World Radiocommunication Seminar 2016

Creating Coordination Contours Around Earth Stations Using GIBC

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Earth Station Coordination

- Determination of the Coordination Area Around an Earth Station based on AP7

- 2 Tools :

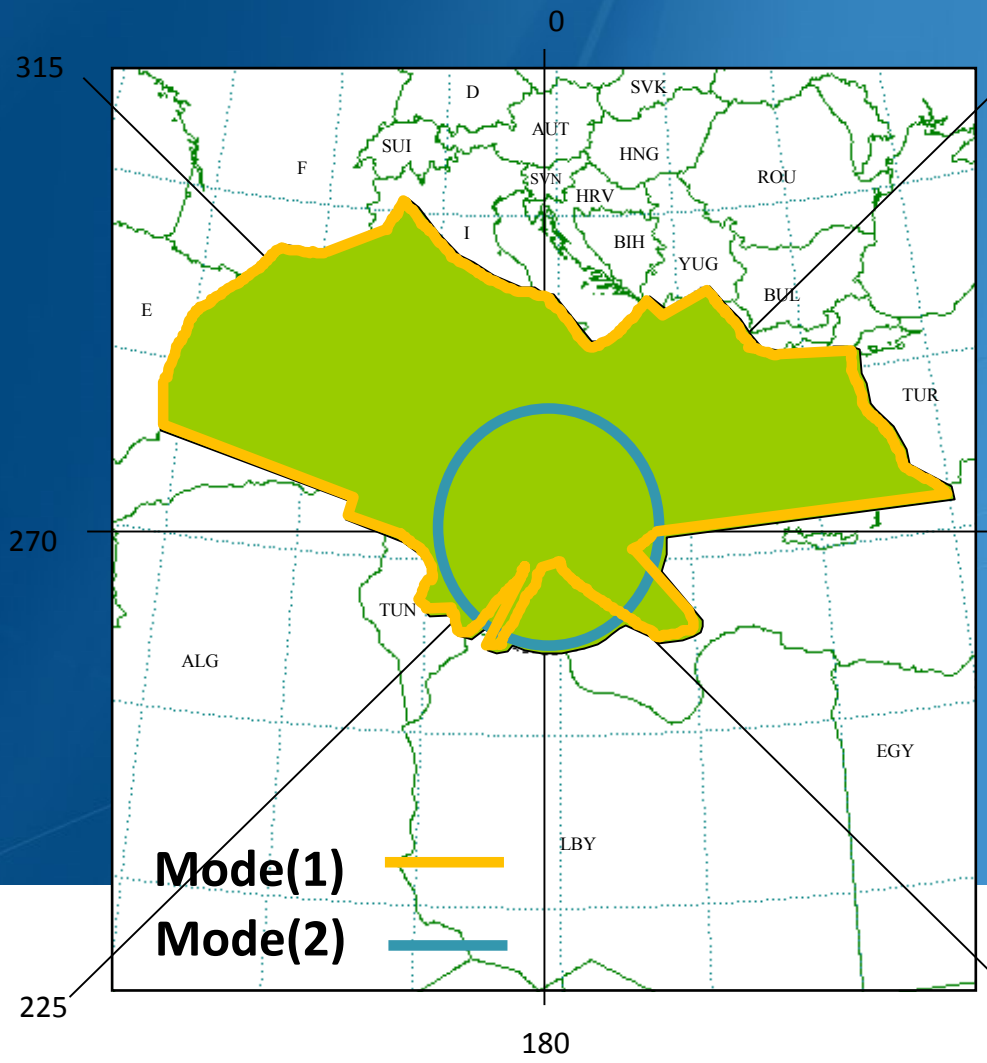
  Capturing (SpaceCap, Appendix 7 Capture)

  GIBC Appendix 7 Calculation

Definition of Coordination Area – AP7

Coordination area represents the area surrounding an earth station sharing the same frequency band with terrestrial stations , or the area surrounding a transmission 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.

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.

Preparation of Coordination Data

AP7 Capture
(BR Software)

SpaceCap
(BR Software)

BASIC

ES Capture data
(.MDB)

COMPLETE

ES Capture data
(.MDB)

PLEASE NOTE

Only COMPLETE ES capture Data can be sent
- **for Coordination with ADM**
- **for Notification to BR**

GIBC/AP7
(BR Software)

Coordination
Area/ADM

International Telecommunication Union

In this workshop….

GIBC Appendix 7 Calculation

- **Software Installation**
- **Select input database**
- **Appendix 7 calculation**
- **Generate report document**
- **Include Auxiliary Contours**

Proposed Exercises:

- To generate Coordination Contours for FSS Transmitting and Receiving Earth Station in the 6/4 GHz band

- To repeat the calculations to see the effect of the horizon elevation angles on the coordination contours

Installation

GIBC software can be installed from the ITU-R website
(ITU-R/software)

As of January 2012, the Space Radiocommunications Stations (SRS) on DVD-ROM is replaced by the BR International Frequency Information Circular (BR IFIC) - Space Service.

Each edition of the BR IFIC Space Services will contain the SRS database.

Install GIBC & Open the application

Proposed Exercises

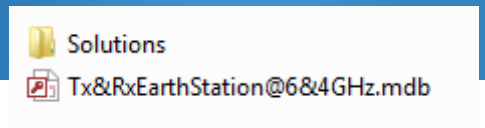
Generation of coordination contours:

FSS Transmitting and **Receiving ES** in the **6/4 GHz band**

-Input example database (SNS format):
Tx&RxEarthStation@6&4GHz.mdb

-ES name: **HELSINKI TEHTAANKATU**

-ES Notice ID: Ex.1 **112505405**(with zero deg. horizon elevation angles)
Ex.2 **112505404**(with non-zero deg. horizon elevation angles)



