X[11]				A.7.d	
A.7.e						X[11]		X		A.7.e	

A – General characteristics of the satellite network or the earth station *(end)*

Items in Appendix	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article S9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article S9	Notification or coordination of a geostationary-satellite network (including Appendix S30B)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station	Notice for space stations in the broadcasting-satellite service under Appendix S30	Notice for feeder-link stations under Appendix S30A	Notice for stations in the fixed-satellite service under Appendix S30B	Items in Appendix	Radio astronomy
A.8							X			A.8	
A.10						X[11]				A.10	
A.11							X	X		A.11	
A.12								X		A.12	
A.13				X	X	X				A.13	
A.14.a					X					A.14.a	
A.14.b					X					A.14.b	
A.14c					X					A.14.c	
A.15					X					A.15	
A.16				X						A.16	
A.17.a					X					A.17.a	
A.17.b					X					A.17.b	
A.17.c					X					A.17.c	
A.17.d					X					A.17.d	

X Mandatory information O Optional information C This information need only be furnished when it has been used as a basis to effect coordination with another administration

[11] Not required for coordination under No. **S9.7A** or **S9.7B**.

[11] Required for networks operating in the bands defined in No. **S22.5C**, **S22.5D** or **S22.5F**.

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B – Characteristics to be provided for each satellite antenna beam and for each earth station antenna

Items in Appendix	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article S9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article S9	Notification or coordination of a geostationary-satellite network (including Appendix S30B)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station	Notice for space stations in the broadcasting-satellite service under Appendix S30	Notice for feeder-link stations under Appendix S30A	Notice for stations in the fixed-satellite service under Appendix S30B	Items in Appendix	Radio astronomy
B.1			X	X	X	X	X	X	X	B.1	
B.2			X	X	X	X[11]			X	B.2	
B.3.a				X						B.3.a	
B.3.b.1				X						B.3.b.1	
B.3.b.2				X						B.3.b.2	
B.3.c				C						B.3.c	
B.3.d				X			X	X	X	B.3.d	
B.3.e				X						B.3.e	
B.3.f				X				X		B.3.f	
B.3.g.1							X	X	X	B.3.g.1	
B.3.g.2							X	X	X	B.3.g.2	
B.3.g.3							X	X	X[9]	B.3.g.3	
B.3.g.4							X	X	X[9]	B.3.g.4	
B.3.g.5							X	X	X[9]	B.3.g.5	

B – Characteristics to be provided for each satellite antenna beam and for each earth station antenna *(end)*

Items in Appendix	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article S9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article S9	Notification or coordination of a geostationary-satellite network (including Appendix S30B)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station	Notice for space stations in the broadcasting-satellite service under Appendix S30	Notice for feeder-link stations under Appendix S30A	Notice for stations in the fixed-satellite service under Appendix S30B	Items in Appendix	Radio astronomy
B.4.a			X		X					B.4.a	
B.4.b			X		X					B.4.b	
B.5.a						X				B.5.a	
B.5.b						X[11]				B.5.b	
B.5.c						X[12]				B.5.c	
B.6										B.6	X

X Mandatory information O Optional information C This information need only be furnished when it has been used as a basis to effect coordination with another administration

[9] Only information on co-polar antenna characteristics is required.

[11] Not required for coordination under No. **S9.7A** or **S9.7B**.

[12] In the case of coordination under **S9.7A**, the reference radiation pattern is to be provided.

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C – Characteristics to be provided for each group of frequency assignments for a satellite antenna beam or an earth station antenna

Items in Appendix	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article S9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article S9	Notification or coordination of a geostationary-satellite network (including Appendix S30B)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station	Notice for space stations in the broadcasting-satellite service under Appendix S30	Notice for feeder-link stations under Appendix S30A	Notice for stations in the fixed-satellite service under Appendix S30B	Items in Appendix	Radio astronomy
C.1	X	X	X						X	C.1	
C.2.a				X	X	X	X	X		C.2.a	
C.2.b										C.2.b	X
C.3.a				X	X	X		X		C.3.a	
C.3.b										C.3.b	X
C.4	X	X	X	X	X	X	X	X		C.4	X
C.5.a			X	X	X			X	X	C.5.a	
C.5.b						X				C.5.b	
C.5.c										C.5.c	X
C.6			X	X	X	X[11]	X	X		C.6	
C.7.a			O	X	X	X	X	X		C.7.a	
C.7.b			O	C	C	C				C.7.b	
C.7.c			O	C	C	C				C.7.c	
C.7.d			O	C	C	C				C.7.d	
C.8.a			X[1,7]	X[7]	X[7]	C[8]				C.8.a	
C.8.b			X[1,7]	X[7]	X[7]	X[11]				C.8.b	

C – Characteristics to be provided for each group of frequency assignments for a satellite antenna beam or an earth station antenna

Items in Appendix	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article S9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article S9	Notification or coordination of a geostationary-satellite network (including Appendix S30B)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station	Notice for space stations in the broadcasting-satellite service under Appendix S30	Notice for feeder-link stations under Appendix S30A	Notice for stations in the fixed-satellite service under Appendix S30B	Items in Appendix	Radio astronomy
C.8.c			O	X[6]	X[6]	X[6, 11]				C.8.c	
C.8.d				X[2]	X[2]					C.8.d	
C.8.e			O	X[6]	X[6]	X[6, 11]				C.8.e	
C.8.f			X[3]							C.8.f	
C.8.g				C[4]	C[4]	C[4, 5]				C.8.g	
C.8.h							X			C.8.h	
C.8.i								X		C.8.i	
C.8.j									X	C.8.j	
C.9.a.1			O	C	C					C.9.a.1	
C.9.a.2			O	C	C					C.9.a.2	
C.9.a.3			O	C	C					C.9.a.3	
C.9.a.4			O	C	C					C.9.a.4	
C.9.a.5			O	C	C					C.9.a.5	
C.9.a.6			O	C	C					C.9.a.6	
C.9.b.1							X	X		C.9.b.1	
C.9.b.2							X	X		C.9.b.2	
C.9.b.3							X	X		C.9.b.3	
C.9.b.4							X	X		C.9.b.4	
C.9.b.5							X	X		C.9.b.5	
C.9.b.6							X	X		C.9.b.6	
C.9.b.7							X	X		C.9.b.7	
C.9.b.8							X	X		C.9.b.8	
C.9.b.9							X	X		C.9.b.9	
C.9.b.10							X	X		C.9.b.10	

C – Characteristics to be provided for each group of frequency assignments for a satellite antenna beam or an earth station antenna *(end)*

Items in Appendix	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article S9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article S9	Notification or coordination of a geostationary-satellite network (including Appendix S30B)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station	Notice for space stations in the broadcasting-satellite service under Appendix S30	Notice for feeder-link stations under Appendix S30A	Notice for stations in the fixed-satellite service under Appendix S30B	Items in Appendix	Radio astronomy
C.9.c			X		X					C.9.c	
C.9.d							X	X		C.9.d	
C.10.a			X	X	X					C.10.a	
C.10.b			X	X	X			X		C.10.b	
C.10.c.1			X	X	X			X	X	C.10.c.1	
C.10.c.2			X	X	X			X	X	C.10.c.2	
C.10.c.3			O	X	X			X	X	C.10.c.3	
C.10.c.4			X	X	X			X	X	C.10.c.4	
C.10.c.5			X	X	X				X	C.10.c.5	
C.10.c.6								X		C.10.c.6	
C.11.a	X[10]	X[10]	X	X	X					C.11.a	
C.11.b								X		C.11.b	
C.11.c							X		X	C.11.c	
C.11.d					X					C.11.d	
C.12									X	C.12	
C.13										C.13	X
C.15							X	X		C.15	

X Mandatory information O Optional information C This information need only be furnished when it has been used as a basis to effect coordination with another administration

1 Only the value of maximum power density is mandatory.

2 For transmission from the space station only.

3 For space-to-space relay only.

4 For transmission from the earth station only.

5 Not required for coordination under Nos. **S9.15**, **S9.17** or **S9.17A**.

6 Required, if applicable, for the type of transmission. If not applicable, a reason why it is not applicable is required.

