Earth Station Coordination and Tools

Presented by :

ITU (International Telecommunication Union)

BR-Space Services Department

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AFRALTI, Nairobi-KENYA, 8-12 August 2016

Process for E/S Coordination

Frequency Study

- Article 5 : Frequency Allocation
- Article 9: Understanding Coordination Provisions

Sending Information

- Appendix 7: Copy of Coordination Diagram
- Appendix 4: Coordination data (AP4/III)

Coordination & Notification

- Coordination under 9.15 / 9.17 / 9.17A / 9.21
- Send Notification data (AP4 captured by SpaceCap)

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Frequency Allocations for Earth Station

Volume No.1 → **Article 5**

Region 1 *Example*

5850 - 5925 MHz

FIXED
FIXED-SATELLITE
(Earth-to-space) ↑

equal rights

Space = Terrestrial

All Regions *Example*

6700 - 7075 MHz

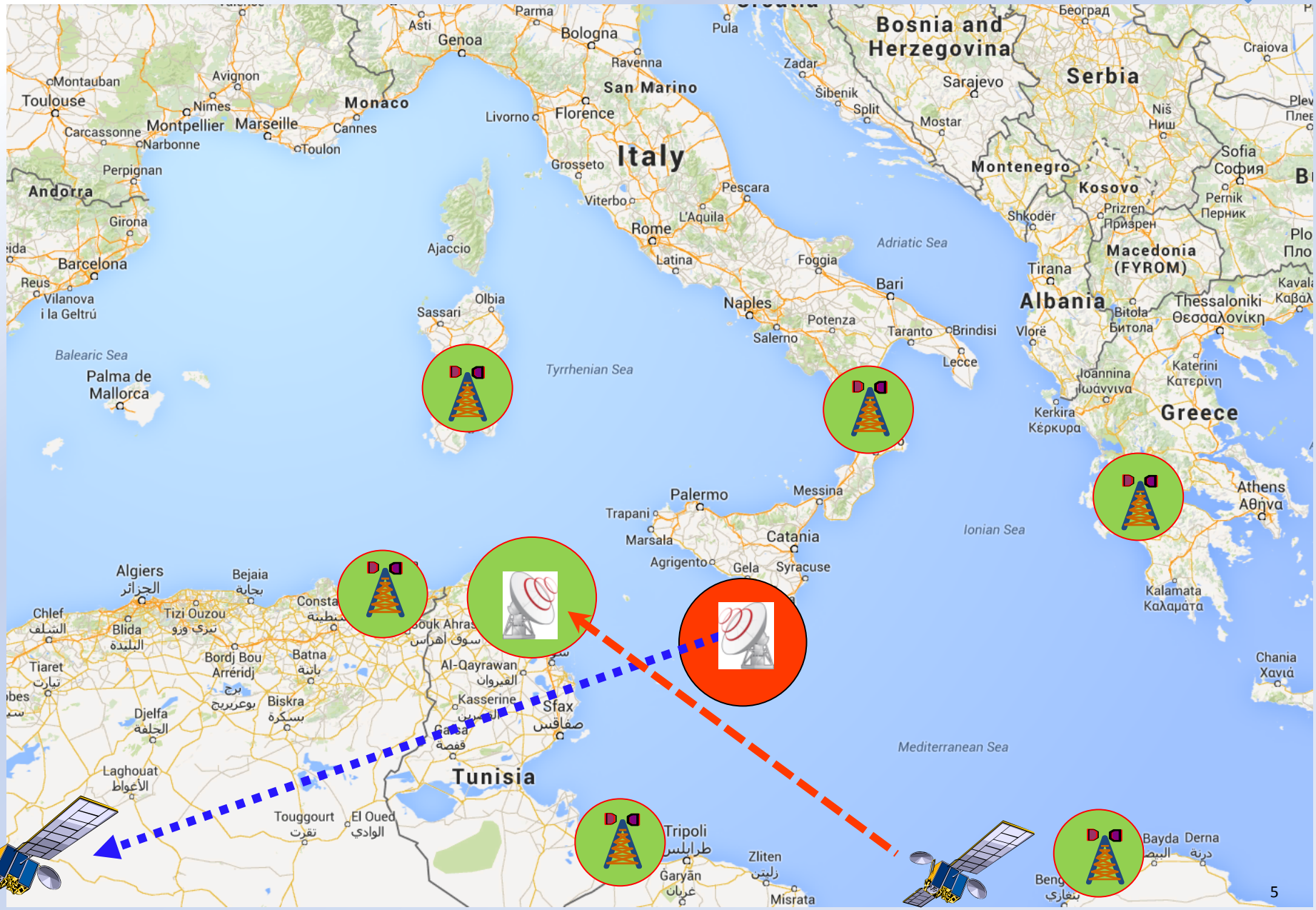
FIXED-SATELLITE
(Earth-to-space) ↑
(space-to-Earth) ↓

opposite direction

Uplink ↔ Downlink

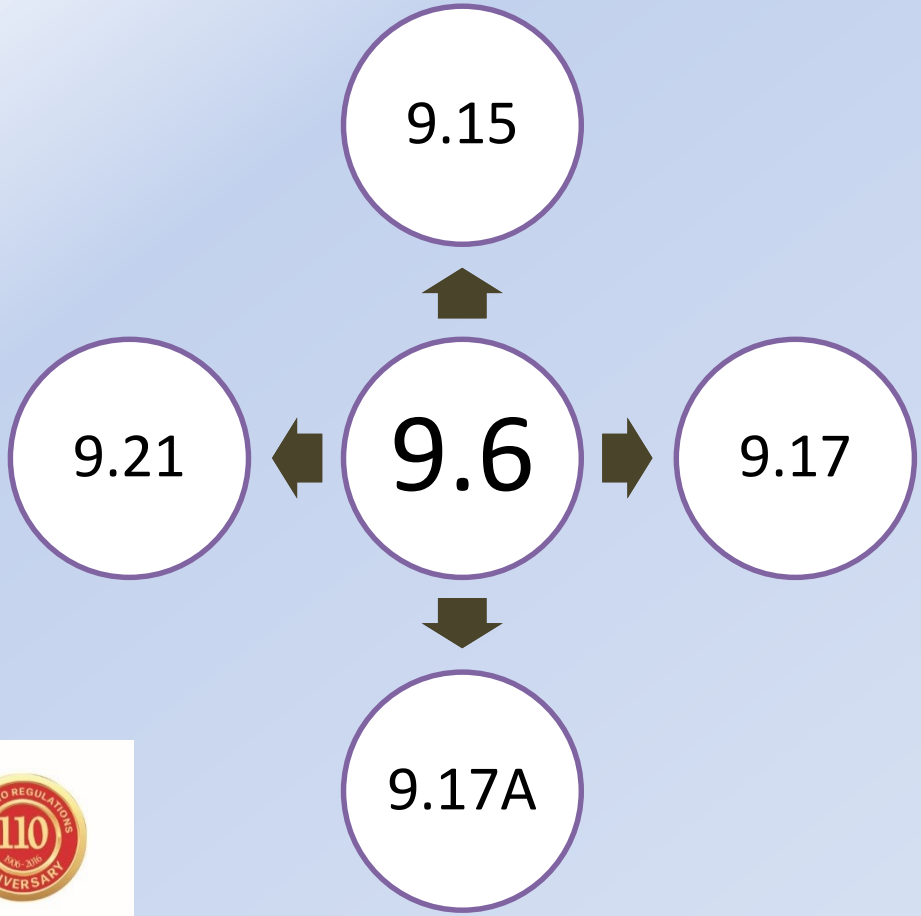
Propagation do not care for Borders.

