

HCM-MS (C# implementation)

Quick Start Guide

16.04.2026

Foreword

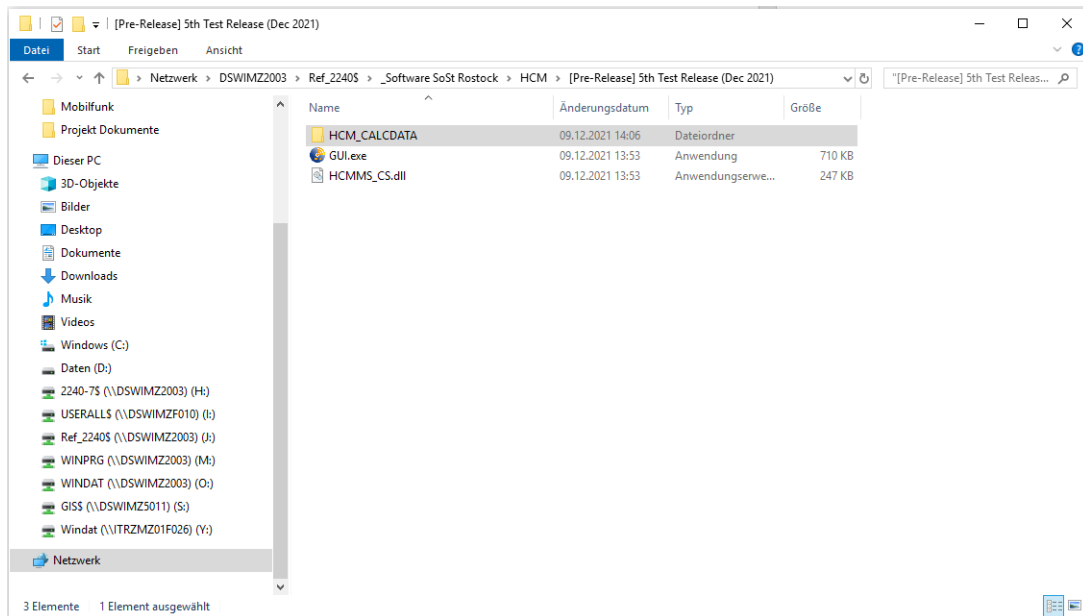
The document describes how to install and use the new HCM software. Follow the steps below to install and operate the application. If you have questions or remarks, please contact the following e-mail addresses:

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Installation

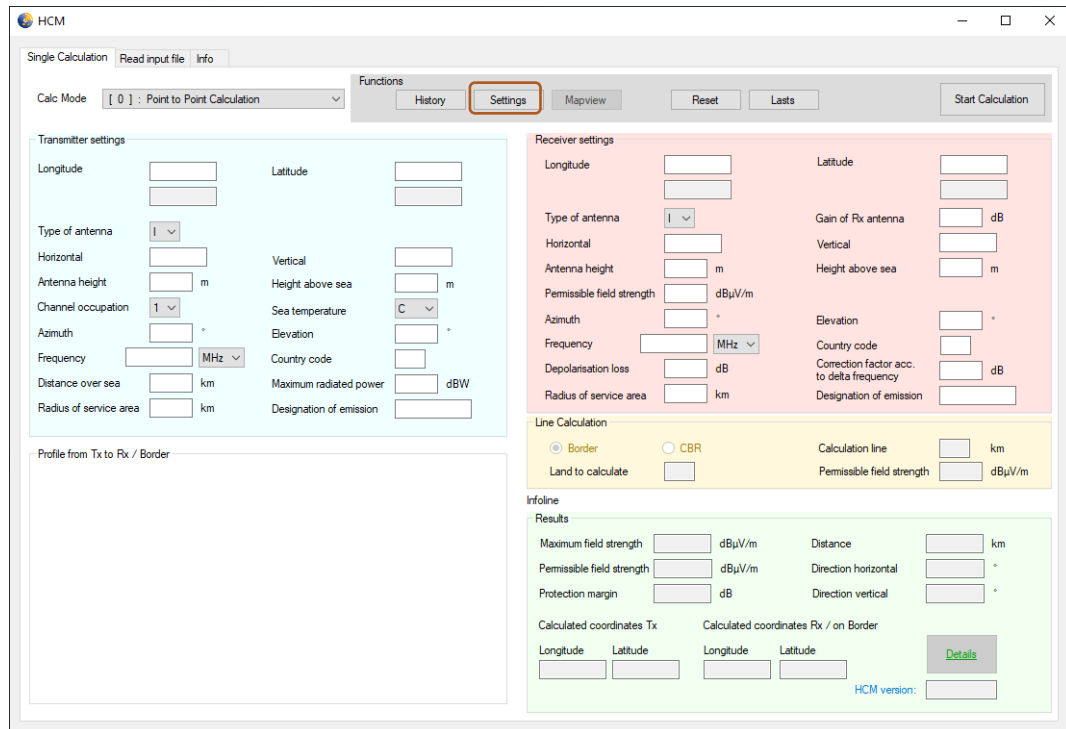
1. Unzip the “HCMMS_CS vx.x.zip” in a directory of your choice (with the appropriate rights to run applications).
2. Start the application by running the GUI.exe.



