

# HCM-MS (C# implementation)

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Quick Start Guide

15.12.2021

## Foreword

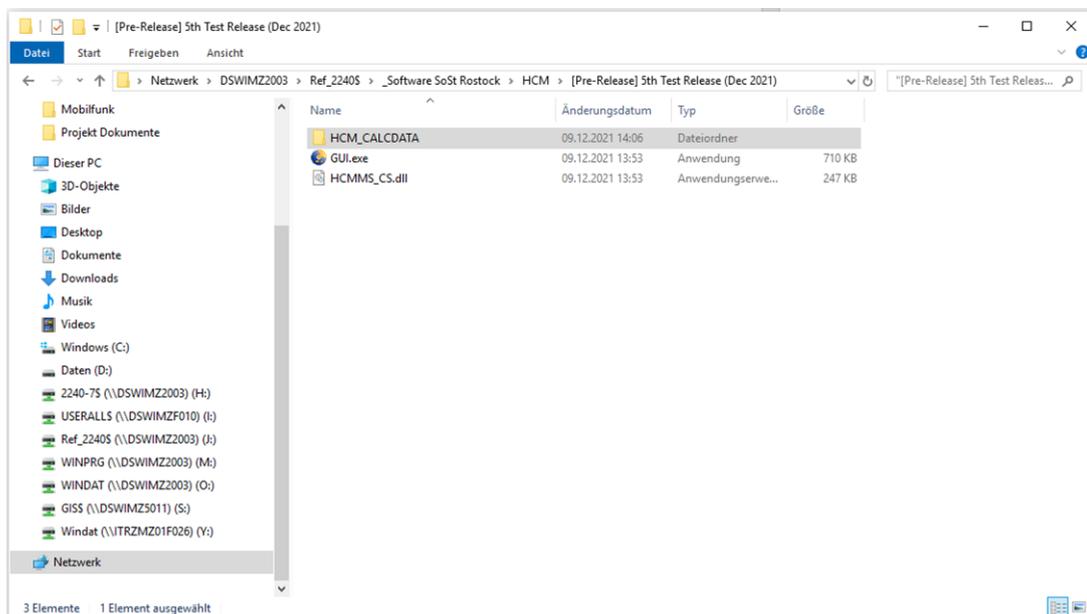
The document describes how to install and use the new HCM software. Follow the steps below to install and operate the application. If you have questions or remarks, please contact the following e-mail addresses:

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## Installation

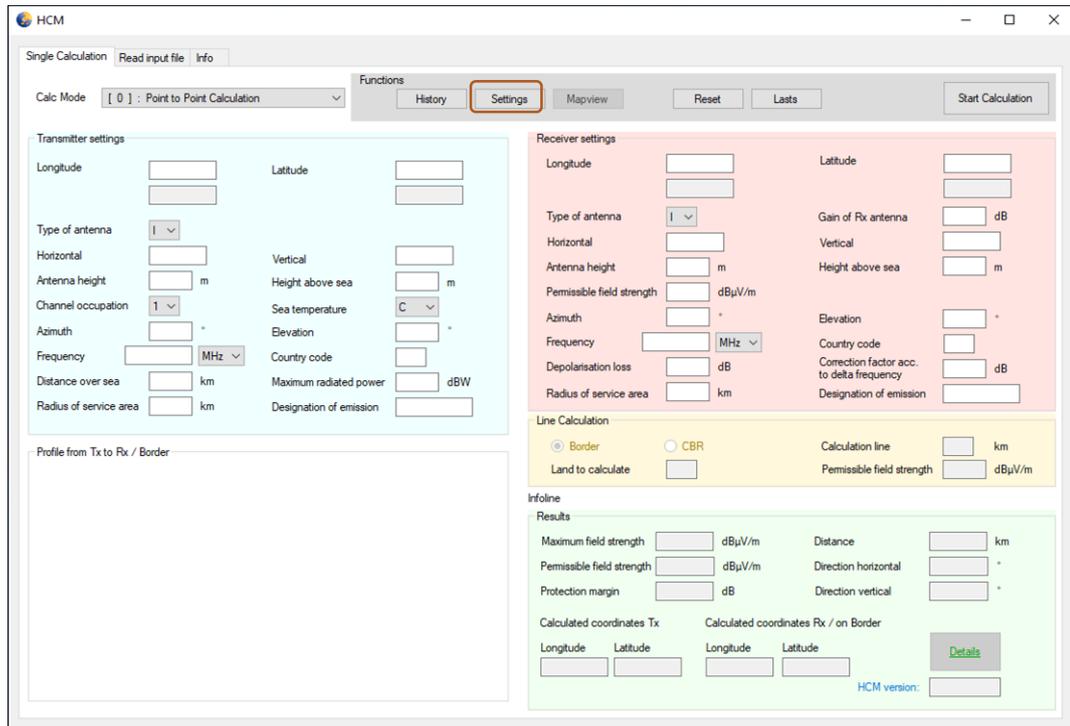
1. Unzip the installation folder in a directory of your choice (with the appropriate rights to run applications).
2. Start the application by running the GUI.exe.



