HCM-MS (C# implementation)

Quick Start Guide 15.12.2021

Foreword

The document describes how to install and use the new HCM software. Follow the steps below to install and operate the application. If you have questions or remarks, please contact the following e-mail addresses:

Erik.falkuss@bnetza.de Cedric.Kalies@bnetza.de

Installation

- 1. Unzip the installation folder in a directory of your choice (with the appropriate rights to run applications).
- 2. Start the application by running the **<u>GUI.exe.</u>**



First Start – Configuration

On first use BORDER, TOPO and MORPHO paths must be set.

1. Press the <u>Settings</u> button.

HCM			;
HCM Single Calculation Read input file Info Calc Mode [0]: Point to Point Calculation Transmitter settings Longitude Type of antenna Horizontal Horizontal Antenna height m Channel occupation I v Azimuth Frequency MHz v Distance over sea km Radus of service area km Profile from Tx to Rx / Border	Vertical	ngs Mapview Reset Lasts Receiver settings Longitude Type of artenna Horizontal Artenna height Mainuth Permissible field strength GBµU/m Azimuth Frequency MHz ✓ Depolarisation loss GB Radius of service area km Une Calculation Border CBR Land to calculate Infolme Infolme Results Maximum field strength GBµU/m Agy/m Permissible field strength GBµU/m	Start Calculation Latitude Gain of Rk antenna Gain of Rk ante
		Protection margin dB Calculated coordinates Tx Calculated coordinate Longitude Latitude Longitude Latitude	Direction vertical • s Rx / on Border ude Details HCM version:

2. In the Settings window, select the path for the respective data type by pressing the **Browse** button. If you haven't installed the data locally, it is possible to download it from the HCM homepage.

Settings		-		×	🖳 Settings		-		×
Topopath					Topopath	D:\TOPO			
			Browse					Browse	
Morphopath					Morphopath	D:\MORPHO			
			Browse					Browse	
Borderpath					Borderpath	D:\BORDER			
			Browse					Browse	
	Save and Close		Cancel			Save and Close		Cancel	

- If you have defined all file paths, confirm the selection by pressing the <u>Save and Close</u> button. The window will close automatically.
- 4. If you want to quit the action, press the <u>Cancel</u> button.

The location of calculation output files (folder "CALCDATA") depends on your system configuration. By useing the <u>Open the folder for Calculation data</u> button, you have access to the CALC DATA files. The button <u>Open the folder for Calculation data</u> is to be found on the info-tab.

Single Calculation

1. First, determine whether it is a point-to-point or point-to-line calculation by selecting the respective **Calculation Mode**.

An example for each Calculation mode is deposited. When you have entered all parameters, press the <u>Start Calculation</u> button.

alc Mode [0]:	Point to Point Calculation	~] luica	History Setting	s Mapview	Reset Lasts		Start Calculation
						_	
ransmitter settings				Receiver settings			
ongitude	013E5435	Latitude	53N0942	Longitude	012E1443	Latitude	49N4844
	13.909722		53.161667		12.245278		49.812222
vpe of antenna	1 ~			Type of antenna	EV	Gain of Rx antenna	2.8 dB
orizontal	033EA20	Vedeel	000ND00	Horizontal	060LA27	Vertical	016EB00
ntenna height	11 m	Verucal		Antenna height	55 m	Height above sea	m
hannel occupation	1 ~	Contractore and		Permissible field strength	-9.7 dBµV/m		
zim th	88 *	Sea temperature	.9.4	Azimuth	58 *	Elevation	0 *
	2586.2 MHz V	Country code	-0.4	Frequency	3438.7 MHz ~	Country code	D
istance over sea	km	Maximum radiated power	17 dBW	Depolarisation loss	5.3 dB	Correction factor acc. to delta frequency	8 dB
adjus of equipe area	19 km	Designation of emission	47/1020/	Radius of service area	9 km	Designation of emission	46K0G9W
adius of service area		Designation of emission	4/KIG2W	Line Calculation			
rofile from Tx to Rx / B	lorder			Border	O CBR	Calculation line	0 km
				Land to calculate		Permissible field strength	dBµV/n
				Infoline			
				Results			
				Maximum field strength	dBµV/m	Distance	km
				Permissible field strength	dBµV/m	Direction horizontal	•
				Protection margin	dB	Direction vertical	•
				Calculated coordinates Tx	Calculated coordinate	s Rx / on Border	
				I anothula I atituda	star obuteen	uda.	