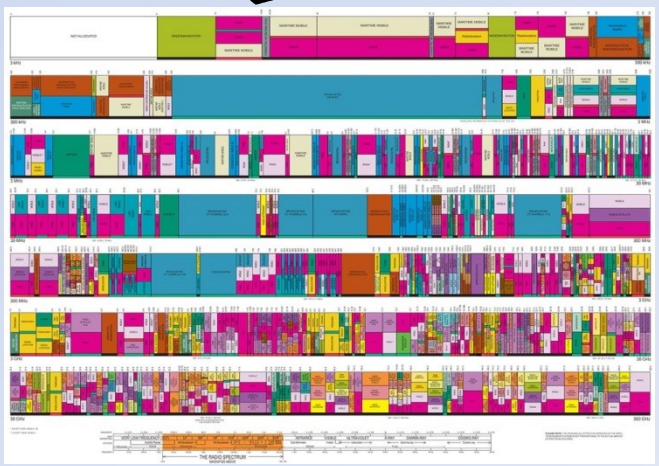
Frequency Study



Volume No.1 → Article 9

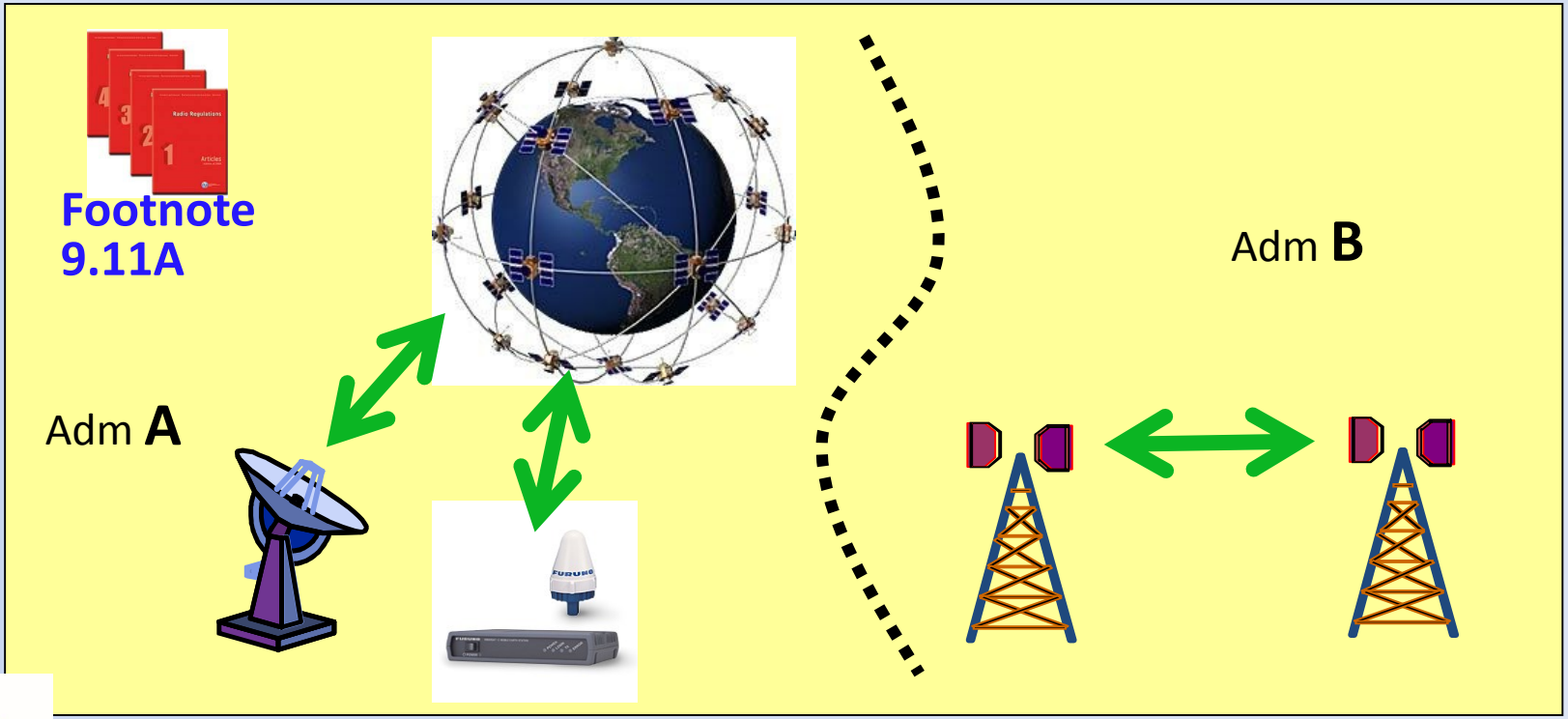
9.6	Administrations **shall effect coordination before** notifying to the BR or brings into use any frequency assignment.





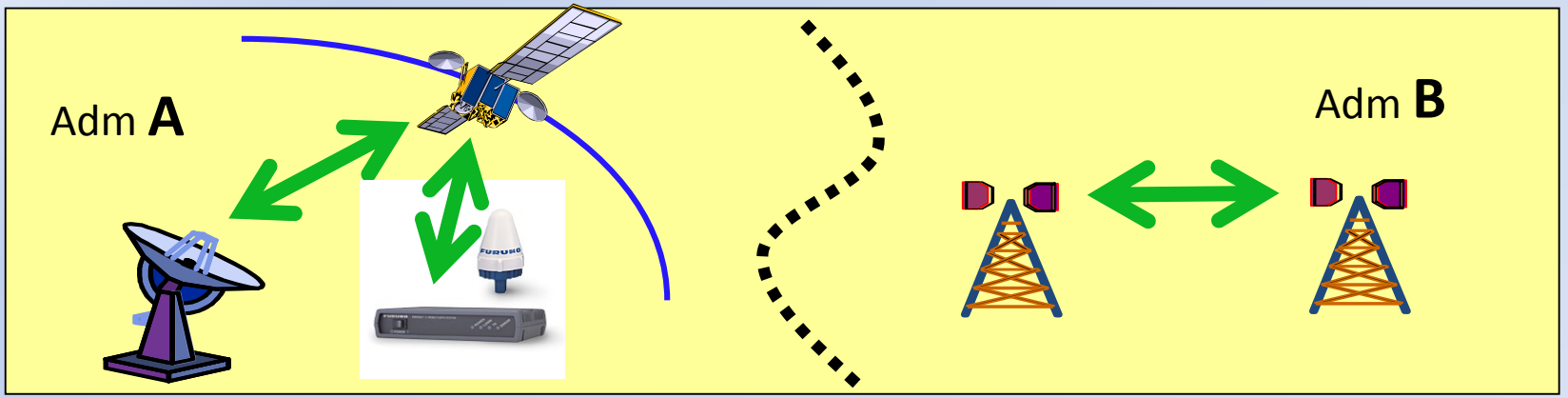
Volume No.1 → Article 9

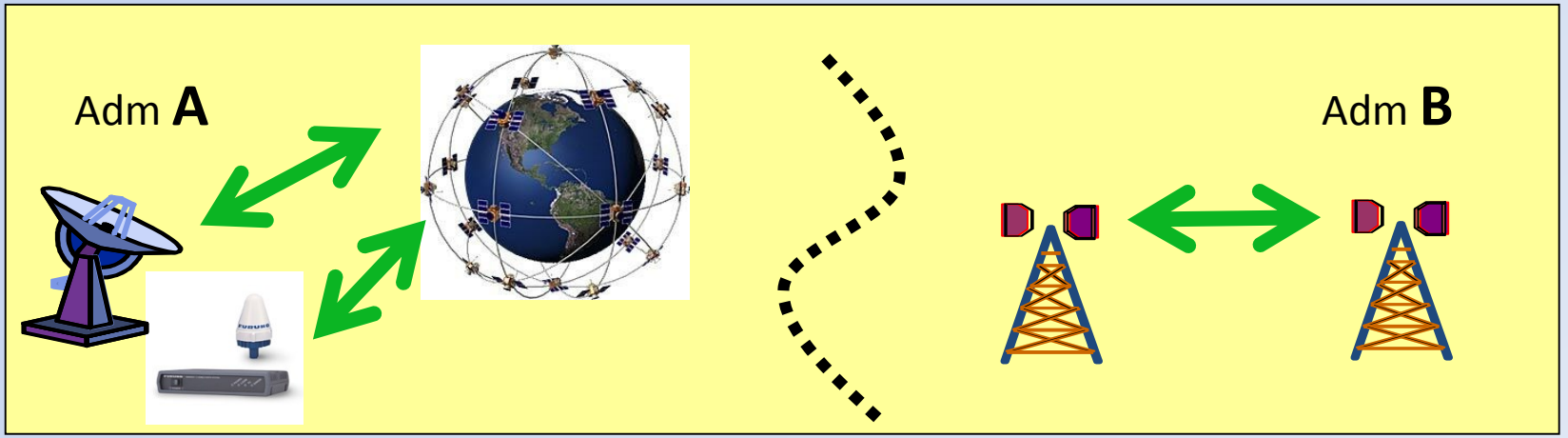
9.15	Coordination of a **Specific or Typical** Earth Station of **non-GSO** in respect of **Terrestrial Stations** (associated with Footnote - 9.11A)