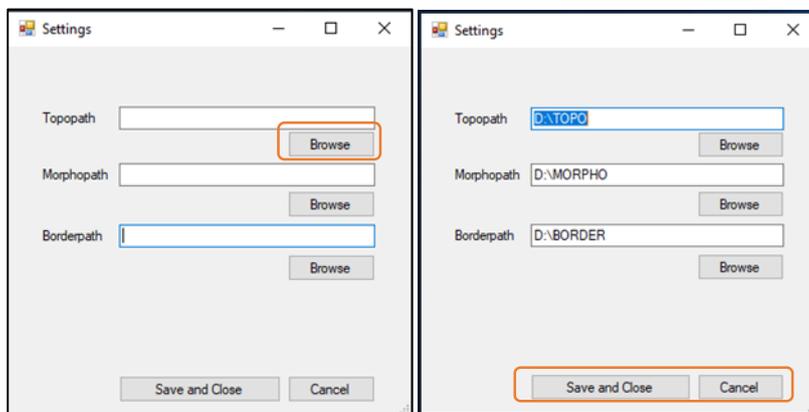
## First Start – Configuration

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.

Single Calculation Read input file Info

Functions

Calc Mode [ 0 ] : Point to Point Calculation History Settings Mapview Reset Lasts Start Calculation

**Transmitter settings**

Longitude: 013E5435 Latitude: 53N0942  
13.909722 53.161667

Type of antenna: I

Horizontal: 033EA20 Vertical: 000ND00

Antenna height: 11 m Height above sea: m

Channel occupation: 1 Sea temperature: C

Azimuth: 8.8 ° Elevation: -8.4 °

Frequency: 2586.2 MHz Country code: D

Distance over sea: km Maximum radiated power: 17 dBW

Radius of service area: 18 km Designation of emission: 47K1G2W

Profile from Tx to Rx / Border

**Receiver settings**

Longitude: 012E1443 Latitude: 49N4844  
12.245278 49.812222

Type of antenna: E Gain of Rx antenna: 2.8 dB

Horizontal: 060LA27 Vertical: 016EB00

Antenna height: 55 m Height above sea: m

Permissible field strength: -9.7 dBμV/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 Designation of emission: 46K0G9W

**Line Calculation**

Border  CBR Calculation line: 0 km

Land to calculate:  Permissible field strength: dBμV/m

**Info**

**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:

Details

HCM version: HCM version:

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.

Single Calculation Read input file Info

Functions

Calc Mode [ 0 ] : Point to Point Calculation History Settings Mapview Reset Lasts Start Calculation

**Transmitter settings**

Longitude: 013E5435 Latitude: 53N0942  
13.909722 53.161667

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Azimuth: 8.8 ° Elevation: -8.4 °

Frequency: 2586.2 MHz Country code: D

Distance over sea: km Maximum radiated power: 17 dBW

Radius of service area: 18 km Designation of emission: 47K1G2W

Profile from Tx to Rx

Show normalized profile  
Profile line Text distance: 0.1 km

**Receiver settings**

Longitude: 012E1443 Latitude: 49N4844  
12.245278 49.812222

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Radius of service area: 9 km Designation of emission: 46K0G9W

**Line Calculation**

Border  CBR Calculation line: 0 km

Land to calculate:  Permissible field strength: dBμV/m

**The Calculation was successful - performed in 472 milliseconds**

**Results**

Maximum field strength: -67.18 dBμV/m Distance: 362.85 km

Permissible field strength: 1.49 dBμV/m Direction horizontal: 197.78 °

Protection margin: 68.67 dB Direction vertical: 0.07 °

Calculated coordinates Tx: Calculated coordinates Rx

Longitude: Latitude: Longitude: Latitude:

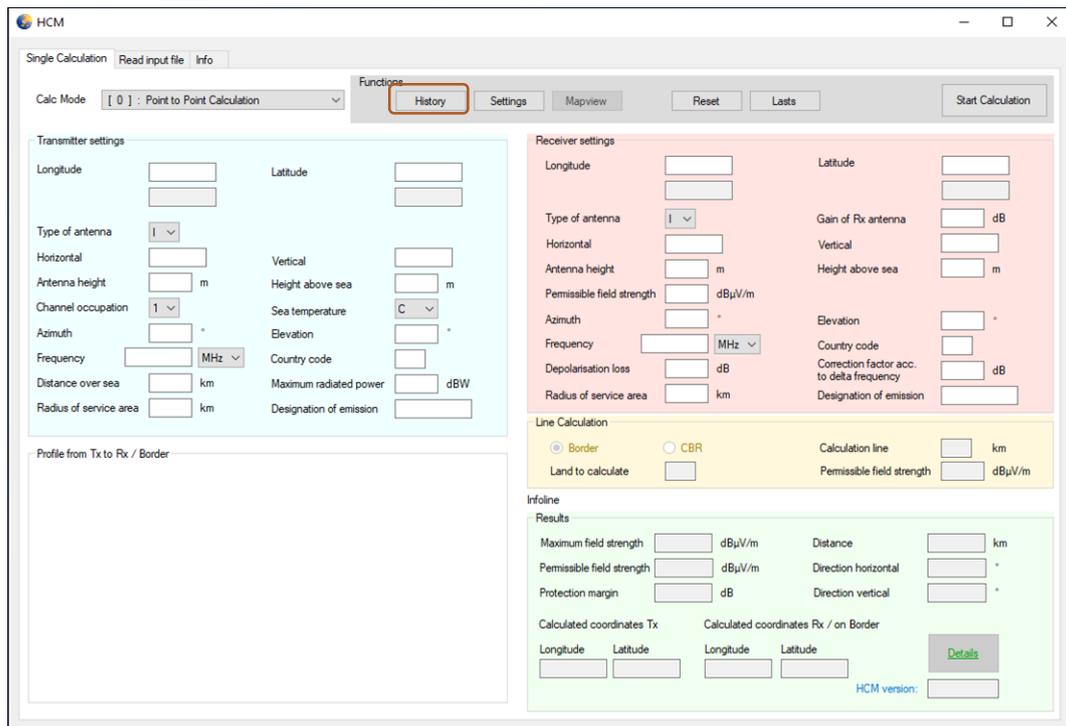
13.827222 53.0075 12.281111 49.889722

Details

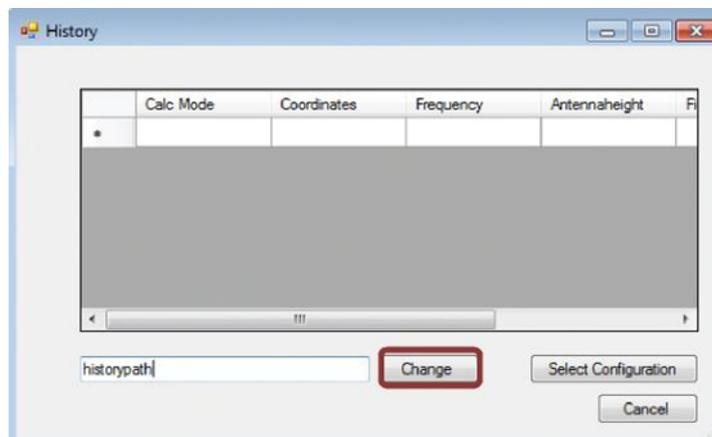
HCM version: HCM version: 7.213

## Use of catalogue data

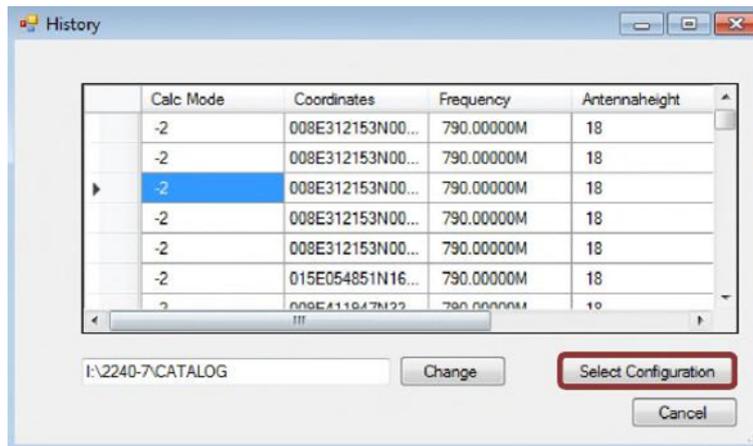
1. Press the **History** button.



