MCS Manual

User guide
2015

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MCS Manual

The Aaronia MCS software is an advanced control and reporting software for the *Spectran* series of Aaronia spectrum analyzer devices. This manual is based on version 2.0.2 of the software released in July 2015, but should in general also apply to newer versions.

Installation

The setup routine for the MCS software uses the standard procedure on each operating system (installer on Windows, disk image on MacOS, packages on Linux) to simplify installation as much as possible.

System Requirements

To install the Aaronia MCS software your system must satisfy the following requirements:

- Windows 7/8.1/10, MacOS X 10.9 or higher, Linux
- Intel Core2 or AMD Athlon 64 CPU with 1.5 GHz or more (SSE2 extensions are required). A Dual- or Quadcore CPU is not required, but recommended.
- minimum of 2 GB memory
- 100 MB free diskspace (more when recording measurements to disk)
- display resolution of at least 1200x800 (smaller resolutions will work, but can make the MCS unusable)
- free USB port to connect SPECTRAN device, or network connection for remote control

On Windows and Linux Administrator priviledges are required for installation.

Installation on Windows

Just run the provided `MCS_Spectrum_Analyzer_X.Y.Z_Setup.exe` setup program.
You can change the installation directory on the second screen.

After the installation is complete you can start the MCS and its tools using the "Aaronia AG -> MCS Spectrum Analyzer" start menu group.

Installation on MacOS X

Just open the provided `.dmg` file and run the MCS from there. You can copy/move the MCS application folder, however the extra tools need to be in the same location as the MCS application folder to work correctly.

Installation on Linux (Packages)

Please use the package manager of your distribution to install the `.deb` or `.rpm` package file. This will automatically setup the necessary permissions and menu entries.

After the installation is complete you should be able to start the MCS and its tools via the "Aaronia" menu group. On some distributions it could be necessary that you logout and login again before the menu entry is visible. Some other distributions (e.g. certain Ubuntu versions using the Unity interface) may not use the standard menu system, please check the distribution documentation on how to access third party applications in those cases.

Installation on Linux (Static Build)

After unpacking the static archive you can simply start the MCS from the `bin/` subdirectory. However in order to connect to a Spectran USB device you need to have permissions on the relevant USB device file, which by default is not the case. To fix this please copy the `extra/99-aaronia-spectran.rules` file into the `/etc/udev/rules.d/` directory (requires superuser priviledges) and reconnect the device.

First Start

When you start the MCS for the first time you will be asked to select a language for the MCS user interface. You only have to make this selection once, but you can change it at any time later using the Select Language menu entry.
By default the MCS will automatically check at startup if there is a new version available and suggest to download and install it. This can be disabled in the application settings
For general usage instructions please see the Quickstart and Main Screen Layout sections.

Getting Support

If you have questions regarding topics not covered in this manual or your Spectran Device Manual please check the MCS help menu for additional documentation or visit our support forum at spectran-developer.net

General Advice

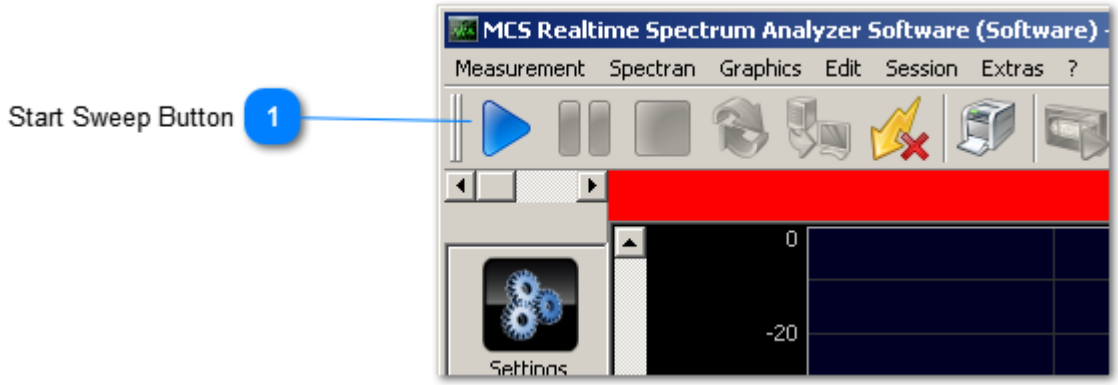
General Advice when using the MCS software:

- Do not operate the device using the on-device menu system while it is connected to the MCS. The device will not react to any USB commands and will not send data while the menu is active, and changes made using the on-device menu will not be visible in the MCS software. In some cases the device may become unresponsive to USB commands completely and a restart is needed.
- Ensure that you're using the latest software version in case you encounter any problems. The MCS software is updated regulary and problems may have already been fixed in a newer version.

Quickstart

Basic instructions to get a measurement running.

Connect to Device

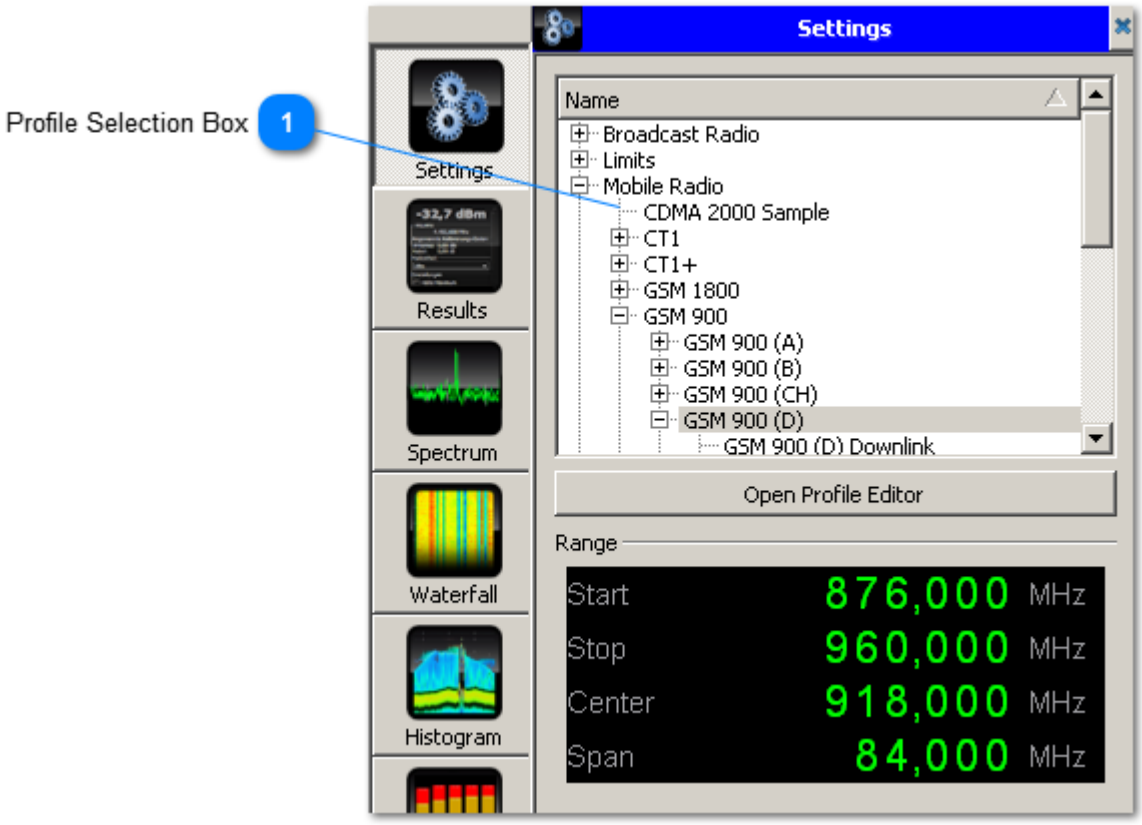


After starting the MCS software simply power on your Spectran device and click the Start Sweep button. If there is more than once device connected to your system you can use the connection manager (via the Device Manager menu entry) to connect and disconnect each device separately. For more details on multi-device handling see Managing Multiple Devices.

When you want to disconnect the Spectran simply use the Disconnect menu entry.

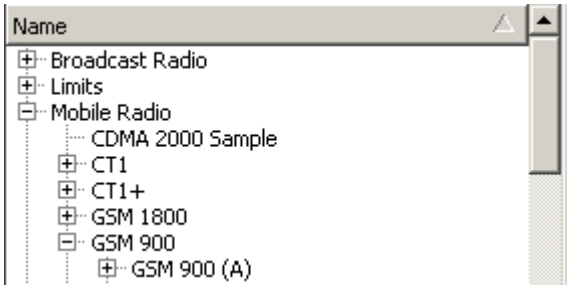
1 **Start Sweep Button**

Select Sweep Profile



The MCS contains an extensive list of predefined Measurement profiles for different scenarios, like cellphone and WLAN measurements or EMC tests. Profiles can be selected in the Settings Control on the Sidebar. Once a profile has been selected the MCS will automatically setup the correct measurement parameters on the device. If necessary you can of course adjust all parameters manually as well. Please refer to Settings Control, Calibration Control and your Spectran Manual for a detailed explanation of the available settings.

