USER GUIDE FOR THE HARMONIZED CALCULATION METHOD FOR THE MOBILE SERVICE (HCM_MS_V7)

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1. GENERAL

The Harmonized Calculation Method (HCM) is a method to perform field strength calculations between two points or from a point to a line as described in the Annexes of the HCM Agreement. The HCM software can perform calculations for several systems.

A detailed description of the software is given in the HCM-MS software documentation. This document can be found on the server of the HCM Agreement.

2. BASIC FEATURES OF THE HCM SOFTWARE

- calculations for all services are based on the ITU-R P.1546
- automatic calculations on borderline and x-km line
- point to point calculations according to annex 5 of the HCM Agreement for several types of services
- automatic calculation of the position of a mobile according to §2 Annex 5 of the HCM Agreement
- automatic mixed path propagation determination based on morphological data

3. WHAT IS NEW IN V7?

(2011)

- new frequency bands and field strength values according Main Text and Annex 1
- new interface because of new data exchange format according Annex 2
- el. tilted antennas and new antenna codes included
- depolarization loss calculation

(2013)

- redefined CMODES for non-strict HCM calculations

(2015)

- Old CMODES for non-strict HCM calculations removed

4. WHAT IS NEEDED

All calculations (taking into account the predicted interference field strength and the calculated permissible interference field strength) are performed on a point to point basis. Therefore the data of the transmitter and the receiver are required as input values. To run this program a topographical database is required, for automatic calculations including sea path also a morphological database is needed. In addition this program performs calculations on borderlines, preferential-lines and cross border ranges. For these calculations, data of the borderlines and preferential-lines are required, too. The preferential-lines can be calculated using the original borderline-data and the BORDER program, which is available on the server of the HCM Agreement. Administrations can use common HCM elevation data on which they agreed upon. In the case such a database is not available, other sources of elevation data, such as gotopo30 or SRTM data can be used; these databases are available on the server.

Because the HCM program is only a subroutine provided as source code or as DLL, a surrounding program is required to run this software. A simple test program is provided. This test program is called HCM_MS_V7xx.EXE. It serves as an interface to the HCM-subroutine, passing input data (entered by keyboard or stored in a file) to the subroutine and formatting the output to present it on the screen or write it to a text file. All HCM programs are available on the HCM server.

5. INSTALLATION OF THE TEST PROGRAM

5.1. RECOMMENDED SYSTEM AND SOFTWARE REQUIREMENTS

- PC with Pentium 4 compatible processor or higher
- Windows 2000 or newer
- A hard disk with enough disk space to install the program, terrain- and borderline data
- (program 1 MB, borderline data 1 MB, terrain data depending on the coverage area)
- A SVGA monitor (set up to 800 x 600 pixels or more)

5.2. REQUIRED FILES

- The HCM_MS_V7xx.EXE in a directory or sub-directory of your choice.
- In addition, either 'DRIVE.DAT' or 'PATH.DAT' in the working directory of the HCM_MS_V7xx program (normally the same directory, HCM_MS_V7xx.EXE is located in).

DRIVE.DAT contains one character, the drive letter where your elevation- and borderline data is stored and a CR /LF. You can create this file using a text editor (NOTEPAD, WRITE etc.). Please enter the letter of the drive where your elevation- and line data is located (in uppercase) and the Enter-key. Store this file with the name DRIVE.DAT in the directory where HCM_MS_V7xx.EXE is in.

Note

Using DRIVE.DAT, you need (top level) directories named TOPO (where the elevation data is stored), BORDER and MORPHO (where the morphological data is stored for automatic sea path propagation calculations)!

PATH.DAT may contain three lines of text, e.g.

```
Border = E:\border
Topo   = E:\topo
Morpho = E:\morpho
```

Note

Each line is terminated by a CR /LF (produced by pressing the Enter key). The path for both lines is limited to a maximum of 63 characters. In the directory (or sub-directory) you specify for the 'Border =' entry, all line data have to be stored. In the directory (or sub-directory) for the 'Topo =' entry, all sub-directories named e.g. E010, W002 etc. containing the elevation data have to be stored. In the directory (or sub-directory) you specify for the 'Morpho =' entry, all morphological data have to be stored.

Border and x-km lines

The border directory should contain 4 different types of borderline files

- The borderline with the affected countries
- The x-km lines (calculations will only be possible on provided x-km lines)
- .CBR lines
- .ALL lines (To ensure that the position of the mobile is limited to the borderline, this one is needed)

5.3. USING THE PROGRAM FOR MULTIPLE CALCULATIONS

With the program it is possible to use file input (Chapter 11), to queue as many calculations as you like in one input file.

6. CALCULATION MODES

The program is developed for the HCM Agreement. But in addition, for non-strict HCM calculations, it is possible to supersede settings according HCM by supplying input values for a lot of parameters.

The HCM program gives you the choice of different calculation-modes. These choices are called CMODE and numbered.

- Negative CMODE - numbers are for (border-) line-calculations. Transmitter-data has to be supplied and appropriate (border-) line should be selected.
- Zero and all positive CMODE - numbers are for point to point calculations.
- For calculation of INTR coordination requests please refer to chapter 0: “Questions and answers”.
- For the automatic detection of TETRA systems, the designation of emission is defined as 25K0G7W.
- For the detection of the applicable field strength value according to Annex 1 in the band of 862-960 MHz the correct CMODE has to be chosen.

CMODE 12	P2P	Non strict HCM	(t%=1%)
CMODE 11	P2P	Non strict HCM	(t%=50%)
CMODE 10	P2P	Non strict HCM	(t%=10%)
CMODE 1 to 9	P2P	Non strict HCM	Deprecated
CMODE 0	P2P	Strict HCM	(t%=Channel occ.)
CMODE -1	P2L	Strict HCM	(t%=Channel occ., 10m)
CMODE -2 to -8	P2L	Non strict HCM	Deprecated
CMODE -9	P2L	Non strict HCM	(t%=10%, 3m)
CMODE -10	P2L	Non strict HCM	(t%=10%, 10m)
CMODE -11	P2L	Non strict HCM	(t%=50%, 3m)

P2P - Point to Point calculations
P2L - Point to (border-) Line calculations
t% - Time probability of the curves
3m, 10m - Height of receiving antenna

Possible usage of the CMODEs (not exhaustive)

Calculations for UMTS / IMT2000 systems (38 dBµV/m for 900 MHz, 21 dBµV/m for 2100 MHz)

This calculation mode is used for evaluating the interference situation between UMTS / IMT2000 stations.

➔ CMODE 0 or 10 (Formerly 9)

Calculations for Emergency / Security Services in the band 380 - 400 MHz (18 dBµV/m)

This calculation mode is used for evaluating the interference situation in this frequency band for the Emergency / Security Services.

➔ CMODE 10 (Formerly 8)

Coverage calculations (50% time)

This calculation mode is used for checking field strength measurements, as mentioned in Annex 7 of the HCM Agreement.

➔ CMODE 11 (Formerly 7)

GSM 1800 FB -> GSM 1800 ML (42dBµV/m)

This calculation mode is used for evaluating the interference situation between a GSM 1800 base station and a GSM 1800 mobile station.

➔ CMODE 10 (Formerly 6)

GSM 1800 ML -> GSM 1800 FB (38dBµV/m)

This calculation mode is used for evaluating the interference situation between a GSM 1800 mobile station and a GSM 1800 base station.

➔ CMODE 10 (Formerly 5)

GSM 900 <-> GSM 900 (32 dBµV/m)

This calculation mode is used for evaluating the interference situation between two GSM stations.

➔ CMODE 10 (Formerly 1)

Point to point calculations (Strict HCM)

This calculation mode is used for evaluation of the interference situation between two stations in accordance with the Annexes of the HCM Agreement for PMR and PAMR services. For the automatic detection of TETRA systems, the designation of emission is defined as 25K0G7W.

➔ CMODE 0

(Border-) line calculations (h2 = 10m) (Strict HCM)

This calculation mode is used for evaluating the coordination situation of a planned station in the PMR or PAMR services. Field strength calculations will be performed on lines. These calculations are on borderlines, x-km lines (preferential lines) or for cross-border-range-calculations.