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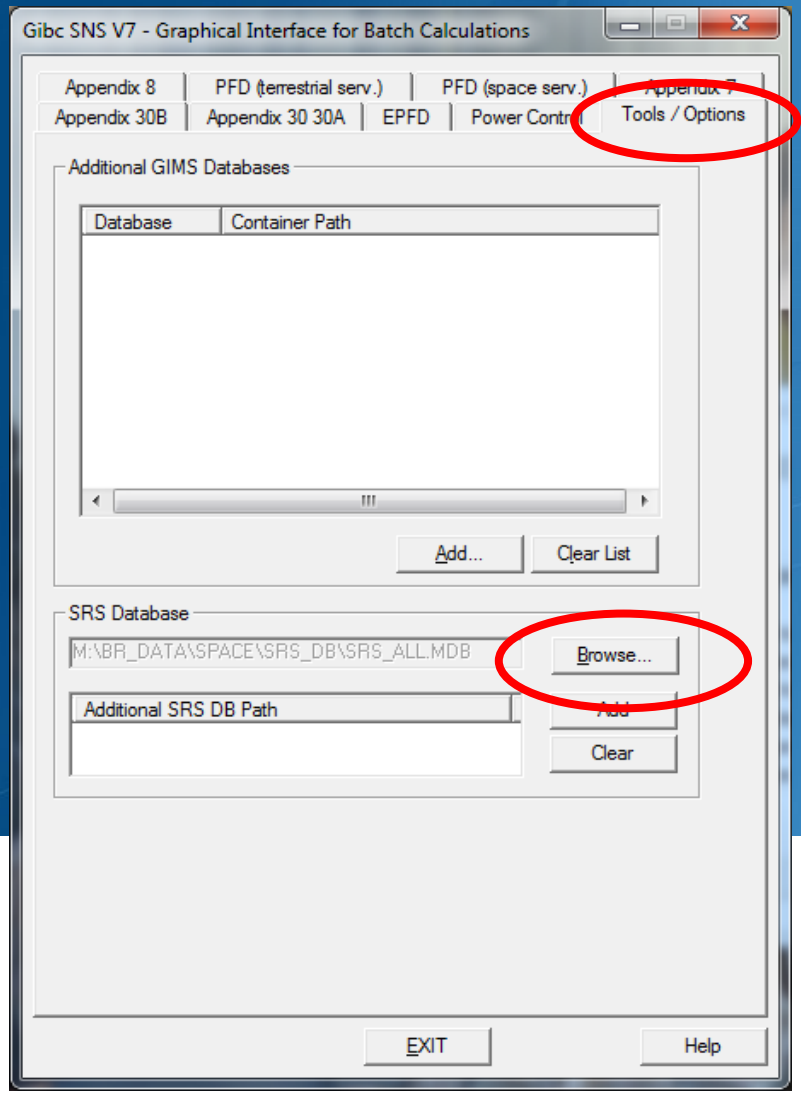
GIBC/ AP 7- Input Database

Database file location- Tools/ Options page



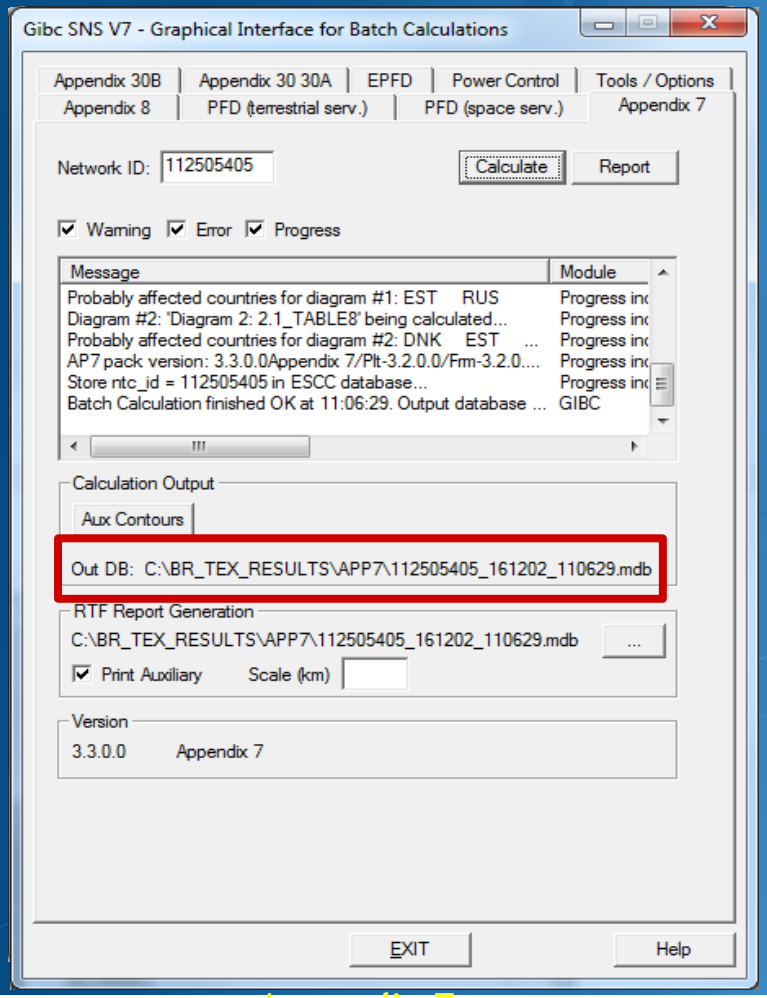
Run GIBC

Select Tools & Options tab

Use the browse button to select following file from the Workshop directory:

Tx&RxEarthStation@6&4GHz .mdb

Ex-1 GIBC/ AP 7- Calculation



How to Proceed?

- **Select the Appendix 7 tab**
- **Enter ES Network ID**

112505405

- **Press Calculate**

Check Progress of Calculation

Select type of messages : Warning\Error\Progress

Results in MS–Access file

Each calculation in a separate file

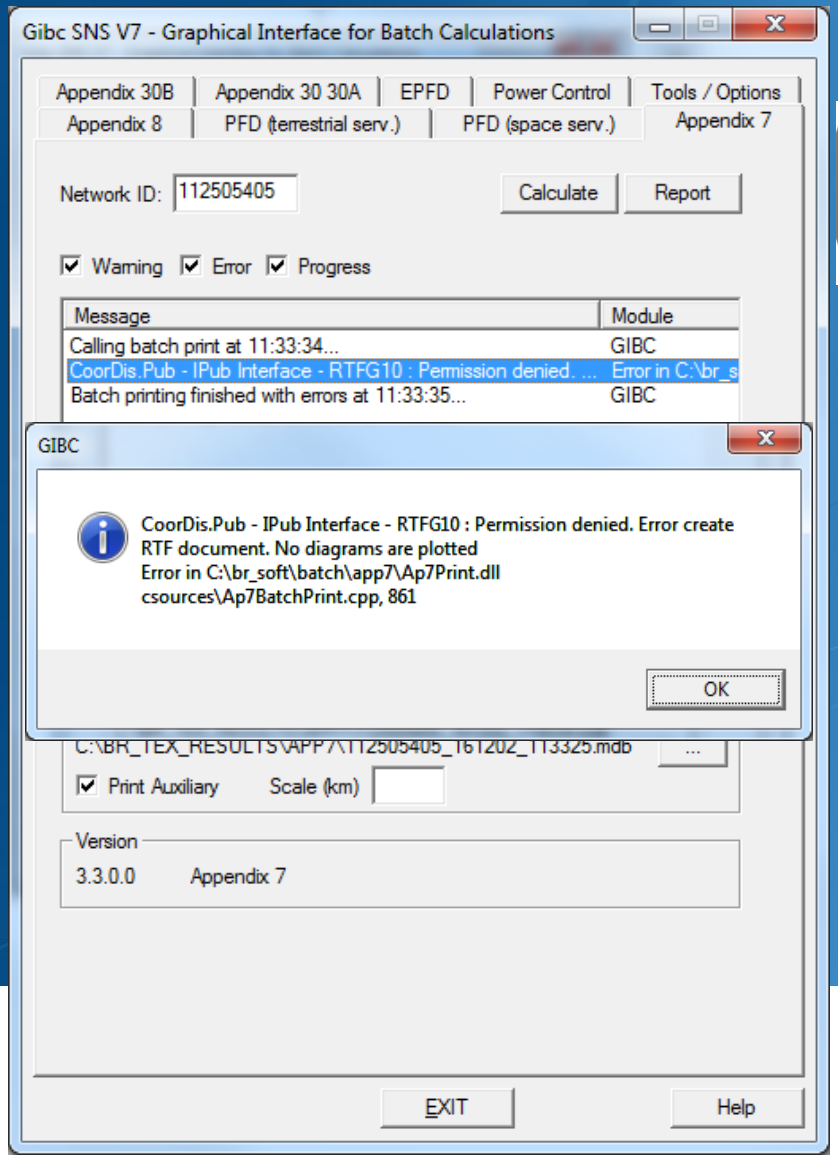
Results Directory:

C:\BR_TEX_RESULTS\APP7

Naming convention:

NetworkId_Date_Time.mdb

Ex-1 GIBC/ AP 7- Generate Report



Report Generation

Ap7print.rtf

After an Appendix 7 calculation…

- **Just Press the Report button**

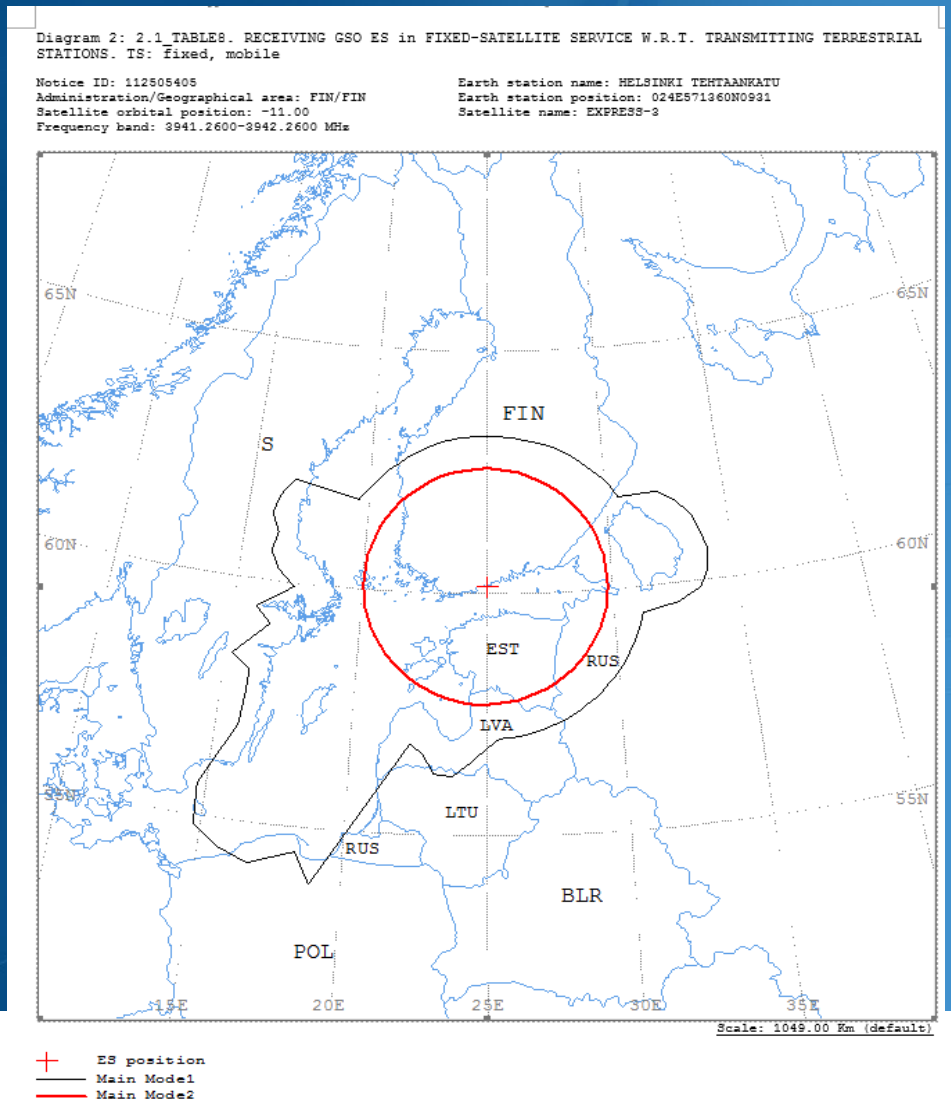
Note!

Ap7Print.RTF is rewritten each time!!!

If the file is locked you will get an error message.

Generate report

Ex-1 Report Document- Graphics



Ap7Print.RTF Document

Graphics:

Contains diagrams displaying:

- Title
- Details
- Coordination Contours
  - Main Mode I and II
  - Auxiliary Contours
- Country codes
- Legend

Edits the Ap7Print.RTF file in the C:\br_tex_results\ap7 folder

Ex-1 Report Document- Details

ANALYSIS DATE AND TIME: 2016-12-02 11:48:27
VERSION: 3.3.0.0Appendix 7/Plt-3.2.0.0/Frm-3.2.0.2/Clc-3.1.0.0/Prp-1.2.0.0/SNS-3.1.0.0/AP7F-3.1.0.0/Ref-3.2.0.1

Diagram 2: 2.1_TABLE8. RECEIVING GSO ES in FIXED-SATELLITE SERVICE W.R.T. TRANSM

NOTICE ID: 112505405 EARTH STATION NAME: HELSINKI TEHTAANKATU EARTH STATION POS
ADM/GEO_AREA: FIN/FIN RAIN CLIMATICAL ZONE: E
SATELLITE NAME: EXPRESS-3 SATELLITE ORBITAL POSITION: -11.00 DEG
ANTENNA AZIMUTH: 219.90 DEG ANTENNA ELEVATION: 15.38 DEG
FREQUENCY BAND: 3941.2600-3942.2600 MHZ ASSIGNED FREQUENCY: 3941.76 MHZ PE
MAXIMUM ANTENNA GAIN: 34.30 DBI MAXIMUM POWER DENSITY: - DBW/HZ NO
ANTENNA PATTERN: APENST806V01
2.1_TABLE8 Model: PLM_DUCTING

TRANSMISSION LOSS MODE 1: 198.9 DB (DOES NOT INCLUDE HOR. CORR. AND ANT. GAIN)
TRANSMISSION LOSS MODE 2: 156.9 DB

AZIMUTH	0	5	10	15	20	25	30	35	40	45	50	55	60	65
OFF-AXIS	137.7	142.3	146.7	151.0	155.0	158.7	161.8	163.9	164.6	163.8	161.7	158.6	154.9	150.8
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
COORDINATION DISTANCE (KM)														
MODE 1														
0.0 DB	343	343	343	343	348	349	351	351	351	355	355	355	435	462
MODE 2														
0.0 DEG	269	269	269	269	269	268	268	268	268	268	268	268	269	269

AZIMUTH	120	125	130	135	140	145	150	155	160	165	170	175	180	185
OFF-AXIS	99.5	94.7	89.9	85.1	80.3	75.5	70.7	65.9	61.1	56.3	51.6	46.9	42.3	37.7
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
COORDINATION DISTANCE (KM)														
MODE 1														
0.0 DB	354	354	354	354	354	354	354	354	354	354	354	354	375	408
MODE 2														
0.0 DEG	270	271	271	271	271	271	272	272	272	272	272	272	273	273

