



Radio Interference Calculations

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What to expect in these slides

- ✘ **Basic Concepts of Measurements**
 - ✘ **How radio interference prediction helps**
 - ✘ **Filed strength measurements**
 - ✘ **Relevant ITU reports and Recommendations**
-



Basic Concept of Measurement

The measurement is the process of assigning a value to an attribute or phenomenon.

The result is, in principle, independent of the procedure used.

Nevertheless, the accuracy of the measurement process is essential to obtain a reliable value.



Basic Concept of Measurement

The measurement process should define

× **Attribute or phenomenon to measure**

Measurement of electromagnetic fields which could be characterized as either a value of E or H fields or as characteristics of a signal (frequency, amplitude, phase, bandwidth, etc.)

× **Conditions of operations**

Details of all conditions including influences caused by surrounding infrastructure, weather, limitation with measuring equipment (size of antenna, embedded equipment) have to be known to ensure the measurement is reproducible

× **The measurement system and parameters to use**

All devices involved in the measurement should be specified to take into account all parameters in the measurement result (type of equipment, characteristics and uncertainties)



Basic Concept of Measurement

The measurement process should define:

× Sequence of technical operations to apply.

A general description of how to perform the measurements is provided below:

- *The description of the measurement chain set up, including identification of equipment used.*
- *The description of preliminary measurements to carry out (e.g. measurements to ensure that there's no strong emitter at the measurement location which could lead to a wrong result).*
- *Measuring device settings to be used (e.g. frequency band, resolution bandwidth (RBW), span, etc.)*
- *Tasks to be achieved to carry out the measurement*
- *Consistency of the result (e.g. checking of the result by comparison with theoretical reckoning, uncertainty calculation, etc.)*

× Result reckoning and uncertainties

To provide a reliable value of the measurement, post-processing is necessary to take into account uncertainties of the measurement chain to assess the uncertainty of the final result.

The final step could be, if necessary, to specify the form of publication of the results.



Radio Interference Prediction

Helps in

- × Planning and co-ordinating a station
- × Determine if special protection required?
- × Determine if Co-ordination required?
- × Having reference values for calculation of interfering field strength at specified height on border
- × Having reference values for calculation of cross-border interference range according to prediction method, band, etc.

Need to consider

- × Station's technical characteristics
 - × Frequency offset and bandwidth of stations affected
 - × Use of specific propagation curves
-

Radio Interference Prediction - Example



Interference field strength based on ITU-R P.1546

*(Method for **point-to-area predictions** for terrestrial services in the frequency range 30 MHz to 3 000 MHz)*

- × **Determine Type of Propagation path**
- × **Determine Nominal Time percentages and Nominal frequencies**
- × **Estimate field strength while factoring in:**
 - *Terrain clearance angle*
 - *Tropospheric scattering*
 - *Receiving antenna height*
 - *Clutter around the transmitting/base terminal*
 - *Slope-path correction*
 - *Adjustment for different climatic regions etc.*



Field Strength Measurements - Ways

Basic two ways of measurements

- **At a monitoring station;**
- **Along a route (Mobile)**

Time durations can vary and the measurements can be more complex involving coordinated use of multiple measurements equipments at different geographical sites

Field Strength Measurements - Categories



The term “measurement of field strength” is intended to apply to four general categories of measurement:

- Measurements performed with portable or mobile facilities, to obtain relatively instantaneous or **short-term data at one or several locations**;
 - Measurements performed with mobile facilities to obtain **statistical parameters** of coverage in the field of mobile radio;
 - **Short-term measurements at a fixed location**, generally in support of other monitoring operations;
 - **Long-term measurements** involving field strength recordings and analysis of chart records, respectively storage and analysis of measured data using computers.
-



Field Strength Measurements - Types

Two types of measurements:

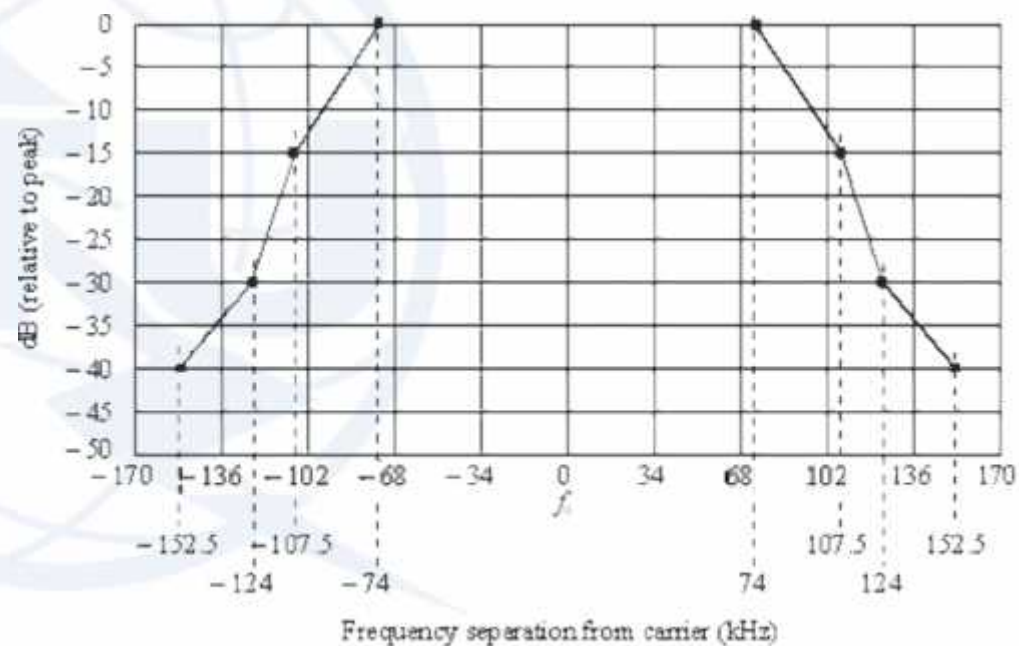
- Simple “go-no go” test based on a spectrum mask
 - Method used when the values of the deviation and modulation power are required
-



Field Strength Measurements - Deviation

Mask method

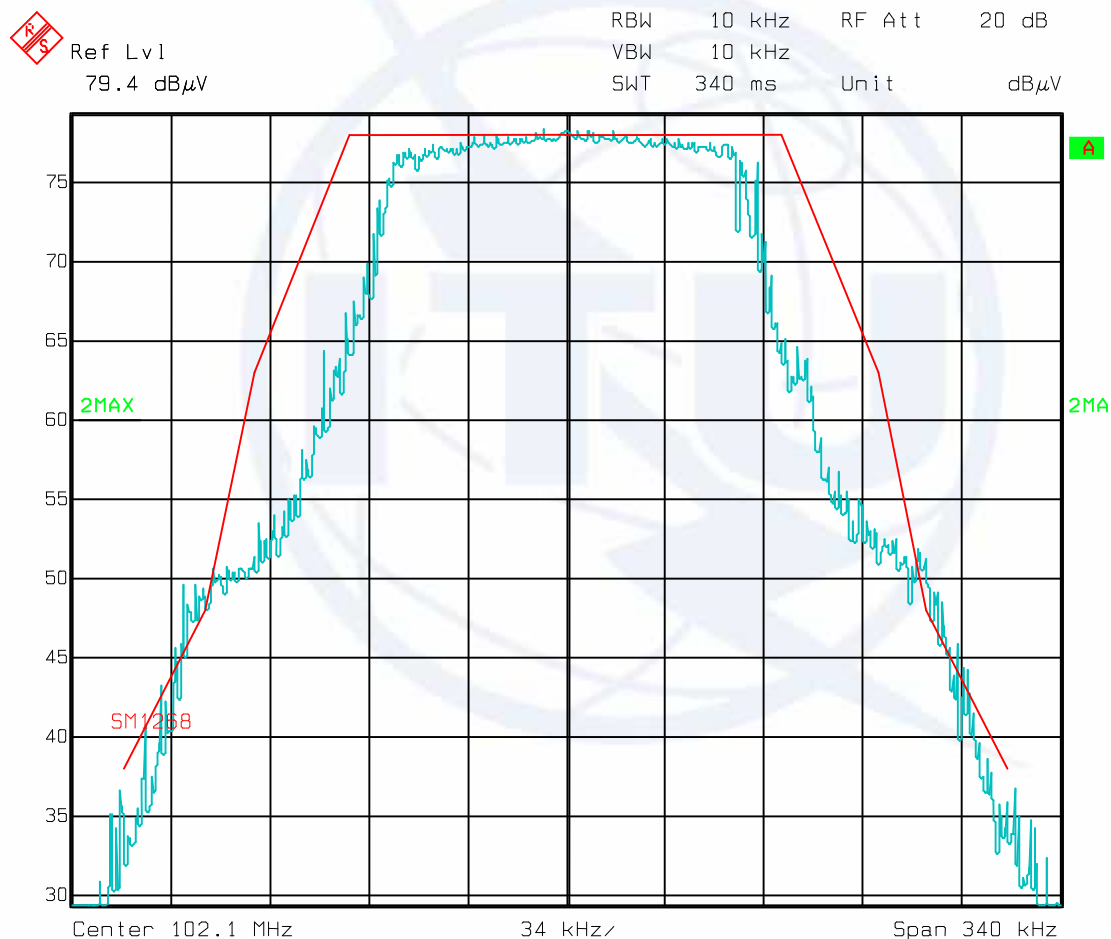
- May be used as a verification to indicate whether the frequency deviation of an FM broadcasting station exceeds the limits;
- Cannot be applied on transmissions with 50 kHz peak deviation due to the fact that no appropriate spectrum mask is available;





Field Strength Measurements - Deviation

Example Spectrum Mask measurement



Date: 21.JUL.1999 10:20:19

Field Strength Measurements - Deviation



Method when the values of the deviation and modulation power are required.