➔ CMODE -1

(Border-) line calculations for GSM 900 (19 dBµV/m, h2=3m)

This calculation mode is used for evaluating the coordination situation of a GSM 900 base station. Field strength calculations will be performed on the border- or the 15 km line.

➔ CMODE -9 (Formerly -2)

(Border-) line calculations GSM 1800 (25 dBµV/m, h2=3m)

This calculation mode is used for evaluating the co-ordination situation of a GSM 1800 base station. Field strength calculations will be performed on the border- or on the 15 km line.

➔ CMODE -9 (Formerly -6)

(Border-) line calculations for the Emergency / Security Services in the band 380 - 400 MHz (18 dBµV/m)

This calculation mode is used for evaluating the co-ordination situation in this frequency band for the Emergency / Security Services. The field strength calculations will be performed on the border- or on the 50 km line.

➔ CMODE -10 (Formerly -7)

(Border-) line calculations for UMTS/ IMT2000 Systems (38 dBμV/m for 900 MHz, 21 dBμV/m for 2100 MHz, h2=10m)

This calculation mode is used for evaluating the co-ordination situation for UMTS/ IMT2000 Services. The field strength calculations will be performed on the border line or on any provided x-km line. (May change in future)

➔ CMODE -10 (Formerly -8)

Coverage (border-) line calculations (50% time)

This calculation mode is used for checking field strength measurements, as mentioned in Annex 7 of the HCM Agreement.

➔ CMODE -11

Remarks

Non strict CMODEs are not supported from the MS group regarding implementation, defaults and so on.

7. INPUT VALUES FOR THE TEST PROGRAM

"Optional" means program uses default values if field is left blank

If the DLL module is used, refer to the program description

• Mode of calculation:	Mandatory
• Transmitting frequency:	Mandatory
• Geographical co-ordinates of the transmitter:	Mandatory (including seconds)
• Height of transmitter above sea level:	Optionally. If missing, height is taken from the terrain database
• Transmitter antenna height:	Mandatory
• Type of antenna horizontal (Tx):	Mandatory (if left blank; default = 000ND00)
• Type of antenna vertical (Tx):	Mandatory (if left blank; default = 000ND00)
• Azimuth of maximum radiation Tx:	Mandatory (if horizontal directional antenna is used)
• Elevation angle of main radiation Tx:	Mandatory (if vertical directional antenna is used)
• Maximum radiated power:	Mandatory; in dBW.
• Type of Tx antenna:	Mandatory; "E" or "I"
• Channel occupation:	Optionally; "0" or "1" (default = 0).
• Radius of the service area of the transmitter:	Mandatory. If 0, effective antenna height of Tx is calculated, if > 0, eff. antenna height is taken from the input value for the transmitter antenna height, but at least 3 m (for mobiles).
• Designation of emission Tx:	Mandatory
• Distance over sea:	Optionally; in km. If missing, the distance over sea is calculated by using the morphological data (if available)
• Sea temperature (valid after mod of program during 2016):	Optionally; cold or warm ("C" or "W"). C = North sea, W = Mediterranean sea. If empty the parameter is chosen from the program by distinguishing the latitudes of the positions
• Reception frequency:	Mandatory for point to point calculations, value not used for (border-) line calculations.
• Geographical co-ordinates of Rx:	Mandatory for point to point calculations, value not used for (border-) line calculations.
• Height of receiver above sea level:	Optionally. If missing, height is taken from terrain database. Value not used for (border-) line calculations.
• Receiver antenna height:	Mandatory for some point to point calculations, value not used for (border-) line calculations.
• Type of antenna horizontal (Rx):	Mandatory for point to point calculations, value not used for (border-) line calculations.
• Type of antenna vertical (Rx):	Mandatory for point to point calculations, value not used for (border-) line calculations.
• Azimuth of maximum gain of Rx antenna:	Mandatory for point to point calculations, value is not used for (border-) line calculations or if horiz. Rx antenna is '000ND00'.
• Elevation angle of main gain of Rx	Mandatory for point to point calculations,

antenna:	value is not used for (border-) line calculations or if verti. Rx antenna is '000ND00'.
• Gain of Rx-antenna:	Mandatory for point to point calculations, value is not used for (border-) line calculations.
• Type of Rx antenna gain:	Mandatory for point to point calculations ("E" or "I"), value is not used for (border-) line calculations.
• Designation of emission Rx:	Mandatory for point to point calculations, value is not used for (border-) line calculations.
• Depolarization loss:	Optionally for point to point calculations, value is not used for (border-) line calculations. (see chap. 12)
• Radius of the service area of the receiver:	Mandatory. If 0, effective antenna height of Rx is calculated, if > 0, eff. antenna height is taken from the input value for the receiver antenna height, but at least 3 m (for mobiles).
• Input-value: permissible field strength:	Optionally, if missing, value is taken from table in Annex 1 of HCM Agreement for strict CMODEs
• Input value of correction factor according frequency difference:	Optionally. Not used for (border-) line calculations. If missing, value is calculated.
• Land to calculate from (code of country):	Mandatory for (border-) line calculations. Not used for point to point calculations. See Preface to the IFL.
• Land to calculate to (code of country):	Mandatory for (border-) line calculations. Not used for point to point calculations. See Preface to the IFL.
• Distance to borderline:	Mandatory for (border-) line calculations. Not used for point to point calculations. negative values = Cross-border range 0 = calculation on borderlines positive value x = calculation on x km line.
• Input value of „Maximum cross border range of harmful interference“:	Optionally for (border-) line calculations. If missing, value is taken from table in Annex 1 of HCM Agreement for strict CMODEs.

8. OUTPUT VALUES

- Correction according vertical antenna [dB] (Tx)
- Correction according antenna type [E or I] [dB] (Tx).
- Azimuth (Tx) [degree]
- Elevation (Tx) [degree]
- Direction to Rx [degree]
- Angle vertical Tx to Rx [degree]
- Difference angle vertical (Tx-Rx - elev.) [degree]
- Difference angle horizontal (Tx-Rx - azim. Tx) [degree]
- Angle vertical Rx to Tx [degree]
- Difference angle horizontal (Rx-Tx - azim. Rx) [degree]
- Difference angle vertical (Rx-Tx - elev. Rx) [degree]
- Azimuth (Rx) [degree] (only point to point calculations).
- Elevation (Rx) [degree] (only point to point calculations).
- Direction to Tx [degree] (only point to point calculations).
- Clearance angle [degree] Tx
- Clearance angle [degree] Rx
- Correction factor according clearance angle Tx [dB]
- Correction factor according clearance angle Rx [dB]
- Distance over sea [km] (calculated or from input value)
- Correction according horizontal antenna (Rx) [dB] (only point to point calculations).
- Correction according vertical antenna (Rx) [dB] (only point to point calculations).
- Correction according antenna type [E or I] (Rx) [dB] (only point to point calculations).
- Delta frequency [kHz] (only point to point calculations).
- Correction factor according delta frequency [dB] (only point to point calculations).
- Channel spacing of Rx [kHz] (only point to point calculations).
- Channel spacing of Tx [kHz] (only point to point calculations).
- Calculated field strength [dBµV/m]
- Permissible field strength [dBµV/m]
- Permissible field strength of table in Annex 1 of HCM Agreement [dBµV/m]
- Max. range of harmful interference [km] (only (border-) line calculations).
- E.R.P. of reference transmitter [dBW] (only (border-) line calculations).
- Protection margin (EP - EC) [dB]
- Maximum field strength at (border-)line [dBµV/m] (only (border-) line calculations).
- Tx Co-ordinates calculated
- Rx Co-ordinates calculated (only point to point calculations).
- Co-ordinates of (border) line point (only (border-) line calculations)
- Distance to (border-) line - point [km] (only (border-) line calculations).
- Direction to (border-) line - point [degree] (only (border-) line calculations).
- Profile heights
- [Depolarization loss (not in HCM Agreement Zagreb 2010)]

Applied correction factors

If it is needed to perform non HCM Agreement calculations (with different correction factors), you have to:

- write the results to a text file (HCM.TXT),
- find the desired correction factor in this text,
- modify the resulting field strength value according to the desired change of this correction factor

9. HCM_ERROR VALUES

0	No error
36	Error opening terrain- or morphological data file (data not available)
200	Error in longitude (in 'Point_height' or 'Point_type' subroutine)
210	Error in latitude (in 'Point_height' or 'Point_type' subroutine)
220	Error reading record (in 'Point_height' or 'Point_type' subroutine)
300	Latitude is not in range of 0.0 - 90.0 (in 'Point_height' or 'Point_type' subroutine)
400	Height is missing (-9999) (in 'Point_height' subroutine)
1000	Distance between Tx and Rx = 0. Calculations not possible
1001	Error in geographical coordinates (Tx longitude, degrees)
1002	Error in geographical coordinates (Tx longitude, minutes)
1003	Error in geographical coordinates (Tx longitude, seconds)
1004	Error in geographical coordinates (Tx longitude, E/W)
1005	Error in geographical coordinates (Tx latitude, degrees)
1006	Error in geographical coordinates (Tx latitude, minutes)
1007	Error in geographical coordinates (Tx latitude, seconds)
1008	Error in geographical coordinates (Tx latitude, N/S)
1009	Error in Tx antenna height
1010	Error in transmitting frequency value
1011	Error in transmitting frequency unit
1012	Error in radius of service area of Tx
1013	Error in input value height of Tx site above sea level
1014	Error in geographical coordinates (Rx longitude, degrees)
1015	Error in geographical coordinates (Rx longitude, minutes)
1016	Error in geographical coordinates (Rx longitude, seconds)
1017	Error in geographical coordinates (Rx longitude, E/W)
1018	Error in geographical coordinates (Rx latitude, degrees)
1019	Error in geographical coordinates (Rx latitude, minutes)
1020	Error in geographical coordinates (Rx latitude, seconds)
1021	Error in geographical coordinates (Rx latitude, N/S)
1022	Error in Rx antenna height
1023	Error in reception frequency value
1024	Error in reception frequency unit
1025	C_mode is out of range
1026	Error in input value of permissible field strength
1027	Error in input value of maximum cross border range
1028	The distance is greater than 1000 km. Calculations not possible
1029	Error in radius of Rx service area
1030	Error in input value Rx site height above sea level
1031	Error in Tx elevation
1032	Error in Tx azimuth
1033	Error in type of Tx antenna (E/I)
1034	Error in power
1035	Error in input value of distance over sea
1036	The 'xxx.ALL' borderline file for Tx is missing
1037	The 'xxx.ALL' borderline file for Rx is missing
1038	Error in type of antenna
1039	Error in input data of correction factor according frequency difference

1040	Channel spacing outside definition range (Rx)
1041	Channel spacing outside definition range (Tx)
1042	Error in Rx elevation
1043	Error in Rx azimuth
1044	Error in Rx type of antenna ("E" or "I")
1045	Error in gain of Rx antenna
1046	Error in input data of depolarization loss
1047	Distance to borderline is too long
1048	Selected line data not available
1049	Error in line data
1050	No HCM Agreement frequency and important technical data missing e.g. CBR, max. perm. FS
2000	wrong Figure_frequency (from Get_figure_FS_value)
2001	wrong Time_percentage (from Get_figure_FS_value)
2002	wrong Sea_temperature (from Get_figure_FS_value)
2003	wrong Figure_Heff (from Get_figure_FS_value)
2004	wrong Figure_distance (from Get_figure_FS_value)
3000	DLL inputstring to short

10. INFO(I) VALUES

1	No height of Tx site is given or Tx is mobile; height is taken from the terrain database
2	Height of Tx site differs from height of terrain database
3	Height of Tx site differs more than 10%, calculated values may be (extremely) wrong!
4	Frequency out of range of table in Annex 1
5	Input value of permissible field strength is used
6	Input value of maximum cross border range is used
7	Distance between Tx and Rx is less than both service area radiuses; field strength is set to 999.9
8	No height of Rx site is given or Rx is mobile/line, height is from the terrain database
9	Height of Rx site differs from height of terrain data
10	Rx site height differs more than 10%, calculated values may be (extremely) wrong!
11	Free space field strength used because distance < 1km
12	Free space field strength is used, because 1st Fresnel zone is free
13	Distance over sea is greater than total distance. Distance between Tx and Rx is used!
14	Input value of correction factor according frequency difference is used
15	Frequency difference outside definition range; 82 dB is used
16	Calculated distance over sea is set to 0 because of missing morphological data.
17	Tx channel spacing outside definition range, 25 kHz is used!
18	Correction factors for the band 380 - 400 MHz are used.

11. USING TEXT FILES FOR THE INPUT

For simple surrounding programs (e.g. written in MS ACCESS), it is possible to select all input data and write it to a text file. Then the HCM program can be run using the 'read input from file' option. In this case, no additional input is requested and the output is written to a text file 'HCM.TXT'. The format of the input text file differs according to the CMODE. Examples are shown below.

Note

It is possible to queue as many calculation input data as you like. Simply add more lines to the input text file.

The examples can be used as reference for the format of data not listed in Annex 2 of the HCM Agreement.

Example 1

for a data file containing all input for a borderline calculation.

Data	Description /Format (not part of data!)
` - 9`	mode of calculation /N3
`00 6E2 0 0 0 5 1N 0 0 0 0`	Tx co-ordinates /C15
	Tx height above sea level /NC4
`0 0 0 N D 0 0`	Tx antenna type horizontal /C7
`0 0 0 N D 0 0`	Tx antenna type vertical /C7
`  0 . 0`	azimuth /D5.1
`  0 . 0`	elevation /D5.1
`  2 0`	Tx antenna height /N4
`  1 0 . 0`	radiated power /D6.1
`E`	Tx type of antenna (E or I) /C1
`00 9 5 4 . 4 0 0 0 0 M`	Tx frequency /D11.5 + C1
`0`	channel occupation / N1
`C`	sea temperature (C or W) /C1
`  0 . 0`	distance over sea /DC5.1
`  0`	radius of service area /N5
`  0`	distance to borderline (km) /N4
`D`	land of Tx (IFL - code) /C3
`HOL`	land to calculate to /C3
` 1 9 . 0`	perm. field str. (input) /DC5.1
`100`	max. cbr (input) /C3
`14K0`	Tx designation of emission /C9

Format description

Nx = Number, x = number of digits, right justified.
Cx = Character (letters or numbers), x = maximum number of characters, left justified.
Dx.y = Decimal numbers, x = total length (including the decimal point), y = number of digits after the decimal point.
NCx = Same as Nx, but it is possible to leave this field empty (blanks).
DCx.y = Same as Dx.y, but it is possible to leave this field empty (blanks).

Example 2

for a data file containing all input for a normal calculation.

Data	Description /Format (not part of data!)
2	mode of calculation /N3
0 0 6 E 0 0 0 0 5 0 N 0 0 0 0	Tx co-ordinates /C15
	Tx height above sea level /NC4
0 0 0 N D 0 0	Tx antenna type horizontal /C7
0 0 0 N D 0 0	Tx antenna type vertical /C7
0 . 0	azimuth of Tx antenna /D5.1
0 . 0	elevation of Tx antenna /D5.1
1 0	Tx antenna height /N4
1 0 . 0	radiated power /D6.1
E	Tx type of antenna (E or I) /C1
0 0 1 4 7 . 7 7 0 0 0 M	Tx frequency /N11+ C1
0	channel occupation /N1
C	sea temperature (C or W) /C1
0 . 0	distance over sea /DC5.1
0	radius of Tx service area /N5
0 0 6 E 2 0 0 0 5 0 N 0 0 0 0	Rx coordinates /C15
	Rx height above sea level /NC4
1 0	Rx antenna height /N4
L U X	country from /C3
D	country to /C3
	perm. Field str. (input) /DC5.1
0 0 1 4 7 . 7 7 0 0 0 M	Rx frequency /N11+ C1
1 4 K 0	Tx designation of emission /C9
1 4 K 0	Rx designation of emission /C9
0 0 0 N D 0 0	Rx antenna type horizontal /C7
0 0 0 N D 0 0	Rx antenna type vertical /C7
0 . 0	azimuth of Tx antenna /D5.1
0 . 0	elevation of Rx antenna /D5.1
E	Rx type of antenna (E or I) /C1
0 0 . 0	gain of Rx antenna /D4.1
0 0 . 0	depolarization loss /D4.1
	corr. factor acc. freq. diff. /NC4
0	radius of Rx service area /N5

Format description

Nx = Number, x = number of digits, right justified.
Cx = Character (letters or numbers), x = maximum number of characters, left justified.
Dx.y = Decimal numbers, x = total length (including the decimal point), y = number of digits after the decimal point.
NCx = Same as Nx, but it is possible to leave this field empty (blanks).
DCx.y = Same as Dx.y, but it is possible to leave this field empty (blanks).