1 Profile Selection Box

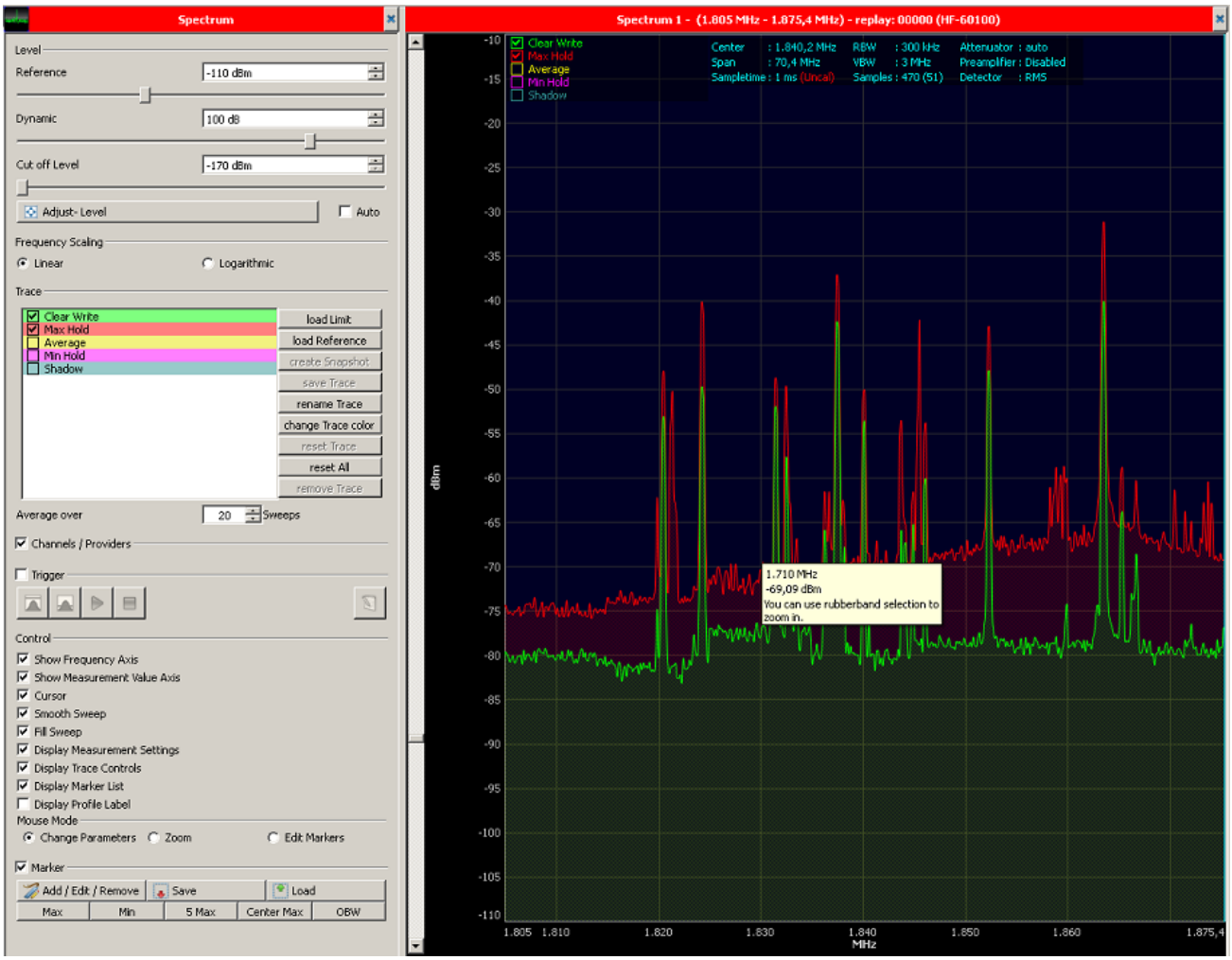


Setup Graphics Parameters

The MCS contains several different graphic views to analyze measurement data. This Quickstart guide will only cover the Spectrum and Waterfall views briefly, but many elements are common to all views. For more details on all available views please read the relevant sections of chapter Views and Controls.

Setting Up Spectrum View

When you start the MCS by default there is already a single Spectrum view open, set up to visualize the most recent measurement data received from the device. This way you can directly check that your device is connected properly and the MCS is receiving data.



In the Spectrum Control you can adjust the Reference level and Dynamic range, or just use the Adjust-Level button to let the MCS determine suitable values automatically. Changing the Reference level simply moves the graph up or down, while the Dynamic range determines the vertical resolution of the graph.
Measurement values below the Cut off Level are discarded, this way you can remove noise from the graph.

The other important group of settings determine which traces are displayed in the graph. By default only the current Sweep ("Clear Trace") is shown, but you can also enable/disable graphs for minimum, maximum and average values as well as adding multiple reference traces.

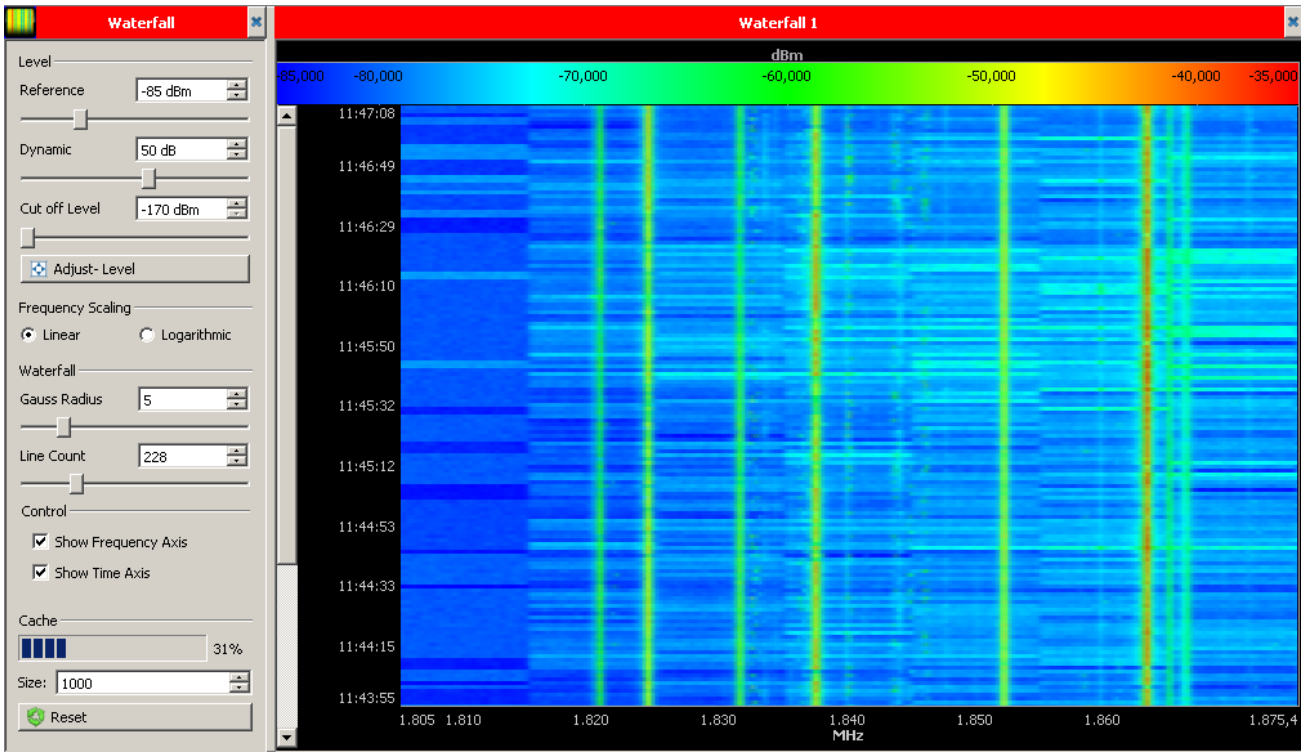
If the Channels / Providers option is checked a semi-transparent overlay is shown in the graph that displays the allocated frequencies based on the selected sweep profile.

Please read Spectrum Control and View for a more detailed explanation of all available settings.