Example

*The protection ratios specified in Recommendation ITU-R BS.412 for the planning of FM sound broadcasting transmitters **apply on the condition that** a peak deviation of ± 75 kHz is not exceeded and that the average modulation power over any interval of 60 s does not exceed that of a single sinusoidal tone which causes a peak deviation of ± 19 kHz.*

Field Strength Measurements - Frequency



Conventional methods are :

- Beat Frequency (BF) method
- Offset Frequency (OF) method
- Direct Lissajous (DL) method
- Frequency Counter (FC) method
- Frequency Discriminator (FD) method
- Phase Recording (PR) method
- Swept Spectrum Analyser (SSA) method.

At monitoring stations most of the time the methods DL, FC and SSA are used as these methods cover all types of frequency measurements. The other methods are included for completeness but are in practice not used anymore and not available due to the introduction of Digital signal processing (e.g. FFT, IFM...), which is now generalized in measuring equipment.



Field Strength Measurements - Frequency

Digital Signal Processing (DSP) based methods are :

- Instantaneous Frequency Measurement (IFM) method
- FFT method.

DSP methods should be preferable on Monitoring Stations.



ITU Reports and Recomm. on Measurements

Category	Report/Recommendation Details
General	<ul style="list-style-type: none">• Recommendation ITU-R SM.1050• Recommendation ITU-R SM.1723• Recommendation ITU-R SM.1794• ITU Spectrum Monitoring Handbook, 2011, Chapter 1
Direction finding measurement and location determination	<ul style="list-style-type: none">• Recommendation ITU-R SM.854• Recommendation ITU-R SM.1598• ITU Spectrum Monitoring Handbook, 2011, Section 4.7
Spectrum and channel Occupancy measurement	<ul style="list-style-type: none">• Recommendation ITU-R SM.1880• Report ITU-R SM.2256• ITU Spectrum Monitoring Handbook, 2011, Section 4.10
Unwanted emissions	<ul style="list-style-type: none">• Recommendation ITU-R SM.328• Recommendation ITU-R SM.329• Recommendation ITU-R SM.1752• Recommendation ITU-R SM.1792• ITU Spectrum Monitoring Handbook, 2011, Section 4.12
Measurement on digital broadcasting systems	<ul style="list-style-type: none">• Recommendation ITU-R SM.1682• Recommendation ITU-R SM.1792• ITU Spectrum Monitoring Handbook, 2011, Sections 4.11 and 5.2
Mobile monitoring	<ul style="list-style-type: none">• Recommendation ITU-R SM.1708• Recommendation ITU-R SM.1723• ITU Spectrum Monitoring Handbook, 2011, Section 2.4.2
Standard data exchange format at monitoring stations	<ul style="list-style-type: none">• Recommendation ITU-R SM.1809



ITU Reports and Recomm. on Measurements

Category	Report/Recommendation Details
Frequency	<ul style="list-style-type: none">• Recommendation ITU-R SM.377• ITU Spectrum Monitoring Handbook, 2011, Section 4.2
Field strength (see also Radio Regulations Art. 21)	<ul style="list-style-type: none">• Recommendation ITU-R P.845• Recommendation ITU-R SM.378• Recommendation ITU-R SM.1447• Recommendation ITU-R SM.1708• ITU Spectrum Monitoring Handbook, 2011, Section 4.10
Modulation	<ul style="list-style-type: none">• Recommendation ITU-R SM. 1268• ITU Spectrum Monitoring Handbook, 2011, Sections 4.6 and 4.8
Bandwidth	<ul style="list-style-type: none">• Recommendation ITU-R SM.443• ITU Spectrum Monitoring Handbook, 2011, Section 4.5
Identification	<ul style="list-style-type: none">• Recommendation ITU-R SM.1052• Recommendation ITU-R SM.1600• ITU Spectrum Monitoring Handbook, 2011, Section 4.8
Signal analysis	<ul style="list-style-type: none">• ITU Spectrum Monitoring Handbook, 2011, Section 4.8
Measurements related to inspection of radio installations	<ul style="list-style-type: none">• Report ITU-R SM.2130

ITU Reports and Recomm. on Measurements



Category	Report/Recommendation Details
Selectivity of monitoring receivers	<ul style="list-style-type: none">• Recommendation ITU-R SM.1836• Report ITU-R SM.2125
IP3 of monitoring receivers	<ul style="list-style-type: none">• Recommendation ITU-R SM.1837• Report ITU-R SM.2125
Noise figure of monitoring receivers	<ul style="list-style-type: none">• Recommendation ITU-R SM.1838• Report ITU-R SM.2125
Scanning speed of monitoring receivers	<ul style="list-style-type: none">• Recommendation ITU-R SM.1839• Report ITU-R SM.2125
Sensitivity of monitoring receivers	<ul style="list-style-type: none">• Recommendation ITU-R SM.1840• Report ITU-R SM.2125
Other parameters	<ul style="list-style-type: none">• Report ITU-R SM.2125
Selectivity of monitoring receivers	<ul style="list-style-type: none">• Recommendation ITU-R SM.1836• Report ITU-R SM.2125



Calculation of Interference : Example FX and MS (Germany)

Calculation of Interference : Fixed, Mobile



Based on previous introduction of IT-supported frequency co-ordination following examples shall illustrate evaluation of co-ordination obligation and interference calculations in fixed and mobile service:

Fixed Service (CalcFiSH):

- Co-ordination Distance (determination of affected country)
- Threshold Degradation (stations: point-to-point)

Mobile Service (HCM-MS and GREKO/FLAP):

- Co-ordination Trigger (determination of PM on border-line)
- Cross Border Range (determination of PM on CBR-line)
- Preferential Condition (determination of PM on x-km-line)
- Stations: Point-to-Point (determination of PM at counter-stations)
- Point-to-Area prediction (propagation from a station to an area)

Calculation of Interference : Fixed, Mobile



The screenshot shows a software window titled 'CaufGH' with a table of station data. The table has four columns: 'Name', 'Reference', 'Country', and 'Error'. The data is as follows:

Name	Reference	Country	Error
1 ZGORZELEC C	POL2009016344602001	CZE B_	
2 NOWA KARCZMA B	POL2009016344602002	CZE D_	
3 KRESZE A	POL20090164831002001	POL	
4 WYSOKA GORA A	POL20090164831002002	POL	

A red circle highlights the 'Country' column for the first two rows. Below the table, a small dialog box titled 'CaufGH' displays the message: 'Calculations completed in 2.12102e+11 seconds.' with a 'Close' button.

Considered station obliged to be co-ordinated as two countries are affected.

Calculation of Interference : Fixed, Mobile



The screenshot shows the CalcFQH software interface. A table displays the results of interference calculations for two stations. The 'Td' column for the first station is circled in red, indicating a value of 3.62. A dialog box titled 'Choose an HCM file' is open, showing the 'HCM testing file' and 'HCM reference data file' paths. The 'Report:' field is set to 'Show station if TD > 1'. The status bar at the bottom indicates the time is 18:57 on 24.06.2015.

	TsName	RoName	TsName	RoName	Td	tdcrit	TsCountry	PsCountry	RoCountry	TsReference	PRReference	PTsReference	RoReference	ference_L	stopping_A	N
1	CZANTORYJA B		WRIEZEN E		3.62		POL		D	POL20080133197010201			D 20080071664010404	-129.84	5.99	0.45
2	WRIEZEN E		CZANTORYJA B		1.91		D		POL	D 20080071664010401			POL20080133196010202	-129.55	5.99	0.45

