

Quick guide

Plugin-NetworkViewer

English

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Content

1 About this manual.....	1
2 Requirements.....	2
3 First steps.....	3
4 Start of the programme and introduction to operation.....	4
4.1 basic configuration of the NetworkViewer.....	5
5 The TETRA-RSSI-Logger-Plugin.....	12
5.1 The programme TetraRssiLogger.....	12
5.2 The programme NetworkViewer with TETRA-RSSI-Logger-Plugin.....	15
6 The Kenwood-Logger-Plugin.....	23
6.1 Import of test points.....	23
7 Working with the displayed RSSI-Data.....	28
7.1 Export of the map view as file.....	31
7.2 Centring the map view with the help of the ‚Data List‘.....	32
7.3 GPS bookmarks.....	32
7.4 Offline maps.....	32
8 User interface NetworkViewer.....	35
8.1 Docking windows.....	36
8.2 Menus of the NetworkViewer.....	40
8.3 The pop-up menu.....	48
8.4 Programme settings in dialogue ‚Settings‘.....	49
8.4.1 Settings in the ‚Path‘ tab.....	49
8.4.2 Settings in the ‚Map‘ tab.....	50
8.4.3 Settings in ‚Server‘ tab.....	52
8.4.4 Settings in the ‚Color‘ tab.....	53
8.5 Map data saving with ‚Cache Tiles‘.....	54
8.6 The data list.....	56
8.7 Plugin specific configuration.....	57
8.7.1 Kenwood-Logger-Plugin.....	57
8.7.2 RecordFile-Plugin.....	58
8.7.3 TETRA-RSSI-Logger-Plugin.....	60
9 Glossary.....	61

Legal Disclosure

Information in accordance with section 5 TMG and section 2 DL-InfoV

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Version 1.0 (10/13/2017)

Technical changes reserved.

The use of symbols

The following manual includes several symbols to make it easier for you to follow.

	<p>The information symbol indicates an additional information on the action of the programme or on the handling with the programme.</p>
<p>NOTICE</p>	<p>The notice indicates an important information. Disregarding this information may affect actions to be performed by the programme.</p>
	<p>The arrow indicates a pre-condition for the following action. If this pre-condition is not given, the programme may can not follow with the given instructions.</p>
	<p>The check mark indicates the result of an action.</p>
	<p>This symbol indicates a Glossary entry. The symbol is placed behind the corresponding word.</p>

General notes

NOTICE

Modifications to the software that go beyond the scope presented in this document are prohibited!
Any consequences resulting from such changes will not be covered by the company.

1 About this manual

These operating instructions provide an introduction to the **NetworkViewer** plugin. The following instructions describe the structure of the programme and show how to use it properly.

This manual is intended for users with as well as without sound knowledge in the field of map display. Therefore, this manual contains in some places further information on this area, which enables the user to make correct settings for his purposes.

More detailed information on specific keywords can be found in the glossary.

The manual follows a logical sequence for a step-by-step familiarisation. Before using the programme, read this manual thoroughly.

Follow the instructions.

2 Requirements

PC Requirements	
PC-Hardware (Minimum)	Intel [®] Core [™] i5, 8GB RAM, 20 GB sufficient free space on hard-drive
OS	Windows 10 (32- or 64-Bit-Version)
USB-Ports	3 x USB 2.0 (used for license dongle connection, GPS-receiver and TETRA terminal connection)
Ethernet	10/100/1000 Mbit/s (used for internet connection to the openstreetmap server to download the map data)
Supported file formats for import of GPS-Data sets from Kenwood-Logger-Plugins	
<ul style="list-style-type: none"> • Kenwood NX-5000 RSSI Log 	
Supported GPS-Receiver for recording of GPS-Daten used for the TETRA-RSSI-Logger-Plugin	
<ul style="list-style-type: none"> • Navilock NL-442U 	
Supported TETRA-Terminals for recording of TETRA RSSI-Data used for the TETRA-RSSI-Logger-Plugin	
<ul style="list-style-type: none"> • Sepura STP 8038 • Sepura SRM2000, SRM/G3x00 	

3 First steps

The Networkviewer-Plugin needs a valid license.

The license is provided with a hardware dongle.

Connect the hardware dongle with the PC with the PC and make sure that the LED is red. If no light is on, check the driver installation.

To record TETRA RSSI data, install the drivers for the TETRA terminal (for example, for Sepura, the FTDI driver) and for the connected GPS receiver.

4 Start of the programme and introduction to operation

After the **NetworkViewer plug-in** has been started, the user interface of the **NetworkViewer** opens. Chapter 35 describes the user interface in detail. This chapter only facilitates the introduction to the operation of the programme.



This description assumes that NetworkViewer can establish an internet connection to the map server of Openstreetmap.

The chapter contains the following procedure:

1. basic configuration of the NetworkViewer and configuration regarding access to the map server of Openstreetmap
2. creating a new project and importing RSSI information mapped to GPS coordinates
3. work with the displayed data

This procedure is recommended for getting started with the operation of the programme, especially for the first programme execution after the programme installation

4.1 basic configuration of the NetworkViewer

After starting the programme for the first time, the view shown in figure 35 opens.

No maps are displayed in the view yet because access to the map server has not yet been configured.

To configure access to the map server, follow the next steps.

➔ The **NetworkViewer** is open.

1. Open the window for configuring access to the map server via ‚Edit‘ > ‚Settings‘.

✓ The window opens (see figure 1). In this window, settings for the standard paths, the map display, the map server and the colour display are possible.

❗ The 'Path' tab is automatically displayed.

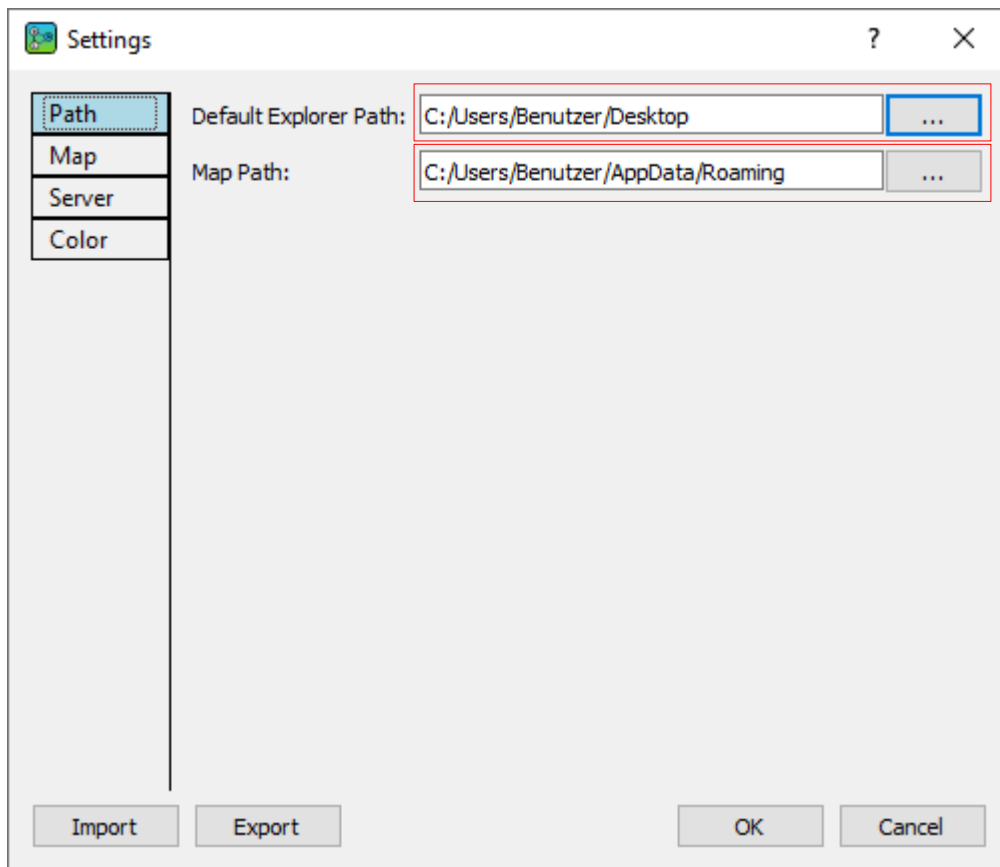


Figure 1 NetworkViewer: Settings – Path

❗ The 'Default Explorer Path' is used to set the default path for the explorer, for example when creating a new project.

Start of the programme and introduction to operation

- Under the 'Map Path' the map sections (tiles) are stored that were downloaded from the map server for the display of the map from the Internet. Subsequently, this map data is
- ① used for the display of the map and new map sections are only loaded from the map server if the displayable area lies outside the stored map data or the zoom level used. This reduces the number of accesses to the server and enables offline map display.

2. Set the 'Default Explorer Path' and 'Map Path' in the 'Path' tab. Any existing directories can be specified
3. The next step is to allow the programme to download map sections from map servers. Select the 'Server' tab in the window. Leave the 'Server Address' and 'User Agent' unchanged, but check 'Download Allowed'.

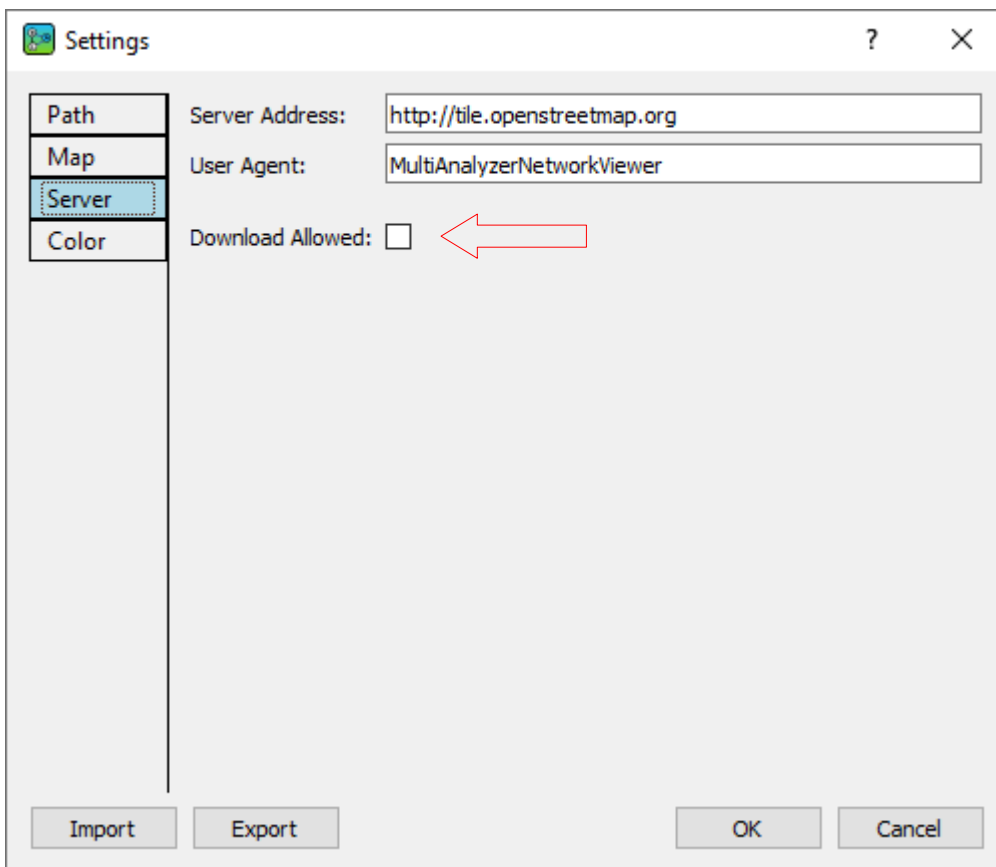


Figure 2 NetworkViewer: Settings – Server

4. The changes in the window 'Settings' are confirmed with 'OK'.
- ✓ The dialogue closes and access to the map server has been configured
 - ① The settings can be changed again at any time.


Start of the programme and introduction to operation

- ✓ The main view shows a map display centred on the coordinate origin (0°, 0°).

By 'pressing' and 'holding' the left mouse button and simultaneously 'dragging', the map display can be moved to any coordinate. The mouse wheel can be used to zoom in or out of the map. Zooming always takes place at the position of the mouse pointer so that the new map view is displayed centred on the mouse pointer.

The **NetworkViewer** saves the initial coordinate for the map display. Each time the programme is started, the map view is centred on this initial coordinate.

To save the initial coordinate for the map view, follow the next steps.

- ➔ The **NetworkViewer** is open.
 1. Centre the map view on the desired coordinate (for example Berlin).
 2. Open the window for configuring the map via 'Edit' > 'Settings'.
 - ✓ The window opens (see 1). In this window, settings for the standard paths, the map display, the map server and the colour display are possible.
 -  The 'Path' tab is automatically displayed.
 3. Select the 'Map' tab.
 - ✓ The window displays the contents of the 'Map' tab (see 3).

Start of the programme and introduction to operation

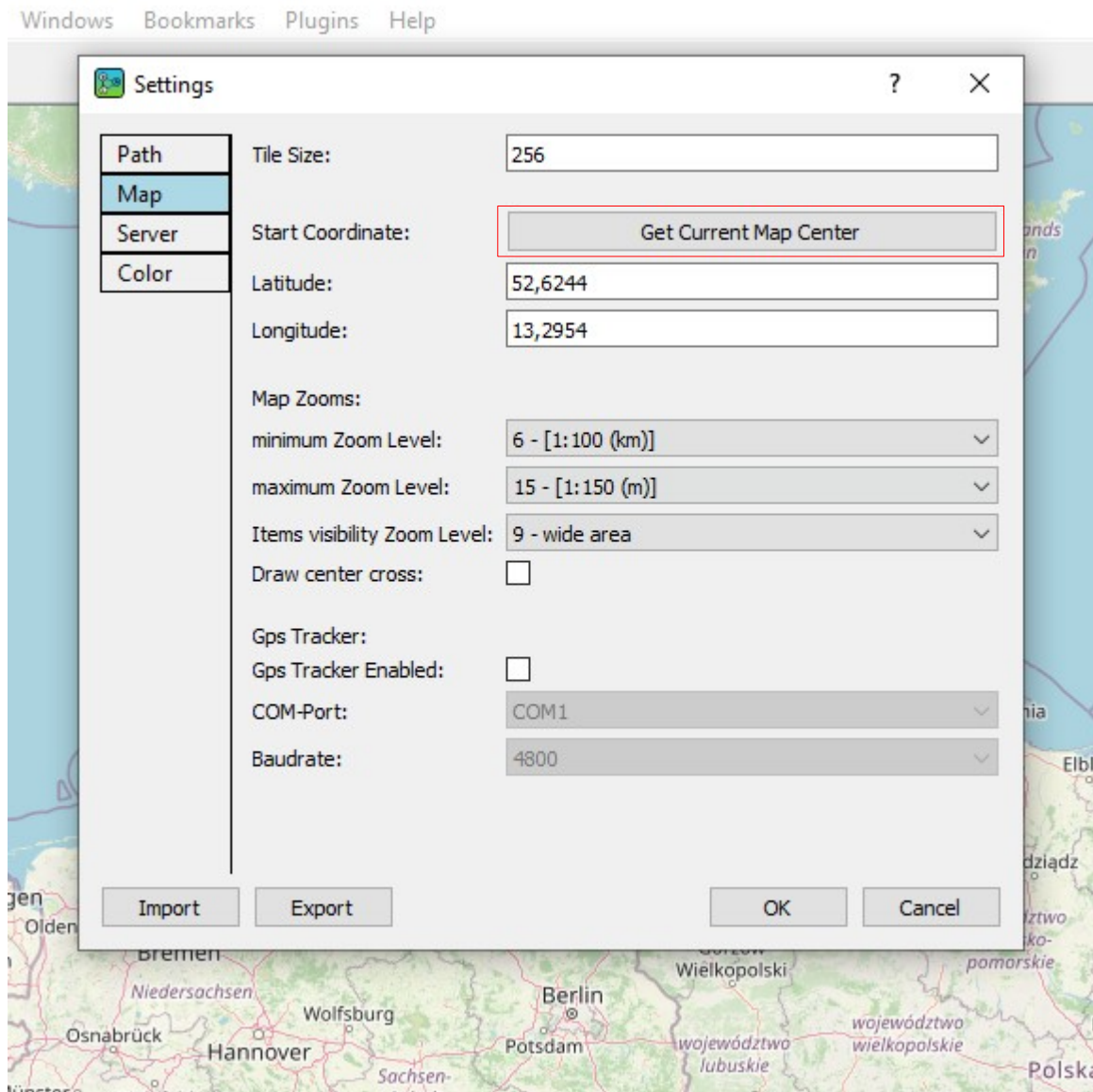


Figure 3 NetworkViewer: Settings – Map

4. Press the button ,Get Current Map Center‘.
- ✓ The coordinates of the map centre of the current view are entered under ,Latitude‘ and ,Longitude‘.
5. The changes in the window ,Settings‘ are confirmed with ,OK‘.
- ✓ The window closes and the initial coordinate for the map view has been set.
 - ❗ The settings can be changed again at any time.
- ✓ Each time the programme is started, the map display is now centred on the coordinate (Berlin in the example).

Start of the programme and introduction to operation


With the **NetworkViewer** programme, the zoom level for the map display can also be limited in the settings. In addition, you can set the zoom level at which the RSSI information is later displayed as a point on the map. The default setting for the permitted zoom levels is the range from zoom level 4 to 15. By default, the RSSI information is displayed on the map from zoom level 9.

To change the zoom level limit for the map view in the settings, follow the next steps.

➔ The **NetworkViewer** is open.

1. Open the window for the configuration of the card via ‚Edit‘ > ‚Settings‘.

✓ The window opens (see 1). In this window, settings for the standard paths, the map display, the map server and the colour display are possible.

 The ‚Path‘ tab is automatically displayed.

2. Select the ‚Map‘ tap.

✓ The window displays the contents of the ‚Map‘ tab (see 4).

