Earth Station Filings

Nayani Karunajeewa

nayani.karunajeewa@itu.int
Space Services Department
Radiocommunication Bureau
International Telecommunication Union

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How we proceed…..

- Introduction to Earth Stations Filing Process
- Data Capturing Exercise
- Coordination Contour Creation Exercise
- Submission of Notification to the Bureau

Earth Station Filing Process

Coordination

Notification

Earth Stations Filing Process- Articles, Appendices and BR Software

1.

Frequency Study

Article 5 : Frequency Allocations
Article 9 : Coordination Provisions

2.

Collecting and Capturing Data

Appendix 4 : ES Characteristics
SpaceCap : Data Capturing

3.

Coordination Request to Admins

Appendix 7 : Coordination Area
GIBC/AP7 : Identify affected Admins

4.

Notification to BR

SpaceCap : Submission of Notices to BR

Earth Station Filing Process

Coordination

Frequency Study
Article 5 & Article 9 (RR)

Collecting & Capturing Data
Appendix 4 (RR)
SpaceCap
(BR Software)

Data file

GIBC/AP7 (BR Software)

Coordination contours
Appendix 7 (RR)

Coordination Request
send to Adm ns

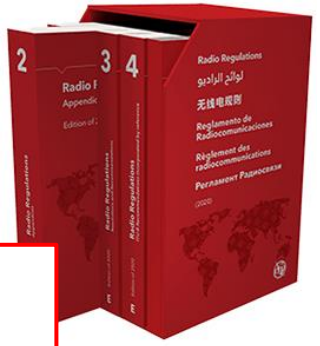
Notification

SpaceCap
(BR Software)

Coordination Agreements

Notification Request
send to BR

Radio Regulations- Frequency allocations



ARTICLE 5

Frequency allocations

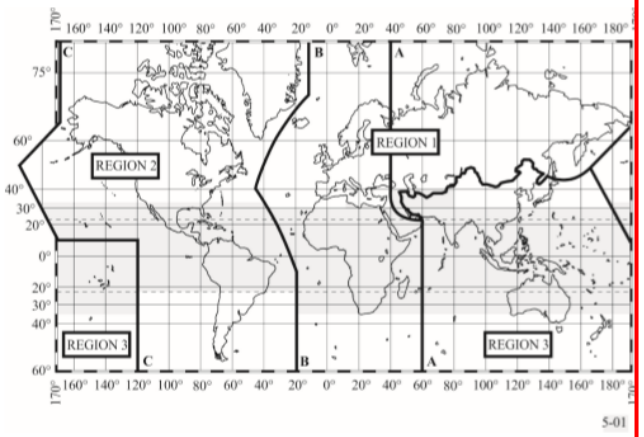
Introduction

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

Frequency distribution to	French	English	Spanish	Arabic	Chinese	Ru
Services	Attribution (attribuer)	Allocation (to allocate)	Atribución (atribuir)	توزيع (يوزع)	划分	распре (распр
Areas or countries	Allotissement (allotir)	Allotment (to allot)	Adjudicación (adjudicar)	تعيين (يعين)	分配	выде (выд
Stations	Assignation (assigner)	Assignment (to assign)	Asignación (asignar)	تخصيص (يخصص)	指配	прис (прис

Section I – Regions and areas

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



The shaded part represents the Tropical Zones as defined in Nos. **5.16** to **5.20** and **5.21**.

Section IV – Table of Frequency Allocations
(See No. **2.1**)

8.3-110 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
Below 8.3	(Not allocated) 5.53 5.54	
8.3-9	METEOROLOGICAL AIDS 5.54A 5.54B 5.54C	
9-11.3	METEOROLOGICAL AIDS 5.54A RADIONAVIGATION	
11.3-14	RADIONAVIGATION	
14-19.95	FIXED MARITIME MOBILE 5.57 5.55 5.56	
19.95-20.05	STANDARD FREQUENCY AND TIME SIGNAL (20 kHz)	
20.05-70	FIXED MARITIME MOBILE 5.57 5.56 5.58	
70-72	**70-90**	**70-72**

Frequency Allocations - Earth Stations

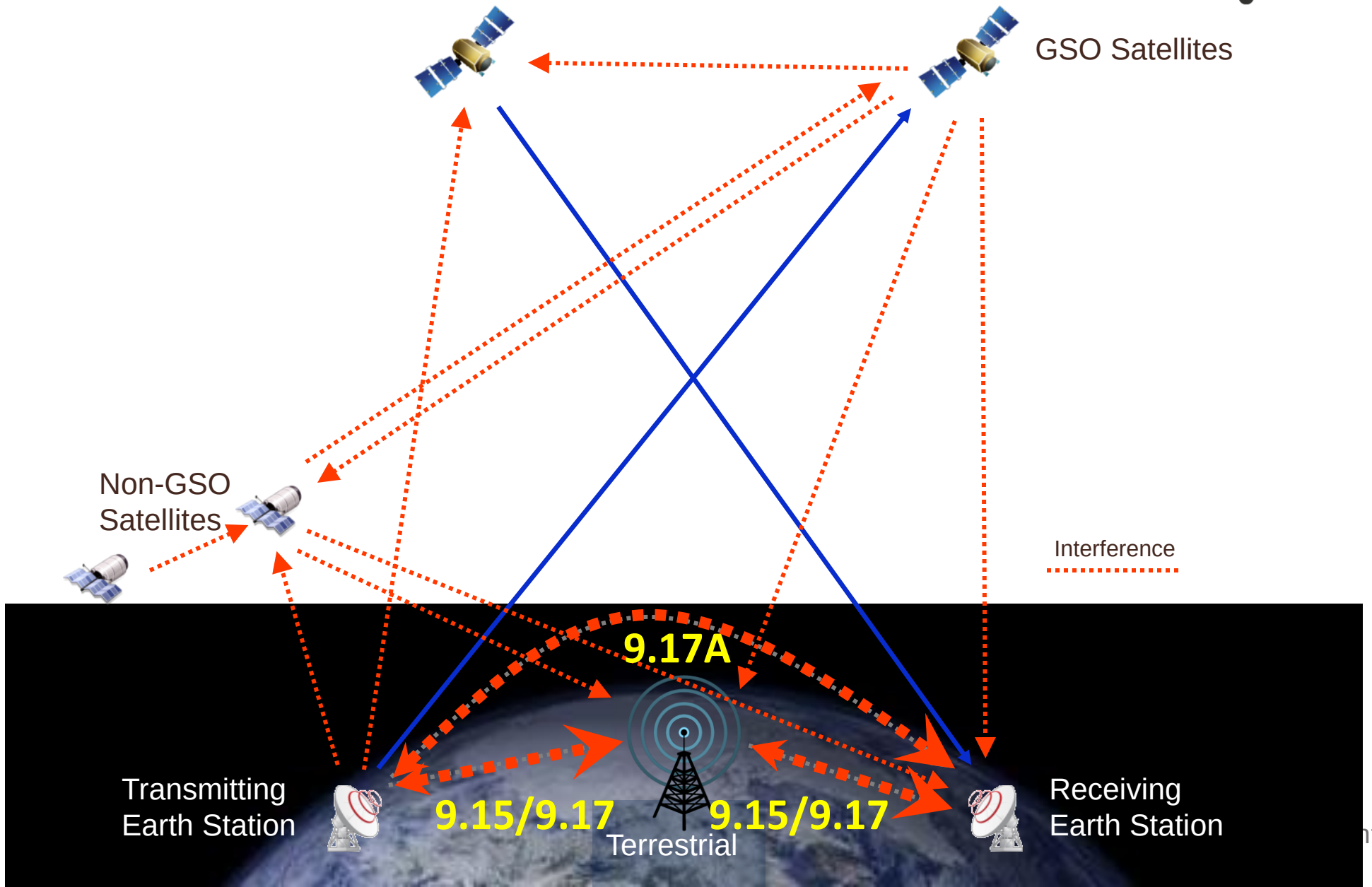
Examples

Allocation to services		
Region 1	**Region 2**	**Region 3**
7 250-7 300	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE 5.461	

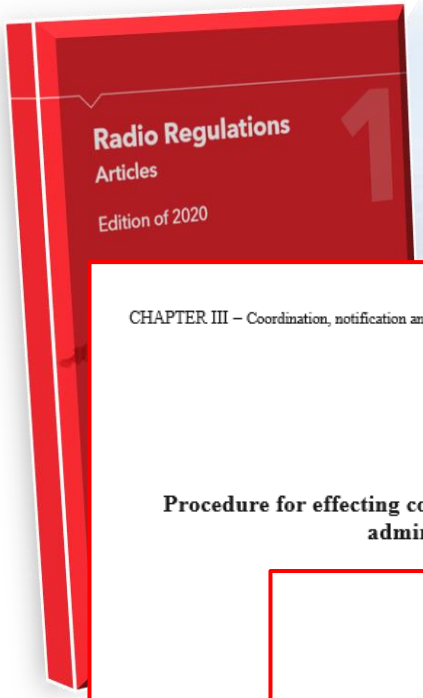
Allocation to services		
Region 1	**Region 2**	**Region 3**
8 025-8 175	EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.463 5.462A	

Allocation to services		
Region 1	**Region 2**	**Region 3**
6 700-7 075	FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441 MOBILE 5.458 5.458A 5.458B	

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



Radio Regulations – Coordination requirements



CHAPTER III – Coordination, notification and recording of frequency assignments and Plan modifications RR9-1

ARTICLE 9

Procedure for effecting coordination with or obtaining agreement of other administrations[1, 2, 3, 4, 5, 6, 7, 8] (WRC-19)

Section II – Procedure for effecting coordination[13, 14]