12. DEPOLARIZATION LOSS

Taking into account the depolarization loss is optional and should be agreed for individual coordination requests on a bilateral basis.

If the existing field “depolarization loss” is set to -9.9 the HCM program for P-P calculation considers one station as vertical polarized and the other as horizontal and calculates according the following principles:

If both transmitter and receiver are base stations,

and

if the antenna of the one station is vertically polarized, while that of the other station is horizontal polarized,

and

if the gain losses of both antennas each are less than 10 dB,

a correction for the depolarization decoupling is to be considered according to the following equation:

$aDepol = 25dB - 0.5 * (F0 - F)$, in the area of 0 to 50dB for (F0-F)

and

$aDepol = 0$ for (F0-F) > 50dB

With:

F0 = free space field strength at the receiving site in dBµV/m
F = predicted field strength at the receiving site in dBµV/m
aDepol = depolarization decoupling loss in dB

13. ELECTRICALLY TILTED ANTENNAS

On-site performance of antenna is determined by its characteristics (represented by vertical and horizontal code) and installation (azimuth, elevation). Some antennas allow additional way how to form pattern of radiation. This technique is called electrical tilt. Although there are more possibilities, only the vertical diagram is tilted down in technical practice. Use of electrically tilted antennas have become popular (mainly in cellular networks) so this kind of antennas / necessary calculations were introduced into HCM Agreement.

TA code

It was the first attempt to include the electrically tilted antennas into HCM Agreement (2005). Some simplifications were done to keep compatibility with the existing Annex 2A. The use of the TA code is limited to the exactly vertically mounted antennas, because it is not possible to express the mechanical elevation of antenna in this case (the field 9B of Annex 2A means electrical tilt instead of elevation).

Px code

Electrically tilted antennas are usually mechanically elevated too. So a new (more general) model of vertical characteristics was developed and included into HCM Agreement (2010). The Px code can be used for antennas with electrically down tilted vertical diagram only. This code consist of parts as described in Annex 6. It was decided to express value of the electrical tilt by 4th and 5th character of code in order to keep compatibility with existing Annex 2A. The 4th character was fixed to "P" (electrical down tilt). The 5th character express electrical tilt in degrees (from A=0 to Z=-25). Mechanical elevation of the antenna is entered into field 9B in the same way as it is in case of traditional antennas.

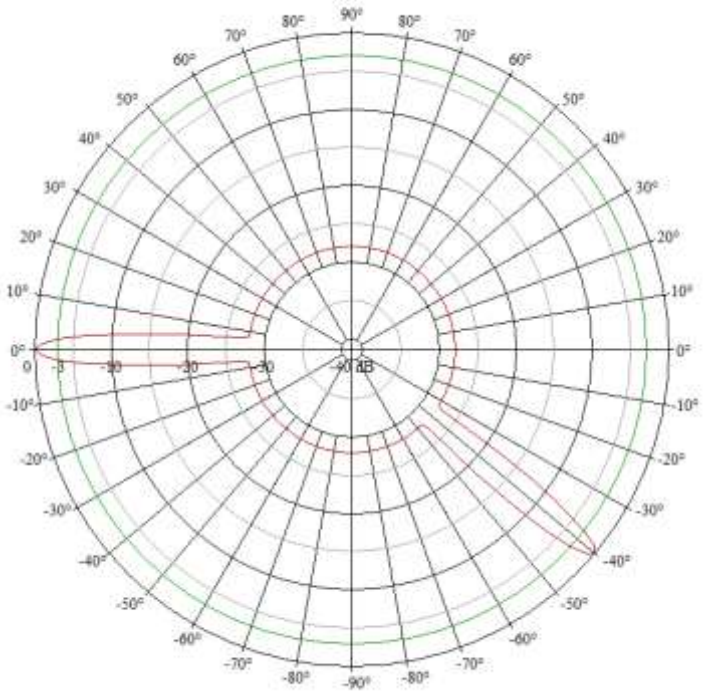
Conclusion

Although it is possible to describe electrically tilted antennas by the code TA in some cases, it is strongly recommended not to use the TA code anymore for vertical diagrams. The TA code (as a relict) is kept for backward compatibility with existing co-ordinations only.

The new Px code is more general than historical TA code and can fully replace it yyyPxyy combined with 9B=0 is equal to yyyTAyy).

The Px code is the only perspective one and should be used for all new co-ordinations of electrically tilted antennas."

Example of a mechanical elevated Px antenna



Antenna horizontal diagramm 000ND00 (omni)

Antenna vertical diagram 030PU04 with an mechanical elevation of 20°

14. QUESTIONS AND ANSWERS

14.1. IN WHICH CASE DO I HAVE TO CALCULATE ON A BORDERLINE (AN X-KM-LINE, THE CROSS BORDER RANGE)?

The answer is: It depends on the situation.

For normal HCM Agreement

First calculations to coordinated stations are required. In cases, where no coordinated station is disturbed, further calculations are required: First calculations on the borderlines are performed. If the calculated field strength on a borderline is less than the permissible field strength, no coordination procedure with this country is required. If the calculated field strength is higher, coordination is necessary and an addition calculation on the cross border range is required. If the calculated field strength on the cross border range is higher than the permissible field strength, the coordination request can be rejected.

Note

For normal HCM Agreement no calculations on x-km-lines are performed!

In case of a preferential frequency agreement

If there is a preferential frequency agreement, first step is to calculate to coordinated stations. Second step is to calculate on borderlines to determine the involved countries (relationship between two, three or four countries). Taken into account the involved countries, the frequency and the agreement, the question whether it is a preferential frequency of the own country or not can be answered. In case of a preferential frequency of the own country and a field strength at the borderline higher than the permissible field strength, an additional calculation on the x-km-line is required.

Coordination request is required in case of no own preferential frequency and the field strength at the borderline higher than the permissible field strength or if there is an own preferential frequency and the field strength at the x-km-line higher than the permissible field strength.

Information is required in case of an own preferential frequency, the field strength on the borderline higher and the field strength on the x-km-line lower than the permissible field strength

Note

For preferential frequency agreements calculations on the cross border range are performed for the protection of the receivers!

In general

All bi- or multilateral agreements (preferential frequency agreements, lattice plans etc.) overrule the HCM Agreement.

14.2. WHEN IS THE ELEVATION ANGLE POSITIVE OR NEGATIVE?

If the antenna is pointing towards the earth, the elevation angle is negative;
if the antenna is pointing towards the sky, the elevation angle is positive.

14.3. HOW TO SELECT X-KM LINE - CALCULATIONS?

At the 2nd page of the input - dialogue (Distance to the borderline), type in the value x (e.g. 15 for the 15 km - line).

14.4. HOW TO SELECT CROSS-BORDER-RANGE - CALCULATIONS?

At the 2nd page of the input - dialogue (Distance to the borderline), type in a negative value (e.g. -1).