HCM Library version: 2.3.1.0

Choose an HCM file

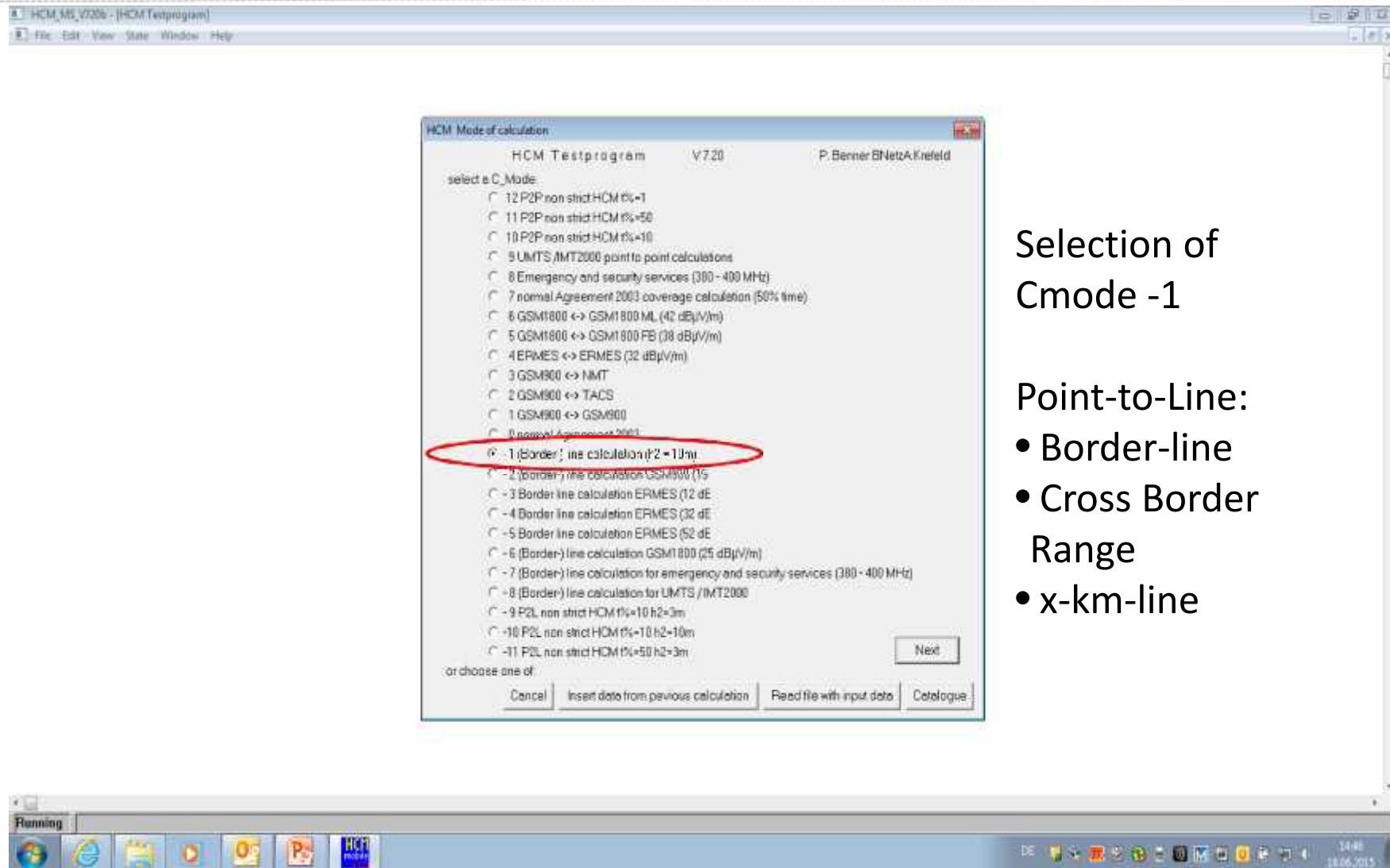
HCM testing file: Report: Show station if TD > 1

HCM reference data file: OK Cancel

Requested station to be refused as TD > 1 at station of affected country.

18:57 24.06.2015

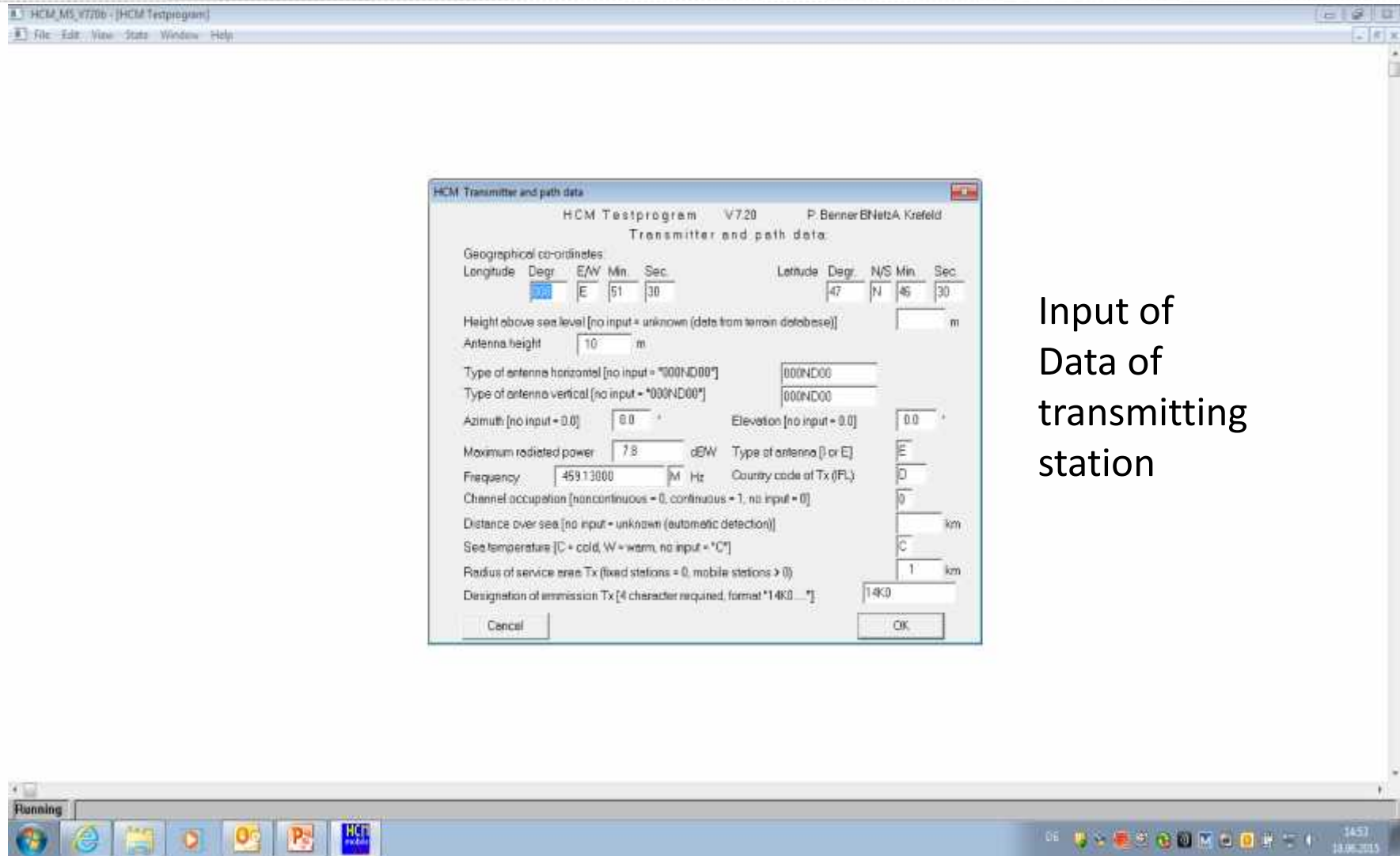
Calculation of Interference : Fixed, Mobile



Selection of
Cmode -1

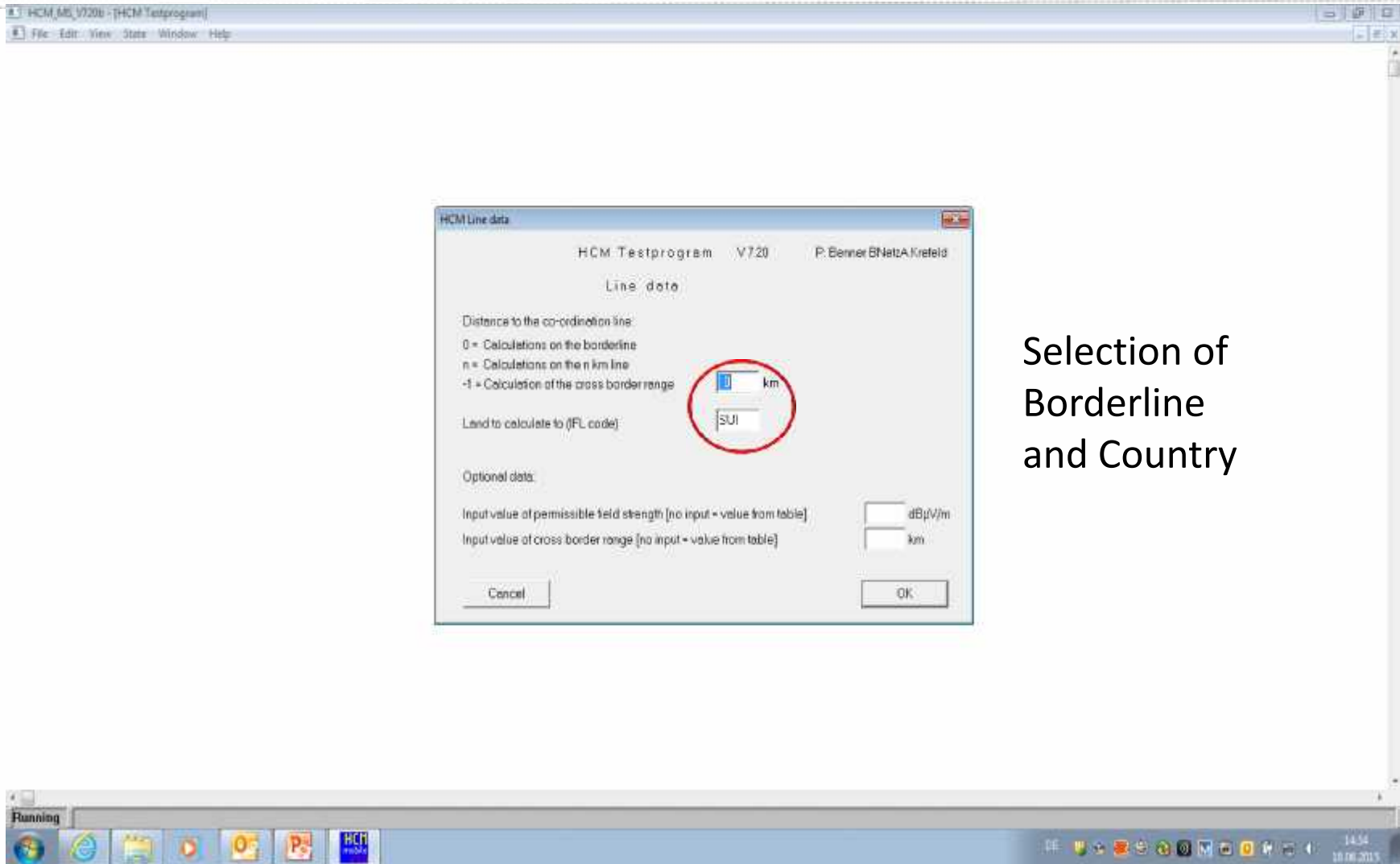
- Point-to-Line:
- Border-line
 - Cross Border Range
 - x-km-line