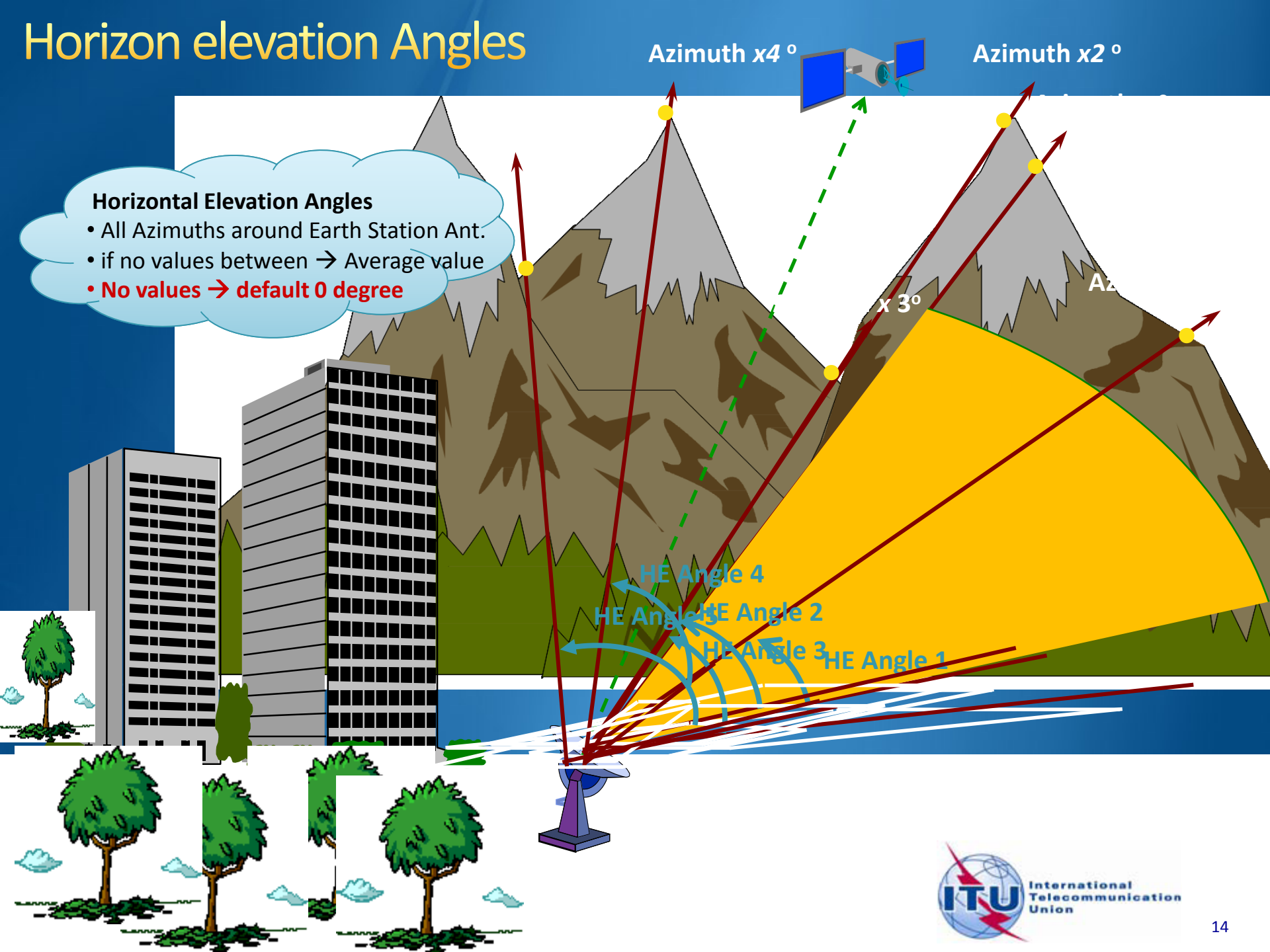
AZIMUTH	240	245	250	255	260	265	270	275	280	285	290	295	300	305
OFF-AXIS	25.1	29.2	33.5	37.9	42.5	47.1	51.8	56.5	61.3	66.0	70.8	75.6	80.5	85.3
HOR.ELEV.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOR.CORR.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANT.GAIN	-6.0	-7.6	-9.1	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0
COORDINATION DISTANCE (KM)														
MODE 1														
0.0 DB	636	590	561	583	488	513	426	461	483	476	502	500	488	346
MODE 2														
0.0 DEG	273	273	273	273	273	272	272	272	272	272	272	271	271	271

PROBABLY AFFECTED COUNTRIES: DNK EST LTU LVA POL RUS S

- Coordination distances at 72 azimuths
- (0-355degrees at 5 deg steps)
- Details of the calculation
- Intermediate data
- List of affected countries