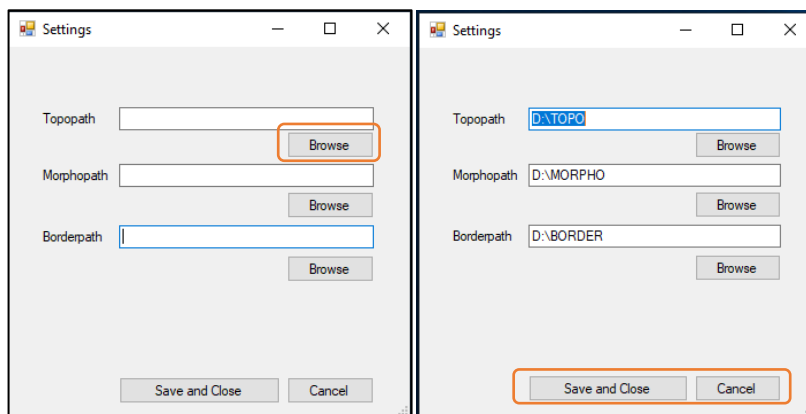
First Start – Configuration

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

1. Press the **Settings** button.



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.



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

The location of calculation output files (folder "CALCDATA") depends on your system configuration. By using the **Open the folder for Calculation data** button, you have access to the CALC DATA files. The button **Open the folder for Calculation data** 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 **Start Calculation** button.

The screenshot shows the HCM Single Calculation window. The 'Calc Mode' is set to '[0] : Point to Point Calculation'. The 'Start Calculation' button is highlighted with a red box. The window is divided into several sections: Transmitter settings, Receiver settings, Line Calculation, and Results. The Transmitter settings section includes fields for Longitude (013E5435), Latitude (53N0942), Type of antenna (I), Horizontal (033EA20), Vertical (000ND00), Antenna height (11 m), Height above sea (0 m), Channel occupation (1), Sea temperature (C), Azimuth (8.8 °), Elevation (-8.4 °), Frequency (2586.2 MHz), Country code (D), Distance over sea (0 km), Maximum radiated power (17 dBW), Radius of service area (18 km), and Designation of emission (47K1G2W). The Receiver settings section includes fields for Longitude (012E1443), Latitude (49N4844), Type of antenna (E), Gain of Rx antenna (2.8 dB), Horizontal (060LA27), Vertical (016EB00), Antenna height (55 m), Height above sea (0 m), Permissible field strength (-9.7 dBuV/m), Azimuth (58 °), Elevation (0 °), Frequency (3438.7 MHz), Country code (D), Depolarisation loss (5.3 dB), Correction factor acc. to delta frequency (8 dB), Radius of service area (9 km), and Designation of emission (46K0G9W). The Line Calculation section has radio buttons for 'Border' (selected) and 'CBR', and a 'Calculation line' field set to 0 km. The Results section is empty, and the 'Details' button is visible.

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

The screenshot shows the HCM Single Calculation window after a successful calculation. The 'Results' section is now populated with the following values: Maximum field strength (-67.18 dBuV/m), Distance (362.85 km), Permissible field strength (1.49 dBuV/m), Direction horizontal (197.78 °), Protection margin (68.67 dB), and Direction vertical (0.07 °). The 'Calculated coordinates Tx' are Longitude 13.827222 and Latitude 53.0075, and the 'Calculated coordinates Rx' are Longitude 12.281111 and Latitude 49.889722. The 'Details' button is highlighted with a red box. The 'Profile from Tx to Rx' section shows a graph of the profile line with a distance of 0.1 km. The 'HCM version' is 7.213.

Use of catalogue data

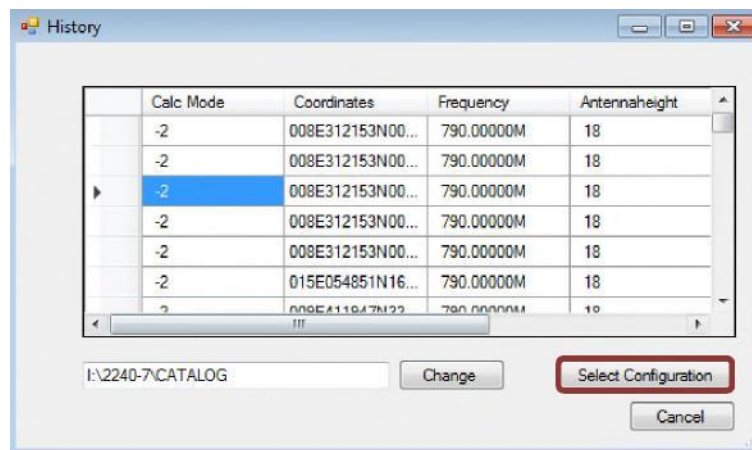
1. Press the **History** button.

The screenshot shows the HCM software interface. The 'History' button is highlighted with a red rectangle. The interface includes several sections: 'Transmitter settings' (Longitude, Latitude, Type of antenna, Antenna height, Channel occupation, Azimuth, Frequency, Distance over sea, Radius of service area), 'Receiver settings' (Longitude, Latitude, Type of antenna, Gain of Rx antenna, Horizontal, Vertical, Antenna height, Height above sea, Permissible field strength, Azimuth, Elevation, Frequency, Country code, Depolarisation loss, Correction factor acc. to delta frequency, Radius of service area, Designation of emission), 'Line Calculation' (Border, Land to calculate, Calculation line, Permissible field strength), and 'Info/line Results' (Maximum field strength, Distance, Permissible field strength, Direction horizontal, Protection margin, Direction vertical, Calculated coordinates Tx, Calculated coordinates Rx / on Border, Longitude, Latitude, HCM version).