Sub-Section IIA – Requirement and request for coordination

9.6 Before an administration[15, 16, 17] notifies to the Bureau or b
frequency assignment in any of the cases listed below, it shall effect coordination,
other administrations identified under No. **9.27**: (WRC-03)

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)

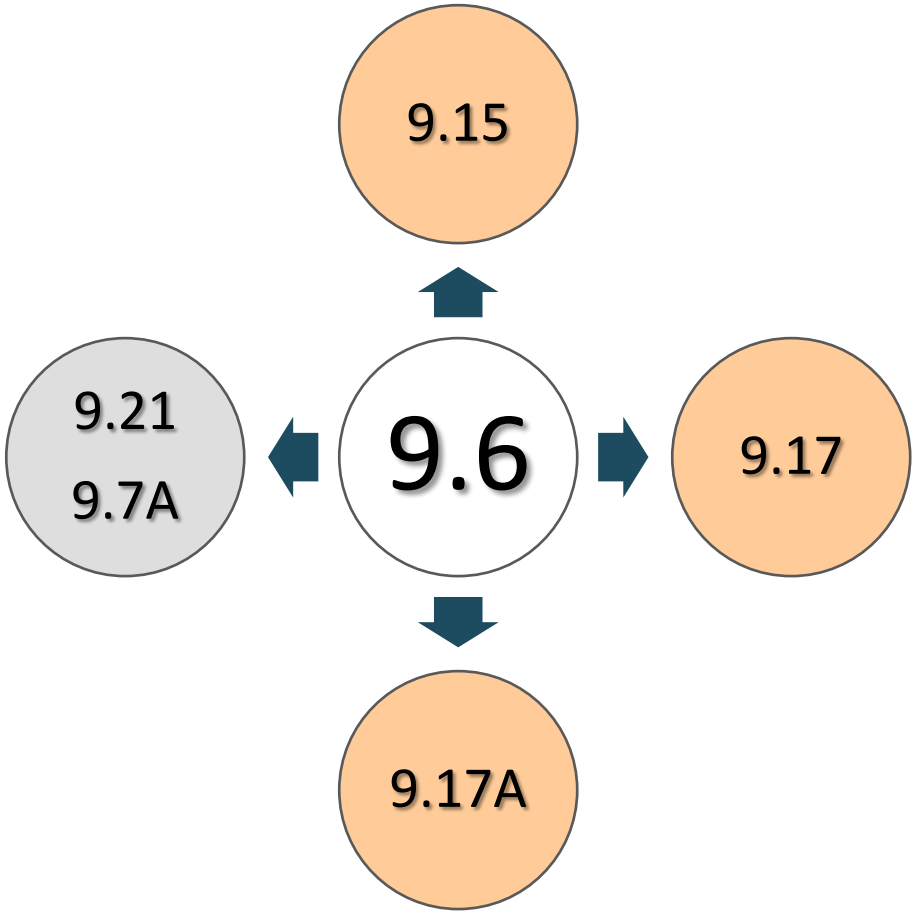
9.20 Not used;

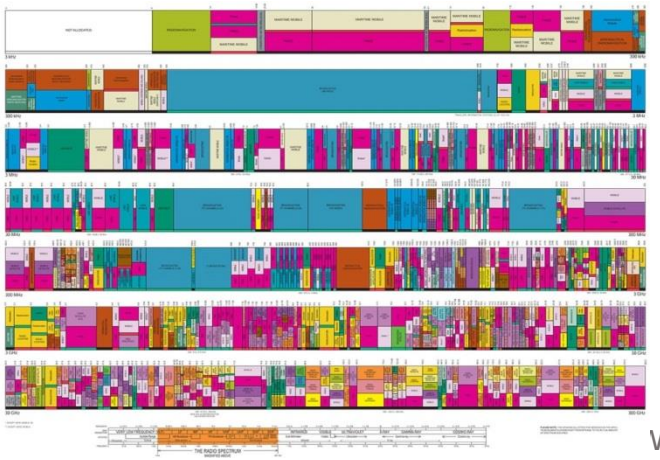
9.21 *p)* for any station of a service for which the requirement to seek the agreement of other administrations is included in a footnote to the Table of Frequency Allocations referring to this provision. (WRC-2000)

Coordination Provisions in Article 9 of RR

Volume No.1 → Article 9

9.6	Administrations **shall effect coordination before** notifying to the BR or brings into use any frequency assignment.

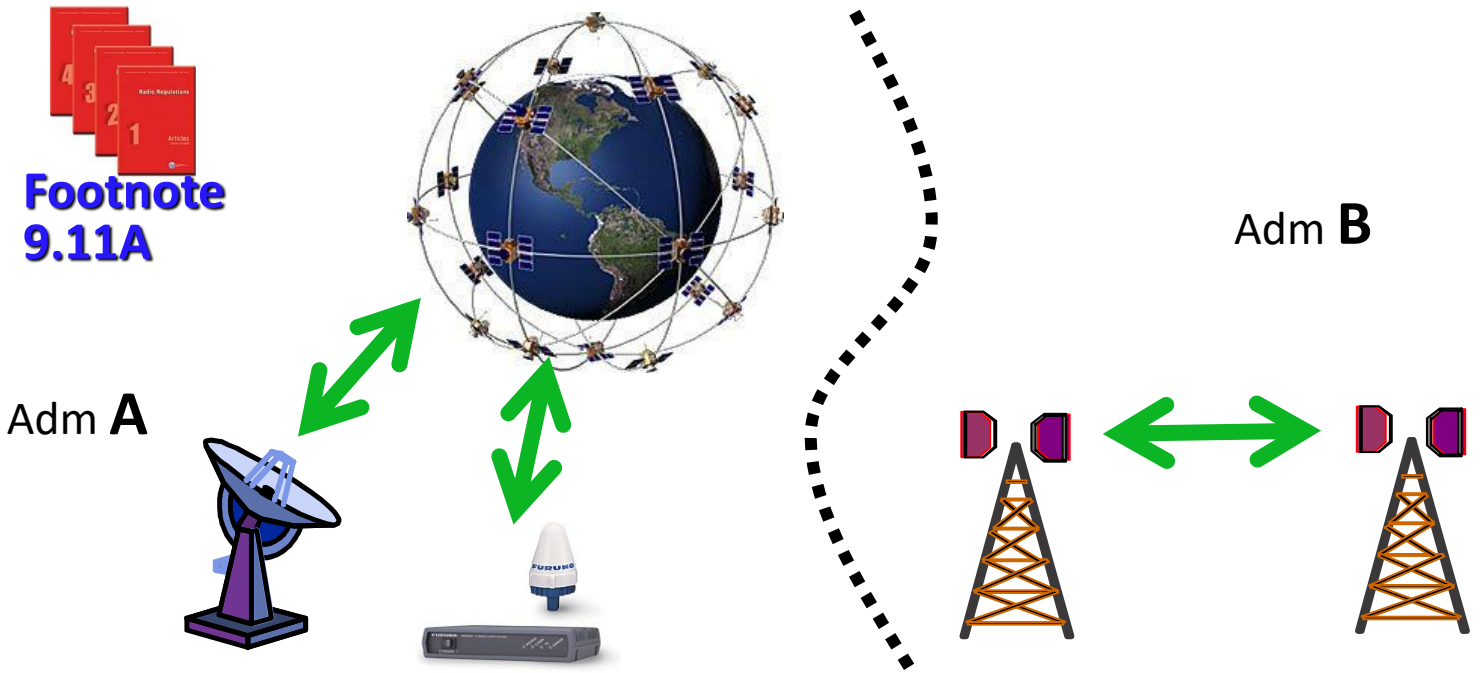




Coordination Provisions in Article 9 of RR

Volume No.1 → Article 9

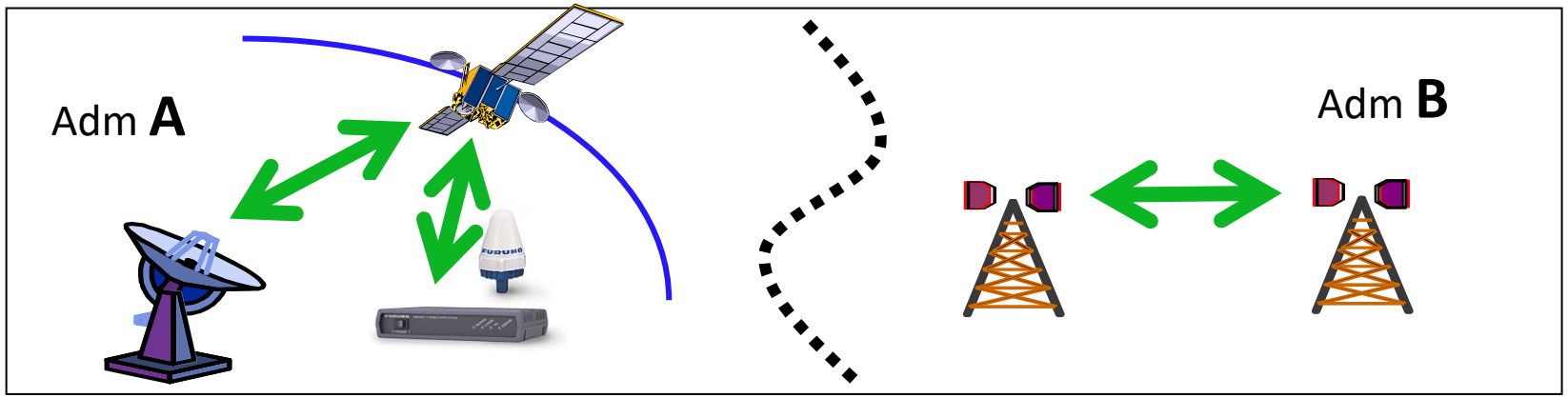
9.15	Coordination of a **Specific or Typical** Earth Station of **non-GSO** in respect of **Terrestrial Stations** (associated with Footnote - 9.11A)

