Generation of Earth Station Coordination contours

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World Radiocommunication Seminar
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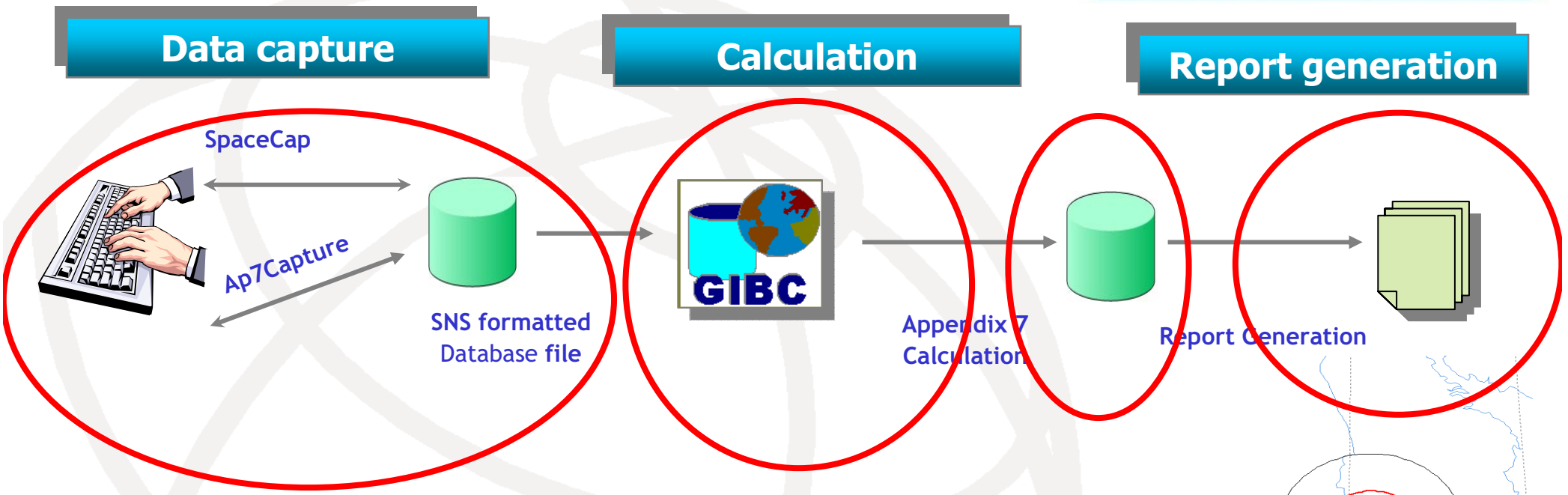
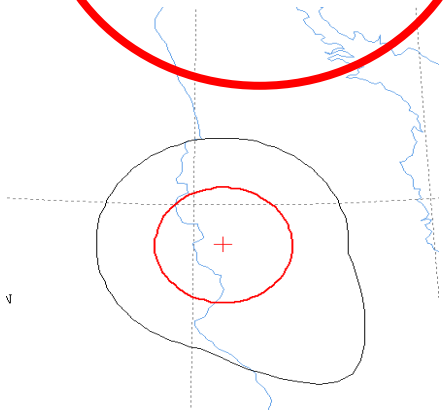
Earth Station Coordination

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

- 2 Tools :
  - Appendix 7 Capture
  - GIBC Appendix 7 Calculation

AP7 data capture/calculation





Data capture and storage in the SNS formatted database
Extract all required information from the database
Perform Appendix 7 calculation
Save the results in an ESCC formatted database file
Produce report document in RTF format

In this workshop…

Appendix 7 Capture tool

- **Software Installation**
- **Select or create a database**
- **Browse an existing database**
- **Create a copy of an ES**
- **Modify parameters**
- **Create new ES**
- **Save into existing database**
- **Save into a new database**

GIBC Appendix 7 Calculation

- **Software Installation**
- **Select input database**
- **Appendix 7 calculation**
- **Generate report document**
- **Report re-generation**
- **Include Auxiliary Contours**
- **Change Printing Options**

Proposed Exercises:

- To generate Coordination Contours for
  - -FSS Transmitting and Receiving Earth Station in the 6/4 GHz band
  - -FSS Transmitting Earth Station in the 8 GHz band
- To repeat the calculations to see the effect of the horizon elevation angles on the coordination contours

Installation

GIBC and *Ap7Capture* software can be installed from the SRS DVD.

To Install from the SRS DVD**:**

- Find the **GIBC** and **AP7Capture** programs in BR_SOFT directory
- Run the setup program

Install GIBC & Open the application

Install Ap7Cap & Open the application

AP7 Capture Tool

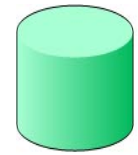
Enter AP7 data for a new earth station

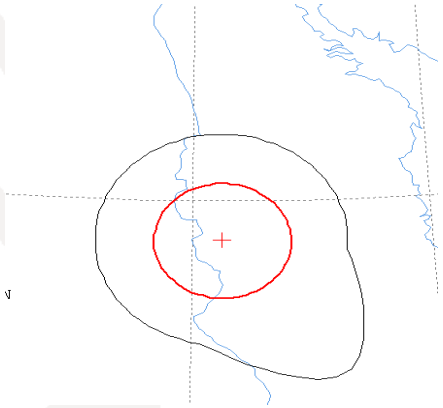
Modify parameters of an existing earth station

Create a copy of an existing earth station entry

Ap7Capture

SNS formatted Database file





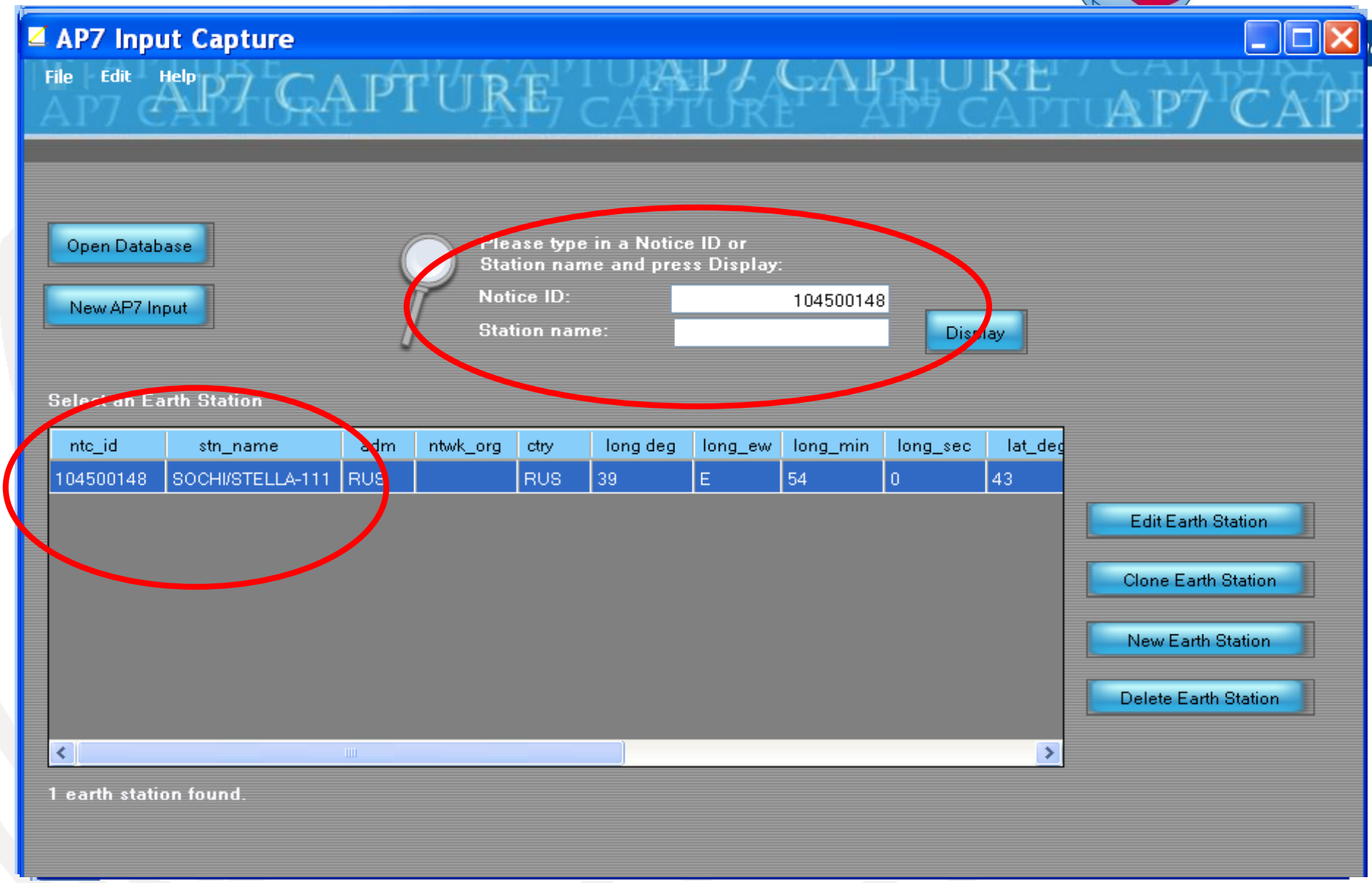
In addition, Ap7 Capture tool provides:

- Search for an earth station by Notice ID
- Basic validation of AP7 input parameters
- Deletion of earth stations from AP7 input database
- User friendly interface!