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

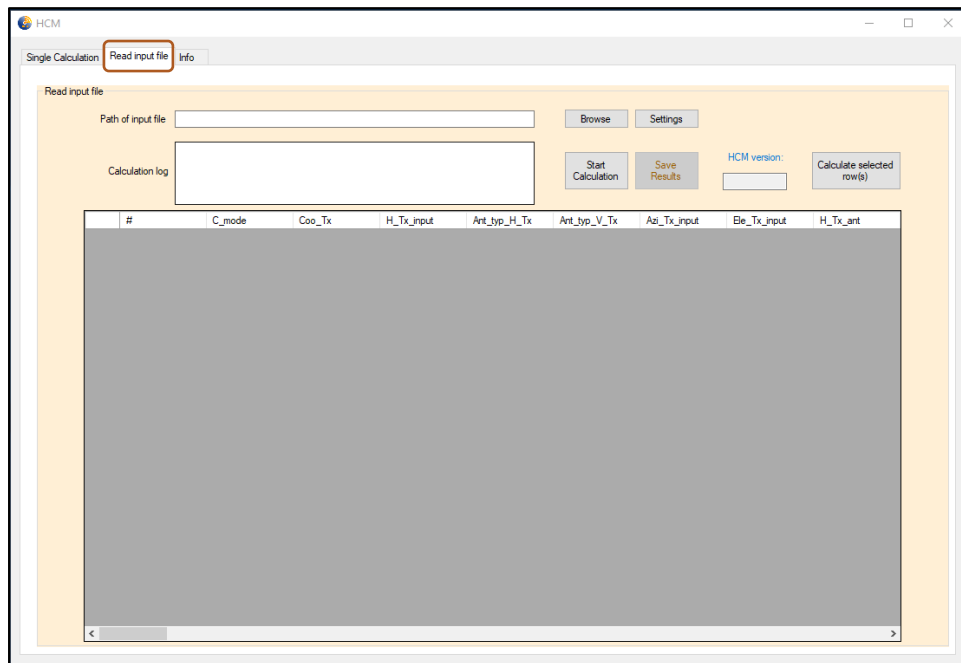
The screenshot shows the 'History' dialog box. It contains a table with columns: Calc Mode, Coordinates, Frequency, Antenna height, and Field strength. Below the table is a text input field labeled 'historypath' and a 'Change' button, which is highlighted with a red rectangle. Other buttons include 'Select Configuration' and 'Cancel'.

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 **Select Configuration** button to fill the user interface with the specific data.