7 One or the other of C.8.a or C.8.b is mandatory, but not both.

8 Only the value of total peak envelope power is required for coordination under Nos. **S9.15**, **S9.17** or **S9.17A**.

10 Only the list of country or geographic designators or a narrative description of the service area shall be supplied.

11 Not required for coordination under No. **S9.7A** or **S9.7B**.

APPENDIX S5

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article S9

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1

g) for terrestrial radiocommunication stations or earth stations operating in the opposite direction of transmission[4] and, in addition, operating in accordance with these Regulations, or to be so operated prior to the date of bringing the earth station assignment into service, or within the next three years from the date of dispatch of coordination data under No. **S9.29**, whichever is the longer, or from the date of the publication referred to in No. **S9.38**, as appropriate.

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[4] The associated space network characteristics must have been communicated to the Bureau under No. **S9.30** or under § 4.1.3/4.2.6 of Appendix **S30** or § 4.1.3/4.2.6 of Appendix **S30A**.

ADD

TABLE S5-1

Technical conditions for coordination
(see Article **S9**)

Reference of Article S9	**Case**	**Frequency bands (and Region) of the service for which coordination is sought**	**Threshold/condition**	**Calculation method**	**Remarks**
No. **S9.7** GSO/GSO	A station in a satellite network using the geostationary-satellite orbit (GSO), in any space radiocommunication service, in a frequency band and in a Region where this service is not subject to a Plan, in respect of any other satellite network using that orbit, in any space radiocommunication	1) 3 400-4 200 MHz 5 725-5 850 MHz (Region 1) and 5 850-6 725 MHz	i) Bandwidth overlap; and ii) Any network in the fixed-satellite service with a space station within an orbital arc of ±10 degrees of the nominal orbital position of a proposed network in the fixed-satellite service		With respect to FSS in the bands in (1), (2) and (3), an administration may request, pursuant to No. **S9.41**, to be included in requests for coordination, indicating the networks for which the value of $\Delta T/T$ calculated by the method in §§ 2.2.1.2 and 3.2 of Appendix **S8** exceeds 6%. When the

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
	service in a frequency band and in a Region where this service is not subject to a Plan, with the exception of the coordination between earth stations operating in the opposite direction of transmission	2) 10.95-11.2 GHz 11.45-11.7 GHz 11.7-12.2 GHz (Region 2) 12.2-12.5 GHz (Region 3) 12.5-12.75 GHz (Regions 1 and 3) 12.7-12.75 GHz (Region 2) and 13.75-14.5 GHz	i) Bandwidth overlap; and ii) Any network in the fixed-satellite service with a space station within an orbital arc of ±9 degrees of the nominal orbital position of a proposed network in the fixed-satellite service		Bureau, on request by an affected administration, studies this information pursuant to No. **S9.42**, the calculation method given in §§ 2.2.1.2 and 3.2 of Appendix **S8** shall be used. With respect to FSS in the bands in 1), 2) and 3), an administration may request, pursuant to No. **S9.41**, that an administration be excluded from requests for coordination,

TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
		3) 17.7-20.2 GHz and 27.5-30 GHz	i) Bandwidth overlap; and ii) Any network in the fixed-satellite service with a space station within an orbital arc of ±8 degrees of the nominal orbital position of a proposed network in the fixed-satellite service		giving as reason that the network of this administration will not be affected because value of $\Delta T/T$ calculated by the method in §§ 2.2.1.2 and 3.2 of Appendix **S8** do not exceed 6%. When the Bureau, at the request of an administration, studies this information pursuant to No. **S9.42**, the calculation method given in §§ 2.2.1.2 and 3.2 of Appendix **S8** shall be used.
		4) All frequency bands, other than those in items 1, 2 and 3, allocated to a space service, and the bands in items 1), 2) and 3) where the radio service of the proposed network or affected networks is other than the fixed-satellite service, or in the case of coordination of space stations operating in the opposite direction of transmission.	Value of $\Delta T/T$ exceeds 6%	4) Appendix **S8**	

TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **S9.7A** GSO earth station/ non-GSO system	A specific earth station in a geostationary-satellite network in the fixed-satellite service in respect of a non-geostationary-satellite system in the fixed-satellite service.	The following frequency bands: 10.7-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.75 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Region 1, 17.8-18.6 GHz (space-to-Earth), and 19.7-20.2 GHz (space-to-Earth)	Conditions: i) bandwidths overlap; and ii) the satellite network using the geostationary-satellite orbit has specific receive earth stations which meet all of the following conditions: a) earth station antenna maximum isotropic gain greater than or equal to 64 dBi for the frequency bands 10.7-12.75 GHz or 68 dBi for the frequency bands 17.8-18.6 GHz and 19.7-20.2 GHz; b) G/T of 44 dB/K or higher; c) emission bandwidth of 250 MHz or higher for the frequency bands below 12.75 GHz or 800 MHz or higher for the frequency bands above 17.8 GHz; and	i) Check by using the assigned frequencies and bandwidths; ii) use the maximum antenna gain (G), the lowest total receiving system noise temperature (T), and the emission bandwidth of the specific receive earth station as given in the Appendix **S4** data;	The threshold/condition for coordination does not apply to typical receive earth stations operating in satellite networks using the geostationary-satellite orbit

TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
			iii) the epfd↓ from the satellite system using the non-geostationary orbit exceeds: a) in the frequency band 10.7-12.75 GHz: –174.5 dB(W/(m^2 · 40 kHz)) for any percentage of time for non-GSO systems with all satellites only operating at or below 2 500 km altitude, or –202 dB(W/ (m^2 · 40 kHz)) for any percentage of the time for non-GSO systems with any satellites operating above 2 500 km altitude; b) in the frequency bands 17.8-18.6 GHz or 19.7-20.2 GHz: –157 dB(W/(m^2 · MHz)) for any percentage of time for non-GSO systems with all satellites only operating at or below 2 500 km altitude, or –185 dB(W/(m^2 · MHz)) for any percentage of the time for non-GSO systems with any satellites operating above 2 500 km altitude	iii) use the epfd↓ radiated by the non-GSO FSS system into the earth station employing the very large antenna when this antenna is pointed towards the wanted GSO satellite	

TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **S9.7B** non-GSO system/ GSO earth station	A non-geostationary-satellite system in the fixed-satellite service in respect of a specific earth station in a geostationary-satellite network in the fixed-satellite service.	The following frequency bands: 10.7-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.75 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Region 1, 17.8-18.6 GHz (space-to-Earth), and 19.7-20.2 GHz (space-to-Earth)	Conditions: i) bandwidths overlap; and ii) the satellite network using the geostationary-satellite orbit has specific receive earth stations which meets all of the following conditions: a) earth station antenna maximum isotropic gain greater than or equal to 64 dBi for the frequency bands 10.7-12.75 GHz or 68 dBi for the frequency bands 17.8-18.6 GHz and 19.7-20.2 GHz; b) G/T of 44 dB/K or higher; c) emission bandwidth of 250 MHz or higher for the frequency bands below 12.75 GHz or 800 MHz or higher for the frequency bands above 17.8 GHz; and	i) Check by using the assigned frequencies and bandwidths; ii) use the maximum antenna gain (G), the lowest total receiving system noise temperature (T), and the emission bandwidth of the specific receive earth station as given in the Appendix **S4** data;	The threshold/condition for coordination do not apply to typical receive earth stations operating in satellite networks using the geostationary-satellite orbit

TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
			iii) the epfd↓ from the satellite system using the non-geostationary orbit exceeds: a) in the frequency bands 10.7-12.75 GHz: −174.5 dB(W/(m^2 · 40 kHz)) for any percentage of time for non-GSO systems with all satellites only operating at or below 2 500 km altitude, or −202 dB(W/(m^2· 40 kHz)) for any percentage of the time for non-GSO systems with any satellites operating above 2 500 km altitude; b) in the frequency bands 17.8-18.6 GHz or 19.7-20.2 GHz: −157 dB(W/(m^2 · MHz)) for any percentage of time for non-GSO systems with all satellites only operating at or below 2 500 km altitude, or −185 dB(W/(m^2 · MHz)) for any percentage of the time for non-GSO systems with any satellites operating above 2 500 km altitude	iii) use the epfd↓ radiated by the non-GSO FSS system into the earth station employing the very large antenna when this antenna is pointed towards the wanted GSO satellite	

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TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **S9.11** GSO/terrestrial	A space station in the BSS in any band shared on an equal primary basis with terrestrial services and where the BSS is not subject to a Plan, in respect of terrestrial services	620-790 MHz 1 452-1 492 MHz 2 310-2 360 MHz 2 520-2 655 MHz 2 655-2 670 MHz 12.5-12.75 GHz (Region 3) 17.7-17.8 GHz (Region 2) 21.4-22 GHz (Region 1 and 3) 40.5-42.5 GHz 74-76 GHz	Condition: bandwidths overlap	Check by using the assigned frequencies and bandwidths	
No. **S9.12** Non-GSO/ non-GSO	A station in a satellite network using a non-geostationary-satellite orbit in the frequency bands for which a footnote or a resolution refers to No. **S9.11A** or to No. **S9.12**, in respect of any other satellite network using a non-geostationary-satellite orbit, with the exception of coordination between earth stations operating in the opposite direction of transmission	[See modifications by Working Group 4A]	Condition: bandwidths overlap	Check by using the assigned frequencies and bandwidths	

TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **S9.12A** Non-GSO/ GSO	A station in a satellite network using a non-geostationary-satellite orbit in the frequency bands for which a footnote or a resolution refers to No. **S9.11A** or to No. **S9.12A**, in respect of any other satellite network using the geostationary-satellite orbit, with the exception of coordination between earth stations operating in the opposite direction of transmission	[See modifications by Working Group 4A]	Condition: bandwidths overlap	Check by using the assigned frequencies and bandwidths	
No. **S9.13** GSO/non-GSO	A station in a satellite network using the geostationary-satellite orbit in the frequency bands for which a footnote or a resolution refers to No. **S9.11A** or to No. **S9.13**, in respect of any other satellite network using a non-geostationary-satellite orbit, with the exception of coordination between earth stations operating in the opposite direction of transmission	[See modifications by Working Group 4A]	Condition: bandwidths overlap	Check by using the assigned frequencies and bandwidths	

TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **S9.17** GSO, non-GSO/ terrestrial	A specific earth station or a typical mobile earth station in frequency bands above 1 GHz allocated with equal rights to space and terrestrial services, in respect of terrestrial stations, where the coordination area of the earth station includes the territory of another country, with the exception of the coordination under No. **S9.15**	Any frequency band allocated to a space service	The coordination area of the earth station covers the territory of another administration	Appendix **S7** (for earth stations in the radiodetermination-satellite service (RDSS) in the bands: 1 610-1 626.5 MHz, 2 483.5-2 500 MHz and 2 500-2 516.5 MHz, see Remarks column) 1) The coordination area of aircraft earth stations is determined by increasing the service area by 1 000 km with respect to the aeronautical mobile service (terrestrial) or 500 km with respect to terrestrial services other than the aeronautical mobile service	NOTE – For RDSS earth stations, a uniform coordination distance of 400 km corresponding to an airborne earth station shall be used. In cases where the earth stations are all ground-based, a coordination distance of 100 km shall be used

TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **S9.17** GSO, non-GSO/ terrestrial (*cont.*)				2) For receiving earth stations in the meteorological-satellite service in frequency bands shared with the meteorological aids service, the coordination distance is considered to be the visibility distance as a function of the earth station horizon elevation angle for a radiosonde at an altitude of 20 km above mean sea level, assuming 4/3 Earth radius	

TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **S9.17A** GSO, non-GSO/ GSO, non-GSO	A specific earth station in respect of other earth stations operating in the opposite direction of transmission in frequency bands allocated with equal rights to space radiocommunication services in both directions of transmission, where the coordination area of the earth station includes the territory of another country or the earth station is located within the coordination area of a coordinated earth station with the exception of coordination under No. **S9.19**	Any frequency band allocated to a space service	The coordination area of the earth station covers the territory of another administration or the earth station is located within the coordination area of an earth station	i) For bands in Table S5-2, see § 2 of Annex 1 of this Appendix ii) See Appendix **S7**	

TABLE S5-1 (*continued*)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **S9.19** Terrestrial/ GSO	A transmitting station of a terrestrial service or a transmitting earth station in the fixed-satellite service (Earth-to-space) in a frequency band shared on an equal primary basis with the broadcasting-satellite service, with respect to typical earth stations included in the service area of a space station in the broadcasting-satellite service	Bands listed in No. **S9.11** and the band 11.7-12.7 GHz	i) Necessary bandwidths overlap; and ii) the pfd of the interfering station at the edge of the BSS service area exceeds the permissible level	Check by using the assigned frequencies and bandwidths	See also Article 6 of Appendix **S30**

SUP

APPENDIX S7

Method for the determination of the coordination area around an earth station in frequency bands between 1 GHz and 40 GHz shared between space and terrestrial radiocommunication services

ADD

APPENDIX S7

Methods for the determination of the coordination area around an earth station in frequency bands between 100 MHz and 105 GHz

1 Introduction

This Appendix addresses the determination of the coordination area (see No. **S1.171**) around a transmitting or receiving earth station that is sharing spectrum in frequency bands between 100 MHz and 105 GHz with terrestrial radiocommunication services or with earth stations operating in the opposite direction of transmission.

