

29TH WORLD RADIOCOMMUNICATION SEMINAR 30 November – 11 December 2020



Coordination of Earth Stations (Appendix 7)

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BR Space Services Department International Telecommunication Union 29TH WORLD RADIOCOMMUNICATION SF

30 November - 4 December 2020 Geneva, Switzerland www.itu.int/go/wrs-20 #ITUWRS

Coordination of Earth Stations with respect to Terrestrial stations/ES operating in the opposite direction of transmission







ES Coordination Requirements

Coordination Contour Diagrams









Actions on Coordination request





Radio waves propagate beyond borders.





Introduction





Frequency allocations & Coordination Data

Radio Regulations Articles

Edition of 2020



ARTICLE 5

Frequency allocations

Introduction

5.1 In all documents of the Union where the terms *allocation, allotment* and *assignment* are to be used, they shall have the meaning given them in Nos. 1.16 to 1.18, the terms used in the six working languages being as follows:

Frequency distribution to	French	English	Spanish	Arabic	Chinese	Russian
Services	Attribution (attribuer)	Allocation (to allocate)	Atribución (atribuir)	توزيع (يوذع)	划分	распределение (распределять)
Areas or countries	Allotissement (allotir)	Allotment (to allot)	Adjudicación (adjudicar)	تعیین (یعین)	分配	выделение (выделять)
Stations	Assignation (assigner)	Assignment (to assign)	Asignación (asignar)	كمميوس (پخصيص)	指配	присвоение (присваивать)

Section I – Regions and areas

5.2 For the allocation of frequencies the world has been divided into three Regions¹ as shown on the following map and described in Nos. 5.3 to 5.9:





The data item is not applicable to the corresponding notice



Frequency allocations for Earth Stations

RR Volume No.1 \rightarrow Article 5

Example:



Coordination requirements







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Coordination requirements



- **9.15** *j*) for either a specific earth station or typical earth station of a non-geostationary satellite network for which the requirement to coordinate is included in a footnote to the Table of Frequency Allocations referring to No. **9.11A**, in respect of terrestrial stations in frequency bands allocated with equal rights to space and terrestrial services and where the coordination area of the earth station includes the territory of another country; (WRC-2000)
- 9.16 k) for a transmitting station of a terrestrial service for which the requirement to coordinate is included in a footnote to the Table of Frequency Allocations referring to No. 9.11A and which is located within the coordination area of an earth station in a non-geostationary-satellite network; (WRC-2000)
- 9.17 l) for any specific earth station or typical mobile earth station in frequency bands above 100 MHz 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. 9.15; (WRC-2000)
- 9.17A m) for any specific earth station, in respect of other earth stations operating in the opposite direction of transmission or for any typical mobile earth station in respect of specific 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 and 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 another earth station, with the exception of the coordination under No. 9.19; (WRC-03)
- **9.18** *n*) for any transmitting station of a terrestrial service in the bands referred to in No. **9.17** within the coordination area of an earth station, in respect of this earth station, with the exception of the coordination under Nos. **9.16** and **9.19**; (WRC-2000)
- 9.19 o) for any transmitting station of a terrestrial service or any 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. (WRC-2000)
- 9.20 Not used;
- **9.21** p) for any station of a service for which the requirement to seek the agreement of other administrations is included in a footnote to the Table of Frequency Allocations referring to this provision. (WRC-2000)





Volume No.1 → Article 9





Volume No.1 → Article 9

9.15	Coordination of a Specific or Typical Earth Station of non-GSO in respect of Terrestrial Stations (associated with Footnote - 9 11A)
	(associated with roothole - 3.11A)





Volume No.1 → Article 9

9.17 Coordination of any Specific Earth Station or Typical Mobile Earth Station in frequency bands above 100 MHz, in respect of Terrestrial Stations, with the exception of the coordination under 9.15





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Volume No.1 → Article 9







Volume No.1 → Article 9

9.21 Specific Earth Station of a service required to seek agreement of other administrations (under Footnotes)

"rare case for Earth Station"



Space Service under No. 9.21 agreement (ex: footnote 5.461 – MSS)





Coordination of Earth Station is ADM's duty and responsibility.