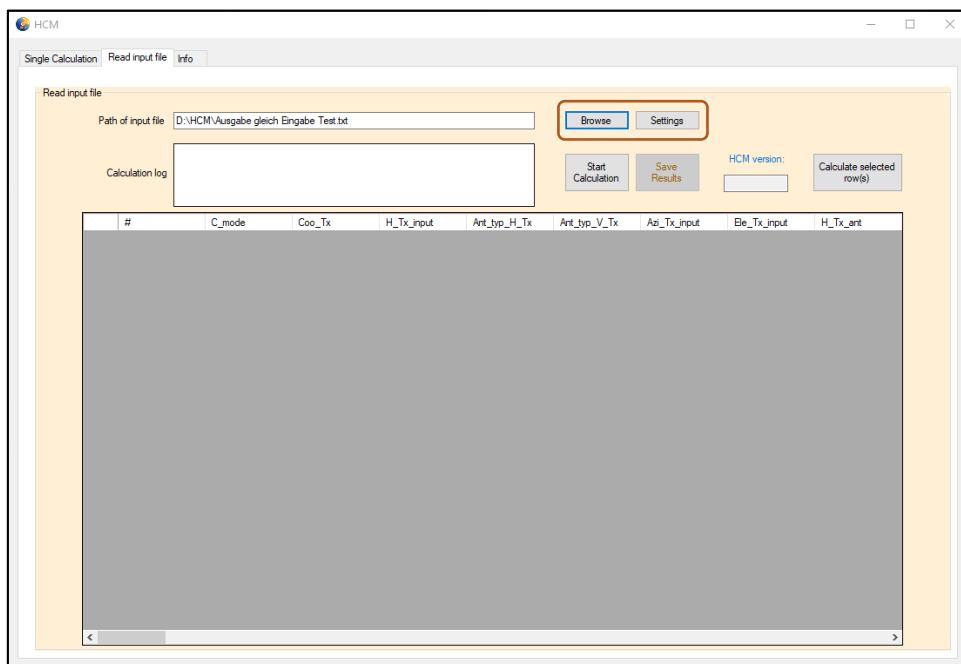


Read input file for calculation

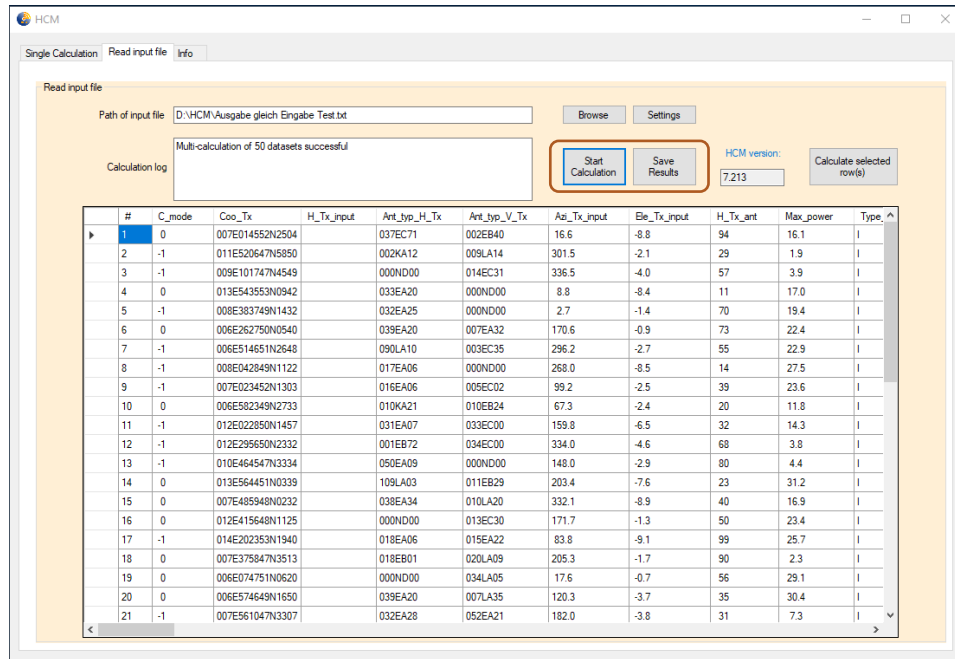
1. To execute a multiple calculation choose the Page **Read input file**.



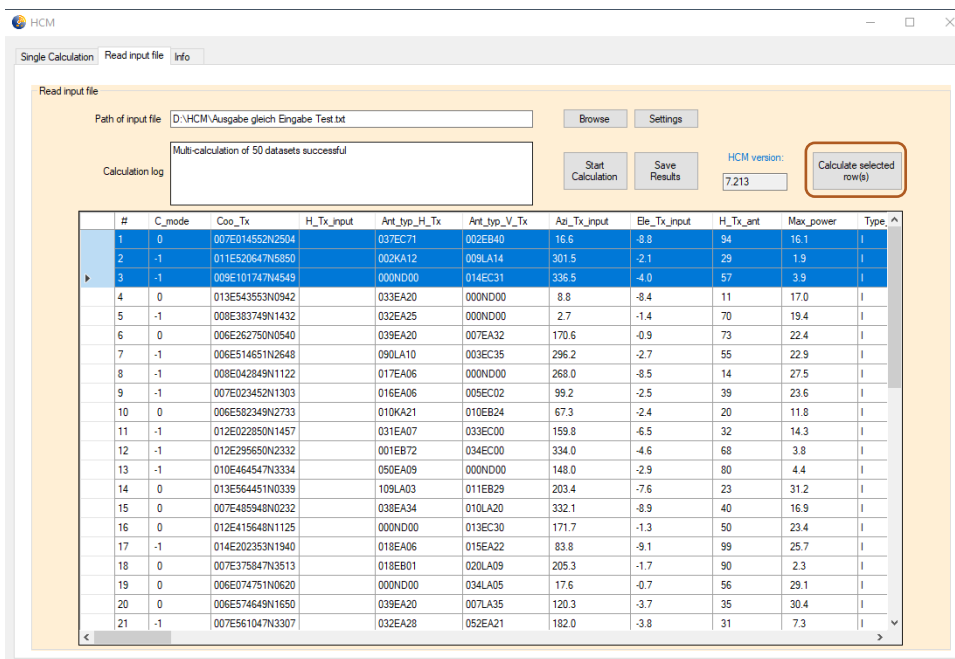
2. Press the **Browse** button to select a file. If you have not configured the settings yet, you will have to do so now by pressing the **Settings** button.



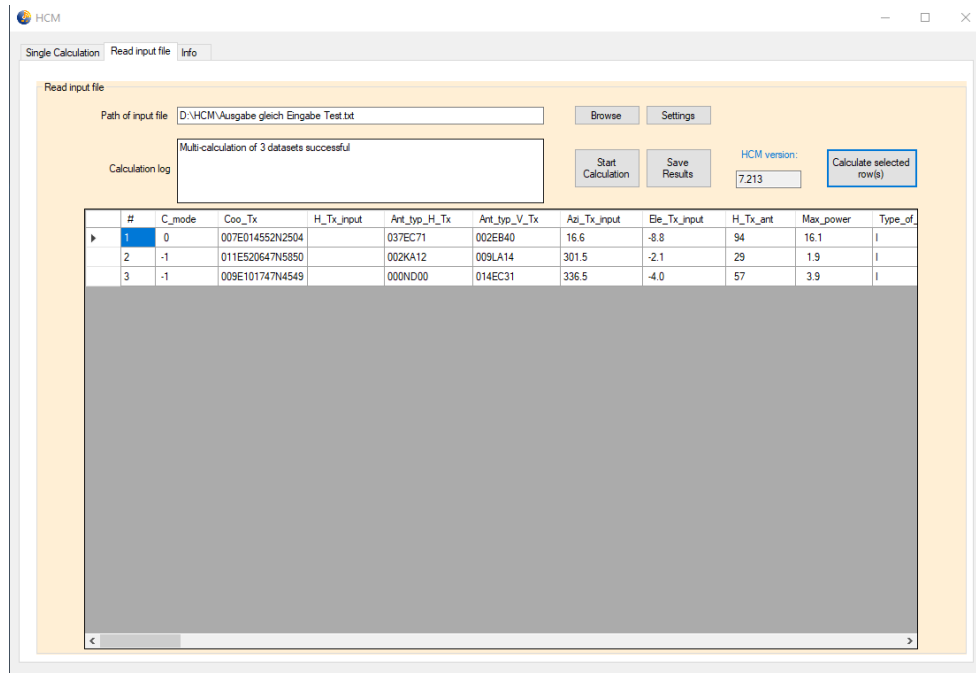
- To start the calculation push the **Start Calculation** button.