Start of the programme and introduction to operation

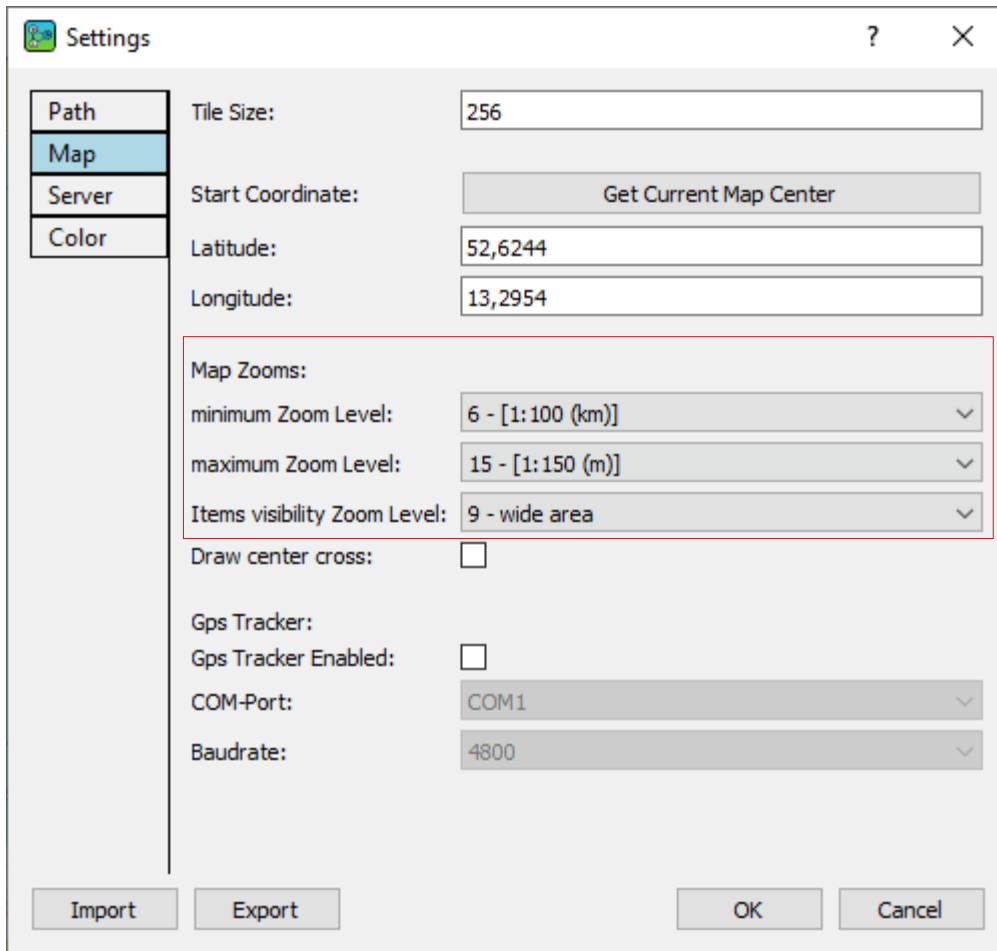



Figure 4 NetworkViewer: Settings – Map

3. Use ,minimum Zoom Level' and ,maximum Zoom Level' selection buttons to set the zoom level range used in the programme.

 The map display of the main window can only be zoomed between the values ,minimum Zoom Level' and ,maximum Zoom Level'.

4. Use the selection buttons ,Items visibility Zoom level' to define the zoom level from which the RSSI information will later be displayed as a point on the map.
 5. Confirm the changes in the ,Settings' window by pressing ,OK'.
- ✓ The dialogue closes and the settings for the zoom levels have been adopted.

NOTICE The display of RSSI points on the map is only calculated for the zoom range set at the time of data import. This reduces the required computing capacity when processing larger amounts of data.

If the zoom range is extended after the data import, the drawing of the data must be

Start of the programme and introduction to operation

repeated so that the change of the zoom range is also displayed on the map for the new zoom levels.

This completes the basic configuration of the NetworkViewer.

5 The TETRA-RSSI-Logger-Plugin

This chapter describes how to use the **TETRA-RSSI-Logger** plugin. The plugin **TETRA-RSSI-Logger** is used to record RSSI data from TETRA cells with a connected TETRA terminal via its PEI interface. The current GPS position is determined via a connected GPS mouse and also saved. The result is a csv file that can be loaded into **NetworkViewer** with the **TETRA-RSSI-Logger plugin**. The collection of the data and the generation of the csv file is done by the programme **TetraRssiLogger**, which is included in the package of the **TETRA-RSSI-Logger-Plugin**.

5.1 The programme TetraRssiLogger

To record the TETRA RSSI values, follow the steps below.

- ➔ The dongle with the programme licence is connected.
 - ➔ A GPS receiver is connected.
 - ➔ A TETRA-Terminal is connected.
1. Start the programme **TetraRssiLogger**.
- ✓ The **TetraRssiLogger** window opens (see figure 5).

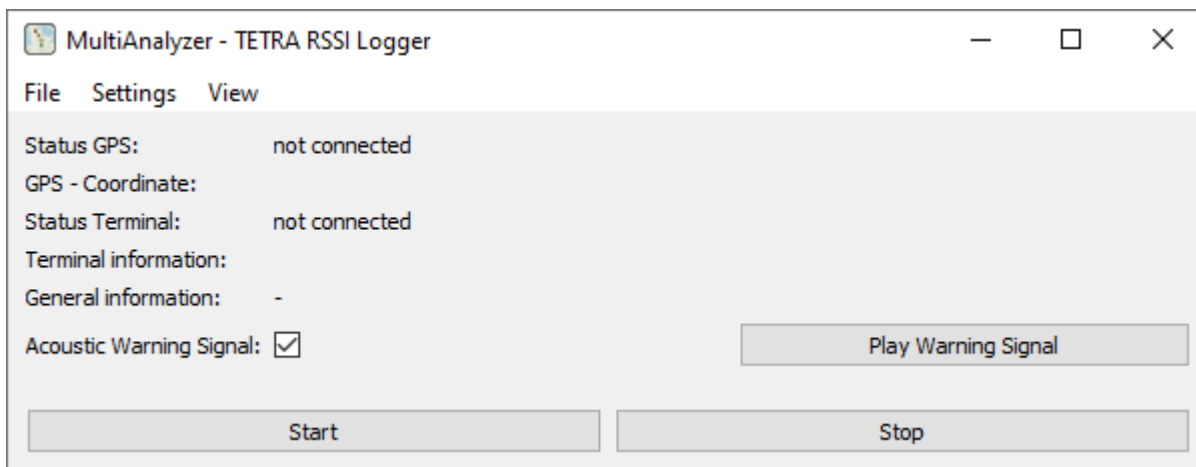


Figure 5 TETRA-RSSI-Logger: programme

2. Open the window for setting the file path in which the csv file is written via ‚Settings‘ > ‚Change Logging Path‘.
- ✓ The window ‚Save Path‘ is opened (see figure 6).

The TETRA-RSSI-Logger-Plugin

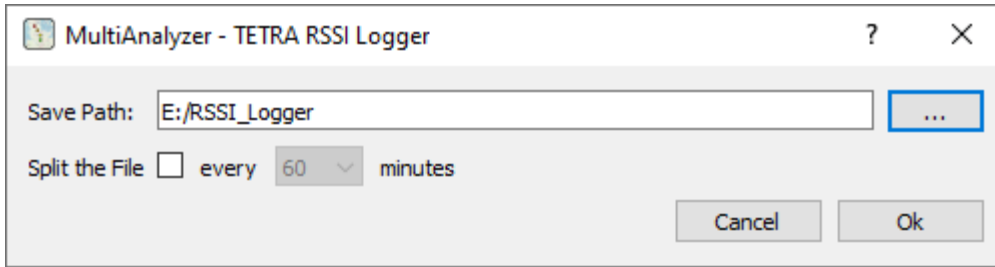

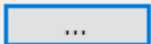


Figure 6 TETRA-RSSI-Logger: Dialogue Save Path

 Using the checkbox ‚Split the File‘ the recording duration per file can be set. After the time has expired, a new file is automatically created in which the RSSI and GPS data are saved.

3. Enter the path for exporting the csv file or open the file explorer with the field  to select the path.
4. The entries are confirmed with ‚OK‘.
- ✓ The csv file is saved under this directory.
5. Open the window for setting the GPS setting for the connected GPS receiver via ‚Settings‘ > ‚Change GPS Settings‘.
- ✓ The window ‚Change GPS Settings‘ opens (see figure 7).

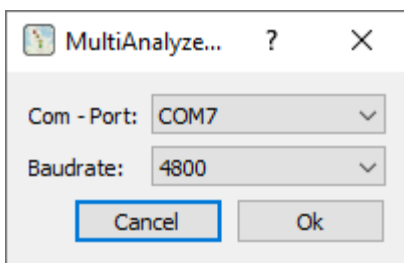


Figure 7 TETRA-RSSI-Logger: Dialogue Change GPS Settings

6. Enter the COM-Port and the baud-rate of the GPS receiver.
7. The entries are confirmed with ‚OK‘.
- ✓ The window closes and the COM port is set.
8. Open the window for setting the terminal settings for the connected TETRA terminal via ‚Settings‘ > ‚Change Terminal Settings‘.
- ✓ The window ‚Change Terminal Settings‘ opens (see figure 8).

The TETRA-RSSI-Logger-Plugin

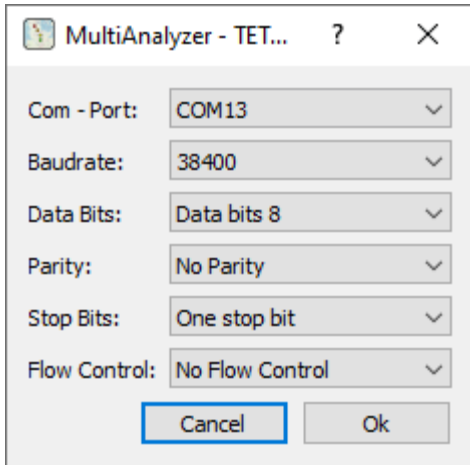


Figure 8 TETRA-RSSI-Logger: Dialogue Change Terminal Settings

9. Enter the COM port of the TETRA terminal and the COM port configuration according to the TETRA terminal specification. (the values given in figure 8 for the baud rate, data bits, etc. correspond to the configuration of a Sepura terminal).
10. Confirm the entries with ,OK‘.
- ✓ The window closes and the settings have been stored.
11. Use the checkbox ,Acoustic Warning Signal‘ to select whether a warning tone is played in the event of an error. The button ,Play Warning Signal‘ plays the warning tone once. This can be used to check the volume of the warning tone. The volume of the warning tone can be adjusted via the volume of the Windows loudspeaker.
12. Start the recording of the TETRA-RSSI measured values by pressing the ,Start‘ button.

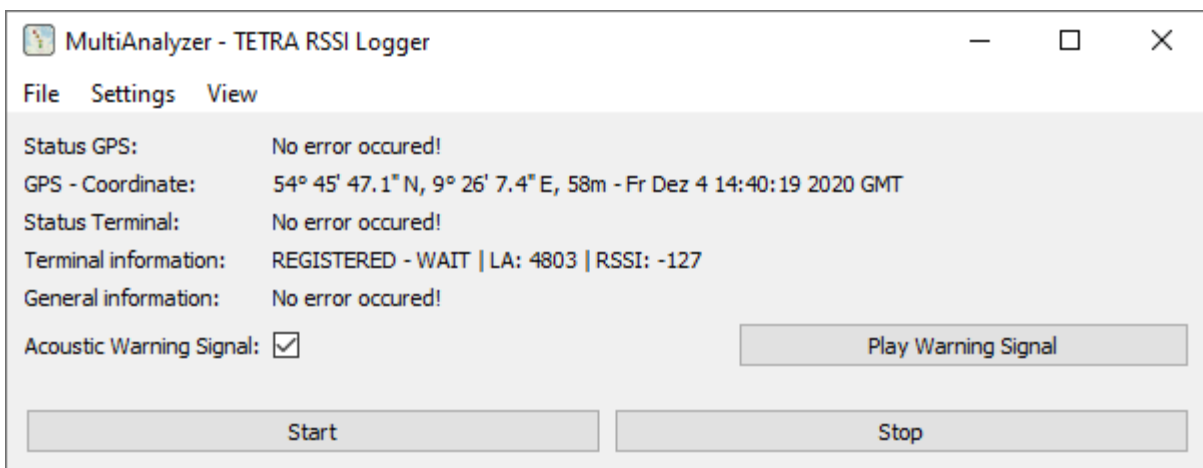


Figure 9 TETRA-RSSI-Logger: Start of the measurement

- ✓ The current GPS coordinate appears with the current date and time.

The TETRA-RSSI-Logger-Plugin

- ✓ The ‚Terminal information‘ contains the current TETRA registration status, the location area of the current cell and the current measured RSSI value of the current TETRA cell.
 - ✓ No error is displayed in the ‚Status GPS‘, ‚Status Terminal‘ and ‚General information‘ lines.
13. After 5 seconds the ‚Terminal information‘ changes from ‚REGISTERED – WAIT‘ to ‚REGISTERED‘. The terminal reports that it is registered in the cell.

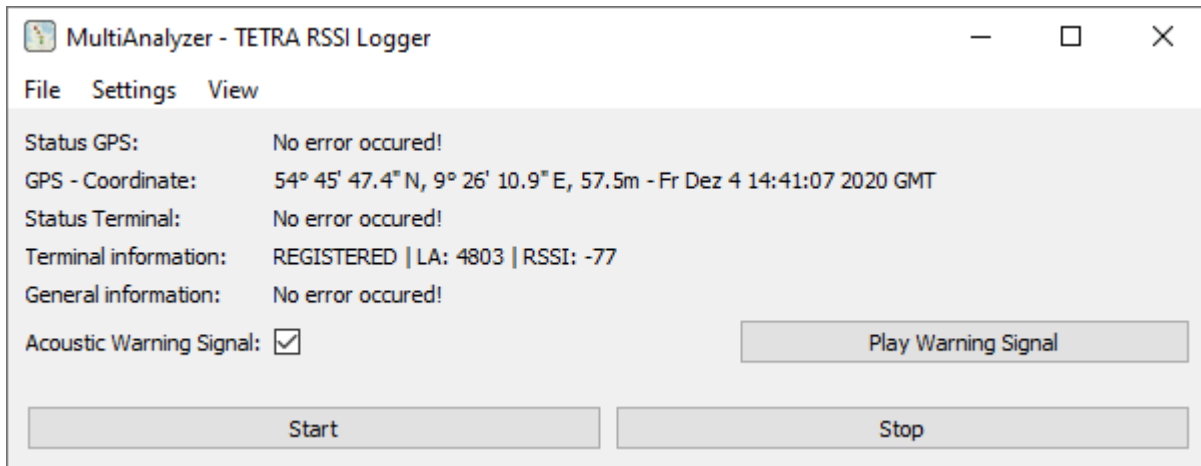


Figure 10 TETRA-RSSI-Logger: start of the measurement

- ✓ The GPS coordinate, the time and the terminal information are continuously updated.
- ✓ A csv file is created that contains the RSSI values assigned to the TETRA cells and the respective GPS coordinate.

To view the contents of the csv file, use the **TETRA-RSSI-Logger plugin** in NetworkViewer.

5.2 The programme NetworkViewer with TETRA-RSSI-Logger-Plugin

The **NetworkViewer** is programme used for displaying the TETRA-RSSI data.



The **NetworkViewer** can be switched to the English language via menu ‚Ansicht‘ > ‚Sprache‘ > ‚en‘.

To display the TETRA RSSI on the map, follow the steps below.

- ➔ The dongle with the programme licence is connected.
- ➔ The NetworkViewer is started.
- ➔ The basic settings for the map display have been made.

The TETRA-RSSI-Logger-Plugin

1. Create a new project via ,File' > ,Create Project'.
- ✓ The window ,Create Project' opens (see figure 11).

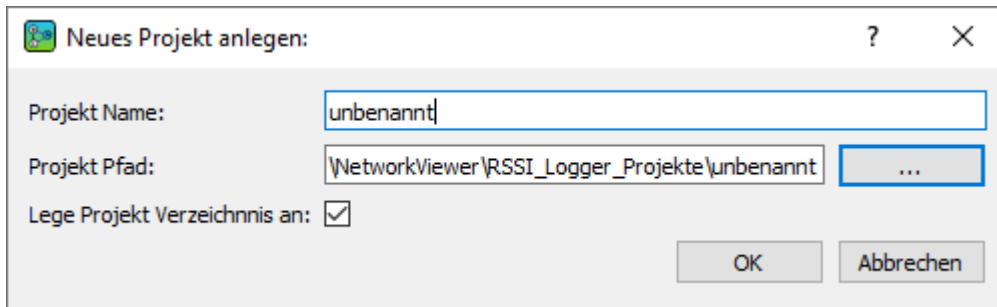


Figure 11 NetworkViewer: Dialogue ,Create Project'

2. Insert the Project-Path and/or Project name.
3. Confirm with ,OK'.
- ✓ The window closes and the project name is displayed in the upper left corner above the menu (see figure 12).
4. Now load the configuration file (csv) via ,Plugins' > ,Tetra Logger' > ,Load Config File'. The configuration file contains the locations and parameters of the TETRA base stations such as the location area and channel frequency, etc. The plugin needs this information to be able to correctly assign the data from the TETRA terminal. This means the RSSI values measured on the individual frequencies are assigned to the TETRA cells and displayed accordingly.
- ✓ The NetworkViewer shows the imported TETRA base stations in the data list (see figure 12). At the same time, a symbol for the base stations is created on the map, which contains the respective location area of the base station).