Volume No.1 → Article 9

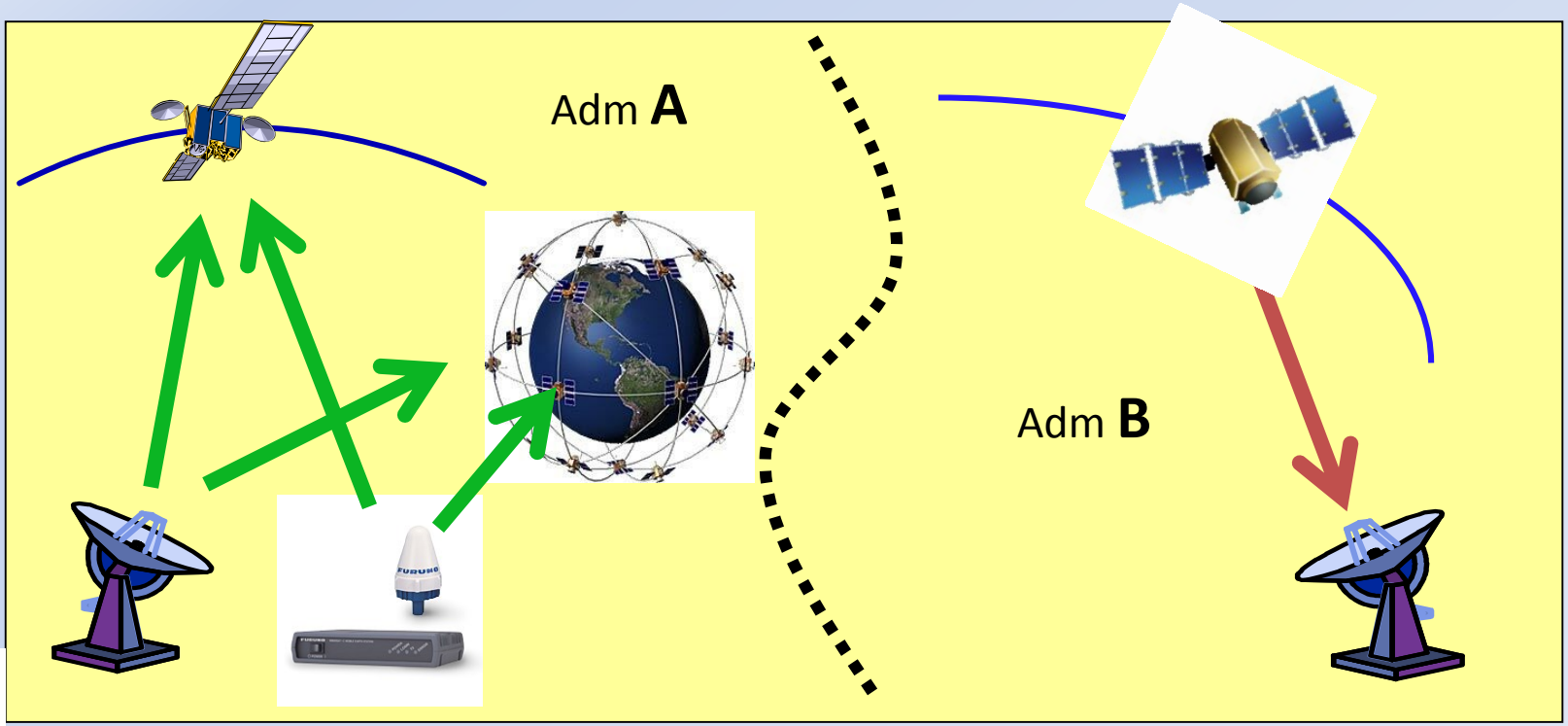
9.17	Coordination of any **Specific** **Earth Station** or **Typical Mobile** Earth Station in frequency bands above 100 MHz, in respect of **Terrestrial Stations**, *with the exception of the coordination under 9.15*





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***



Volume No.1 → Article 9

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

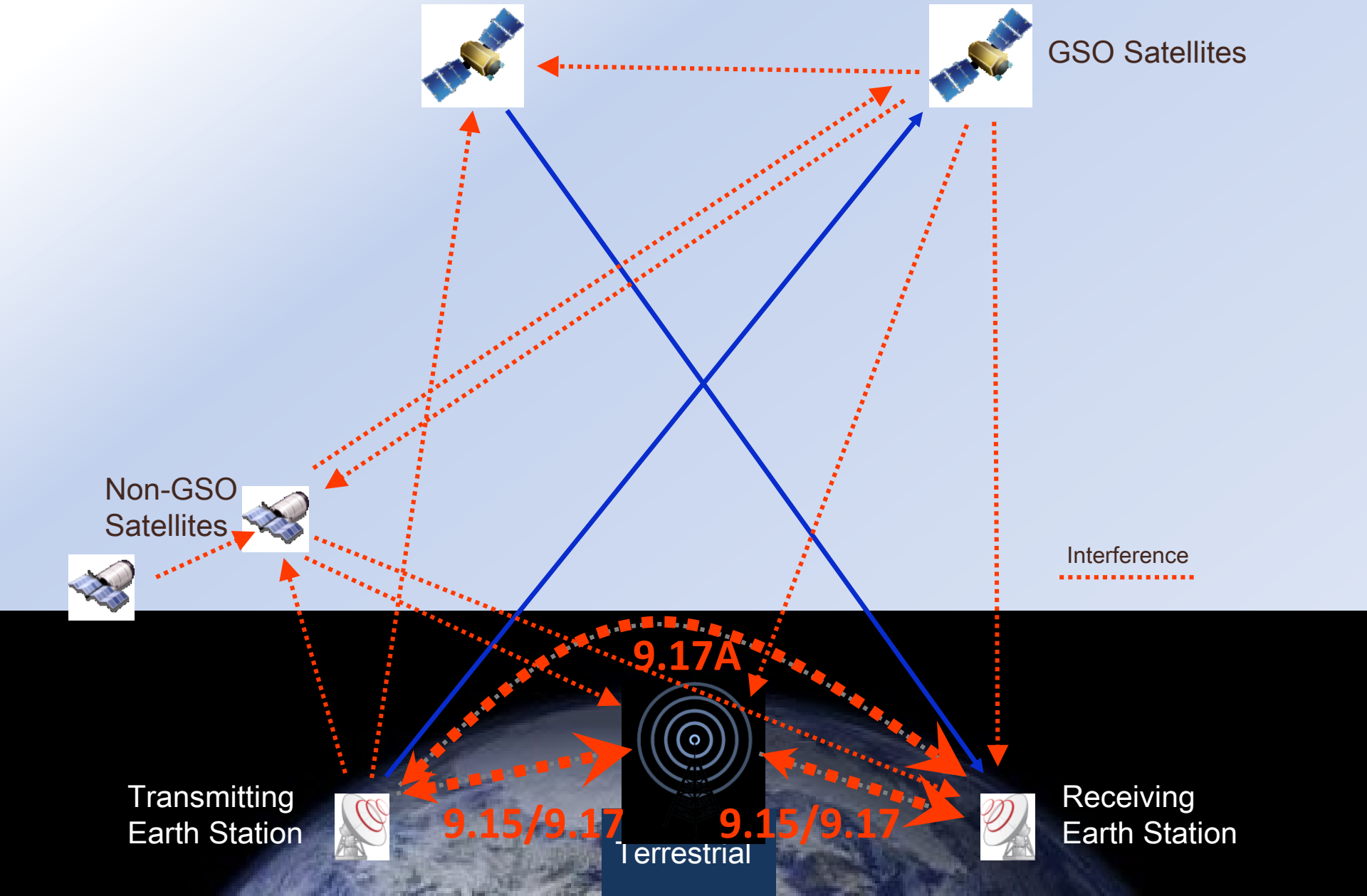
"rare case for Earth Station"

Space Service under No. 9.21 agreement

(ex: footnote 5.461 – MSS)

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

Frequency Study



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Preparation of Coordination Data

Collecting AP4 data

AP7 Capture (BR Software)

SpaceCap (BR Software)

Capture data (.MDB)

GIBC/AP7 (BR Software)

Coordination Area/ADM

Coordination Request

Where is BR Software ?