The coordination area represents the area surrounding an earth station sharing the same frequency band with terrestrial stations, or the area surrounding a transmitting earth station that is sharing the same bidirectionally allocated frequency band with receiving earth stations, within which the permissible level of interference may be exceeded and hence coordination is required. The coordination area is determined on the basis of known characteristics for the coordinating earth station and on conservative assumptions for the propagation path and for the system parameters for the unknown terrestrial stations (see Tables 7 and 8 of Annex 7), or the unknown receiving earth stations (Table 9 of Annex 7), that are sharing the same frequency band.

1.1 Overview

This Appendix contains procedures and system parameters for calculating an earth station's coordination area, including predetermined distances.

The procedures allow the determination of a distance in all azimuthal directions around a transmitting or receiving earth station beyond which the predicted path loss would be expected to exceed a specified value for all but a specified percentage of the time. This distance is called the coordination distance (see No. **S1.173**). When the coordination distance is determined for each azimuth around the coordinating earth station it defines a distance contour, called the coordination contour (see No. **S1.172**), that encloses the coordination area.

It is important to note that, although the determination of the coordination area is based on technical criteria, it represents a regulatory concept. Its purpose is to identify the area within which detailed evaluations of the interference potential need to be performed in order to determine whether the coordinating earth station or any of the terrestrial stations, or in the case of a bidirectional allocation any of the receiving earth stations that are sharing the same frequency band, will experience unacceptable levels of interference. Hence, the coordination area is not an exclusion zone within which the sharing of frequencies between the earth station and terrestrial stations or other earth stations is prohibited, but a means for determining the area within which more detailed calculations need to be performed. In most cases a more detailed analysis will show that sharing within the coordination area is possible since the procedure for the determination of the coordination area is based on unfavourable assumptions with regard to the interference potential.

For the determination of the coordination area, two separate cases are to be considered:

- case when the earth station is transmitting and hence capable of interfering with receiving terrestrial stations or earth stations;
- case when the earth station is receiving and hence may be the subject of interference from transmitting terrestrial stations.

Calculations are performed separately for great circle propagation mechanisms (propagation mode (1)) and, if required by the sharing scenario (see § 1.4), for scattering from hydrometeors (propagation mode (2)). The coordination contour is then determined using the greater of the two distances predicted by the propagation mode (1) and propagation mode (2) calculations for each azimuth around the coordinating earth station. Separate coordination contours are produced for each sharing scenario. Guidance and examples of the construction of coordination contours, and their component propagation mode (1) and propagation mode (2) contours, are provided in § 1.6.

To facilitate bilateral discussion it can be useful to calculate additional contours, defining smaller areas, that are based on less conservative assumptions than those used for the calculation of the coordination contour.

1.2 Structure of this appendix

In this Appendix the general principles are separated from the detailed text on methods. The general principles are contained in the main body of the Appendix, while the methods are contained in a series of annexes, enabling the user to select only those sections that are relevant for a specific sharing scenario.

Table 1 is provided to help the user to navigate through the Appendix and the Annexes; it also indicates the relevant sections that need to be explored for a specific coordination case.

1.3 Basic concepts

Determination of the coordination area is based on the concept of the permissible interference power at the antenna terminals of a receiving terrestrial station or earth station. Hence, the attenuation required to limit the level of interference between a transmitting terrestrial station or earth station and a receiving terrestrial station or earth station to the permissible interference power for p% of the time is represented by the "minimum required loss", which is the loss that needs to be equalled or exceeded by the predicted path loss for all but p% of the time[1].

For propagation mode (1) the following equation applies:

$$L_b(p) = P_t + G_t + G_r - P_r(p) \qquad \text{dB} \qquad (1)$$

where:

p: maximum percentage of time for which the permissible interference power may be exceeded

$L_b(p)$: propagation mode (1) minimum required loss (dB) for p% of the time; this value must be exceeded by the propagation mode (1) predicted path loss for all but p% of the time

P_t: maximum available transmitting power level (dBW) in the reference bandwidth at the terminals of the antenna of a transmitting terrestrial station or earth station

$P_r(p)$: permissible interference power of an interfering emission (dBW) in the reference bandwidth to be exceeded for no more than p% of the time at the terminals of the antenna of a receiving terrestrial station or earth station that may be subject to interference, where the interfering emission originates from a single source

G_t: gain (dB relative to isotropic) of the antenna of the transmitting terrestrial station or earth station. For a transmitting earth station, this is the antenna gain towards the physical horizon on a given azimuth; for a transmitting terrestrial station, the maximum main beam axis antenna gain is to be used

G_r: gain (dB relative to isotropic) of the antenna of the receiving terrestrial or earth station that may be subject to interference. For a receiving earth station, this is the gain towards the physical horizon on a given azimuth; for a receiving terrestrial station, the maximum main beam axis antenna gain is to be used.

In the case of a receiving earth station, the permissible interference power $P_r(p)$ is specified with respect to the actual percentage of time the receiver is in operation, rather than the total elapsed time.

[1] When p is a small percentage of the time, in the range 0.001% to 1.0%, the interference is referred to as "short-term"; if $p \geq 20$%, it is referred to as "long-term" (see § 1.5.3).

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TABLE 1

Cross-reference between sharing scenarios and calculation methods

	Sharing scenarios of § 1.4						
Applicable sections and Annexes	§ 1.4.1 Earth stations operating with geostationary space stations	§ 1.4.2 Earth stations operating with non-geostationary space stations [1]	§ 1.4.3 Earth stations operating to both geostationary and non-geostationary space stations	§ 1.4.4 Earth stations operating in bidirectionally allocated frequency bands	§ 1.4.5 Broadcasting-satellite service earth stations	§ 1.4.6 Mobile (except aeronautical mobile) earth stations	§ 1.4.7 Aeronautical mobile earth stations
§ 1.3 Basic concepts	X	X	X	X	X	X	X
§ 1.5 Propagation model concepts	X	X	X	X	See § 1.4.1, § 1.4.2, § 1.4.3 or § 1.4.4 as applicable and § 1.6	See § 1.4.1, § 1.4.2, § 1.4.3 or § 1.4.4 as applicable and § 1.6	See § 1.4.1, § 1.4.2, § 1.4.3 or § 1.4.4 as applicable and § 1.6
§ 1.6 The coordination contour: concepts and construction	X	X	X	X			
§ 2.1 Earth stations operating with geostationary space stations	X		X				
§ 2.2 Earth stations operating with non-geostationary space stations		X	X				
§ 3 Determination of the coordination area between earth stations operating in bidirectionally allocated frequency bands				X			
§ 4 General considerations for the determination of the propagation mode (1) required distance	X	X	X	X			
§ 5 General considerations for the determination of the propagation mode (2) required distance	X		X				
Annex 1 Determination of the required distance for propagation mode (1)	X	X	X	X			
Annex 2 Determination of the required distance for propagation mode (2)	X		X				
Annex 3 Antenna gain towards the horizon for an earth station operating with a geostationary space station	X		X				
Annex 4 Antenna gain towards the horizon for earth stations operating with non-geostationary space stations		X	X	X			
Annex 5 Determination of the coordination area for a transmitting earth station with respect to receiving earth stations operating with geostationary space stations in bidirectionally allocated frequency bands				X			
Annex 6 Supplementary and auxiliary contours	X	X	X	X			
Annex 7 System parameters and predetermined coordination distances for determination of the coordination area around an earth station	X	X	X	X			

[1] For an earth station using a non-tracking antenna the procedure of § 2.1 is used. For an earth station using a non-directional antenna the procedures of § 2.1.1 are used.