The TETRA-RSSI-Logger-Plugin

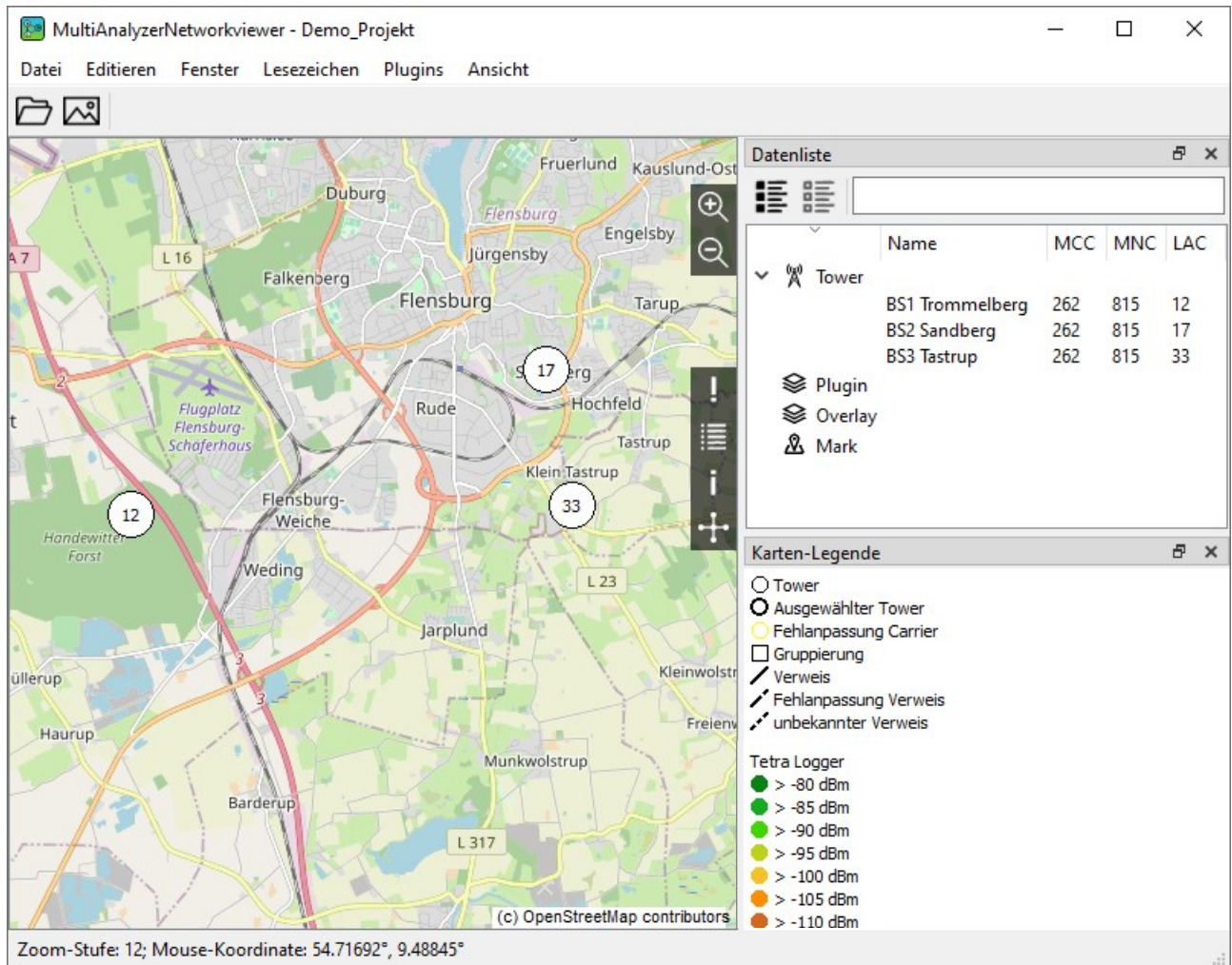


Figure 12 NetworkViewer: configuration file loaded

5. Import the RSSI readings from the measurement with the **TetraRssiLogger** via ‚File‘ > ‚Import‘ > ‚Tetra Logger File...‘. In the dialogue that opens, several files can be specified separated by a semicolon. If the Explorer is opened, several files can also be selected here, which are automatically imported one after the other by the programme. The opening dialogue contains the last imported file.
- ✓ The NetworkViewer shows the processing of the data in a progress bar (see figure 13).

The TETRA-RSSI-Logger-Plugin

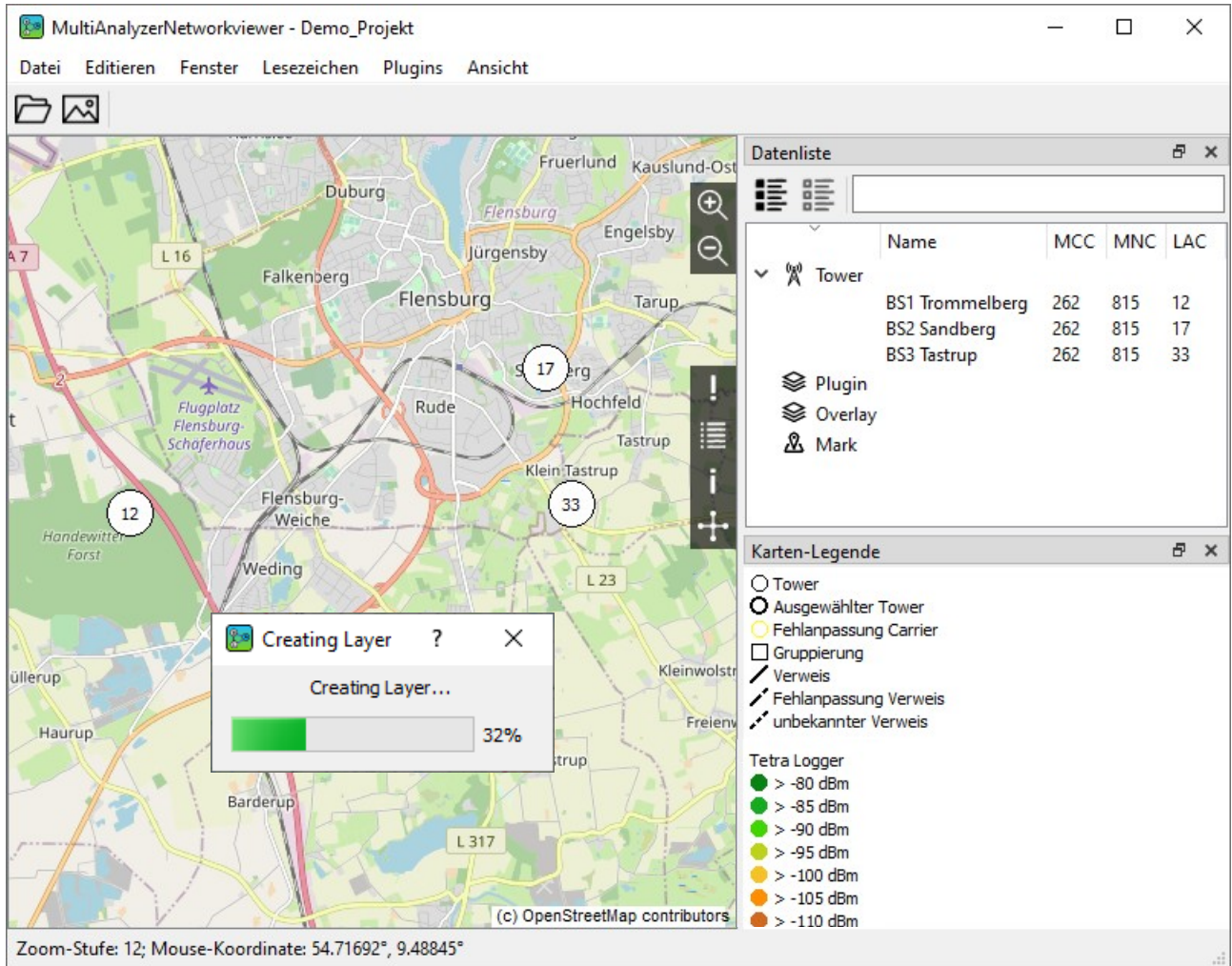


Figure 13 NetworkViewer: Import of RSSI-Data is in progress

- ✓ When processing is complete, the result of the import is displayed (see figure 14).

The TETRA-RSSI-Logger-Plugin

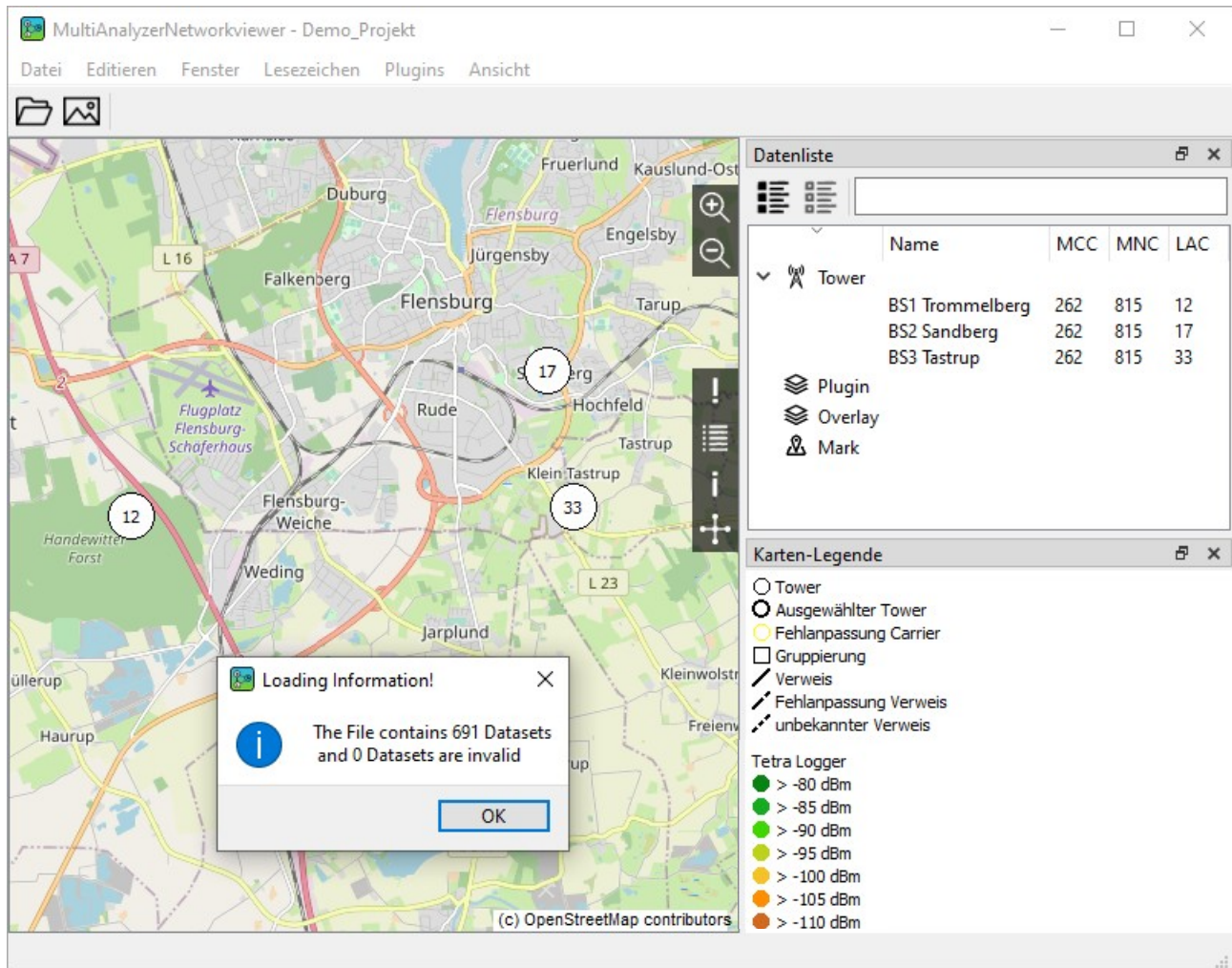


Figure 14 NetworkViewer: Import of the RSSI-Data successful

- ✓ In the data list under Plugin, the grouped entries (layers) are now displayed (see figure 15).

The TETRA-RSSI-Logger-Plugin

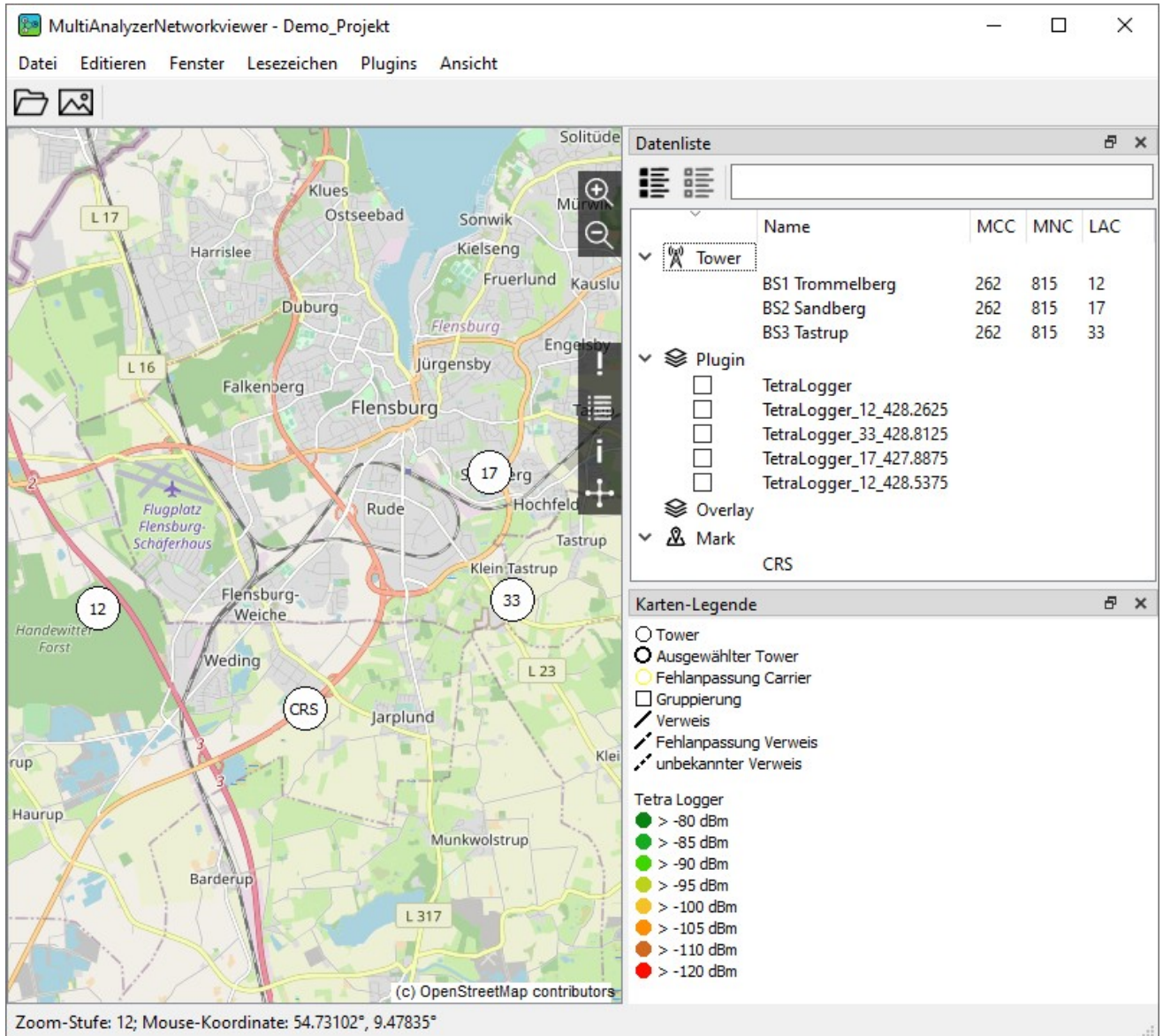


Figure 15 NetworkViewer: View of the Layer in the data list below Plugin

- ✓ The layers in the data list under Plugin contain the location area and the downlink frequencies of the TETRA base stations. There is one layer per downlink frequency. This layer contains all RSSI measurement values contained in the measurement data set (csv file), regardless of whether the TETRA terminal was logged into this cell or the cell was only measured as a neighbouring cell.
 - ✓ The 'TetraLogger' layer contains the RSSI values of the TETRA cells in which the TETRA terminal was logged in. It is therefore the layer of the best server.
6. To draw the RSSI data on the map, select 'Plugins' > 'Tetra Logger' > 'Draw Data'. The RSSI data for the zoom levels specified in the 'Map' tap of the 'Edit' > 'Settings' menu under 'Map Zooms' will be drawn. The drawing is done for zoom levels greater than the zoom level specified in 'Items visibility Zoom Level' and less than or equal to the zoom level specified in 'maximum Zoom Level' (see

The TETRA-RSSI-Logger-Plugin

Figure 4 NetworkViewer: Settings – Map). A progress bar is displayed as long as the programme is drawing the RSSI values.

- ✓ When the drawing is finished, the progress bar closes automatically.
- 7. Now check the layer that is to be displayed.
- ✓ The NetworkViewer displays the RSSI values according to the selected layer. (see figure 16).

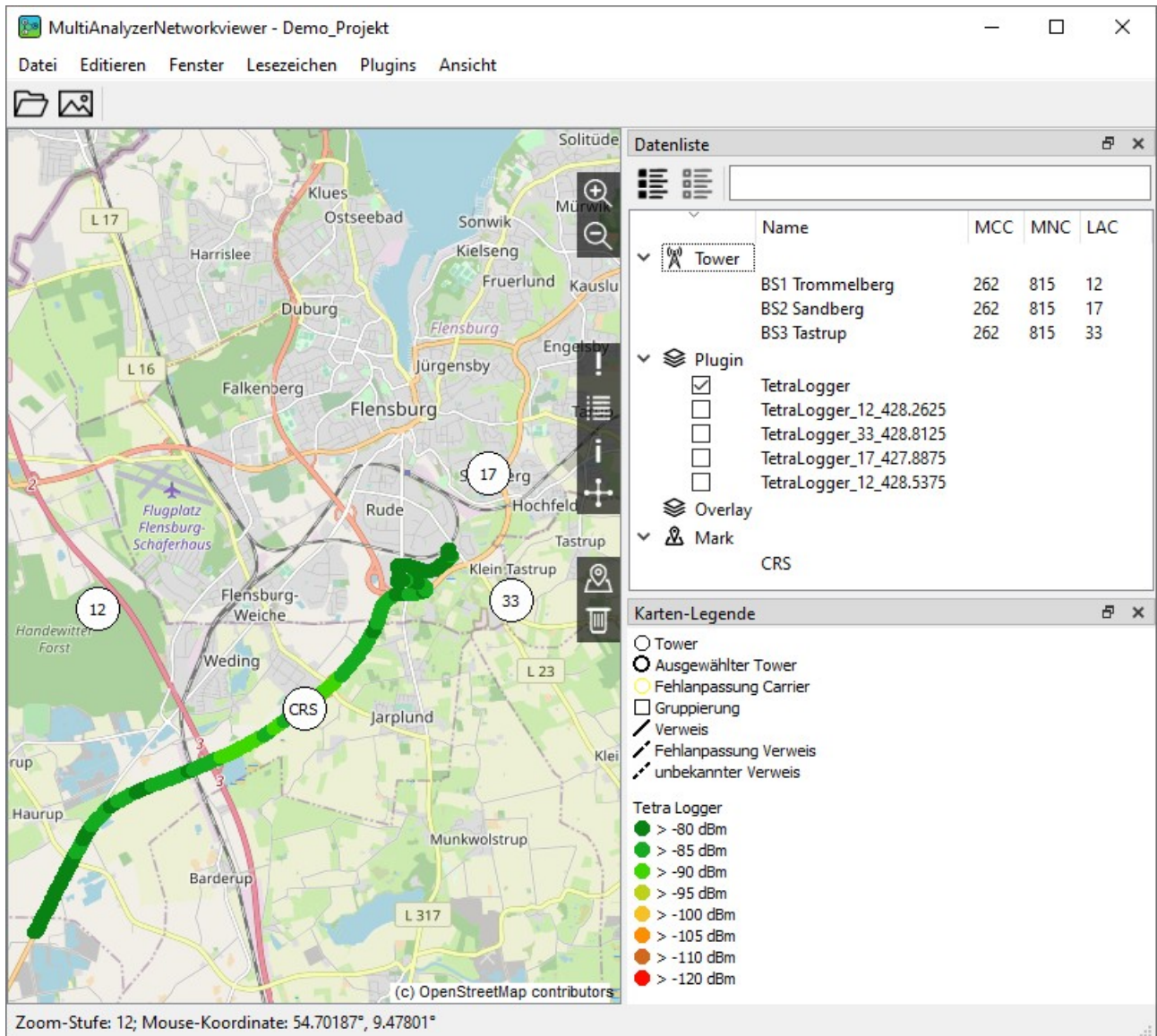


Figure 16 NetworkViewer: loading a configuration file and drawing RSSI-values

- ✓ This completes all steps for the configuration and import of RSSI data.