Calculation of Interference : Fixed, Mobile



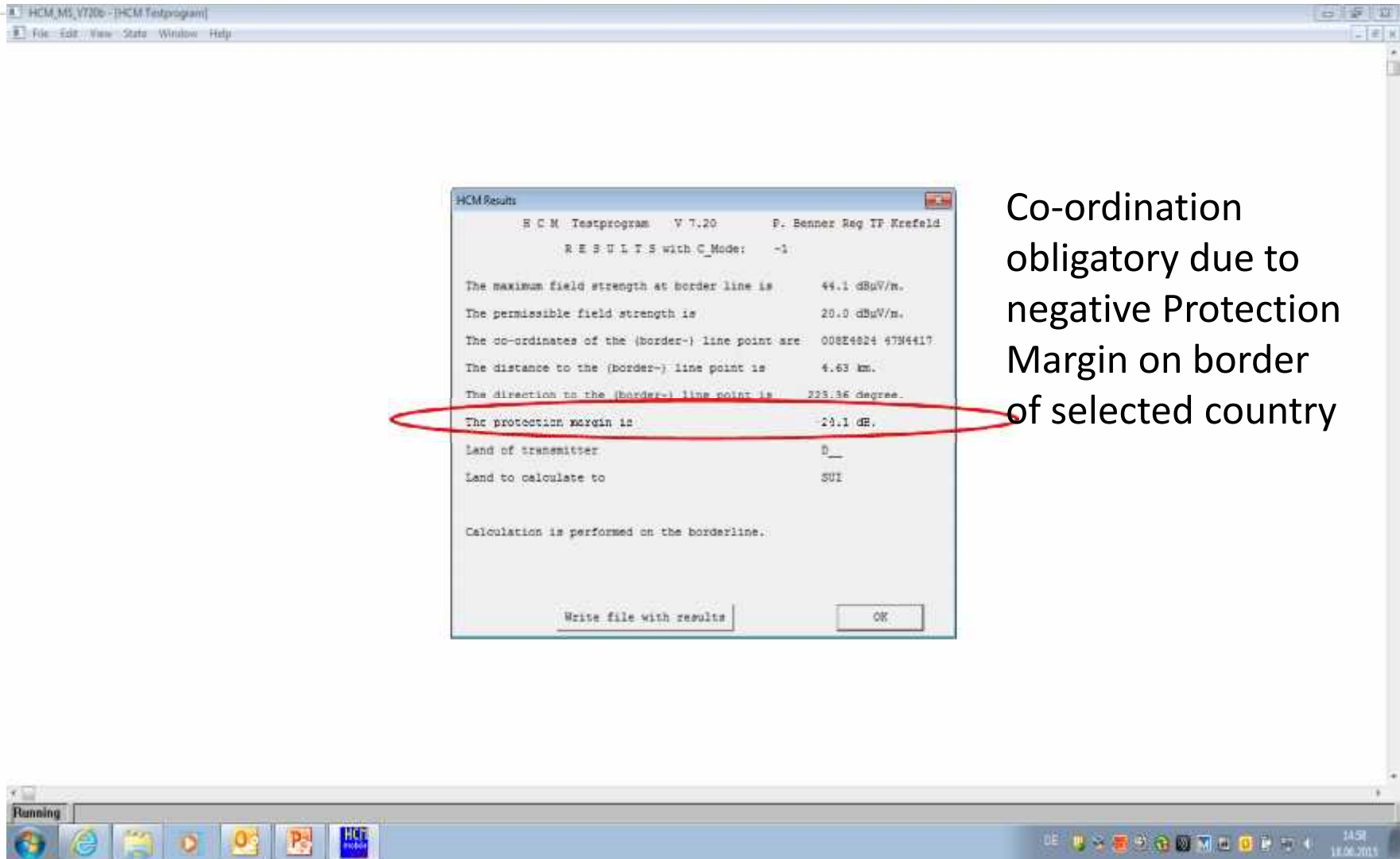
Input of
Data of
transmitting
station

Calculation of Interference : Fixed, Mobile



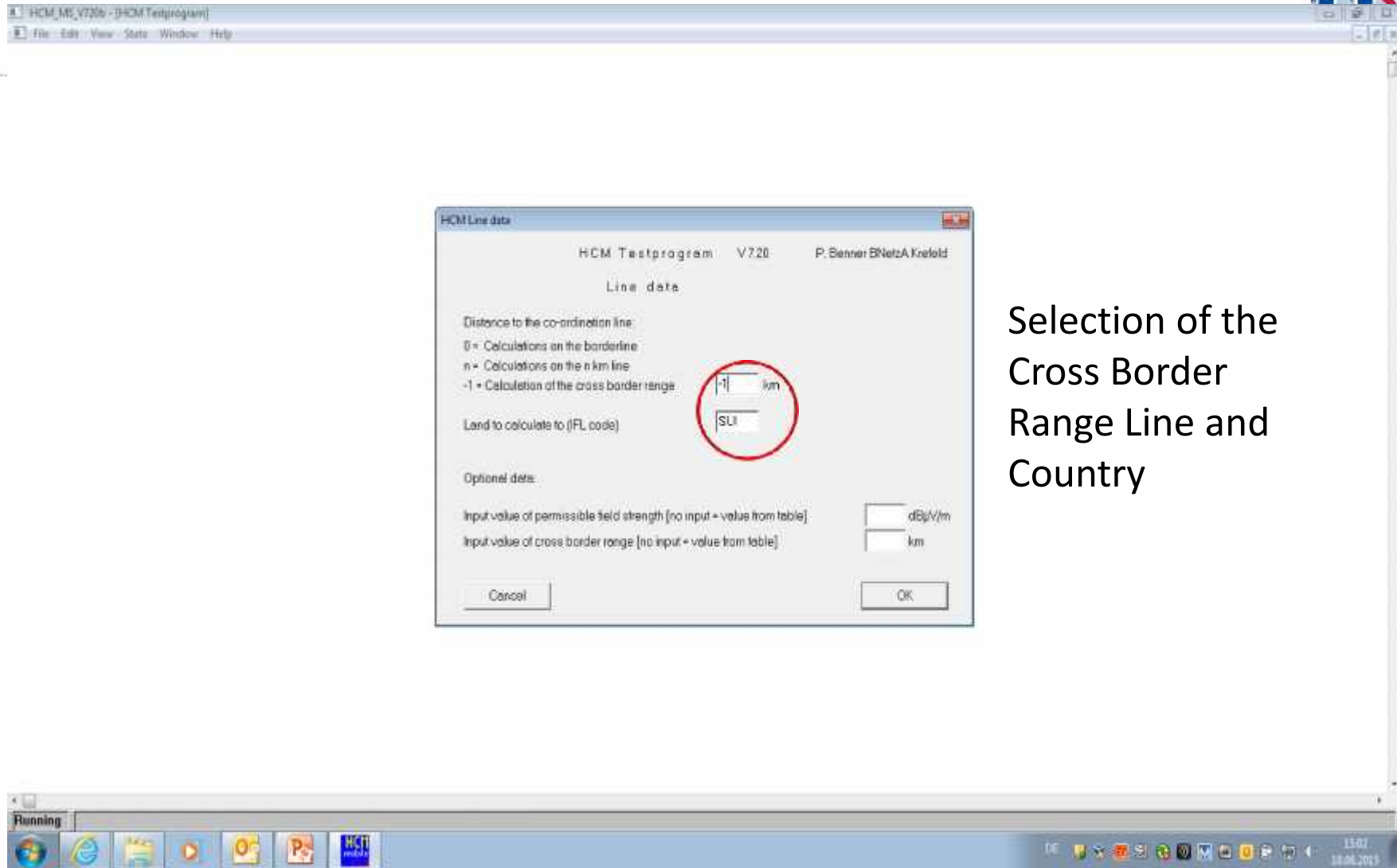
Selection of
Borderline
and Country

Calculation of Interference : Fixed, Mobile



Co-ordination
obligatory due to
negative Protection
Margin on border
of selected country