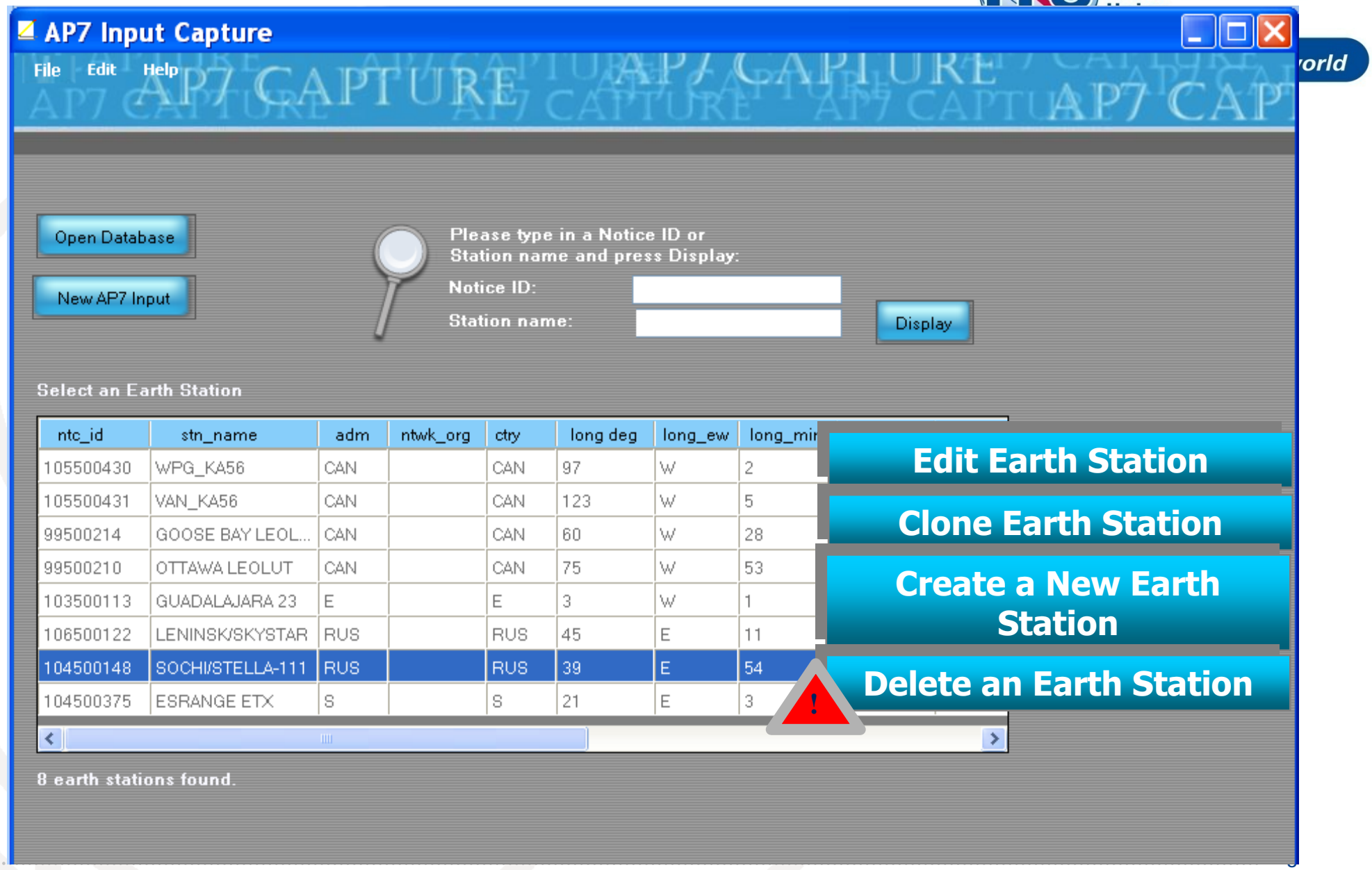
Open Ap7capture tool

Select the database

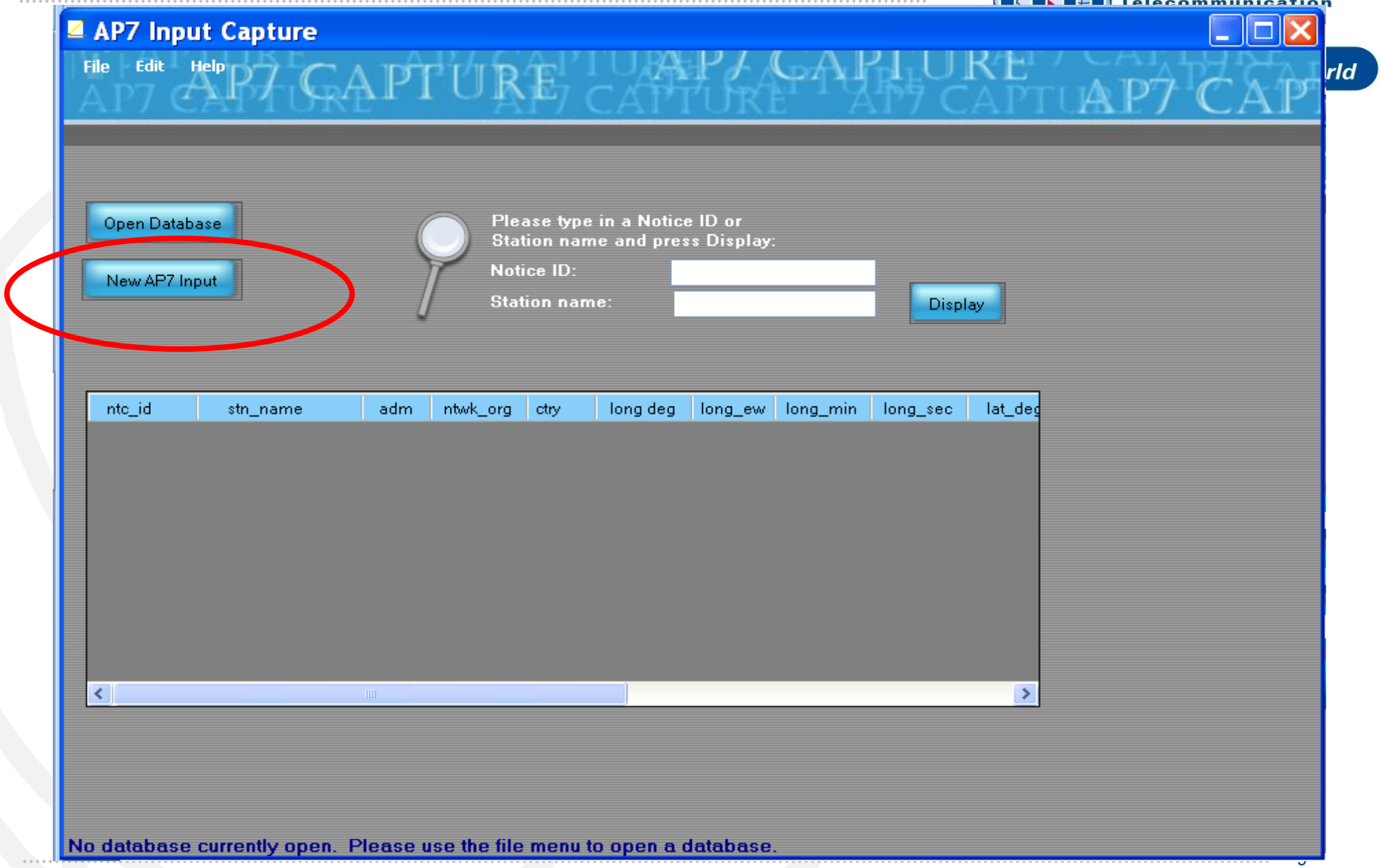
AP7 Capture Tool



AP7 Capture Tool

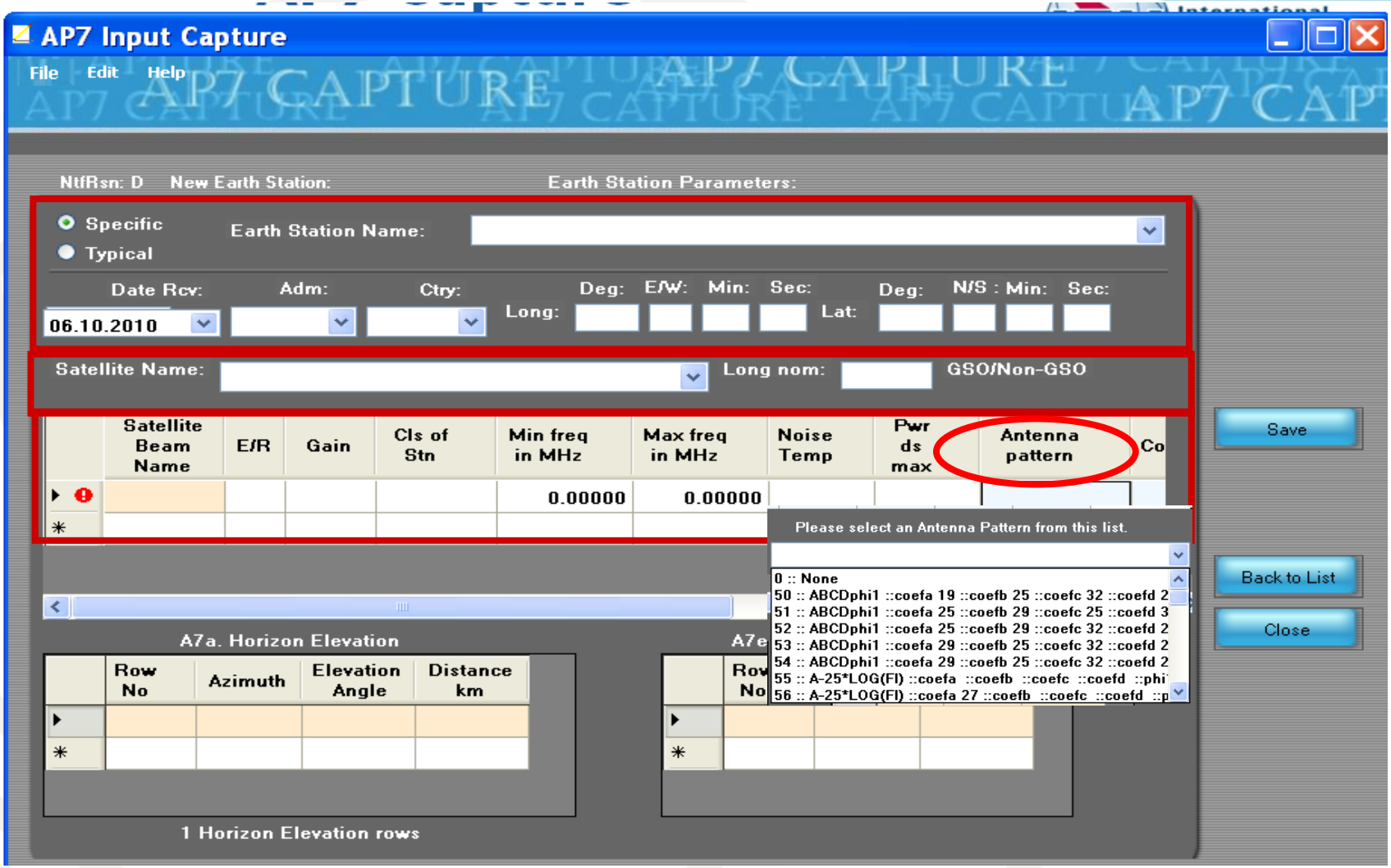


AP7 Capture Tool- New input

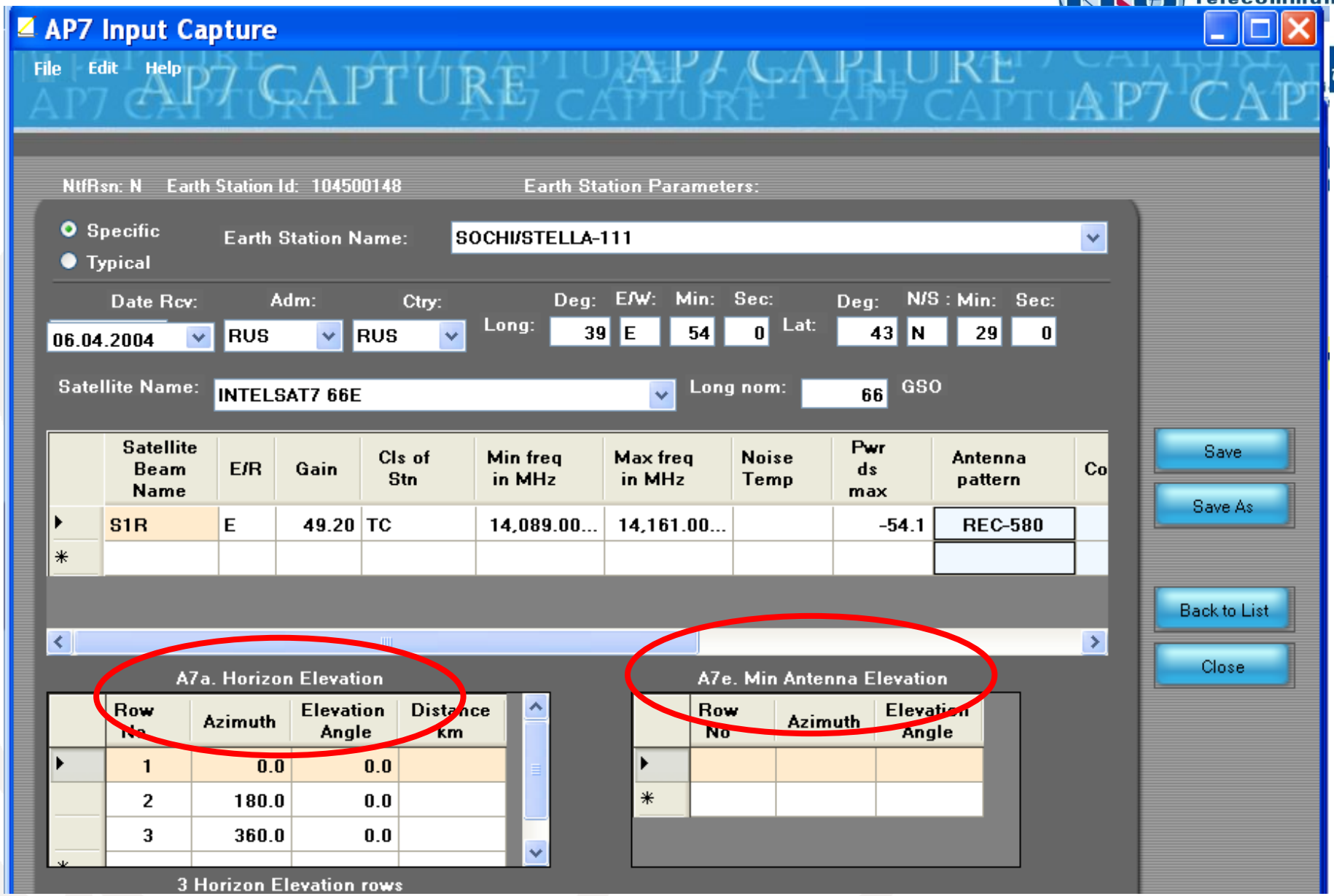


AP7 Capture tool- New input

Earth Station Parameters

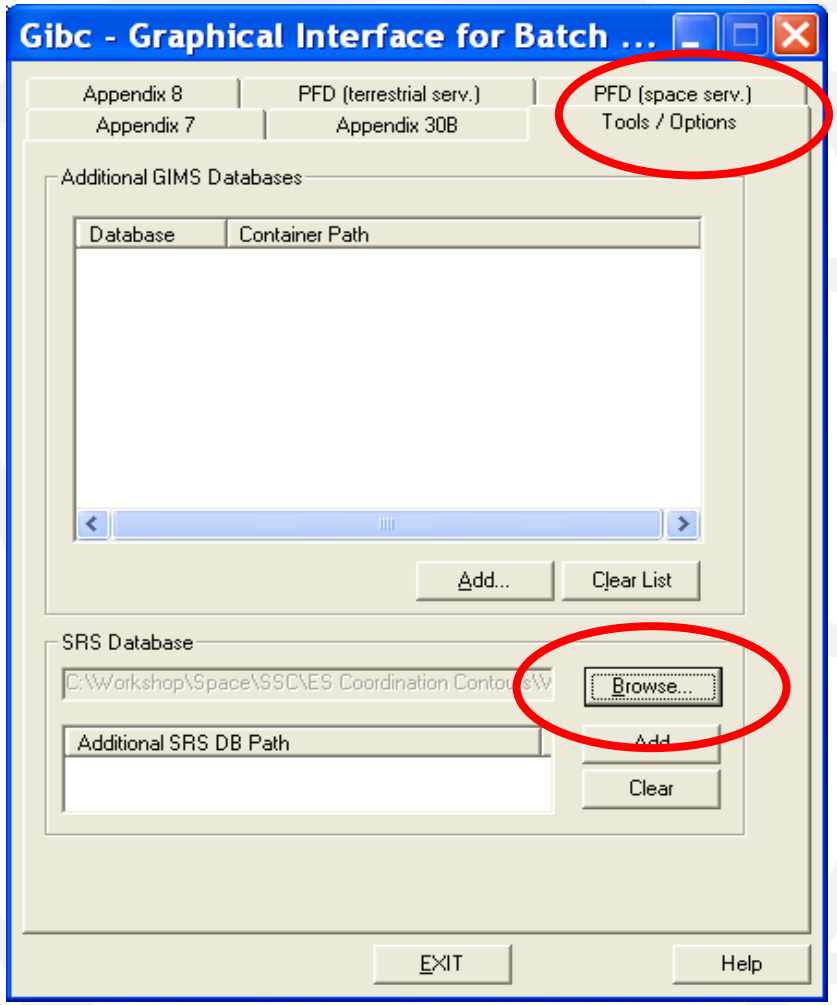


AP7 Capture tool- New input



GIBC/Appendix 7- Input Database

Database file location- Tools/ Options page



Default location: **SRS.MDB database file in the DVD Drive.**

Use the browse button to:

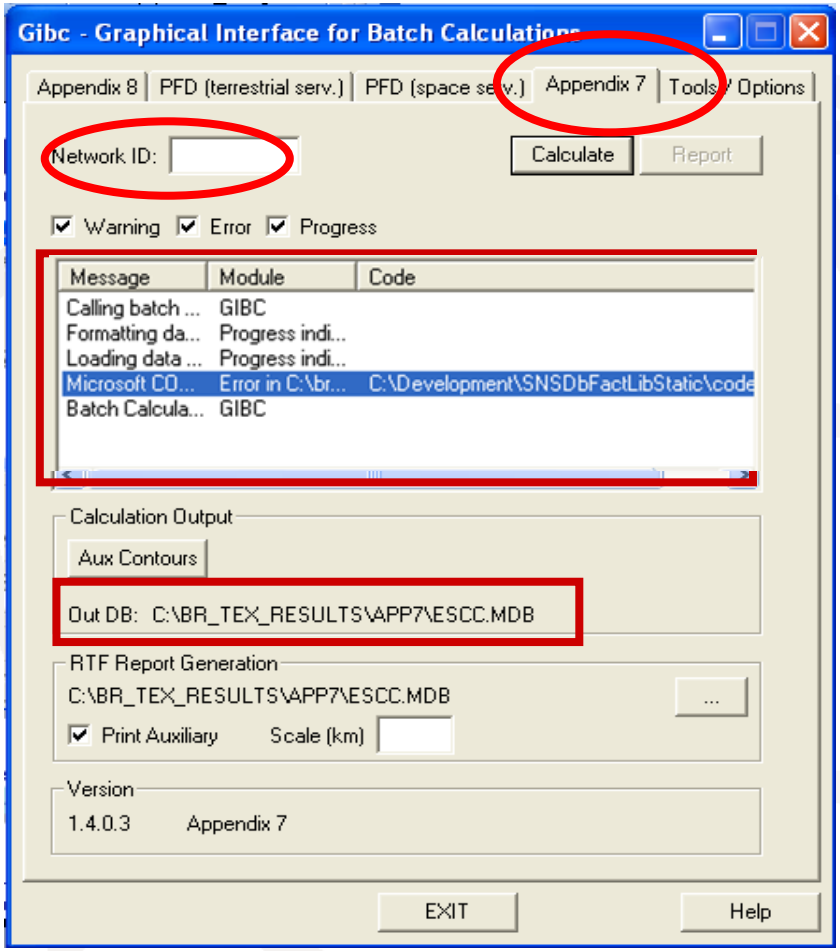
- **change the default location of the input database**
- **select a different input database file**

Select the **Tools & Options** tab

Check the SRS database file location

Select the input **WRS10-Workshop_srs.MDB** file

GIBC/Appendix 7 Calculation



How to Proceed?