Setting Up Waterfall View

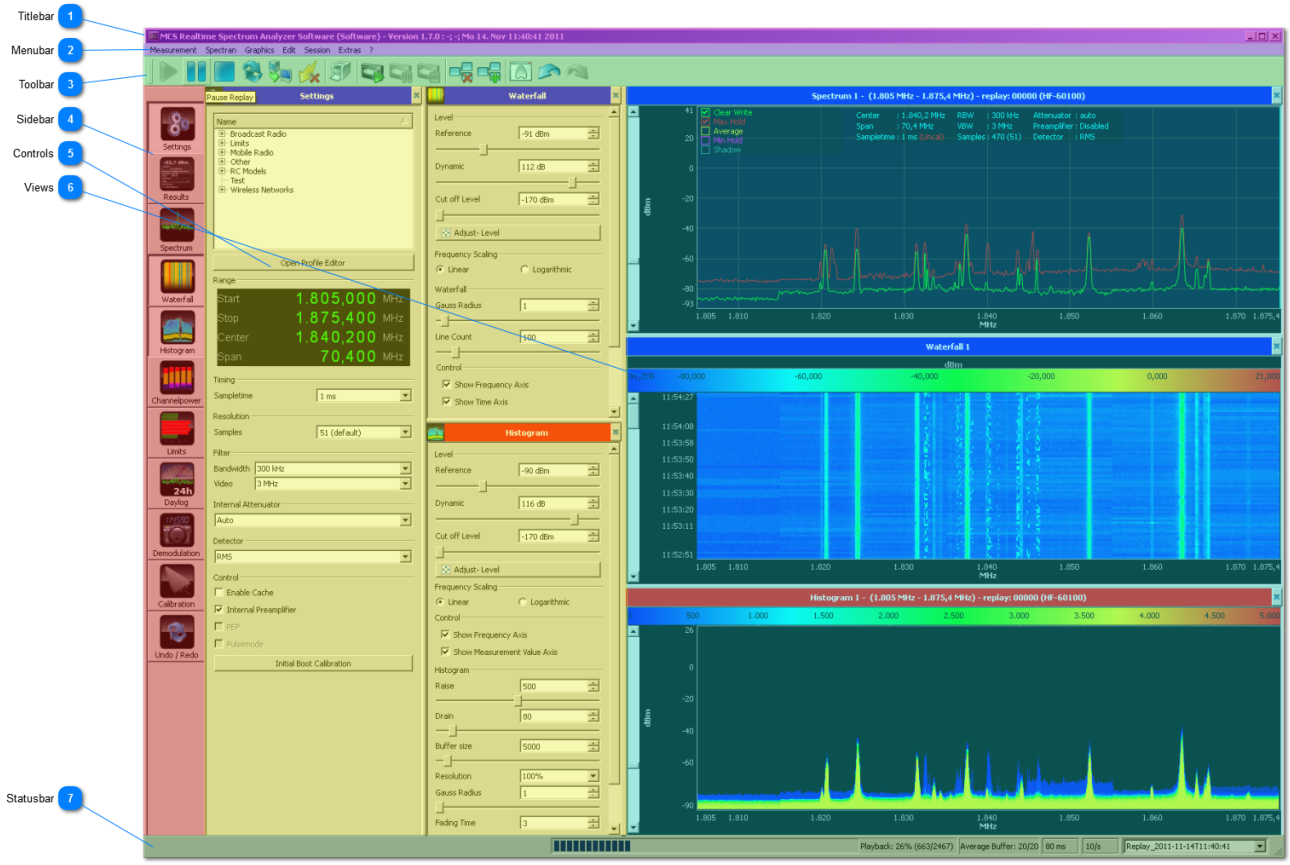
Unlike the Spectrum view the Waterfall view is not enabled by default when you start the MCS. To open it you can either use the Add Graphic button in the toolbar and select the "Add Waterfall" entry from the popup menu, or simply click on the "Waterfall" button in the sidebar to open the Waterfall control together with the view. The same procedure also works for the Histogram, Limits, Channelpower and Daylog views.

While the Spectrum view displays data just in the frequency domain the Waterfall also includes the time coordinate in the vertical axis, and encodes the measured value as color instead, where each line represents one sweep. Therefore changing Reference level and Dynamic range does not affect the vertical axis but instead changes the mapping of measurement values to colors.



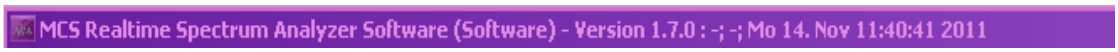
Please see Waterfall Control and View for more details.

Main Screen Layout



The image above shows the (default) location of the main MCS user interface elements:

1 Titlebar



The titlebar has the usual functions as in other applications. It includes the following information which may be useful for troubleshooting:

- Full name of the software
- Wether software or hardware (OpenGL) rendering mode is used
- Version of the software
- Name of the active session
- Short description of current device or replay

2 Menubar

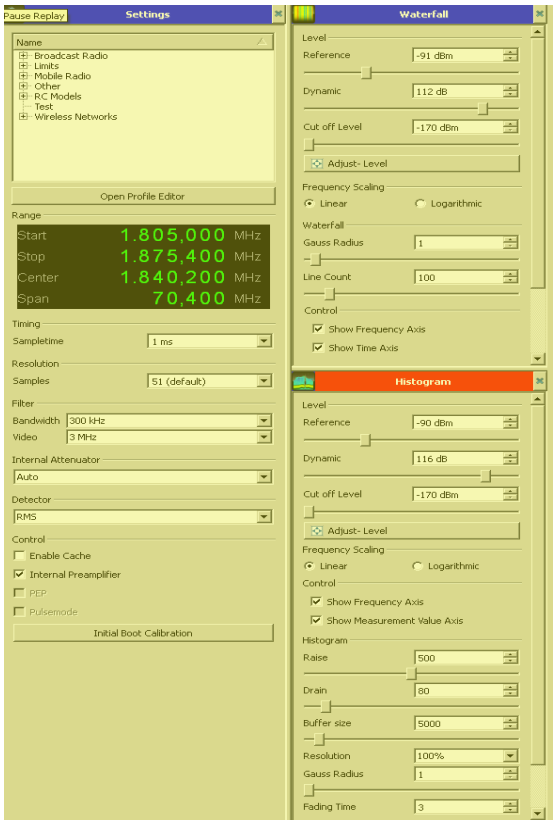
3 Toolbar

The Toolbar provides direct access to some of the more common actions that are contained in the different menus of the Menubar. Unlike the Menubar the Toolbar can be adjusted in size and location, by using the context menu. Just right-click on a free area (where no button is) of the Toolbar, and select your preferred orientation, icon size and how actions should be displayed (with/without text and/or icon).

4 Sidebar

On the left side of the MCS main window is the sidebar, which is used to show and hide the different Controls. Controls can be activated by either clicking the associated button, or with the `F1-F9` keyboard shortcuts. When a control for a view is activated and the view is not present it will automatically be added together with the control.

5 Controls

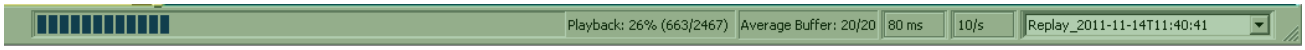


Controls are, as the name implies, used for controlling connected devices and displayed views. By default when a control is activated it is shown between the Sidebar area and the Views area. Each control however provides a titlebar that can be used to reaarrange its position via simple drag and drop. The MCS tries to remember the position of each control, so when it is closed and opened again later its position can be restored as good as possible.
Please see Views and Controls for a description of the available controls.

6 Views

The main area of the MCS window is occupied by one or more views that display the data received from a Spectran device in different ways. The chapter Views and Controls contains a detailed description for each view.
Unlike Controls views currently cannot be moved or reordered, order is solely determined by creation time. If more than one view is opened you can however change how the vertical space is allocated between them, by clicking and dragging the frame between two views.

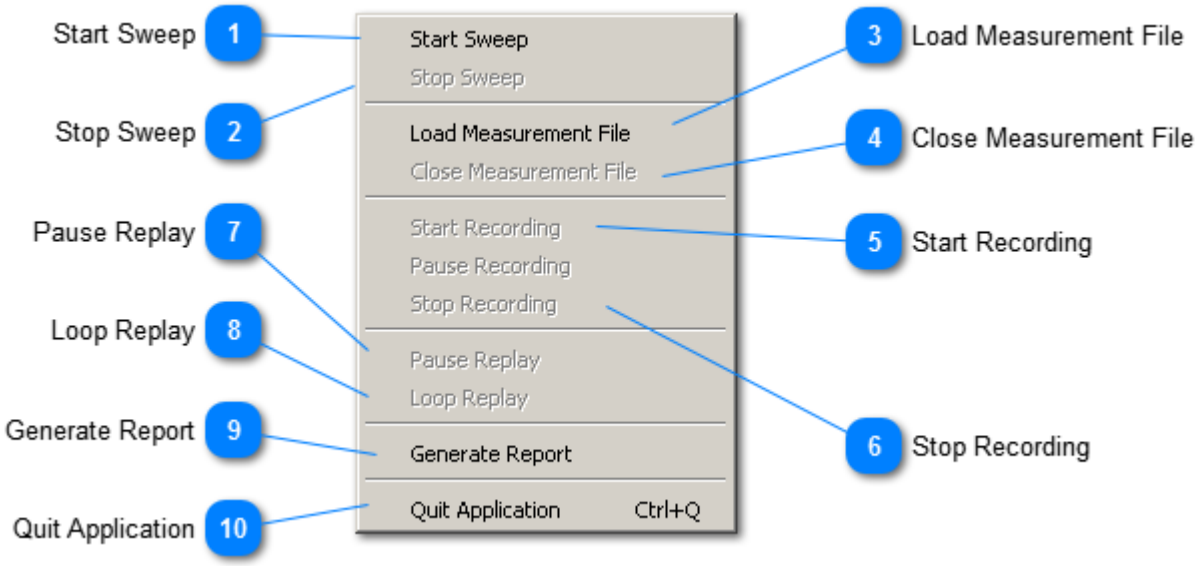
7 Statusbar



Like in other applications the statusbar displays various informational messages. It also shows some performance data and includes the device selection box to assign different devices to views, see Managing Multiple Devices for details.