Further descriptions for working with the imported RSSI data are contained in the chapter 7. In this chapter, the handling is explained using the Kenwood Logger Plugin as an example, but the functions also apply to the **TETRA-RSSI-Logger-Plugin**.

6 The Kenwood-Logger-Plugin

The chapter contains a description of how to use the plugin **Kenwood-Logger**.

6.1 Import of test points

To import RSSI information from a file, a project must first be created. To create a project, follow the steps below.

- ➔ The **NetworkViewer** is open
 - ➔ The **NetworkViewer** has been configured to access the map server.
 - ➔ The **Kenwood Logger plugin** has been loaded into the programme.
1. Open the window for creating a project via ‚File‘ > ‚Create Project‘.
- ✓ The window opens (ses 17).

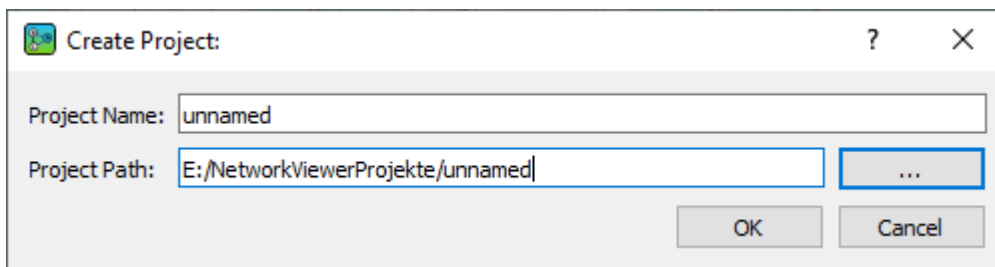


Figure 17 NetworkViewer: create a new project

2. Enter the name of the new project and, if necessary, change the path under which the project is created.
 3. The entries are confirmed with ‚OK‘.
- ✓ A directory with the project name is automatically created. The project is saved under this directory. The name of the currently loaded project is displayed in the top line of the programme.

Then the RSSI information can be imported from a file.

To import the RSSI information from a file, follow the next steps.

- ➔ The **NetworkViewer** is open.
 - ➔ The **NetworkViewer** has been configured to access the map server.
 - ➔ The **Kenwood Logger plugin** has been loaded into the programme.
 - ➔ A project has been created or loaded.
1. Select ‚File‘ > ‚Import‘ > ‚Kenwood Logger File‘.

The Kenwood-Logger-Plugin

- ✓ A window for selecting the file opens (see figure 18).

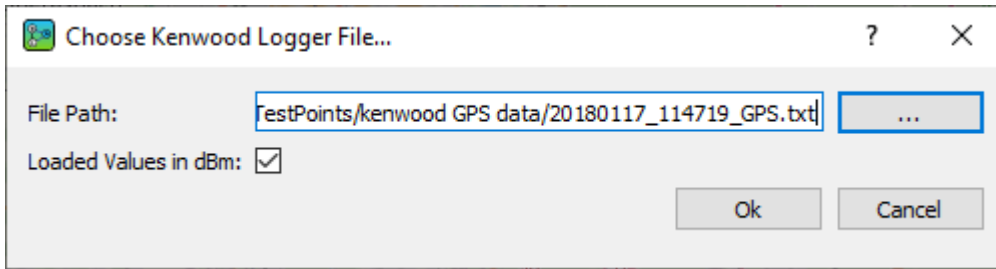

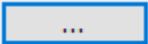


Figure 18 Kenwood-Logger: Import RSSI informations from a file

-  The 'Default Explorer Path' is used to set the default path for the explorer, for example, for creating a new project.
2. Enter the path and file name for importing the RSSI information or open the file explorer using the field  to select the file
 3. Check the checkbox 'Loaded values in dBm' to display the RSSI values read in the unit dBm. Otherwise the RSSI values are displayed with the unit dB.
 4. The import of the file is started with 'OK'.
- ✓ The window closes and a window (see figure 19) with the number of records found in the imported file is displayed.

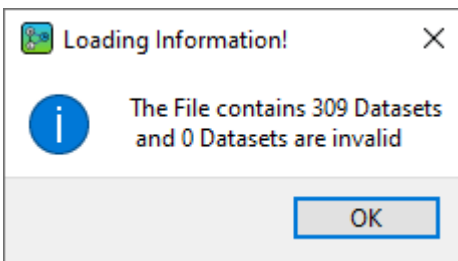



Figure 19 Kenwood-Logger: result of file import

-  A data set consists of a GPS coordinate with time, an assigned RSSI value and, if applicable, a BER value.
- ✓ The file name of the imported file is displayed in the 'Data List' below 'Plugin'.

The Kenwood-Logger-Plugin

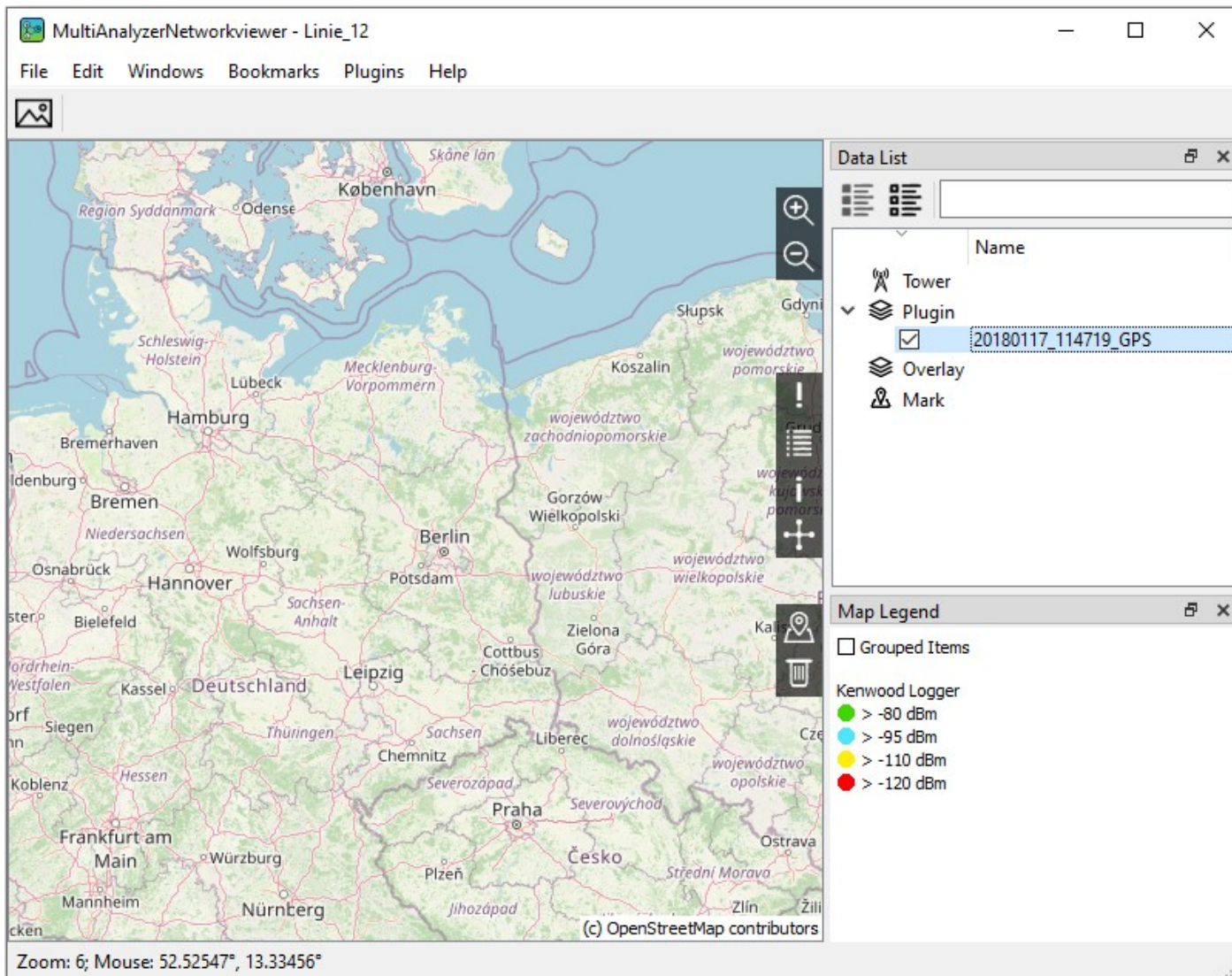



Figure 20 Kenwood-Logger: view after importing an RSSI file

The imported file name is indicated in the data list under ,Plugin'. With the check mark in front of the file name, the display of the RSSI information imported from this file can be shown or hidden. With a left click on the file name in the ,Data List' the data set can be removed from the project (left click on the file name (in figure 20 „20180117_114719_GPS“) > ,Delete').

In figure 20 the zoom level 6 is used for the display (bottom left in the main window). To see the imported RSSI information, the zoom level must be higher than the ,Items visibility Zoom level' in the ,Edit' > ,Settings' menu in the ,Map' tab (in the example, the zoom level must be higher than 9).

The Kenwood-Logger-Plugin

To display the imported RSSI information on the map, follow the steps below:

- ➔ The **NetworkViewer** is open.
 - ➔ The **NetworkViewer** has been configured for map access to the map server
 - ➔ The **Kenwood Logger plugin** has been loaded into the program.
 - ➔ RSSI information has been imported from a file.
1. Display the ‚Data List‘ window by checking ‚Windows‘ > ‚Data List‘ or by pressing the button ‚Toggle Data list View‘ (see chapter 8 point 6j) in the quick access bar.
 - ✓ The window ‚Data List‘ is displayed.
 2. Zoom into the map display until the zoom level is higher than the ‚Items visibility Zoom level‘ in the menu ‚Edit‘ > ‚Settings‘ in the ‚Map‘ tab (in the example the zoom level must be higher than 9). Either the mouse wheel or the ‚Zoom In‘ button is used for this (see chapter 8 point 4j).
 3. Left click on the filename of the imported file and select ‚Center on‘
or
 4. Click with the right mouse button on the file name of the imported file. The button ‚Center On‘  appears in the quick access bar, which you then press.
 - ✓ The map view now shows the imported RSSI information.

The Kenwood-Logger-Plugin

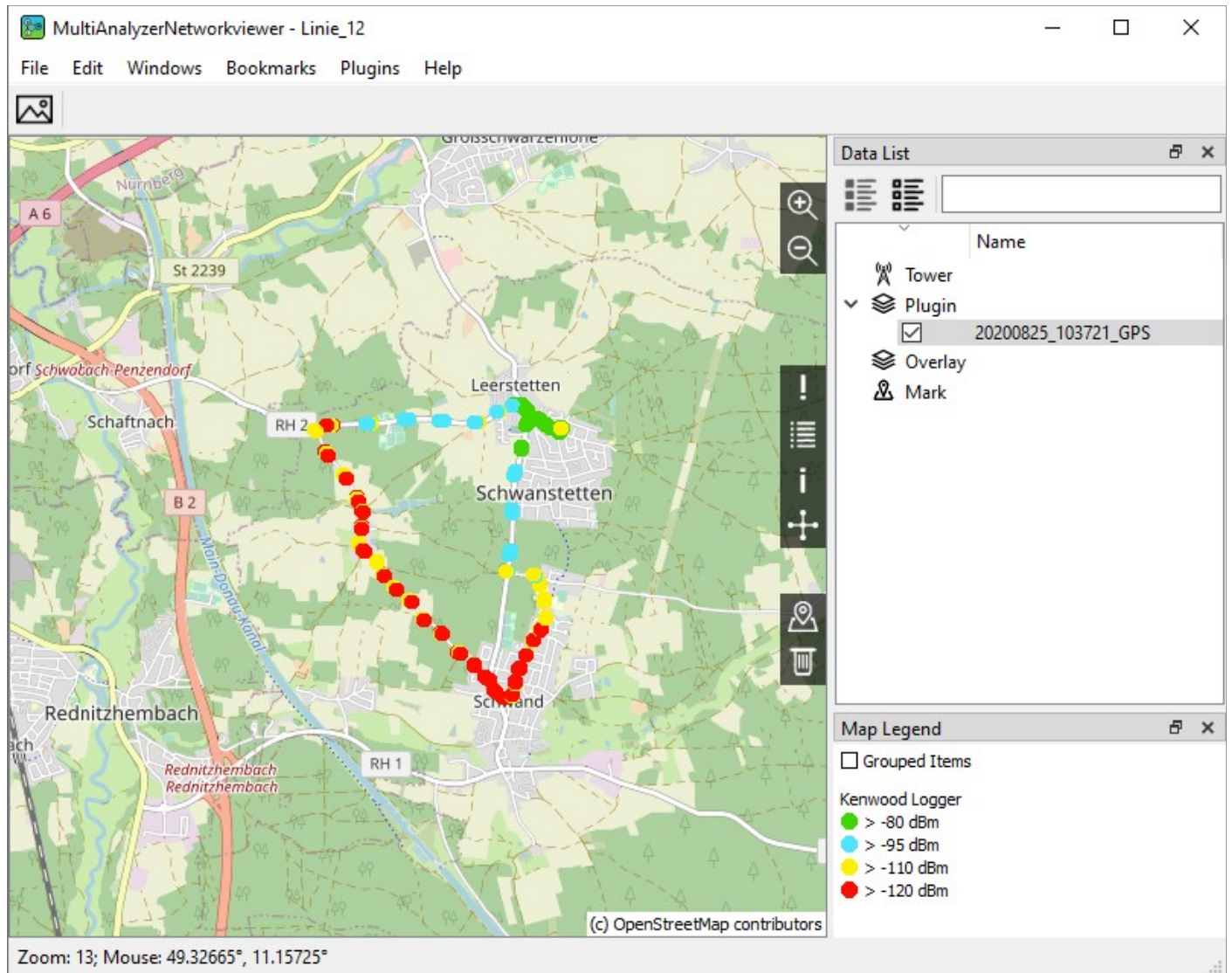


Figure 21 Kenwood-Logger: display of the RSSI values and the legend

The current coordinate can be saved as the start coordinate using the button ,Get Current Map Center' in the menu ,Edit' > ,Settings' in the tab ,Map'.

This centres the map view on the current map view when the programme is started.

If the project is closed ,File' > ,Close Project' or the programme is closed directly via ,File' > ,Close', the current map view and the current zoom level are saved in the project. If the project is reloaded using ,File' > ,Recent File' > Project-File or via ,File' > ,Open Project File', this last map view is displayed again.

This completes the import of RSSI information from a file.

7 Working with the displayed RSSI-Data

This chapter explains the possibilities of working with the imported RSSI data.

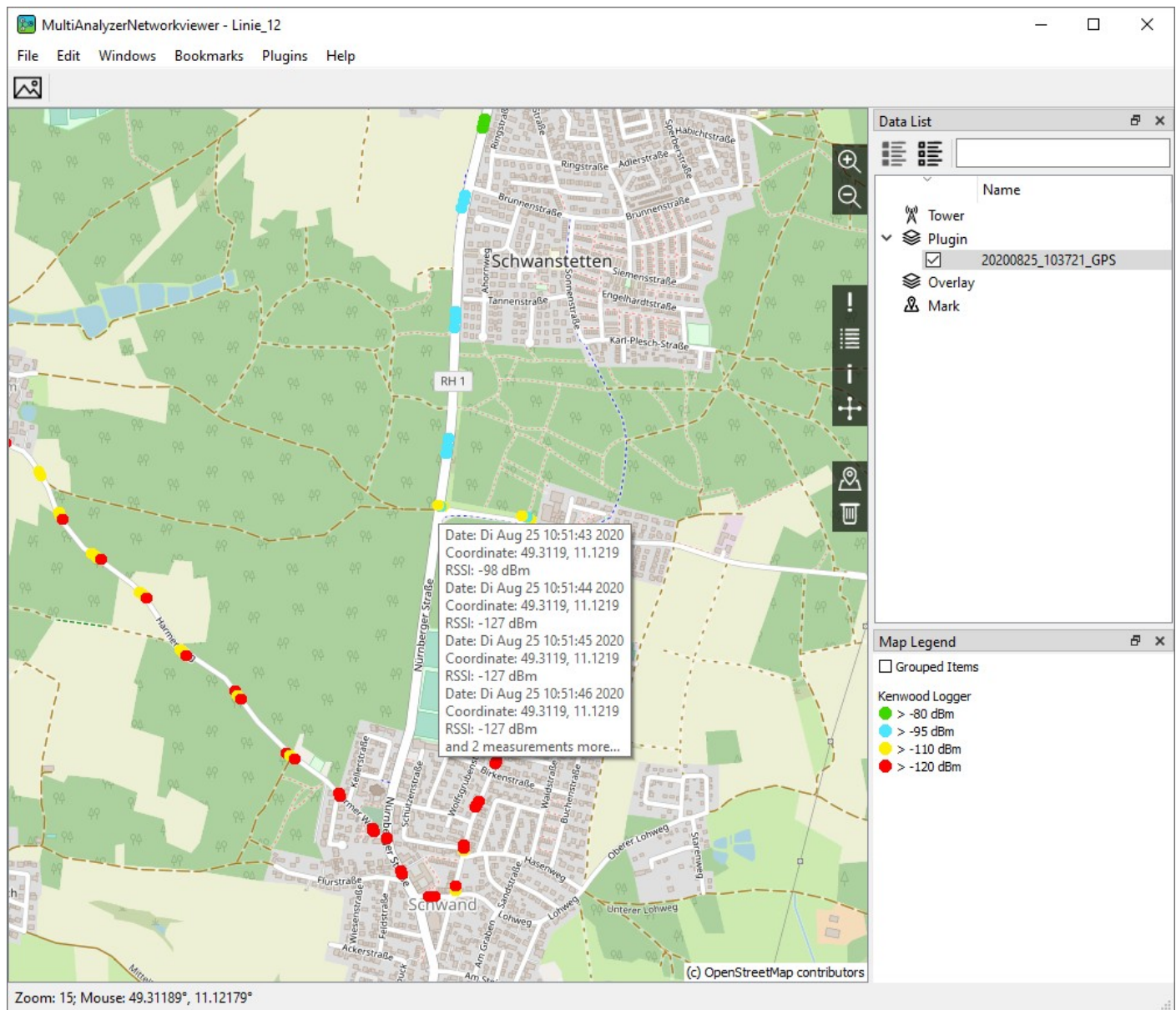


Figure 22 NetworkViewer: Tooltip RSSI values

For each data set (GPS position + time information + RSSI + BER, if applicable), one point is displayed in the respective colour according to the RSSI gradation set (see legend 'Map Legend'). If several points are on top

Working with the displayed RSSI-Data

of each other, the point with the highest RSSI is displayed. The values of the points below can be displayed with the help of the mouse pointer.