- **BR IFC (Space Services) - International Frequency Information Circular**

or

- http://www.itu.int/ITU-R/go/space-software/en

Volume No.2 → **Appendix 4**

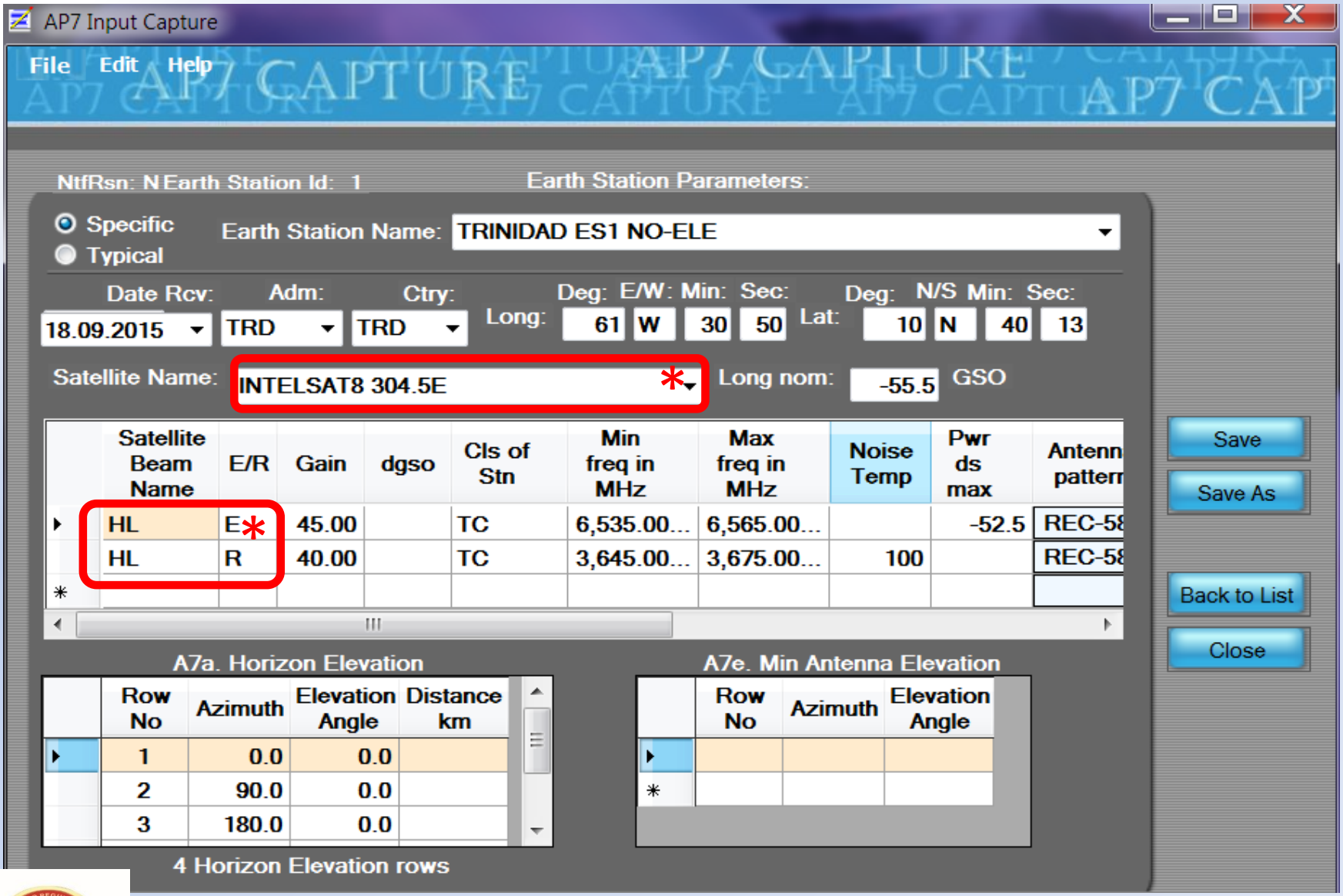
Coordination data

Annex 2

	GEOGRAPHICAL DATA	Longitude / Latitude Altitude
	SATELLITE	Orbital Location, Identification (Geo, Non-Geo)
	ANTENNA	Maximum gain Radiation pattern
	SIGNAL CHARACTERISTICS	Power Maximum Power Density Frequencies Noise temperature Emission Type
	Others	Horizontal Elevation Angle

Option 1: AP4 data - AP7 Capture (*Exercise Purpose*)

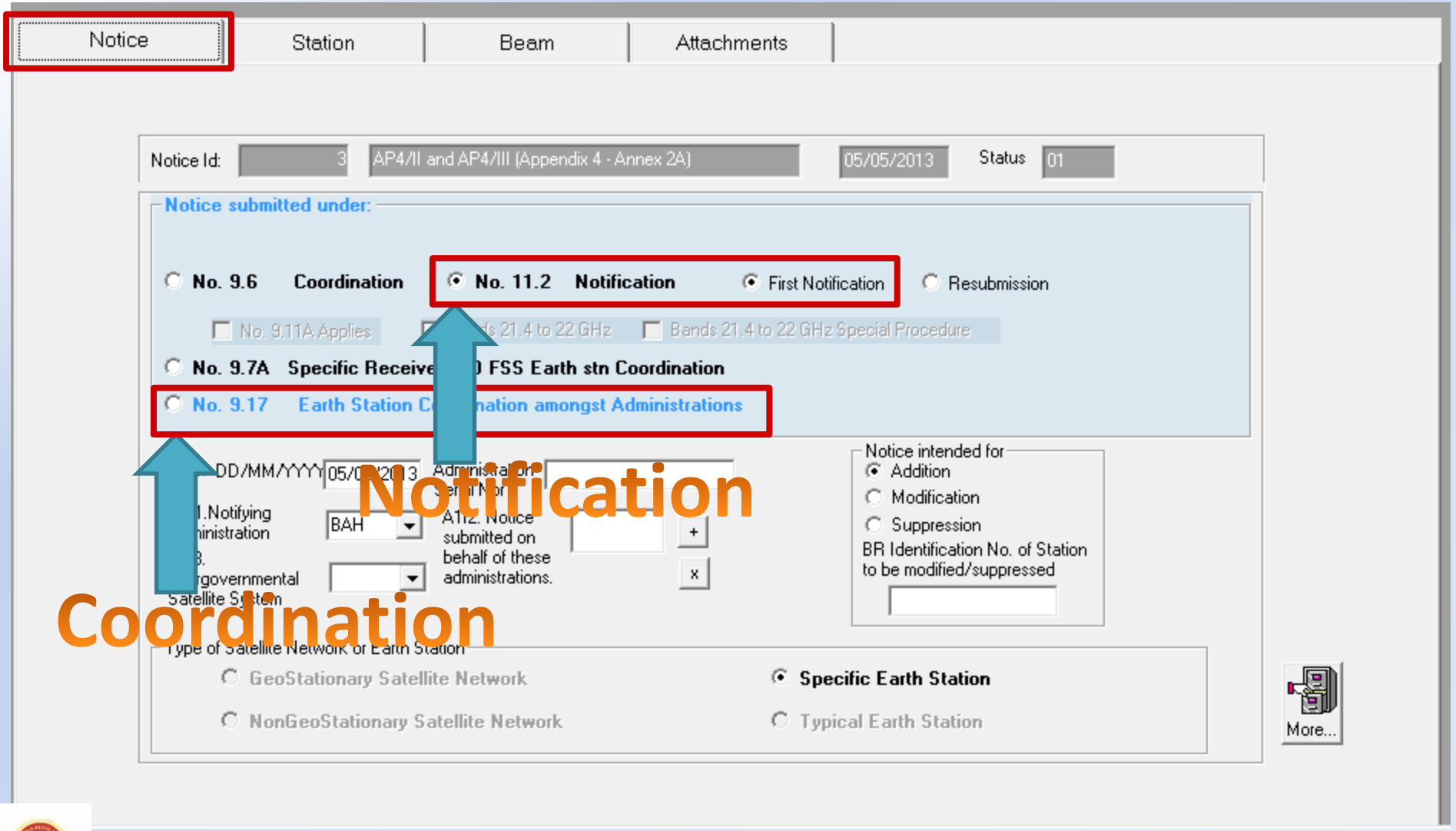
Sending Information



* *The associated Space Station should be notified and the beam should be matched.*