Menu and Toolbar Actions

Measurement Menu



1 Start Sweep

When no device is connected this action tries to find and connect to a USB device. If there is more than one USB device attached to the system it will open the connection manager so you can select which device you want to use. If no device could be found you will see an error message.

If a device is connected this action then tells it to send measurement data with the current sweep parameters.

2 Stop Sweep

Tells the current device to stop sending measurement data, but does not disconnect it.

3 Load Measurement File

Opens a file selection dialog where you can select a recorded measurement for replay. See Replaying a Recorded Measurement.

4 Close Measurement File

Has the same effect as Disconnect, but only if the current "device" is a replay file.

5 Start Recording

Opens a file dialog to set the target for the recording. The MCS will determine the recording backend to use based on the chosen filename. Some backends (like MDR) may allow you to enter additional information to be stored with the measurement. Note that the recording only starts when all dialogs opened by this action are closed and that the selected file will be overwritten if it already exists.
See Recording a Measurement for more details.

6 Stop Recording

Ends the current recording. No more data will be recorded once it is stopped, and the recording file will be closed. Calling Start Recording again will start a new recording with a new file.

7 Pause Replay

Pauses the running replay at the current position. Selecting this entry again will resume the replay.

8 Loop Replay

If enabled the current replay will automatically restart at the beginning after the last sweep has been replayed, acting like an infinite measurement. Note that in this mode the recorded timestamps are ignored, so e.g. the Daylog and Waterfall will show the current time instead.

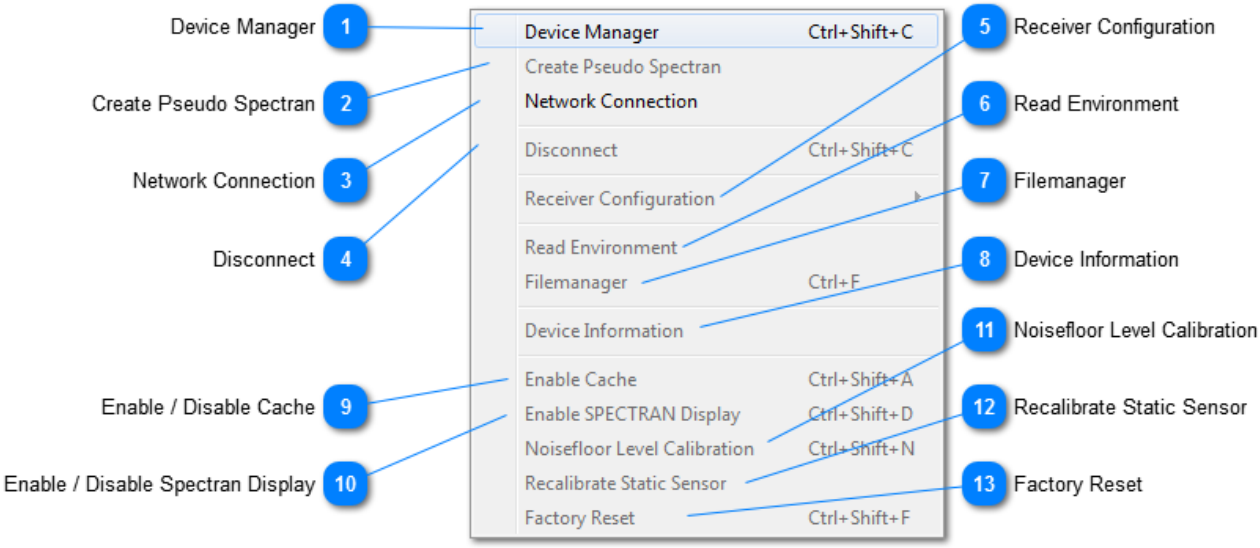
9 Generate Report

This function allows to generate a configurable, printable report using predefined report templates. This feature is still in development and may not be fully functional.

10 Quit Application

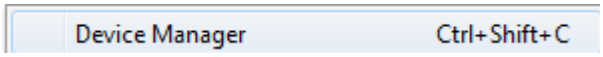
Stops all recodings, disconnects any devices and terminates the application.

Spectran Menu



This menu contains device related actions for connection management and controlling advanced features. Note that some actions may not be available, either because the device doesn't support the feature or because the action isn't valid for current device or software mode.

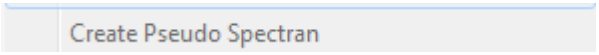
1 Device Manager



Opens the device manager where you can connect and disconnect individual USB devices. See Managing Multiple Devices for details. Note that the device manager does not handle replays or devices connected over network.

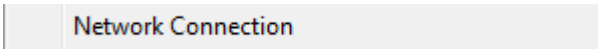
In most cases using Start Sweep is the easier and faster way to connect a device though.

2 Create Pseudo Spectran



See Multisweep Mode. Warning: This function is experimental and potentially unstable, use at your own risk.

3 Network Connection

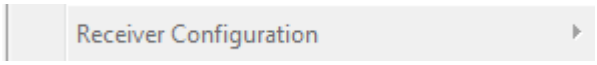


Opens the network connection dialog. See Spectran Remote Control for details.

4 Disconnect

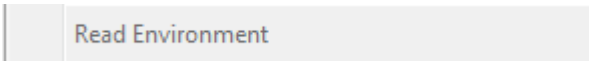
Closes the connection of the current device or replay file. Unlike Device Manager this works for all datasources: USB devices, network devices and replay files. Views and Controls currently assigned to the device will not be closed, but may loose any device related data, so you should use Stop Sweep instead if you just want to stop the measurement.
Note that closing the connection by other means (like unplugging the USB or network cable) will have the same effects as Disconnect, but may leave the device in an unknown state preventing a reconnect until it is powered off and on again.

5 Receiver Configuration



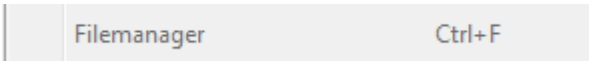
If the current device supports it you can select its receiver mode with this submenu. See your Spectran Manual for details.

6 Read Environment



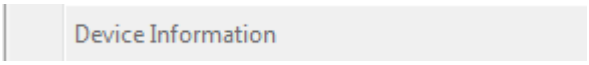
Reads the current settings of the device and transfers them into the MCS software. This is useful if you change settings directly on the device as the MCS will **not** be notified about such changes automatically.

7 Filemanager



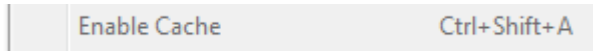
Opens the Spectran Filemanager for the current device.

8 Device Information



Opens a dialog containing Detailed Device Information for the current device or replay.

9 Enable / Disable Cache

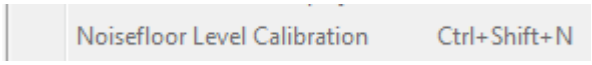


Enables a cache on the current device if supported. This may have an effect on performance, but is usually not visible.

10 Enable / Disable Spectran Display

To conserve battery power, the MCS will disable the display of a device when a connection is established and the device supports this. It can be reenabled with this option.

11 Noisefloor Level Calibration

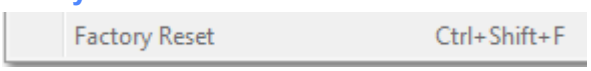


Recalibrate the Noisefloor of the current device. See Calibration Control for details.

12 Recalibrate Static Sensor

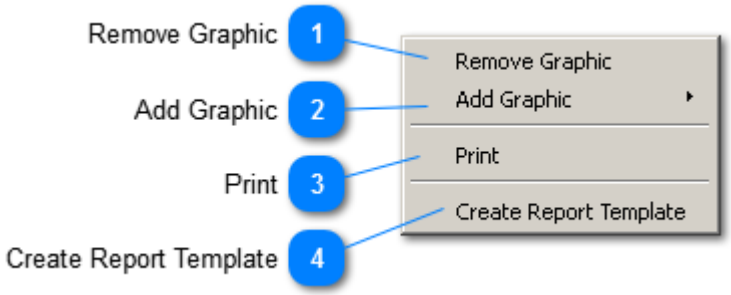
Opens the Recalibrate Static Sensor dialog.

13 Factory Reset



Instructs the current device to perform a factory reset, which will discard all current settings and user modifications. This operation is not supported by all devices.