For propagation mode (2), a volume scattering process is involved and a modification of the above approach is necessary. Where the coordinating earth station antenna beam intersects a rain cell, a common volume may be formed with a terrestrial station beam or an earth station beam (operating in the opposite direction of transmission in bidirectionally allocated frequency bands). In the case of a terrestrial station, the assumptions are made that the terrestrial station beamwidth is relatively large in comparison with that of the coordinating earth station (terrestrial station gain values are given in Tables 7 and 8 of Annex 7) and that the terrestrial station is some distance from the common volume. The terrestrial station beam is therefore assumed to illuminate the whole rain cell, which is represented by a vertical cylinder filled with hydrometeors that give rise to isotropically scattered signals. This scattering process may give rise to unwanted coupling between the coordinating earth station and terrestrial stations or other earth stations operating in bidirectionally allocated frequency bands, via the common volume.

The earth station antenna gain and its beamwidth are interdependent. The size of the common volume, and the number of scattered signals arising within that volume, increases as the gain of the earth station antenna transmitting or receiving those signals decreases, the one effect compensating for the other. A term which approximates the full integral required to evaluate the volume scattering process within the earth station antenna beam is included in equation (2-11). Therefore in the procedure for evaluation of interference that may arise from propagation mode (2) mechanisms a simplifying assumption can be made that the path loss is independent of the earth station antenna gain[2].

Hence for propagation mode (2), equation (1) reduces to:

$$L_x(p) = P_t + G_x - P_r(p) \qquad \text{dB} \tag{2}$$

where:

$L_x(p)$: minimum loss required for propagation mode (2)

G_x: maximum antenna gain (dBi) assumed for the terrestrial station. Tables 7 and 8 of Annex 7 give values of G_x for the various frequency bands.

To facilitate the calculation of propagation mode (2) auxiliary contours (see Annex 6) the calculation is further modified by placing the terrestrial network antenna gain G_x within the iterative loop for the propagation mode (2) required loss calculations[3].

[2] If the earth station antenna has a wide beamwidth, the method can still be used to determine the propagation mode (2) contour. However, the fact that the antenna beam may be wider than the rain cell and hence not actually fully filled with hydrometeors will mean that the interference potential may be slightly overestimated.

[3] See equation (2-21).

Hence equation (2) further reduces to:

$$L(p) = P_t - P_r(p) \qquad \text{dB} \tag{3}$$

where:

$L(p)$: propagation mode (2) minimum required loss (dB) for p% of the time; this value must be exceeded by the propagation mode (2) predicted path loss for all but p% of the time.

For both modes of propagation, P_t and $P_r(p)$ are defined for the same radio-frequency bandwidth (the reference bandwidth). Further, $L_b(p)$, $L(p)$ and $P_r(p)$ are defined for the same small percentage of the time, and these values are set by the performance criteria of the receiving terrestrial station or receiving earth station that may be subject to interference.

For an earth station operating with a geostationary space station, Annex 3 provides the numerical method for determining the minimum angle between the earth station antenna main beam axis and the physical horizon as a function of azimuth, and the corresponding antenna gain. In the case of a space station in a slightly inclined geostationary orbit, the minimum elevation angle and corresponding horizon gain will depend on the maximum inclination angle to be coordinated.

For an earth station operating with non-geostationary space stations, the antenna gain of the earth station in the direction of the horizon varies as a function of time and Annex 4 provides the numerical methods for its determination.

For an earth station operating in a frequency band with a bidirectional allocation, the antenna gain to be used in determining the propagation mode (1) minimum required loss is calculated using the methods in Annex 3 or Annex 4, as appropriate.

Determination of the coordination area requires the calculation of the predicted path loss and its comparison with the minimum required loss, for every azimuth around the coordinating earth station, where:

- the predicted path loss is dependent on several factors including the length and general geometry of the interfering path (e.g. antenna pointing, horizon elevation angle), antenna directivity, radio climatic conditions, and the percentage of the time during which the predicted path loss is less than the minimum required loss; and
- the minimum required loss is based on system and interference model considerations.

The required coordination distance is the distance at which these two losses are considered to be equal for the stated percentage of time.

In determining the coordination area, the pertinent parameters of the coordinating earth station are known, but knowledge of the terrestrial stations or other earth stations sharing that frequency range is limited. Hence it is necessary to rely on assumed system parameters for the unknown terrestrial stations or the unknown receiving earth stations. Furthermore, many aspects of the interference path between the coordinating earth station and the terrestrial stations or other earth stations (e.g. antenna geometry and directivity) are unknown.

The determination of the coordination area is based on unfavourable assumptions regarding system parameter values and interference path geometry. However, in certain circumstances, to assume that all the worst-case values will occur simultaneously is unrealistic, and leads to unnecessarily large values of minimum required loss. This could lead to unnecessarily large coordination areas. For propagation mode (1), detailed analyses, supported by extensive operational experience, have shown that the requirement for the propagation mode (1) minimum required loss can be reduced because of the very small probability that the worst-case assumptions for system parameter values and interference path geometry will exist simultaneously. Therefore, a correction is applied within the calculation for the propagation mode (1) predicted path loss in the appropriate sharing scenario to allow benefit to be derived from these mitigating effects. The application of this correction factor is described in more detail in § 4.4.

This correction applies to cases of coordination with the fixed service. It is frequency, distance and path dependent. It does not apply in the case of the coordination of an earth station with mobile stations, nor with other earth stations operating in the opposite direction of transmission, nor in the case of propagation via hydrometeor scatter (propagation mode (2)).

A number of propagation models are used to cover the propagation mechanisms that exist in the full frequency range. These models predict the path loss as a monotonically increasing function of distance. Therefore, coordination distances are determined by calculating the path loss iteratively for an increasing distance until either the minimum required loss is achieved, or a maximum calculation distance limit is reached (see § 1.5.3).

The iteration method always starts at a defined value of minimum distance, d_{min} (km), and iteration is performed using a uniform step size, s (km), for increasing the distance. A step size of 1 km is recommended.

1.4 Sharing scenarios

The following subsections describe the basic assumptions made for the various earth station sharing scenarios. These subsections need to be read in conjunction with the information contained in Table 1 and § 1.6 which contains guidance on the development of a coordination contour. Except as discussed in §§ 1.4.5 to 1.4.7, the earth stations around which coordination areas are determined are assumed to be fixed earth stations authorized to operate at a single permanent location. In cases of earth stations that can be operated from a number of fixed locations, the coordination areas are determined for each individual location.[4]

[4] While some fixed satellite systems transmit to fixed earth stations operating at unspecified locations within a service area defined by an administration, methods for determining the coordination areas are specified only for individual sites. To minimize the number of individual earth stations requiring detailed coordination in these cases, administrations may wish to develop bilateral agreements based on distances, calculated in accordance with Recommendation ITU-R SM.1448, extended from the periphery of a service area.

1.4.1 Earth stations operating with geostationary space stations

For an earth station operating with a space station in the geostationary orbit, the space station appears to be stationary with respect to the Earth. However variations in gravitational forces acting on the space station and limitations in positional control mean that a geostationary space station's orbital parameters are not constant. Movement from the space station's nominal orbital position in an east/west direction (longitudinal tolerance) is limited under the Radio Regulations (see Nos. **S22.6** to **S22.18**), but movement in the north/south direction (inclination excursion) is not specified.