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

Check Progress of Calculation

Select type of messages : Warning\Error\Progress

Results in MS–Access file

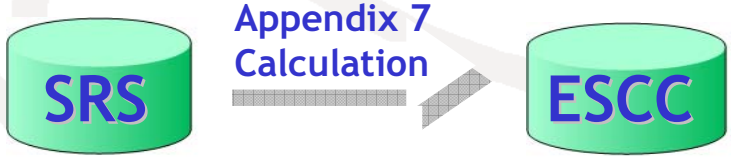
Each calculation in a separate file

Results Directory:

C:\BR_TEX_RESULTS\APP7

Naming convention:

NetworkId_Date_Time.mdb

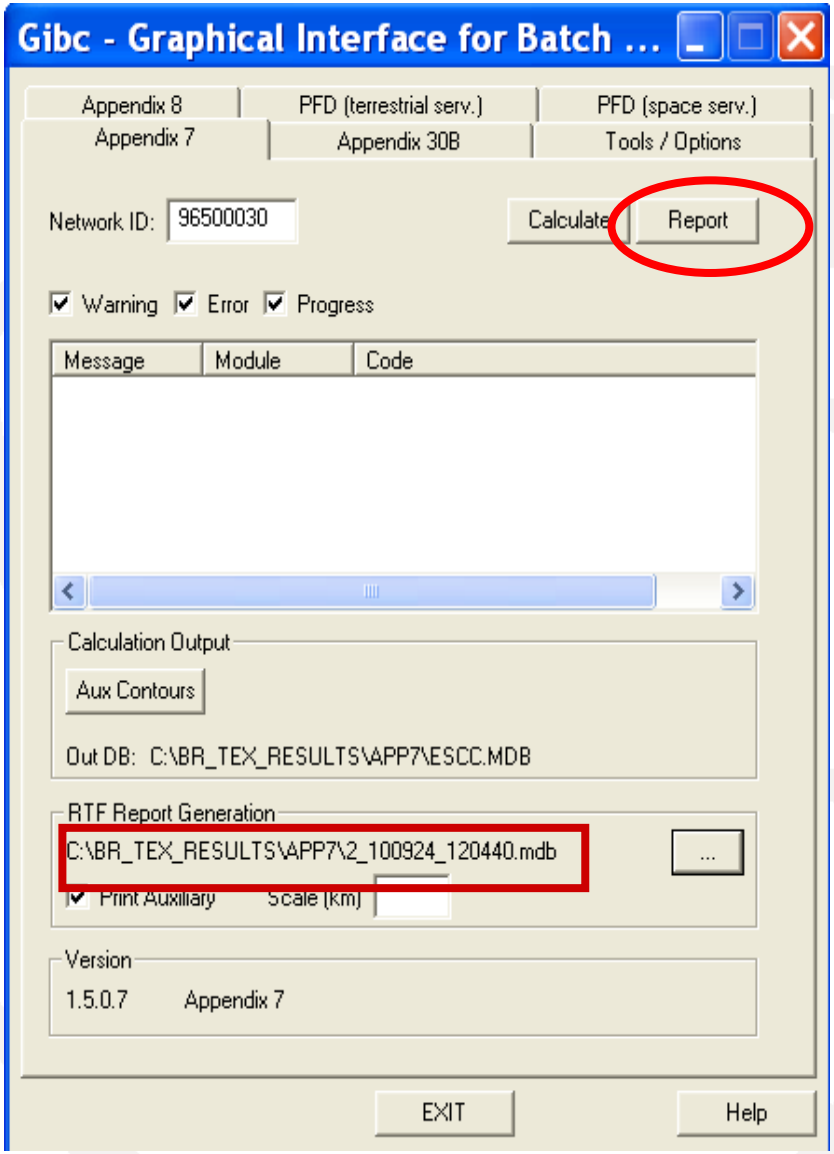


Select the **Appendix 7** tab

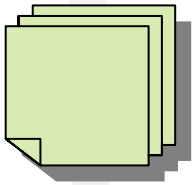
Enter the **Network Id** of the earth station (test case 104500375)

Press **Calculate**

GIBC/AP7- Generate Report



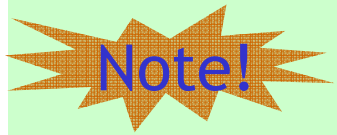
Report Generation



Ap7print.rtf

After an Appendix 7 calculation…

- **Just Press the Report button**

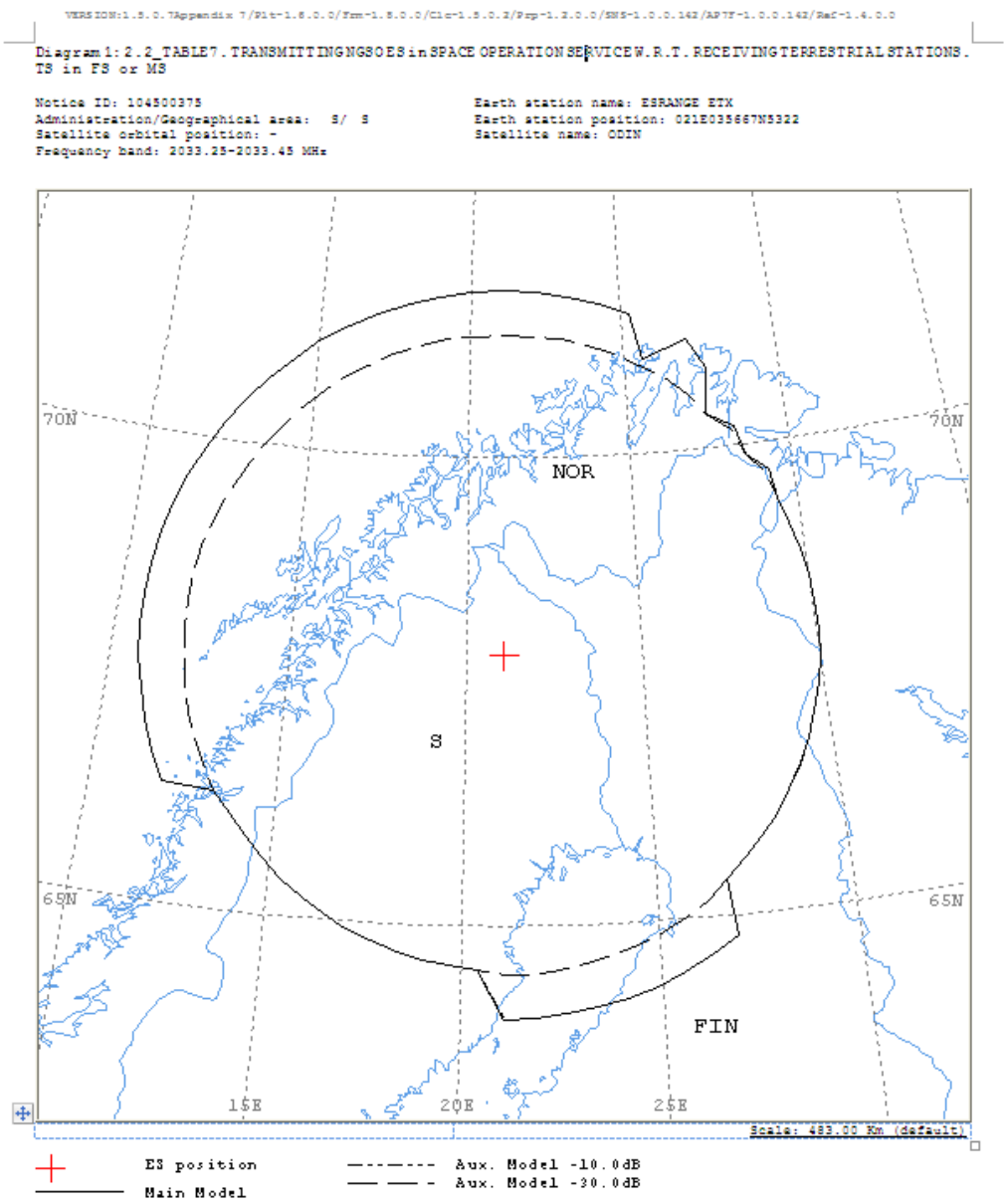


Ap7Print.RTF is rewritten each time!!!

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

Generate report

Report Document - Graphics



Committed to connecting the world

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

Report Document- Details

ANALYSIS DATE AND TIME: 2010-10-05 16:42:57
VERSION: 1.5.0.7Appendix 7/Plt-1.6.0.0/Frm-1.8.0.0/Clc-1.5.0.2/Prp-1.2.0.0/SNS-1.0.0.142/AP7F-1.0.0.142/Ref-1.4.0.0

Diagram 1: 2.2_TABLE7. TRANSMITTING NGSO ES in SPACE OPERATION SERVICE W.R.T. RECEI

NOTICE ID: 104500375 EARTH STATION NAME: ESRANGE ETX EARTH STATION POSITIC
ADM/GEO_AREA: S/ S RAIN CLIMATICAL ZONE: C
SATELLITE NAME: ODIN SATELLITE ORBITAL POSITION: - DEG
ANTENNA AZIMUTH: - DEG ANTENNA ELEVATION: - DEG
FREQUENCY BAND: 2033.25-2033.45 MHZ ASSIGNED FREQUENCY: 2033.35 MHZ
MAXIMUM ANTENNA GAIN: 41.0 DBI MAXIMUM POWER DENSITY: -32.0 DBW/HZ
ANTENNA PATTERN: APEND_099V01
2.2_TABLE7 Model: PLM_DUCTING

TRANSMISSION LOSS MODE 1: 193.0 DB (DOES NOT INCLUDE HOR. CORR. AND ANT. GAIN)
TRANSMISSION LOSS MODE 2:

AZIMUTH	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
OFF-AXIS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOR.ELEV.	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.1	5.1	5.1	5.1	5.1	5.1	5.1
HOR.CORR.	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.1	35.1	35.1	35.1	35.1	3
ANT.GAIN	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	4
COORDINATION DISTANCE (KM)																
MODE 1																
0.0 DB	433	433	433	433	433	389	433	419	375	387	375	385	375	375	375	375
-10.0 DB	433	433	433	433	433	389	433	419	375	387	375	385	375	375	375	375
-30.0 DB	381	381	381	381	381	381	381	381	375	381	375	381	375	375	375	375

AZIMUTH	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195
OFF-AXIS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOR.ELEV.	5.1	5.1	5.1	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.4	5.6	5.6
HOR.CORR.	35.1	35.1	35.1	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.4	35.6	3
ANT.GAIN	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	4
COORDINATION DISTANCE (KM)																
MODE 1																
0.0 DB	375	375	375	375	433	433	433	433	433	433	433	433	433	375	375	375
-10.0 DB	375	375	375	375	433	433	433	433	433	433	433	433	433	375	375	375
-30.0 DB	375	375	375	375	380	380	380	380	380	380	380	380	380	375	375	375

AZIMUTH	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315
OFF-AXIS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOR.ELEV.	5.4	5.3	5.3	5.3	5.3	5.3	5.2	5.2	5.2	5.2	5.1	5.2	5.3	5.4	5.5	5.5
HOR.CORR.	35.4	35.3	35.3	35.3	35.3	35.3	35.2	35.2	35.2	35.2	35.1	35.2	35.3	35.4	35.5	3
ANT.GAIN	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	4
COORDINATION DISTANCE (KM)																
MODE 1																
0.0 DB	375	381	432	432	432	432	433	433	433	433	433	433	432	432	432	432
-10.0 DB	375	381	432	432	432	432	433	433	433	433	433	433	432	432	432	432
-30.0 DB	375	380	380	380	380	380	380	380	380	381	381	380	380	379	379	379

PROBABLY AFFECTED COUNTRIES: FIN NOR RUS

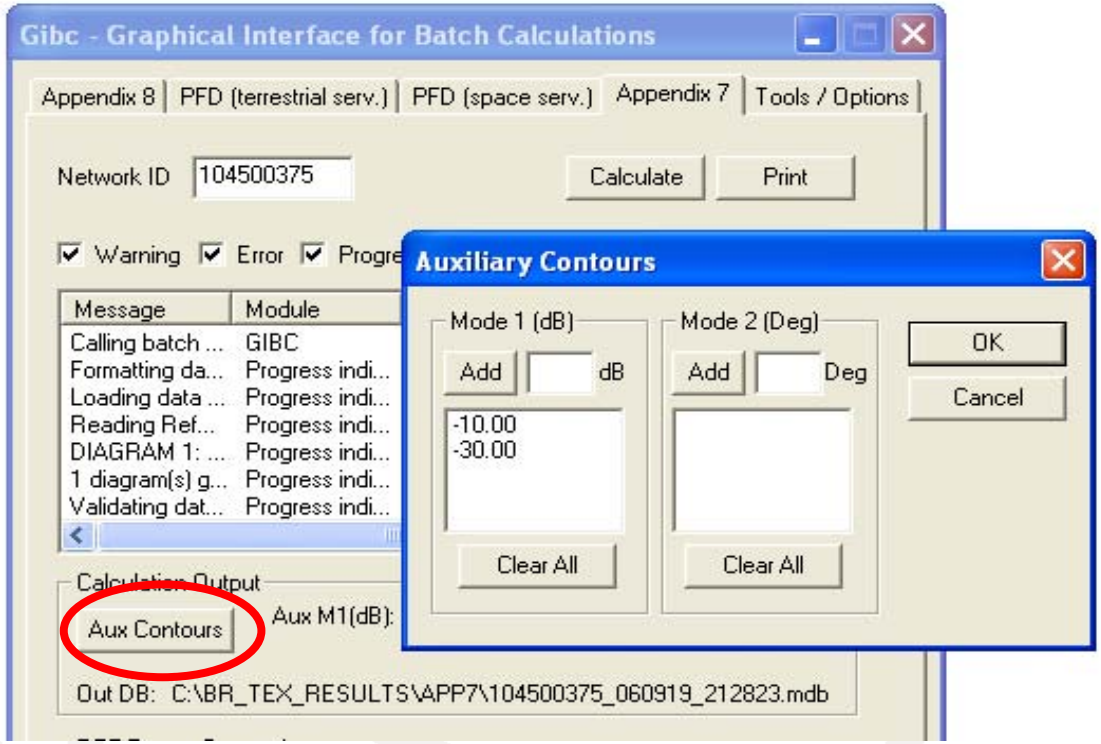
- Coordination distances at 72 azimuths (0-355degrees at 5 deg steps)
- Details of the calculation
- Intermediate data
- List of affected countries

Print the Report Document

Auxiliary Contours

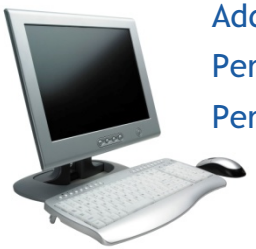
Auxiliary Mode 1 **reduced required loss expressed in dB**

Auxiliary Mode 2 **Angular offset between beams expressed in degrees**



How to produce auxiliary contours?

- **Press Auxiliary Contours button**
- **Enter the values in the list**
  - Mode 1 (dB) (negative values)
  - Mode 2 (deg)
- **Perform the Calculation**



To add Mode 1 aux contours press the **Auxiliary Contours** button.

Add Mode 1 Contours (-10dB, -30dB)

Perform Calculation

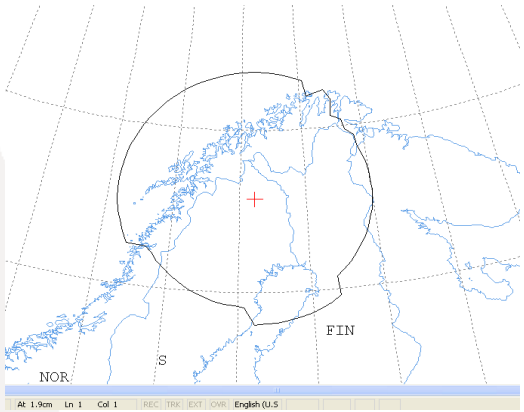
Perform Report Generation

Printing Options

Print Auxiliary

Check **Print Auxiliary** (if auxiliary contours information exists).

This option is without effect if there is not any auxiliary contours information in the database.



Distance\Scale

Size of the window of the map (expressed in Km).

By default automatic value is selected that accommodates the diagram.

Useful in comparing results from two different earth stations.