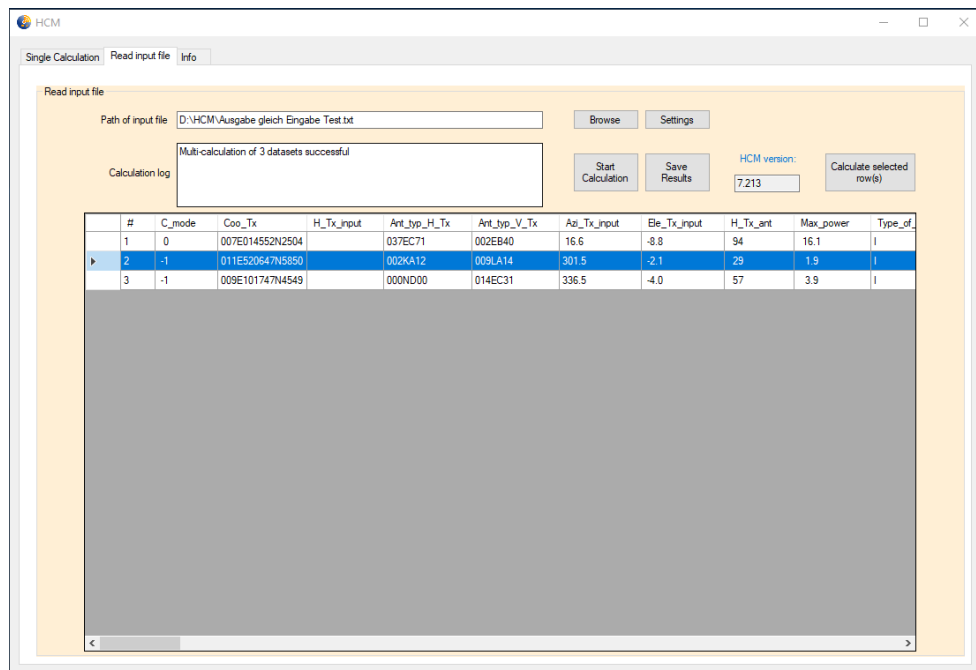
- If you want to save the results, you can use the **Save Results** button to generate a txt file and a csv file.
- By pressing the **Calculate selected row(s)** button, the checked lines will be calculated and shown in the table.



6. Result as shown.



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



8. Result as shown.

HCM

Single Calculation
Read input file
Info

Calc Mode
[-1] : Line Calculation (h = 10m)