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).

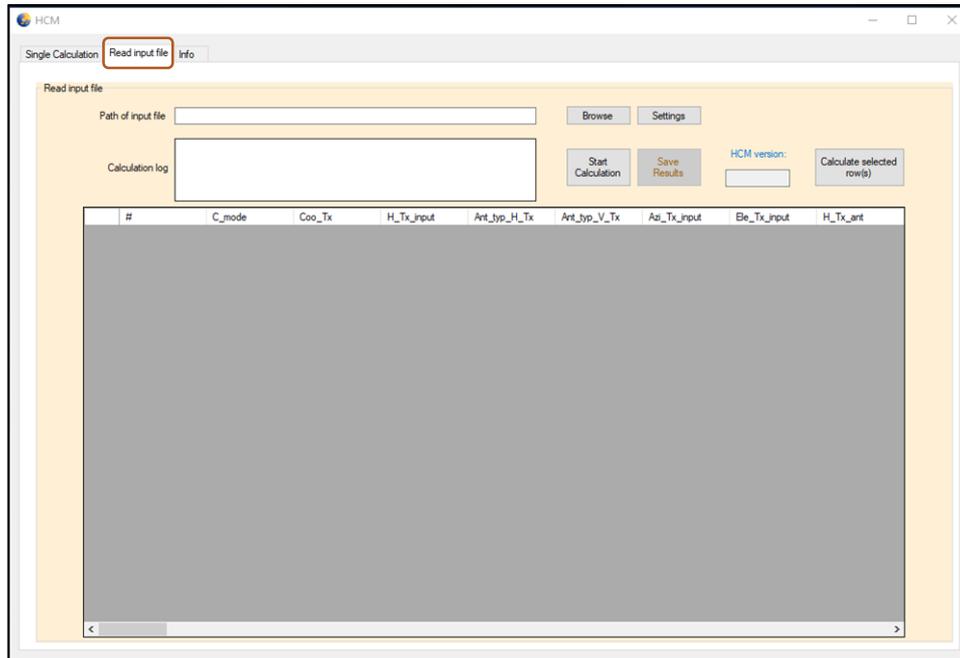


3. After confirmation, a table should appear. This table lists all former configurations. If you want to re-calculate one of these predictions, you will mark the line or a value of this line. Then push the **Select Configuration** button to fill the user interface with the specific data.