2. The result is displayed in the green box "Results". If you want to see all the output and input parameters, press the <u>Details</u> button. In case of errors a description of the error is given above the result box.

gle Calculation Rea	d input file Info						
Calc Mode [0]	: Point to Point Calculation	Funct	ons History Setting	s Mapview	Reset	asts	Start Calculation
ransmitter settings				Receiver settings			
ongitude	013E5435 13.909722	Latitude	53N0942 53.161667	Longitude	012E1443 12.245278	Latitude	49N4844 49.812222
lune of antenna				Type of antenna	Ε 🗸	Gain of Rx antenna	2.8 dB
lype or antenna	033EA20		000ND00	Horizontal	060LA27	Vertical	016EB00
Antenna height	11 m	Vertical Height above sea	m	Antenna height	55 m	Height above sea	m
hannel occupation	1 ~	Sea temperature	C ~	Permissible field strength	-9.7 dBµV/m	Deveties	
Azimuth	8.8	Elevation	-8.4 *	Frequency	3438.7 MHz ×	Country code	
requency	2586.2 MHz ~	Country code	D	Depolarisation loss	5.3 dB	Correction factor acc.	8 dB
Distance over sea	km	Maximum radiated power	17 dBW	Radius of service area	9 km	to delta frequency Designation of emission	46K0G9W
Radius of service area	a 18 km	Designation of emission	47K1G2W	Line Calculation			
Profile from Tx to By -				Border	O CBR	Calculation line	0 km
			4	Land to calculate		Permissible field streng	th dBμV/m
				The Calculation was success	sful - performed in 472 millis	econds	
			1.1	Results			
			and the	Maximum field strength	-67.18 dBµV/m	Distance	362.85 km
				Permissible field strength	1.49 dBµV/m	Direction horizontal	197.78 *
		Nat		Protection margin	68.67 dB	Direction vertical	0.07 *
	ha	Archelle		Calculated coordinates Tx	Calculated coord	dinates Rx	
				Longitude Latitude	Longitude	Latitude	Details
Show normalized p	vrofile			13.827222 53.0075	12.281111	49.889722	7.212
Tome are reat distance	20. V. I NII					FICINI Version:	7.213

Use of catalogue data

1. Press the <u>History</u> button.

ICM		- 0
gle Calculation Read input file Info		
Calc Mode [0]: Point to Point Calculation V History Sett	ngs Mapview Reset Lasts	Start Calculation
Transmitter settings	Receiver settings	
ongitude Latitude	Longitude Latitude	
	Type of antenna I 🗸 Gain of Rx antenna	dB
	Horizontal Vertical	
International Vertical	Antenna height m Height above sea	m
m Height above sea m	Permissible field strength dBµV/m	
hannel occupation 1 V Sea temperature C V	Azimuth Clevation	•
Izimuth Eevation	Frequency MHz Country code	
requency MHz Country code	Depolarisation loss dB Correction factor acc. to delta frequency	dB
Jistance over sea km Maximum radiated power BBW	Radius of service area km Designation of emission	n
tadius of service area km Designation of emission	Line Calculation	
Penfile from Tu to Du / Paudar	Border CBR Calculation line	km
	Land to calculate Permissible field streng	th dBµV/m
	Infoline	
	Results	
	Maximum field strength dBµV/m Distance	km
	Permissible field strength dBµV/m Direction horizontal	•
	Protection margin dB Direction vertical	•
	Calculated coordinates Tx Calculated coordinates Rx / on Border	
	Longitude Latitude Longitude Latitude	Detaile
		Ucidits
	HCM version:	

2. Press the <u>Change</u> button to select the path for CATALOG folder. (*Note: It is possible to select the CATALOG folder from the "old" HCM.exe*).

Calc Mode	e Coordinates	Frequency	Antennaheigh
•			-
< [m		

3. After confirmation, a table should appear. This table lists all former configurations. If you want to re-calculate one of these predictions, you will mark the line or a value of this line. Then push the <u>Select Configuration</u> button to fill the user interface with the specific data.

-2 008E312153N00 790.00000M 18
-2 008E312153N00 790.00000M 18
▶ -2 008E312153N00 790.00000M 18
-2 008E312153N00 790.00000M 18
-2 008E312153N00 790.00000M 18
-2 015E054851N16 790.00000M 18
2 000E411047bi22 700 000004 10

Read input file for calculation

1. To execute a multiple calculation choose the Page **<u>Read input file.</u>**

🊱 на	CM									-	- ×
Single	e Calcula	tion Read input file	Info								
F	Read inpu	ut file									
		Path of input file					Browse	Settings			
		Calculation log					Start Calculation	Save Results	HCM version:	Calculate selected row(s)	
		#	C_mode	Coo_Tx	H_Tx_input	Ant_typ_H_Tx	Ant_typ_V_Tx	Azi_Tx_input	Be_Tx_input	H_Tx_ant	
		2	C_mode	Coo_Tx	H_Tx_rput	Art_typ_H_Tx	Art_yp_V_Tx	Ag_Tr_input	Be_Tx_nput	H_Tx_ort	
		٢								>	

2. Press the <u>Browse</u> button to select a file. If you have not configured the settings yet, you will have to do so now by pressing the <u>Settings</u> button.