Coordination Area - Appendix 7







Coordination Area - Appendix 7



Coordination Area - Definition

The coordination area is defined as "the area surrounding an earth station *sharing the same frequency* band with terrestrial stations, or surrounding a transmitting earth station sharing the same bidirectionally allocated frequency band with receiving earth stations, beyond which the level of *permissible* interference will not be exceeded and coordination is therefore not required" (No. 1.171).





Determination of Coordination Area





Determination of Coordination Area





Determination of Coordination Area

Distance limits:

AP7 only addresses protection provided by short-term criteria(time % 0.001% - 1%) -> assumption: if short-term criteria is satisfied , long-term will also be satisfied -> may not be valid at short distances due to additional propagation effects (diffraction, building/terrain scattering etc..) To avoid- > Minimum coordination distance

Minimum coordination distance for propagation modes (1) and (2)

 Depends on the frequency band and the latitude of the ES location (§4.2 of AP7)

Maximum calculation distance

- For propagation mode (1): Depends on the frequency band, radioclimatic Zones in the propagation path(§4.3 of AP7)
- For propagation mode (2): Depends on the latitude of the ES(§2 of Annex 2 of AP7)





Coordination Area – What does it mean?



Coordination request - Process



Generation of Coordination contour diagrams



Exercise 1: Generate Coordination Contours





Coordination data

RR Volume No.2 \rightarrow Appendix 4

		An	nex 2
		GEOGRAPHICAL DATA	Longitude / Latitude Altitude
	THAT IS A REAL FOR THE PARTY OF	SATELLITE	Orbital Location, Identification (Geo, Non-Geo)
		ANTENNA	Maximum gain Radiation pattern
	THE REAL PROPERTY OF A	SIGNAL CHARACTERISTICS	Power Maximum Power Density Frequencies Noise temperature Emission Type
GENEVA		Others	Horizon Elevation Angle



Example Earth Station: WRS-2020

- Earth Station Notice ID : 123
- Notifying Administration : BEL
- Specific Earth Station location: 4 E 12 00; 50 N 36 00
- Associated GSO Space Station: SICRAL-2A
- ES Transmitting frequency: 8300 MHz
- ES Receiving frequency: **7300 MHz**

ES Coordination Exercise folder:

Database WRS-2020.mdb

Contour diagrams



Folder name: GIBC exercise (zip) Located: <u>https://www.itu.int/en/ITU-R/space/Pages/wrs2020SpaceWorkshop.aspx</u>



Generating coordination contour diagrams using GIBC









Generating coordination cont	tour diagrams using GIBC	
	GIBC SNS V9 - Graphical Interface for Batch Calculations $ \Box$ $ imes$	
 Start GIBC from SAM Go to <i>Tools/Options</i> Browse and select the correct location of your file 	GIBC SNS V9 - Graphical Interface for Batch Calculations – × Appendix 30B Appendix 30 30A EPFD Appendix 8 PFD (terrestrial serv.) PED (space serv.) Appendix 7 Power Control Tools / Options PFD NGSO Additional GIMS Databases Database Container Path Add Clear List SRS Database C:\BR_SOFT\WRS-2020.mdb Browse Additional SRS DR Bath	
	Clear	
GENEVA2020		



Generating coordination contour diagrams using GIBC





	TUWRS SENEVA2020
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GIBC SNS V9 - Graphical Interface for Batch Calco	ulations –	
Appendix 30B Appendix 30 30A Power Control Tools / Option PFD (terrestrial serv.) PFD (space)	EPFD s serv.)	Appendix 8 PFD NGSO Appendix 7
Network ID: 123	Calculate	Report
Varming V Error V Progress		
Message	M	odule
< Calculation Output Aux Contours		>
Out DB:		>
RTF Report Generation		
<	2	
Print Auxiliary Scale (km)		
9.0.0.2 Appendix 7		



Generating coordination contour diagrams using GIBC





Results mdb file will be saved in a specific location

ID_Date__Time



GIBC SNS V9 - Graphical Interface for Batch Calculations —	×
Appendix 30B Appendix 30 30A EPFD Appe	ndix 8
Power Control Tools / Options PED NG	SO
PFD (terrestrial serv.) PFD (space serv.) Appen	dix 7
Network ID: 123 Calculate Report	:
Message Module Probably affected countries for diagram #4: D F G Progress inc Diagram #5: 'Diagram 5: 2.1_TABLE8' being calculated Progress inc Progress inc Probably affected countries for diagram #5: D DNK F Progress inc AP7 pack version: 9.0.0.2Appendix 7/Plt-3.2.0.1/Fm-3.8.0 Progress inc Store ntc_id = 123 in ESCC database Progress inc Batch Calculation finished OK at 14:54:14. Output database GIPC	•
<	
Calculation Output	