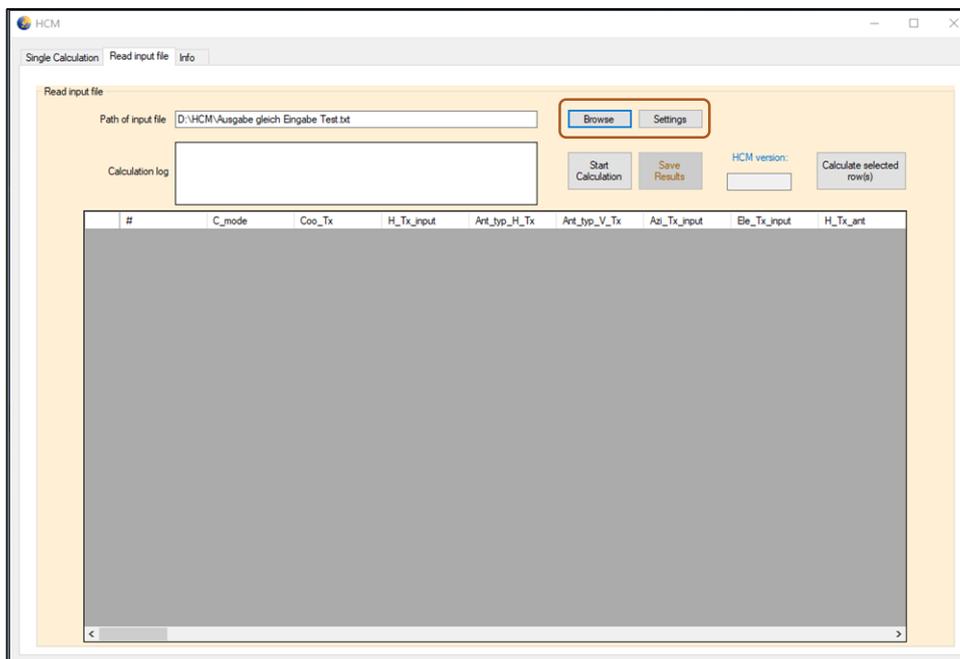


## Read input file for calculation

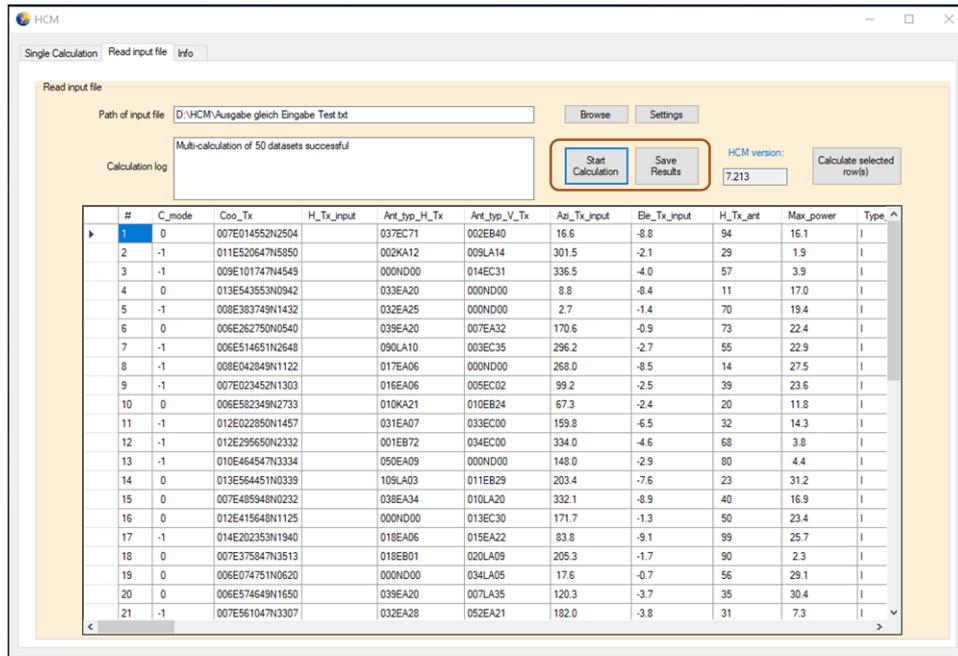
1. To execute a multiple calculation choose the Page **Read input file**.



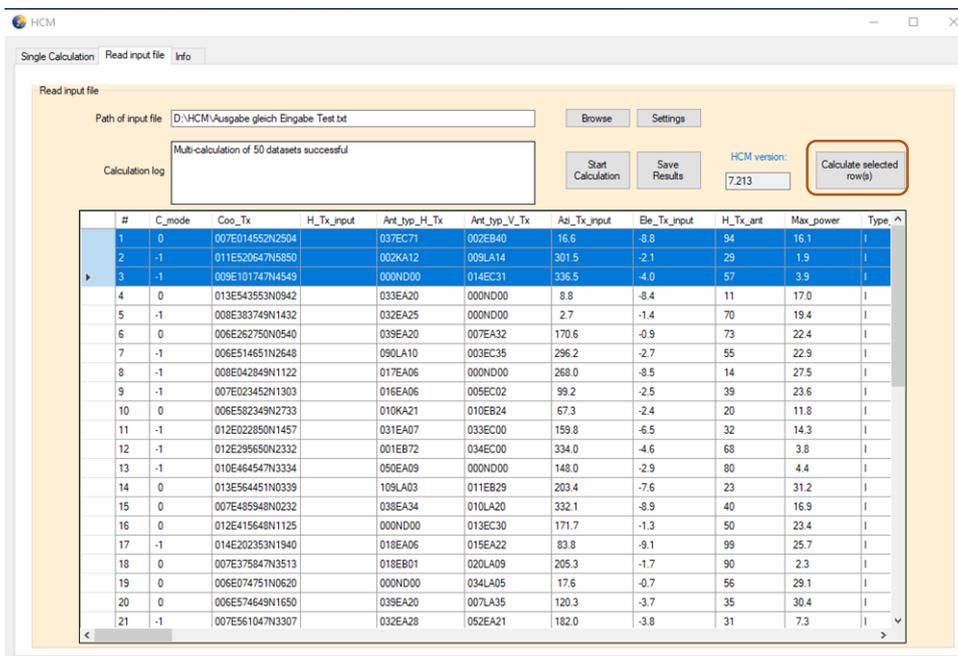
2. Press the **Browse** button to select a file. If you have not configured the settings yet, you will have to do so now by pressing the **Settings** button.