If the mouse pointer is over an RSSI point, a window (tooltip) is displayed in which the RSSI information is assigned to the GPS coordinates and the time. If several points lie on top of each other, only a maximum of 4 data records with the highest RSSI values are displayed.

For further resolution, you can now zoom into the map display (using the mouse wheel or the magnifying glass symbols +/- at the top right).

NOTICE

The display of the points is determined by the programme for each zoom level permitted in the 'Settings' (see Chapter 4.1) at the time of the file import. If the 'maximum zoom level' is increased after importing the data, no RSSI points are displayed for this zoom level. This can be remedied by importing the data again after the permitted zoom level has been increased in the 'Settings'.

Working with the displayed RSSI-Data

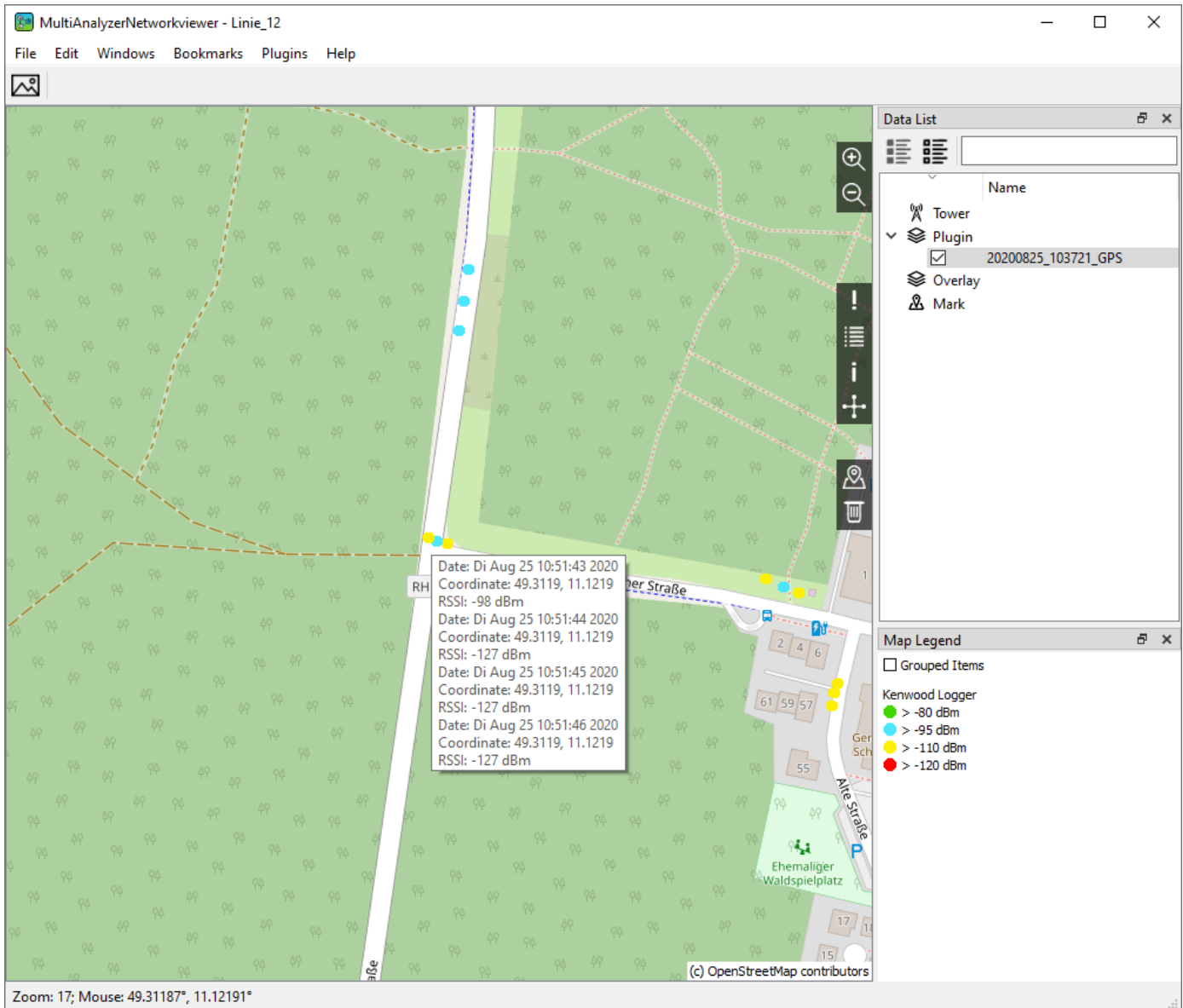


Figure 23 NetworkViewer: Tooltip RSSI values Zoom

In figure 23 the tooltip of the left yellow dot is shown. The RSSI measurement resulted in a value of -98 dBm; according to the legend, the reception field strength is less than -95 dBm but greater than -110 dBm and is shown in yellow.

The subdivision of the RSSI values and their colour display can be set in the menu under 'Plugins' under the respective Plugin below 'Options' (see chapter 8.7.1).

If the imported data also contains BER values or other plugin-specific values (for example, the LA of the **TETRA-RSSI-logger plugin**), these are also displayed in the tooltip. For example, the following figure 24 shows that 44.73% of the received bits were received correctly in the specified second. The remaining bits

Working with the displayed RSSI-Data

were changed during the signal transmission. These BER values are a direct measure of the signal quality, measured by the receiving terminal.

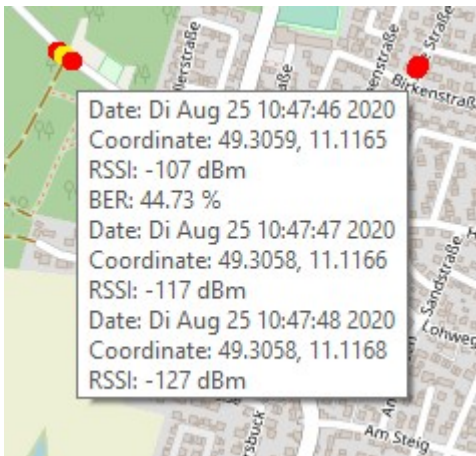


Figure 24 NetworkViewer: Tooltip BER values

7.1 Export of the map view as file

The map view can be exported as an image file.

To export the current map view as an image file, follow the steps below:

- ➔ The **NetworkViewer** is open.
 - ➔ The **NetworkViewer** has been configured for map access to the map server.
 - ➔ The **Kenwood-Logger-Plugin** was loaded into the programme.
 - ➔ RSSI information was imported from a file.
 - ➔ The map section and zoom level were selected so that RSSI values are displayed as points on the map.
1. Select ‚Edit‘ > ‚Save View to Image‘.
- ✓ The file explorer opens.
2. Set the file type for the image file to be saved. The image file formats png and jpeg are supported.
 3. Select the destination directory and enter the file name.
 4. Confirm the saving with ‚Save‘.
- ✓ The image file has now been saved in the specified directory under the specified file name.

Working with the displayed RSSI-Data

7.2 Centring the map view with the help of the ‚Data List‘

If several files have been loaded, each containing RSSI information from different locations, the map view can be centred on the respective location. With a left click on the file name in the ‚Data List‘ (in figure 23 „20200825_103721_GPS“) > ‚Center On‘ the map view can be centred on the data set.

7.3 GPS bookmarks

GPS bookmarks can also be inserted. With a right click on the map > ‚Create GPS-Bookmark‘ a window opens where the name of the bookmark can be entered. The bookmark saves the GPS position of the right click and the current zoom level. This bookmark then appears in the menu below ‚Bookmarks‘ and can be used as a jump marker. If the bookmark is selected beneath ‚Bookmarks‘ > ‚bookmark name‘, the map display is centred on the saved GPS coordinate and the saved zoom level is set. The GPS bookmarks can also be edited and deleted again via the ‚Bookmark‘ menu.

7.4 Offline maps

For the use of offline maps, it is possible to define a map section, download it from the map server and save it. The saved map data are automatically used for the map display and independently of a loaded project. The use of saved map data has priority over the map data downloaded from the map server.

To specifically download a map section from the map server, follow the next steps.

- ➔ The **NetworkViewer** is open.
- ➔ The **NetworkViewer** has been configured for map access to the map server.
- 1. In the main window, define the map section you want to download specifically from the map server by moving and zooming.
- 2. In the menu, select ‚Edit‘ > ‚Cache Tiles‘.
- ✓ The window ‚Cache Tiles‘ opens (see figure 25).

Working with the displayed RSSI-Data

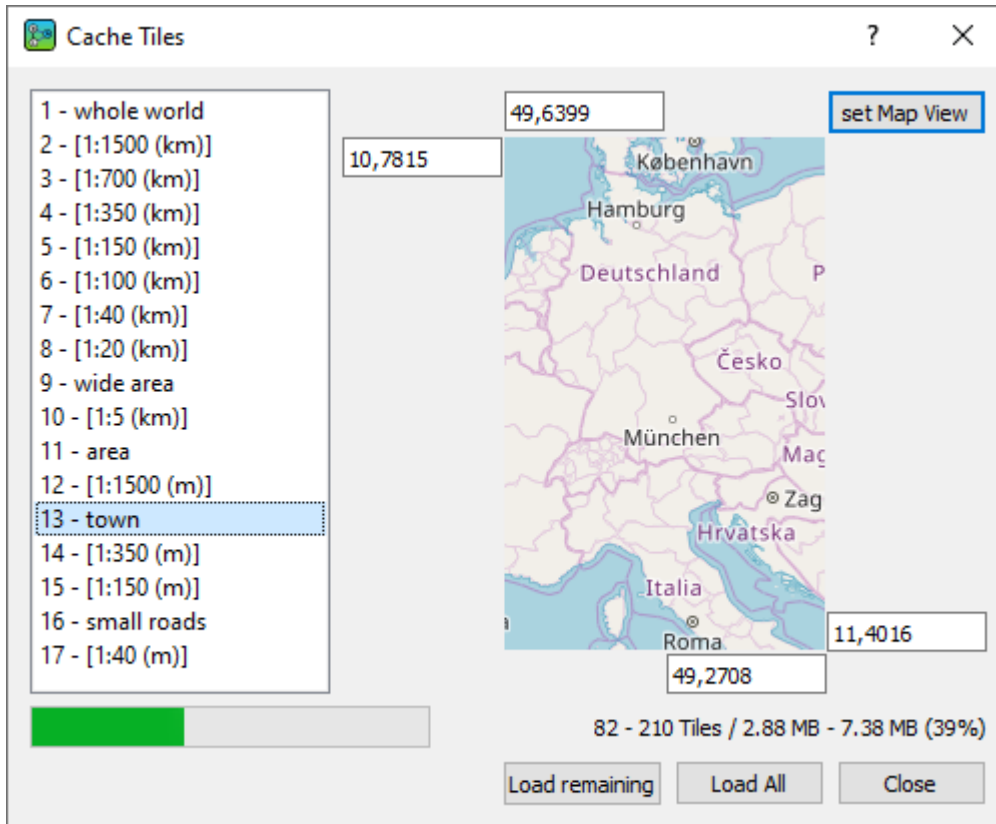


Figure 25 NetworkViewer: loading maps used for offline map view

i The map shown is only an image and does not change.

3. Press the button ,set Map View' to take over the corner coordinates of the current map view of the main window.
- ✓ The window now shows the north-western and south-eastern coordinates of the current map view.
4. In the list on the left, select the zoom level for which the map material is to be downloaded from the map server.
- ✓ Above the buttons, the number of tiles already in the cache and the amount of data needed to download the remaining tiles are displayed for the selected zoom level. Below the list of zoom levels, the bar graph also shows the ratio of map data already loaded and still to be loaded for the selected zoom level.

i The larger the zoom level, the larger the amount of map data.

5. Start the download of the tiles not yet loaded for the selected zoom level by pressing the button ,Load Remaining'.

or

Working with the displayed RSSI-Data

6. Start the download of all tiles for the selected zoom level by pressing the ‚Load All‘ button. This also overwrites map data already in the cache.
 - ✓ The tiles are downloaded.
7. Repeat steps 4 to 6 for each desired zoom level.
8. Press the button ‚Close‘.
 - ✓ The dialogue closes and access to the map server has been configured.

NOTICE

Openstreetmap reserves the right to permanently prevent excessive data traffic requested by a single computer. It is therefore recommended to handle the stored map data with care.

8 User interface NetworkViewer

This chapter gives an overview of the user interface of NetworkViewer. After starting the programme for the first time, the main view shown in figure 26 opens.

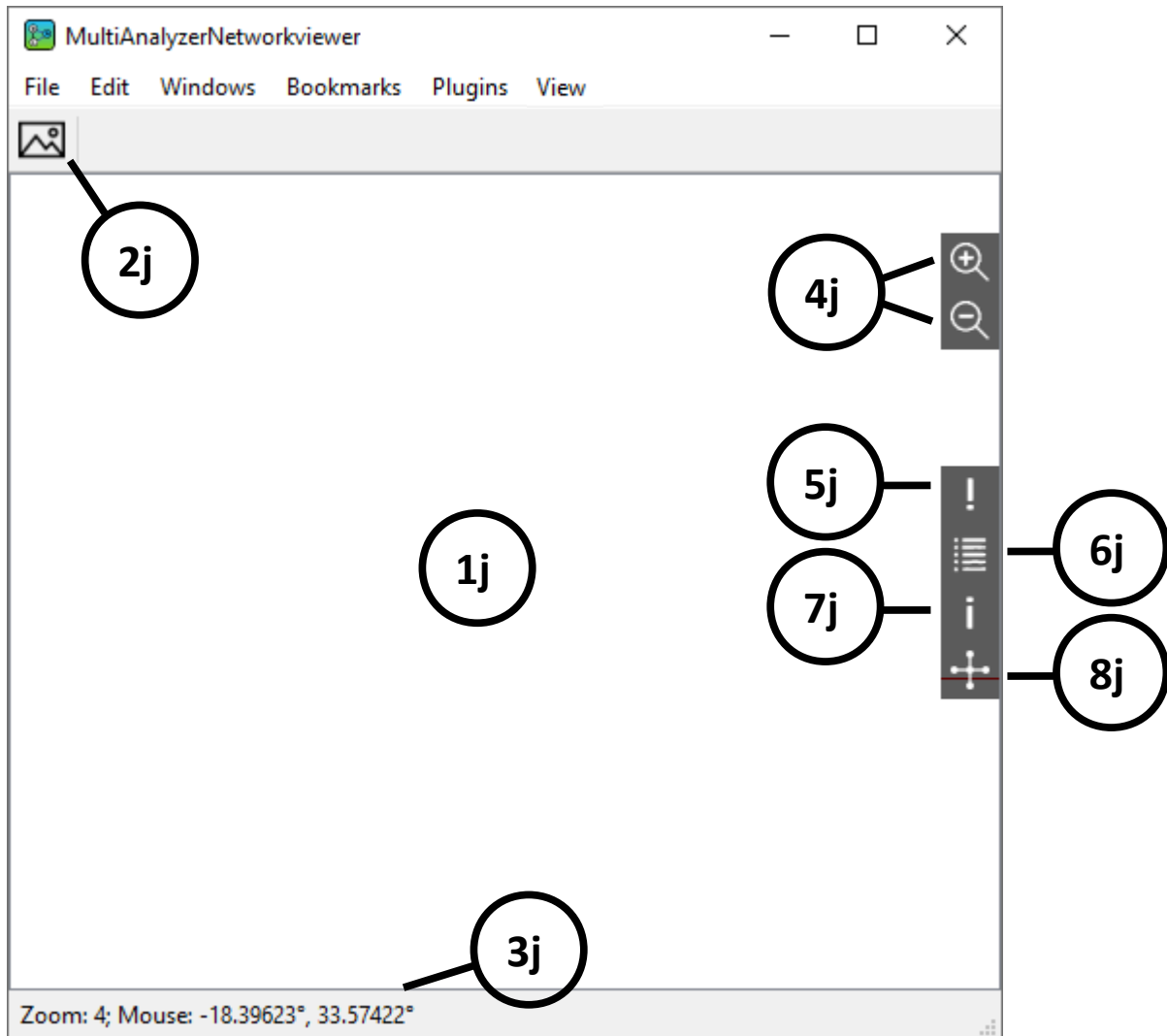


Figure 26 NetworkViewer: user interface overview

No	description
1j	Field with the representation of the map and the imported data.
2j	Opens the dialogue for opening an overlay file.
3j	Display of the current zoom level and the GPS coordinate of the current mouse cursor.
4j	Zoom in and out in the map display. Alternatively, the mouse wheel can be used.
5j	,Toggle Map Legend View' – shows or hides the legend.

User interface NetworkViewer

No	description
6j	,Toggle Data list View' – shows or hides the data list.
7j	,Toggle Informations View' – shows or hides the information docking window.
8j	,Toggle Star View' – shows or hides the star graph for displaying the neighbourhood relations between neighbouring TETRA cells.

Table 1 NetworkViewer: User interface overview

8.1 Docking windows

This chapter provides an overview of the different docking windows in the **NetworkViewer**.