TEX_RESULTS\APP7\123_201110_145413.mdb

C:\Users\karunaje\ITU\BR_SPACE_v9.0\TEX_RESULTS\APP7

Scale (km)

9.0 x 7

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J.	U.	2		φ	p	e	nc	JD
	-	_			-	-		



Coordination contour diagram- Page 1



Diagram 1: 2.1_TABLE7. TRANSMITTING GSO ES in FIXED-SATELLITE SERVICE W.R.T. RECEIVING TERRESTRIAL STATIONS. TS: fixed, mobile

Notice ID: 123 Administration/Geographical area: BEL/BEL Satellite orbital position: 16.20 Frequency band: 8295.0000-8305.0000 MHz Earth station name: WRS-2020 Earth station position: 004E120050N3600 Satellite name: SICRAL-2A







Affected Administrations- page 2

ANALYSIS DATE AND TIME: 2020-11-10 14:54:14 VERSION: 9.0.0.2Appendix 7/Plt-3.2.0.1/Frm-3.8.0.1/Clc-3.7.0.2/Prp-2.0.0.0/SNS-3.1.0.0/AP7F-3.1.0.0/Ref-9.0.0.1 Diagram 1: 2.1_TABLE7. TRANSMITTING GSO ES in FIXED-SATELLITE SERVICE W.R.T. RECEIVING TERRESTRIAL STATIONS. TS: fixed, mobile NOTICE ID: 123 EARTH STATION NAME: WRS-2020 EARTH STATION POSITION: 004E120050N3600 PHASE: D ADM/GEO AREA: BEL/BEL RAIN CLIMATICAL ZONE: E SATELLITE NAME: SICRAL-2A SATELLITE ORBITAL POSITION: 16.20 DEG ANTENNA AZIMUTH: 164.62 DEG ANTENNA ELEVATION: 30.93 DEG ASSIGNED FREQUENCY: 8300.00 MHZ PERCENTAGE OF TIME: 0.0050 % FREQUENCY BAND: 8295.0000-8305.0000 MHZ MAXIMUM ANTENNA GAIN: 57.70 DBI MAXIMUM POWER DENSITY: -52.00 DBW/HZ NOISE TEMPERATURE: - K ANTENNA PATTERN: APEREC015V01 2.1 TABLE7 Model: PLM_DUCTING TRANSMISSION LOSS MODE 1: 161.0 DB (DOES NOT INCLUDE HOR. CORR. AND ANT. GAIN) TRANSMISSION LOSS MODE 2: 115.0 DB AZIMUTH 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 OFF-AXIS 145.8 143.5 140.8 137.7 134.4 130.8 127.0 123.2 119.2 115.1 110.9 106.7 102.5 98.2 94.0 89.7 85.4 81.1 76.9 72.6 68.4 64.3 60.2 56.2 HOR.ELEV. _ _ _ _ _ _ _ _ _ _ _ -----HOR.CORR. ANT.GAIN -10.0 -COORDINATION DISTANCE (KM) MODE 1 0.0 DB 150 150 129 129 MODE 2 0.0 DEG 100 100 100 100 100 100 100 100 100 101 101 List of Administrations to forward AZIMUTH 120 125 130 135 140 145 150 155 160 230 235 OFF-AXIS 52.4 48.6 45.1 41.8 38.8 36.1 33.9 32.3 31.2 30 69.1 73.3 HOR.ELEV. - - - - --your coordination request HOR.CORR. ANT.GAIN -10.0 -10.0 -9.4 -8.5 -7.7 -6.9 -6.3 -5.7 -5.4 -10.0 -10.0 COORDINATION DISTANCE (KM) MODE 1 0.0 DB 133 138 143 147 151 155 157 157 129 129 129 129 MODE 2 102 101 101 101 101 101 101 101 101 101 0.0 DEG 101 101 102 102 102 102 102 102 102 101 101 240 245 250 255 260 265 270 275 280 285 300 305 310 315 320 325 330 335 340 345 350 355 AZIMUTH .8 127.6 131.4 134.9 138.2 141.2 143.9 146.1 147.7 148.8 149.1 148.6 147.5 OFF-AXIS 77.5 81.8 86.0 90.3 94.6 98.9 103.1 107.4 111.6 115. HOR.ELEV. - - - - - --HOR.CORR. ANT.GAIN -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10. -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 -10.0 COORDINATION DISTANCE (KM) MODE 1 0.0 DB MODE 2 0.0 DEG PROBABLY AFFECTED COUNTRIES: D HOL F