Option 2: AP4 data - SpaceCap *(for Coordination & Notification)*

Sending Information

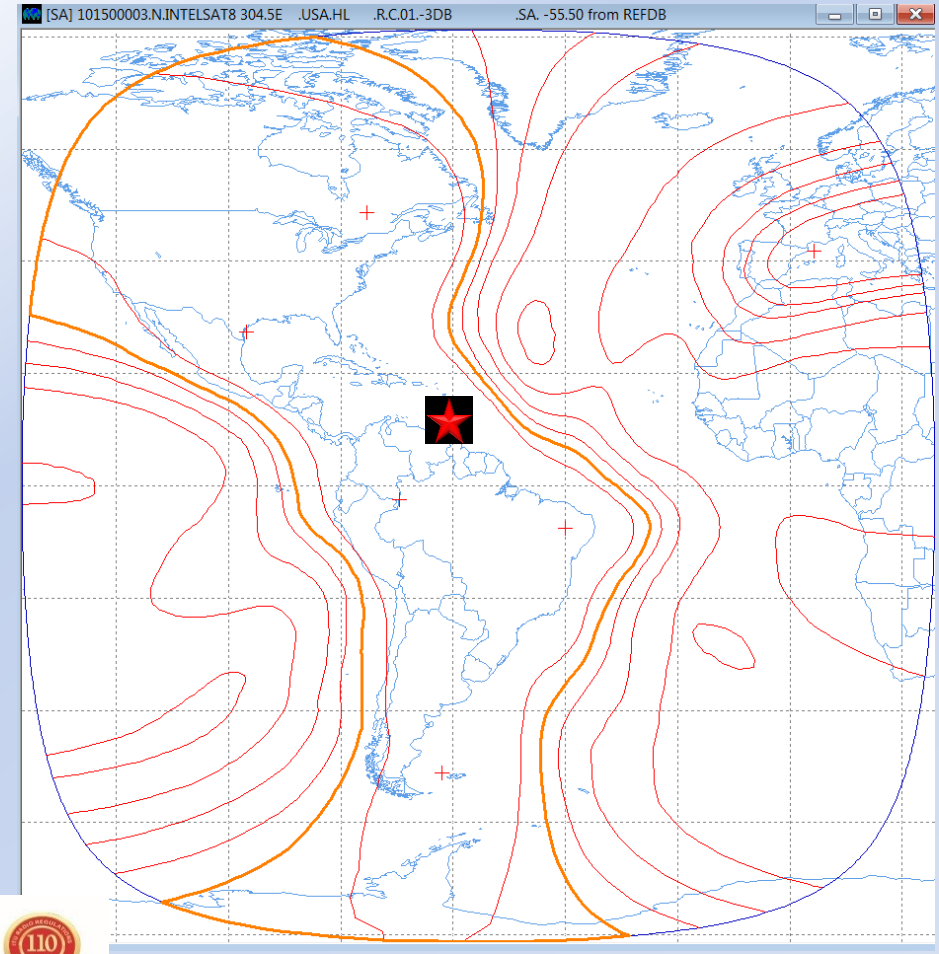


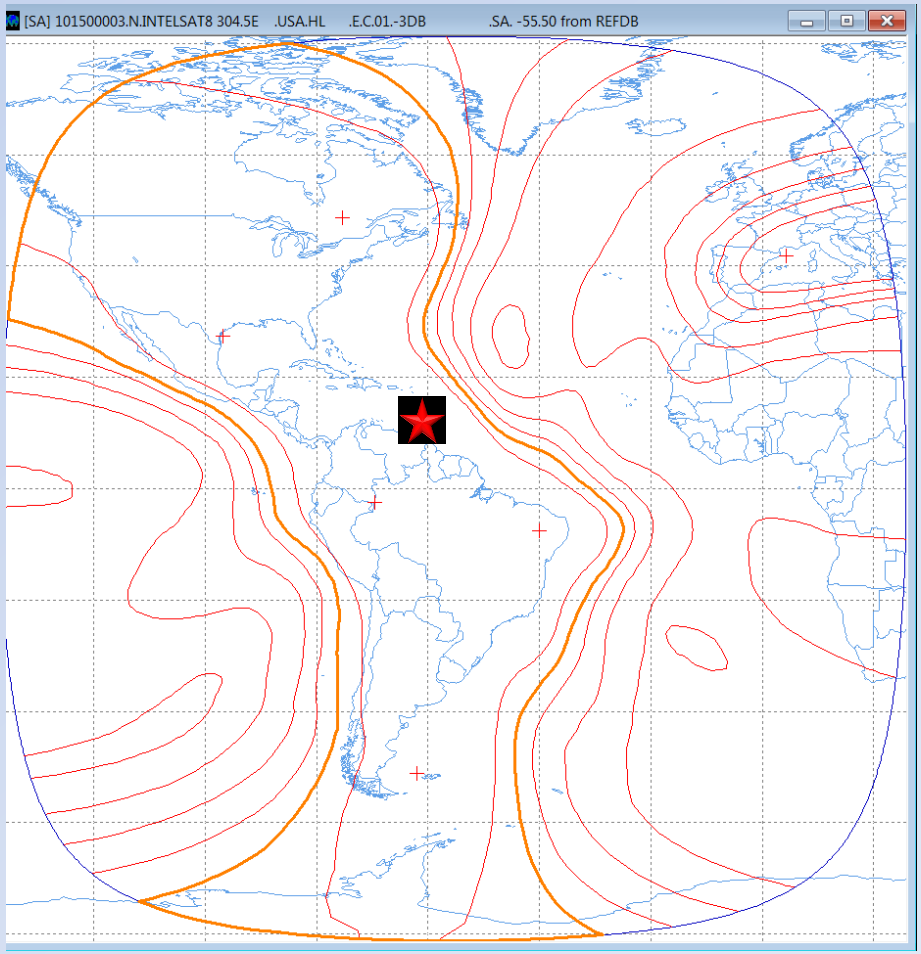
Attention: Check Associated Satellite:

- satellite network: INTELSAT8 304.5E ***(not Commercial name)***
- Check Service area as follows in **GIMS**
- **Check *Beam name & direction* correctly at the point of Earth Station**

↑Up link (↔ ***Downlink for*** ↓ ***ES***) beam: HL

↓Down link SS (↔ ***Uplink for*** ↑ ***ES***) beam: HL





Computer Program for Determination of Coordination Area

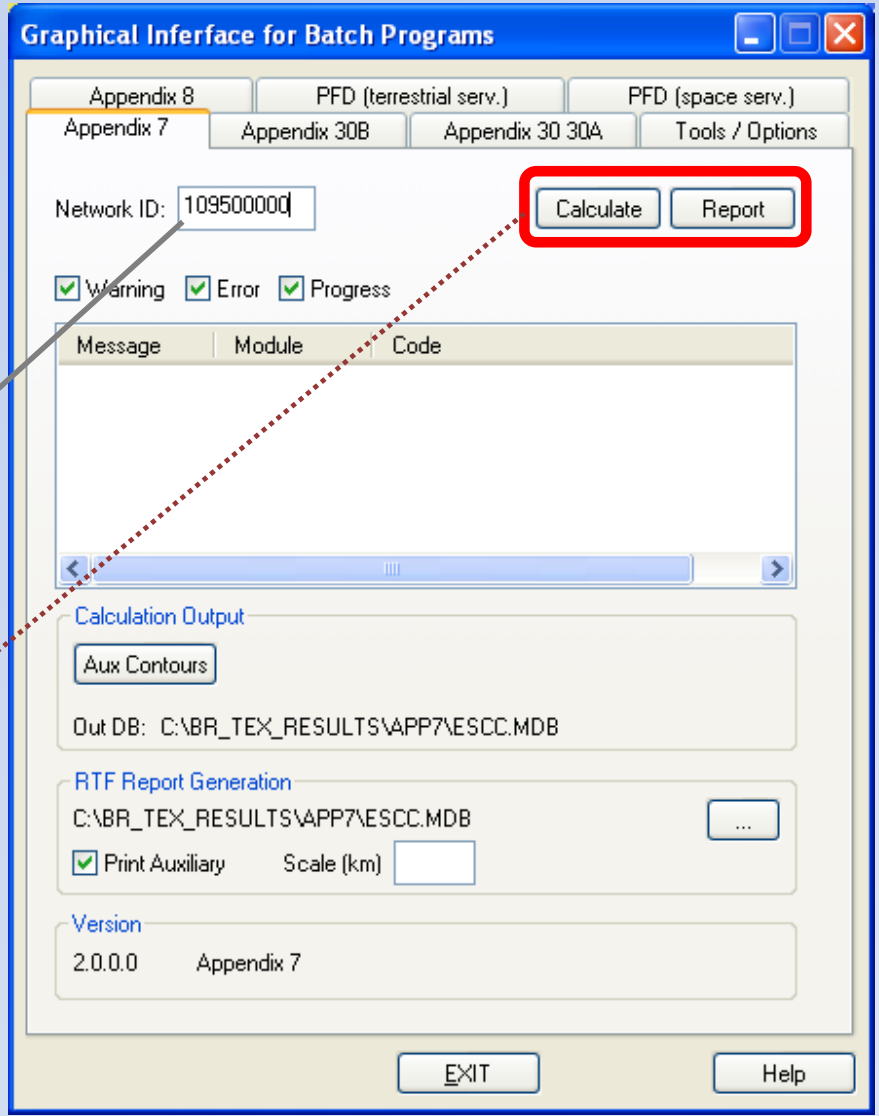
Sending Information

AP7 embedded in GIBC (from BR IFIC DVD)