Calculation of Interference : Fixed, Mobile



Selection of the
Cross Border
Range Line and
Country

Calculation of Interference: Fixed, Mobile



The screenshot shows a Windows desktop environment. At the top, a window titled 'HCM_MS_V720b - (HCM Testprogram)' is open. In the center, a dialog box titled 'HCMResults' is displayed. The dialog box contains the following text:

```
H C M Testprogram V 7.20 P. Benner Reg IP Krefeld
R E S U L T S with C_Mode: -1

The maximum field str. at the cross b. range is -0.6 dBuV/m.
The permissible field strength is 20.0 dBuV/m.
The co-ordinates of the (border-) line point are 008E2100 47N2438
The distance to the (border-) line point is 54.63 km.
The distance to the (border-) line point is 129.94 degrees
The protection margin is 20.6 dB.
Land to calculate to SUI

Calculation is performed on the cross border range.

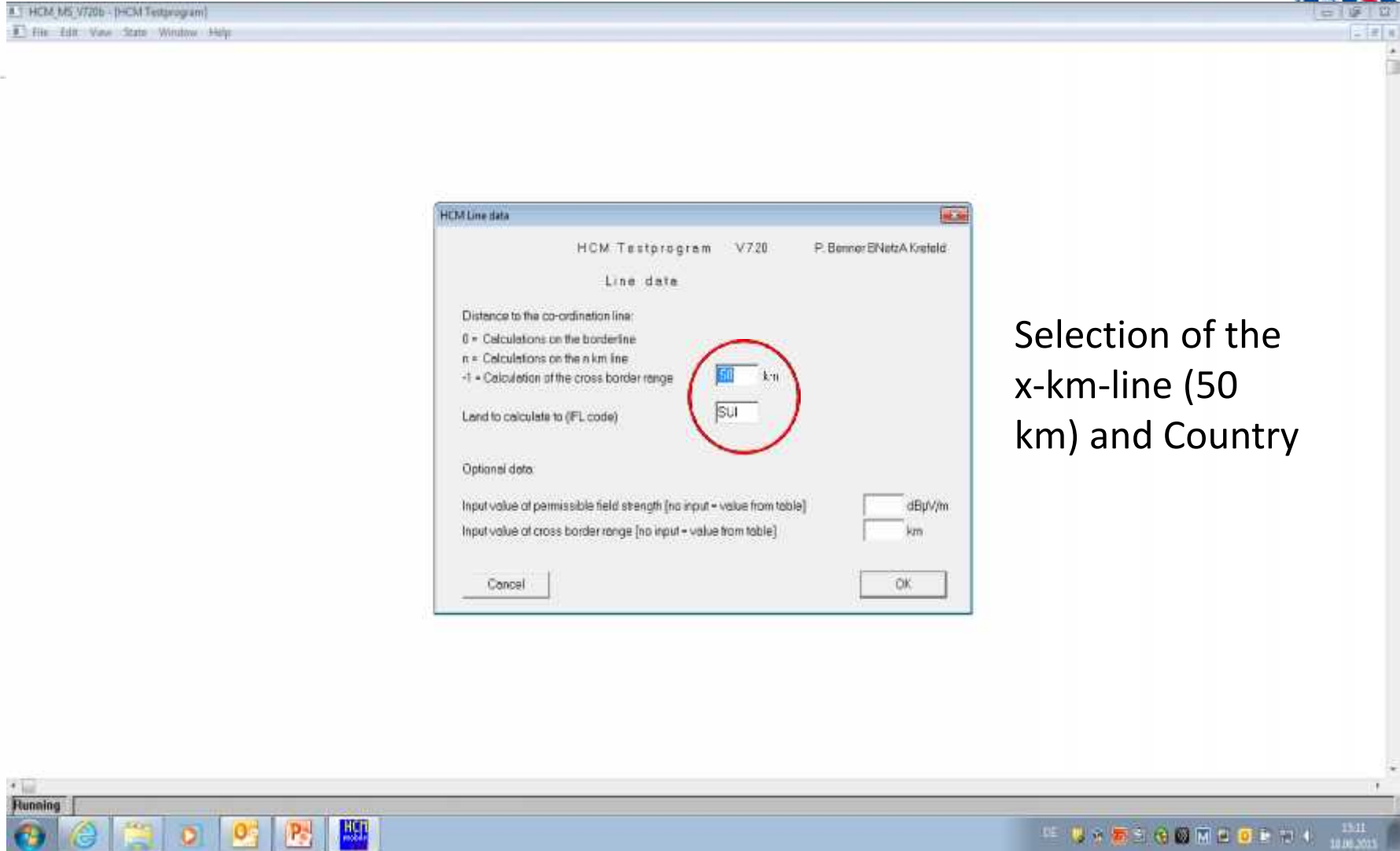
Write file with results OK
```

The text 'The protection margin is 20.6 dB.' is circled in red. To the right of the dialog box, the following text is written:

No refusal permitted due to positive Protection Margin on CBR-Line

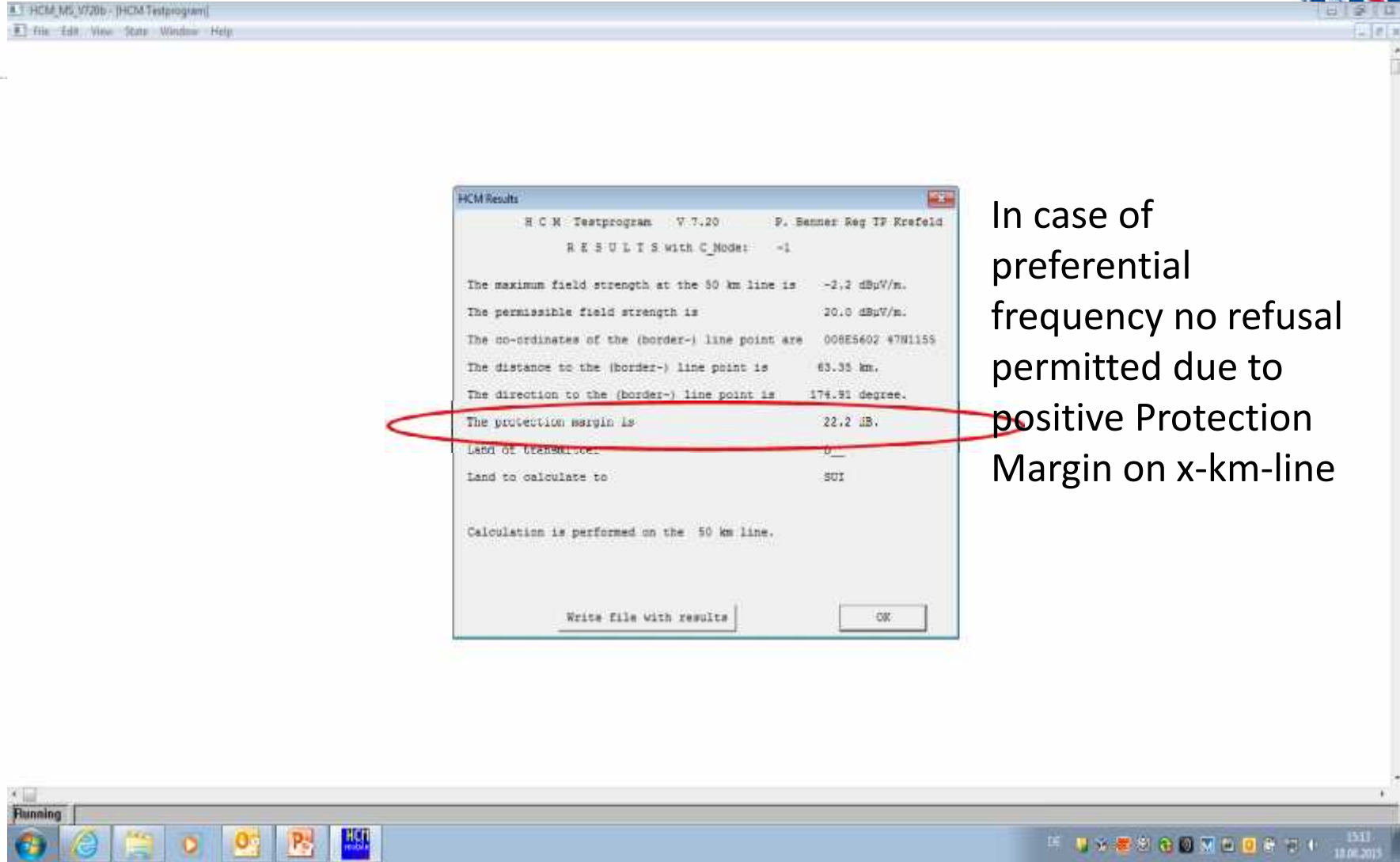
At the bottom of the screenshot, the Windows taskbar is visible, showing the 'Running' taskbar, several application icons, and the system tray with the date '11:05 11.04.2015'.