Print the Report Document

Horizon elevation Angles

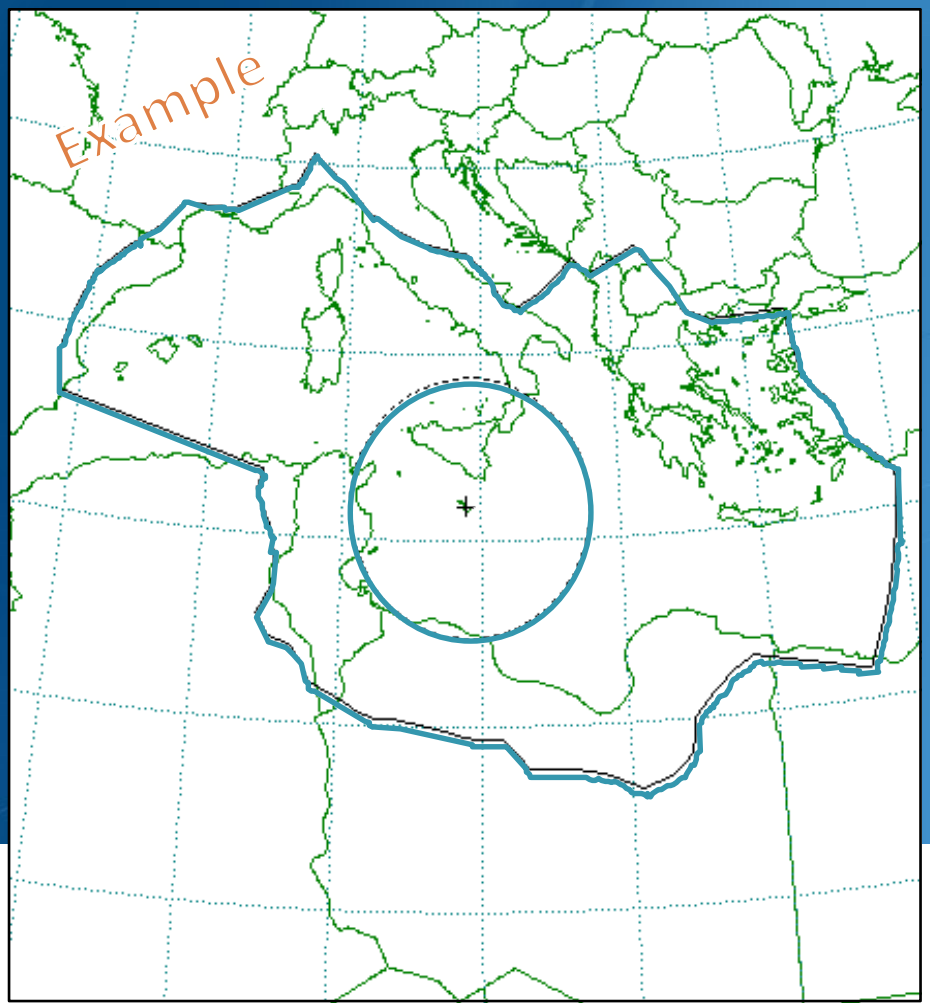


Horizontal Elevation Angles

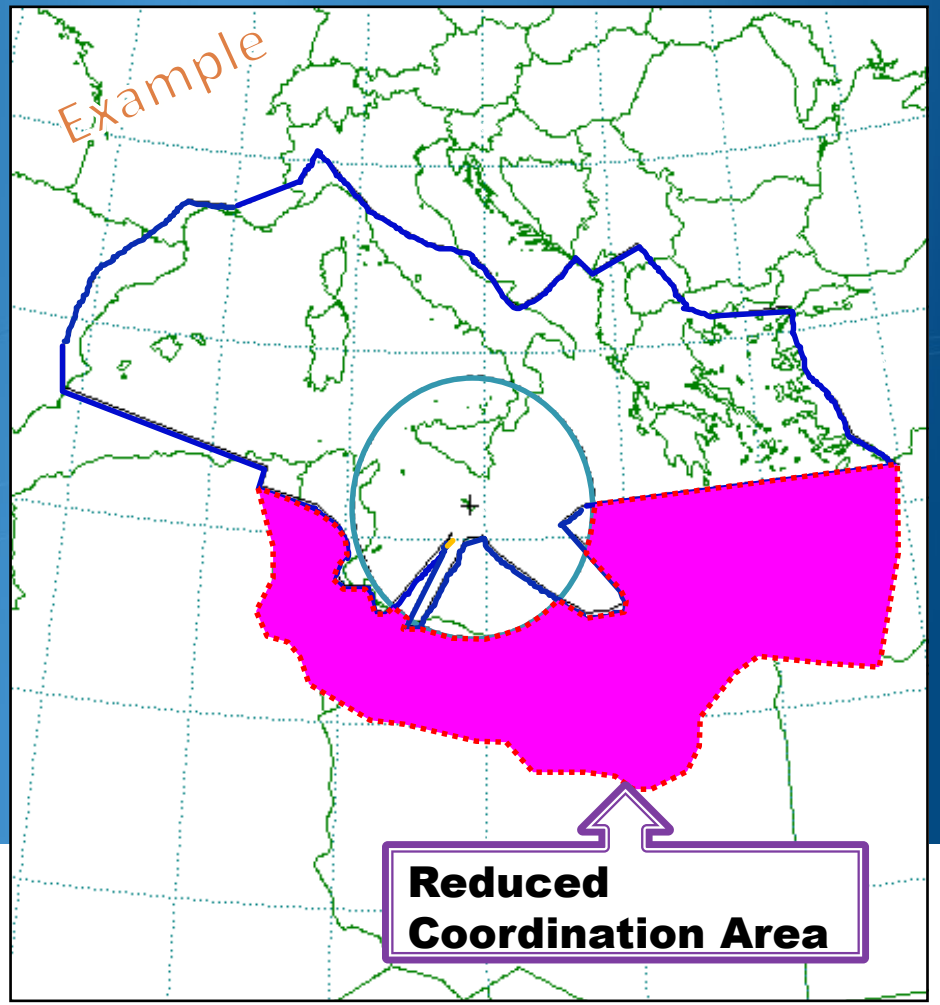
- All Azimuths around Earth Station Ant.
- if no values between → Average value
- **No values → default 0 degree**