C:\BR_SOFT\BATCH

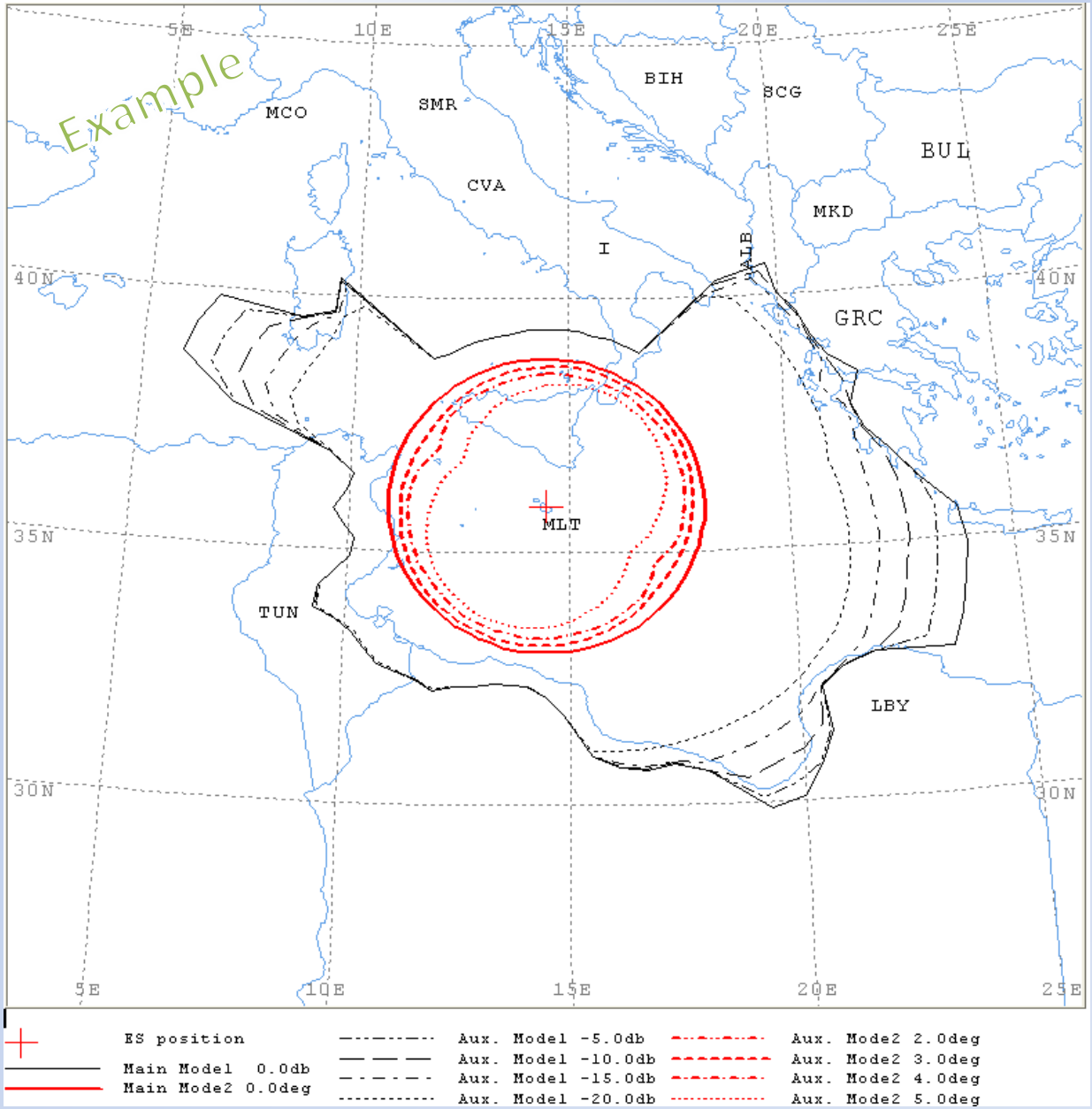
Create your Input File

Magic button for Coordination?



Report (p1) of AP7 (GIBC) program – 9.17

Sending Information



ex: **Rcv GSO** ES (FSS) w.r.t. **Terrestrial** St (TS, FS, MS)

Freq: 3850-4200 GHz
Sat longitude : 18 W
Horizon Ele. Anagle : 0

Affected countries:

Countries included in Coordination Distance/Area

Automatic indication in AP7 report

Report (p2) of AP7 (GIBC) program

Sending Information

Example

Diagram 4: 2.1_TABLE8. RECEIVING GSO ES in FIXED-SATELLITE SERVICE W.R.T. TRANSMITTING TERRESTRIAL STATIONS. TS in FS or MS

NOTICE: 108500000 EARTH STATION NAME: BR SEMINAR ES1 EARTH STATION POSITION: 014E264035N5556 PHASE: N
ADM/ITU_AREA: BEL/MLT RAIN CLIMATICAL ZONE: K
SATELLITE NAME: ITU BR TEST SAT SATELLITE ORBITAL POSITION: -18.00 DEG
ANTENNA AZIMUTH: 227.09 DEG ANTENNA ELEVATION: 36.09 DEG
FREQUENCY BAND: 10700-12750 MHz REFERENCE BANDWIDTH: 4 KHz PERCENTAGE OF TIME: 0.0017 %
MAXIMUM ANTENNA GAIN: 59.3 DBI MAXIMUM POWER DENSITY: - DBW/HZ NOISE TEMPERATURE: 100.0 K
ANTENNA PATTERN: APEREC015V01
2.1_TABLE8 Model: PLM_DUCTING

TRANSMISSION LOSS MODE 1: 204.9 DB (DOES NOT INCLUDE HOR. CORR. AND ANT. GAIN)
TRANSMISSION LOSS MODE 2: 162.9 DB

Tech. parameters of the planning E/S

Calculated parameters by 5° Azimuth

Coordination distance by 5° Azimuth

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	123.3	126.7	130.0	133.1	135.9	138.4	140.5	142.1	143.3	143.8	143.8	143.2	142.0	140.3	138.2	135.7	132.8	129.7	126.4	122.9	119.3	115.6	111.7	107.8
HOR.ELEV.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOR.CORR.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANT.GAIN	-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	-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	391	391	391	391	394	394	391	615	696	669	668	667	665	704	665	674	719	769	841	855	850	850	847	748
MODE 2																								
0.0 DEG	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	322	322	322	322

AZIMUTH	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235
OFF-AXIS	103.9	99.9	95.9	91.8	87.8	83.8	79.8	75.8	71.8	67.9	64.1	60.4	56.8	53.3	50.0	46.9	44.1	41.6	39.5	37.9	36.7	36.2	36.2	36.8
HOR.ELEV.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOR.CORR.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANT.GAIN	-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	-9.8	-9.1	-8.5	-7.9	-7.5	-7.1	-7.0	-7.0	-7.1
COORDINATION DISTANCE (KM)																								
MODE 1																								
0.0 DB	703	691	765	801	820	808	674	626	618	595	561	465	425	401	402	408	427	444	470	470	477	491	488	485
MODE 2																								
0.0 DEG	322	322	323	323	323	323	323	323	324	324	324	324	324	324	325	325	325	325	325	325	325	325	325	325

(0 - 355º)

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	38.0	39.7	41.8	44.3	47.2	50.3	53.6	57.1	60.7	64.4	68.3	72.2	76.1	80.1	84.1	88.1	92.2	96.2	100.2	104.2	108.2	112.1	115.9	119.6
HOR.ELEV.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOR.CORR.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANT.GAIN	-7.5	-8.0	-8.5	-9.2	-9.8	-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	-10.0	-10.0	-10.0	-10.0
COORDINATION DISTANCE (KM)																								
MODE 1																								
0.0 DB	498	525	497	416	400	415	434	409	401	456	697													
-10.0 DB	498	525	497	416	400	415	434	409	401	456	649													
MODE 2																								
0.0 DEG	325	325	325	325	325	325	324	324	324	324	324													

PROBABLY AFFECTED COUNTRIES: ALB GRC I LBY MLT TUN

- To: Probably Affected ADMs (9.29/31)
- Send AP4/III Coord. Data
- Send Copy of Cood. Contour

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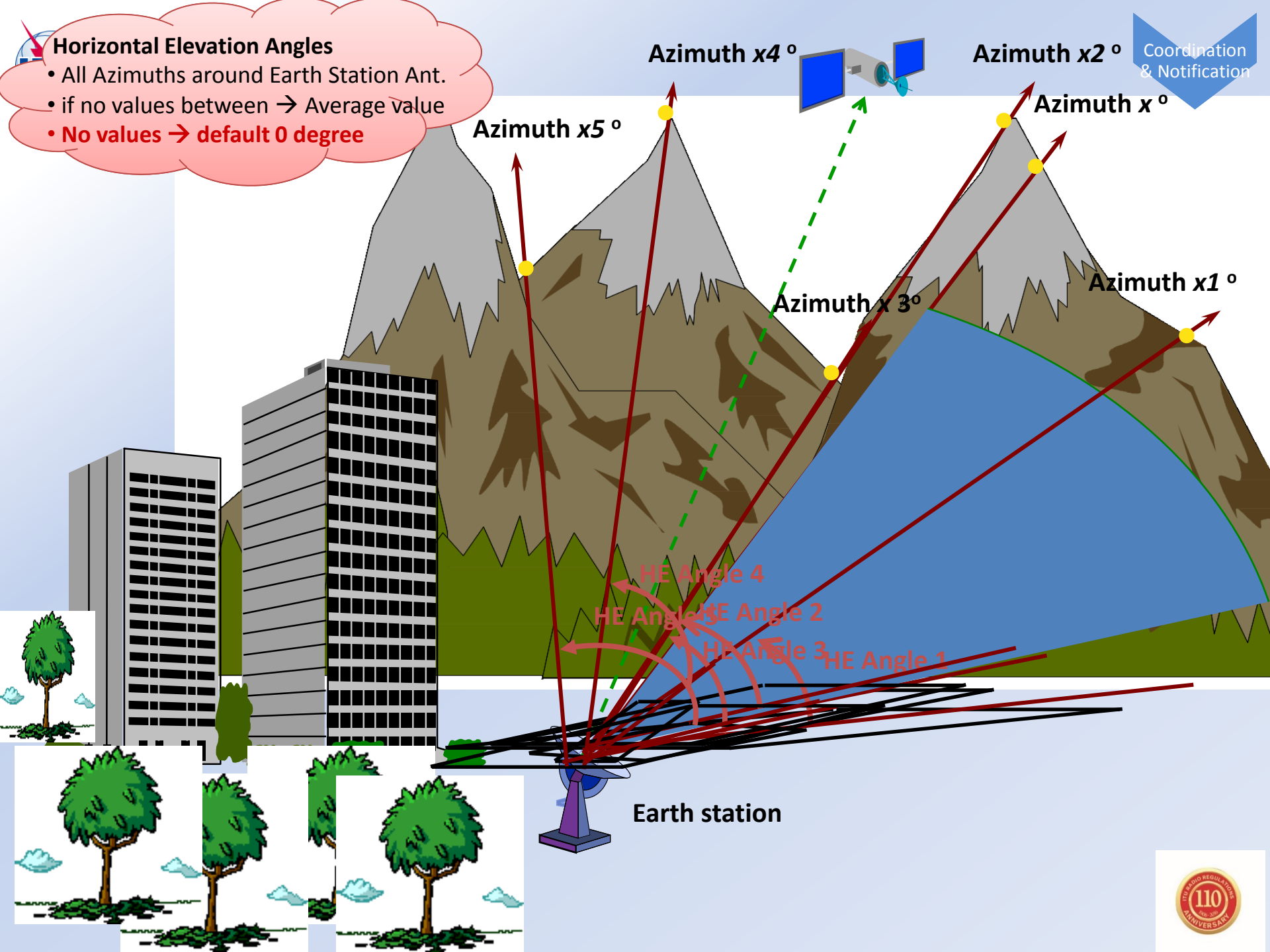
Horizontal Elevation Angles