Calculation of Interference : Fixed, Mobile



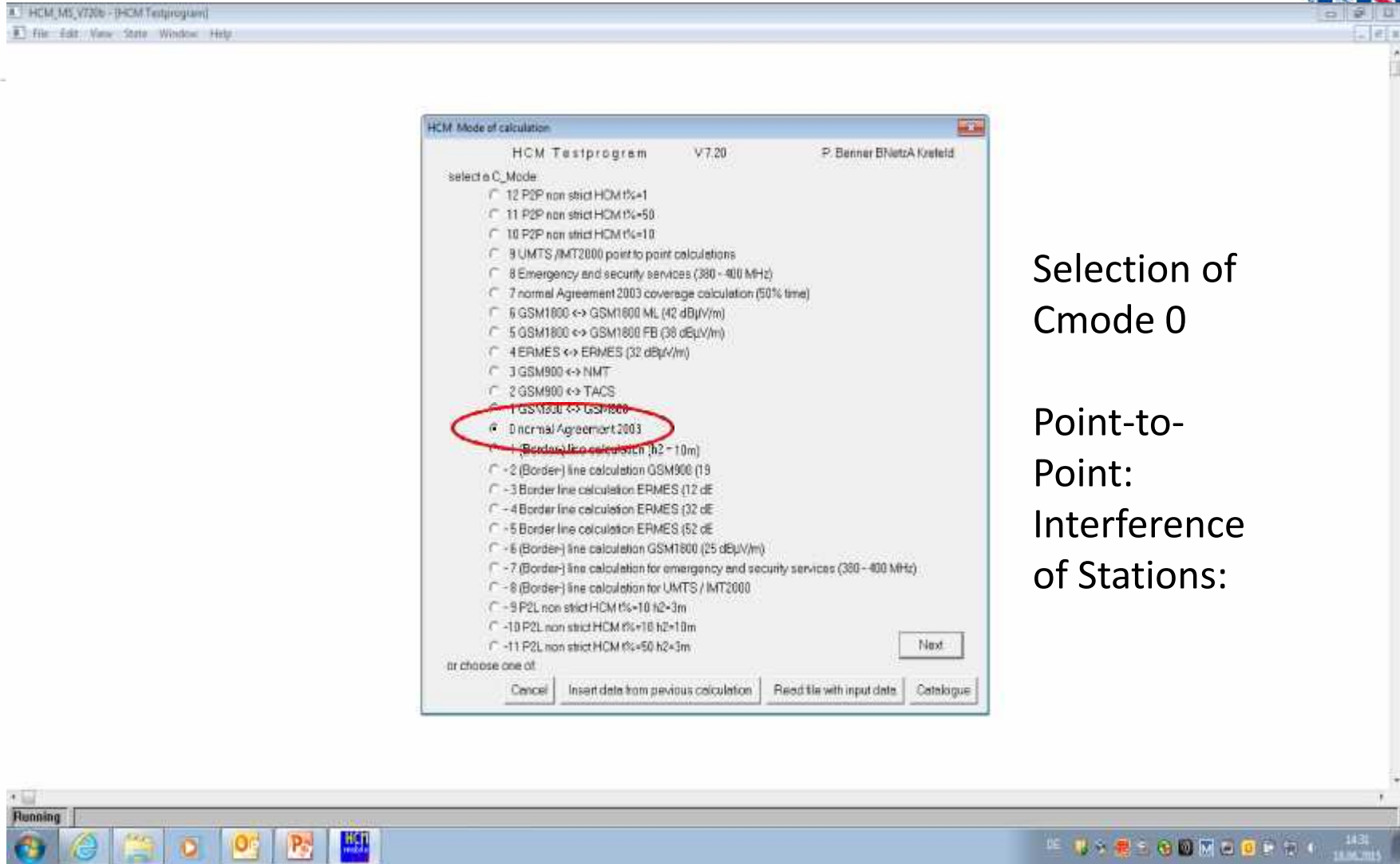
Selection of the
x-km-line (50
km) and Country

Calculation of Interference : Fixed, Mobile



In case of preferential frequency no refusal permitted due to positive Protection Margin on x-km-line

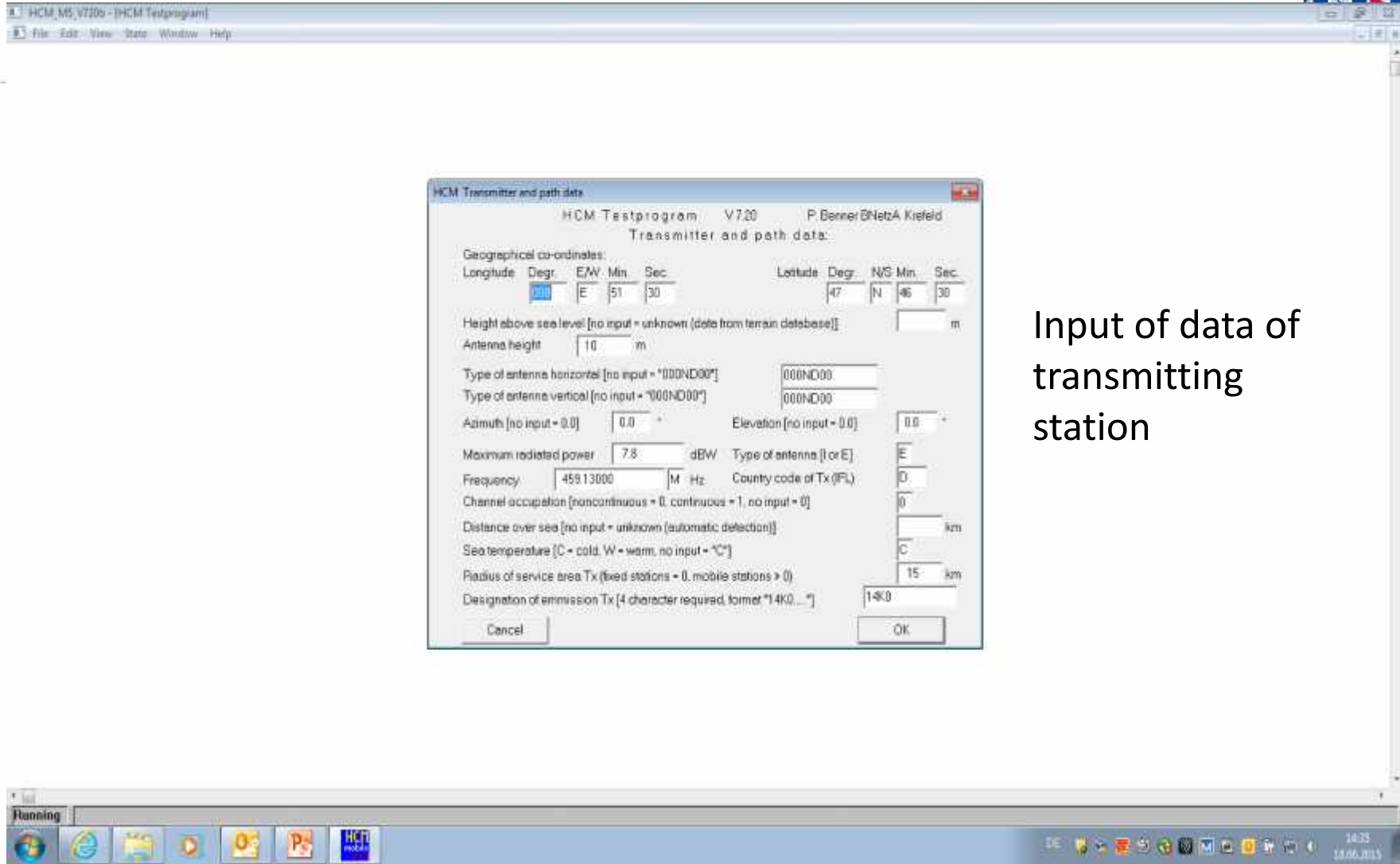
Calculation of Interference : Fixed, Mobile



Selection of Cmode 0

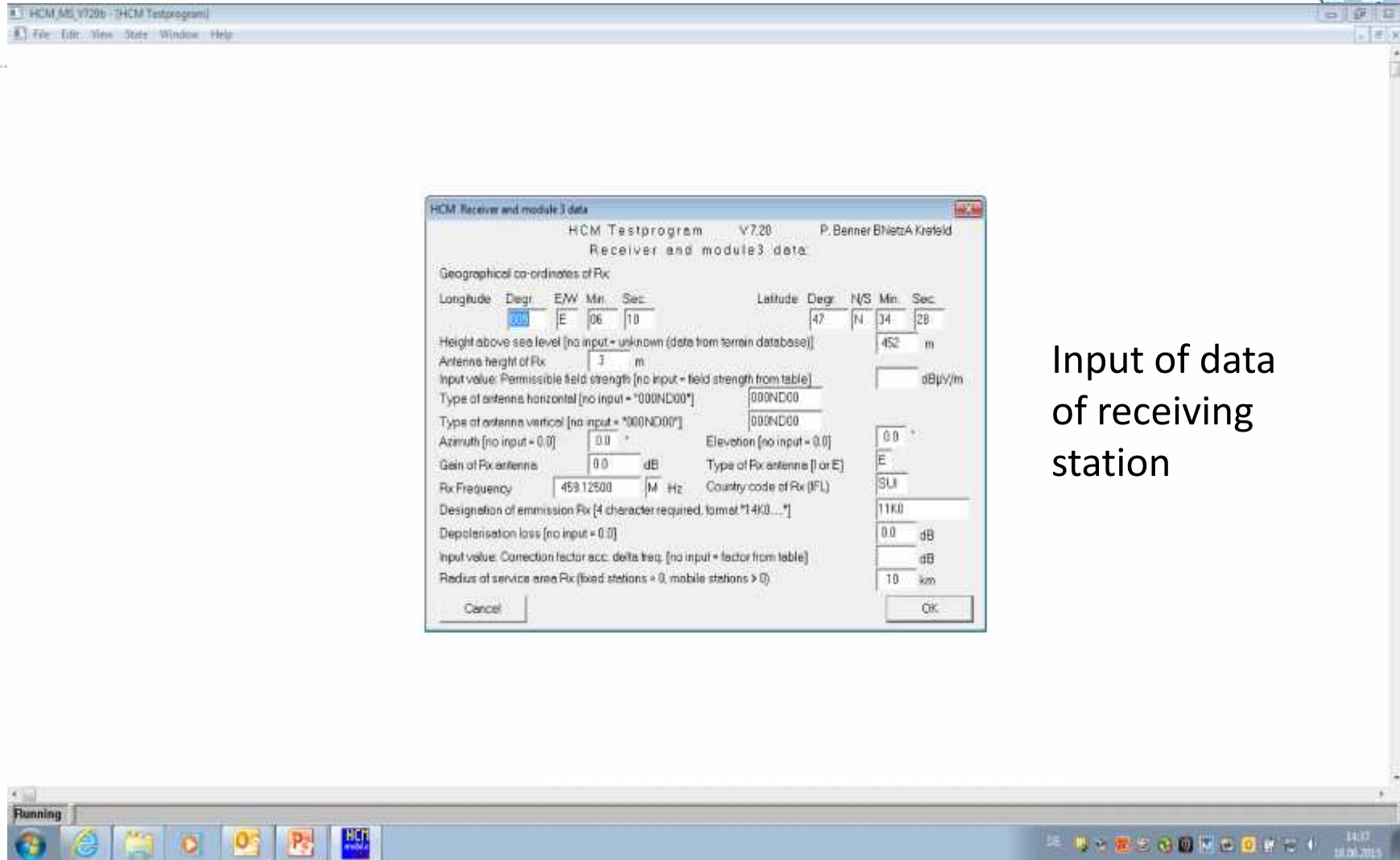
Point-to-Point: Interference of Stations:

Calculation of Interference: Fixed, Mobile



Input of data of transmitting station

Calculation of Interference: Fixed, Mobile



Input of data
of receiving
station

Calculation of Interference: Fixed, Mobile



The screenshot shows a window titled 'HCM Testprogram V 1.20' with a menu bar (File, Edit, View, State, Window, Help) and a toolbar. A smaller window titled 'HCM Results' is open, displaying the following text:

```
H C H Testprogram V 1.20 F. Henner Reg TP Krefeld
R E S U L T S with C_Mode: 0

The total distance is 3.957 km.
The free space field strength is 72.9 dBuV/m
The predicted field strength is 34.9 dBuV/m
The permitted field strength is 20.0 dBuV/m
The protection margin is -14.9 dB
```

The line 'The protection margin is -14.9 dB' is circled in red. At the bottom of the 'HCM Results' window are two buttons: 'Write file with results' and 'OK'. The taskbar at the bottom shows the 'Running' taskbar with several application icons, and the system tray on the right shows the date and time: 14:58, 25.06.2015.

Negative
Protection Margin
at receiving station
leads to refusal of
request

Calculation of Interference: Fixed, Mobile



GreKo Version 3.3.3 Vertreten Tobias Schmetzer (224-2) @ GrekoV3

Daten Bearbeiten Ansicht Prüfungen HCM Berechnung Korrespondenz für D Korrespondenz für A (Usland) Schnittstelle ?

Funkstellendaten mit Koordinierungspartner Fehlermeldungen Altdateifelder Suchmaske Funkstelle und Koordinierungspartner

Kostenträger KoTr 015 gültig Vorgang beim Sb

Funkstellen-Daten

Sendefrequenz	1A	H59,13000	M	Hz			
Funkstelle	6A	ML	Funkdienst	6B	CV		
Benutzer	6Z	X	Kanabelegung	10Z	0		
Standort	4A	SINGEN	Land	4B	D		
Deutwert	4C1	008	E	5t	30	4C1ok	
Nordwert	4C2	47	N	46	30	4C2ok	
Einsatzradius	4D	15	km	Standorthöhe	4Z		m
Bandbreite/Sendart	7A	14KDF3E					
ERP / EIRP	8B1	7,9	dBW	Bezugsantenne	8B2	E	
Azimuth	9A		Elevation	9B			
Polarisation	9D	V	Empfangsgewinn	9G	0,0	dB	
Antennenhöhe	9Y	10	m				
Antennentyp h	90H	000ND00	Antennentyp v	9XV	000ND00		
Empfangsfrequenz	1Y	459,13000	M	Hz			
Bemerkungen (res.)	13Zr						
13Zzus1r	X2(13Y=C GESETZT)						
Koord-Status (res.)	13Yr	C	Beteiligung	BET			
Koord-Referenz	13X	D	95	024105	0122	Nr-Vergabe	
Referenz alt	13Xalt	D950241050122					
Antragsteller	AST	SN	Datum Antragsteller	DataST			
Referenz AST	13XAST						

Koordinierungspartner-Daten

KP-Liste gültig

Koordinierungspartner KP AUT Frequenzkategorie 1Z 2

Bemerkungen 13Zr

13Zzus1 X2(13Y=C GESETZT)

Koord-Status 13Yr C Zuteilung n. Erinnerung 2CZ

Datum: Koord-Antrag 2W 10.06.1985 Nachfrage Erinnerung 2X Bekannntgabe Koord-Abschluss 2Z 19.08.1985 Zuteilung Erinnerung Zuteilung 2CX Inbetriebnahme Zuteilung 2C 29.08.1985 Nichtigkeit

Nutzer Erstellung 224-1 Änderung

Datum Koordinierungsantrag (res.) 2Wr 10.06.1985 Datum Zuteilung (res.) 2Cr 29.08.1985

Datum Koordinierungsabschluss (res.) 2Zr 19.08.1985 Datum Außerbetriebnahme 2R

Bemerkungen 13Zzus2 Zusatz 2 (res.)

Datensatz Nr.: 2 von 8

Erstellung 224-1 Änderung 224-1a

15:27 11.06.2015

Station
retrieved
from
database

Calculation of Interference: Fixed, Mobile



GreKo Version 3.3.3 Verbeten: Tobias Schmetzer (224-2) @ GreKoV3

AlleFreq: Feststellung der möglichen betroffenen Länder
AlleFreq: Punkt zu Grenze (HCM_P-G)
AlleFreq: Punkt zu Grenzabstandslinie (HCM_P-AL)
StandFreq: Punkt auf CBR klassisch (HCM_P-CBR-K)
StandFreq: Punkt auf CBR alternativ (HCM_P-CBR-A)
AlleFreq: HCM komplett
NetzFreq: Verfahren nach Brügge (HCM_BRUEGGE)
AlleFreq: Punkt zu Fläche (PLAP)
AlleFreq: Automatisch gesteuerte Prognose (HCM_AUTO)

Select complete HCM-calculation s from menue, i. e. P2L P2P

Koordinierungspartner-Daten

KP-Liste gültig

Koordinierungspartner	KP	Frequenzkategorie	12	2	
AUT	13Z				
9,1					
Bemerkungen	13Zzus1	X2(13Y=C GESETZT)			
Bemerkungen Zusatz 1 (res.)					
Koordinierungs-Status	13Y	C	Zuteilung n. Erinnerung	<input type="checkbox"/> 2CZ	
Datum:					
Koordinierungs-Antrag	2W	10.06.1985	Nachfrage	<input type="checkbox"/>	
Erinnerung	2X		Bekanntgabe	<input type="checkbox"/>	
Koordinierungs-Abschluss	2Z	19.08.1985	Zuteilung	<input type="checkbox"/>	
Erinnerung Zuteilung	2CX		Inbetriebnahme	<input type="checkbox"/>	
Zuteilung	2C	29.08.1985	Nichtigkeit	<input type="checkbox"/>	
Mitler	Erstellung	224-1	Änderung		
Datum Koordinierungs-antrag (res.)	2Wr	10.06.1985	Datum Zuteilung (res.)	2Cr	29.08.1985
Datum Koordinierungs-abschluss (res.)	2Zr	19.08.1985	Datum Außerbetriebnahme	2R	
Bemerkungen	13Zzus2				
Zusatz 2 (res.)					

Datenblatt Nr.: 2 von 8

Erstellung 224-1 Änderung 224-1a

11:30 11.04.2015

Calculation of Interference: Fixed, Mobile



GreKa Version: 3.3.3

Warteschlange

Complete calculation results pre-view

Warteschlange	ICR	ICR	Berechnungsart	Status	Eingestellt am	# Erreichbar	mP-Protz	Bearbeitet am	Information
D 85 024105 0122	D	D	HCM_P-G		9.18.06.2015 15:36	2	-24,1	18.06.2015 15:38	-CM-Info
D 85 024105 0122	D	D	HCM_P-CBR-K		9.18.06.2015 15:36	4	12,4	18.06.2015 15:38	-CM-Info
U 85 024105 0122	D	D	HCM_P-AL		9.18.06.2015 15:36	2	20,6	18.06.2015 15:38	-CM-Info
D 85 024105 0122	D	D	HCM_P-P		9.18.06.2015 15:36	68	-999,9	18.06.2015 15:37	INTP; -COM-Info
SUI 15 500060 0111	70015	SUI	HCM_P-P		7.28.04.2015 15:02	28	-999,9	28.04.2015 15:03	
SUI 15 500060 0111	70015	SUI	HCM_P-P		7.28.04.2015 14:52	28	-999,9	28.04.2015 14:52	
DNK 15 030411 0111	DNK	DNK	HCM_P-P		7.26.03.2015 11:48	5	-999,9	26.03.2015 11:49	
DNK 15 030411 0111	DNK	DNK	HCM_P-P		7.23.03.2015 16:56	5	-999,9	23.03.2015 16:56	
D 15 X02015 0121	20015	D	HCM_P-G		9.12.03.2015 10:12	1	-1,7	12.03.2015 10:14	HCM-Info
D 15 X02015 0121	20015	D	HCM_P-CBR-K		9.12.03.2015 10:12	2	7,8	12.03.2015 10:14	HCM-Info
D 15 X02015 0121	20015	D	HCM_P-AL		9.12.03.2015 10:12	1	19,0	12.03.2015 10:13	HCM-Info
D 15 X02015 0121	20015	D	HCM_P-P		9.12.03.2015 10:12	12	8,1	12.03.2015 10:13	HCM-Info
D 15 X02007 0121	20015	D	HCM_P-G		9.12.03.2015 10:12	1	-987,9	12.03.2015 10:13	HCM-Info
D 15 X02007 0121	20015	D	HCM_P-CBR-K		9.12.03.2015 10:12	2	-73,0	12.03.2015 10:13	HCM-Info
D 15 X02007 0121	20015	D	HCM_P-AL		9.12.03.2015 10:12	1	-987,9	12.03.2015 10:13	HCM-Info
D 15 X02007 0121	20015	D	HCM_P-P		6.12.03.2015 10:12	0			
D 15 X02005 0121	20015	D	HCM_P-G		9.12.03.2015 10:11	1	7,3	12.03.2015 10:13	HCM-Info