Effect of Horizon Elevation Angle

Coordination Area around a Receiving Earth Station

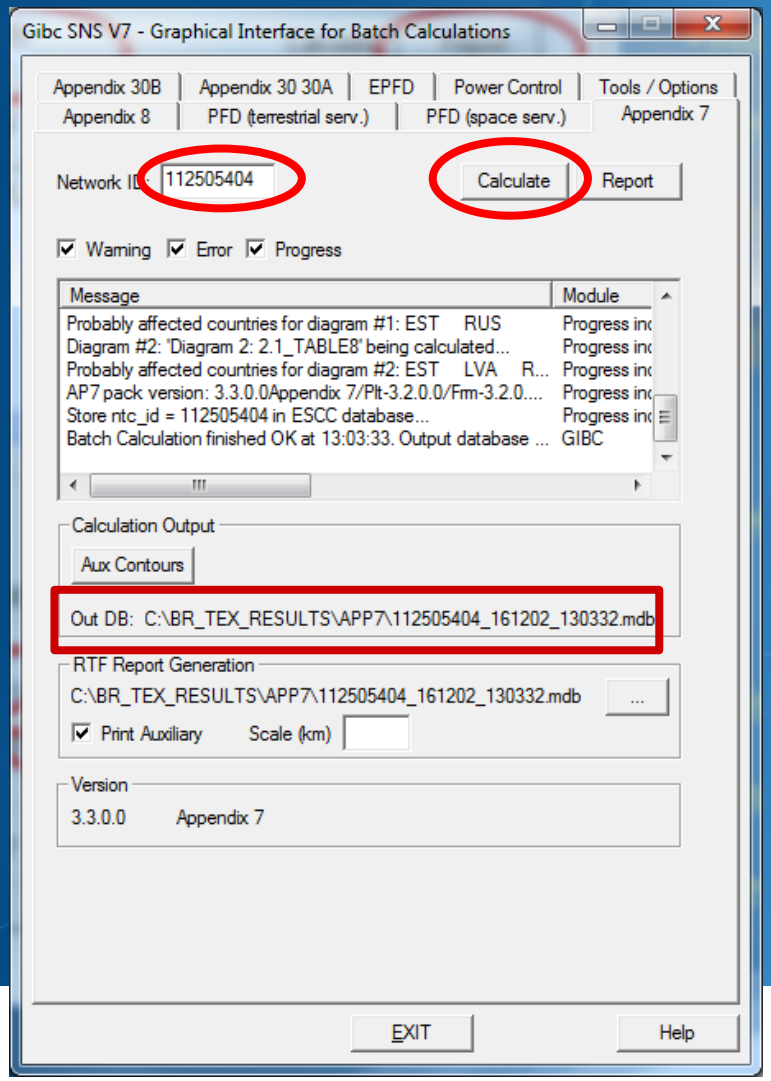


HORIZON ELEVATION ANGLE : 0 °



HORIZON ELEVATION ANGLE: Actual Value

Ex-2 GIBC/ AP 7- Calculation



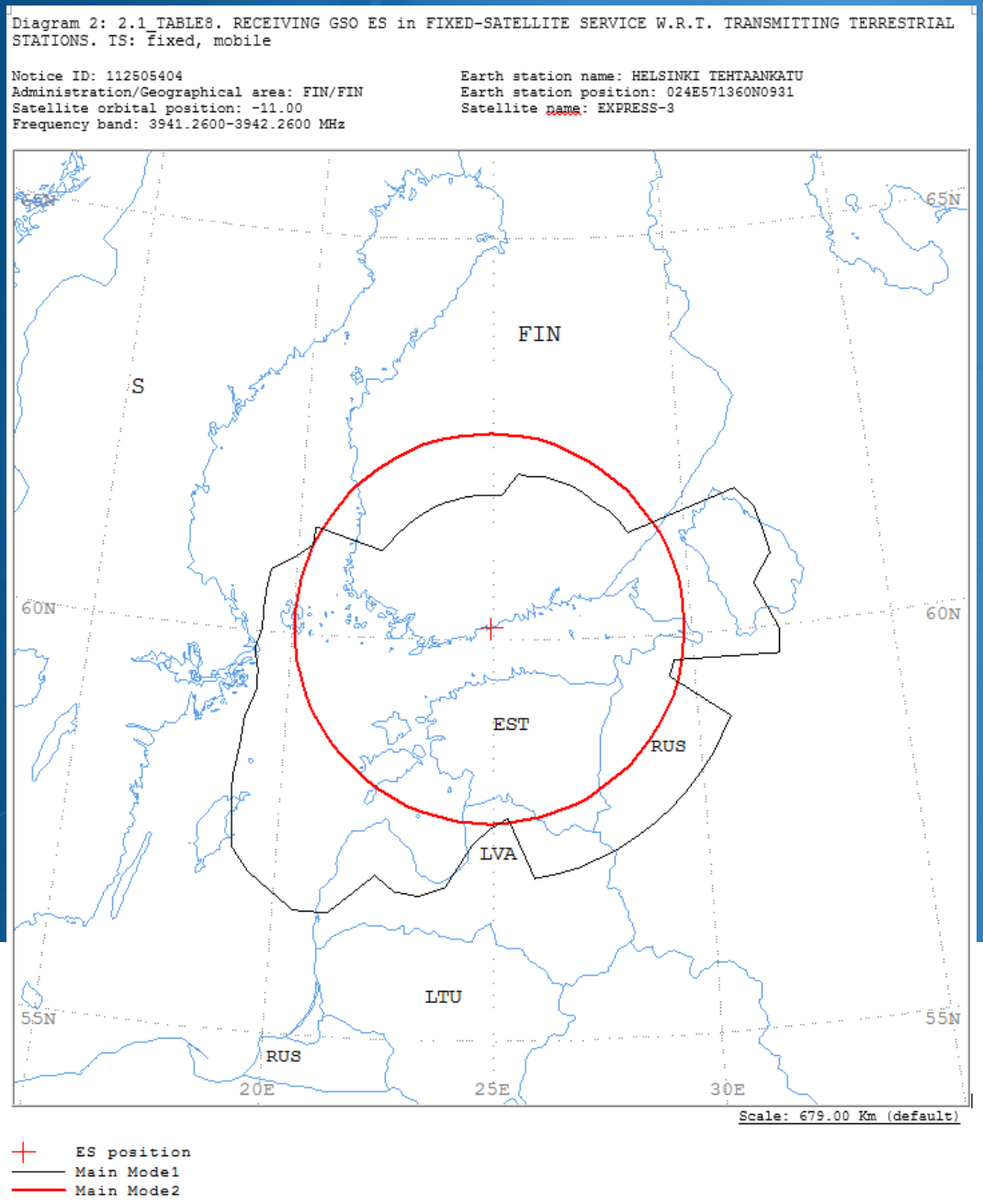
How to Proceed?

- **Select the Appendix 7 tab**
- **ES Network ID**
- **Enter** the 2nd Earth Station notice Id. (Ex.2 non-zero deg horizon elevation angle)

112505404

- **Press Calculate**

Ex-2 Report Document- Graphics



Ex-2 Report Document- Details

Diagram 2: 2.1_TABLE8. RECEIVING GSO ES in FIXED-SATELLITE SERVICE W.R.T. TRANSMITTING TERRESTRIAL STATIONS. TS: fixed, mobile

NOTICE ID: 112505404 EARTH STATION NAME: HELSINKI TEHTAANKATU EARTH STATION POSITION: 024E571360N0931 PHASE: D
ADM/GEO_AREA: FIN/FIN RAIN CLIMATICAL ZONE: E
SATELLITE NAME: EXPRESS-3 SATELLITE ORBITAL POSITION: -11.00 DEG
ANTENNA AZIMUTH: 219.90 DEG ANTENNA ELEVATION: 15.38 DEG
FREQUENCY BAND: 3941.2600-3942.2600 MHZ ASSIGNED FREQUENCY: 3941.76 MHZ PERCENTAGE OF TIME: 0.0017 %
MAXIMUM ANTENNA GAIN: 34.30 DBI MAXIMUM POWER DENSITY: - DBW/HZ NOISE TEMPERATURE: 400.0 K
ANTENNA PATTERN: APENST806V01
2.1_TABLE8 Model: PLM_DUCTING

TRANSMISSION LOSS MODE 1: 198.9 DB (DOES NOT INCLUDE HOR. CORR. AND ANT. GAIN)
TRANSMISSION LOSS MODE 2: 156.9 DB

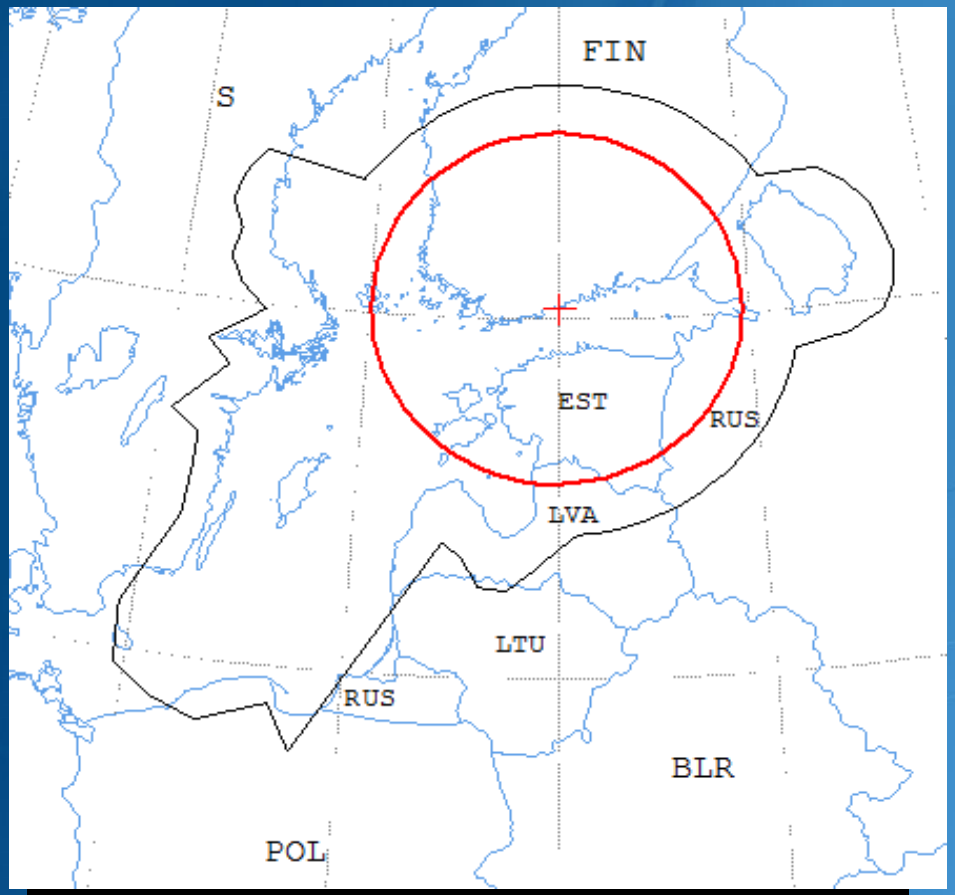
AZIMUTH	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115
OFF-AXIS	135.5	139.9	145.7	149.9	153.7	157.2	160.1	162.0	162.6	161.9	160.0	157.1	153.6	149.7	145.5	141.2	136.7	132.1	127.5	122.8	118.1	113.4	109.2	104.4
HOR.ELEV.	5.0	5.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0
HOR.CORR.	35.0	35.0	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	0.0	0.0
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	184	184	216	216	222	223	226	226	226	231	231	231	389	402	402	402	371	383	401	401	259	257	354	354
MODE 2																								
0.0 DEG	269	269	269	269	269	268	268	268	268	268	268	268	269	269	269	269	269	269	269	269	270	270	270	270