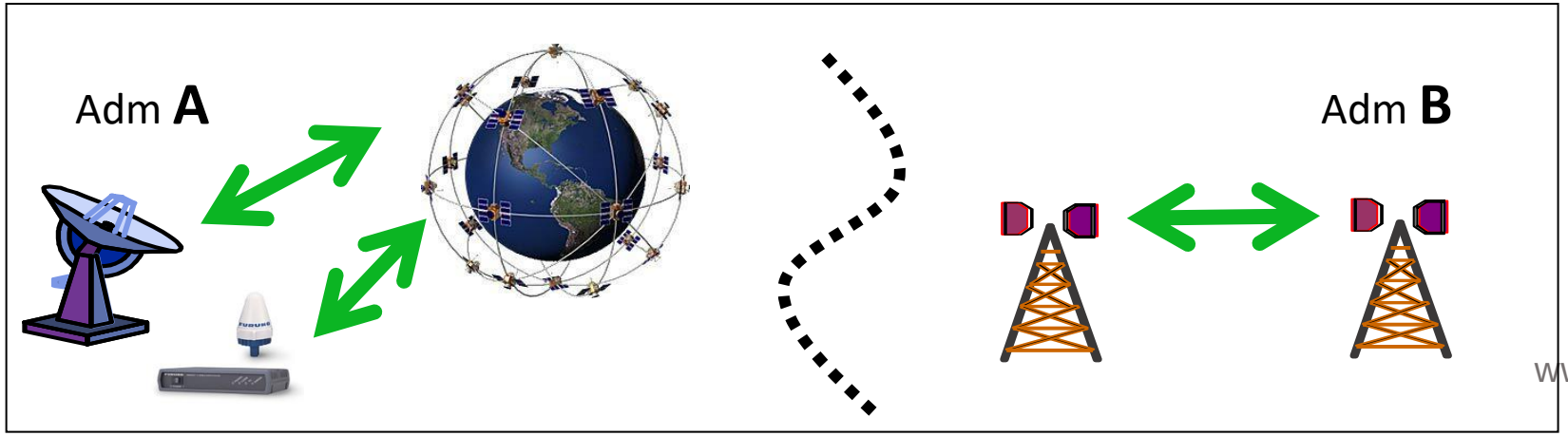


Coordination Provisions in Article 9 of RR

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*

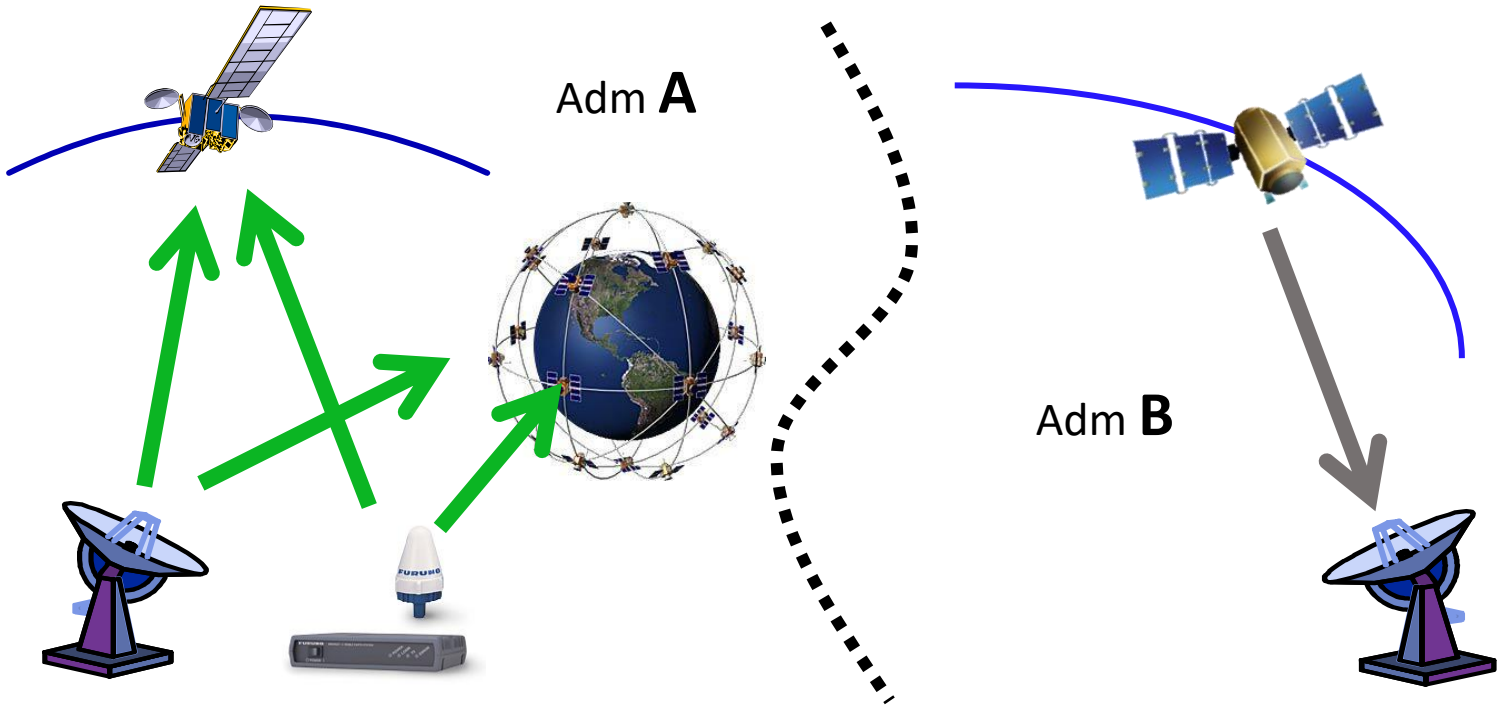




Coordination Provisions in Article 9 of RR

Volume No.1 → Article 9

9.17A	Coordination of any **Specific Earth Station** in respect of other Earth Stations operating in the **opposite direction** of transmission **(ODT)**, or any **Typical Mobile** Earth Station in respect of **Specific Earth Station** **(ODT)** ***Rx E/S – No methodology in AP7***



Coordination Provisions in Article 9 of RR

Volume No.1 → Article 9

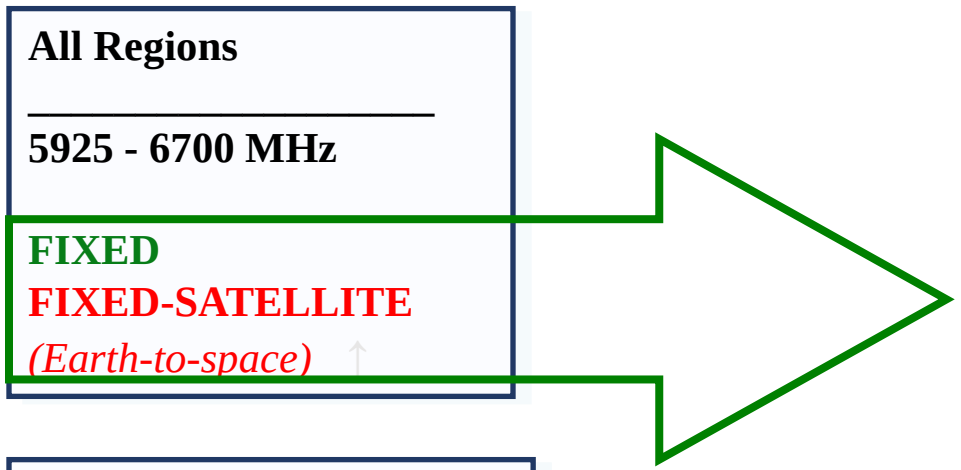
Coordination requirements for ES published in CR/C

9.21	Specific Earth Station of a service required to seek agreement of other administrations (under Footnotes) (e.g. footnote 5.461 – MSS)

9.7A	Coordination of specific earth station in a geostationary-satellite network in the fixed-satellite service in certain frequency bands, in respect of a non-geostationary-satellite system in the fixed-satellite service;