Graphics Menu



1 Remove Graphic

Activates the "Remove Graphics" mode. While this mode is active you can click in any view (not control) to remove it. After a view is removed the "Remove Graphics" mode is disabled and the remaining views will be resized automatically. When the last view is removed as well the view area will stay empty though until another view is added again.
To leave the "Remove Graphics" mode without removing a view press the right mouse button.

2 Add Graphic

This entry includes a submenu when selected where you can choose what type of view should be added to the view area. This also allows creating multiple views of the same type. The new view will automatically be assigned to the current device if possible.

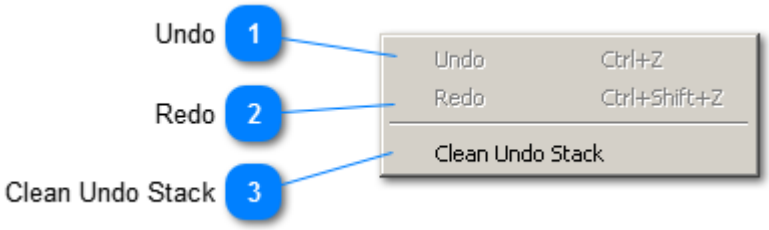
3 Print

Opens a print dialog to generate a hardcopy of all currently active views.

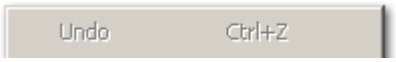
4 Create Report Template

Creates a template file for the Generate Report function using the currently configured views and their settings as reference.

Edit Menu



1 Undo



Reverts the listed operation. This may affect graphics parameters and device settings, which could trigger additional effects (like graphcis/sweep reset). Not all operations can be undone, so please check that the listed operation is really what you want to be undone.

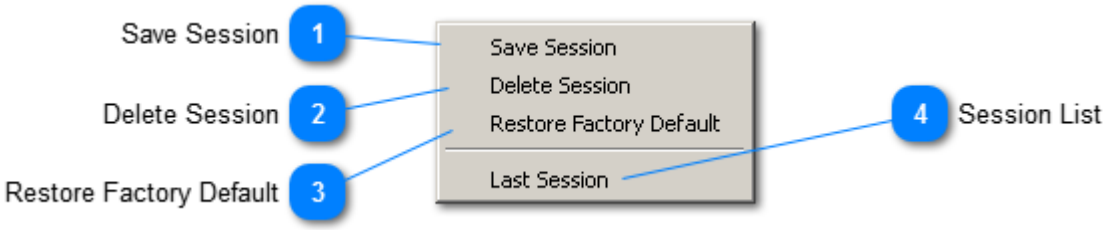
2 Redo

Reverts the last Undo action, restoring the previous state.

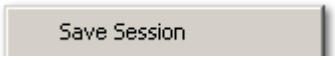
3 Clean Undo Stack

Discards all stored Undo commands, see Undo / Redo Control for more details on this.

Session Menu



1 Save Session



Stores the current state of the MCS and attached devices in a new session.

2 Delete Session

Deletes a selected session.

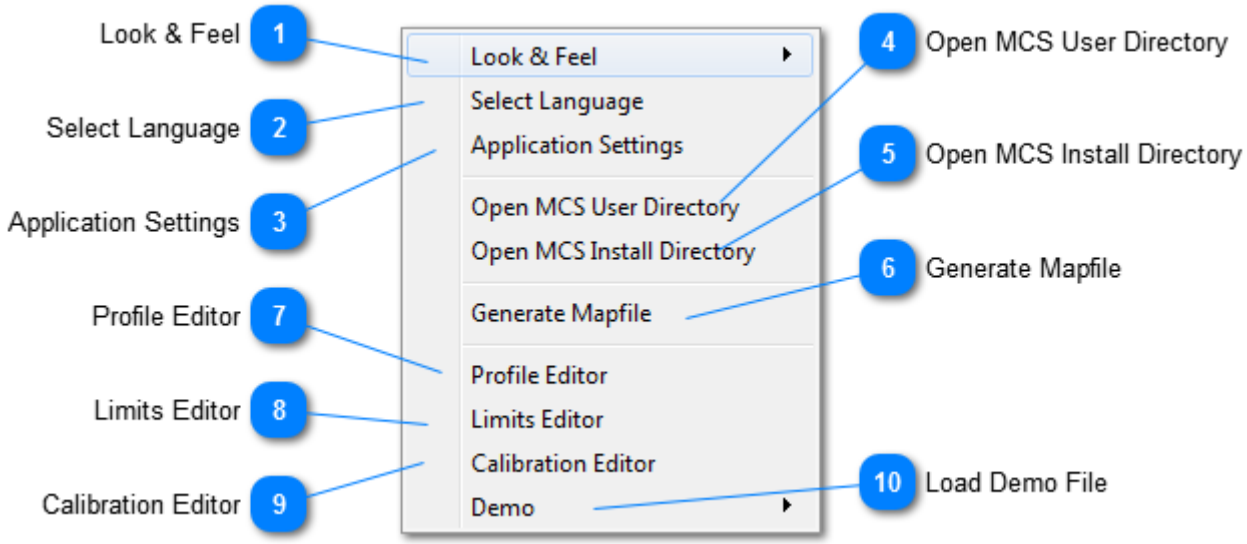
3 Restore Factory Default

Restore MCS state to factory default settings.

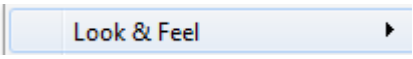
4 Session List

A list of all currently available sessions.

Extras Menu

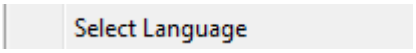


1 Look & Feel



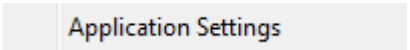
Contains options to select / unselect graphical themes to adjust the visual appearance of the application.

2 Select Language



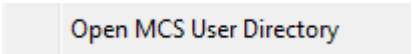
Opens a dialog to select a different translation for the user interface. Note that some elements will only use the new translation after restarting the MCS.

3 Application Settings



Opens the Settings Dialog. Please refer to Application Settings for a detailed listing of available settings.

4 Open MCS User Directory



Opens the MCS User Directory in a file manager (Exporer on Windows, Finder on MacOS). This directory is used for storing sessions, logfiles, overrides for Data Files and other user-supplied contents used by the MCS.

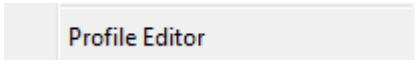
5 Open MCS Install Directory

Opens the MCS Installation Directory in a file manager (Exporer on Windows, Finder on MacOS). This is mainly useful for troubleshooting to quickly check if certain files are present without having to manually find the directory in the filesystem.

6 Generate Mapfile

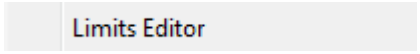
Opens the GPX import dialog. See Generate Google Earth Map.

7 Profile Editor



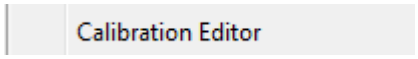
Opens the Profile Editor.

8 Limits Editor



Opens the Limits Editor.

9 Calibration Editor

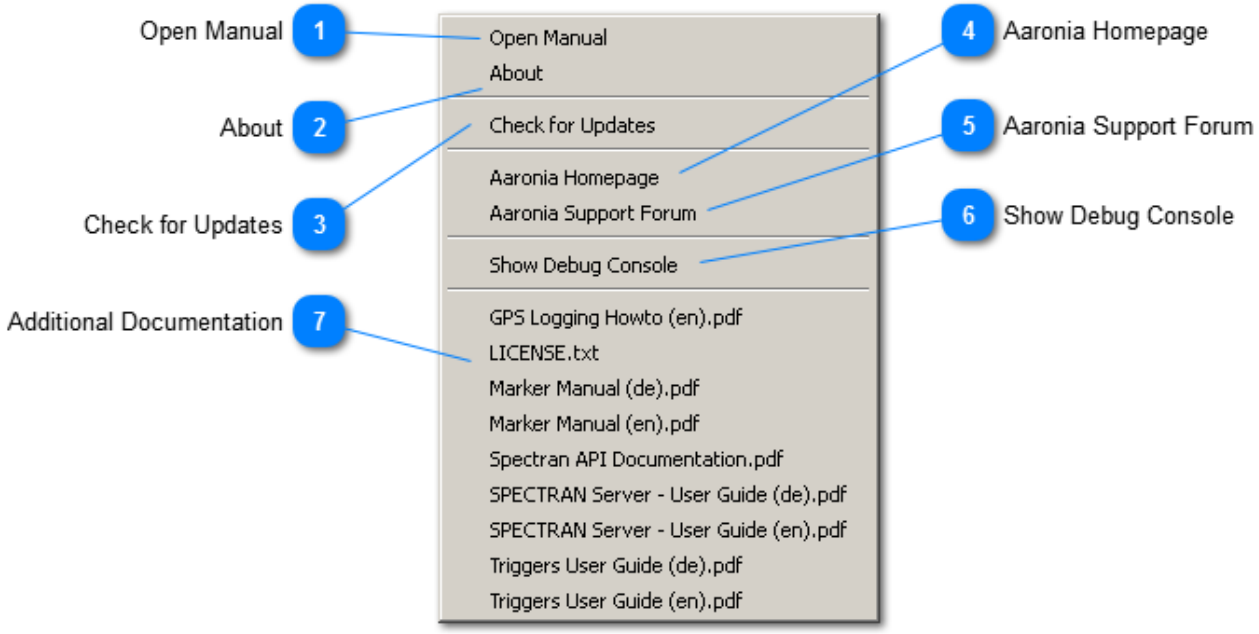


Opens the Calibration Editor.