Relaxation in the north/south station-keeping of a geostationary space station allows its orbit to become inclined, with an inclination that increases gradually with time. Therefore the determination of the coordination area requires consideration of the range of movement of the earth station antenna. Although the direction of pointing of the earth station antenna may in practice vary with time, the earth station antenna may also be pointing in one direction for considerable periods of time. Hence the gain of the earth station antenna in the direction of the horizon is assumed to be constant. For an earth station operating with a space station in an orbit as described above, an assumption of constant horizon gain as the inclination angle increases may lead to a conservative estimation of the coordination area, the degree of conservatism increasing with increasing inclination angle.

For an earth station operating with a geostationary space station the coordination area is determined using the procedures described in § 2.1.

1.4.2 Earth stations operating with non-geostationary space stations

Earth stations operating with non-geostationary space stations may use a directional or a non-directional antenna. Furthermore, earth stations using a directional antenna may track the orbital path of a non-geostationary space station.

While an earth station operating with a geostationary space station is assumed to have a constant antenna gain towards the horizon, for an earth station antenna that is tracking the orbital path of a non-geostationary space station, the antenna gain towards the horizon will vary with time. Therefore, it is necessary to estimate the variation of the antenna gain with time towards the horizon for each azimuth in order to determine the coordination area. The procedure is described in § 2.2.

For an earth station operating with a non-geostationary space station, the motion of a relatively high gain tracking antenna reduces the probability of interference due to propagation mode (2) mechanisms and hence the propagation mode (2) required distances will be relatively short. The minimum coordination distance d_{min} (see § 1.5.3) will provide adequate protection in these cases. The propagation mode (2) contour is therefore taken to be identical to a circle whose radius is the minimum coordination distance. Propagation mode (2) calculations are not required in these circumstances and the coordination area is determined using the propagation mode (1) procedure in § 2.2 only.

For an earth station operating with a non-geostationary space station using a non-directional antenna, a similar situation applies, and the low gain means that propagation mode (2) required distances will be less than the minimum coordination distance. Hence, for the case of a non-directional antenna the propagation mode (2) contour is also coincident with the circle of radius d_{min}, and the coordination area is determined using the propagation mode (1) procedures described in § 2.1.1 only.

For an earth station operating with a non-geostationary space station using a non-tracking directional antenna, the potential for interference arising from propagation mode (2) is the same as for an earth station operating with a geostationary space station. Hence, for the case of non-tracking directional antenna the coordination area is determined using both the propagation mode (1) and propagation mode (2) procedures described in § 2.1.

1.4.3 Earth stations operating with both geostationary and non-geostationary space stations

For earth stations that are sometimes intended to operate with geostationary space stations and at other times with non-geostationary space stations, separate coordination areas are determined for each type of operation. In such cases, the coordination area for the geostationary space station is determined using the procedures described in § 2.1 and the coordination area for the non-geostationary space station is determined using the procedure described in § 2.2. For each case, the percentage of time, p, is specified for all the operational time that the receiving earth station is expected to spend in reception from geostationary space stations or non-geostationary space stations, as appropriate.

1.4.4 Earth stations operating in bidirectionally allocated frequency bands

For earth stations operating in some frequency bands there may be co-primary allocations to space services operating in both the Earth-to-space and space-to-Earth directions. In this case, where two earth stations are operating in opposite directions of transmission it is only necessary to establish the coordination area for the transmitting earth station, as receiving earth stations will automatically be taken into consideration. Hence, a receiving earth station operating in a bidirectionally allocated frequency band will only be involved in coordination with a transmitting earth station if it is located within the transmitting earth station's coordination area.

For a transmitting earth station operating with either geostationary or non-geostationary satellites in a bidirectionally allocated frequency band, the coordination area is determined using the procedures described in § 3.

1.4.5 Broadcasting-satellite service earth stations

For earth stations in the broadcasting-satellite service operating in the unplanned bands, the coordination area is determined by extending the periphery of the specified service area within which the earth stations are operating by the coordination distance based on a typical BSS earth station. In calculating the coordination distance, no additional protection can be assumed to be available from the earth station horizon elevation angle, i.e. $A_h = 0$ dB in Annex 1, for all azimuth angles around the earth station.

1.4.6 Mobile (except aeronautical mobile) earth stations

For a mobile (except aeronautical mobile) earth station, the coordination area is determined by extending the periphery of the specified service area, within which the mobile (except aeronautical mobile) earth stations are operating, by the coordination distance. The coordination distance may be represented by a predetermined coordination distance (see Table 10 of Annex 7), or it may be calculated. In calculating the coordination distance, no additional protection can be assumed to be available from the earth station horizon elevation angle, i.e. A_h = 0 dB in Annex 1, for all azimuths around the earth station.

1.4.7 Aeronautical mobile earth stations

For aeronautical mobile earth stations, the coordination area is determined by extending the periphery of the specified service area within which the aeronautical mobile earth station operates, by an appropriate predetermined coordination (see Table 10 of Annex 7) distance for the respective services.

1.5 Propagation model concepts

For each mode of propagation, according to the requirements of the specific sharing scenario (see § 1.4) it is necessary to determine the predicted path loss. The determination of this predicted path loss is based on a number of propagation mechanisms.

Interference may arise through a range of propagation mechanisms whose individual dominance depends on climate, radio frequency, time percentage in question, distance and path topography. At any given point in time, one or more mechanisms may be present. The propagation mechanisms that are considered within this Appendix in the determination of the interference potential are as follows:

- *Diffraction*: Insofar as it relates to diffraction losses occurring over the earth station's local physical horizon. This effect is referred to below as "site shielding". The remainder of the path along each radial is considered to be flat and therefore free of additional diffraction losses.
- *Tropospheric scatter*: This mechanism defines the "background" interference level for paths longer than about 100 km, beyond which the diffraction field becomes very weak.
- *Surface ducting*: This is the most important short-term interference mechanism over water and in flat coastal land areas, and can give rise to high signal levels over greater distances, sometimes exceeding 500 km. Such signals can exceed the equivalent "free-space" level under certain conditions.
- *Elevated layer reflection and refraction*: The treatment of reflection and/or refraction from layers at heights of up to a few hundred metres is an important mechanism that enables signals to by-pass any diffraction losses due to the underlying terrain under favourable path geometry situations. Here again, the impact can be significant over long distances.

– *Hydrometeor scatter*: Hydrometeor scatter can be a potential source of interference between terrestrial station transmitters and earth stations because it may act isotropically, and can therefore have an impact irrespective of whether the common volume is on or off the great-circle interference path between the coordinating earth station and terrestrial stations, or other receiving earth stations operating in bidirectionally allocated frequency bands.

In this Appendix, propagation phenomena are classified into two modes as follows:

– *Propagation mode (1)*: propagation phenomena in clear air (tropospheric scatter, ducting, layer reflection/refraction, gaseous absorption and site shielding). These phenomena are confined to propagation along the great-circle path.

– *Propagation mode (2)*: hydrometeor scatter.

1.5.1 Propagation mode (1)

For the determination of the propagation mode (1) required distances, the applicable frequency range has been divided into three parts:

– For VHF/UHF frequencies between 100 MHz and 790 MHz and for time percentages from 1% to 50% of an average year.