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	99.5	94.7	89.9	85.1	80.3	75.5	70.7	65.9	61.1	56.3	51.6	46.6	41.9	37.3	31.9	27.5	23.2	19.2	15.8	13.3	12.4	13.4	15.9	19.3
HOR.ELEV.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
HOR.CORR.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.5	21.5	21.5	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
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	-8.6	-7.0	-5.1	-3.1	-0.9	0.9	1.7	0.9	-1.0	-3.2
COORDINATION DISTANCE (KM)																								
MODE 1																								
0.0 DB	354	354	354	354	354	354	354	354	354	354	354	265	280	303	367	386	391	380	457	479	476	479	471	439
MODE 2																								
0.0 DEG	270	271	271	271	271	271	272	272	272	272	272	272	273	273	273	273	273	273	273	273	273	273	273	273

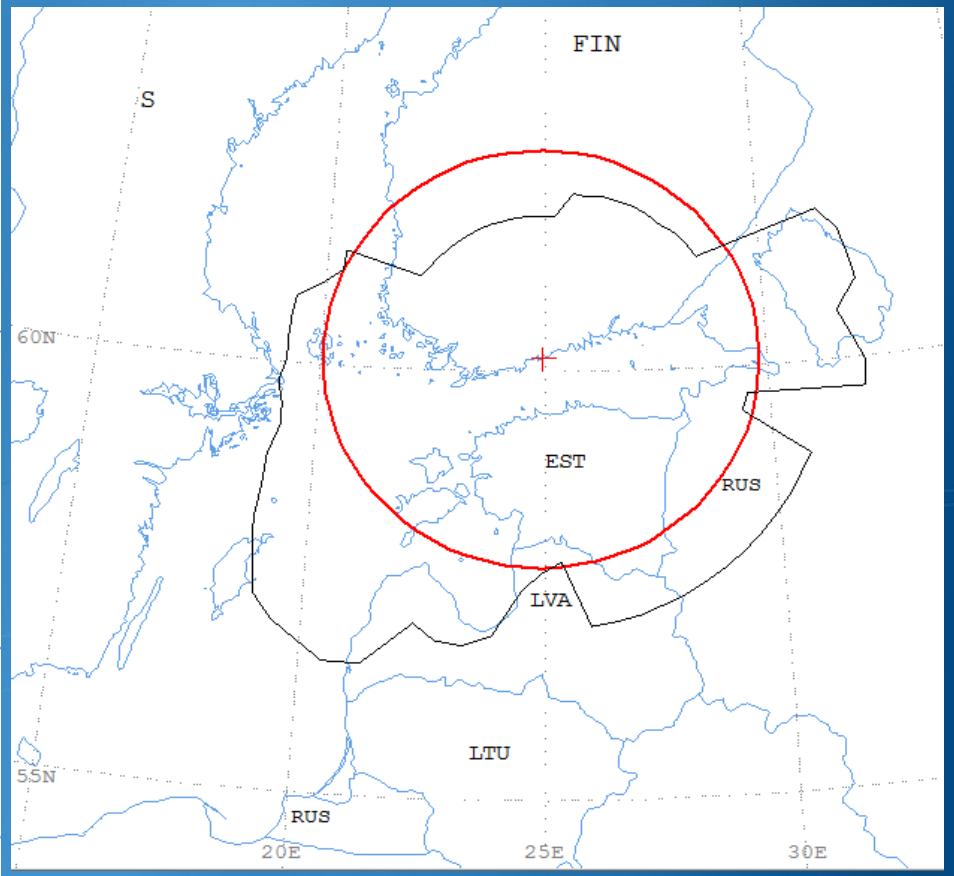
AZIMUTH	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350	355
OFF-AXIS	23.3	27.6	32.1	36.7	41.4	46.1	50.5	55.3	60.1	64.9	69.5	74.3	79.1	84.0	88.8	93.6	98.4	103.1	107.9	112.6	117.3	121.9	126.6	131.1
HOR.ELEV.	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
HOR.CORR.	33.0	33.0	33.0	33.0	33.0	33.0	34.0	34.0	34.0	34.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
ANT.GAIN	-5.2	-7.0	-8.7	-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	413	383	364	336	328	328	316	316	316	316	289	272	280	185	184	184	184	184	184	184	184	184	184	184
MODE 2																								
0.0 DEG	273	273	273	273	273	272	272	272	272	272	272	271	271	271	271	271	270	270	270	270	270	269	269	269

PROBABLY AFFECTED COUNTRIES: EST LVA RUS S

GIBC – Compare Results (Rx)