10 Load Demo File

Allows quick access to a set of recorded demo files in the MCS data directory for presentation purposes. The files must be named demo1.mdr to demo8.mdr.

Help Menu



1 Open Manual

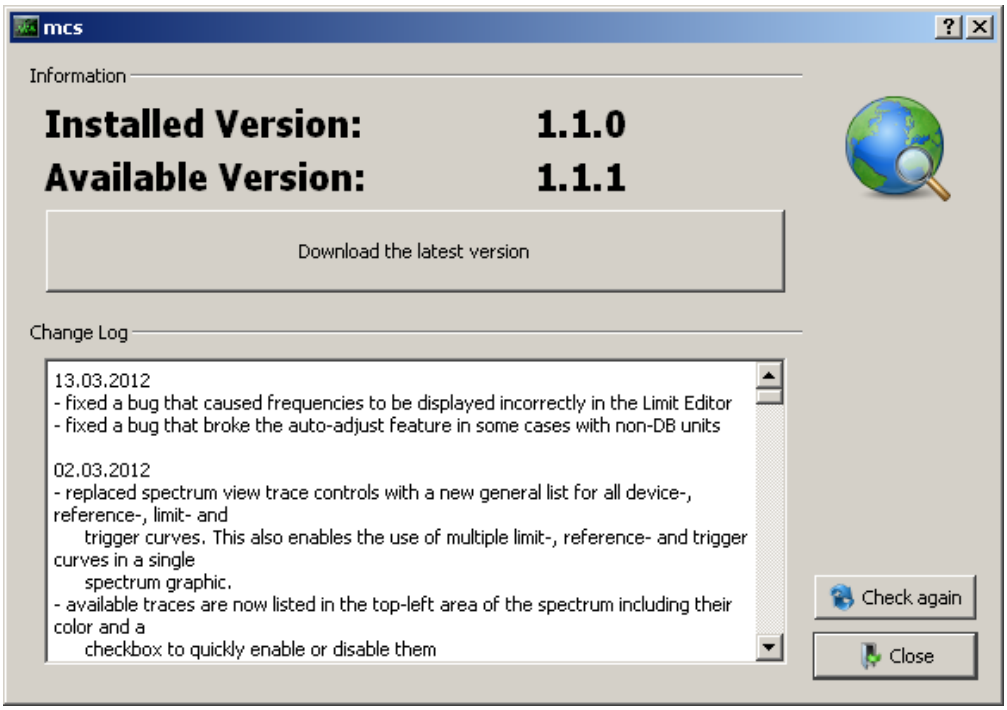
Opens the MCS manual in your browser.

2 About

Opens an dialog listing version and copyright information about the application.

3 Check for Updates

If you have Auto-Check for Software Updates disabled it's recommended to manually check for updates from time to time using this entry.



Clicking the "Download the latest version" will open the download link in your browser. It is recommended to close the MCS before running the setup program of the new version.

4 Aaronia Homepage

Opens the Aaronia AG homepage in your standard browser.

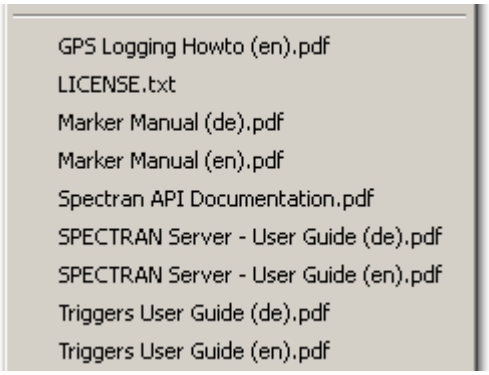
5 Aaronia Support Forum

Opens the Aaronia Support Forum website in your standard browser. There you can ask questions, provide feedback and exchange yourself with other MCS and Spectran users.

6 Show Debug Console

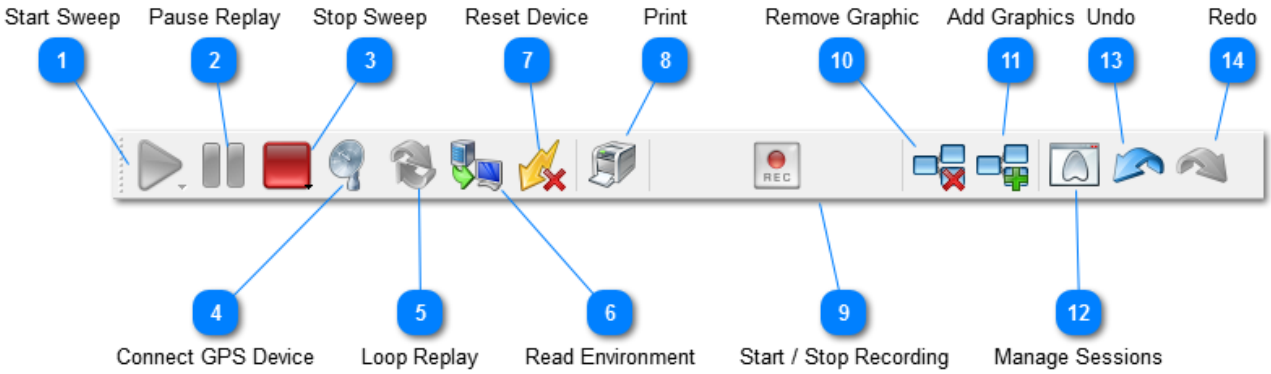
Opens a window that shows various debug messages generated by the software. This can be used for troubleshooting problems. The messages are also recorded in a logfile in the MCS user directory.

7 Additional Documentation



The remaining entries in the Help menu link to external documentation regarding specific topics not yet fully covered in this manual.

Toolbar



1 Start Sweep

See Start Sweep menu entry. Keeping the button pressed for more than a second will open a submenu with some additional options regarding sweep behavior: To stop the sweep after the first sweep is finished, and to not load the default profile.

2 Pause Replay

See Pause Replay menu entry

3 Stop Sweep

See Stop Sweep menu entry

4 Connect GPS Device

Connects a GPS device to the current Spectran device if available. Note that currently only Aaronia GPS logger and the XFR internal GPS are supported.

5 Loop Replay

See Loop Replay menu entry

6 Read Environment

See Read Environment menu entry

7 **Reset Device**

Attempts to reset the device settings to the default profile.

8 **Print**

See Print menu entry

9 **Start / Stop Recording**

This button starts / stops recording of a measurement. If recording is active it also displays the current duration of the recorded data.
See Start Recording menu entry and Stop Recording menu entry