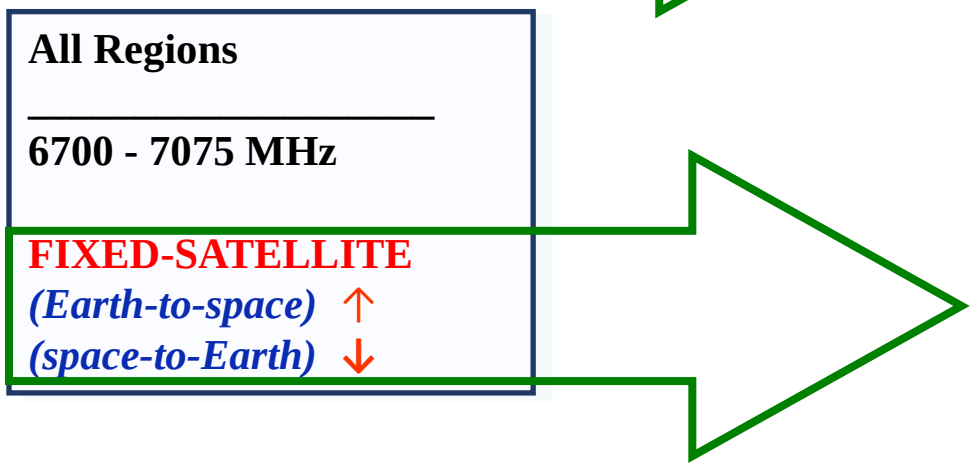
Requirement for ES Coordination

01. Frequencies are shared between Space and Terrestrial services/ES in opposite directions



equal rights

Space = Terrestrial

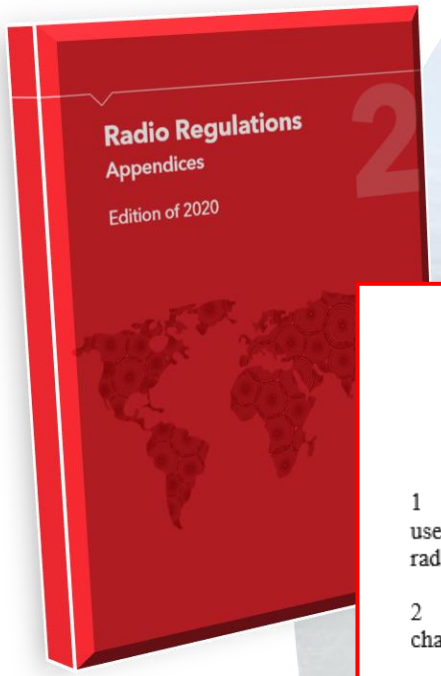


opposite direction

Uplink ↔ Downlink

02. Coordination Area includes the territory of another country

Radio Regulations –Data to be submitted



APPENDIX 4 (REV.WRC-19)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

1 The substance of this Appendix is separated into two parts: one concerning da use for terrestrial radiocommunication services and another concerning data and their us radiocommunication services or the radio astronomy service. (WRC-12)

2 Both parts contain a list of characteristics and a table indicating the use of characteristics in specific circumstances.

Annex 1: Characteristics of stations in the terrestrial services

Annex 2: Characteristics of satellite networks, earth stations or radio astronomy station

ANNEX 1

Characteristics of stations in the terrestrial services[1]

In application of Appendix 4 there are many cases when the data requirements involve standard symbols in submissions to the Radiocommunication Bureau. These standard sy be found in the Preface to the BR International Frequency Information Circular (BR IFIC) Services). In the Tables, this is referred to simply as "the Preface". Also additional infor be found in the guidelines published on the Bureau's website.

Key to the symbols used in Annex 1

X	Mandatory information
+	Mandatory under the conditions specified in Column 3 of Table 1 and Column 2 of T

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations[2] (Rev.WRC-12)

Information relating to the data listed in the following Tables

In many cases the data requirements involve the use of standard symbols in submissions to the Radiocommunication Bureau. These standard symbols may be found in the "Preface to the BR International Frequency Information Circular", (BR IFIC) (Space Services), the ITU-R webpage and the Space Radiocommunication Stations on DVD-ROM. (In the Table, this is referred to simply as "the Preface".) Information relating to the provision of data may also be found in ITU-R Recommendations, for example, information on the mask data can be found in the most recent version of Recommendation ITU-R S.1503, and the most recent version of Recommendation ITU-R SM.1413 provides general information related to submission of data.

Key to the symbols used in Tables A, B, C and D

X	Mandatory information
+	Mandatory under the conditions specified in Column 2
O	Optional information
C	Mandatory if used as a basis to effect coordination with another administration
	The data item is not applicable to the corresponding notice

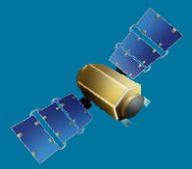
RR Volume No.2 - Appendix 4 Data

Examples: Mandatory Data

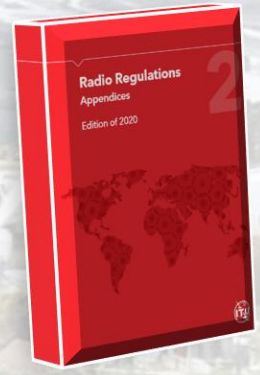
GEOGRAPHICAL DATA

Coordinates (Longitude / Latitude)
Altitude

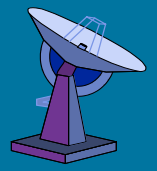
ASSOCIATED SPACE STATION



Identification (Geo, Non-Geo)
Orbital Position (GSO)



ANTENNA

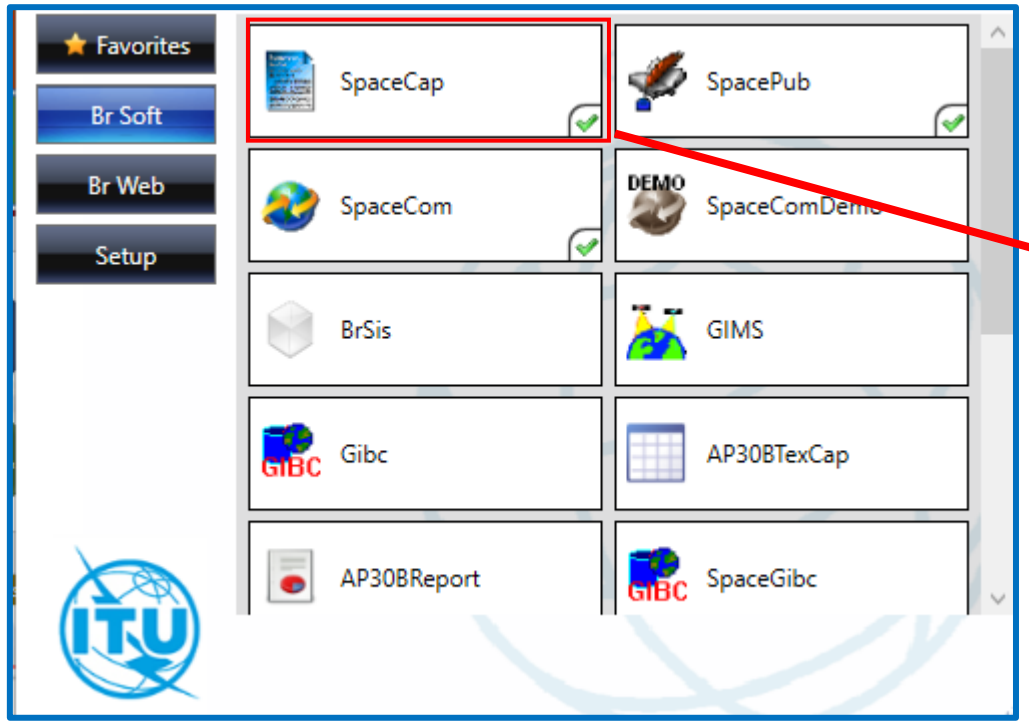


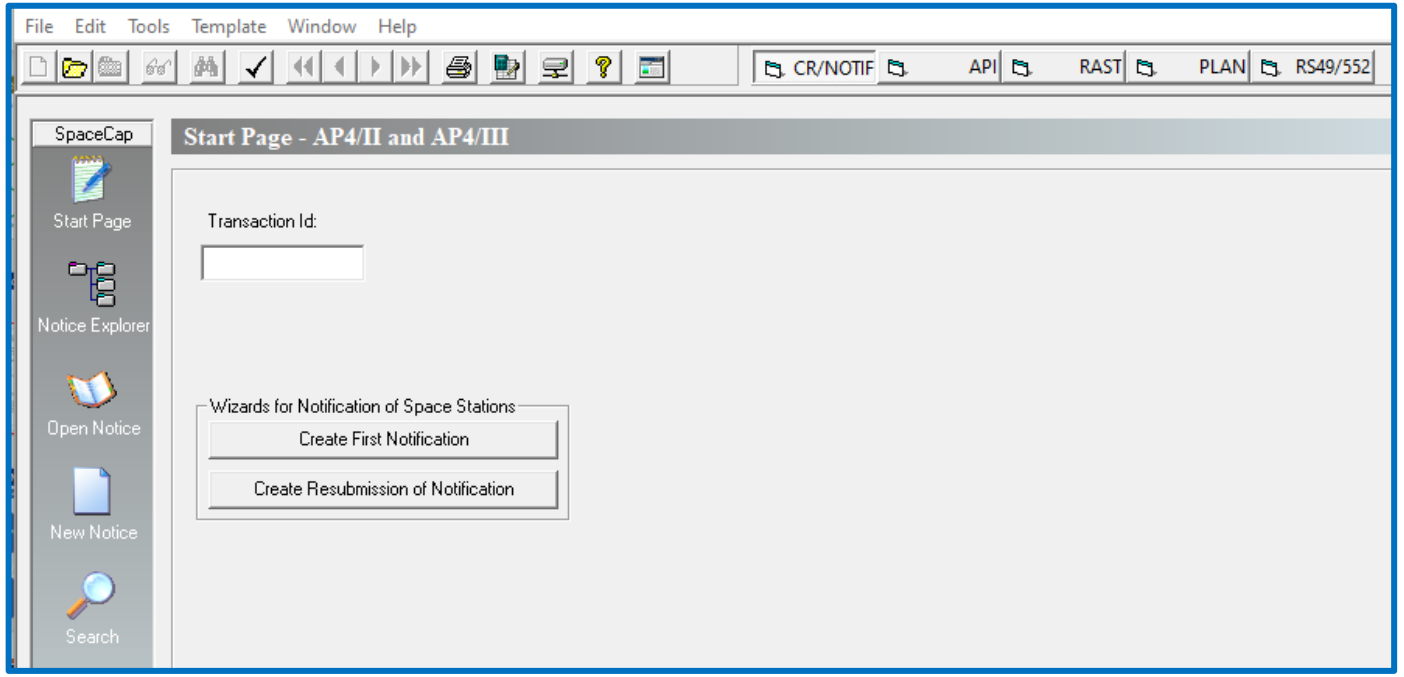
Maximum gain
Radiation pattern
Noise temperature