Appendix 7

Separate contour diagrams created for:

Transmitting ES and Receiving ES

Different services (Tx CoS and Rx CoS)

Different frequency bands

Orbit of Rx ES (GSO or NGSO)- BiDirectional

Parameters required are given in:

Table 7 : Tx ES sharing with Terr.

Table 8 : Rx ES sharing with Terr.

Table 9 : Tx ES sharing with Rx ES

 Table 10 : Predetermined distances



Coordination contour diagram- Table 7 (page 1)







Coordination contour diagram- Table 8



SUI

LIE





Affected Administrations- Table 8

	Diagram 5: 2.1_TABLE8. RECEIVING GSO ES in FIXED-SATELLITE SERVICE W.R.T. TRANSMITTING TERRESTRIAL STATIONS. TS: fixed, mobile																							
NOTICE ID: 123 EARTH STATION NAME: WRS-2020 EARTH STATION POSITION: 0 ADM/GEO_AREA: BEL/BEL RAIN CLIMATICAL ZONE: E SATELLITE NAME: SICRAL-2A SATELLITE ORBITAL POSITION: 16.20 DEG ANTENNA AZIMUTH: 164.62 DEG ANTENNA ELEVATION: 30.93 DEG FREQUENCY BAND: 7295.0000-7305.0000 MHZ ASSIGNED FREQUENCY: 7300.00 MHZ PERCENTAG MAXIMUM ANTENNA GAIN: 55.00 DBI MAXIMUM POWER DENSITY: - DBW/HZ NOISE TEM ANTENNA PATTERN: APEREC015V01 2.1_TABLE8 Model: PIM_DUCTING												004E12 GE OF IPERAT	20050N3 TIME: (URE: 7(600 0.0017 0.0 K	PHA %	SE: D								
TRANSMISSION L TRANSMISSION L	TRANSMISSION LOSS MODE 1: 206.5 DB (DOES NOT INCLUDE HOR. CORR. AND ANT. GAIN) TRANSMISSION LOSS MODE 2: 164.5 DB																							
AZIMUTH OFF-AXIS HOR.ELEV. HOR.CORR. ANT.GAIN COORDINATION D MODE 1	0 145.8 - - -10.0 ISTANCE	5 143.5 - -10.0 (KM)	10 140.8 - - -10.0	15 137.7 _ _ -10.0	20 134.4 _ _ -10.0	25 130.8 - - 10.0	30 127.0 - - -10.0	35 123.2 - - 10.0	40 119.2 - - 10.0	45 115.1 - - -10.0	50 110.9 - - -10.0	55 106.7 - - 10.0	60 102.5 - - -10.0	65 98.2 - - 10.0	70 94.0 - - -10.0	75 89.7 - - 10.0	80 85.4 - - 10.0	85 81.1 - - -10.0	90 76.9 - - -10.0	95 72.6 - - -10.0	100 68.4 _ _ -10.0	105 64.3 - - -10.0	110 60.2 - - -10.0	115 56.2 - - -10.0
0.0 DB MODE 2 0.0 DEG	595 291	599 291	600 291	603 291	604 291	601 291	584 291	585 291	354 291	354 292	354 292	354 29		list	of	Adı	min	isti	ati	ons	to	for	wa	rd
AZIMUTH OFF-AXIS HOR.ELEV. HOR.CORR. ANT.GAIN COORDINATION D	120 52.4 - -10.0 ISTANCE	125 48.6 - - -10.0 (KM)	130 45.1 - -9.4	135 41.8 - - -8.5	140 38.8 - - -7.7	145 36.1 - - -6.9	150 33.9 - - -6.3	155 32.3 - - -5.7	160 31.2 - - -5.4	165 30.9 - - -5.3	170 31.4 - - -5.4	17 32. -5.			γοι	ur c	:00	rdir	nati	on	req	ues	st	
MODE 1 0.0 DB MODE 2	354	354	356	359	362	365	368	370	371	371	371	369	367	3			06	354	354	354	354	354	354	354
AZIMUTH OFF-AXIS	294 240 77.5	294 245 81.8	254 250 86.0	254 255 90.3	294 260 94.6	254 265 98.9	294 270 103.1	294 275 107.4	294 280 111.6	294 285 115.7	294 290 119.8	294 295 123	234	1.4	310 134.9	315 138.2	320 141.2	325 143.9	330 146.1	335 147.7	340 148.8	293 345 149.1	350 148.6	355 147.5
HOR.ELEV. HOR.CORR. ANT.GAIN COORDINATION D MODE 1	-10.0 ISTANCE	- - -10.0 (KM)	-10.0	-10.0	-10.0	-10.0	- - -10.0	-10.0	-10.0	-10.0	-10	~	- -10.0	-10.0	- - -10.0	-10.0	- - -10.0	-10.0	-10.0	- - -10.0	-10.0	- - -10.0	- - -10.0	- - -10.0
0.0 DB MODE 2 0.0 DEG	354 293	354 293	354 293	353 292	353 292	353 292	353 292	353 292	354 292	37 292	385 291	373 291	359 291	356 291	446 291	532 291	549 291	594 291	599 291	599 291	599 291	599 291	595 291	595 291
PROBABLY AFFEC	TED COUN	NTRIES	: D	DNK	C F		G	HOI	. 1	XUX														