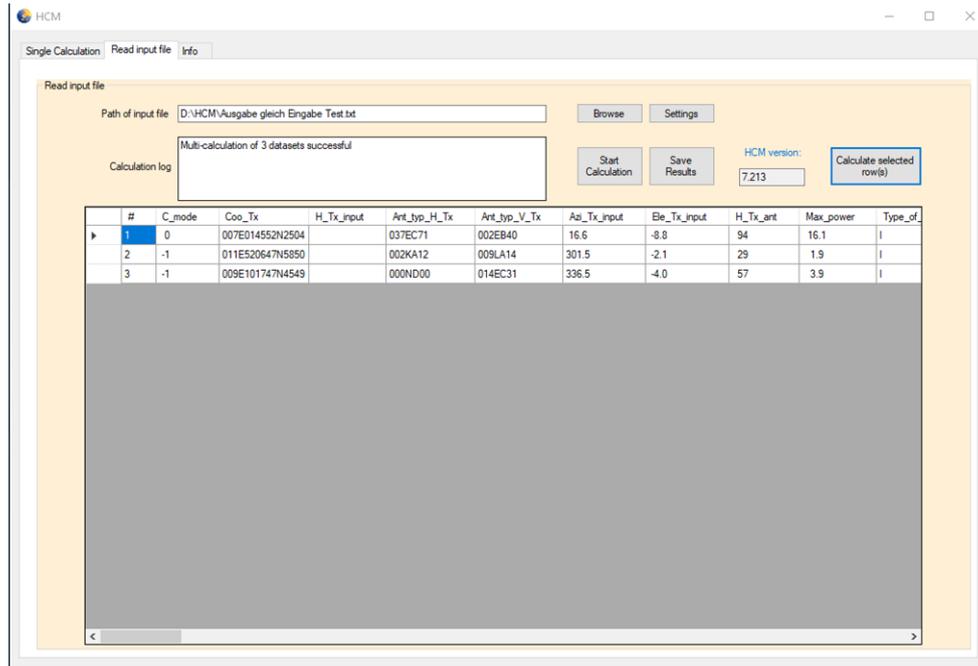
- To start the calculation push the **Start Calculation** button.



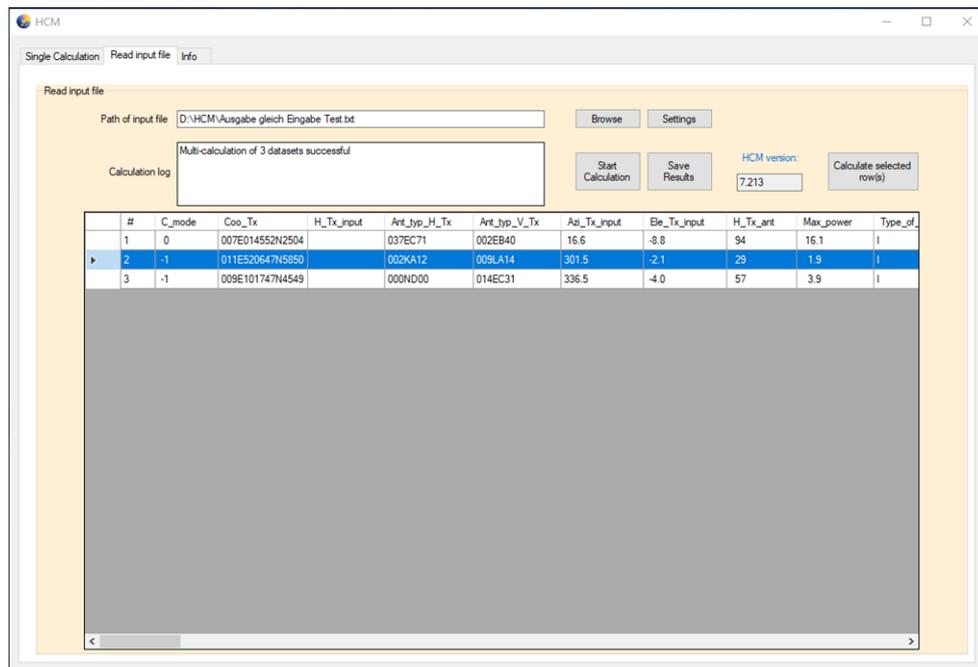
- If you want to save the results, you can use the **Save Results** button to generate a txt file and a csv file.
- By pressing the **Calculate selected row(s)** button, the checked lines will be calculated and shown in the table.