Uncheck the **Print Auxiliary** Contours option

Specify 1000Km
Perform Report Generation
Check the report file

Proposed Exercises

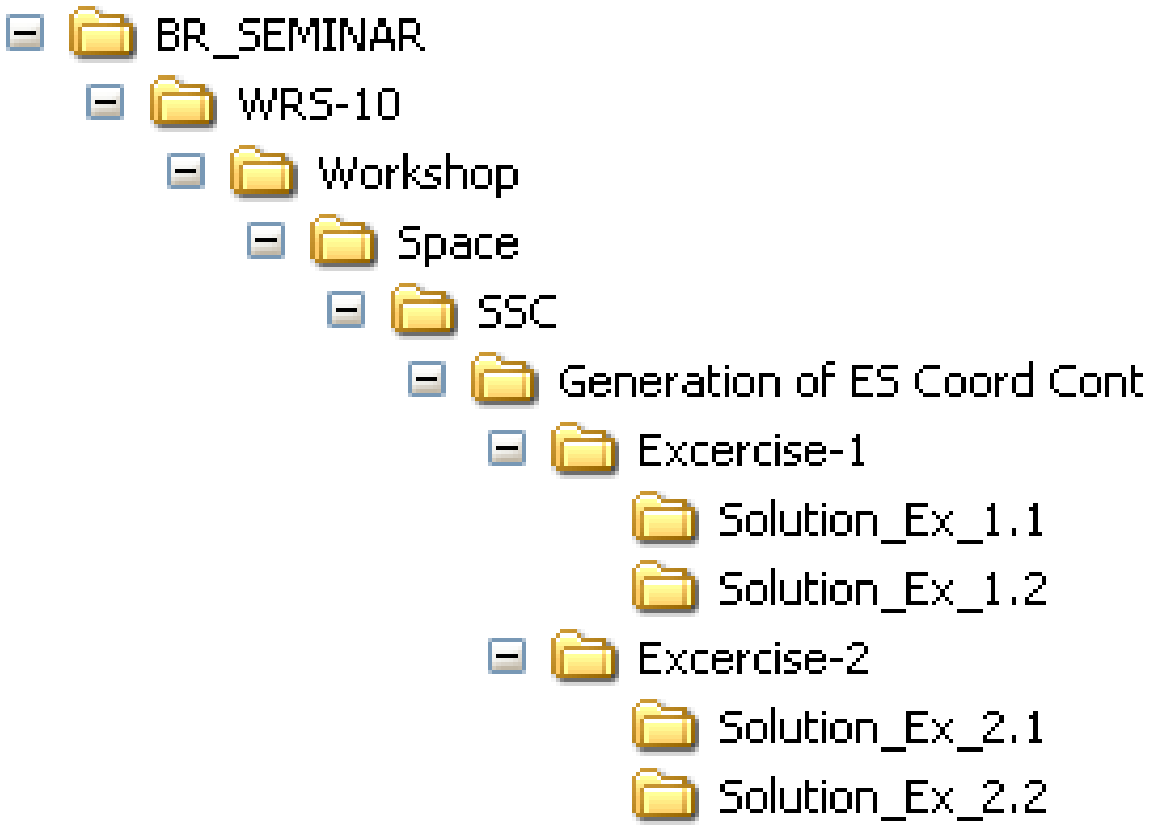
Generation of coordination contours:

- 1st exercise: **FSS Transmitting** and **Receiving ES** in the **6/4 GHz band**
  - -Input example database (SNS format):
    Tx&RxEarthStation@6&4GHz.mdb
  - -ES name: **MAGTAB**
  - -ES Notice Ids: Ex.1.1 **87500999** (with non-zero deg. horizon elevation angles)
    Ex.1.2 **87501000** (with zero deg. horizon elevation angles)

- 2nd exercise: **FSS Transmitting ES** in the **8 GHz band**
  - -Input example database (SNS format):
    TxEarthStation@8GHz.mdb
  - -ES name: **MAGTAB**
  - -ES Notice Ids: Ex. 2.1 **87500999** (with non-zero deg. horizon elevation angles)
    Ex. 2.2 **87501000** (with zero deg. horizon elevation angles)

Proposed Exercises

Input and solution files



Exercise 1

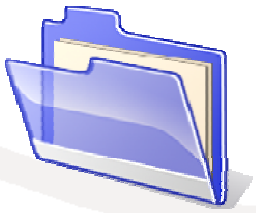
FSS Transmitting and **Receiving ES** in the **6/4 GHz band**

Input database (SNS format):

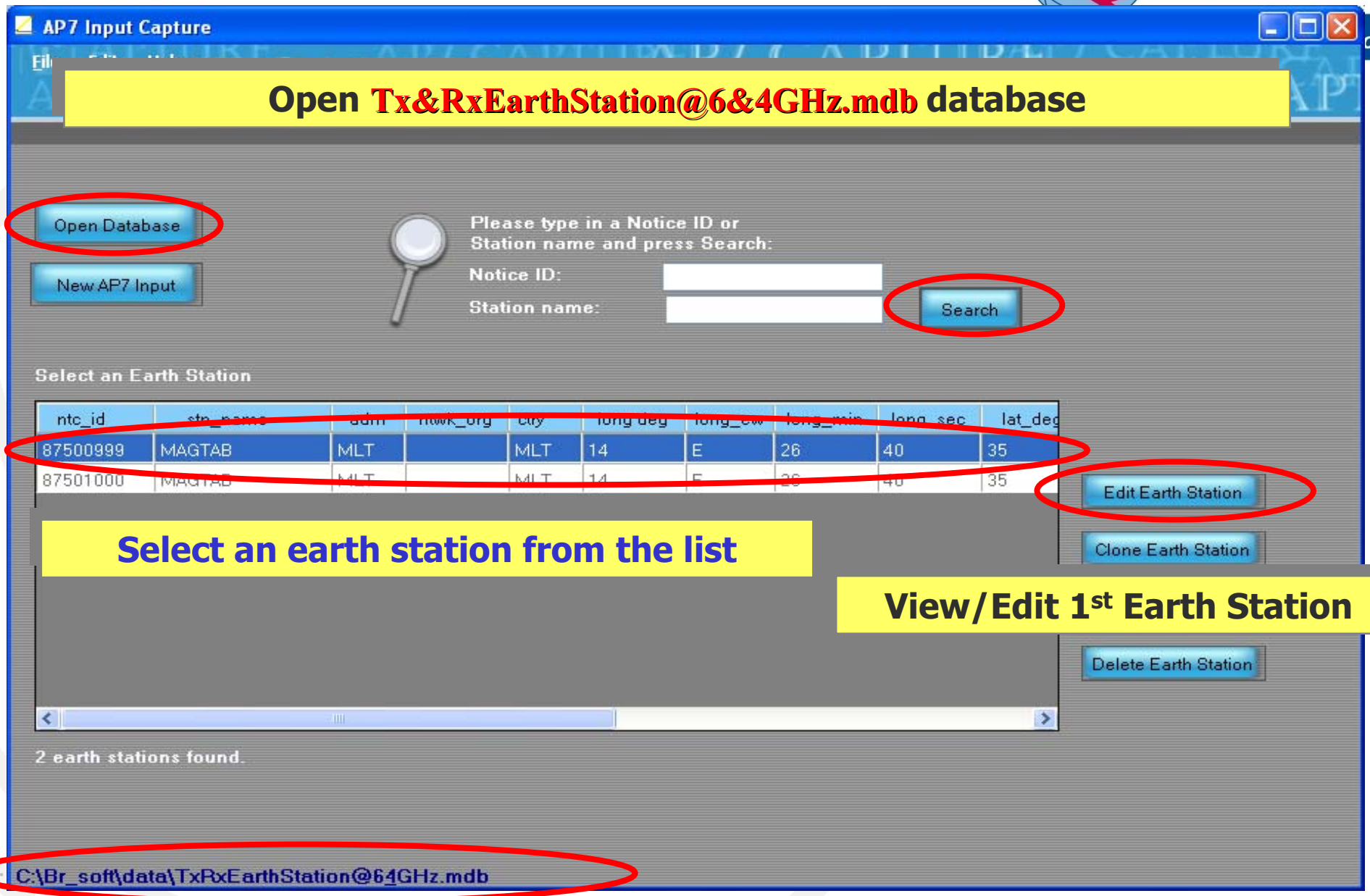
Tx&RxEarthStation@6&4GHz.mdb

ES name: **MAGTAB**

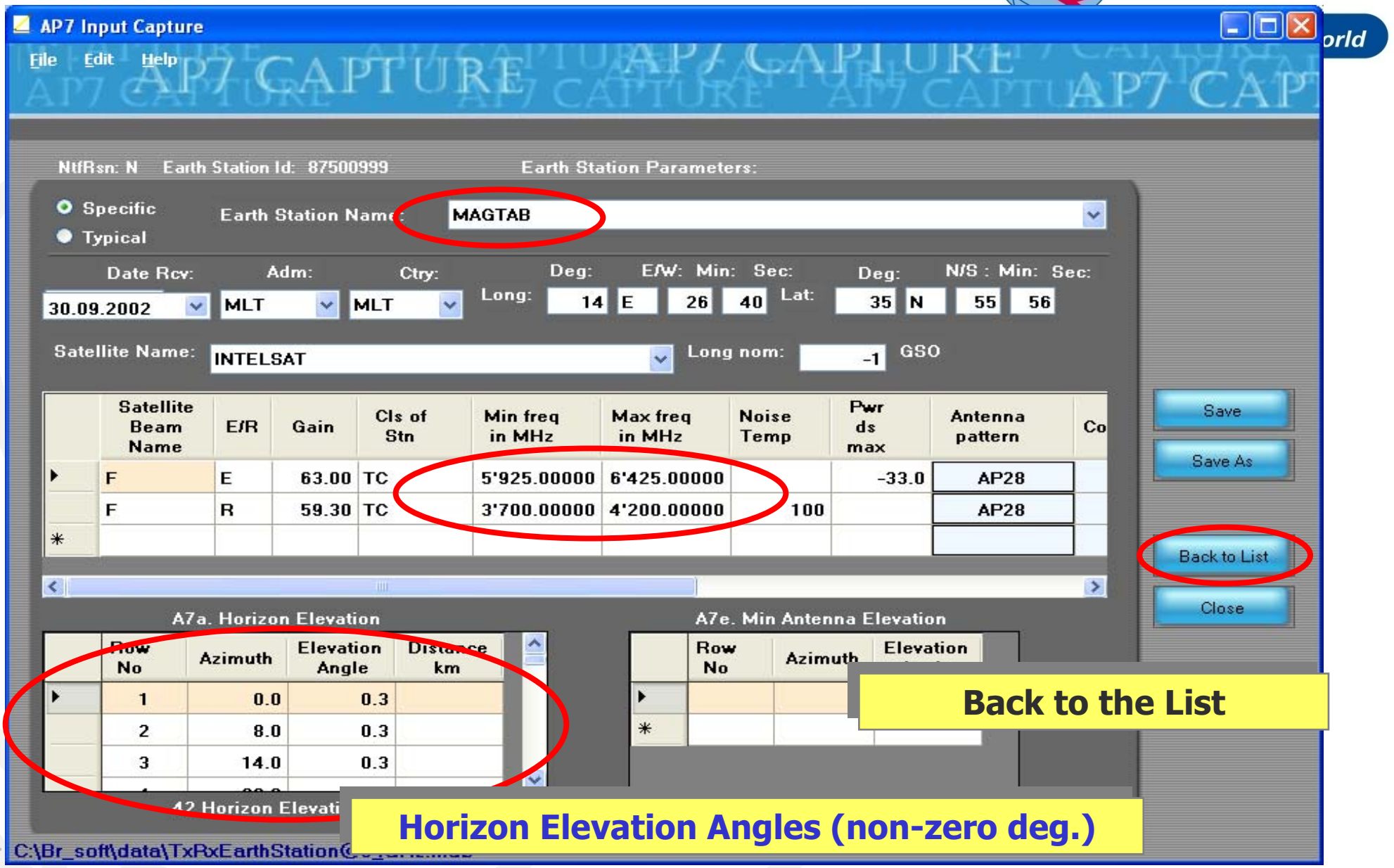
- Ex. 1.1 ES notice id: **87500999** (non-zero deg. horizon elevation angles)
- Ex. 1.2 ES notice id: **87501000** (zero deg. horizon elevation angles)