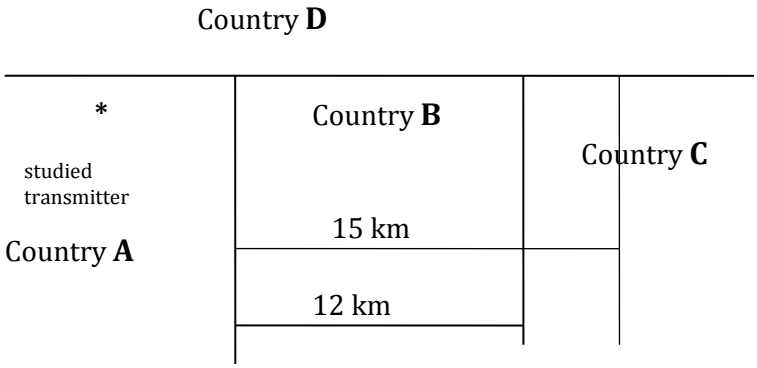
14.5. IN CASE WHERE A PREFERENTIAL FREQUENCY PLAN IS AVAILABLE:

Calculate on the x-km line into direction of country A, but the x-km point is inside country B. Has country A or B or both to be coordinated with?

The question, which country is to coordinate with, depends only on the field strength at the borderline of this country. If this field strength is higher than the permissible field strength, a preferential frequency has to be used or coordination is required. If the field strength at the x-km-line is higher than the permissible field strength, a coordination request can be rejected from those countries, independent whether the x-km-point is in or outside those countries.

14.6. EXAMPLE FOR X-KM-LINE CALCULATIONS

To determine in which coordination situation the transmitter* is in, calculations have to be performed on the border-line of the countries B, C and D. Depending on the result of these calculations a preferential frequency is needed in the two-, three- or four country case. Calculation on the X-km line is performed X km beyond the border into the neighbouring country; it is of no importance if the neighbouring country is smaller than this distance x. (see drawing below).



Note

With default application of the line filter the calculated field strength is not necessarily the highest value on the x-km-line. In cases where the coordination triggers are exceeded anyway the exact position of the point found on the (x-km) line is not relevant for the assignment of a coordination status.

In cases where the exact point of highest field strength has to be determined users should switch off the line filter (please contact the programmer for details). This action is not official HCM and has to be avoided in coordination.

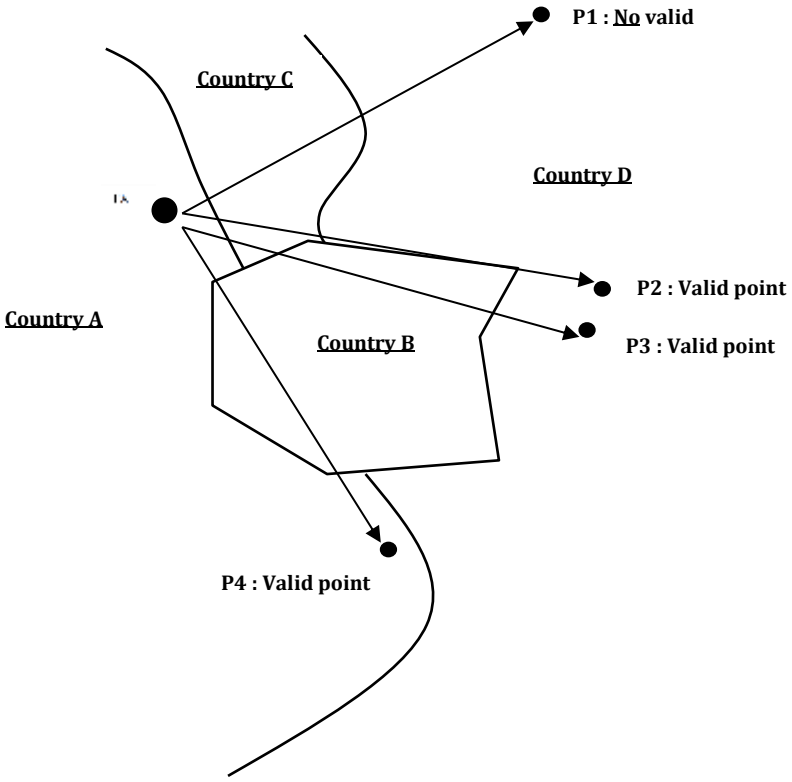
14.7. IN CASE WHERE A PREFERENTIAL FREQUENCY PLAN IS NOT AVAILABLE:

Calculate the cross-border-range to country A, but cross-border-point is in country B. Has country A or B or both to be coordinated with?

The question, which country is to coordinate with, depends only on the field strength at the borderline of this country. If this field strength is higher than the permissible field strength, coordination is required.

If the field strength at the cross-border-range is higher than the permissible field strength, the coordination request can be rejected from those countries, independent whether the point is in or outside those countries.

Calculated CBR points are only valid, when the line between the transmitter and the CBR point intersects with the affected country. See drawing below.



14.8. HOW TO HANDLE OLD “INTR” FREQUENCY REGISTER ENTRIES WITH 4C IS EMPTY

14.8.1. For mobile stations

It is recommended to fill in appropriate coordinates in 4C and an appropriate radius to cover the service area of the transmitter in 4D. This can be done also by surrounding programs without changing the database.

14.8.2. For fixed stations

Not possible in HCM software. Probably implementable in surrounding programs.

14.9. HOW TO REQUEST FREQUENCIES FOR NEW INTR COORDINATIONS

Because of the special needs to put into operation INTR stations, for which no agreed calculation method is available the following cases shall be considered:

1. Preferential frequency agreement is available for the requested frequency band

   - Preferential frequencies shall be applied

2. Preferential frequency agreement is not available for the requested frequency band

   - INTR coordination shall apply for mobile stations only (6A = M*)
   - If INTR coordination is needed for fixed stations (6A = F*), comments with special reasons shall be given in 13Z, followed by special arrangements with the country affected.

3. Although the following calculation method is not agreed, it gives a possible way to perform calculations with INTR stations.

   The INTR station type can be calculated as the "mobile" station with the radius of the service area = 999 km when the centre of the service area is located in the "geometrical centre" of the domestic country. Following this condition the HCM-MS software is able to give the calculation results.

14.10. HOW TO DEAL WITH MISSING PARAMETERS OF OLD COORDINATION ENTRIES FOR THE FREQUENCY REGISTER EXCHANGE

Recommendations to fill in the missing parameters have been developed by 5 administrations and can be found below

Field-name	Problem with old values	Solution	Default value for old entries	Validation-rule
1A	No problems			
1Z	No value available	insert 2 if not known, insert 1 if 13Y=P	2	
6A	No value available	has to be filled in, obligatory		
6B	No value available	OT when empty	OT	
6Z	No value available		XX	
10Z	No problems			
2C	No value available		= field 2Z	
4A	if 4C is empty and 4A is different from "INTR" (zone)	4A= INTR, value of 4A entered in remark		Only characters mentioned in 3.1(annex 2) are allowed
4B			own country code	
4C	if no seconds (old value)	add 00 for the missing seconds		
4D	if 6A is mobile and 4D has no value	fill in 1		
	if 6A is fixed and 4D has no value	fill in 0		
4Z	No problems		empty	
7A	if one of the parts is missing	take the appropriate part of '14K0F3E'		
8B1	if empty for transmitter	fill in 0		
8B2	if empty	fill in 'E'		
9A	if empty	9XH='000ND00'		

Field-name	Problem with old values	Solution	Default value for old entries	Validation-rule
9B	No problems			
9D	if missing	9D=V		
9G	if missing and 1Y is not empty	9G=0	0	
9Y	if missing	9Y=1		
9XH	if missing	9XH='000ND00'		
	if 9A and 9G are not empty	"000ND00" is not allowed, check manually		
9XV	if missing	9XV='000ND00'		
	if 9B is not empty	"000ND00" is not allowed, check manually		
1Y	No problems			
13Z	No problems			Only characters mentioned in 3.1(annex 2) are allowed
13Y	if empty or wrong value	put in value 'A', after the exchange will be changed accordingly to result of comparison	A	
2W	No problems			
2Z	No problems			
13X	if not unique or not filled in, or not valid reference	create a unique and valid reference by:		
		CCC=your country		
		ZZ=50		
		PPPPPP=free choice, resulting reference must remain unique		
		FFRO=0111 if nothing better can be found		

14.11. HOW TO DEAL WITH THE STATUSES OF COORDINATION

Additional information about how to deal with the statuses of coordination can be found in the table below