- All Azimuths around Earth Station Ant.
- if no values between → Average value
- **No values → default 0 degree**

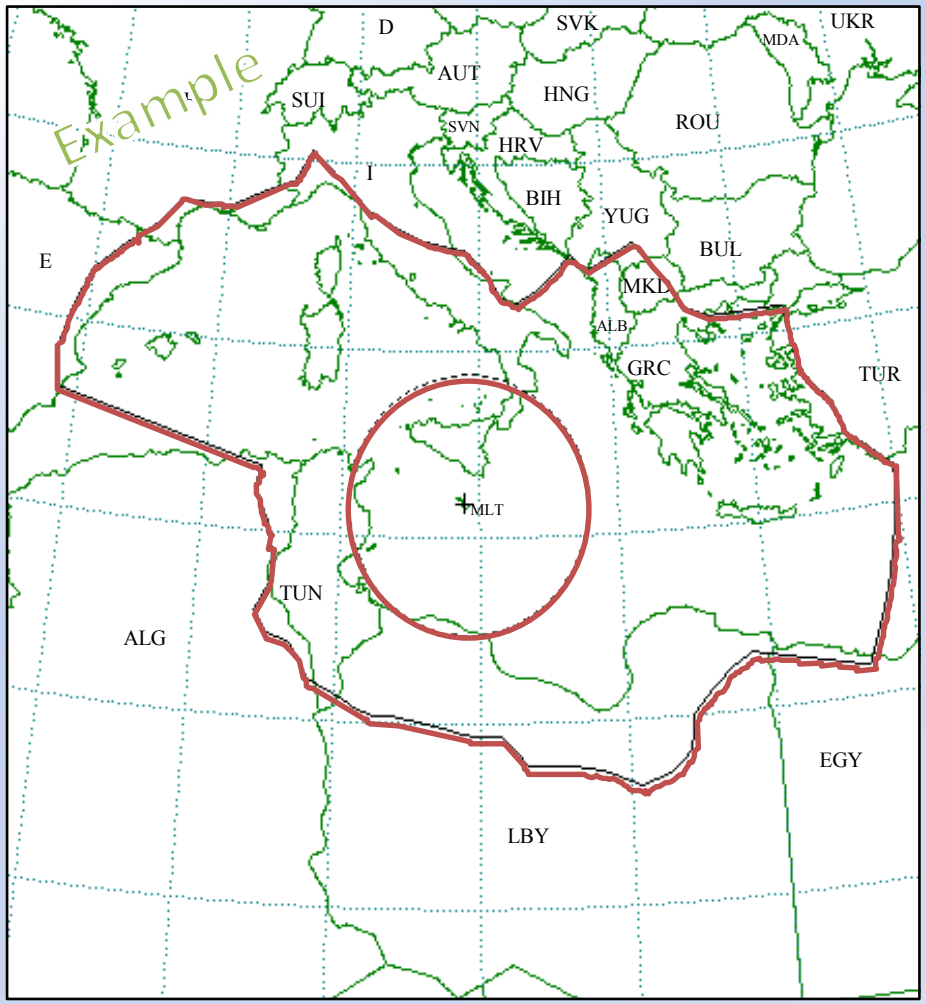


Effect of Horizon Elevation Angle

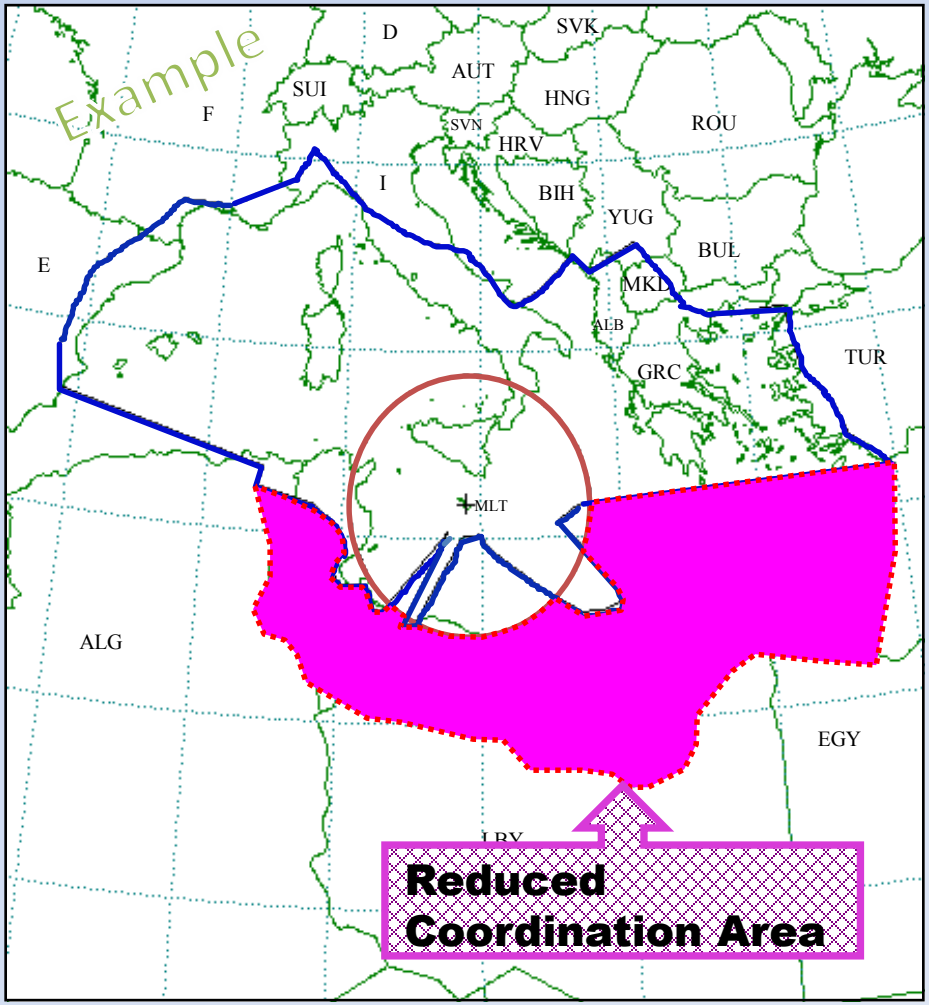
Coordination & Notification

RECEIVING EARTH STATION COORDINATION AREAS

MAGHTAB MLT/MLT 014E2640 35N5556 4135.0 - 4135.0 MHZ



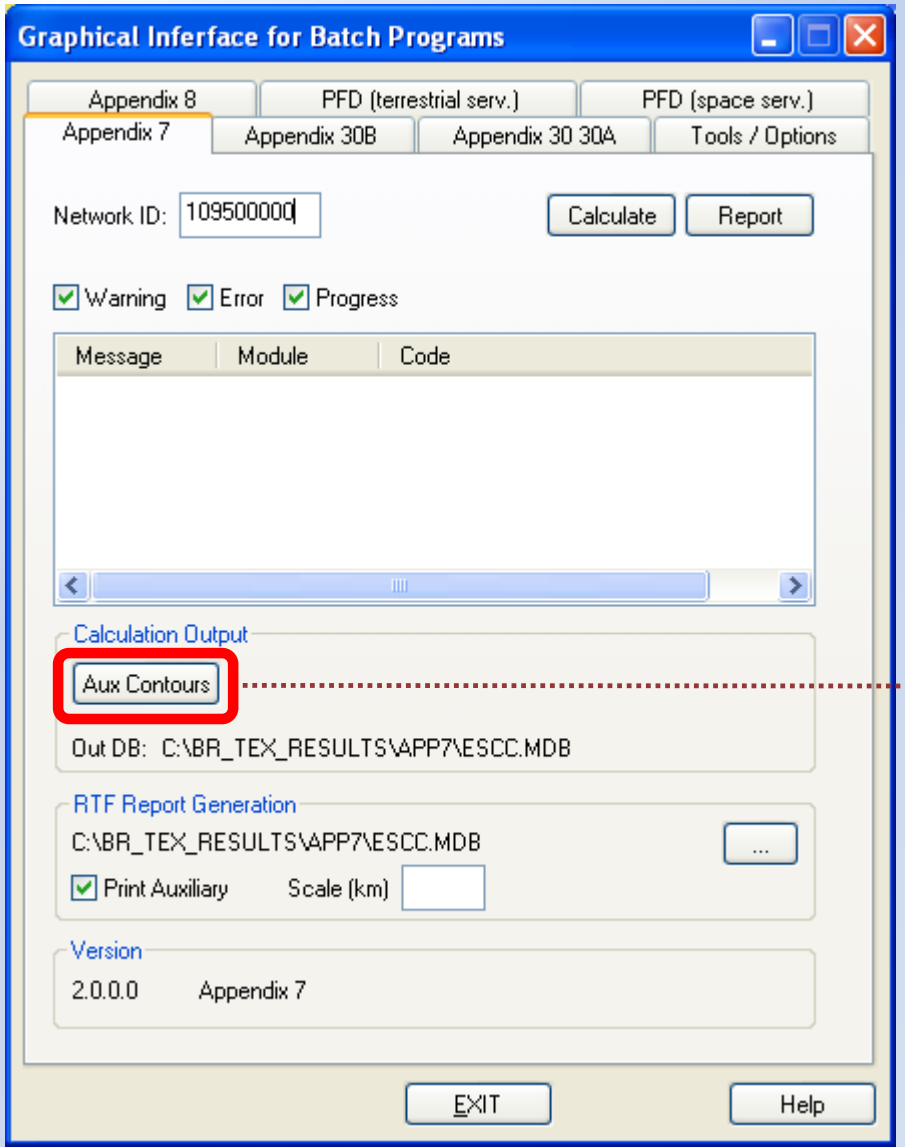
HORIZON ELEVATION ANGLE : 0 °



HORIZON ELEVATION ANGLE: Actual Value

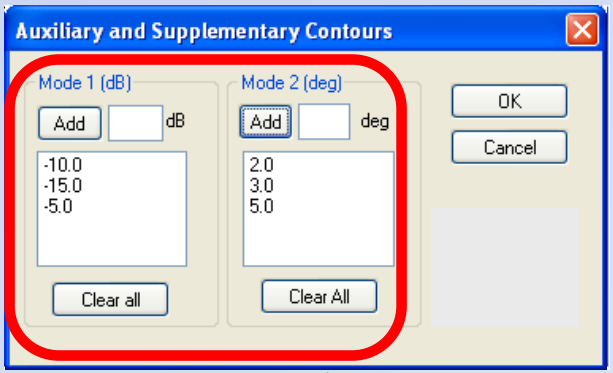
More practical consideration with Auxiliary Contour

AP7 embedded in GIBC



Auxiliary Contour

Extra coordination lines inside main contour

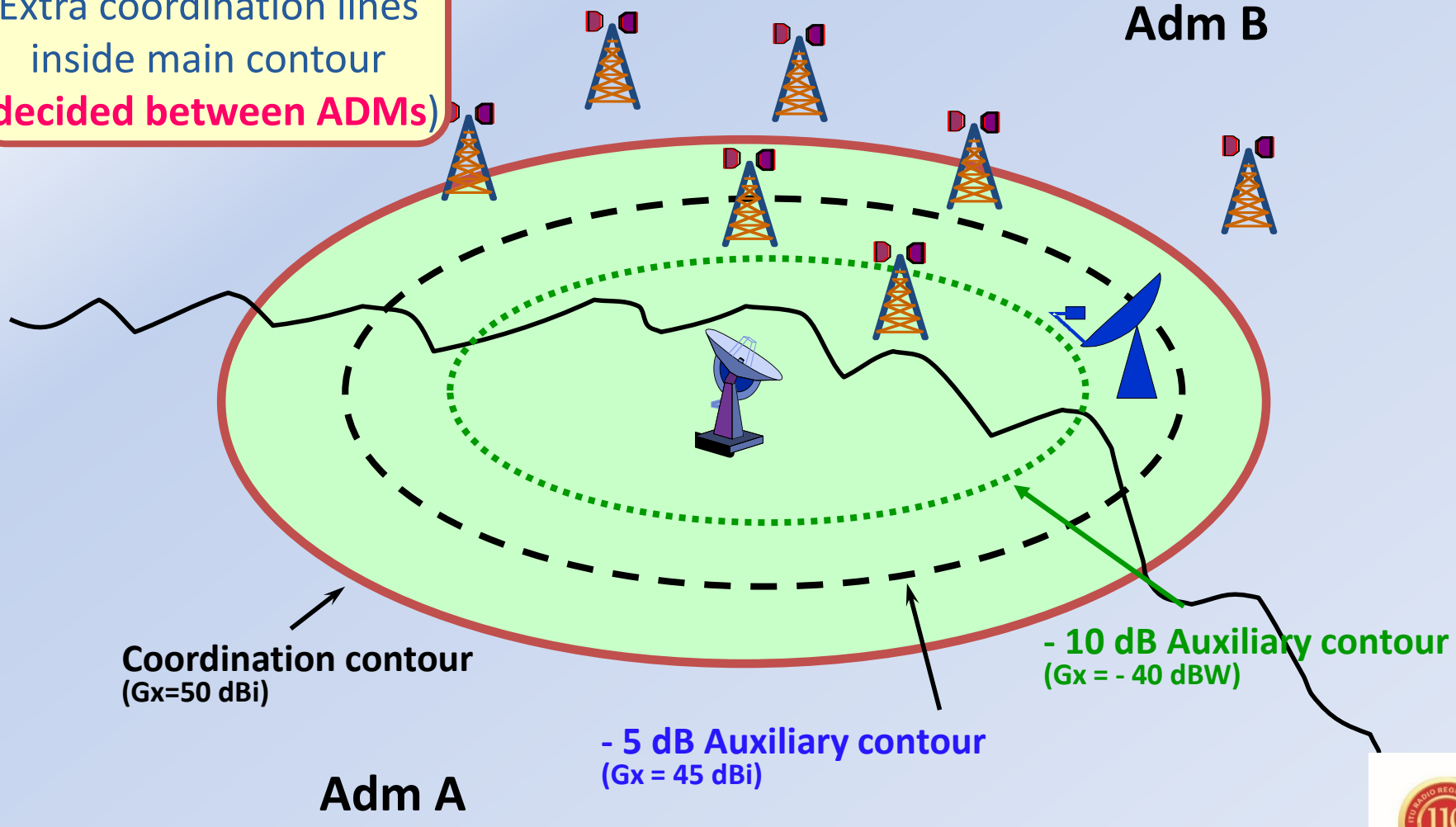


It's all Complementary information.

Auxiliary Contour - Mode 1 (& 2)

Appendix 7 - Annex 6

Extra coordination lines inside main contour (**decided between ADMs**)



Actions on Coordination Request (Article 9)