Data list

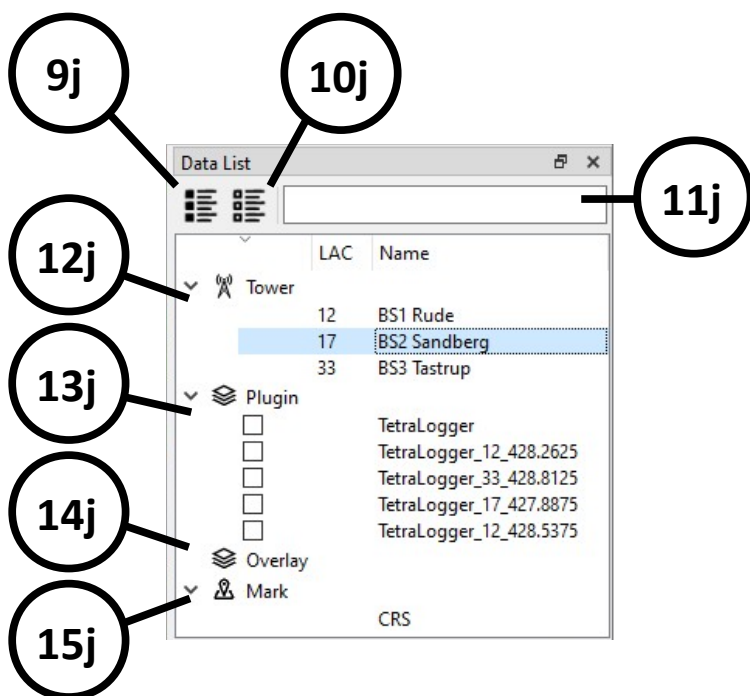


Figure 27 NetworkViewer: Data list

No	description
9j	Button to select all items.
10j	Button to reset the selection of items.
11j	Search bar to search for elements in the list. All elements found are marked.
12j	The list containing the Base stations.

User interface NetworkViewer

No	description
13j	List with the plugin-specific objects (shown here is the list with the grouped entries of the TETRA RSSI Logger plugin).
14j	The Overlay list shows the load overlay files.
15j	Die Mark list contains the marks.

Table 2 NetworkViewer: Data list

Information

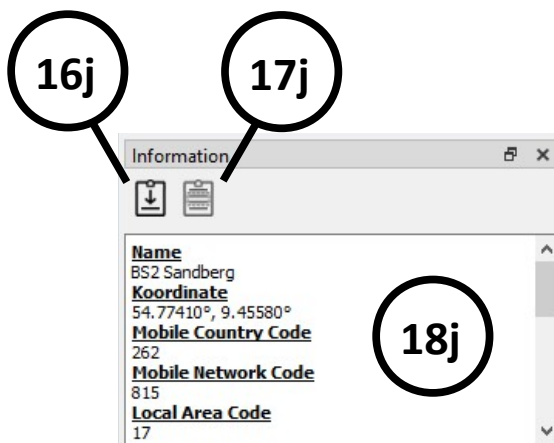


Figure 28 NetworkViewer: Information

No	description
16j	Button to copy the information of the selected item (in the tower list or the mark list) to the clipboard.
17j	Button to copy the selected Information to the clipboard.
18j	Information of the marked item. This can be a Base station from the Tower list or a mark.

Table 3 NetworkViewer: Information

Star View (only RecordFile-Plugin)

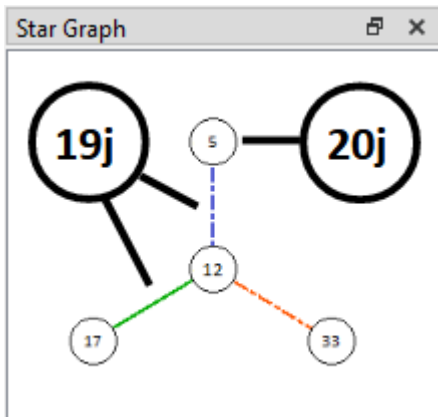


Figure 29 NetworkViewer: Star View

No	description
19j	Logical links between the Base Stations. The references are shown in colour. The colours are explained in the map legend.
20j	Base Stations distinguished by the location area of the respective station.

Table 4 NetworkViewer: Star Graph

The Star Graph shows the logical links between the TETRA Base Stations. The TETRA Base Stations reference to their neighbouring cells on the air interface. The RecordFile plugin reads in record files from the MultiAnalyzer (maf files) and evaluates the neighbourhood relations of the TETRA cells among each other. The result is displayed both directly in the map view and in the Star Graph. The TETRA Base Stations show their neighbouring cells on the air interface. The RecordFile plugin reads recording files from the MultiAnalyzer (maf files) and evaluates the neighbourhood relations of the TETRA cells among each other. The result is displayed both directly in the map view and in the Star view. For the Star Graph, a Base Station must be selected in the data list or in the map display.

Different colours are used for the representation of the neighbourhood relations. The colour representation is identical both in the map view and in the Star Graph view and can be specified in the settings (see Figure 53). In the illustrations, "mismatch" means that there is no mutual reference between the TETRA cells. That is, TETRA cell A identifies TETRA cell B as a neighbouring cell, but TETRA cell B does not contain TETRA cell A as a neighbour. Thus, terminals would be able to switch from cell A to cell B, but conversely, terminals cannot switch from cell B to cell A. "Incomplete", on the other hand, means that the recording files of both TETRA cells have not yet been read in and therefore the mutual neighbourhood relationship cannot be assessed by the programme. For example, if only the recording file of cell A has been imported, but not that of cell B, the reference between cell A and B is shown as "incomplete". A mutual designation of the TETRA cells among each other is indicated by "link".

Map Legend

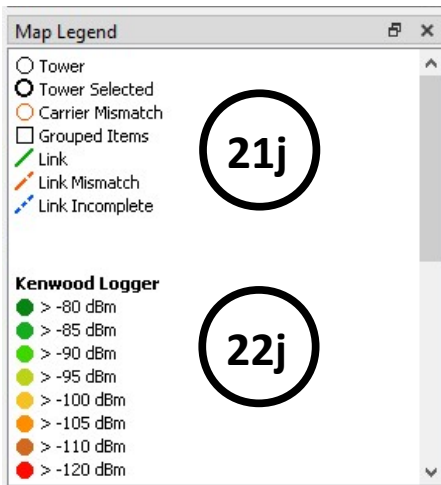


Figure 30 NetworkViewer: Map Legend

No	description
21j	This section shows the description of all colours used for the logical connection of the towers in the display on the map as well as in the star view.
22j	This excerpt shows the legend for the colour gradations of the RSSI values of a plug-in (TETRA RSSI logger plug-in or Kenwood logger plug-in).

Table 5 NetworkViewer: Map Legend

8.2 Menus of the NetworkViewer

This chapter describes the contents of the menus in detail.

Menu ‚File‘

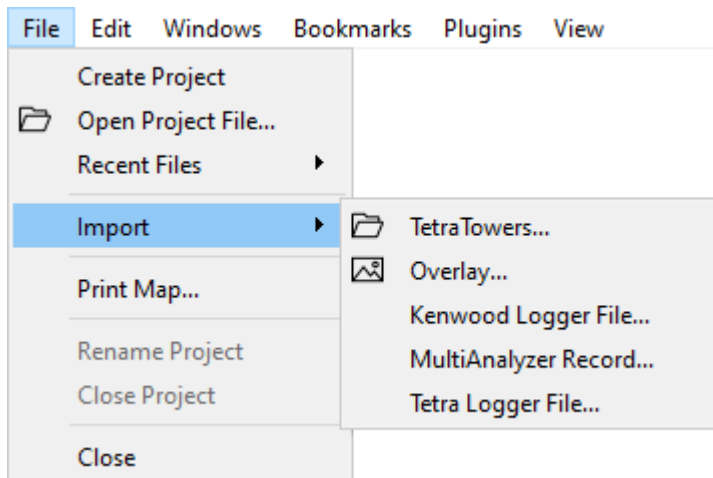


Figure 31 NetworkViewer: Menu ‚File‘

Name	Short cut	description
Create Project	none	Opens a dialogue for creating a project.
Open Project File...	none	Opens an already existing project.
Recent Files	none	Displays the most recently used project files and opens the associated project when the file is clicked.
Import	none	Imports overlay files or files for the plug-ins.
Tetra Towers...	none	Imports the TETRA cell data from a csv file. ⓘ This button is only available if the programme supports the RecordFile Plugin option.
Overlay...	none	Loads an overlay file.
Kenwood Logger File...	none	Imports the RSSI/BER data from a file. ⓘ This button is only available if the programme supports the Kenwood Logger Plugin option.

User interface NetworkViewer



Name	Short cut	description
MultiAnalyzerRecord...	none	<p>Imports the data from a MultiAnalyzer record file. Supported record files have the file extensions *.maf, *.lan or *.tmw.</p> <p> This button is only available if the programme supports the RecordFile Plugin option.</p>
Tetra Logger File...	none	<p>Imports the data from a TetraRssiLogger-record file. The file has the file extension *.csv.</p> <p> This button is only available if the programme supports the TETRA-RSSI-Logger-Plugin.</p>
Rename Project	none	Opens a dialogue for renaming the currently opened project.
Close Project	none	Closes the currently open project.
Close	Ctrl+F4	Exits the programme.

Table 6 NetworkViewer: Menu 'File'

Menu ,Edit‘

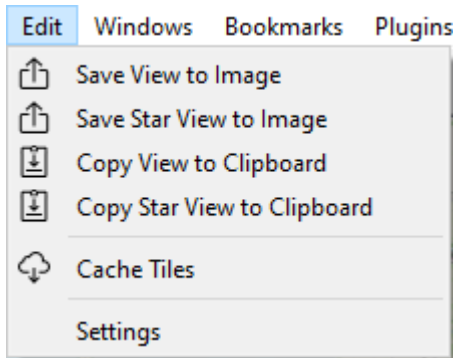


Figure 32 NetworkViewer: Menu ‘Edit‘

Name	Short cut	description
Save View to Image	None	Saves the current map view as an image file. In the dialogue that opens, the name of the image file as well as the file type can be specified.
Save Star View to Image	None	Saves the current Star Graph as an image file. In the dialogue that opens, the name of the image file as well as the file type can be specified.
Copy View to Clipboard	None	Saves the current map view to the clipboard.
Copy Star View to Clipboard	None	Saves the current Star Graph to the clipboard.
Cache Tiles	None	Opens the dialogue for downloading map data based on the map section entered and the desired zoom level.
Settings	None	Opens the dialogue for the programme settings.

Table 7 NetworkViewer: Menu ,Edit‘

User interface NetworkViewer

Menu ,Windows‘

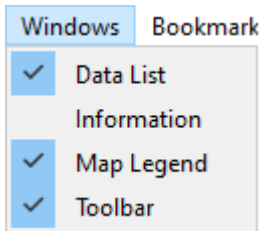


Figure 33 NetworkViewer: Menu 'Windows'

Name	Short cut	description
Data List	none	Shows or hides the window with the Data list.
Information	none	Shows or hides the window with the Information.
Map Legend	none	Shows or hides the window with the Legend.
Toolbar	none	Shows or hides the Toolbar.

Table 8 NetworkViewer: Menu ,Window‘

Menu ‚Bookmarks‘

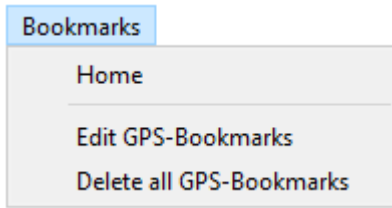


Figure 34 NetworkViewer: Menu ‚Bookmarks‘

Name	Short cut	description
Home	none	GPS bookmark created by the user as a jump mark for the map display. GPS bookmarks can be created by right-clicking on the map display.
Edit GPS-Bookmarks	none	Opens a dialogue in which the GPS bookmarks can be edited. Created bookmarks are displayed in the 'Bookmarks' menu.
Delete all GPS-Bookmarks	none	Deletes all existing GPS bookmarks.

Table 9 NetworkViewer: Menu ‚Bookmarks‘

User interface NetworkViewer

Menu ‚Plugins‘

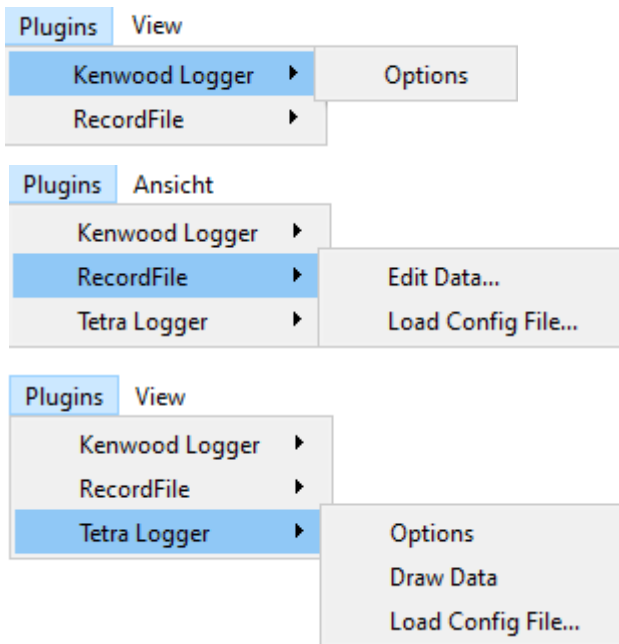


Figure 35 NetworkViewer: Menu ‚Plugins‘

Name	Short cut	description
Kenwood Logger	none	Contains the buttons for the Option Kenwood-Logger-Plugin . ⓘ This button is only available if the programme supports the option Kenwood-Logger-Plugin .
Options	none	Opens a dialogue for entering the RSSI ranges and their colour assignment for the coloured display of the RSSI values (see chapter 8.7.1)
RecordFile	none	Contains the buttons for the option RecordFile-Plugin . ⓘ This button is only available if the programme supports the option RecordFile-Plugin .
Edit Data	none	Opens a dialogue with which the imported data of the TETRA cells can be edited.
Load Config File...	none	Opens the file explorer with which the configuration file can be loaded. The configuration file contains the locations as GPS position, names and other parameters of the TETRA Base Stations. The GPS positions of the Base Stations therefore do not have to be entered manually.

User interface NetworkViewer


Name	Short cut	description
Tetra Logger	none	Contains the buttons for the option TETRA-RSSI-Logger-Plugin .  This button is only available if the programme supports the option TETRA-RSSI-Logger-Plugin .
Options	none	Opens a dialogue for entering the RSSI ranges and their colour assignment for the coloured display of the RSSI values (see chapter 8.7.3)
Draw Data	none	Starts drawing the RSSI points on the map.
Load Config File...	none	Opens the file explorer with which the configuration file can be loaded. The configuration file contains the locations as GPS position, names and other parameters of the TETRA Base Stations with which an assignment of the RSSI measured values to the Base Stations is possible.

Table 10 NetworkViewer: Menu ‚Plugins‘

User interface NetworkViewer

Menu ,View‘

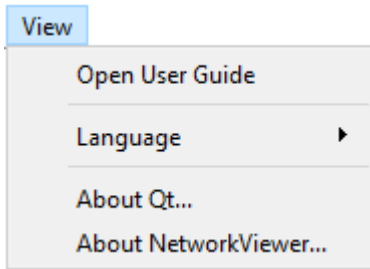


Figure 36 NetworkViewer: Menu ‘View‘

Name	Short cut	description
Open User Guide	none	Opens the user manual.
Language	none	Switching the menu language. The supported languages are displayed and can be selected.
About Qt...	none	Displays information about Qt such as the version number.
About NetworkViewer...	none	Displays information about the NetworkViewer such as the version number.

Table 11 NetworkViewer: Menu ,View‘

8.3 The pop-up menu

The respective pop-up menu can be reached with the right mouse button. There is a pop-up menu for the map display, the 'Information' window and for the 'Star Graph' window.

In the 'Information' field, data can be copied to the clipboard via the pop-up menu. There is also a menu item to select all entries in the 'Information' window and copy them to the clipboard.

The pop-up menu in the 'Star Graph' window offers the option to save the display as an image or to save the display to the clipboard.

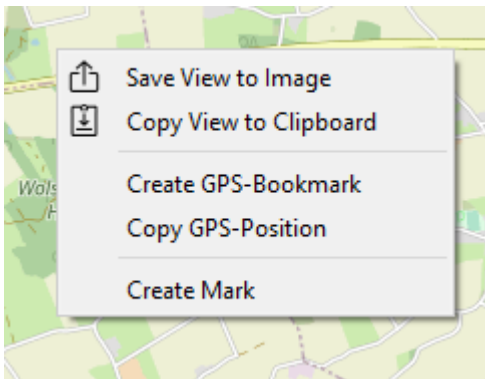


Figure 37 NetworkViewer: pop-up menu of the map display

Name	Short cut	description
Save View to Image	none	Saves the map view with the legend as an image. The file explorer opens, in which the file name and the storage location are specified.
Copy View to Clipboard	none	Copies the map view with the legend as an image to the clipboard.
Create GPS-Bookmark	none	Creates a GPS bookmark at the position of the mouse click (right mouse button). The GPS bookmark is entered in the 'Bookmarks' menu (see Figure 44) and can also be edited and deleted via this menu.
Copy GPS-Position	none	Copies the GPS position of the mouse click (right mouse button) to the clipboard.
Create Mark	none	Creates a mark at the position of the mouse click (right mouse button). The mark is entered in the data list.

Table 12 NetworkViewer: pop-up menu in the map display

8.4 Programme settings in dialogue ,Settings'

In the 'Settings' dialogue there are the tabs 'Path', 'Map', 'Server' and 'Colour', which are shown below.

8.4.1 Settings in the ,Path' tab

In the 'Path' tab, the default paths can be set. This concerns the path that is displayed when opening the file explorer and the path under which the map data is saved.