– From 790 MHz to 60 GHz and for time percentages from 0.001% to 50% of an average year.

– From 60 GHz to 105 GHz and for time percentages from 0.001% to 50% of an average year.

The variation in predicted path loss due to the horizon elevation angle around an earth station is calculated by the method described in § 1 of Annex 1, using the horizon elevation angles and distances along different radials from the earth station. For all frequencies between 100 MHz and 105 GHz, the attenuation arising from the horizon characteristics is included in the value of propagation mode (1) predicted path loss, unless its use is specifically prohibited for a particular sharing scenario (see § 1.4.5 and § 1.4.6).

In the determination of the propagation mode (1) required distance, the world is divided into four basic radio-climatic zones. These zones are defined as follows:

– Zone A1: coastal land, i.e. land adjacent to a Zone B or a Zone C area (see below), up to an altitude of 100 m relative to mean sea or water level, but limited to a maximum distance of 50 km from the nearest Zone B or Zone C area; in the absence of precise information on the 100 m contour, an approximation (e.g. 300 feet) may be used. Large inland areas of at least 7 800 km^2 which contain many small lakes, or a river network, comprising more than 50% water, and where more than 90% of the land is less than 100 m above the mean water level may be included in Zone A1[5].

– Zone A2: all land, other than coastal land as defined in Zone A1 above.

[5] These additional areas may be declared as coastal Zone A1 areas by administrations for inclusion in the ITU Digital World Map (IDWM).

- Zone B: "cold" seas, oceans and large bodies of inland water situated at latitudes above 30°, with the exception of the Mediterranean Sea and the Black Sea. A "large" body of inland water is defined, for the administrative purpose of coordination, as one having an area of at least 7 800 km², but excluding the area of rivers. Islands within such bodies of water are to be included as water within the calculation of this area if they have elevations lower than 100 m above the mean water level for more than 90% of their area. Islands that do not meet these criteria should be classified as land for the purposes of calculating the area of the water.
- Zone C: "warm" seas, oceans and large bodies of inland water situated at latitudes below 30°, as well as the Mediterranean Sea and the Black Sea.

1.5.2 Propagation mode (2)

For the determination of the propagation mode (2) required distance, interference arising from hydrometeor scatter can be ignored at frequencies below 1 000 MHz and above 40.5 GHz outside the minimum coordination distance (see § 1.5.3.1). Below 1 000 MHz, the level of the scattered signal is very low and above 40.5 GHz, although significant scattering occurs, the scattered signal is then highly attenuated along the path from the scatter volume to the receiving terrestrial station or earth station. Site shielding is not relevant to propagation mode (2) mechanisms as the interference path is via the main beam of the coordinating earth station antenna.

1.5.3 Distance limits

The effect of interference on terrestrial and space systems often needs to be assessed by considering long and short term interference criteria. These criteria are generally represented by a permissible interference power not to be exceeded for more than a specified percentage of time.

The long-term interference criterion (typically associated with percentages of time ≥ 20%) allows the error performance objective (for digital systems) or noise performance objective (for analogue systems) to be met. This criterion will generally represent a low level of interference and hence require a high degree of isolation between the coordinating earth station and terrestrial stations, or other receiving earth stations operating in bidirectionally allocated bands.

The short-term criterion is a higher level of interference, typically associated with time percentages in the range 0.001% to 1% of time, which will either make the interfered-with system unavailable, or cause its specified short-term interference objectives (error rate or noise) to be exceeded.

This Appendix addresses only the protection provided by the short-term criterion. There is therefore an implicit assumption that if the short-term criterion is satisfied, then any associated long-term criteria will also be satisfied. This assumption may not remain valid at short distances because additional propagation effects (diffraction, building/terrain scattering etc.) requiring a more detailed analysis become significant. A minimum coordination distance is therefore needed to avoid this difficulty. This minimum coordination distance is always the lowest value of coordination distance used. At distances equal to or greater than the minimum coordination distance, it can be assumed that interference due to continuous (long-term) propagation effects will not exceed levels permitted by the long-term criteria.

In addition to the minimum coordination distance, it is also necessary to set an upper limit to the calculation distance. Hence the coordination distance, on any azimuth, must lie within the range between the minimum coordination distance and the maximum calculation distance.

1.5.3.1 Minimum coordination distance

For the reasons stated in § 1.5.3, it is necessary to set a lower limit (d_{min}) for the coordination distance. The iterative calculation of the coordination distance starts at this minimum distance, and this distance varies according to radiometeorological factors and the frequency band (see § 4.2). This same minimum coordination distance applies both to propagation mode (1) and propagation mode (2) calculations.

1.5.3.2 Maximum calculation distance

Maximum calculation distances are required for propagation modes (1) and (2). In the case of mode (1), this distance corresponds to the maximum coordination distance, d_{max1}, given in § 4.3 for each of the four radioclimatic Zones. The propagation mode (1) maximum calculation distance is therefore dependent on the mixture of radioclimatic Zones in the propagation path, as described in § 4.3.

The maximum calculation distance for propagation mode (2) is given in § 2 of Annex 2.

1.6 The coordination contour: concepts and construction

The coordination distance, determined for each azimuth around the coordinating earth station, defines the coordination contour that encloses the coordination area. The coordination distance lies within the range defined by the minimum coordination distance and the maximum calculation distance.

In this Appendix, the procedures determine the distance at which the minimum required loss is equal to the predicted path loss. In addition, some procedures[6] require that, for any azimuth, the greater of the distances determined for propagation mode (1) and propagation mode (2) is the distance to be used in determining the coordination contour. In both these cases, the distance at which the minimum required loss is equal to the predicted path loss may or may not be within the range of valid values that define the limits for the coordination distance. Hence, the distance determined from the application of all the procedures is referred to as the required distance.

The coordination area is determined by one of the following methods:

- calculating, in all directions of azimuth from the earth station, the coordination distances and then drawing to scale on an appropriate map the coordination contour; or
- extending the service area in all directions by the calculated coordination distance(s); or
- for some services and frequency bands, extending the service area in all directions by a predetermined coordination distance.

Where a coordination contour includes the potential interference effects arising from both propagation mode (1) and propagation mode (2), the required distance used for any azimuth is the greater of the propagation mode (1) and propagation mode (2) required distances.

[6] The same procedures are also used to develop supplementary and auxiliary contours (see Annex 6).

The sharing scenarios and the various procedures contained in this Appendix are based on different assumptions. Hence, the coordination area developed for one sharing scenario is likely to be based on different sharing considerations, interference paths and operational constraints than the coordination area developed under a different sharing scenario. Separate coordination areas are therefore required for each sharing scenario described in § 1.4, and each coordination area is specific to the radiocommunication services covered by the sharing scenario under which it was developed. Further, the coordination area developed for one sharing scenario cannot be used to determine the extent of any impact on the radiocommunication services covered by a different sharing scenario. Thus, a coordinating earth station operating in a bidirectionally allocated frequency band that is also allocated to terrestrial services will have two separate coordination areas:

- one coordination area for determining those administrations with terrestrial services that may be affected by the operation of the coordinating earth station; and
- one coordination area for determining those administrations with receiving earth stations that may be affected by the operation of the coordinating (transmitting) earth station.