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.



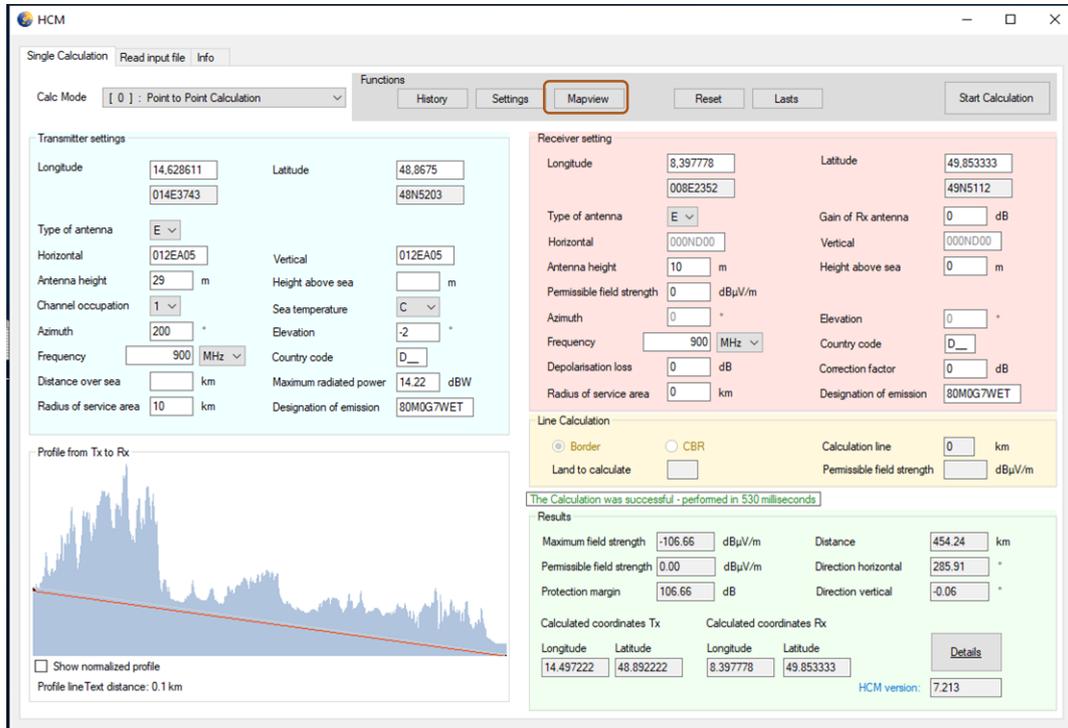
8. Result as shown.

The screenshot displays the HCM software interface with the following sections:

- Transmitter settings:**
  - Longitude: 011E5206, Latitude: 47N5850
  - 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 (selected), CBR: [ ]
  - Calculation line: 0 km
  - Land to calculate: F
  - Permissible field strength: 6.4 dBuV/m
- 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 11.708056, Latitude 48.027222
  - Border: Longitude 8.233333, Latitude 48.966667
- Profile from Tx to Border:** A graph showing terrain elevation with a red line representing the profile line. Text below indicates: Profile line Text distance: 0.1 km.

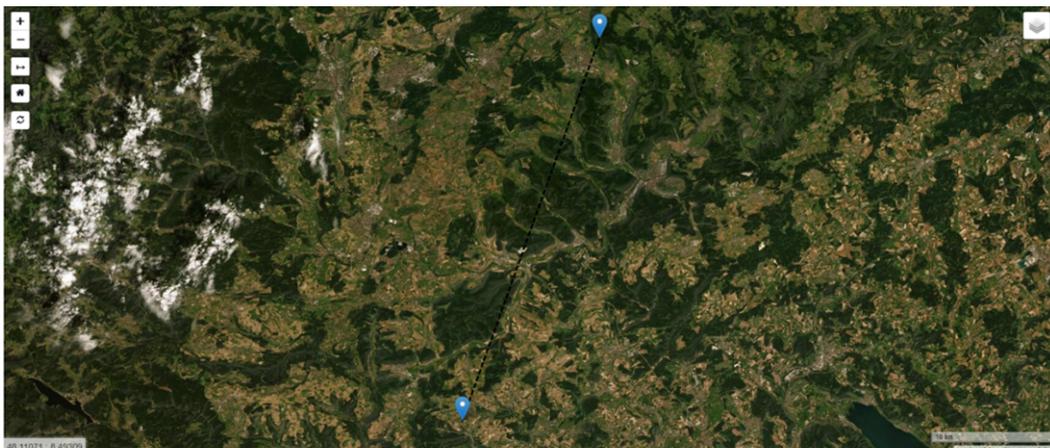
## Map View

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.