🚱 НСМ									-		×
Single Calculation	Read input file Info										
- Read input file Pa	ath of input file D:\Hi	CM\Ausgabe gleich Ei	ingabe Test.txt			Browse Start Calculation	Settings Save Results	HCM version:	Calculate selected row(s)]	
٢	#	C_mode	Coo_Tx	H_Tx_input	Art_typ_H_Tx	Ant_typ_V_Tx	As_Tx_nput	Be_Tx_nput	H_Tx_are		

3. To start the calculation push the <u>Start Calculation</u> button.

Calculatio	n Re	ad input file	Info									
and incut f	la											
	~		_									
	Path	of input file	D:\HCI	M\Ausgabe gleich Einga	sbe Test.txt			Browse	Settings			
			Multi-ca	alculation of 50 datasets	successful							
	Cal	culation log						Start	Save	HCM versio	n: Calcula	te selected
								Calculation	nesuits	7.213		ow(s)
Г	-	# C.	_mode	Coo_Tx	H_Tx_input	Ant_typ_H_Tx	Ant_typ_V_Tx	Azi_Tx_input	Ele_Tx_input	H_Tx_ant	Max_power	Type ^
•		1 0		007E014552N2504		037EC71	002EB40	16.6	-8.8	94	16.1	1
		2 -1		011E520647N5850		002KA12	009LA14	301.5	-2.1	29	1.9	1
		3 -1		009E101747N4549		000ND00	014EC31	336.5	-4.0	57	3.9	1
		4 0		013E543553N0942		033EA20	000ND00	8.8	-8.4	11	17.0	1
		5 -1		008E383749N1432		032EA25	000ND00	2.7	-1.4	70	19.4	1
		6 0		006E262750N0540		039EA20	007EA32	170.6	-0.9	73	22.4	1
		7 -1		006E514651N2648		090LA10	003EC35	296.2	-2.7	55	22.9	1
		8 -1		008E042849N1122		017EA06	000ND00	268.0	-8.5	14	27.5	1
		9 -1		007E023452N1303		016EA06	005EC02	99.2	-2.5	39	23.6	1
		10 0		006E582349N2733		010KA21	010EB24	67.3	-2.4	20	11.8	1
		11 -1		012E022850N1457		031EA07	033EC00	159.8	-6.5	32	14.3	1
		12 -1		012E295650N2332		001EB72	034EC00	334.0	-4.6	68	3.8	1
		13 -1		010E464547N3334		050EA09	000ND00	148.0	-2.9	80	4.4	1
		14 0		013E564451N0339		109LA03	011EB29	203.4	-7.6	23	31.2	1
		15 0		007E485948N0232		038EA34	010LA20	332.1	-8.9	40	16.9	1
		16 0		012E415648N1125		000ND00	013EC30	171.7	-1.3	50	23.4	1
		17 -1		014E202353N1940		018EA06	015EA22	83.8	-9.1	99	25.7	1
		18 0		007E375847N3513		018EB01	020LA09	205.3	-1.7	90	2.3	1
		19 0		006E074751N0620		000ND00	034LA05	17.6	-0.7	56	29.1	1
		20 0		006E574649N1650		039EA20	007LA35	120.3	-3.7	35	30.4	1
		21 -1		007E561047N3307		032EA28	052EA21	182.0	-3.8	31	7.3	1 ×

- 4. If you want to safe the results, you can use the <u>Save Results</u> button to generate a txt file and a csv file.
- 5. By pressing the <u>Calculate selected row(s) button</u>, the checked lines will be calculated and shown in the table.