Status	Applied for co-ordination…(acc. To…)	Definition	Reference main text[I]	1Z[II]	FCC[III]
A	Information	The assignment described is not submitted to a co-ordination procedure and to any protection requirement.		6	N
		Information on frequencies used on the basis of arrangements between operators.	1.3.7	8	
	Notification (4.1.9)[VIII, IX]	… of a temporary use until a date notified in 13Z.		2	
B	Request (4.1.1)	Request for agreement.		2[IV], 4	N
	Request (4.1.8)		4.1.8[V]		M
	Request (excl. 4.2.5)			1	N
	Request (excl. 4.4.2)			3	
C	Answer (4.1.3)	Agreed without reservation.		2, 4	A, O
	Notification (4.1.8)[VI, VIII, IX]		4.1.8[VI, VII]		M, O
D	Answer (4.1.3)	Temporary status: Coordination subject to operational test to show that coexistence is possible.	4.8	2, 4 1, 3	A
E	Answer (4.1.3)	Agreed with the reservation that the requested transmitter produces no interference at the quoted assignment(s) (NIB); revocation of the co-ordination of the requested transmitter requires proof that harmful interference has been caused to the quoted assignment.	4.7.2, 4.7.7	2, 4 1, 3	A, O
	Notification (4.1.8)[VI, VIII, IX]		4.1.8[VI, VII]		M, O
F		Agreed, subject to a requirement identical or analogous to the requirement of RR 4.4.			
G	Answer (4.1.3)	Agreed with the reservation that the requested receiver may be concerned by interference caused by the quoted assignment(s) (NOGAR) or condition(s); revocation of the co-ordination of the quoted assignment(s) cannot be demanded.	4.7.3, 4.7.6, 4.7.7, 4.7.8,	2, 4 1, 3	A, O
	Notification (4.1.8)[VI, VIII, IX]		4.1.8[VI, VII]		M, O
H	Answer (4.1.3)	E+G	as for E+G	2, 4 1, 3	A, O
	Notification (4.1.8) [VI, VIII, IX]		4.1.8 [VI, VII]		M, O
M	Request (4.1.1)	… for modification during a pending co-ordination process	[VII]	2, 4 1, 3	M
P	Notification[VIII, IX]	… according to agreements on			N, O

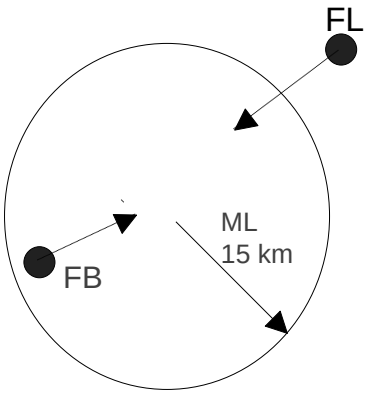
Status	Applied for co-ordination…(acc. To…)	Definition	Reference main text[I]	1Z[II]	FCC[III]
		a) preferential frequencies , b) geographical network plans , c) shared frequencies , d) preferential codes.	a) 1.3.2 b) 1.3.5 c) 1.3.3 d) 1.3.6	1[IX] 3[IX] 5[IX] 7[IX]	
R	Notification (4.1.10)[VIII]	… of a deletion of an entry of the frequency register.		all	D
W	Notification (4.1.7)[VIII]	… of a withdrawal of a request.		2, 4 1, 3	D
Z	Answer (4.1.3)	Request refused because of the quoted assignment(s) or condition(s).	4.7.2, 4.7.7	2, 4 1, 3	A

[I] for setting or applying this status
[II] mandatory Frequency Category acc. App. 4 to Annex 2A
[III] mandatory File Contents Code acc. App. 2 to Annex 2A
[IV] Is set additionally, if a condition of an additional agreement is not met.
[V] increased probability of interference (13X <FFRO> = "NEW", OLD entry: 13Y=R after co-ordination).
[VI] unchanged or decreased probability of interference, a hint on changed field(s) may be given in 13Z.
[VII] 13X unchanged.
[VIII] No answer will be given.
[IX] … as long as the conditions of the agreement and the additional agreement respectively are met.

1A	**:**			**4**	**6**	**8**	**.**	**8**	**4**	**3**	**7**	**5**	**M**															
1Z	:	2																										
6A	:	F	B																									
6B	:	C	O																									
6Z	:	U																										
10Z	:	0																										
2C	:																											
4A	:	B	U	D	A	P	E	S	T																			
4B	:	H	N	G																								
4C	:	0	1	9	E	0	2	3	0	4	7	N	3	3	0	1												
4D	:					0																						
4Z	:		5	3	0																							
7A	:	8	K	5	0	F	3	E	J	N																		
8B1	:			-	3	.																						
8B2	:	E																										
9A	:		8	5	.																							
9B	:		-	1	.	5																						
9D	:	V																										
9G	:	1	2	.	0																							
9Y	:			4	0																							
9XH	:	0	1	0	E	B	0	8																				
9XV	:	1	7	0	P	E	1	0																				
1Y	**:**			**4**	**5**	**8**	**.**	**8**	**4**	**3**	**7**	**5**	**M**															
13Z	:																											
13Y	:	B																										
2W	:	2	5	0	3	2	0	1	0																			
2Z	:																											
13X	:	H	N	G	1	0	S	F	3	1	1	3	0	1	3	1												

SEMI-DUPLEX FB FL ML D
Page 1/3

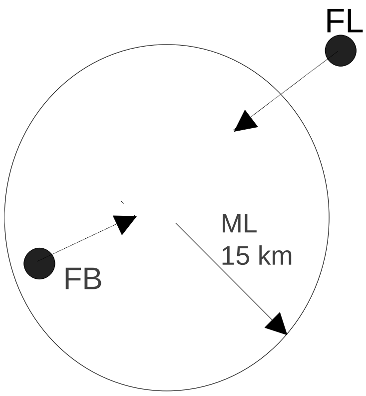
FB	40m	-3 dBW	D
FL	20m	0 dBW	D
ML	3m	3 dBW	ND



Field		Value
1A	**:**	**458.84375M**
1Z	:	2
6A	:	ML
6B	:	CO
6Z	:	U
10Z	:	0
2C	:	
4A	:	R/BUDAPEST
4B	:	HNG
4C	:	019E0330 47N3310
4D	:	15
4Z	:	
7A	:	8K50F3EJN
8B1	:	3.
8B2	:	E
9A	:	
9B	:	
9D	:	V
9G	**:**	**0.0**
9Y	:	3
9XH	:	000ND00
9XV	:	000ND00
1Y	**:**	**468.84375M**
13Z	:	
13Y	:	B
2W	:	25032010
2Z	:	
13X	:	HNG10SF3113 0132

SEMI-DUPLEX FB FL ML D
Page 2/3

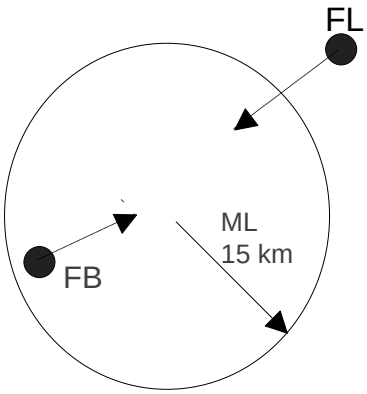
FB	40m	-3 dBW	D
FL	20m	0 dBW	D
ML	3m	3 dBW	ND



1A	**:**			**4**	**5**	**8**	**.**	**8**	**4**	**3**	**7**	**5**	**M**
1Z	:	2											
6A	:	F	L										
6B	:	C	O										
6Z	:	U											
10Z	:	0											
2C	:												
4A	:	B	U	D	A	P	E	S	T		E	A	S	T						
4B	:	H	N	G																
4C	:	0	1	9	E	0	5	4	7	4	7	N	3	3	5	0				
4D	:					0														
4Z	:		2	5	0															
7A	:	8	K	5	0	F	3	E	J	N										
8B1	:				0	.														
8B2	:	E																		
9A	:	2	6	5	.															
9B	:		+	2	.	0														
9D	:	V																		
9G	:	1	2	.	0															
9Y	:			2	0															
9XH	:	0	1	0	E	B	0	8												
9XV	:	0	0	5	E	B	1	0												
1Y	**:**			**4**	**6**	**8**	**.**	**8**	**4**	**3**	**7**	**5**	**M**
13Z	:	D	I	S	P	A	T	C	H	E	R	S	T	A	T	I	O	N		
13Y	:	B																		
2W	:	2	5	0	3	2	0	1	0											
2Z	:																			
13X	:	H	N	G	1	0	S	F	3	1	1	3	0	1	3	3				