10 **Remove Graphic**

See Remove Graphic menu entry

11 **Add Graphics**

See Add Graphic menu entry

12 **Manage Sessions**

See Sessions menu

13 **Undo**

See Undo menu entry

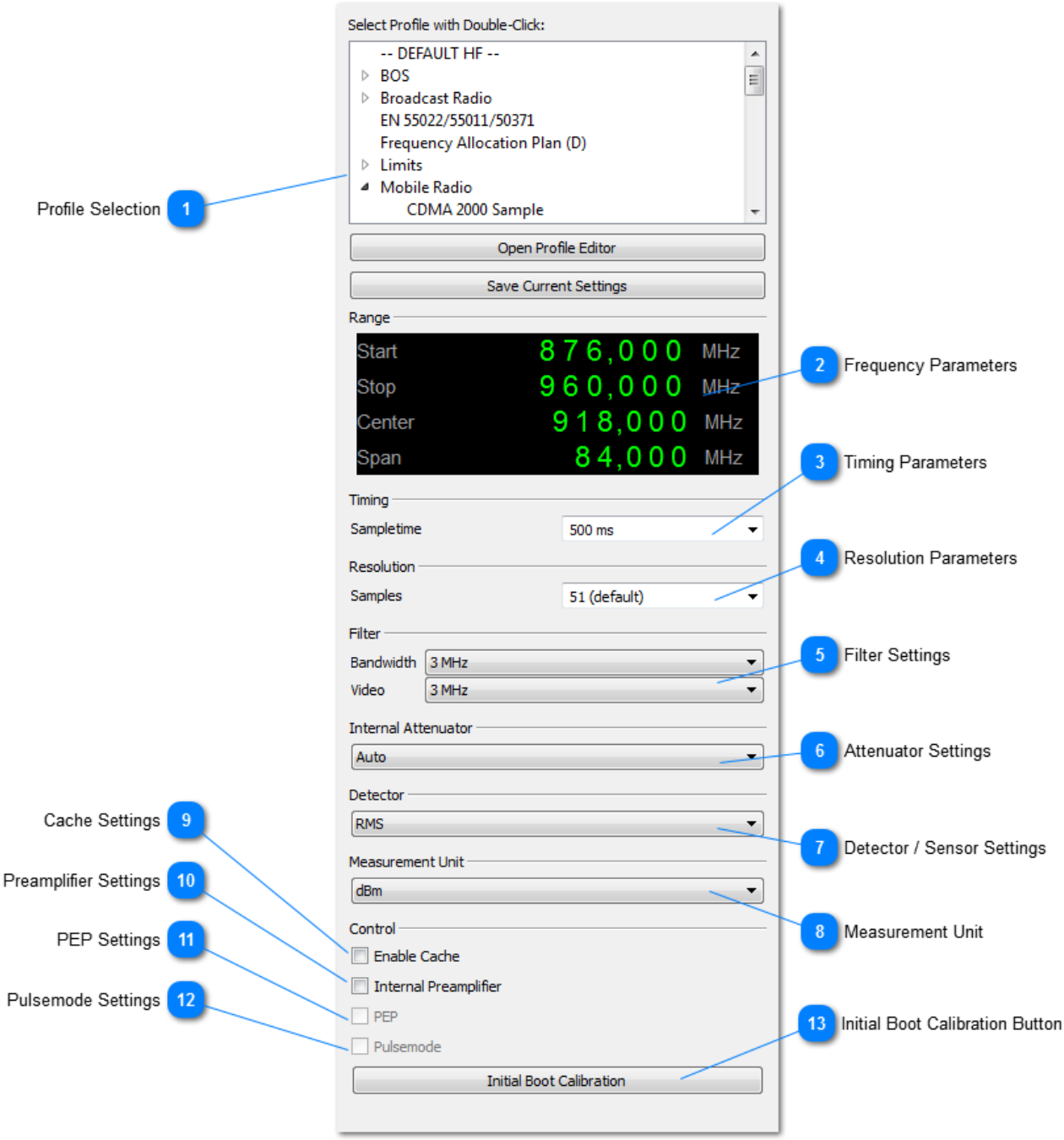
14 **Redo**

See Redo menu entry

Views and Controls

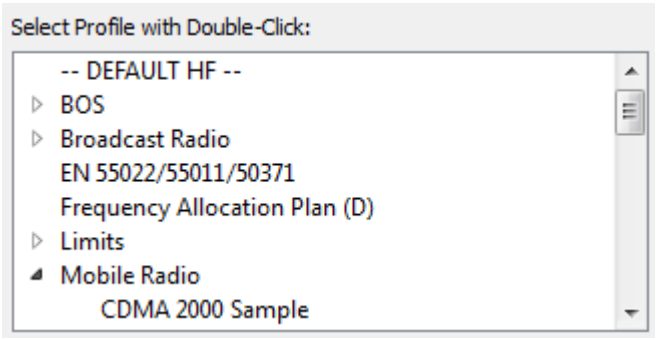
Descriptions for the different graphic views and sidebar controls.

Settings Control



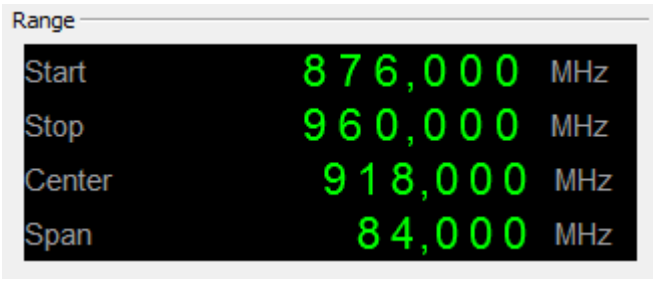
The Settings Control is the main interface for controlling the Spectran device parameters. It allows to adjust most settings that are also available in the Spectran device menu. Therefore please refer to your *Spectran Manual* for a detailed explanation of each setting. Note that only settings relevant for the current device are displayed, so for example when a HF device is connected you cannot change the sensor setting like on a NF. Also not all settings of the Spectran device menu are available in the Settings Control: Variables that only affect what is displayed on the Spectran device are obviously useless when used with the MCS software, some other settings are located in the Spectran Menu of the MCS.

1 Profile Selection



Select a predefined profile to quickly setup all relevant device parameters.

2 Frequency Parameters



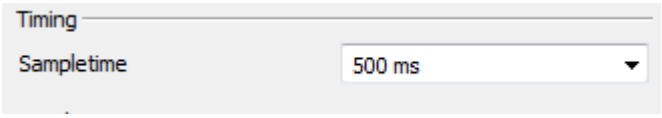
Frequency range to measure. As these values are all dependent on each other the following rules apply:

- changing the start- or stopfrequency will adjust centerfrequency and frequency span accordingly
- changing the centerfrequency or frequency span will adjust the start- and stopfrequency

Note that changes might result in start- or stopfrequency being beyond device limits. In that case the frequency span will be reduced until both are within device limits again.

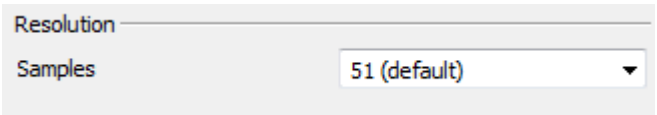
To change any of the frequencies you can either click on it to open an advanced edit field (allowing you to enter frequencies in a different unit than displayed) or use your mouse-wheel to stepwise increase/ decrease the frequency at the digit under the mouse-cursor.

3 Timing Parameters



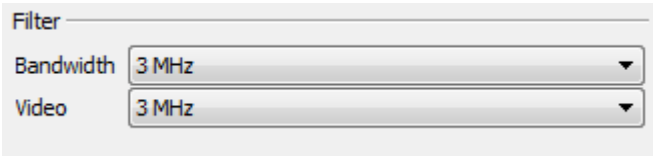
Higher sampletimes will result in a more accurate sweep, but will require more time for each sweep to complete.

4 Resolution Parameters



The minimal number of samples to take in each sweep. If the selected frequency and filter settings may result in a higher samplecount that value will be used instead.

5 Filter Settings

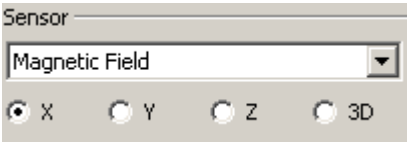


Filter settings, see *Spectran Manual*.

6 Attenuator Settings

Internal Attenuator settings, see *Spectran Manual*.

7 Detector / Sensor Settings

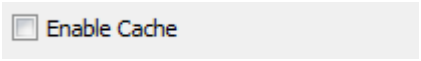


Detector (HF devices) or Sensor (NF devices) settings, see *Spectran Manual.*

8 Measurement Unit

Select unit to use for displaying measurement data. See Unit Setting for details.

9 Cache Settings

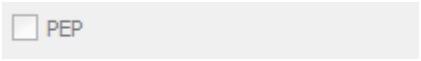


Enable the internal SPECTRAN cache to accelerate the sweep

10 Preamplifier Settings

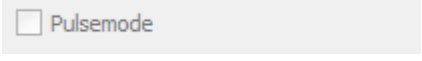
Enable / Disable the internal preamplifier, see *Spectran Manual*. Only available on devices where the preamplifier option is installed.

11 PEP Settings



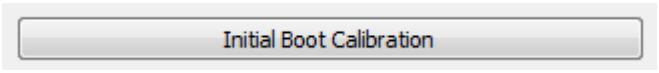
Not implemented.

12 Pulsemode Settings



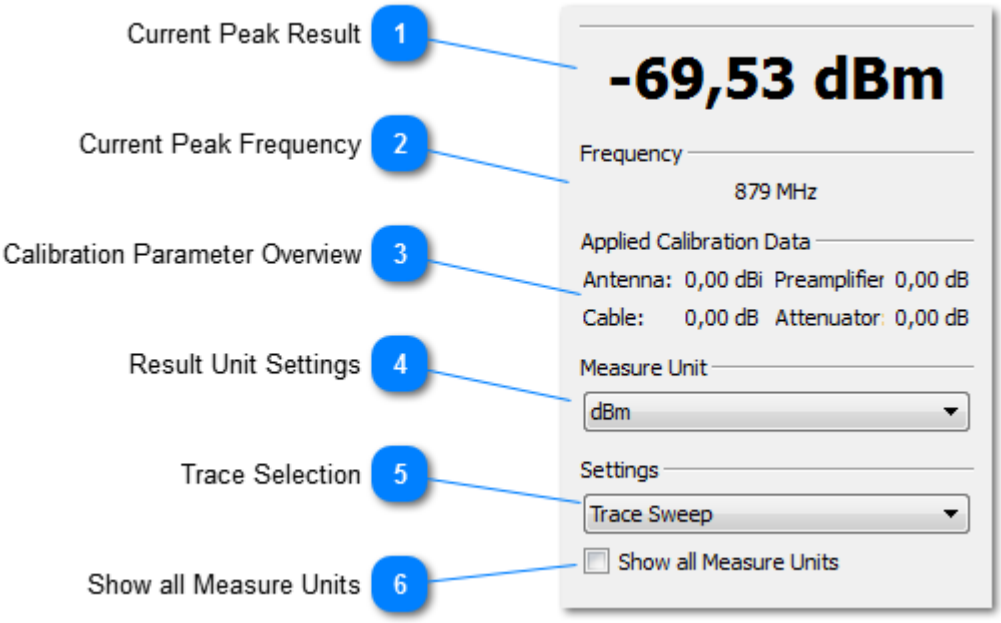
Enable / Disable Pulsemode setting, see *Spectran Manual.*

13 Initial Boot Calibration Button



Repeat the calibration program that is executed on the Spectran at bootup.