SIGNAL CHARACTERISTICS

Power , Maximum Power Density
Frequencies, Bandwidth
Emission Type

Data capturing - SpaceCap





Coordination Area

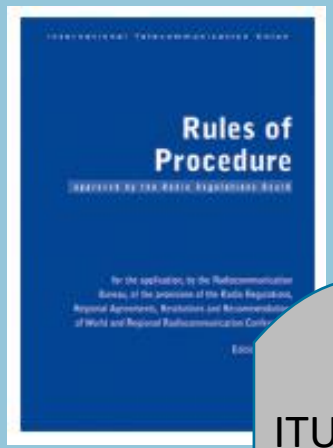
Affected Administrations within the **Coordination Area**

Determination of the Coordination Area Around an Earth Station:
Technical and regulatory requirements
in

Appendix 7 of RR

+

Rules of Procedure



ITU-R Recommendations:

ITU-R SM. 1488
ITU-R P. 452
ITU-R P. 620

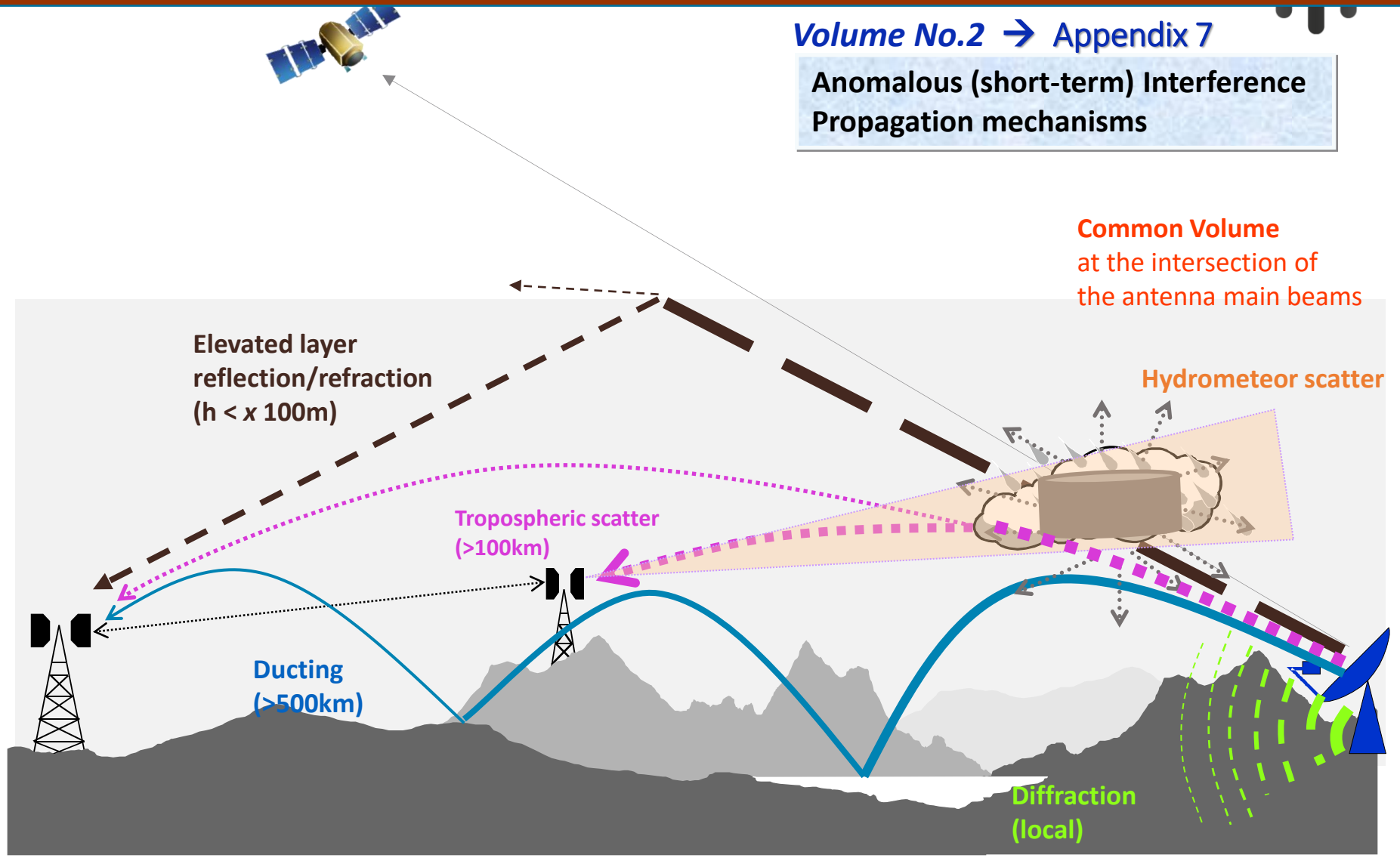
Coordination Area- Definition

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

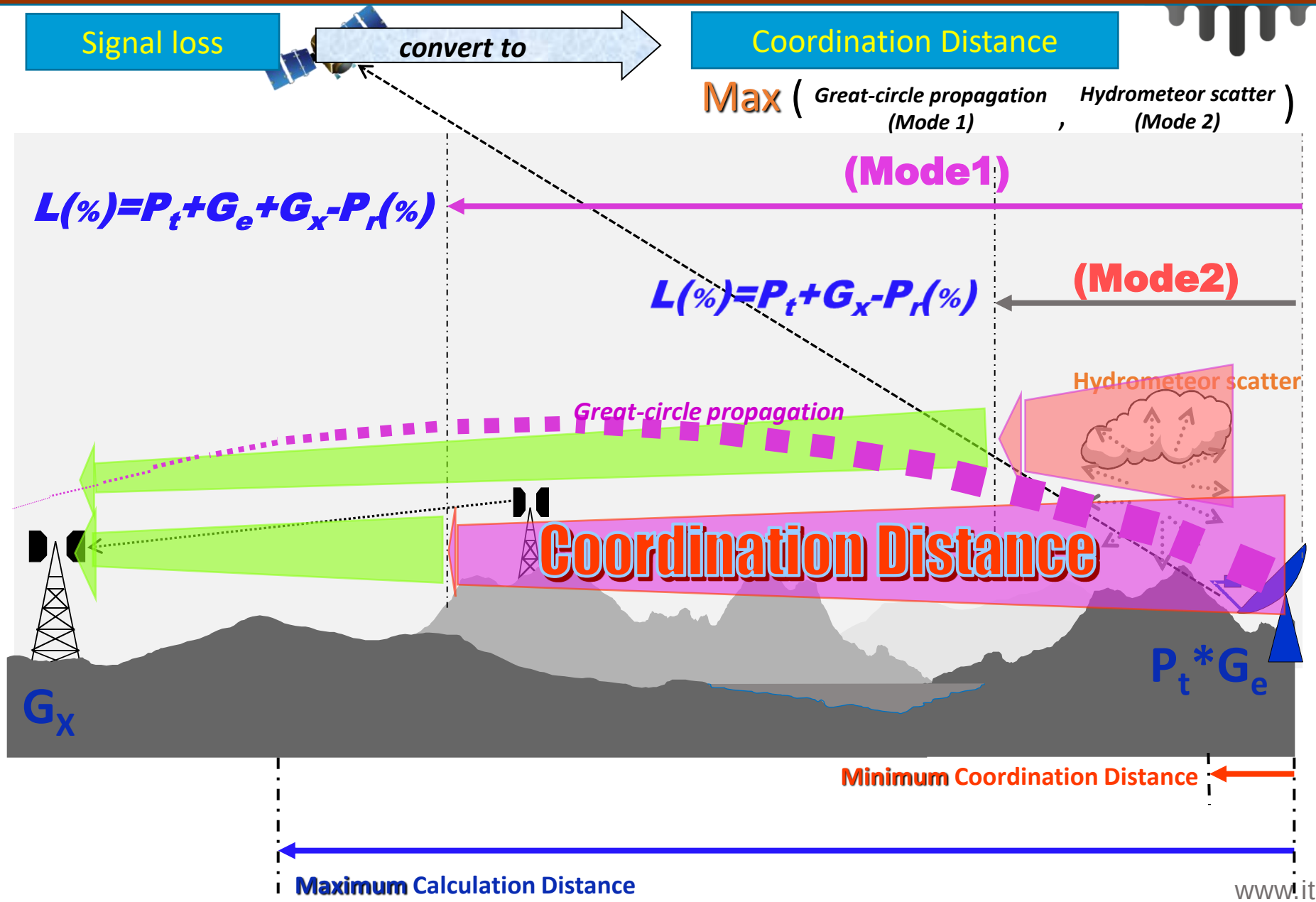
Volume No.2 → Appendix 7

Anomalous (short-term) Interference Propagation mechanisms



Great-circle propagation (Mode 1) – *4 Radio-Clim. zone* + ***Hydrometeor scatter*** (Mode 2) – *15 Rain zone A-Q* ⇨ **Coordination Distance**

Determination of Coordination Area



Known Characteristics of ES

Conservative assumptions for the propagation path & system parameters of the unknown station

Min required path loss ->to meet Max permissible interfering power level at the Rx

Coordination contour diagrams

Appendix 7

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

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

Coordination contour diagrams

Table 7
Transmitting ES

TABLE 7a (Rev.WRC-12)

Parameters required for the determination of coordination distance for a transmitting earth station