SEMI-DUPLEX FB FL ML D
Page 3/3

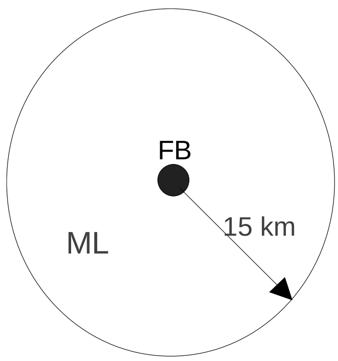
FB	40m	-3 dBW	D
FL	20m	0 dBW	D
ML	3m	3 dBW	ND



1A :			**1**	**7**	**2**	**.**	**6**	**0**	**0**	**0**	**0**	**M**													
1Z :	2																								
6A :	F	B																							
6B :	C	V																							
6Z :	X																								
10Z :	0																								
2C :																									
4A :	B	E	R	N																					
4B :	S	U	I																						
4C :	0	0	7	E	3	0	2	1	4	6	N	5	5	2	4										
4D :					0																				
4Z :		5	5	0																					
7A :	1	1	K	0	G	3	E																		
8B1 :		+	1	4	.																				
8B2 :	E																								
9A :																									
9B :			0	.	0																				
9D :	V																								
9G :		**6**	**.**	**0**																					
9Y :			1	2																					
9XH :	0	0	0	N	D	0	0																		
9XV :	**0**	**4**	**2**	**D**	**E**	**0**	**0**																		
1Y :			**1**	**7**	**2**	**.**	**6**	**0**	**0**	**0**	**0**	**M**													
13Z :																									
13Y :	B																								
2W :	2	5	1	0	2	0	1	0																	
2Z :																									
13X :	S	U	I	1	0	0	0	0	0	0	1	0	1	2	1										

SIMPLEX FB ML ND
Page 1/2

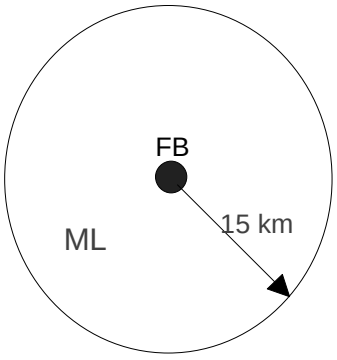
FB	12m	14 dBW	ND
ML	3m	10 dBW	ND



1A	**:**			**1**	**7**	**2**	**.**	**6**	**0**	**0**	**0**	**0**	**M**
1Z	:	2											
6A	:	M	L										
6B	:	C	V										
6Z	:	X											
10Z	:	0											
2C	:												
4A	:												
4B	:	S	U	I									
4C	:	0	0	7	E	3	0	2	1	4	6	N	5	5	2	4
4D	:				1	5										
4Z	:												
7A	:	1	1	K	0	G	3	E					
8B1	:			1	0	.	0						
8B2	:	E											
9A	:												
9B	:												
9D	:	V											
9G	**:**		**0**	**.**	**0**								
9Y	:				3								
9XH	:	0	0	0	N	D	0	0					
9XV	:	0	0	0	N	D	0	0					
1Y	**:**			**1**	**7**	**2**	**.**	**6**	**0**	**0**	**0**	**0**	**M**
13Z	:												
13Y	:	B											
2W	:	2	5	1	0	2	0	1	0				
2Z	:												
13X	:	S	U	I	1	0	0	0	0	0	0	1	0	1	2	2

SIMPLEX FB ML ND
Page 2/2

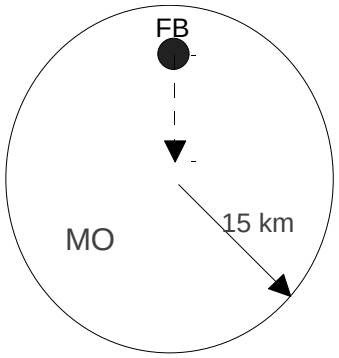
FB 12m 14 dBW ND
ML 3m 10 dBW ND



1A	**:**			**4**	**6**	**5**	**.**	**5**	**5**	**0**	**0**	**0**	**M**																			
1Z	:	1																														
6A	:	F	B																													
6B	:	C	V																													
6Z	:	X	P																													
10Z	**:**	**0**																														
2C	:	3	0	1	1	2	0	1	0																							
4A	:	F	R	E	I	B	U	R	G																							
4B	:	D																														
4C	:	0	0	8	E	0	0	0	1	4	8	N	2	0	1	2																
4D	:					0																										
4Z	:		3	1	0																											
7A	:	1	4	K	0	F	3	E																								
8B1	:				9	.																										
8B2	:	E																														
9A	:	1	8	0	.																											
9B	:			0	.																											
9D	:	V																														
9G	:		6	.																												
9Y	:			1	0																											
9XH	:	0	3	0	E	B	2	0																								
9XV	:	0	6	0	E	B	4	0																								
1Y	**:**			**4**	**6**	**5**	**.**	**5**	**5**	**0**	**0**	**0**	**M**																			
13Z	:																															
13Y	:	P																														
2W	:	2	5	1	1	2	0	1	0																							
2Z	:																															
13X	:	D			1	0	0	0	0	0	0	2	0	1	2	1																

SIMPLEX FB MO D
(PREFERENTIAL NOTIFICATION)
Page 1/2

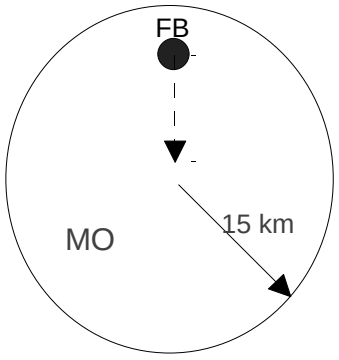
FB 10m 9.0 dBW D
MO 3m 7.8 dBW ND



1A	**:**			**4**	**6**	**5**	**.**	**5**	**5**	**0**	**0**	**0**	**M**																			
1Z	:	1																														
6A	:	M	O																													
6B	:	C	V																													
6Z	:	X	P																													
10Z	**:**	**0**																														
2C	:	3	0	1	1	2	0	1	0																							
4A	:																															
4B	:	D																														
4C	:	0	0	8	E	0	0	0	1	4	8	N	1	5	1	2																
4D	:				1	5																										
4Z	:																															
7A	:	1	4	K	0	F	3	E																								
8B1	:				7	.	8																									
8B2	:	E																														
9A	:																															
9B	:																															
9D	:	V																														
9G	**:**		**0**	**.**	**0**																											
9Y	:				3																											
9XH	:	0	0	0	N	D	0	0																								
9XV	:	0	0	0	N	D	0	0																								
1Y	**:**			**4**	**6**	**5**	**.**	**5**	**5**	**0**	**0**	**0**	**M**																			
13Z	:																															
13Y	:	P																														
2W	:	2	5	1	0	2	0	1	0																							
2Z	:																															
13X	:	D			1	0	0	0	0	0	0	2	0	1	2	2																