Functions
History
Settings
Mapview
Reset
Lasts
Start Calculation

Transmitter settings

Longitude
011E5206
Latitude
47N5850

Type of antenna
I

Horizontal
002KA12
Vertical
009LA14

Antenna height
29 m
Height above sea
m

Channel occupation
0
Sea temperature

Azimuth
301.5 °
Elevation
-2.1 °

Frequency
121.5 MHz
Country code
D

Distance over sea
km
Maximum radiated power
1.9 dBW

Radius of service area
13 km
Designation of emission
25K0G7W

Receiver settings

Longitude
Latitude

Type of antenna
E
Gain of Rx antenna
dB

Horizontal
000ND00
Vertical
000ND00

Antenna height
m
Height above sea
m

Permissible field strength
dBuV/m

Azimuth
0 °
Elevation
0 °

Frequency
MHz
Country code

Depolarisation loss
dB
Correction factor acc. to delta frequency
dB

Radius of service area
km
Designation of emission

Line Calculation

☒ Border
☐ CBR
Calculation line
0 km

Land to calculate
F
Permissible field strength
6.4 dBuV/m

The Calculation was successful - performed in 926 milliseconds

Results

Maximum field strength
-29.16 dBuV/m
Distance
276.50 km

Permissible field strength
6.40 dBuV/m
Direction horizontal
293.49 °

Protection margin
35.56 dB
Direction vertical
-0.10 °

Calculated coordinates Tx

Longitude
Latitude
Longitude
Latitude

11.708056
48.027222
8.233333
48.966667

Details

Calculated coordinates on Border

Longitude
Latitude

8.233333
48.966667

Profile from Tx to Border

Profile lineText distance: 0.1 km

HCM version: 7.213

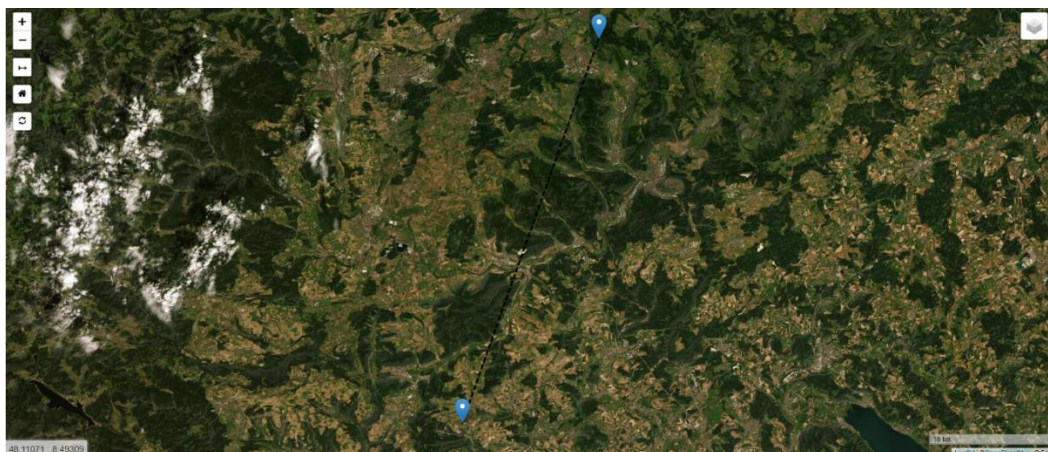
Map View

1. To display the points of the calculation in a map, press the button **Mapview**. 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.

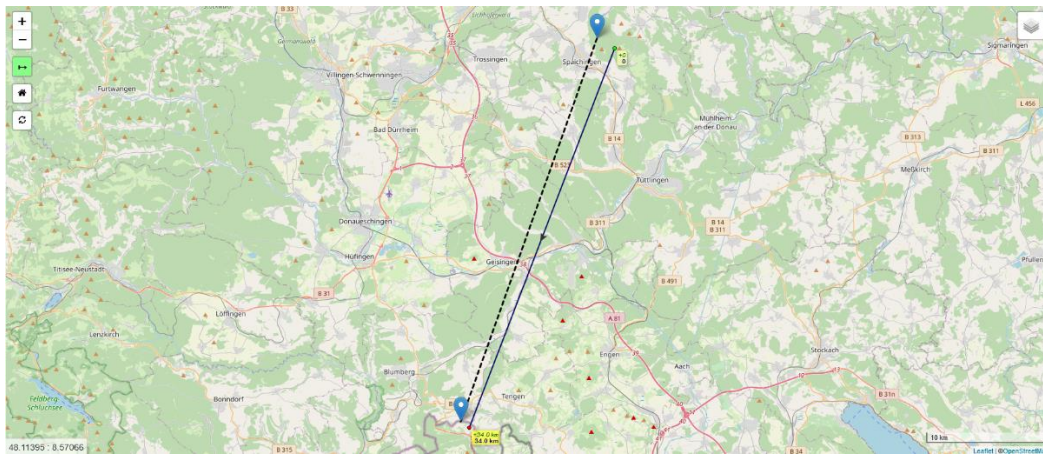
The screenshot shows the HCM software interface. The 'Functions' tab is active, and the 'Mapview' button is highlighted with a red box. The interface is divided into several sections:

- Transmitter settings:** Includes fields for Longitude (14.628611), Latitude (48.8675), Type of antenna (E), Horizontal (012EA05), Vertical (012EA05), Antenna height (29 m), Height above sea (0 m), Channel occupation (1), Sea temperature (C), Azimuth (200), Elevation (-2), Frequency (900 MHz), Country code (D), Distance over sea (0 km), Maximum radiated power (14.22 dBW), Radius of service area (10 km), and Designation of emission (80MOG7WET).
- Receiver setting:** Includes fields for Longitude (8.397778), Latitude (49.853333), Type of antenna (E), Gain of Rx antenna (0 dB), Horizontal (000ND00), Vertical (000ND00), Antenna height (10 m), Height above sea (0 m), Permissible field strength (0 dBuV/m), Azimuth (0), Elevation (0), Frequency (900 MHz), Country code (D), Depolarisation loss (0 dB), Correction factor (0 dB), Radius of service area (0 km), and Designation of emission (80MOG7WET).
- Line Calculation:** Includes options for Border (selected) and CBR, Land to calculate (0 km), and Permissible field strength (0 dBuV/m).
- Results:** Displays Maximum field strength (-106.66 dBuV/m), Permissible field strength (0.00 dBuV/m), Protection margin (106.66 dB), Distance (454.24 km), Direction horizontal (285.91), and Direction vertical (-0.06).
- Calculated coordinates:** Shows Tx coordinates (Longitude: 14.497222, Latitude: 48.892222) and Rx coordinates (Longitude: 8.397778, Latitude: 49.853333).
- Profile from Tx to Rx:** A graph showing the signal profile with a red line indicating the profile line text distance of 0.1 km.

2. To measure the distance, use the button.
To reset the view, use the button.
To update the points on the map, use the 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.