Transmitting space radiocommunication service designation		Mobile-satellite, space operation	Earth exploration-satellite, meteorological satellite		Space operation	Space research, space operation	Mobile-satellite	Space operation		Mobile-satellite, radio-determination-satellite	Mobile-satellite		Space operation, space research		Mobile-satellite		Space research, space operation, Earth exploration-satellite
Frequency bands (MHz)		148.0-149.9	401-403		433.75-434.25	449.75-450.25	806-840	1 427-1 429		1 610-1 626.5	1 668.4-1 675		1 750-1 850		1 980-2 025		2 025-2 110 2 110-2 120 (Deep space)
Receiving terrestrial service designations		Fixed, mobile	Meteorological aids		Amateur, radiolocation fixed, mobile	Fixed, mobile, radio-location	Fixed, mobile broadcasting, aeronautical radionavigation	Fixed, mobile		Aeronautical radionavigation	Fixed, mobile		Fixed, mobile		Fixed, mobile		Fixed, mobile
Method to be used		§ 2.1, § 2.2	§ 2.1, § 2.2		§ 2.1, § 2.2	§ 2.1, § 2.2	§ 1.4.6	§ 2.1, § 2.2		§ 1.4.6	§ 1.4.6		§ 2.1, § 2.2		§ 1.4.6		§ 2.1, § 2.2
Modulation at terrestrial station [1]		A	A	N		A and N	A and N	A	N		A	N	A	N	A	N	A
Terrestrial station interference parameters and criteria	p_0 (%)	1.0				0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01		0.01
	N	1				2	2	2	2		2	2	2	2	2		2
	p (%)	1.0				0.005	0.005	0.005	0.005		0.005	0.005	0.005	0.005	0.005		0.005
	N_I (dB)	–				0	0	0	0		0	0	0	0	0		0
	M_s (dB)	–				20	20	33	33		33	33	33	33	26 [2]		26 [2]
	W (dB)	–				0	0	0	0		0	0	0	0	0		0
Terrestrial station parameters	G_X (dBi) [3]	8				16	16	33	33		35	35	35	35	49 [2]		49 [2]
	T_e (K)	–				750	750	750	750		750	750	750	750	500 [2]		500 [2]
Reference bandwidth	B (Hz)	4×10^3				12.5×10^3	12.5×10^3	4×10^3	10^6		4×10^3	10^6	4×10^3	10^6	4×10^3		4×10^3
Permissible interference power	$P_y(p)$ (dBW) in B	−153				−139	−139	−131	−107		−131	−107	−131	−107	−140		−140

1 A: analogue modulation; N: digital modulation.

2 The parameters for the terrestrial station associated with transhorizon systems have been used. Line-of-sight radio-relay parameters associated with the frequency band 1 668.4-1 675 MHz may also be used to determine a supplementary contour. (WRC-03)

3 Feeder losses are not included.

Coordination contour diagrams

Table 8
Receiving ES

TABLE 8a (Rev.WRC-23)

Parameters required for the determination of coordination distance for a receiving earth station

Receiving space radiocommunication service designation			Space operation, space research	Meteoro-logical-satellite, mobile-satellite	Space research	Space research, space operation	Space operation	Mobile-satellite	Meteoro-logical-satellite	Mobile-satellite	Space research	Space operation	Meteoro-logical-satellite	Mobile-satellite	Broadcasting-satellite (DAB)	Mobile-satellite, land-mobile satellite, maritime mobile-satellite
Frequency bands (MHz)			137-138	137-138	143.6-143.65	174-184	163-167 272-273 [5]	335.4-399.9	400.15-401	400.15-401	400.15-401	401-402	460-470	856-890	1 452-1 492	1 518-1 530 1 555-1 559 2 160-2 200 [1]
Transmitting terrestrial service designations			Fixed, mobile	Fixed, mobile	Fixed, mobile, radio-location	Fixed, mobile, broad-casting	Fixed, mobile	Fixed, mobile	Meteoro-logical aids	Meteoro-logical aids	Meteoro-logical aids	Meteoro-logical aids, fixed, mobile	Fixed, mobile	Fixed, mobile, broad casting	Fixed, mobile, broadcasting	Fixed, mobile
Method to be used			§ 2.1	§ 2.1	§ 2.1	§ 2.1	§ 2.1	§ 1.4.6	§ 1.4.6	§ 1.4.6	–	§ 2.1	§ 2.1	§ 1.4.6	§ 1.4.5	§ 1.4.6
Modulation at earth station [2]			N		N		N				N	N			N	N
Earth station interference parameters and criteria	p_0 (%)		0.1		0.1		1.0		0.012		0.1	0.1	0.012			10
	n		2		2		1		1		2	2	1			1
	p (%)		0.05		0.05		1.0		0.012		0.05	0.05	0.012			10
	N_L (dB)		0		0		0		0		0	0				0
	M_s (dB)		1		1		1		4.3		1	1				1
	W (dB)		0		0		0		0		0	0				0
Terrestrial station parameters	E (dBW) in B [3]	A	–		–		15				–	–	5		38	37 [4]
		N	–		–		15				–	–	5		38	37
	P_t (dBW) in B	A	–		–		–1				–	–	–11		3	0
		N	–		–		–1				–	–	–11		3	0
	G_x (dBi)		–		–		16				–	–	16		35	37
Reference bandwidth	B (Hz)		1		1		10^3		177.5×10^3		1	1	85		25×10^3	4×10^3
Permissible interference power	$P_r(p)$ (dBW) in B		–199		–199		–173		–148		–208	–208	–178			–176

[1] In the band 2 160-2 200 MHz, the terrestrial station parameters of line-of-sight radio-relay systems have been used. If an administration believes that, in this band transhorizon systems need to be considered, the parameters associated with the frequency band 2 500-2 690 MHz may be used to determine the coordination area.

[2] A: analogue modulation; N: digital modulation.

[3] E is defined as the equivalent isotropically radiated power of the interfering terrestrial station in the reference bandwidth.

[4] This value is reduced from the nominal value of 50 dBW for the purposes of determination of coordination area, recognizing the low probability of high power emissions falling fully within the relatively narrow bandwidth of the earth station.

[5] The fixed-service parameters provided in the column for 163-167 MHz and 272-273 MHz are only applicable to the band 163-167 MHz.

Coordination contour diagrams

Table 9
Bidirectional allocations

TABLE 9a (Rev.WRC-19)

Parameters required for the determination of coordination distance for a transmitting earth station in bands shared bidirectionally with receiving earth stations

Space service designation in which the transmitting earth station operates		Mobile-satellite	Earth exploration-satellite, meteorological-satellite	Mobile-satellite		Fixed-satellite, mobile-satellite	Aeronautical mobile-satellite (R) service		Fixed-satellite [3]		Fixed-satellite	Fixed-satellite, meteorological-satellite	Fixed-satellite
Frequency bands (GHz)		0.272-0.273	0.401-0.402	1.670-1.675		2.655-2.690	5.030-5.091		5.150-5.216		6.700-7.075	8.025-8.400	8.025-8.400
Space service designation in which the *receiving* earth station operates		Space operation	Space operation	Meteorological-satellite		Fixed-satellite, broadcasting-satellite	Aeronautical mobile-satellite (R) service		Fixed-satellite	Radiodetermination-satellite	Fixed-satellite	Earth exploration-satellite	Earth exploration-satellite
Orbit [6]		Non-GSO	Non-GSO	Non-GSO	GSO		Non-GSO	GSO	Non-GSO		Non-GSO	Non-GSO	GSO
Modulation at *receiving* earth station [1]		N	N	N	N						N	N	N
Receiving earth station interference parameters and criteria	p_0 (%)	1.0	0.1	0.006	0.011						0.005	0.011	0.083
	n	1	2	3	2						3	2	2
	p (%)	1.0	0.05	0.002	0.0055						0.0017	0.0055	0.0415
	N_L (dB)	0	0	0	0						1	0	1
	M_s (dB)	1	1	2.8	0.9	2			2	2	2	4.7	2
	W (dB)	0	0	0	0						0	0	0
Receiving earth station parameters	G_m (dBi) [2]	20	20	30	45		45	45	48.5		50.7		
	G_r (dBi) [4]	19	19	19 [9]	8		8	8	10		10	10	8
	ε_{min} [5]	10°	10°	5°	3°	3°	10°	10°	3°	3°	3°	5°	3°
	T_e (K) [7]	500	500	370	118	75	340	340	75	75	75		
Reference bandwidth	B (Hz)	10^3	1	10^6	4×10^3		37.5×10^3	37.5×10^3			10^6	10^6	10^6
Permissible interference power	$P_r(p)$ (dBW) in B	−177	−208	−145	−178		−163.5	−163.5			−151	−142	−154