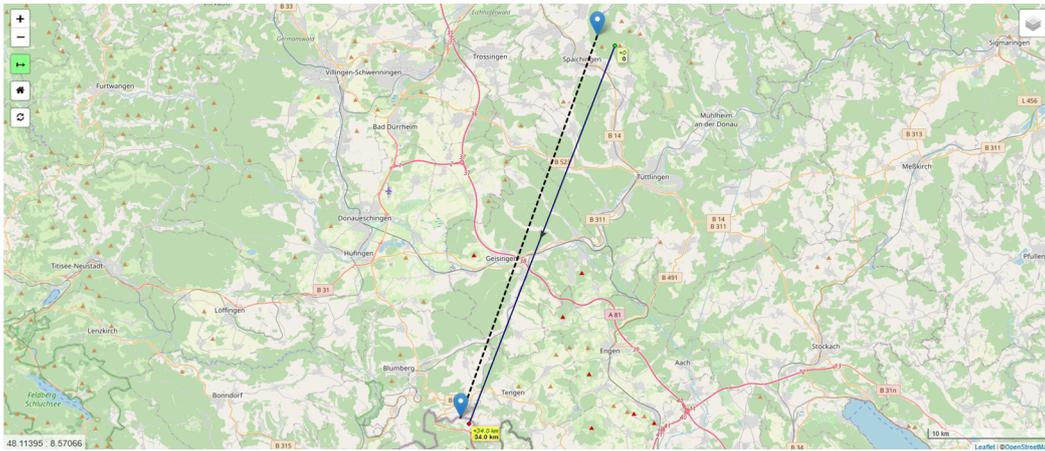


The screenshot shows the HCM software interface. The 'Mapview' button in the 'Functions' menu is highlighted with a red box. The interface is divided into several sections: 'Transmitter settings' (left, light blue), 'Receiver setting' (right, light red), 'Line Calculation' (bottom right, light yellow), and 'Results' (bottom right, light green). The 'Transmitter settings' section includes fields for Longitude (14.628611), Latitude (48.8675), Type of antenna (E), Horizontal (012EA05), Vertical (012EA05), Antenna height (29 m), Height above sea, Channel occupation (1), Sea temperature (C), Azimuth (200), Elevation (-2), Frequency (900 MHz), Country code (D), Distance over sea, Maximum radiated power (14.22 dBW), Radius of service area (10 km), and Designation of emission (80MOG7WET). The 'Receiver setting' section 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, 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). The 'Line Calculation' section includes 'Border' and 'CBR' radio buttons, 'Calculation line' (0 km), and 'Land to calculate' and 'Permissible field strength' (0 dBuV/m) checkboxes. The 'Results' section displays: Maximum field strength (-106.66 dBuV/m), Distance (454.24 km), Permissible field strength (0.00 dBuV/m), Direction horizontal (285.91), Protection margin (106.66 dB), and Direction vertical (-0.06). Below the results, there are tables for 'Calculated coordinates Tx' and 'Calculated coordinates Rx'. The 'Calculated coordinates Tx' table has columns for Longitude (14.497222) and Latitude (48.892222). The 'Calculated coordinates Rx' table has columns for Longitude (8.397778) and Latitude (49.853333). A 'Details' button is located to the right of the Rx coordinates. At the bottom right, the 'HCM version' is 7.213. A 'Profile from Tx to Rx' graph is visible on the left side of the interface, showing a blue area under a red line. A status message at the bottom of the interface reads: 'The Calculation was successful - performed in 530 milliseconds'.

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 (*HCMMMS\_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 (*HCMMMS\_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).

*HCMMMS\_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 (*HCMMMS\_CS.dll* AND *HCMMMS\_UMB.dll*) in the same folder where the Fortran-DLL resides and reference the *HCMMMS\_UMB.dll* in your program / code.



Data flow between surrounding program and C#-DLL

The interface to *HCMMMS\_UMB.dll* is part of official HCM-MS documentation and can be downloaded from the HCM homepage. Additionally the header file of the *HCMMMS\_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).