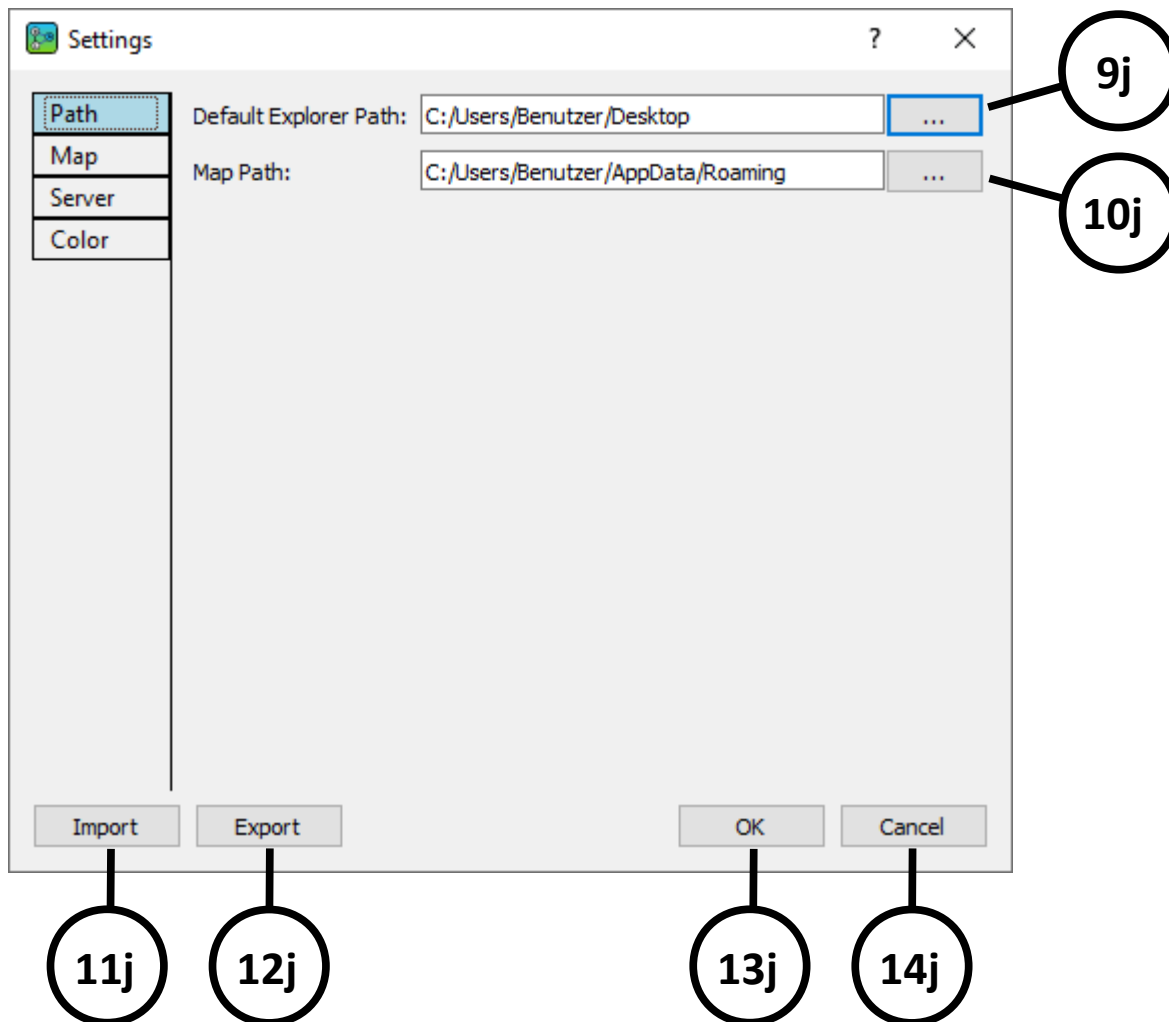


Figure 38 NetworkViewer: dialogue Settings – Path

No	description
9j	Setting the default path for the file explorer, for example, for creating a new project.
10j	Path under which the map data is saved. Saved map data is not downloaded from the map server. This reduces access to the server and enables offline map display.
11j	Imports all settings from a text file.

User interface NetworkViewer

No	description
12j	Exports all settings to a text file.
13j	Confirms the changes and closes the dialogue.
14j	Discards all changes and closes the dialogue.

Table 13 NetworkViewer: *dialogue* Settings – Path

8.4.2 Settings in the ,Map' tab

In the 'Map' tab, settings can be made for the display of the map.

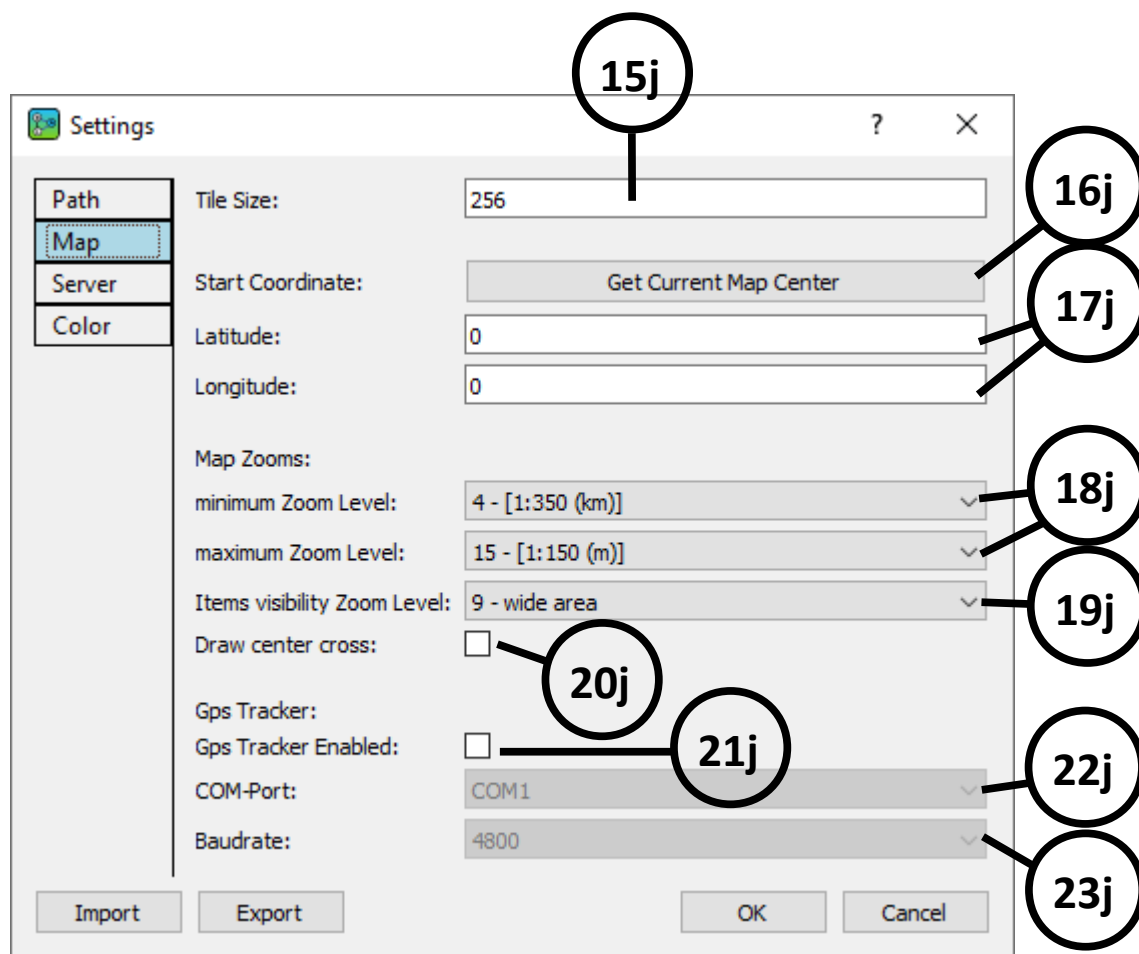


Figure 39 NetworkViewer: *dialogue* Settings – Map

No	description
15j	Text box to set the pixel size of a single map tile. <div style="display: flex; align-items: center;"> i <p>The tile size is a server-specific parameter and specifies the size of a tile in pixels (e.g. 256 means that a tile consists of 256x256 pixels).</p> </div>

User interface NetworkViewer



No	description
16j	Set the initial coordinate for the map display. The position of the red thread cross or the centre of the map is entered under 'Latitude' and 'Longitude'. When the programme is started, the map view is centred on this coordinate.
17j	Set initial coordinate for the map display.
18j	<p>The minimum and maximum zoom level to which the map display may be enlarged or reduced.</p> <p> A reduction in the amount of map data downloaded from the map server can be achieved by limiting the allowed zoom level range.</p>
19j	<p>The zoom level from which items such as towers, markers or RSSI points are displayed on the map.</p> <p> This setting serves to clarify the display of the items on the map.</p>
20j	Shows or hides the red cross hairs in the map view.
21j	Activates/deactivates GPS reception via a GPS mouse connected to the PC.
22j	Text field to specify the COM port of the GPS mouse connected to the PC.
23j	Text field to set the baud rate of the GPS mouse connected to the PC.

Table 14 NetworkViewer: dialogue Settings – Map

8.4.3 Settings in ,Server' tab

The settings in the 'Server' tab concern access to the map server.

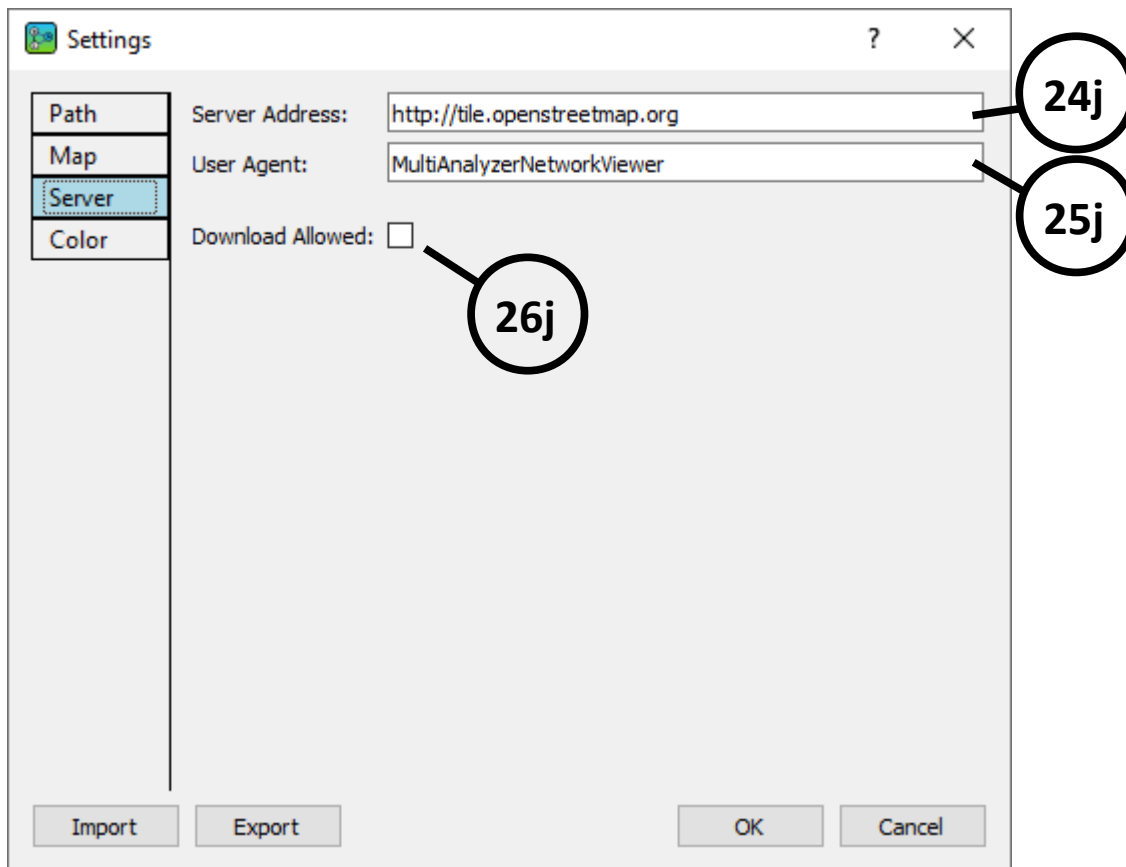


Figure 40 NetworkViewer: dialogue Settings – Server

No	description
24j	Text field to set the server address of the map server.
25j	Text field for entering the user agent used to log in to the map server.
26j	Checkbox to activate or deactivate the internet download for the map data. If the checkbox is not selected, the map is only loaded from the local cache (specified in the 'Path' see 10j in Figure 49).

Table 15 NetworkViewer: dialogue Settings – Server

8.4.4 Settings in the ,Color' tab

The colour display is configured in the 'Colour' tab.

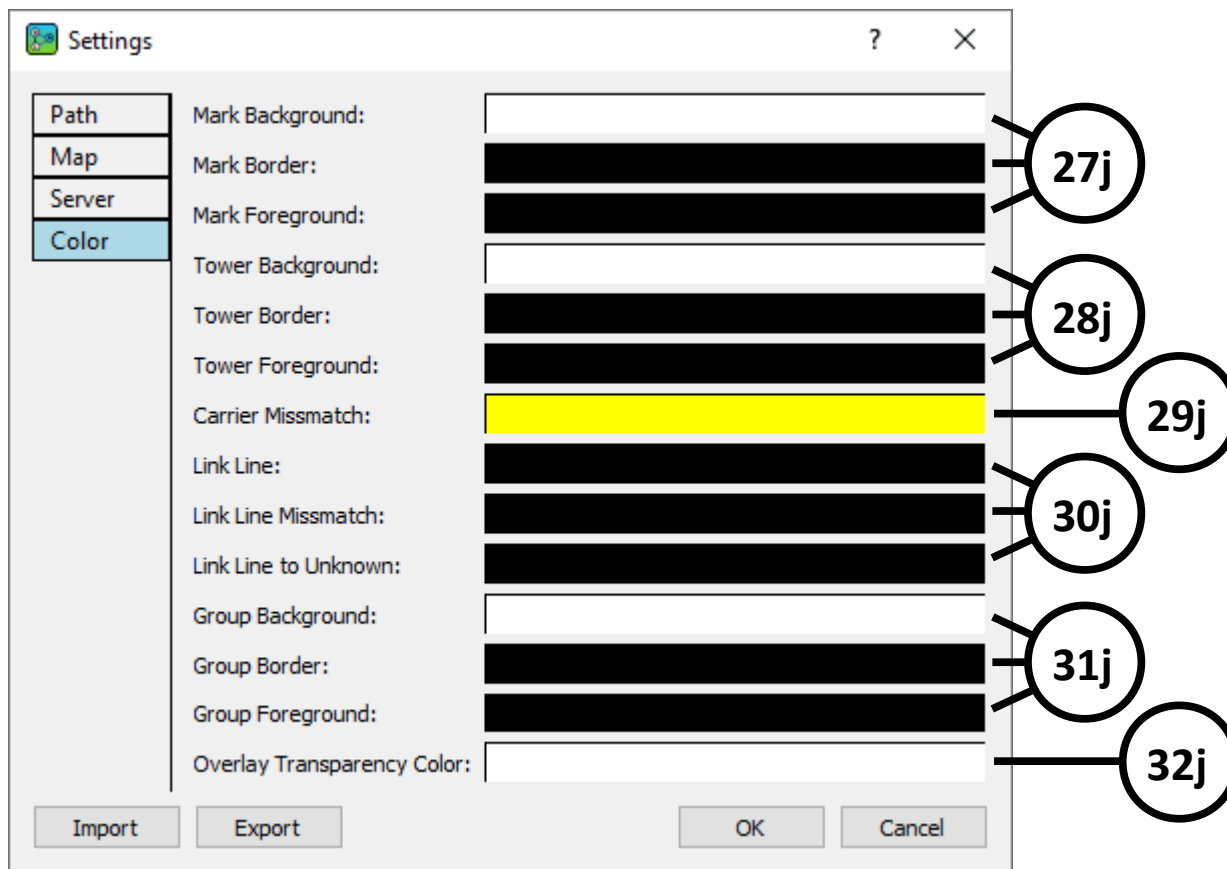


Figure 41 NetworkViewer: dialogue Settings – Colour

No	description
27j	Colour selection for the representation of the marks. Right-click on the respective colour to open the dialogue for changing the colour.
28j	Colour selection for the representation of the towers. Right-click on the respective colour to open the dialogue for changing the colour.
29j	Colour selection for the representation of the towers with a one-sided or mutual misconfiguration regarding the designation of the neighbouring cells. Right-clicking on the respective colour opens the dialogue for changing the colour.
30j	Colour selection for the representation of the connecting lines between the towers. Right-clicking on the respective colour opens the dialogue for changing the colour.
31j	Colour selection for the display of the grouped towers. Right-clicking on the respective colour opens the dialogue for changing the colour.

User interface NetworkViewer

No	description
32j	Colour selection for the display of the overlay. Right-click on the respective colour to open the dialogue for changing the colour.

Table 16 NetworkViewer: dialogue Settings – Colour

8.5 Map data saving with ‚Cache Tiles‘

Map data can be downloaded specifically from the map server. This enables the map to be displayed even if the PC is not connected to the internet (offline map operation). In addition, saving map data in this way saves transmission capacity when downloading maps from the map server.

To download map data from the map server, select ‚Edit‘ > ‚Cache Tiles‘. The window shown in figure 27 is opened.

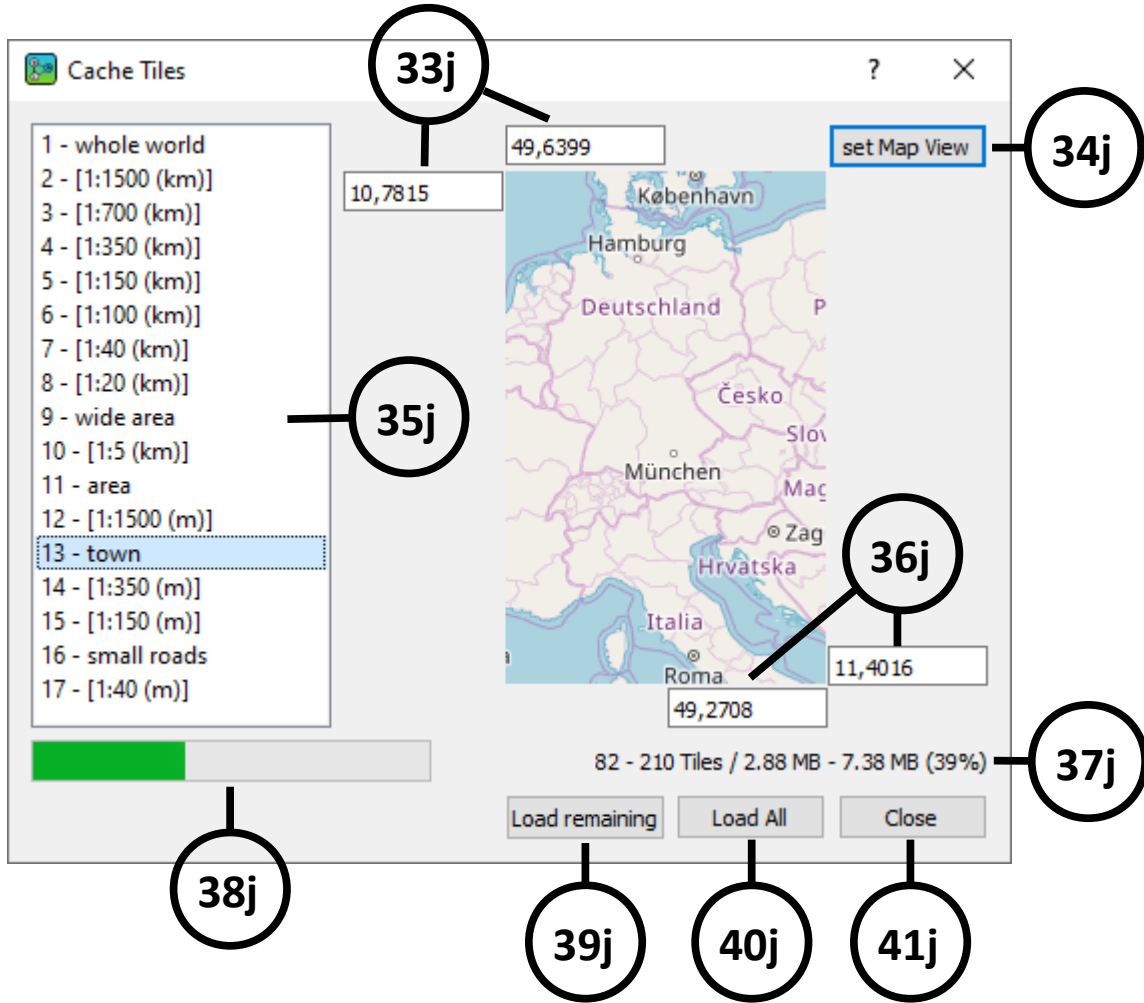


Figure 42 NetworkViewer: User interface Cache Tiles

No	description
33j	Northernmost and easternmost coordinates of the selected map section.
34j	Set the current map section selected in the main view.
35j	Zoom level of the maps to be downloaded.
36j	Southernmost and westernmost coordinates of the selected map section.
37j	Information about the map information already available in the cache for the currently selected map section and zoom level in the format: number of existing tiles - number of required tiles / existing amount of data - required amount of data (percentage of already existing data). The map display is composed of tiles. The higher the resolution of the map, i.e. the higher the zoom level, the higher the number of tiles required for the display.
38j	Information about the map information already in the cache as graphic output.