This means that the establishment of the coordination area for an earth station will generally require the determination of several individual coordination areas, each drawn on a separate map. For example, an earth station which transmits to a geostationary space station in the band 10.7-11.7 GHz will need to develop the following coordination areas with respect to:

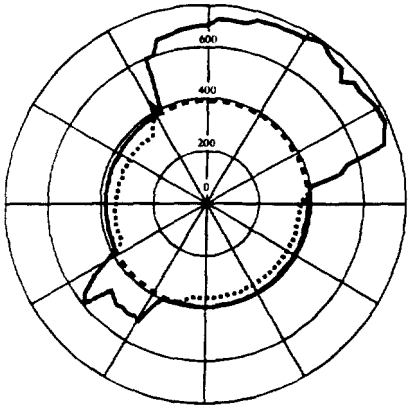
- analogue terrestrial services which receive in the same band; this will comprise the potential effects arising from both propagation mode (1) and propagation mode (2) interference paths;
- an earth station operating with a geostationary space station which receives in the same band; this will comprise the potential effects arising from both propagation mode (1) and propagation mode (2) interference paths;
- an earth station operating with a non-geostationary space station which receives in the same band; this will comprise the potential effects arising from propagation mode (1) interference paths.

In addition, separate coordination contours are produced if the earth station both transmits and receives in bands shared with terrestrial services. However, for earth stations in bidirectionally allocated frequency bands, the coordination contours with respect to other earth stations are only produced for a transmitting earth station (see § 1.4.4).

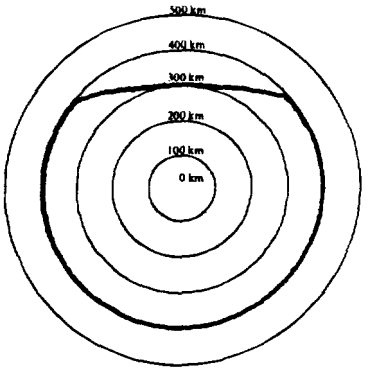
Examples of coordination contours for each of the sharing scenarios in § 1.4 is provided in Fig. 1. It will be noticed that for some of the sharing scenarios there is a commonality to the construction of the coordination contour (shown by a solid line) that encompasses each coordination area. For those sharing scenarios where both propagation mode (1) and propagation mode (2) interference paths need to be taken into consideration, the parts of the propagation mode (1) contour and that part of the propagation mode (2) contour located within the overall coordination contour may be drawn using dashed lines.

FIGURE 1

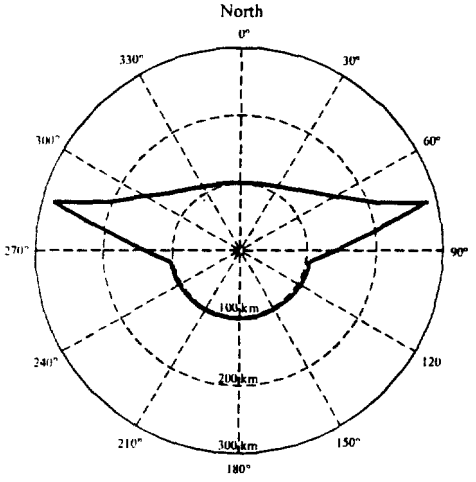
Examples of coordination contours for each of the sharing scenarios listed in § 1.4



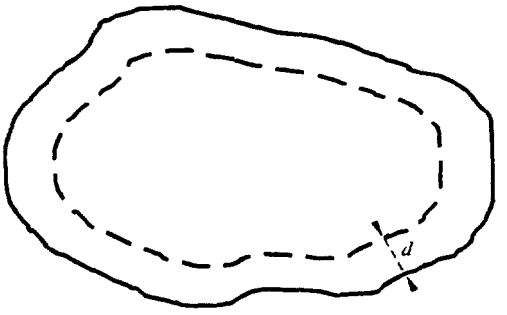
Example of the coordination contour for an earth station operating to a GSO space station in § 1.4.1 and § 1.4.3. The coordination contour is marked by the outer line and is comprised of a propagation mode (1) contour and a circular propagation mode (2) contour. The propagation mode (1) contour could also be an example of an earth station with a non-tracking directional antenna operating to a non-GSO space station in § 1.4.2.



Example of the coordination contour for an earth station with a tracking antenna operating to a non-GSO space station in § 1.4.2 and § 1.4.3.



Example of the coordination contour for an earth station operating in bidirectionally allocated frequency bands in § 1.4.4. The coordination contour has been developed from a propagation mode (1) contour for a coordinating earth station operating to a non-GSO space station with respect to unknown earth stations operating to GSO space stations. For a propagation mode (2) contour for the GSO-GSO case see Annex 5.



Example of the coordination contour for an earth station operating in a specified service area in § 1.4.5, § 1.4.6 and § 1.4.7. The coordination contour is marked by the solid outer line and the specified service area by the broken inner line. The coordination distance, *d*, may be a constant value, or vary with azimuth, depending on the sharing scenario and the type of radiocommunication service.

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In addition to the coordination contour, supplementary contours and auxiliary contours (see Annex 6) may be drawn to facilitate more detailed sharing discussions. Supplementary contours are based on the coordinating earth station sharing frequency bands with other radiocommunication services, or other types of radio systems in the same service, that have less onerous sharing criteria than the radio system used for developing the coordination area. These supplementary contours may be developed by the same method used to determine the coordination contour, or by other methods as agreed on a bilateral basis between administrations. For example, the Time Variant Gain method described in § 4 of Annex 6 can be used to generate supplementary contours for earth stations operating with non-geostationary space stations. Auxiliary contours are based on less conservative assumptions, with regard to the interference path and operational constraints, for the unknown terrestrial stations, or earth stations. Auxiliary contours are developed separately for propagation mode (1) and propagation mode (2) interference paths. In this context, the contours from which the coordination contour was developed are called main contours, and the auxiliary contours for propagation mode (1) and propagation mode (2) are referenced to the appropriate main contour. The various assumptions used for developing auxiliary contours to the propagation mode (1) contour, or the propagation mode (2) contour, can also be applied to supplementary contours. Hence, auxiliary contours may be drawn for both a main or a supplementary contour.

Supplementary contours are always drawn on a separate map as they apply to other types of radio system within the same radiocommunication service, or to radio systems in different radiocommunication services. However, as auxiliary contours apply to the various assumptions used in developing the main, or supplementary, contour they are always drawn on the same map that contains the corresponding main, or supplementary, contour.

While the use of supplementary or auxiliary contours allows less conservative assumptions with regard to the interference path and operational constraints to be taken into consideration, earth stations may transmit or receive a variety of classes of emissions. Hence, the earth station parameters to be used in the determination of the coordination contour, and any supplementary or auxiliary contours, are those which lead to the greatest distances for each earth station antenna beam and each allocated frequency band which the coordinating earth station shares with other radiocommunication systems.

2 Determination of the earth station coordination area with respect to terrestrial stations

This section contains the procedures for determining the coordination area for the case of earth stations sharing frequency bands with terrestrial stations. These procedures cover the cases for earth stations operating with space stations in the geostationary orbit, or in non-geostationary orbits, and are described in the following subsections.

For earth stations operating with space stations in non-geostationary orbits, consideration has to be given to the potential time-varying nature of the earth station's antenna gain towards the horizon.