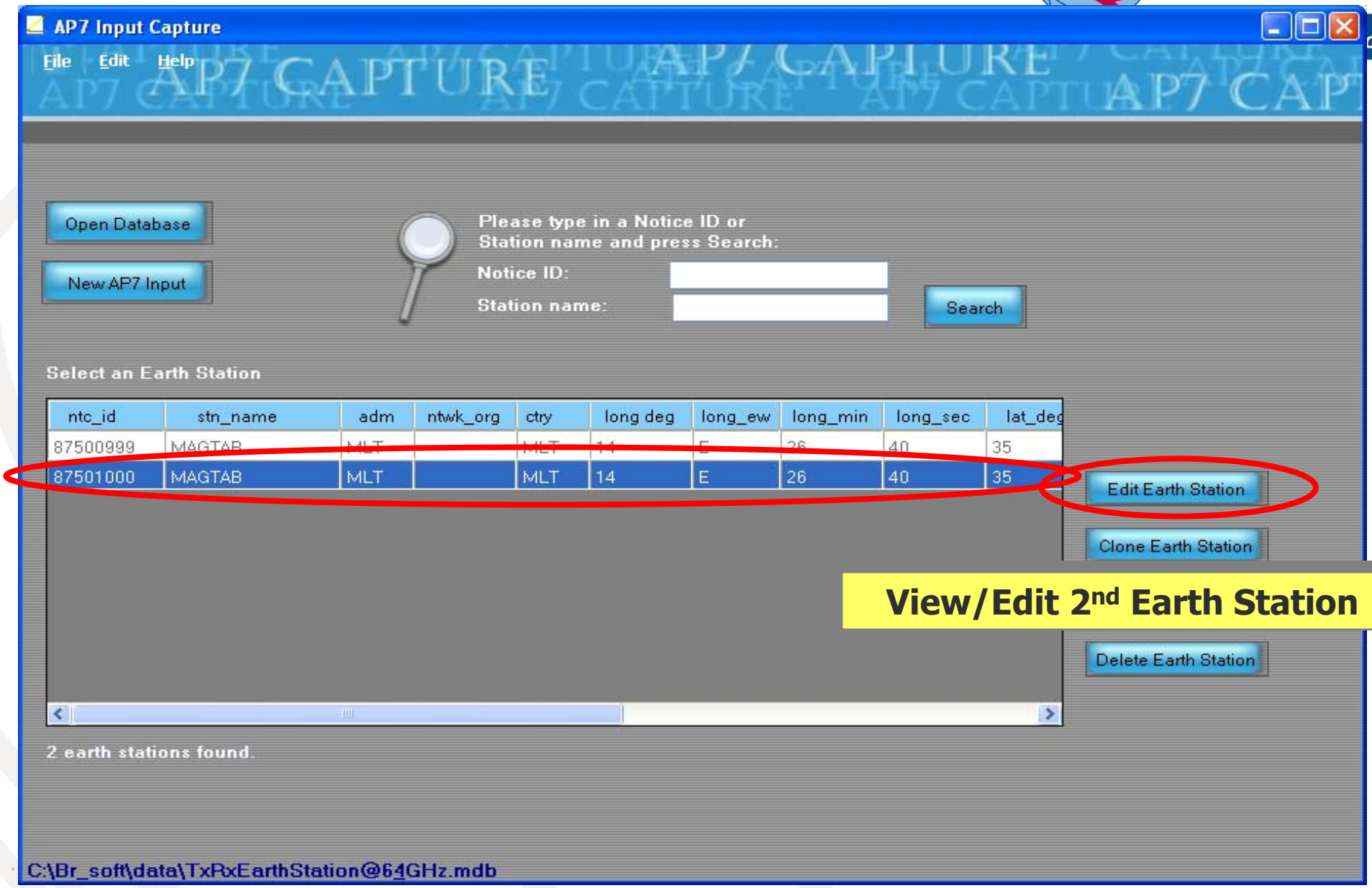
AP7 Capture/View - Exercise 1



Exercise 1 - AP7 Capture/View

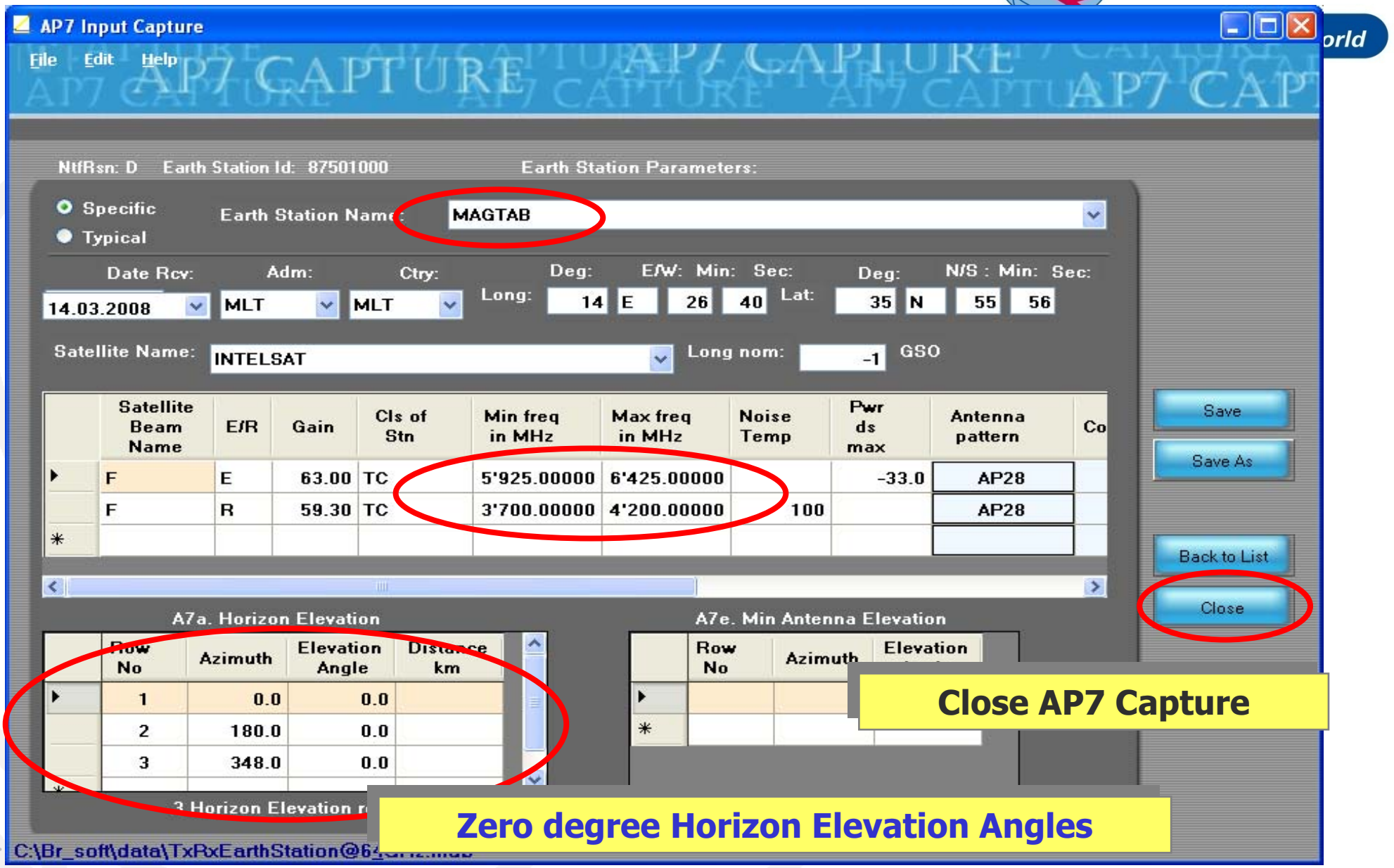


Exercise 1 - AP7 Capture/View

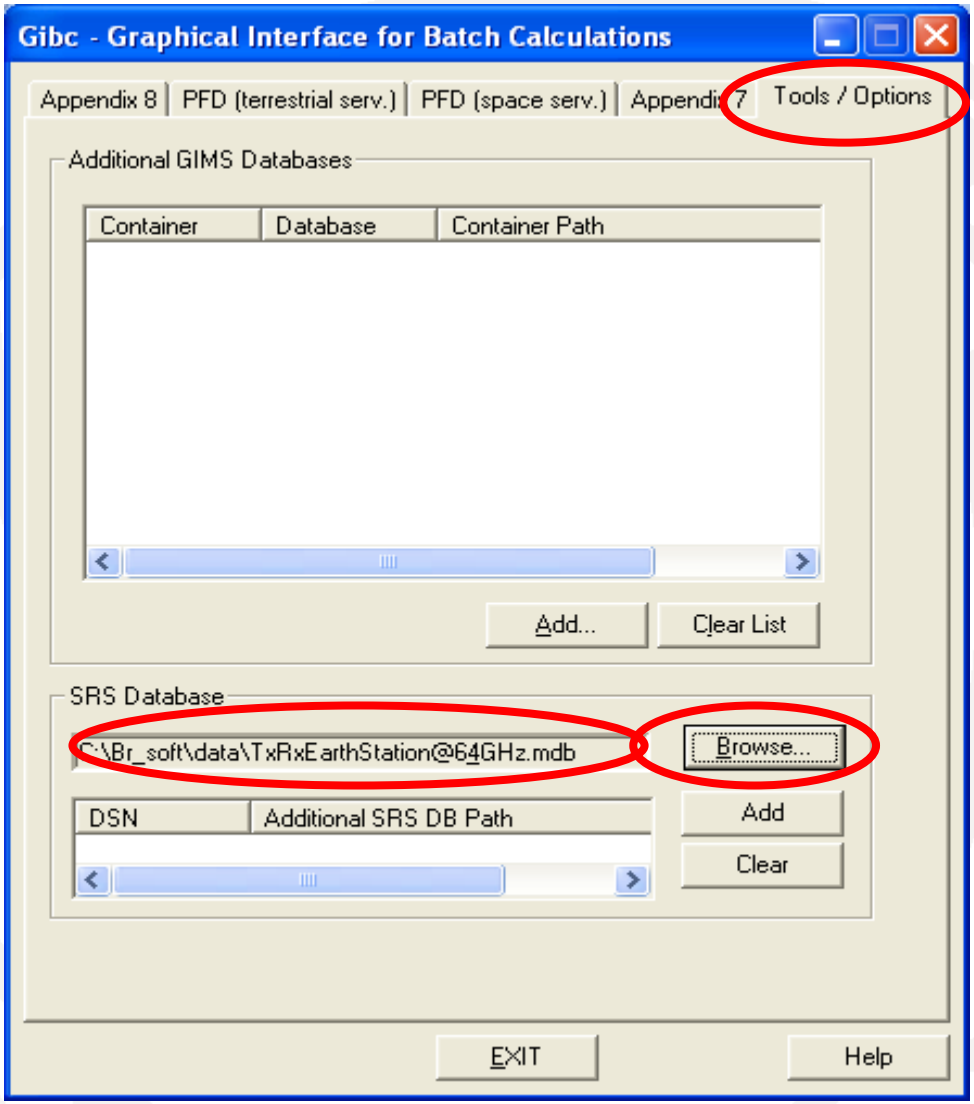


View/Edit 2nd Earth Station

Exercise 1 - AP7 Capture/View



Exercise 1 - GIBC – Open input Database

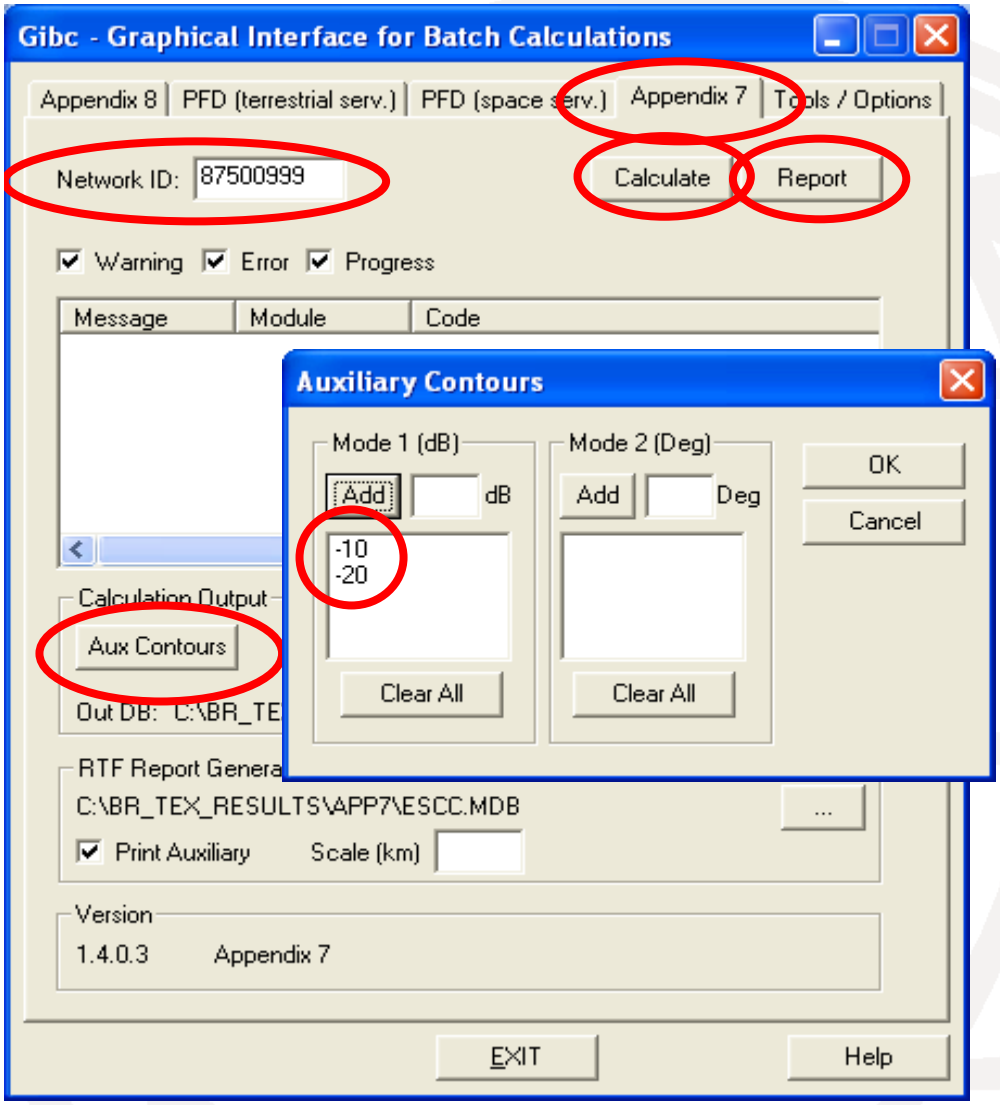


- Run GIBC
- Select the **Tools & Options** tab
- Change the SRS database reference input file:

⇒ Browse and Select the following file from the Workshop directory

Tx&RxEarthStation@6&4GHz .mdb

Exercise 1 - GIBC – Calculate



- Select the **Appendix 7** tab
- Enter the 1st Earth Station notice Id.(Ex.1.1 Non-Zero deg horizon elevation angle):

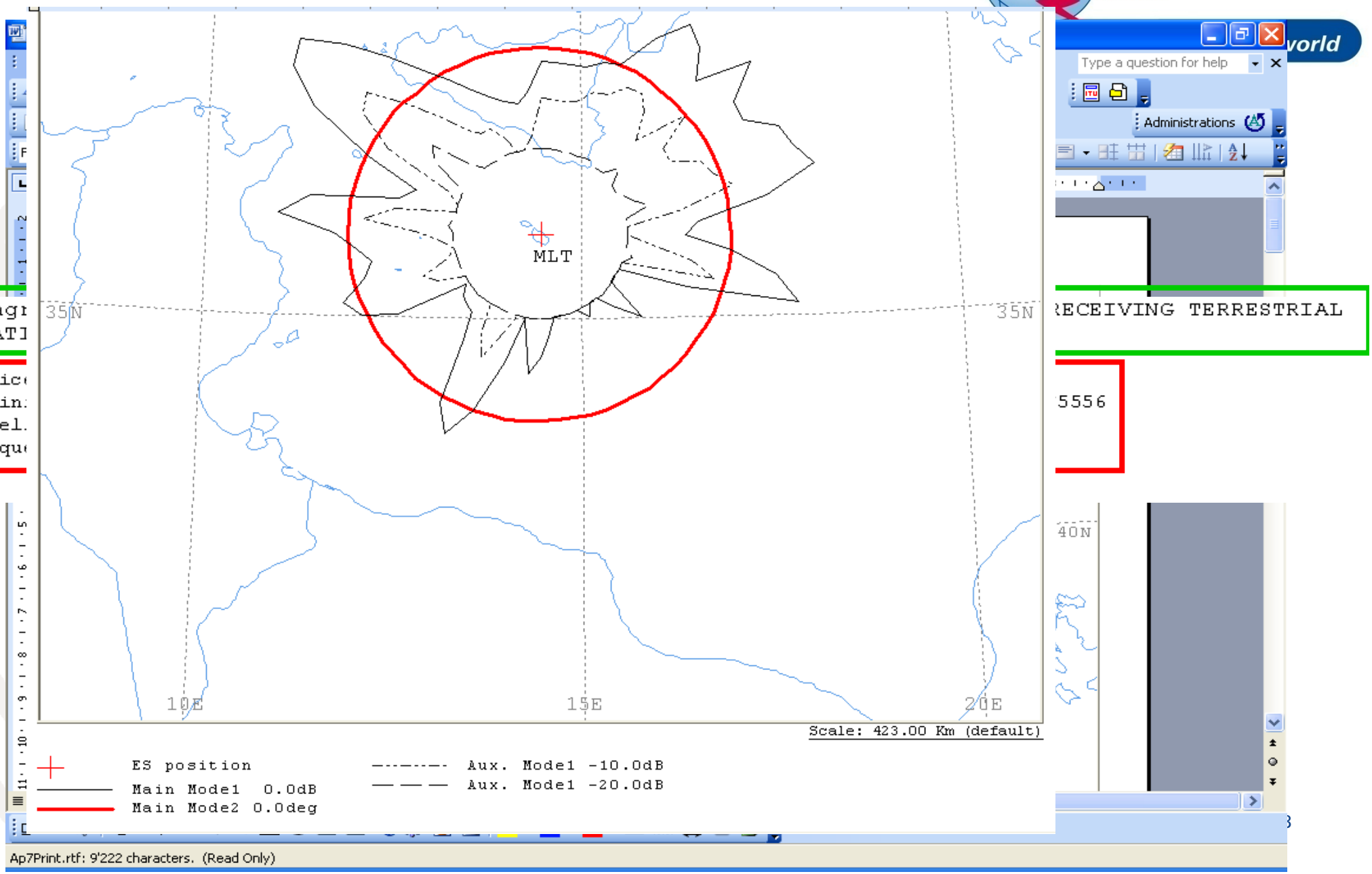
  87500999

- Select the values for generating Auxiliary Contours :

  -10 dB and -20 dB for mode 1

- Calculate
- Create and Open the Report

GIBC –Results –Exercise 1.1(Tx)



GIBC –Results –Exercise 1.1 (Tx)

ANALYSIS DATE AND TIME: 2010-10-07 11:43:35
VERSION: 1.5.0.7Appendix 7/Plt-1.6.0.0/Frm-1.8.0.0/Clc-1.5.0.2/Prp-1.2.0.0/SNS-1.0.0.142/AP7F-1.0.0.142/Re

Diagram 1: 2.1_TABLE7. TRANSMITTING GSO ES in FIXED-SATELLITE SERVICE W.E

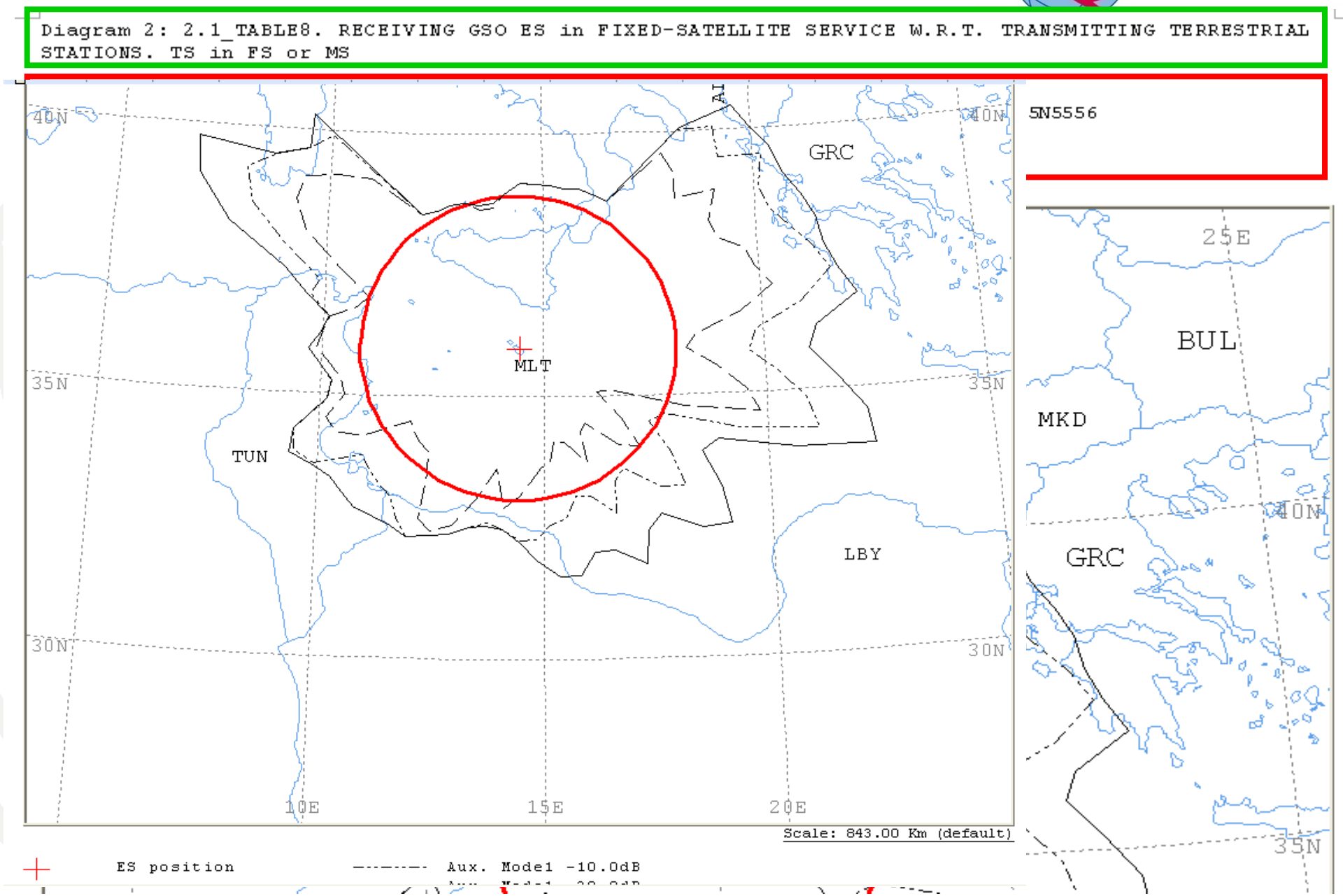
NOTICE ID: 87500999 EARTH STATION NAME: MAGTAB EARTH STATI
ADM/GEO_AREA: MLT/MLT RAIN CLIMATICAL ZONE: K
SATELLITE NAME: INTELSAT SATELLITE ORBITAL POSITION: -1.00 DEG
ANTENNA AZIMUTH: 205.21 DEG ANTENNA ELEVATION: 45.19 DEG
FREQUENCY BAND: 5925.00-6425.00 MHZ ASSIGNED FREQUENCY: 6175.00 MHZ
MAXIMUM ANTENNA GAIN: 63.0 DBI MAXIMUM POWER DENSITY: -33.0 DBW/HZ
ANTENNA PATTERN: APERR_001V01
2.1 TABLE7 Model: PLM DUCTING