Coordination contour diagram- Table 9 – Tx ES in Bidirectional allocations





Coordination contour diagram- Table 10



Predetermined coordination distances for mobile earth stations and earth stations in specific services and specific frequency bands with respect to terrestrial stations

Frequency sharin	g situation	Coordination distance (in sharing situations involving services
Type of earth station	station	allocated with equal rights) (km)
Ground-based in the bands below 1 GHz to which No. 9.11A applies. Ground-based mobile in the bands within the range 1-3 GHz to which No. 9.11A applies	Mobile (aircraft)	500
Aircraft (all bands)	Ground-based	500
Aircraft (all bands)	Mobile (aircraft)	1 000
Ground-based in the bands: 400.15-401 MHz 1 668.4-1 675 MHz	Station in the meteorological aids service (radiosonde)	580
Aircraft in the bands: 400.15-401 MHz 1 668.4-1 675 MHz	Station in the meteorological aids service (radiosonde)	1 080
Ground-based in the radiodetermination-satellite service (RDSS) in the bands: 1 610-1 626.5 MHz 2 483.5-2 500 MHz 2 500-2 516.5 MHz	Ground-based	100
Airborne earth station in the radiodetermination-satellite service (RDSS) in the bands: 1 610-1 626.5 MHz 2 483.5-2 500 MHz 2 500-2 516.5 MHz	Ground-based	400
Receiving earth stations in the meteorological-satellite service	Station in 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 altitud of 20 km above mean sea level, assuming 4/3 Earth radius (see Note 1)
Non-GSO MSS feeder-link earth stations (all bands)	Mobile (aircraft)	500
Non-GSO MSS feeder-link earth stations in the band 5 091-5 150 MHz	Station in the aeronautical radionavigation service	Note 2
Receiving earth stations in the space research service in the band: 2 200-2 290 MHz	Mobile (aircraft)	880
Ground-based in the bands in which the frequency sharing situation is not	Mobile (aircraft)	500