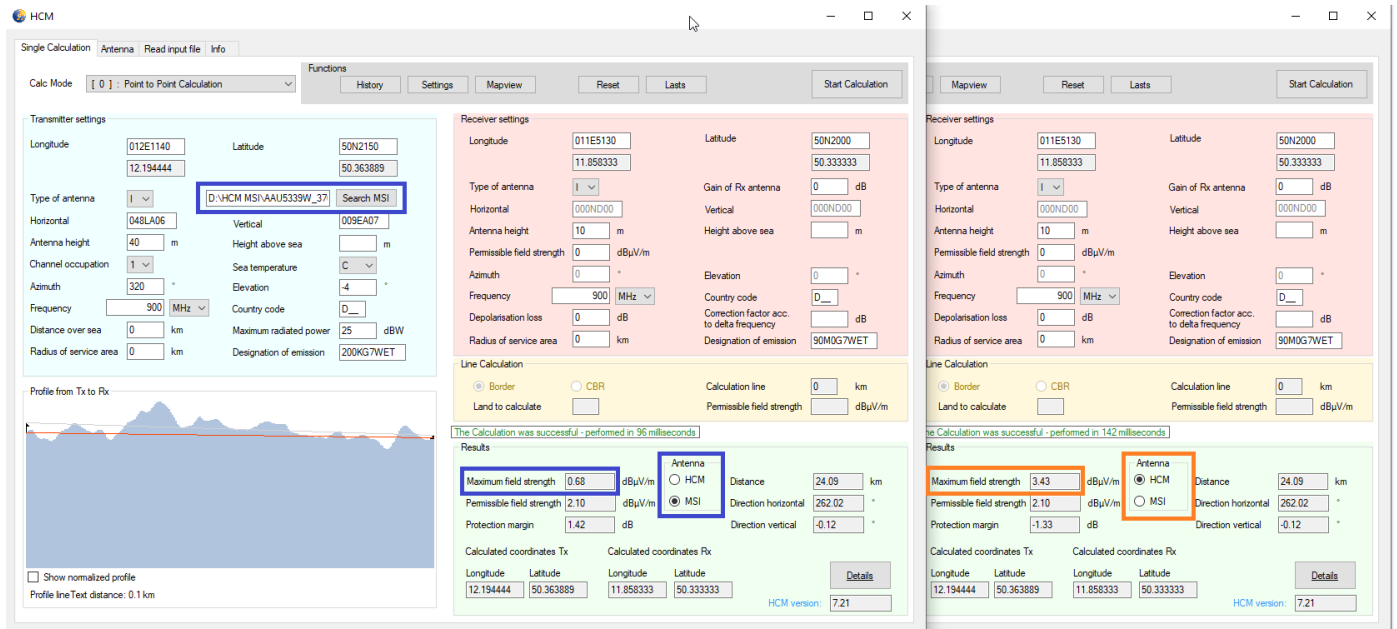
Data flow between surrounding program and C#-DLL

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).

Usage of MSI antenna pattern for HCM calculation

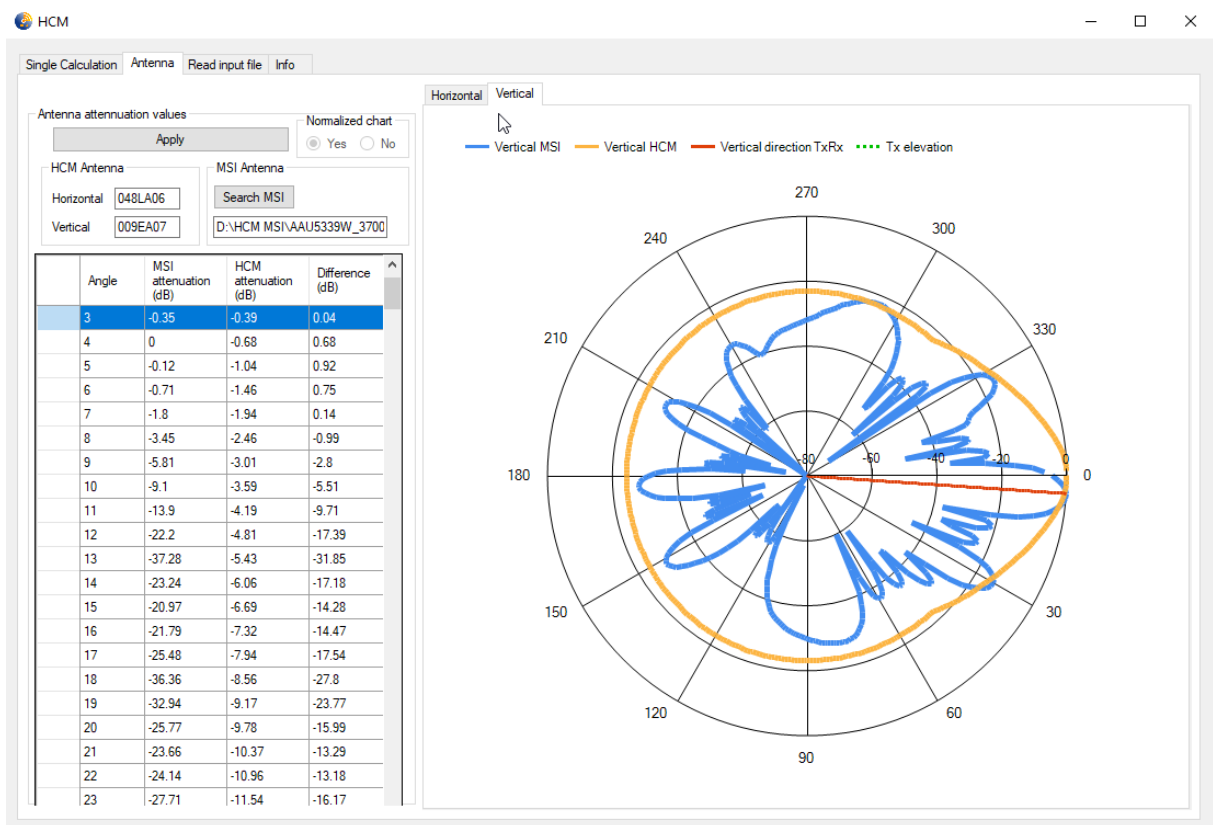
It is possible to load and use a MSI file for HCM calculation. The MSI file contains the antenna gain values in dBd. There must be 360 values for each degree in horizontal and vertical direction.