Coordination contour diagrams

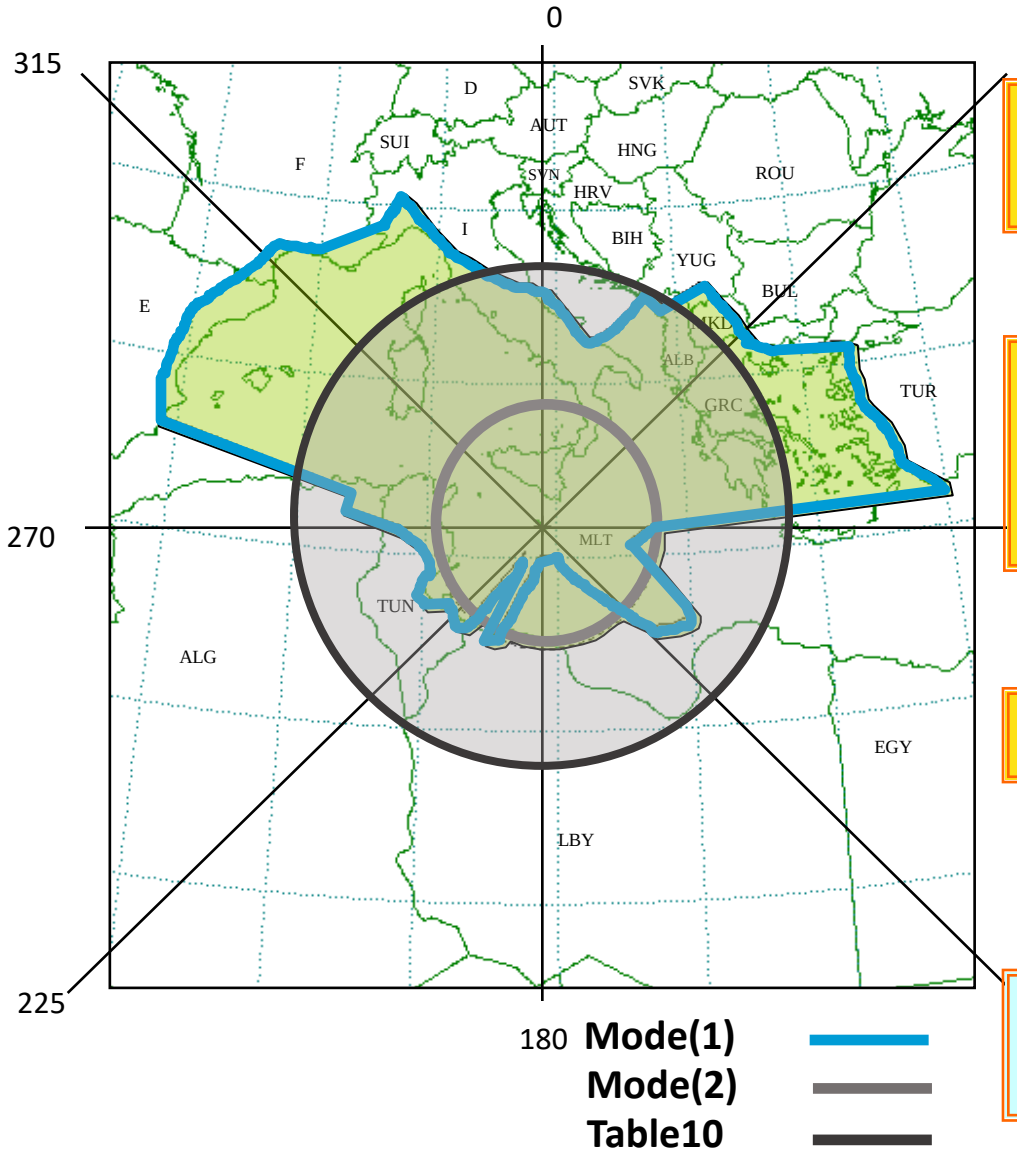
Table 10
Predetermined distances

TABLE 10 (Rev.WRC-19)

Predetermined coordination distances

Frequency sharing situation		Coordination distance (in sharing situations involving services allocated with equal rights) (km)
Type of earth station	**Type of terrestrial station**	
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 altitude 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 covered in the rows above	Mobile (aircraft)	500

Coordination Area- What does it mean?



Coordination contours with the greatest coordination distance

However

It represents a regulatory concept based on Worst Cases & Conservative Assumptions.

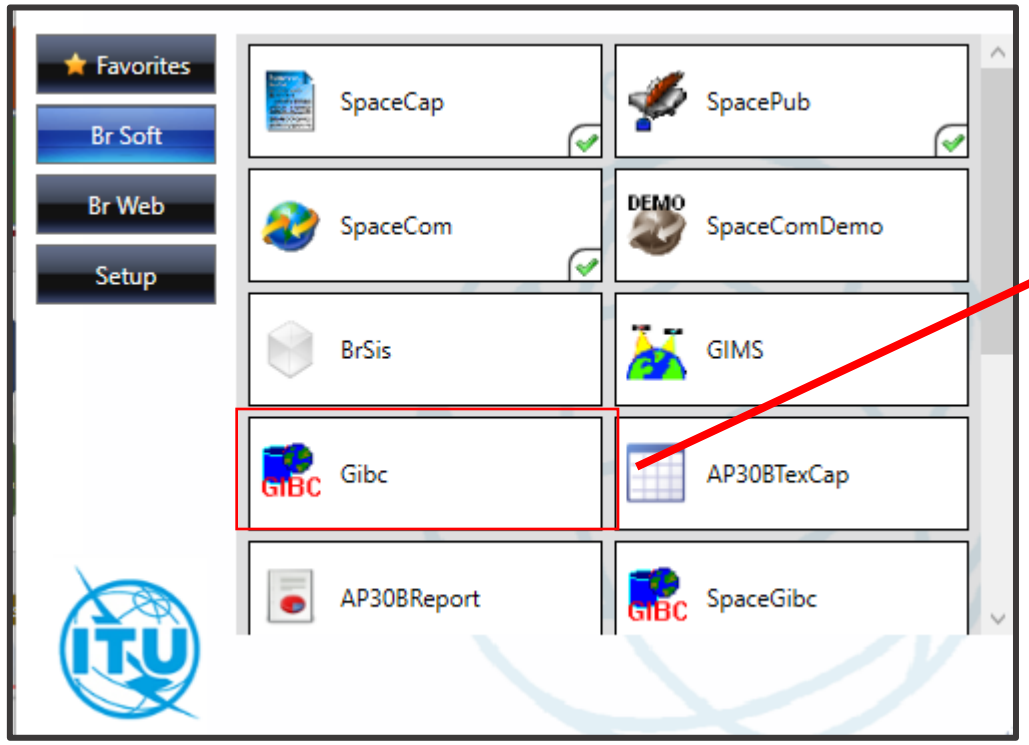
i.e.

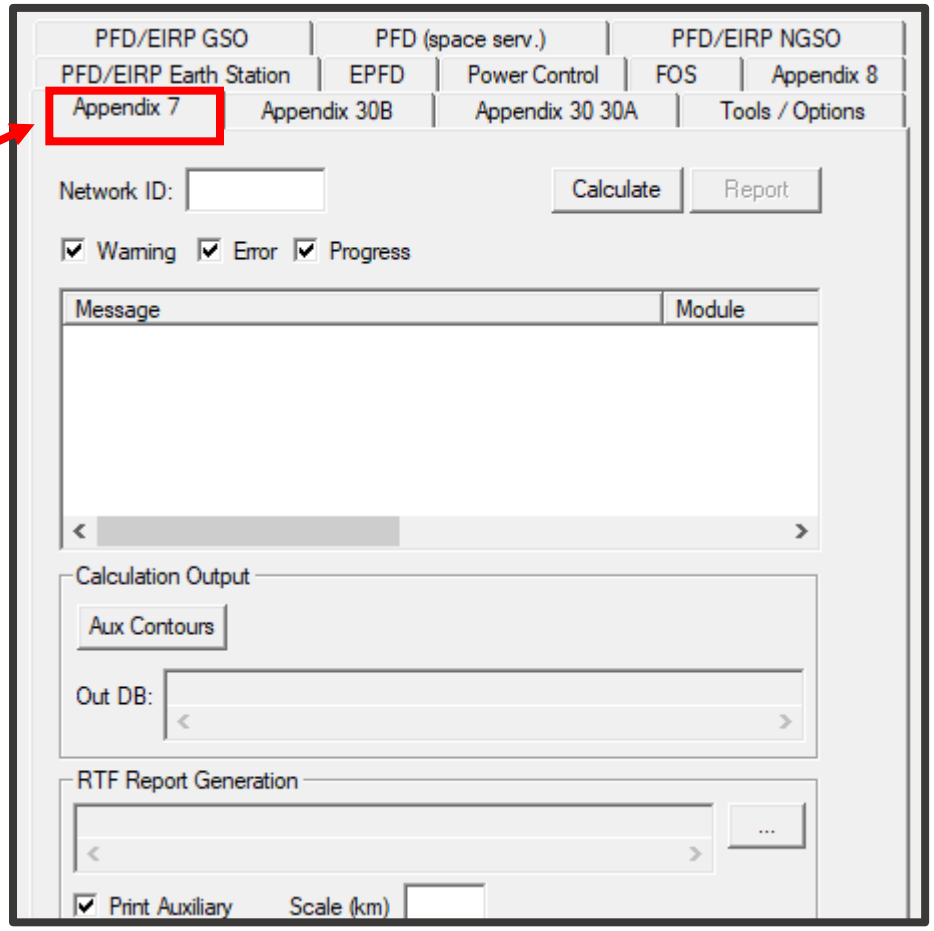
It's not an exclusion zone.