Administration A

Administration B

ITU

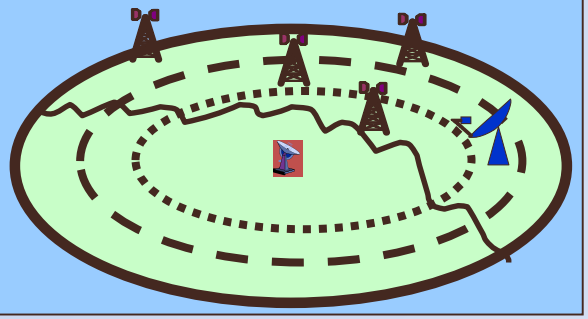
Coordination Req. (9.29/9.31)

Ack. of receipt (9.45)

Req. additional Info (9.54)

if Agreement (9.51A)

Technical Exam (9.50)
- Collect existing/planning system
- Inside Coordination Contours



Send Notification (11.2)

Notify Adm B's system (9.52B, 11.2/11.9)

if Disagreement (9.51A/9.52)
- Adm B's assignment **
- Suggestion for resolution

Notify Adm B's system (9.52, 11.2/11.9)

Assistance Req. - No reply/decision from Adm B (9.33/9.46/9.60)

4 Months

3 Things (Planning Adm A)

on Coordination of Earth Station

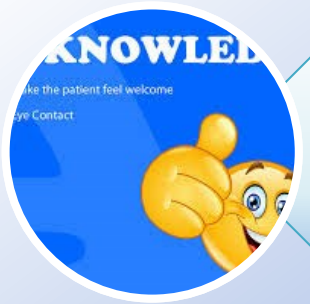
1. Define Affected ADM (AP7)

2. Send Request (AP4 & AP7)

3. Coordinate (with mutual cooperation)

3 Things (Requested Adm B)

on Coordination of Earth Station



1. Acknowledge the reception

2. Coordinate (with mutual cooperation)

3. Give an early decision

Question?