lation	Read inn	ut file Info									
Iduon	ricou rip	or no mo									
put file											
p	ath of innu	t file	CM\Ausarba alsich Eina	she Test tut			Provine	Settings			
		A life D. dia	chi viusgabe gleich bing	abe restant			browse	Jetti iya			
		Multi-	calculation of 50 datasets	s successful					HCM versi		
	Calculatio	in log					Start Calculation	Save Results	7.040	Calcul	ate selected
									7.213		
	#	C mode	Coo Tx	H Tx input	Ant typ H Tx	Ant typ V Tx	Azi Tx input	Ele Tx input	H Tx ant	Max power	Type 1
	1	0	007E014552N2504		037EC71	002EB40	16.6	-8.8	94	16.1	
	2		011E520647N5850		002KA12	009LA14	301.5				1
۶.	3		009E101747N4549		000ND00	014EC31	336.5	-4.0		3.9	1
	4	0	013E543553N0942		033EA20	000ND00	8.8	-8.4	11	17.0	1
	5	-1	008E383749N1432		032EA25	000ND00	2.7	-1.4	70	19.4	1
	6	0	006E262750N0540		039EA20	007EA32	170.6	-0.9	73	22.4	1
	7	-1	006E514651N2648		090LA10	003EC35	296.2	-2.7	55	22.9	1
	8	-1	008E042849N1122		017EA06	000ND00	268.0	-8.5	14	27.5	1
	9	-1	007E023452N1303		016EA06	005EC02	99.2	-2.5	39	23.6	1
	10	0	006E582349N2733		010KA21	010EB24	67.3	-2.4	20	11.8	1
	11	-1	012E022850N1457		031EA07	033EC00	159.8	-6.5	32	14.3	1
	12	-1	012E295650N2332		001EB72	034EC00	334.0	-4.6	68	3.8	1
	13	-1	010E464547N3334		050EA09	000ND00	148.0	-2.9	80	4.4	1
	14	0	013E564451N0339		109LA03	011EB29	203.4	-7.6	23	31.2	1.1
	15	0	007E485948N0232		038EA34	010LA20	332.1	-8.9	40	16.9	1
	16	0	012E415648N1125		000ND00	013EC30	171.7	-1.3	50	23.4	1
	17	-1	014E202353N1940		018EA06	015EA22	83.8	-9.1	99	25.7	1
	18	0	007E375847N3513		018EB01	020LA09	205.3	-1.7	90	2.3	1
	19	0	006E074751N0620		000ND00	034LA05	17.6	-0.7	56	29.1	1
	20	0	006E574649N1650		039EA20	007LA35	120.3	-3.7	35	30.4	1

6. Result as shown.

🚱 HCN

and here	tion R	lead input	t file Info									
sad inpu	Pati	h of input	file D:\HCM	/\Ausgabe gleich Einga	abe Test.txt			Browse	Settings			
	С	alculation	Multi-ca	Iculation of 3 datasets e	successful			Start Calculation	Save Results	HCM version 7.213	on: Calculi	ate selected row(s)
		#	C mode	Coo Tx	H Tx input	Ant typ H Tx	Ant typ V Tx	Azi Tx input	Ele Tx input	H Tx ant	Max power	Type of
	Þ	1	0	007E014552N2504		037EC71	002EB40	16.6	-8.8	94	16.1	1
		2	-1	011E520647N5850		002KA12	009LA14	301.5	-2.1	29	1.9	1
		3	-1	009E101747N4549		000ND00	014EC31	336.5	-4.0	57	3.9	1

7. If there is only one line checked, the whole configuration will be transformed in the Single Calculation window by pressing the <u>Calculate selected row(s) button</u>.

											-	
le Calculation	Read inpu	ut file Info										
Read input file												
Path of input file D:\HCM\Ausgabe gleich Eingabe Test.txt					Browse	Settings						
		Multi-cale	culation of 3 datasets :	successful								
Calculation log						Start Calculation	Save Results	HCM version: Calculate selected row(s)				
									7.213			
	#	C_mode	Coo_Tx	H_Tx_input	Ant_typ_H_Tx	Ant_typ_V_Tx	Azi_Tx_input	Ee_Tx_input	H_Tx_ant	Max_power	Type_of_	
	1	0	007E014552N2504		037EC71	002EB40	16.6	-8.8	94	16.1	1	
E.	2	-1	011E520647N5850		002KA12	009LA14	301.5	-2.1	29	1.9	I	
	3	-1	009E101747N4549		000ND00	014EC31	336.5	-4.0	57	3.9	1	