Coordination contour diagram- Table 10- Predetermined distances

Diagra	am 4: 1	ABLE10). TRAN	ISMITTI	NG ES	in FIX	ED-SAT	ELLITE	SERVI	CE W.R	.T. RE	CEIVIN	G TERR	ESTRIA	l stat	IONS. 1	ES is	ground	-based	. TS:	mobile	(airc	raft)	
NOTICE ID: ADM/GEO_AREA: BE SATELLITE NAME: ANTENNA AZIMUTH: FREQUENCY BAND: MAXIMUM ANTENNA ANTENNA PATTERN: TABLE10: PDD 500	123 SL/BEL : - DEG 8295.0 GAIN: : APERE D KM	EA RA 000-83 57.70 C015V0	RTH ST IN CLI 05.000 DBI 1	ATION : MATICA SIC: 0 MHZ	NAME: L ZONE RAL-2A AI	: E NTENNA	SATELI ELEVA ASSIGN MAXIMU	.ITE OR TION: · NED FRE IM POWE	WR: BITAL - DEG QUENCY R DENS	S-2020 POSITI : 8300 SITY: -	1 ON: 16 .00 MH 52.00	EARTH S 5.20 DE MZ DBW/HZ	STATIO G	POSIT PER NOI	CENTAG	004E120 E OF T PERATU	0050N30 IME: RE: -	K	PHA	SE: D				
TRANSMISSION LOS TRANSMISSION LOS	SS MODE SS MODE	1: 2:																						
AZIMUTH	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115
OFF-AXIS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOR.ELEV.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOR.CORR.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COORDINATION DIS	- STANCE	(MM)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PREDETERMINED																								
FIXED DISTANCE	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
3 7 TMUTU	120	125	120	125	140	145	150	155	1.60	165	170	175	190	105	100	105	200	205	21.0	215	220	225	220	225
OFF-AXIS	120	125	130	135	140	145	120	199	100	105	1/0	1/5	100	105	190	192	200	205	210	215	220	223	230	235
HOR.ELEV.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOR.CORR.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANT.GAIN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COORDINATION DIS	STANCE	(KM)																						
PREDETERMINED																								
FIXED DISTANCE	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
AZIMUTH	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350	355
OFF-AXIS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOR.ELEV.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOR.CORR.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANT.GAIN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COORDINATION DIS	STANCE	(KM)																						
FIVED DISTANCE	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
FINED DISIMNCE	500	500	300	500	300	500	500	500	500	500	500	500	500	300	300	500	300	500	300	500	500	500	500	300





Exercise 2: Effect of Horizon elevation angle





Adjustments for ES Horizon Elevation angle

- Propagation Mode 1
- Distances depend on characteristics of the physical horizon
- Angle viewed from the center of the ES antenna, between the horizontal plane and the physical horizon in a particular direction.



Positive (upward) Elevation Angle

- Required path loss will be reduced

Negative (downward) Elevation Angle

- Required path loss will be increased



Appendix 7 - Annex 1 §1



Effect of the Horizon Elevation angle

	SpaceCapture V9 Eile Edit Jools View Window Help	
In WRS-2020.mdb - Notice id 123 - O Hor.elv. - Notice id 124 - Non-O Hor elv.	Notice Station Beam Attachment Notice Id: 124 Administration: BEL Status: 01 A1e1. Type of Station A1e2. Earth Station WRS-2020 A1e3a. A1e3b. Geographical Coordinates Country Longitude Degrees 4 E/W Min 12 Sec. 0 A4c1. Associated Space Station A4c2. Nominal Orbital Longitude (if SICRAL-2A I 16.20 E E/W A16b Commitment to meet PFD limits (applicable bands 13.75-14 GHz) Yes No N/A (applicable bands 13.75-14 GHz) A7d. Altitude 91 Metres A7a. Table of Horizon/ Evation/ Evation/ Evation/ Evation/ Evation/	A7a. Table of Horizon Elevation Angles — — × Azimuth A7a1 Elevation Angle* A7a2 Distance km (optional) ^ 0 7.0 .0 90 10.0 .0 180 12.0 .0 200 5.0 .0 270 3.0 .0 — — —
(IP) ETUWRS GENEVA2020	Current DB : C:\BR_SOFT\\WRS-2020.mdb	16:34 10.11.20