User interface NetworkViewer

No	description
39j	Start of the download of the map data still required for the currently selected map section and zoom level.
40j	Start of the download of all map data for the currently selected map section and zoom level. The existing map data is overwritten.
41j	Closes the dialogue.

Table 17 NetworkViewer: user interface Cache Tiles

The saved map data is automatically used for the map display and independently of a loaded project. The use of saved map data has priority over map data that must be downloaded from the map server.

8.6 The data list

In the docking window „Datenliste“, information about the TETRA cells (towers), the grouped entries (layers) below the plugin, the loaded overlays and the created marks are displayed depending on the loaded plugin.

In the data list, a right-click on the entry of a TETRA cell, a layer or a mark can be used to centre the map view on the respective entry. In addition, right-clicking on an item in the data list deletes the item.

8.7 Plugin specific configuration

Depending on the Plugin loaded, there are various additional settings. These are presented in this chapter.

8.7.1 Kenwood-Logger-Plugin

The dialogue for the settings of the **KenwoodLogger plugin** can be opened in the menu below ‚Plugins‘ (see figure 45).

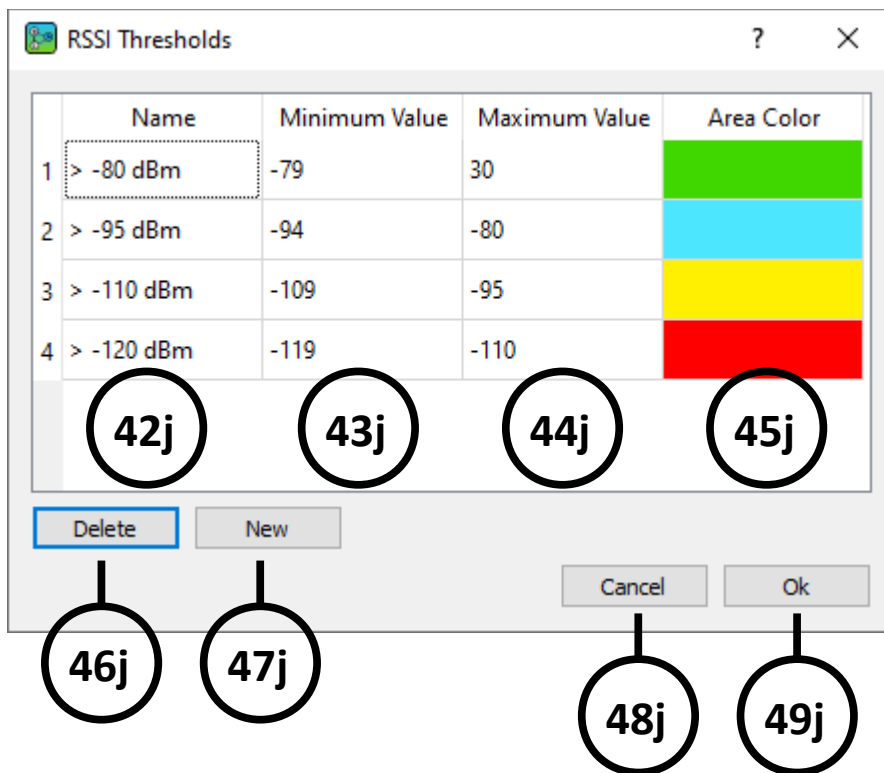


Figure 43 NetworkViewer: user interface Kenwood-Logger-Options

No	description
42j	Column with the respective name of the range.
43j	Column with the respective minimum of the range.
44j	Column with the respective maximum of the area.
45j	Column with the respective colour assigned for the representation of the points of the area.
46j	Deletes the selected line.
47j	Opens a new line for entering the name, the numerical values as well as the colour for the representation of a new area.

User interface NetworkViewer

No	description
48j	Closes the dialogue without saving the changes.
49j	Saves the changes and closes the dialogue.

Table 18 NetworkViewer: user interface Kenwood-Logger-Options

NOTICE

The new settings of the Kenwood Logger plugin will only take effect when the data is re-imported.

8.7.2 RecordFile-Plugin

Using the RecordFile-Plugin record files (maf-files) recorded by the MultiAnalyzer can be imported. The NetworkViewer then offers to enter GPS coordinates of the TETRA cells found in the file (figure 44) and displays the position of the TETRA cells on the map. In addition, NetworkViewer examines the neighbourhood relations of the TETRA cells among each other and also displays them graphically. The RecordFile plugin also offers the possibility to load a configuration file. This file contains the names and GPS positions of the TETRA cells. After loading the configuration file, the GPS coordinates and names of the TETRA cells no longer have to be entered manually. The dialogue in figure 44 is only displayed after importing the recording file(s) if TETRA cells were found in the recording file that were not included in the configuration file. It is recommended to load the configuration file first (see menu ‚Plugins‘ in figure 35 ‚RecordFile‘ > ‚Load Config File...‘) before importing the record files.

User interface NetworkViewer

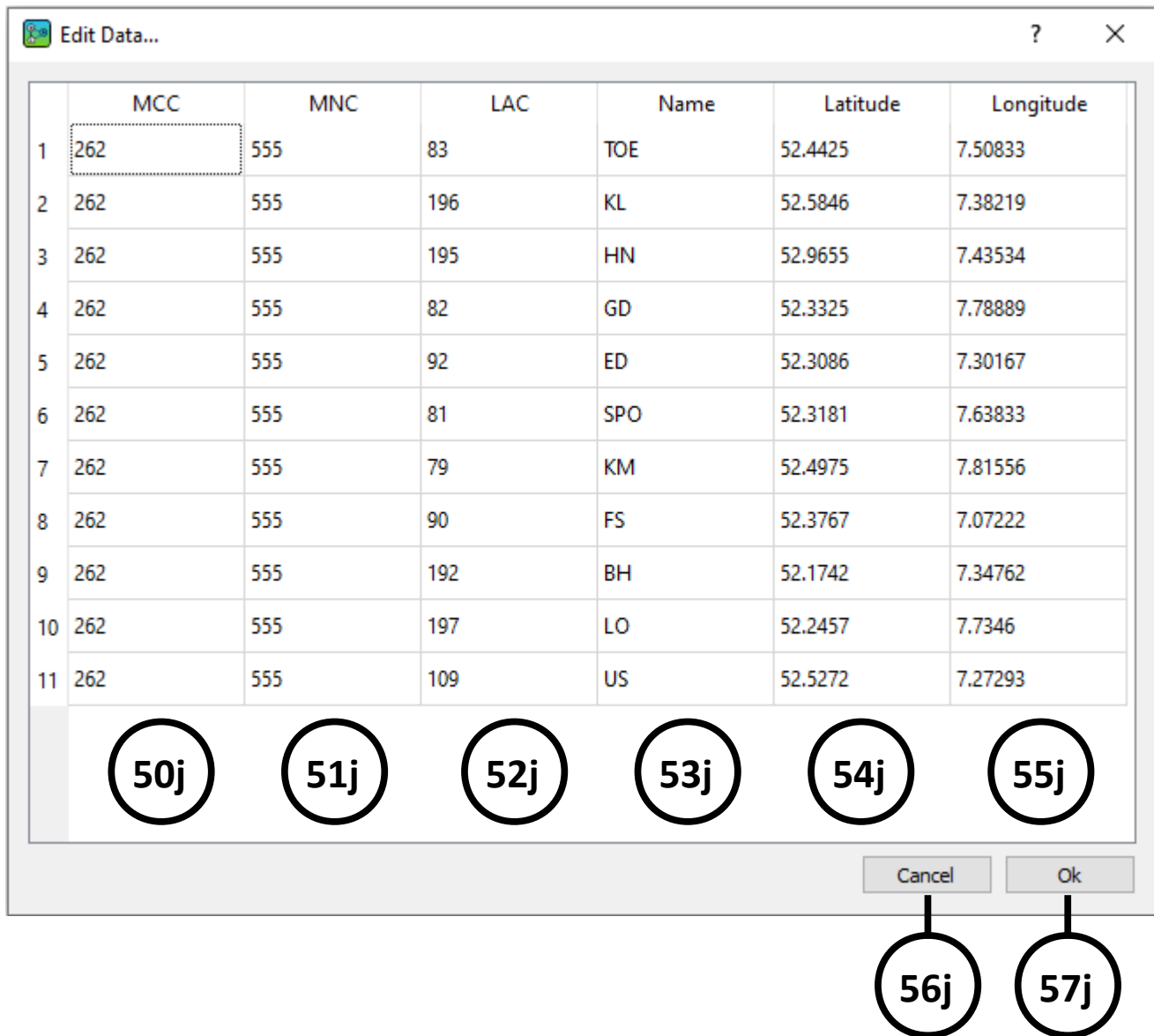


Figure 44 NetworkViewer: user interface RecordFile Edit Data

No	description
50j	Column with the respective Mobile Country Code of the TETRA cell.
51j	Column with the respective Mobile Network Code of the TETRA cell.
52j	Column with the respective Location Area of the TETRA cell.
53j	Column with the respective name of the TETRA cell.
54j	Column with the respective Latitude of the TETRA cell.
55j	Column with the respective longitude of the TETRA cell.
56j	Closes the window without saving the changes.
57j	Saves the changes and closes the window.

Table 19 NetworkViewer: user interface RecordFile Edit Data

The file explorer for importing the recording files allows the simultaneous import of several files. Several recording files can be selected for import in the file explorer with the help of the shift key or the control key (Ctrl). When the „Open“ button is pressed, the selected files are automatically imported one after the other. The last file name is saved and displayed in the file explorer when the import of the recording files is carried out again.

The dialogue for entering the names and GPS positions of the TETRA cells can also be opened after importing the record files below ‚Plugins‘ > ‚RecordFile‘ > ‚Edit Data...‘ (see figure 35).

8.7.3 TETRA-RSSI-Logger-Plugin

The dialogue for the settings of the RSSI-Thresholds of the TETRA-RSSI-Logger-Plugin can be opened in the menu below ‚Plugins‘ (see figure 35).

The ‚CRS‘ fields shown on the map mark cell change locations. If the mouse pointer is over such a field, a window (tooltip) is displayed in which the change of the location area assigned to the GPS coordinates is shown. If the cell change of the terminal takes longer (for example, due to an authentication in the new cell), the terminal signals an unregistered state for about 1s. This state represents the terminal MMI behaviour for services during this time. As long as the terminal is not registered in the new cell, it can neither receive nor send services (calls, SDS, ...). All unregistered states are displayed with location area (LA) = 0 in the tooltip and in the information field. Thus, longer sections with LA = 0 indicate that the terminal was outside the TETRA coverage area.

9 Glossary

B

BER	Bit Error Rate	Bit error rate given as a percentage. It is a measure of the signal quality. The lower the BER, the higher the signal quality.
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D

DMR	Digital Mobile Radio	
Dongle	-	A copy-protected hardware.

L

LA	Location Area	
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M

Mark	-	Marker that can contain data (e.g. cell change location) and is displayed on the map.
MCC	Mobile Country Code	
MNC	Mobile Network Code	

N

NXDN	Next Generation Digital Narrowband	
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O

OSM	Open Street Map	OpenStreetMap is an international project created with the aim of creating a free map of the world.
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R

RSSI	Received Signal Strength Indication	Indicator for the reception field strength given in dBm or dB
-------------	--	---

T

Tiles	-	Also called tiles or tile graphics, tiles are individual parts of a high-resolution raster graphic. The tiles are transmitted individually via the internet and reassembled on the
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Glossary

		computer.
Tower	-	Transmission mast of the base station associated with the received broadcast data.

table of figures

Figure 1 <i>NetworkViewer: Settings – Path</i>	5
Figure 2 <i>NetworkViewer: Settings – Server</i>	6
Figure 3 <i>NetworkViewer: Settings – Map</i>	8
Figure 4 <i>NetworkViewer: Settings – Map</i>	10
Figure 5 <i>TETRA-RSSI-Logger: programme</i>	12
Figure 6 <i>TETRA-RSSI-Logger: Dialogue Save Path</i>	13
Figure 7 <i>TETRA-RSSI-Logger: Dialogue Change GPS Settings</i>	13
Figure 8 <i>TETRA-RSSI-Logger: Dialogue Change Terminal Settings</i>	14
Figure 9 <i>TETRA-RSSI-Logger: Start of the measurement</i>	14
Figure 10 <i>TETRA-RSSI-Logger: start of the measurement</i>	15
Figure 11 <i>NetworkViewer: Dialogue ,Create Project‘</i>	16
Figure 12 <i>NetworkViewer: configuration file loaded</i>	17
Figure 13 <i>NetworkViewer: Import of RSSI-Data is in progress</i>	18
Figure 14 <i>NetworkViewer: Import of the RSSI-Data successful</i>	19
Figure 15 <i>NetworkViewer: View of the Layer in the data list below Plugin</i>	20
Figure 16 <i>NetworkViewer: loading a configuration file and drawing RSSI-values</i>	21
Figure 17 <i>NetworkViewer: create a new project</i>	23
Figure 18 <i>Kenwood-Logger: Import RSSI informations from a file</i>	24
Figure 19 <i>Kenwood-Logger: result of file import</i>	24
Figure 20 <i>Kenwood-Logger: view after importing an RSSI file</i>	25
Figure 21 <i>Kenwood-Logger: display of the RSSI values and the legend</i>	27
Figure 22 <i>NetworkViewer: Tooltip RSSI values</i>	28
Figure 23 <i>NetworkViewer: Tooltip RSSI values Zoom</i>	30
Figure 24 <i>NetworkViewer: Tooltip BER values</i>	31
Figure 25 <i>NetworkViewer: loading maps used for offline map view</i>	33
Figure 26 <i>NetworkViewer: user interface overview</i>	35
Figure 27 <i>NetworkViewer: Data list</i>	36
Figure 28 <i>NetworkViewer: Information</i>	37
Figure 29 <i>NetworkViewer: Star View</i>	38
Figure 30 <i>NetworkViewer: Map Legend</i>	39
Figure 31 <i>NetworkViewer: Menu ‘File‘</i>	40
Figure 32 <i>NetworkViewer: Menu ‘Edit‘</i>	42
Figure 33 <i>NetworkViewer: Menu ‘Windows‘</i>	43
Figure 34 <i>NetworkViewer: Menu ‘Bookmarks‘</i>	44
Figure 35 <i>NetworkViewer: Menu ‘Plugins‘</i>	45
Figure 36 <i>NetworkViewer: Menu ‘View‘</i>	47
Figure 37 <i>NetworkViewer: pop-up menu of the map display</i>	48
Figure 38 <i>NetworkViewer: dialogue Settings – Path</i>	49

Figure 39 NetworkViewer: <i>dialogue Settings – Map</i>	50
Figure 40 NetworkViewer: <i>dialogue Settings – Server</i>	52
Figure 41 NetworkViewer: <i>dialogue Settings – Colour</i>	53
Figure 42 NetworkViewer: <i>User interface Cache Tiles</i>	55
Figure 43 NetworkViewer: <i>user interface Kenwood-Logger-Options</i>	57
Figure 44 NetworkViewer: <i>user interface RecordFile Edit Data</i>	59

tables

Table 1 NetworkViewer: <i>User interface overview</i>	36
Table 2 NetworkViewer: <i>Data list</i>	37
Table 3 NetworkViewer: <i>Information</i>	37
Table 4 NetworkViewer: <i>Star Graph</i>	38
Table 5 NetworkViewer: <i>Map Legend</i>	39
Table 6 NetworkViewer: <i>Menu ‘File’</i>	41
Table 7 NetworkViewer: <i>Menu ,Edit‘</i>	42
Table 8 NetworkViewer: <i>Menu ,Window‘</i>	43
Table 9 NetworkViewer: <i>Menu ,Bookmarks‘</i>	44
Table 10 NetworkViewer: <i>Menu ,Plugins‘</i>	46
Table 11 NetworkViewer: <i>Menu ,View‘</i>	47
Table 12 NetworkViewer: <i>pop-up menu in the map display</i>	48
Table 13 NetworkViewer: <i>dialogue Settings – Path</i>	50
Table 14 NetworkViewer: <i>dialogue Settings – Map</i>	51
Table 15 NetworkViewer: <i>dialogue Settings – Server</i>	52
Table 16 NetworkViewer: <i>dialogue Settings – Colour</i>	54
Table 17 NetworkViewer: <i>user interface Cache Tiles</i>	56
Table 18 NetworkViewer: <i>user interface Kenwood-Logger-Options</i>	58
Table 19 NetworkViewer: <i>user interface RecordFile Edit Data</i>	60