TRANSMISSION LOSS MODE 1: 180.0 DB (DOES NOT INCLUDE HOR. CORR. AND ANT. GAIN)
TRANSMISSION LOSS MODE 2: 134.0 DB

AZIMUTH	240	245	250	255	260	265	270	275	280	285	290	295	300	305
OFF-AXIS	54.0	56.8	59.7	62.5	65.5	68.8	72.2	75.8	79.2	82.2	85.6	89.5	93.3	96
HOR.ELEV.	0.7	0.4	0.4	0.6	0.7	0.6	0.4	0.2	0.3	0.9	1.1	0.5	0.2	0.1
HOR.CORR.	20.2	16.4	15.1	18.5	19.7	18.2	15.5	8.8	12.3	22.6	24.3	17.8	9.2	4.
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	197	236	251	216	205	219	248	315	279	174	157	224	312	360
-10.0 DB	104	135	149	114	104	117	145	213	177	104	104	121	210	257
-20.0 DB	104	104	104	104	104	104	104	111	104	104	104	104	108	155
MODE 2														
0.0 DEG	230	230	230	230	230	230	230	230	229	229	229	229	229	229

PROBABLY AFFECTED COUNTRIES: I

GIBC – Results – Exercise 1.1 (Rx)



GIBC – Results – Exercise 1.1 (Rx)

```
ANALYSIS DATE AND TIME: 2010-10-07 11:43:35
VERSION: 1.5.0.7Appendix 7/Plt-1.6.0.0/Frm-1.8.0.0/Clc-1.5.0.2/Prp-1.2.0.0/SNS-1.0.0.142/AP7F-1.0.0.142/Re
```

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

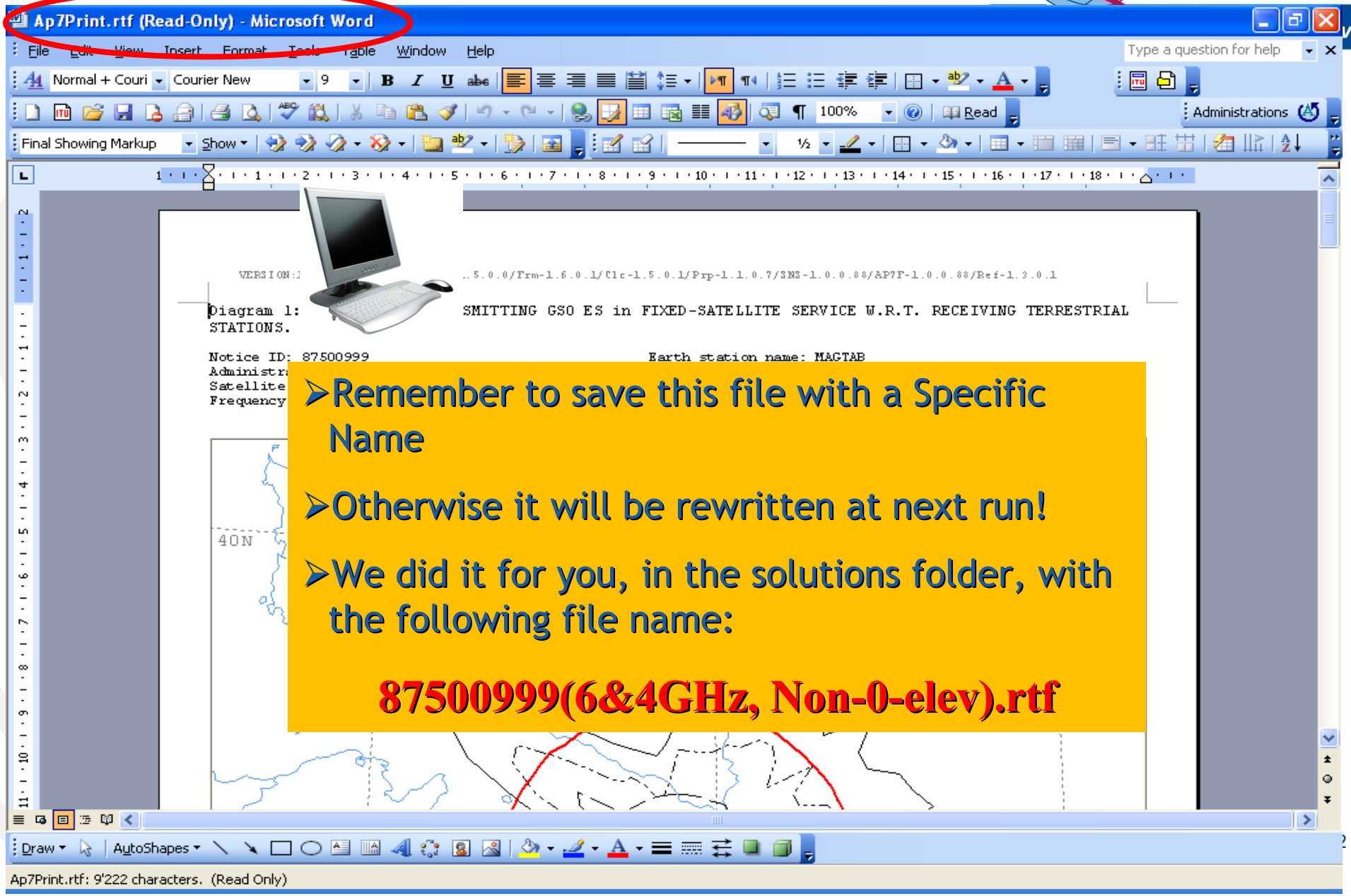
```
NOTICE ID:      87500999        EARTH STATION NAME:                MAGTAB              EARTH STAT
ADM/GEO_AREA:   MLT/MLT         RAIN CLIMATICAL ZONE:  K
SATELLITE NAME:         INTELSAT                SATELLITE ORBITAL POSITION:    -1.00 DEG
ANTENNA AZIMUTH:        205.21 DEG                      ANTENNA ELEVATION:     45.19 DEG
FREQUENCY BAND:         3700.00-4200.00 MHZ             ASSIGNED FREQUENCY:    3950.00 MHZ
MAXIMUM ANTENNA GAIN:   59.3 DBI                        MAXIMUM POWER DENSITY:   -  DBW/HZ
ANTENNA PATTERN:        APERR_001V01
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
```

AZIMUTH	0	5	10	15	20	25	30	35	40	45	50	55	60	65
OFF-AXIS	129.3	131.1	132.6	133.6	134.3	134.6	134.4	133.8	132.7	131.2	129.6	127.4	125.1	
HOR.ELEV.	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.4	0.2	0.3	0.3	0.2
HOR.CORR.	11.8	11.8	11.8	11.6	10.8	9.8	9.2	9.2	10.8	13.8	8.0	12.0	12.2	9.
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.C
COORDINATION DISTANCE (KM)														
MODE 1														
0.0 DB	349	349	349	350	357	359	359	569	672	663	665	655	661	668
-10.0 DB	349	349	349	350	357	359	359	567	612	573	644	596	593	611
-20.0 DB	349	349	349	350	357	359	359	504	487	449	522	471	469	506
MODE 2														
0.0 DEG	321	321	321	321	321	321	321	321	321	321	321	321	322	322

```
PROBABLY AFFECTED COUNTRIES: ALB GRC I   LBY TUN
```

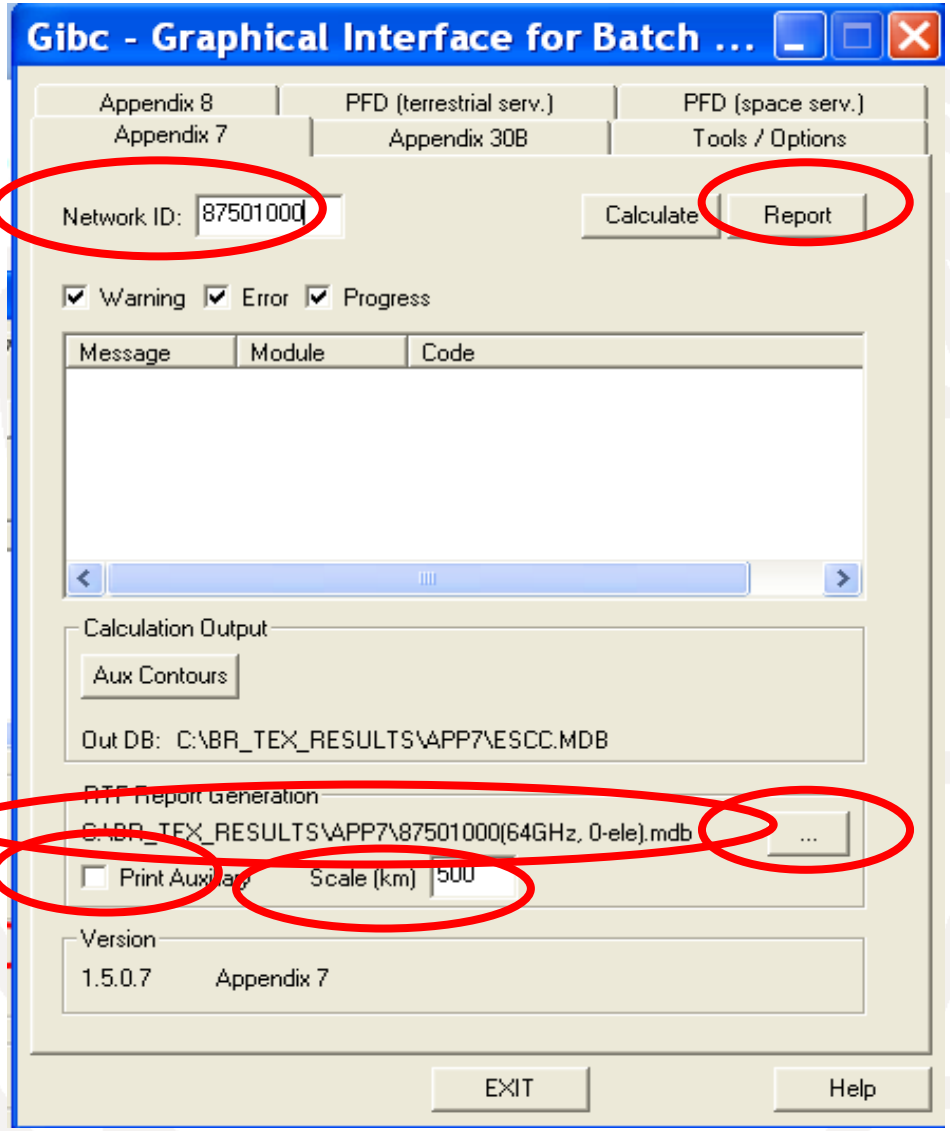
GIBC –Results - Exercise 1.1



- Remember to save this file with a Specific Name
- Otherwise it will be rewritten at next run!
- We did it for you, in the solutions folder, with the following file name:

87500999(6&4GHz, Non-0-elev).rtf

GIBC – Report re-generation – Exercise 1.2



- Run GIBC
- Select the **Appendix 7** page
- Enter the 2nd Earth Station notice Id. (Ex.1.2 Zero deg horizon elevation angle):