Zero-degree horizon elevation angles



Non-zero-degree horizon elevation angles

PROBABLY AFFECTED COUNTRIES:
DNK EST LTU LVA POL RUS S

PROBABLY AFFECTED COUNTRIES:
EST LVA RUS S

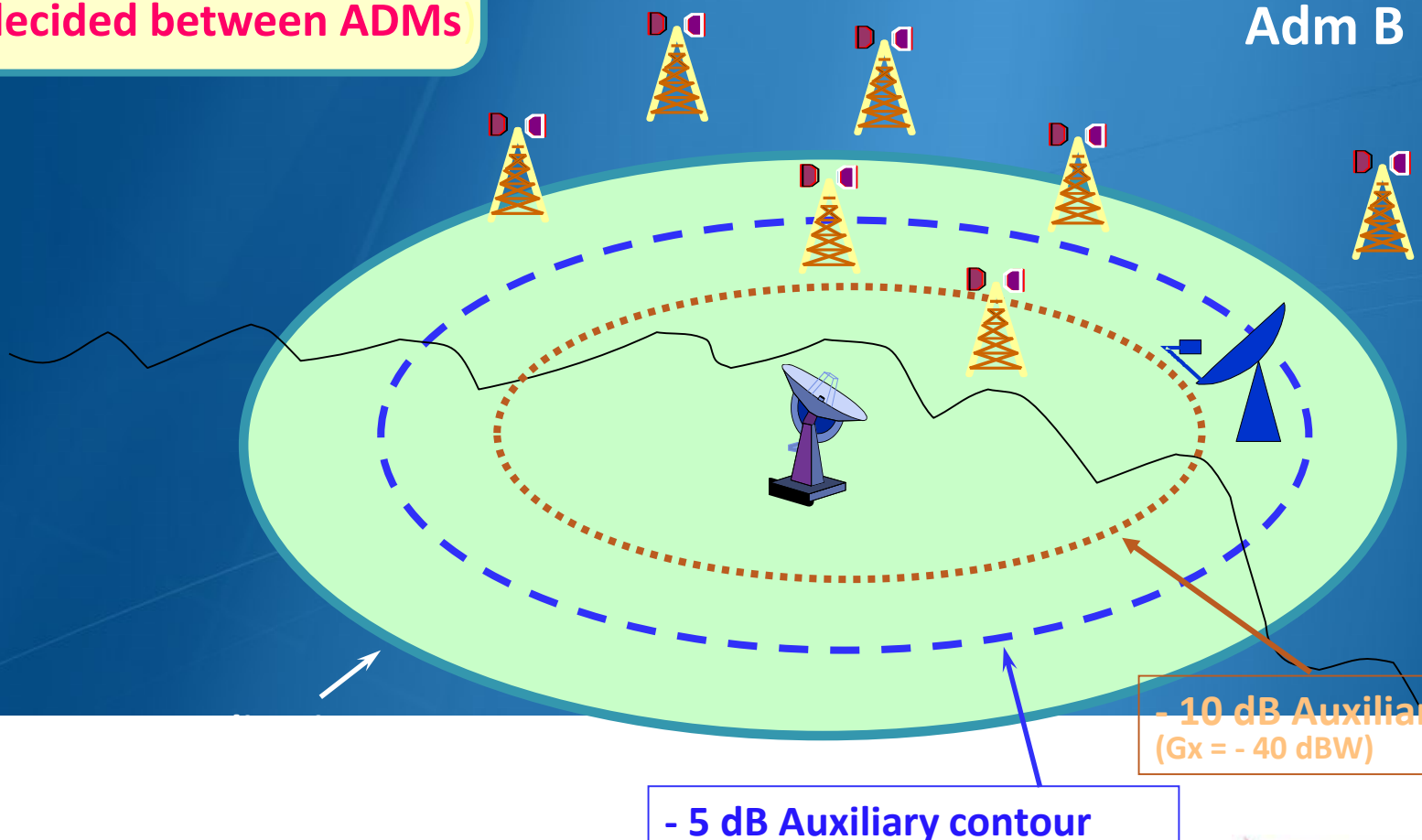
International Telecommunication Union

Auxiliary Contours – Mode 1

Appendix 7- Annex 6

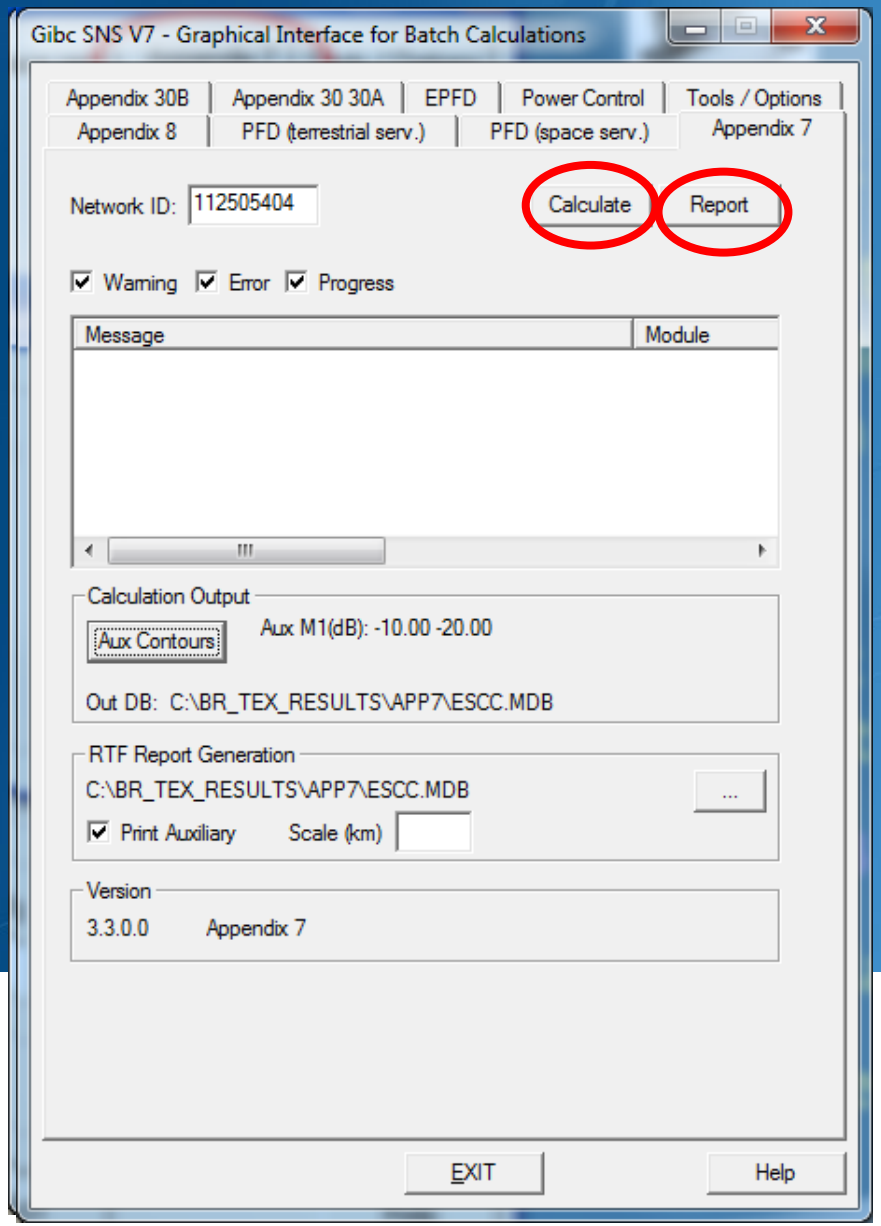
Extra coordination lines inside main contour **decided between ADMs**

AP7- Annex 6
Intend to assist administrations in bilateral discussions



International Telecommunication Union

Creating Auxiliary Contours- GIBC



How to proceed

- Select the **Appendix 7** tab
- Enter the Network ID

112505404

- Select the values for generating Auxiliary Contours :

-10 dB and -20 dB for mode 1

- Calculate
- Create and Open the Report

Creating Auxiliary Contours- GIBC