8. Result as shown.

le Calculation Re	ad input file Info						
alc Mode [-1]	: Line Calculation (h = 10	m) ~	History Set	tings Mapview	Reset	Lasts	Start Calculation
ransmitter settings				Receiver settings			
ongitude	011E5206	Latitude	47N5850 47.980556	Longitude		Latitude	
vne of antenna				Type of antenna	Е 🗸	Gain of Rx antenna	dB
orizontal	002KA12	Vetical	009LA14	Horizontal	000ND00	Vertical	000ND00
ntenna height	29 m	vertical Height above sea		Antenna height	m	Height above sea	m
hannel occupation	0 ~	Sea temperature	~	Permissible field strength	dBμV/m		
zimuth	301.5	Elevation	-2.1	Azimuth	0 *	Elevation	0 *
requency	121.5 MHz ~	Country code	D	Frequency	MHz ~	Country code	
istance over sea	km	Maximum radiated powe	r 1.9 dBW	Depolarisation loss	dB	to delta frequency	dB
adius of service are	a 13 km	Designation of emission	25K0G7W	Radius of service area	km	Designation of emission	in
				Line Calculation	0		
rofile from Tx to Bor	der			Border	CBR	Calculation line	0 km
				Land to calculate	F	Permissible held stren	gtn 6.4 dBµv/n
and such	4	"/ H		Results	ssful - performed in 926 mil	liseconds	
			addala di .	Maximum field strength	-29.16 dBµV/m	Distance	276.50 km
				Permissible field strength	6.40 dBµV/m	Direction horizontal	293.49 *
			- 1°Y	Protection margin	35.56 dB	Direction vertical	-0.10
				Calculated coordinates T	x Calculated cod	rdinates on Border	
				Longitude Latitude	Longitude	Latitude	Detaile
				11.708056 48.0272	8.233333	48.966667	Decails
ofile line Text distar	nce: 0.1 km					HCM version:	7.213

Map View

1. To display the points of the calculation in a map, press the button <u>Mapview</u>. When this button is activated, the web browser window opens and shows the current calculated configuration. A working internet connection is required to use the map feature.

gle Calculation Re	ad input file Info						
Calc Mode [0]	: Point to Point Calculatio	n ~	History Set	tings Mapview	Reset La	sts	Start Calculation
Fransmitter settings				Receiver setting			
longitude	14.628611 014E3743	Latitude	48.8675 48N5203	Longitude	8,397778 008E2352	Latitude	49,853333 49N5112
Type of antenna	E v			Type of antenna		Gain of Rx antenna	
Horizontal	012EA05	Vertical	012EA05	Antenna height	10 m	Venical Height above sea	0 m
Antenna height Channel occupation	29 m	Height above sea Sea temperature	C ~	Permissible field strengt Azimuth	h 0 dBµV/m	Flevation	
Azimuth	200 *	Elevation	-2 *	Frequency	900 MHz ~	Country code	D
Distance over sea	SUU MHZ V	Country code Maximum radiated power	- 14.22 dBW	Depolarisation loss	0 dB	Correction factor	0 dB
Radius of service are	ea 10 km	Designation of emission	80M0G7WET	Line Calculation	U KM	Designation of emission	1 80M0G/WET
Profile from Tx to Rx				Border Land to calculate	CBR	Calculation line Permissible field streng	0 km gth dBµV/m
J.A.	<u>M</u>			The Calculation was succe Results	ssful - performed in 530 millise	conds	
				Permissible field strength	0.00 dBµV/m	Distance Direction horizontal	454.24 Km 285.91 °
the second se				Protection margin	106.66 dB	Direction vertical	-0.06 *
				Calculated coordinates 1	x Calculated coordi	nates Rx	
Show normalized	profile			Longitude Latitude 14.497222 48.8922	Longitude 222 8.397778	49.853333	<u>Details</u>
Profile line Text distan	nce: 0.1 km					HCM version:	7.213

To measure the distance, use the → button.
 To reset the view, use the button.

To update the points on the map, use the $\frac{z}{z}$ button.

To change the background-map, use button. Open Street Map (basic view) and satellite map are available.



Satellite-view



Measure-Tool with Tooltip to add or delete points

DLL for C/C++ programs (or any other languages that don't use CLR)

Direct integration of the C#-DLL (*HCMMS_CS.dll*) is only possible for .NET programs. Programs written in other languages need some extra code to use the C#-DLL, e.g. a wrapper.

The test release now contains another DLL (*HCMMS_UMB.dll*) that can be used as bridge between surrounding programs written in C/C++ or other languages and the C#-DLL (see figure below).

HCMMS_UMB.dll shall provide the same interface as the Fortran-DLL and can (together with the C#-DLL) be used to replace the Fortran-DLL without writing extra code. Put both DLLs (*HCMMS_CS.dll* AND *HCMMS_UMB.dll*) in the same folder where the Fortran-DLL resides and reference the *HCMMS_UMB.dll* in your program / code.



Data flow between surrounding program and C#-DLL

The interface to HCMMS_UMB.dll is part of official HCM-MS documentation and can be downloaded from the HCM homepage. Additionally the header file of the HCMMS_UMB.dll is included in the interface documentation of the C#-DLL that can be found on the HCM homepage (programs\mobile service\Test version\CSharp Implementation\Interface documentation.pdf).