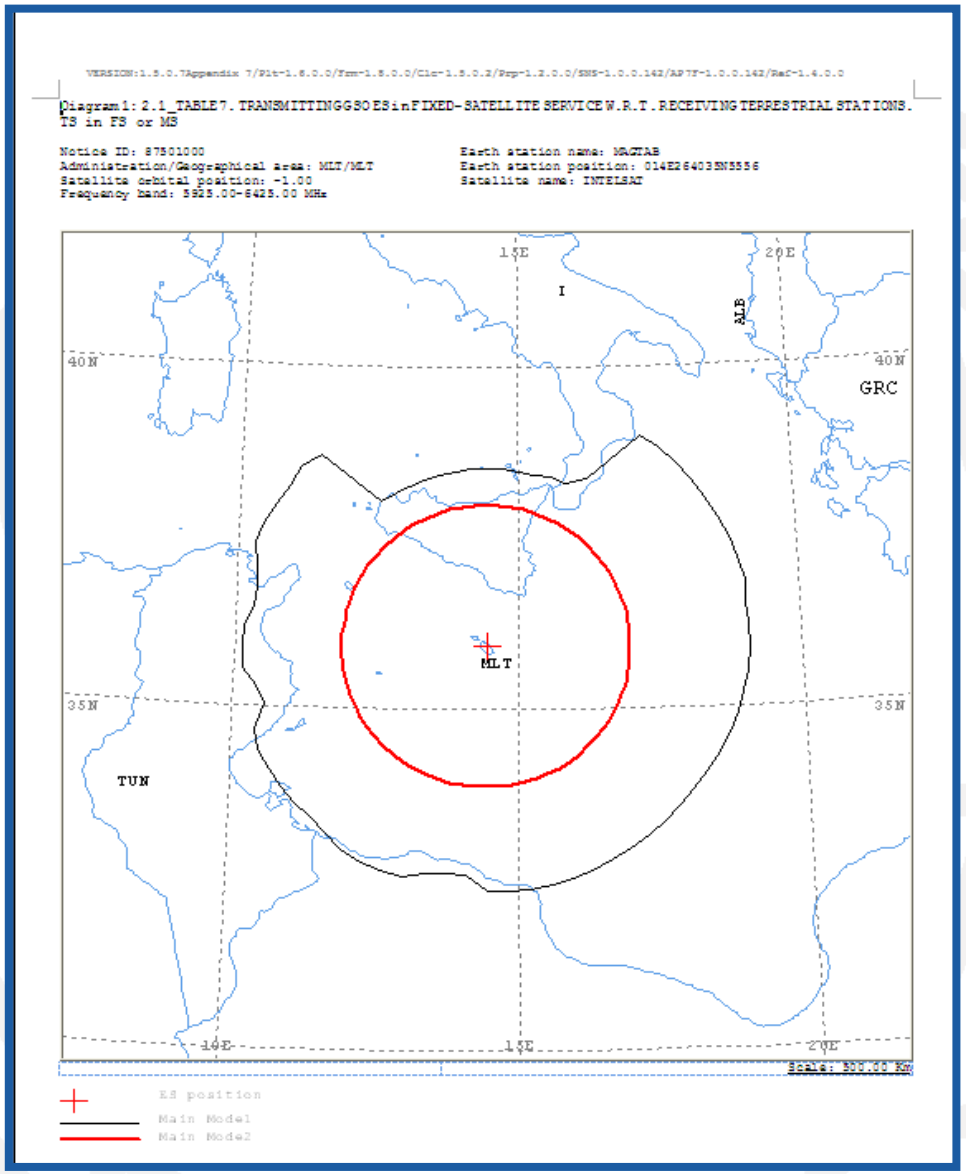
  87501000

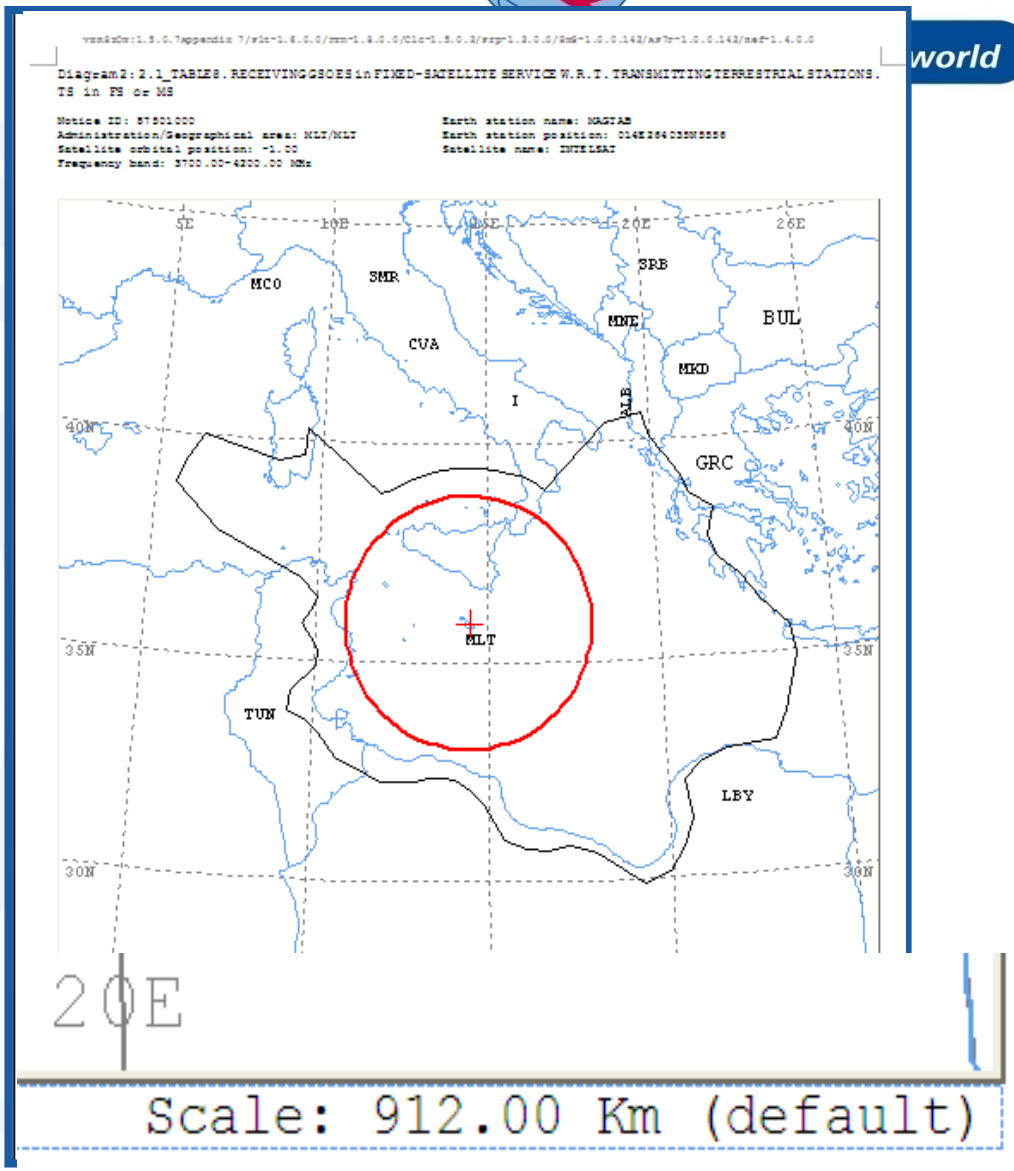
- Select resulting database

  87501000(6&4GHz, 0-elev).mdb

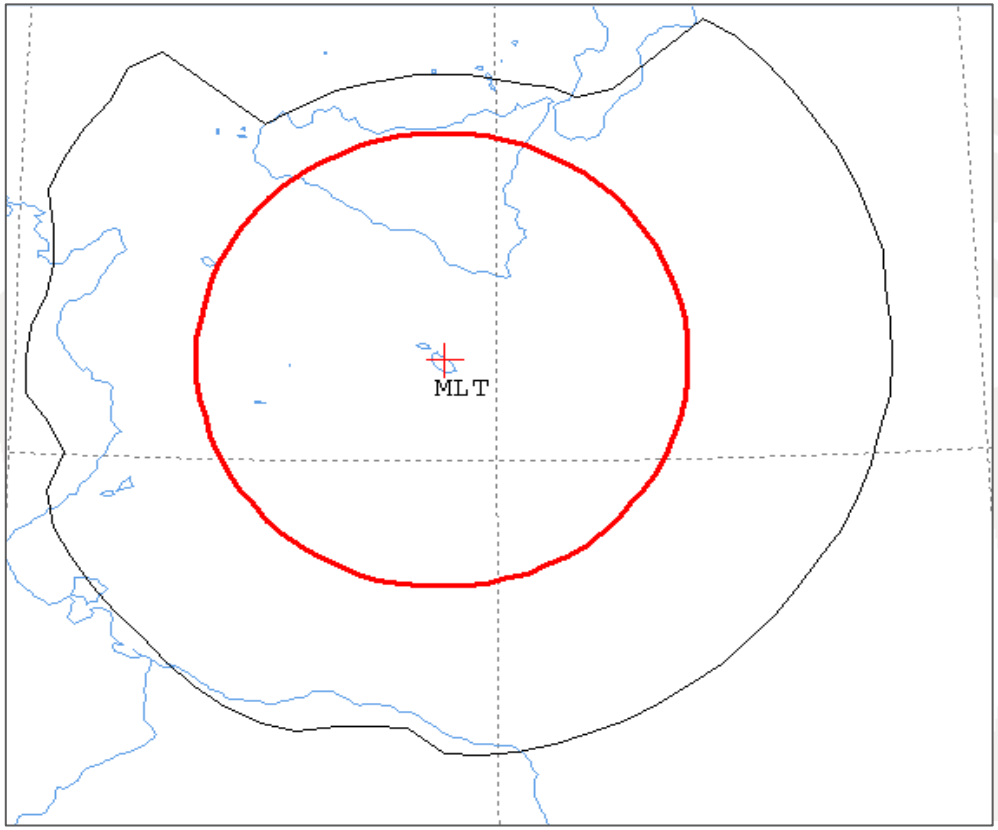
- Disable print of auxiliary contours
- Enter a value for the scale
- Re-create the output Report

GIBC –Results - Exercise 1.2

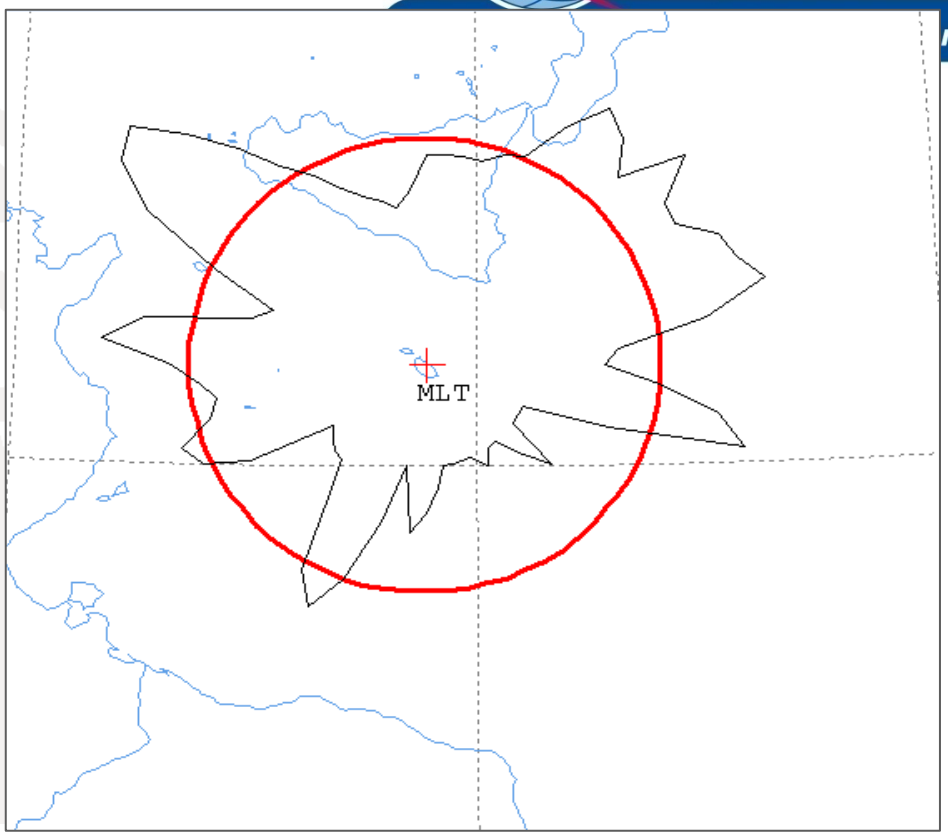




Exercise 1 – GIBC – Compare Results (Tx)



Zero-degree horizon elevation angles

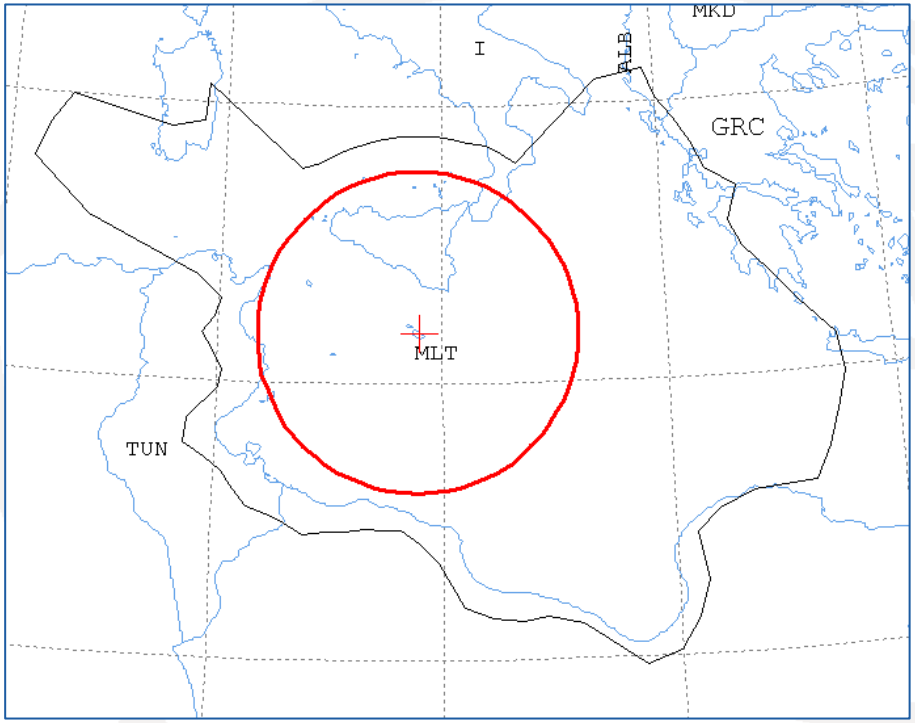


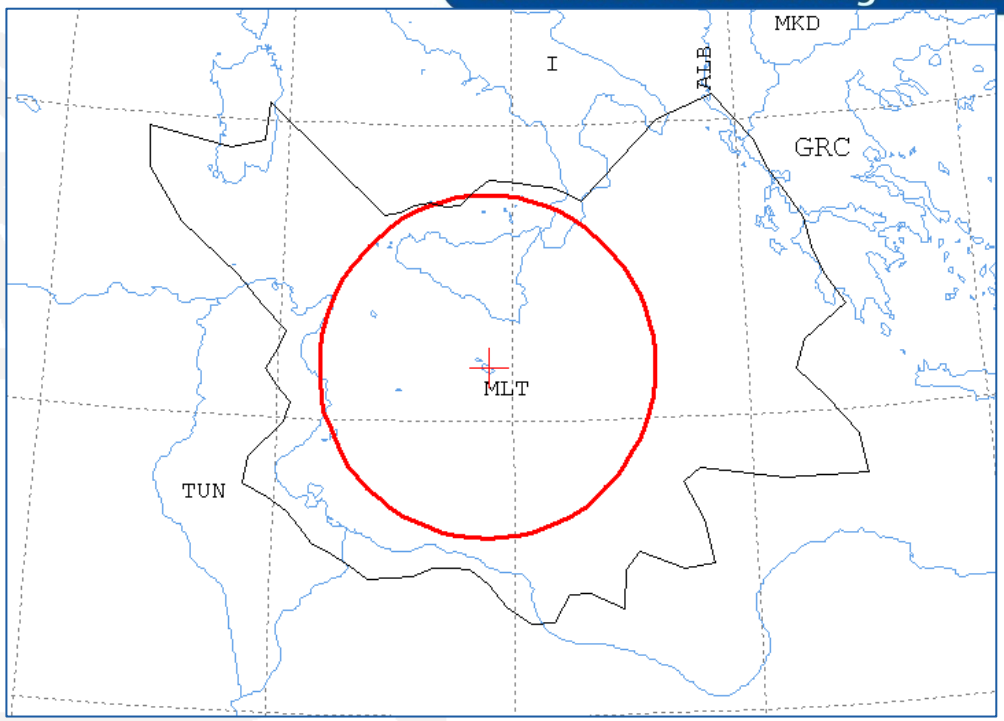
Non-zero-degree horizon elevation angles

```
PROBABLY AFFECTED COUNTRIES:
I    LBY TUN
```

```
PROBABLY AFFECTED COUNTRIES:
I
```

Exercise 1 – GIBC – Compare Results (Rx)





Zero-degree horizon elevation angles

PROBABLY AFFECTED COUNTRIES:
ALB GRC I LBY TUN

Non-zero-degree horizon elevation angles

PROBABLY AFFECTED COUNTRIES:
ALB GRC I LBY TUN

Exercise 2

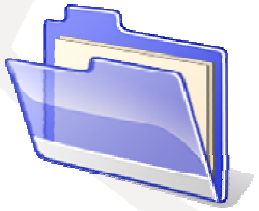
FSS Transmitting ES in the **8 GHz band**

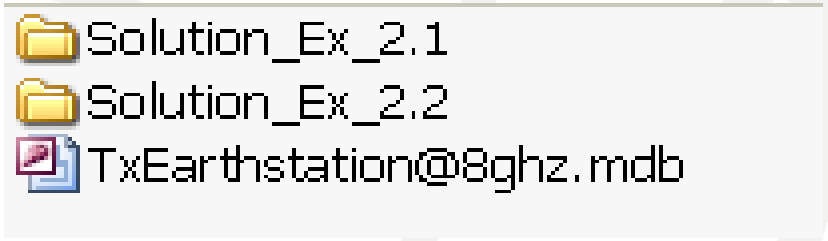
Input example database (SNS format):

TxEarthStation@8GHz.mdb

ES name: **MAGTAB**

- Ex. 2.1 ES Notice Id: **87500999** (non-zero deg. horizon elevation angles)
- Ex. 2.2 ES Notice Id: **87501000** (zero deg. horizon elevation angles)





Exercise 2 – GIBC – Results

- FSS Transmitting Earth Station in 8 GHz band
- Input database file:

TxEarthStation@8GHz.mdb

- Results in following files:

- For Ex. 2.1 with non-zero-degree horizon elevation angle:

87500999(Tx8GHz, Non-0-elev).rtf

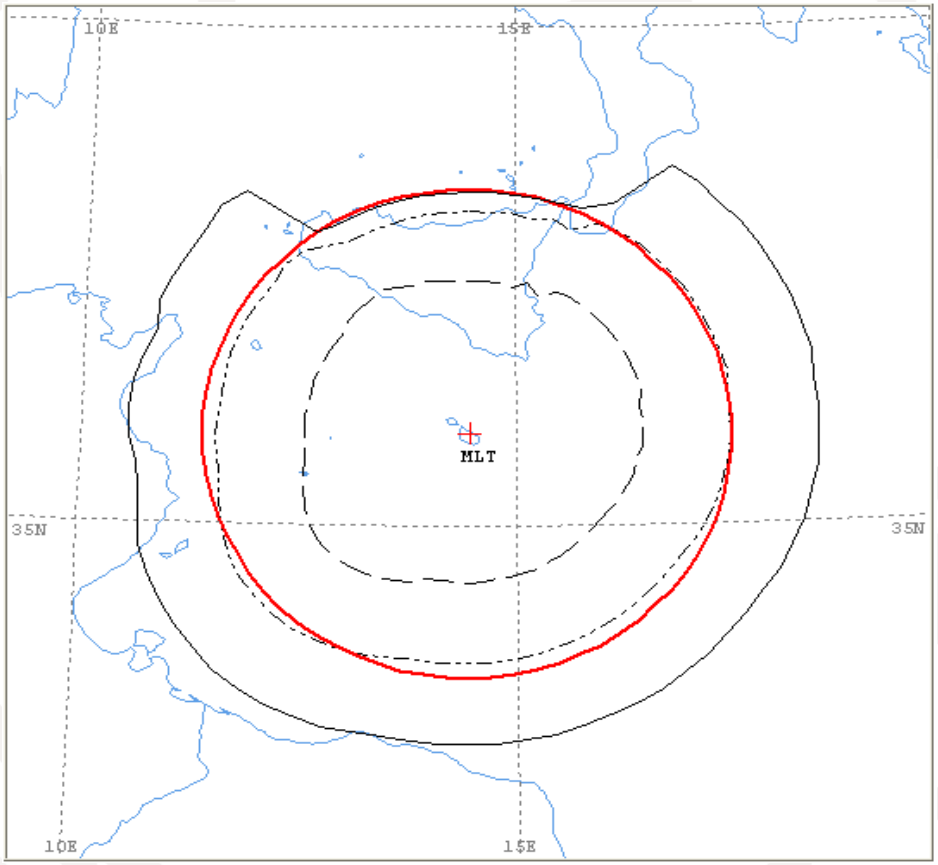
- For Ex. 2.2 with zero-degree horizon elevation angle:

87501000(Tx8GHz, 0-elev).rtf

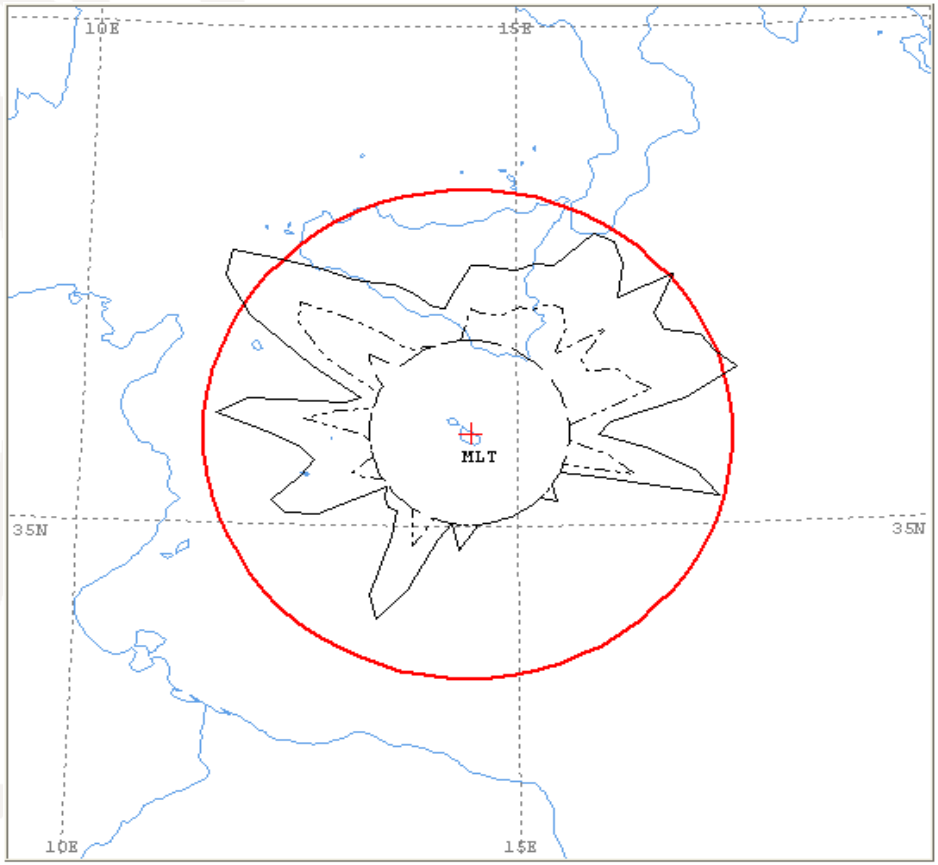
Exercise 2 – GIBC – Results

Diagram 1: 2.1_TABLE7.
TRANSMITTING GSO ES in FIXED-SATELLITE SERVICE W.R.T. RECEIVING TERRESTRIAL STATIONS. TS in FS or MS

With zero-degree horizon elevation angles



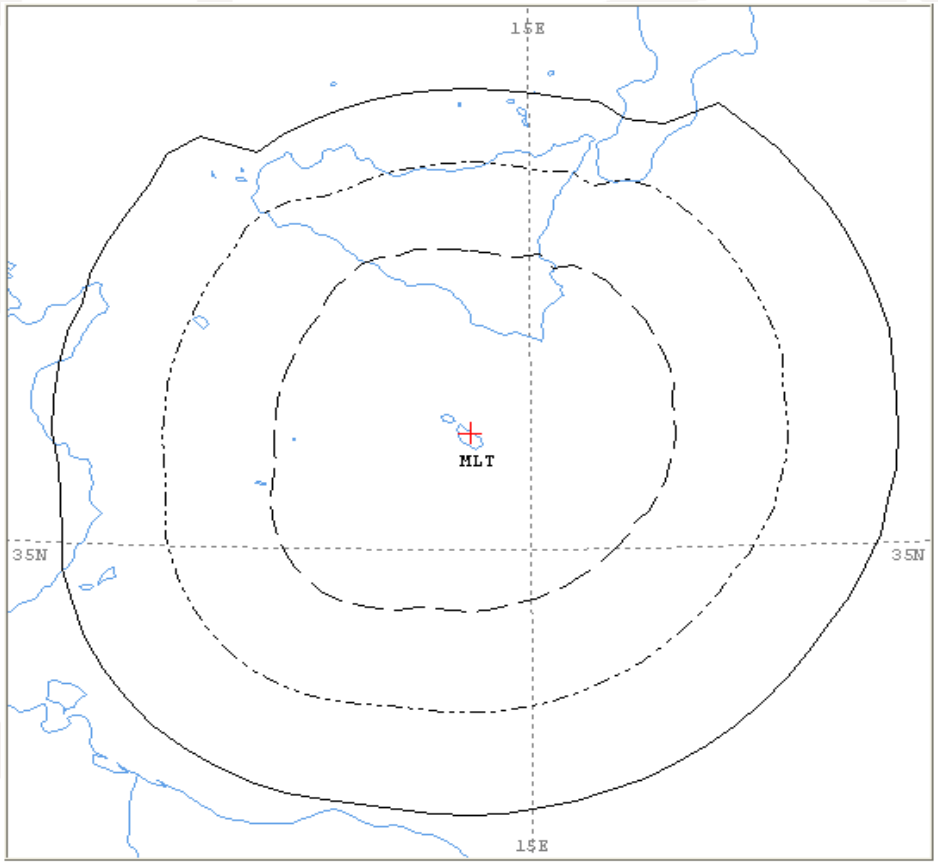
With non-zero-degree horizon elevation angles



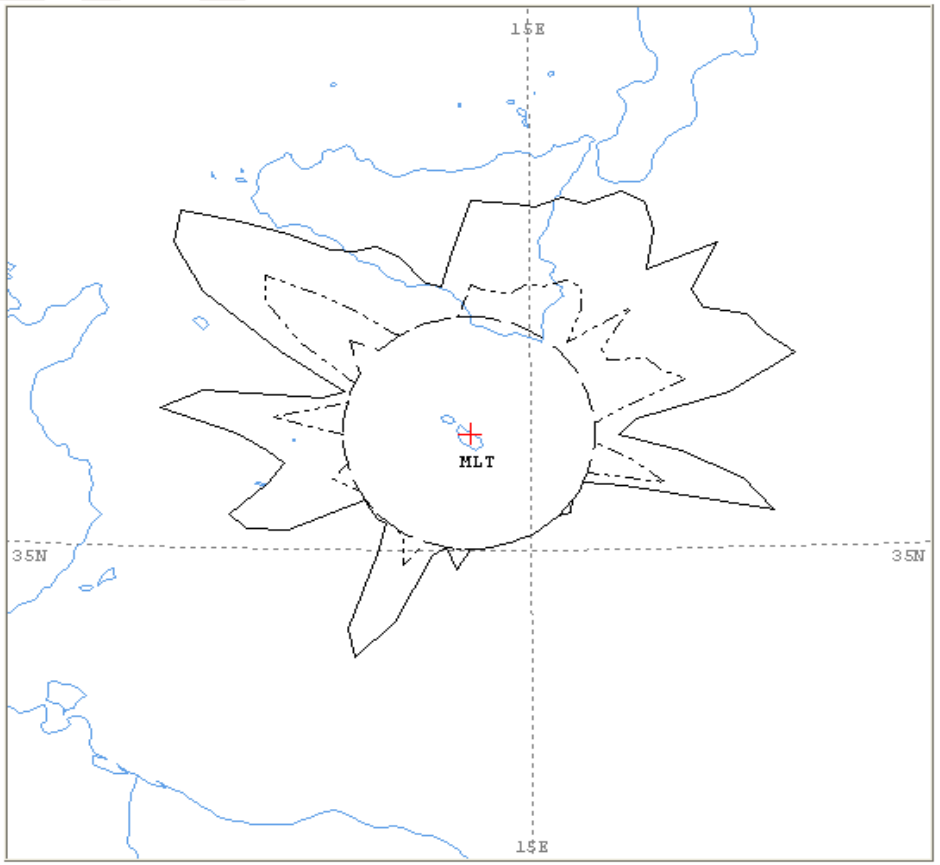
Exercise 2 – GIBC – Results

Diagram 2: 3.2.1_TABLE9.
TRANSMITTING GSO ES in FIXED-SATELLITE SERVICE W.R.T.
RECEIVING NGSO ES in EARTH EXPLORATION SATELLITE SERVICE

With zero-degree
horizon elevation angles



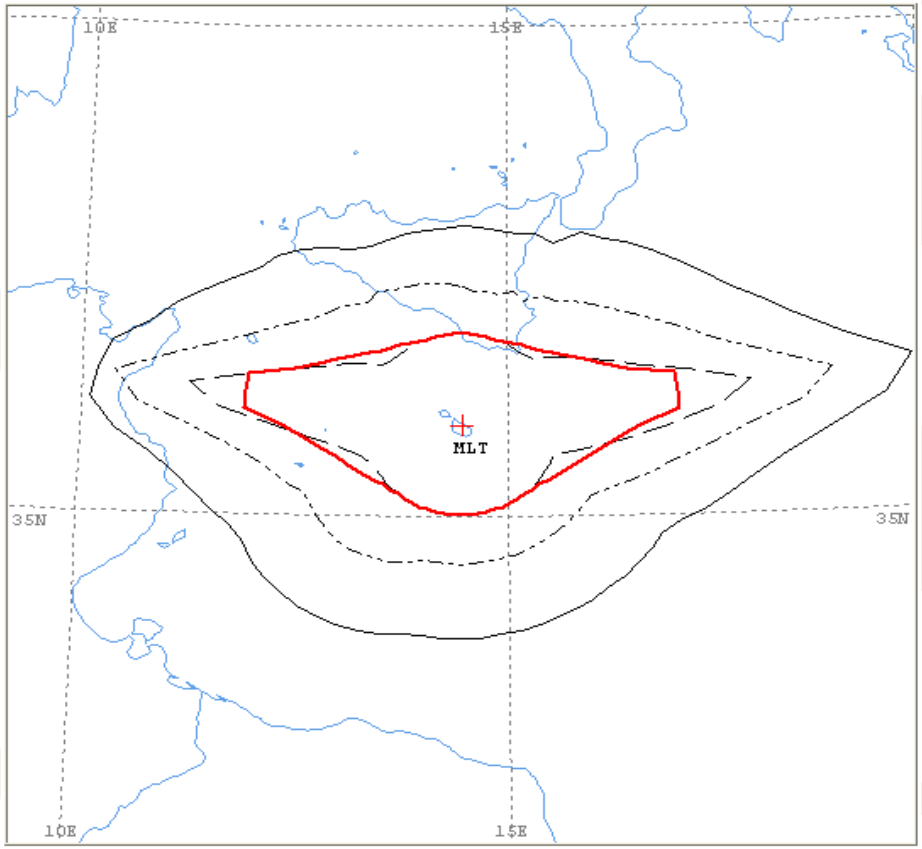
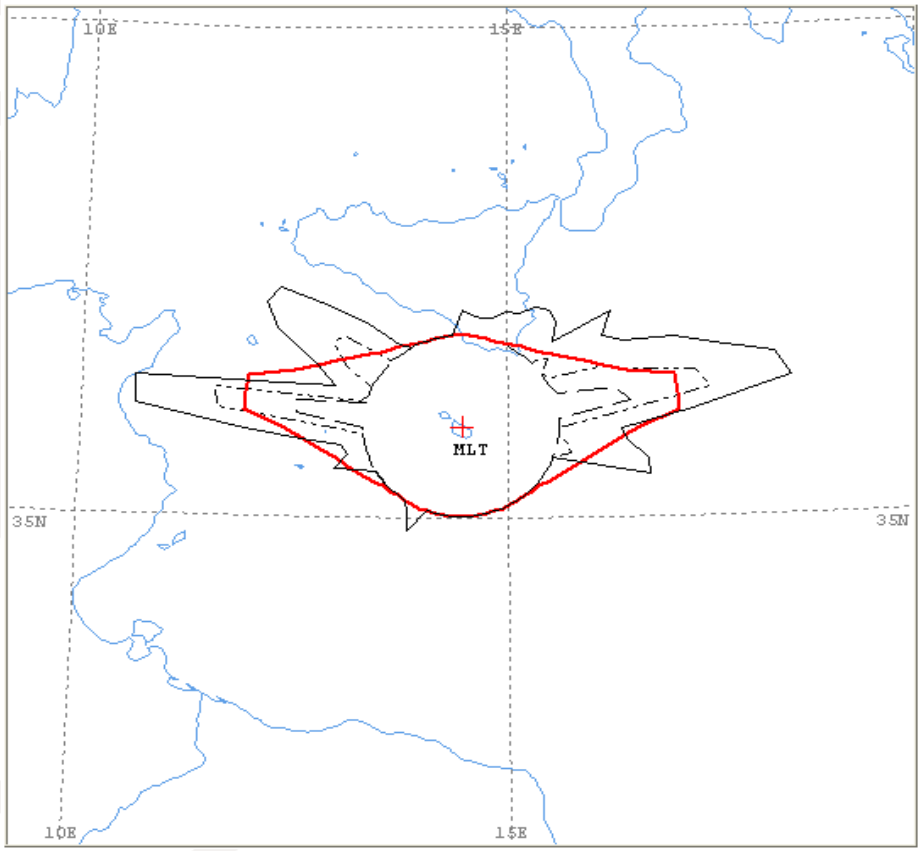
With non-zero-degree
horizon elevation angles



Exercise 2 – GIBC – Results

Diagram 3: 3.1_TABLE9.
TRANSMITTING GSO ES in FIXED-SATELLITE SERVICE W.R.T.
RECEIVING GSO ES in EARTH EXPLORATION SATELLITE SERVICE

With zero-degree
horizon elevation angles



With non-zero-degree
horizon elevation angles