Statusübersicht: Berechnungen ...
 0 - in Warteschlange
 1 - läuft
 5 - beendet, INTR-FuSt bett offen
 6 - nicht möglich, keine FuSt betroffen
 7 - beendet, Berechnungsfehler vorhanden
 9 - fehlerfrei beendet

Buttons: Laden aus Datei, Start, Geschieht, Aktualisieren, Berechnungen mit Grafik speichern, Grafik anzeigen, Ausgabe, Einzelberechnungen, Schliessen

Antennentyp h: 90H D00N(D00) Antenne

Empfangsfrequenz: IV 459,13000

Bemerkungen (res.): 13Zr

Koordinat-Status (res.): 13Yr C

Koordinat-Referenz: 13X D 85 024105

Referenz alt: 13Xalt D950241050122

Antragsteller: AST KN Datum Antragsteller: DatAST

Referenz AST: 13XAST

Datensatz Nr.: 2 von 8

Erstellung: 224-1

Änderung: 224-2

13:38 18.06.2015

Calculation of Interference: Fixed, Mobile



Greko Version: 3.3.3 Vertrieber: Tobias Schuster (224-2) @ GrekoV3

Datei: Bearbeiten Ansicht Prüfungen HCM Berechnung Korrespondenz EPD Korrespondenz EA (Stand) Schnittstelle

Funkstellendaten mit Koordinierungspartner Fehlermeldungen Altdateifelder Suchmaske Funkstelle und Koordinierungspartner

Kostenträger KoTr 1015

HCM Einzelberechnungen Greko Version: 3.3.3 DB: GrekoV3

Warteschlange

33X HauptFuSt	KoTr H	H4B H	HauptFuSt lit	Berechnungsart	13X GegenFuSt	H4B G	4A G	Ergebnfaktoren	Ergebn	Status	Bearbeitet am	Fehler / Information
D 85 024105 0122		D	SENDER	HCM_P-AL		OUT		STANDARDREQ	22,2	✓	18.06.2015 15:38	HCM: 4Z Tx fehlt => TOPD,HCM: EPD,HCM: 4Z Rx feh
D 85 024105 0122		D	SENDER	HCM_P-AL		AUT		STANDARDREQ	32,8	✓	18.06.2015 15:37	HCM: 4Z Tx fehlt => TOPD,HCM: EPD,HCM: 4Z Rx feh

Single result view: Point to x-km-line

Statusübersicht: Berechnung ...
0 - in Warteschlange
1 - läuft
5 - nicht möglich weil INTR-FuSt
7 - nicht möglich weil Berechnungsfehler
9 - fehlerfrei beendet

Abkürzungen:
H - Hauptfunkstelle
G - Gegenfunkstelle

Anzeige FuSt mit NP-Daten
HauptFuSt GegenFuSt

Start Looken Aktualisieren
Grafikanzeige Ausgabe HCM Daten

Schliessen

Datenblatt Nr.: 2 von 4

Erstellung 224-1 Änderung 224-2

18:35 19.06.2015

Calculation of Interference: Fixed, Mobile



Greko Version 3.3.3 Vertreten Tobias Schmetzer (224-2) @ GrekoV3
Datei Bearbeiten Ansicht Prüfungen HCM Berechnung Korrespondenz für D Korrespondenz für A(Lusland) Schnittstelle ?

Senderdarstellung | Empfangsdarstellung

	Haupt-FuSt	gew. Element
13X	D 85 024105 01 22	
13Y	C	
1A1 [MHz]	459,13000	
1Y1 [MHz]	459,13000	
1Z	2	
6Z	X	
10Z	0	
4A	STNGEN	
4C1	008° E 51' 30"	008° E 56' 02"
4C2	047° N 46' 30"	047° N 11' 55"
4D [km]	1	
4E [m]		
7A	14KDF3E	
8B1 [dBm]	7,8	
9A [°]		
9B [°]		
9D	V	
9G [dB]	0,0	
9Y [m]	10	
99H	0000000	

	Werte
FraM	22,2
EP	20,0
EC	-2,2
ΔF	0,00
Dist. TzRec	63

Gratik drucken

HCM-Info

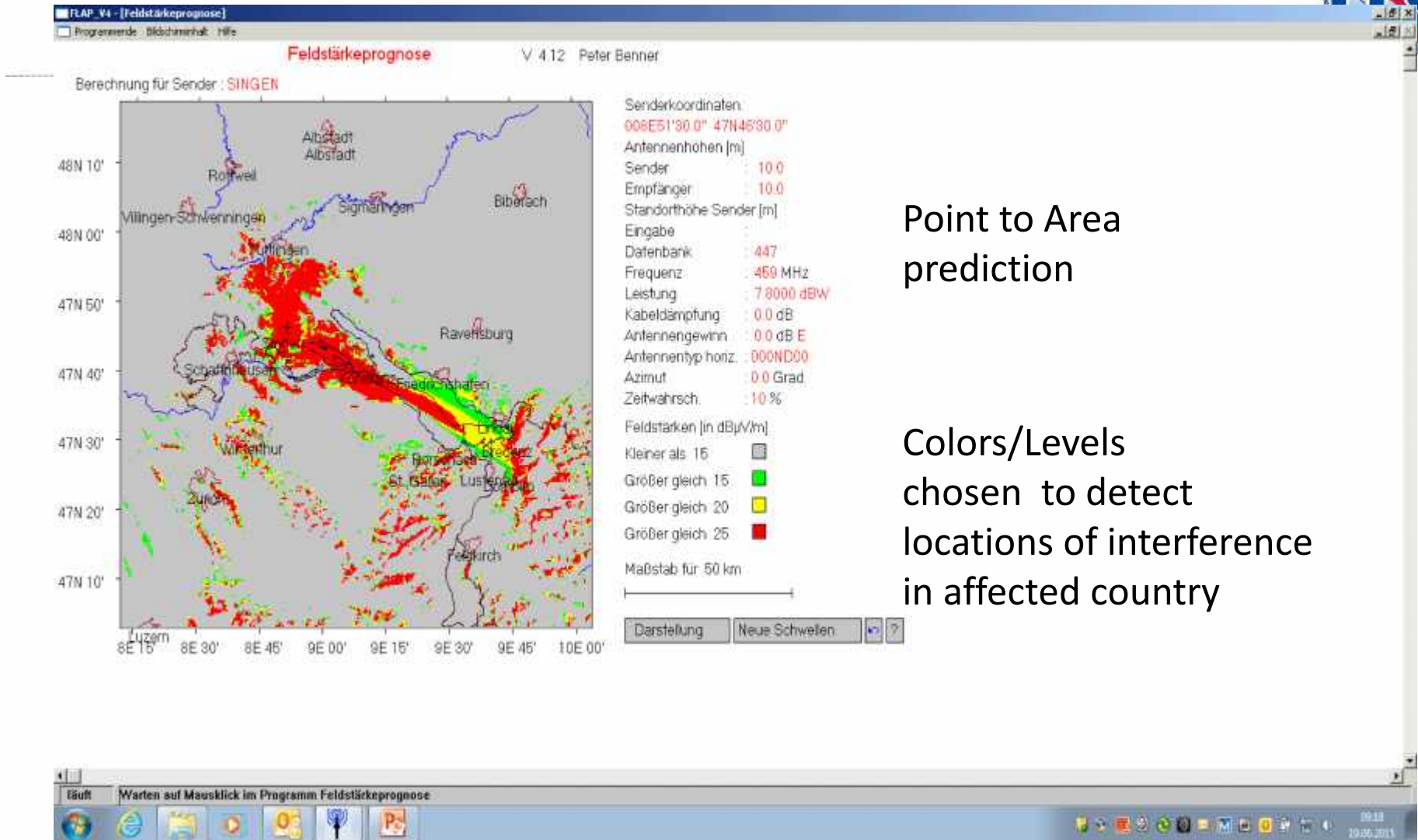
- HCM: 4Z Tx fehler => TOPO
- HCM: EPD
- HCM: 4Z Rx fehler => TOPO

100 km

08:37
19.06.2015

Single result graphic view:
Point to x-km-line

Calculation of Interference: Fixed, Mobile



Point to Area prediction

Colors/Levels chosen to detect locations of interference in affected country



I T hank U

**“Committed to
connecting the
WORLD”**

Major ITU-ASP SM Events in 2017

ITU COE online training on Spectrum Management (Legal and wireless innovation Issues)
13 - 24 February 2017

ITU COE training on Spectrum Engineering and Cross border Coordination
Xian, China, May 2017

ITU-Forum Global regional workshop on Spectrum Management
Bangkok-Thailand, Q2/3 2017

ITU Study Group Meetings
ITU-D (Res. 9) and ITU-R SG1

Your active participation in and contribution to these events is most welcome!