SIMPLEX FB MO D
(PREFERENTIAL NOTIFICATION)
Page 2/2

FB 10m 9.0 dBW D
MO 3m 7.8 dBW ND



1A :			1	6	1	.	2	7	5	0	0	M													
1Z :	2																								
6A :	M	L																							
6B :	C	V																							
6Z :	Z																								
10Z :	**0**																								
2C :																									
4A :	I	N	T	R																					
4B :	A	U	T																						
4C :	**0**	**1**	**3**	**E**	**2**	**2**	**0**	**0**	**4**	**7**	**N**	**3**	**4**	**0**	**0**										
4D :			**2**	**9**	**0**																				
4Z :																									
7A :	1	6	K	0	F	3	E																		
8B1 :				8	.																				
8B2 :	E																								
9A :																									
9B :																									
9D :	V																								
9G :		**0**	**.**	**0**																					
9Y :				3																					
9XH :	0	0	0	N	D	0	0																		
9XV :	0	0	0	N	D	0	0																		
1Y :			**1**	**6**	**1**	**.**	**2**	**7**	**5**	**0**	**0**	**M**													
13Z :																									
13Y :	B																								
2W :	2	5	1	1	2	0	1	0																	
2Z :																									
13X :	A	U	T	1	0	0	0	0	0	0	5	0	1	1	1										

SIMPLEX ML
“INTR”

1A	**:**	
1Z	:	2
6A	:	F X
6B	:	O T
6Z	:	E
10Z	:	0
2C	:	
4A	:	A L P E N H O E H E
4B	:	A U T
4C	:	0 1 2 E 1 0 2 2 4 7 E 0 0 0 0
4D	:	0
4Z	:	2 0 4 3
7A	:	1 6 K 0 G 3 E
8B1	:	
8B2	:	E [2]
9A	:	3 5 2 .
9B	:	- 1 0 .
9D	:	H
9G	:	+ 9 . 0
9Y	:	3 5
9XH	:	0 1 5 L A 1 2
9XV	:	0 4 5 E C 2 0
1Y	**:**	**1 4 7 . 7 7 5 0 0 M**
13Z	:	R E C E I V E R O N L Y S T A T O N
13Y	:	B
2W	:	2 5 1 1 2 0 1 0
2Z	:	
13X	:	A U T 1 0 0 0 0 0 0 4 0 1 1 1

Receiver only FX D

FX 35m D

[2]The type of reference antenna (8B2) has to be the same for receiver antenna gain (9G) and max. transmitter power (8B1).

1A	**147.77500M**
1Z	2
6A	FX
6B	OT
6Z	E
10Z	0
2C	
4A	ERLSBACH
4B	AUT
4C	012E10424 6E5433
4D	0
4Z	2453
7A	16K0G3E
8B1	10.
8B2	E
9A	172.
9B	-15.
9D	H
9G	
9Y	15
9XH	015LA12
9XV	045EC20
1Y	
13Z	TRANSMITTER ONLY STATION
13Y	B
2W	25112010
2Z	
13X	AUT10000003 0111

Transmitter only FX D

FX 15m D

1A	:	**8 1 . 3 6 2 5 0 M**
1Z	:	2
6A	:	F B
6B	:	C V
6Z	:	X
10Z	:	0
2C	:	
4A	:	G E I S H O U S E (R A D A R)
4B	:	F
4C	:	0 0 7 E 0 5 5 4 4 7 N 5 5 0 4
4D	:	0
4Z	:	1 4 0 9
7A	:	1 1 K 0 G 3 E
8B1	:	+ 1 0 .
8B2	:	E
9A	:	
9B	:	
9D	:	V
9G	:	3 . 0
9Y	:	1 2
9XH	:	0 0 0 N D 0 0
9XV	:	0 0 0 N D 0 0
1Y	:	**7 6 . 3 6 2 5 0 M**
13Z	:	
13Y	:	B
2W	:	1 6 1 1 2 0 1 0
2Z	:	
13X	:	F 1 0 0 0 0 0 2 1 0 1 2 1

DUPLEX FB FW D
Page 1/2

FB 12m 10 dBW ND
FW 3m 10 dBW ND

1A	**:**	**76.36250M**
1Z	:	2
6A	:	FW
6B	:	CV
6Z	:	X
10Z	:	0
2C	:	
4A	:	GEISHOUSE (RADAR)
4B	:	F
4C	:	007E055447N5504
4D	:	0
4Z	:	1409
7A	:	11K0G3E
8B1	:	+10.0
8B2	:	E
9A	:	
9B	:	
9D	:	V
9G	**:**	**0.0**
9Y	:	3
9XH	:	000ND00
9XV	:	000ND00
1Y	**:**	**81.36250M**
13Z	:	IN ACCORDANCE WITH § 2.5
		OF ANNEX 5
13Y	:	B
2W	:	16112010
2Z	:	
13X	:	F 100000210122

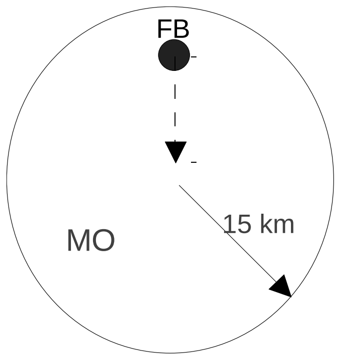
DUPLEX FB FW D
Page 2/2

FB	12m	10 dBW	ND
FW	3m	10 dBW	ND

1A	**:**			**3**	**9**	**1**	**4**	**1**	**5**	**0**	**0**	**0**	**H**													
1Z	:	1																								
6A	:	F	B																							
6B	:	C	V																							
6Z	:	X	P																							
10Z	:	0																								
2C	:	1	6	1	1	2	0	1	0																	
4A	:	S	O	U	F	F	E	L	W	E	Y	E	R	S	H	E	I	M								
4B	:	F																								
4C	:	0	0	7	E	4	6	1	4	4	8	N	3	8	0	3										
4D	:					0																				
4Z	:		1	3	4																					
7A	:	8	K	0	0	G	2	D	C	X																
8B1	:			2	0	.	0																			
8B2	:	I																								
9A	:	2	7	0	.	0																				
9B	:			0	.	0																				
9D	:	S	R																							
9G	:		6	.																						
9Y	:			1	0																					
9XH	:	0	7	5	E	B	6	6																		
9XV	:	0	1	0	E	C	7	5																		
1Y	**:**			**3**	**8**	**1**	**4**	**1**	**5**	**0**	**0**	**0**	**H**													
13Z	:	f	o	r		m	o	r	e		i	n	f	o	r	m	a	t	i	o	n					
		p	l	e	a	s	e		c	o	n	t	a	c	t		m	a	i	l	@	c	o	.	f	R
13Y	:	P																								
2W	:	1	6	1	1	2	0	1	0																	
2Z	:																									
13X	:	F			1	0	0	0	0	4	5	1	0	1	2	1										

SIMPLEX FB MO D
(PREFERENTIAL NOTIFICATION)
Page 1/2

FB	10m	20.0 dBW	D
ML	3m	7.0 dBW	ND



1A	**:**			**3**	**8**	**1**	**4**	**1**	**5**	**0**	**0**	**0**	**H**													
1Z	:	1																								
6A	:	M	O																							
6B	:	C	V																							
6Z	:	X	P																							
10Z	:	0																								
2C	:	1	6	1	1	2	0	1	0																	
4A	:	S	O	U	F	F	E	L	W	E	Y	E	R	S	H	E	I	M								
4B	:	F																								
4C	:	0	0	7	E	4	6	1	4	4	8	N	3	8	0	3										
4D	:				1	5																				
4Z	:																									
7A	:	8	K	0	0	G	2	D	C	X																
8B1	:				7	.	0																			
8B2	:	I																								
9A	:																									
9B	:			0	.	0																				
9D	:	S	R																							
9G	**:**		**0**	**.**	**0**																					
9Y	:				3																					
9XH	:	0	0	0	N	D	0	0																		
9XV	:	0	3	9	D	E	5	0																		
1Y	**:**			**3**	**9**	**1**	**4**	**1**	**5**	**0**	**0**	**0**	**H**													
13Z	:	f	o	r		m	o	r	e		i	n	f	o	r	m	a	t	i	o	n					
		p	l	e	a	s	e		c	o	n	t	a	c	t		m	a	i	l	@	c	o	.	f	R
13Y	:	P																								
2W	:	1	6	1	1	2	0	1	0																	
2Z	:																									
13X	:	F			1	0	0	0	0	4	5	1	0	1	2	2										

SIMPLEX FB MO D
(PREFERENTIAL NOTIFICATION)
Page 2/2

FB 10m 20.0 dBW D
ML 3m 7.0 dBW ND