means

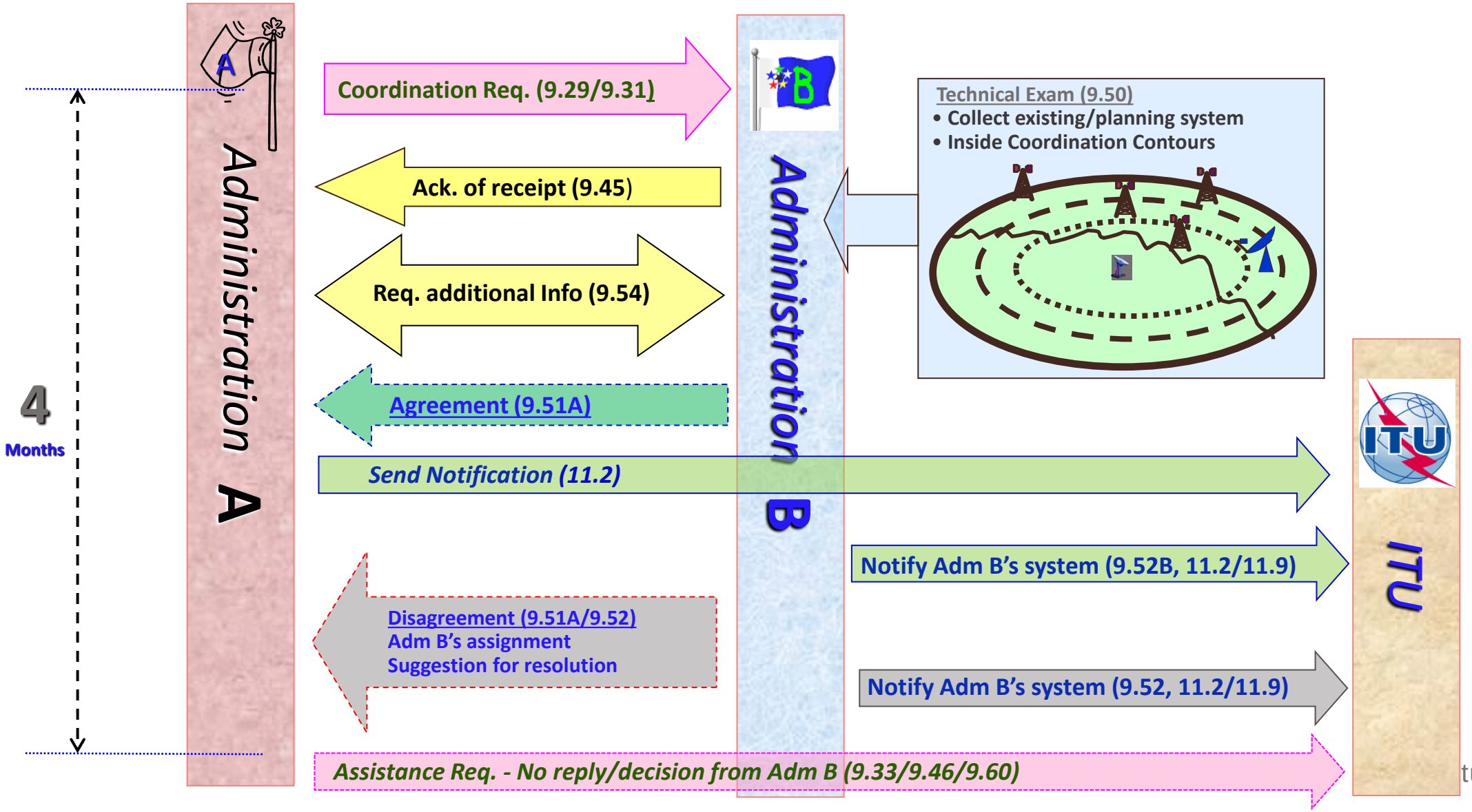
More detailed calculations and discussions **need to be performed.**

Identify affected administrations- GIBC AP7



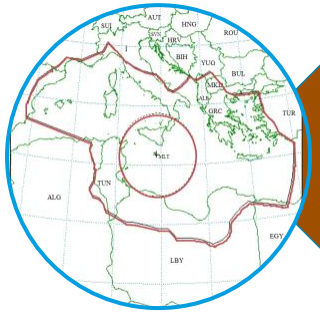


Actions by Administrations on Coordination Request

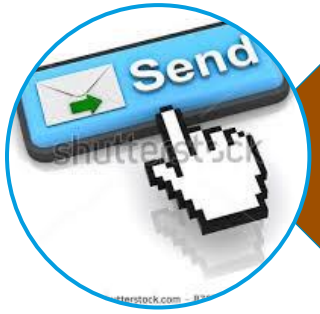


3 Things (Planning Adm A)

Coordination of Earth Station



1. Define Affected ADM (AP7)

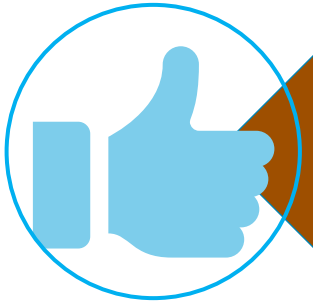


2. Send Request (AP4 & AP7)

3. Coordinate (with mutual cooperation)

3 Things (Requested Adm B)

Coordination of Earth Station

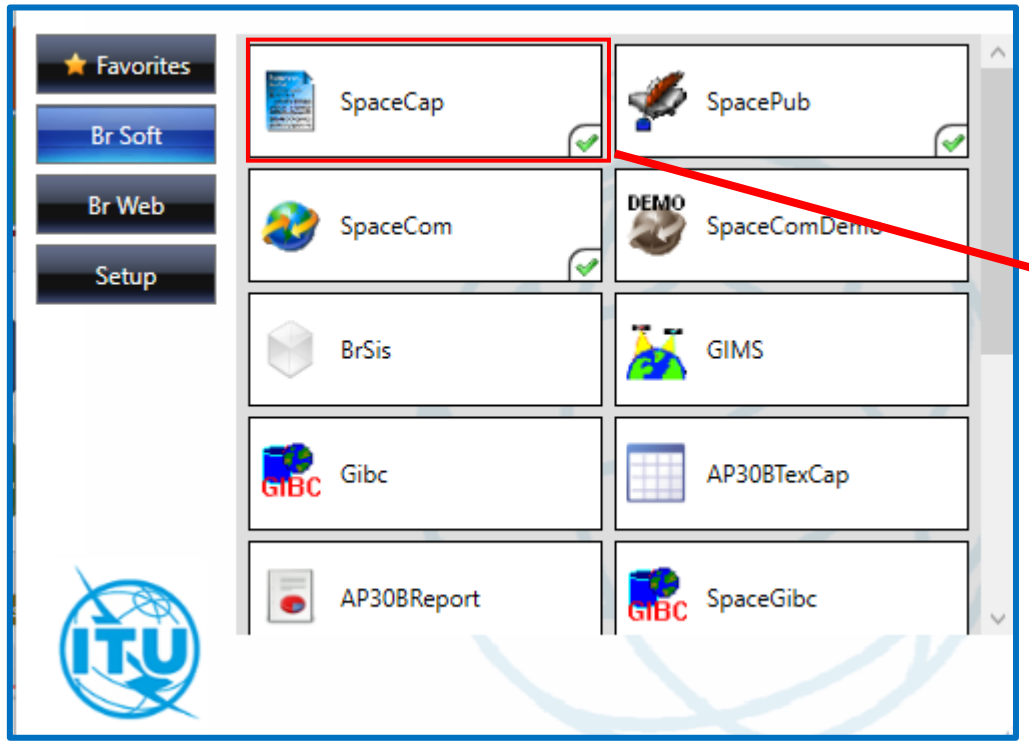


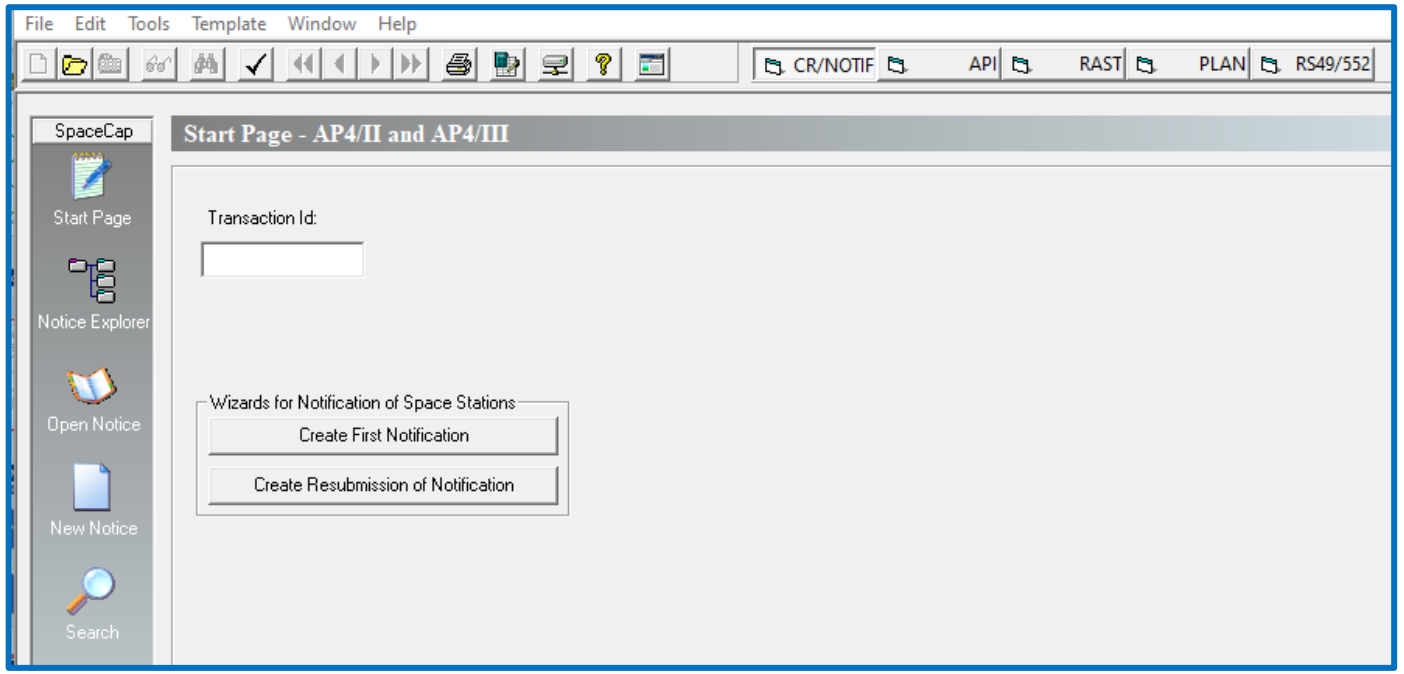
1. Acknowledge receipt of coordination data

2. Coordinate (with mutual cooperation)

3. Give an early decision

Submission of ES for Notification- SpaceCap





Next…

Data Capturing Exercise