The program calculates the field strength for HCM and MSI antenna pattern. It is possible to switch between the calculated values in the GUI:

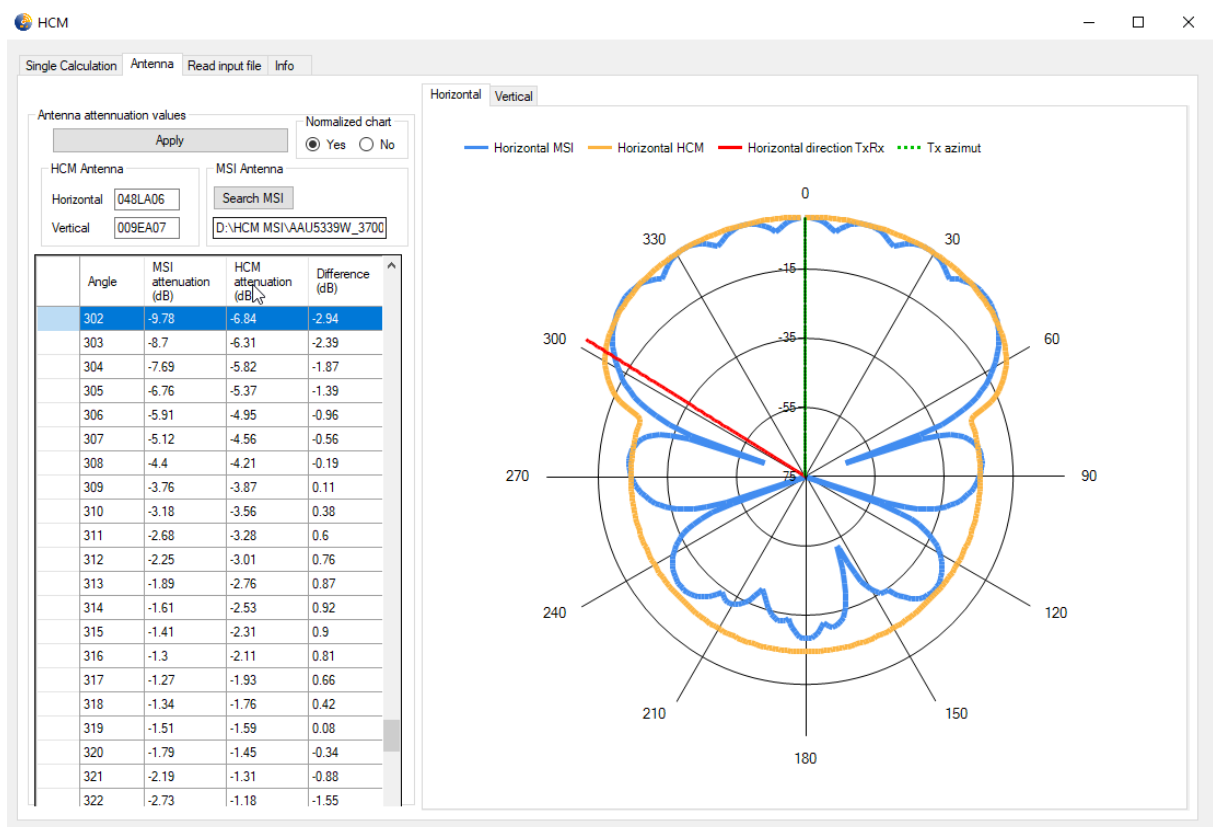


Display of calculated field strengths for HCM and MSI antenna patterns

For a detailed view on the used antenna patterns, it is possible to display them in the tab “Antenna”:



Display of comparison between HCM and MSI antenna pattern in vertical direction



Display of comparison between HCM and MSI antenna pattern in horizontal direction

The right diagram visualizes the gain values for the used antenna pattern (horizontal and vertical):

- The orange line displays the gain values of the HCM antenna pattern
- The blue line displays the gain values of the MSI antenna pattern
- The straight red line indicates the calculated direction between Tx and Rx
- The straight green line indicates the azimuth of Tx

On the left table you can see the used antenna attenuation values for the calculated directions and also the difference between HCM and MSI.

In case you want to check other antenna pattern, it is possible to load a new MSI file by selecting the "Search MSI" button or edit the data fields for the horizontal/vertical HCM antenna patterns.