Effect of the Horizon Elevation angle





GIBC SNS V9 - Graphical Interface for Batch Calculations –	×
Appendix 30B Appendix 30 30A EPFD Appendix Power Control Tools / Options PFD NG: PFD (terrestrial serv.) PFD (space serv.) Appendix	ndix 8 SO dix 7
Network ID: 124 Calculate Report	
Message Module Probably affected countries for diagram #4: D F G Progress inc Diagram #5: 'Diagram 5: 2.1_TABLE8' being calculated Progress inc Progress inc Probably affected countries for diagram #5: D F G Progress inc AP7 pack version: 9.0.0.2Appendix 7/Plt-3.2.0.1/Fm-3.8.0 Progress inc Progress inc Store ntc_id = 124 in ESCC database Progress inc Progress inc Batch Calculation finished OK at 16:38:12. Output database GIBC > Calculation Output >	~
Aux Contours Out DB: C:\Users\karunaje\ITU\BR_SPACE_v9.0\TEX_RESULTS\APP:	7
C:\Users\karunaje\ITU\BR_SPACE_v9.0\TEX_RESULTS\APP7 <	
Version 9.0.0.2 Appendix 7	



Effect of the Horizon Elevation angle



Compare results: Tx ES



Compare results: Rx ES





Effect of the Horizon Elevation angle- Compare



Reduced coordination areas



Exercise 3: Auxiliary Contours







Reduced required loss expressed in dB

Auxiliary Mode 2 : (§3.2 Annex 6 of AP7) Angular offset between beams expressed in degrees



Appendix 7 - Annex 6 §3



AP7 embedded in **GIBC**

Power Control Tools / Option PFD (terrestrial serv.) PFD (space Network ID:	s PFD NGSO serv.) Appendix 7	Created separately for Mode 1 and Mode 2
Message	Module	Auxiliary Contours ×
< Calculation Output Aux Contours Out DB:	>	Mode 1 (dB) Mode 2 (Deg) Add dB -10 -20 Clear All Clear All Clear All
Version	>	It's all Complementary information





Auxiliary contours- Mode 1 and Mode 2

GIBC SNS V9 - Graphical Interface for Batch Calculations —	×
Appendix 30B Appendix 30 30A EPFD Appendix 8 Power Control Tools / Options PFD NGSO PFD (terrestrial serv.) PFD (space serv.) Appendix 7	
Network ID: 123 Calculate Report	
Message Module Probably affected countries for diagram #4: D F G Progress ind Diagram #5: 'Diagram 5: 2.1_TABLE8' being calculated Progress ind Progress ind Probably affected countries for diagram #5: D DNK F Progress ind Probably affected countries for diagram #5: D DNK F Progress ind AP7 pack version: 9.0.0.2Appendix 7/Plt-3.2.0.1/Fm-3.8.0 Progress ind Progress ind Store ntc_id = 123 in ESCC database Progress ind Progress ind Batch Calculation finished OK at 15:51:56. Output database GIBC V	
Calculation Output Aux Contours Aux M1(dB): -10.00 -20.00 Aux M2(Deg): 3.00 4.00 Out DB: C:\Users\karunaje\ITU\BR_SPACE_v9.0\TEX_RESULTS\APP7 >	
RTF Report Generation C:\Users\karunaje\ITU\BR_SPACE_v9.0\TEX_RESULTS\APP7 <	
9.0.0.2 Appendix 7	





Rules of Procedure (Appendix 7)

Rules of Procedure (Appendix 7 §1):

No coordination is required when the overlapping distance is less than 5% of the coordination distance.





Rules of Procedure (Appendix 7)

Rules of Procedure (Appendix 7 §2):

Using the system parameter values specified in Tables 7 to 9





result in different coordination contours

use the set of parameters producing the largest coordination area in a given frequency band

Incomplete information in system parameter Tables:

- use the parameters in Table 7 for a Tx ES in a service not mentioned but allocated with equal rights -> all the parameters available in the Notice form
- use the parameters in Table 8 for Rx ES in respect to a Terr. service not mentioned but allocated with equal rights -> Terr. service has same potential interference as listed services



Actions on Coordination Request (Article 9)



3 Things (Planning Adm A)

Coordination of Earth Station





3. Coordinate (with mutual cooperation)



3 Things (Requested Adm B)

Coordination of Earth Station





2. Coordinate (with mutual cooperation)



3. Give an early decision



Links:

https://www.itu.int/md/R19-WRS20-C-0019/en

https://www.itu.int/en/ITU-R/space/Pages/wrs2020SpaceWorkshopVideo.aspx

Thank you!

ITU – Radiocommunication Bureau

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