Result Control



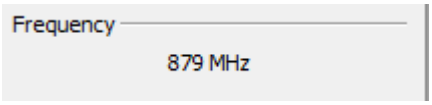
The Results control serves multiple purposes:

1. listing of the current peak value (with frequency)
2. changing the measurement unit used for display
3. provide an overview of current calibration settings
4. evaluate readings from connected probes

1 Current Peak Result

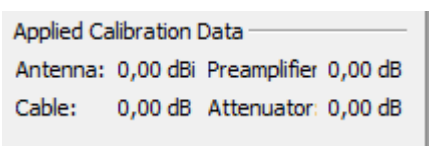
Reports the peak value of the current sweep (or the maximum or average trace, see below). If the Show all Measure Units option is checked it is replaced with a table where the peak value is converted to all available measurement units (some units may not be available if they're not valid for the current device settings).

2 Current Peak Frequency



Lists the frequency where the current peak was found.

3 Calibration Parameter Overview



Summarizes the effects of the current calibration settings at the peak frequency. The reported values may change when peaks are found at different frequencies.

4 Result Unit Settings

Maybe the most important function of the Results control is the ability to change the measurement unit used for display. This does not only affect the Results control itself but also all views attached to the current device. As different measurement units have vastly different scales, in most cases a unit change will automatically adjust the Reference level and Dynamic range of affected views, trying to ensure that a view isn't suddenly empty.

5 Trace Selection

Allows you to change which peak value should be displayed by the control. By default the current peak is used, but it can also display the peak of the maximum or average traces to retain the absolute or average peak. If you need a visual representation of the peak as well please read the Markers section.

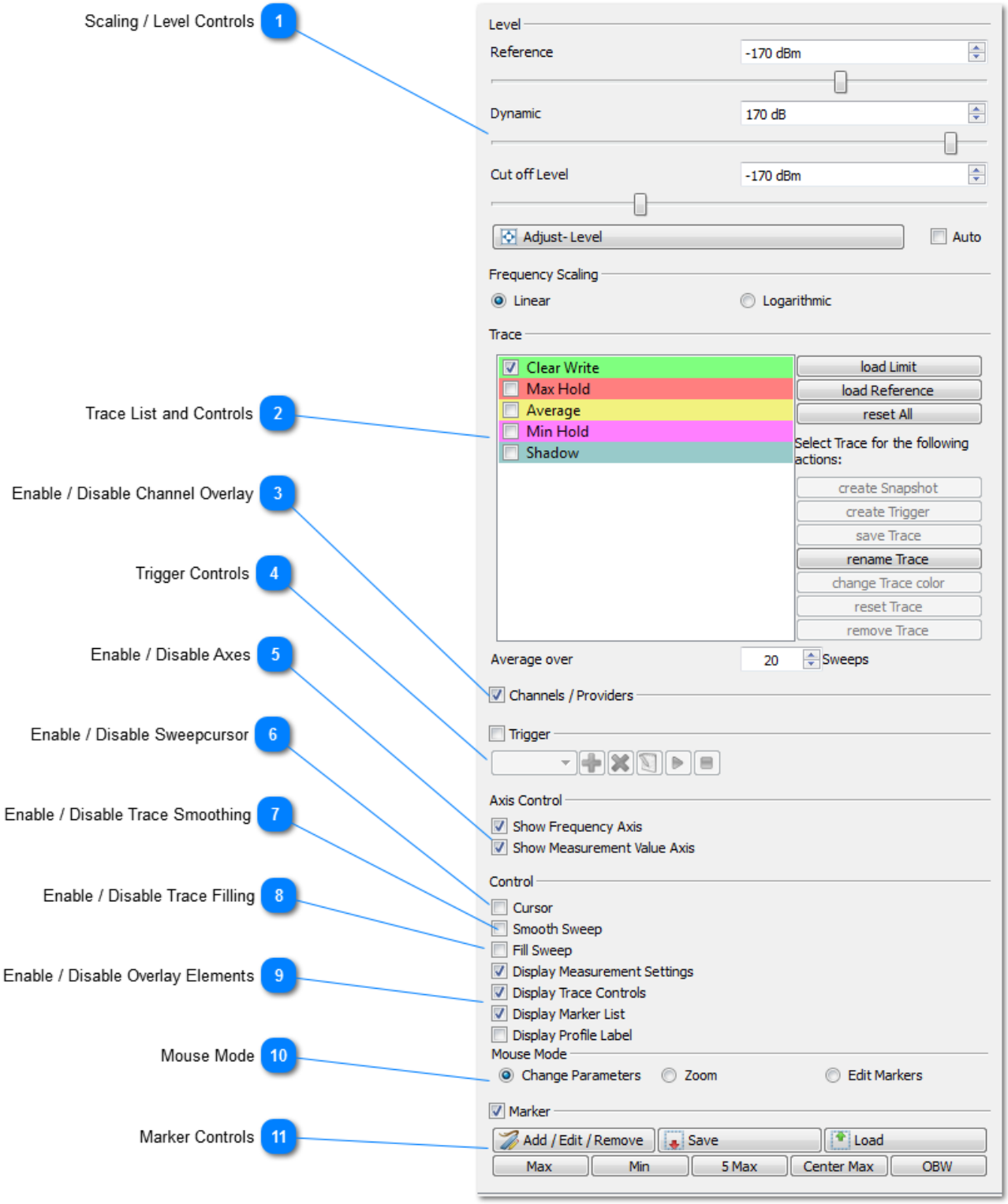
6 Show all Measure Units

If checked the Current Peak Result is replaced with a table where the peak value is converted to all available measurement units (some units may not be available if they're not valid for the current device settings).

Spectrum Control and View

The Spectrum View is a 2D-projection of measurement data in the frequency domain. It can display multiple Traces in a single view, and also highlight specific values using Markers for each trace. You may additionally define Triggers to perform a number of actions if certain limits are exceeded. Last but not least it is possible to add a Channels / Providers Overlay to visualize allocated frequencies in the current frequency spectrum.

Spectrum Control



1 Scaling / Level Controls

See Scaling Controls (1) and Scaling Controls (2)

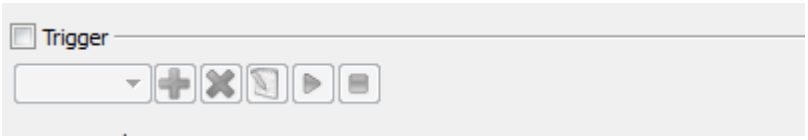
2 Trace List and Controls

See Trace List and Controls

3 Enable / Disable Channel Overlay

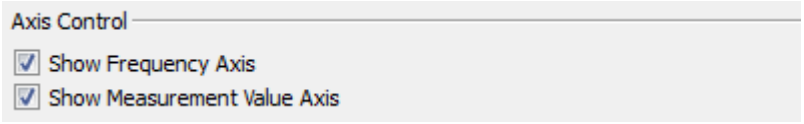
Enables or Disables the Channel Info Overlay.

4 Trigger Controls



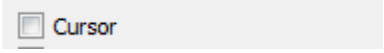
See Trigger Controls

5 Enable / Disable Axes



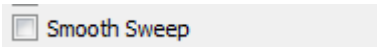
If disabled the scale numbers and unit on the bottom / left part of the view are removed and the space used for the actual data presentation.

6 Enable / Disable Sweepcursor



Enables or Disables the Sweep Cursor

7 Enable / Disable Trace Smoothing



Switch to a different drawing algorithm to avoid sharp edges on displayed traces.

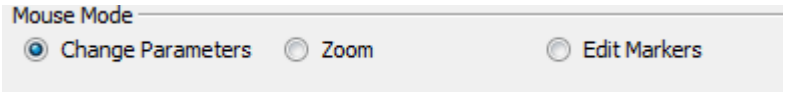
8 Enable / Disable Trace Filling

Fill the area between each trace and the x-axis.

9 Enable / Disable Overlay Elements

You can show/hide various overlay elements inside the spectrum view.

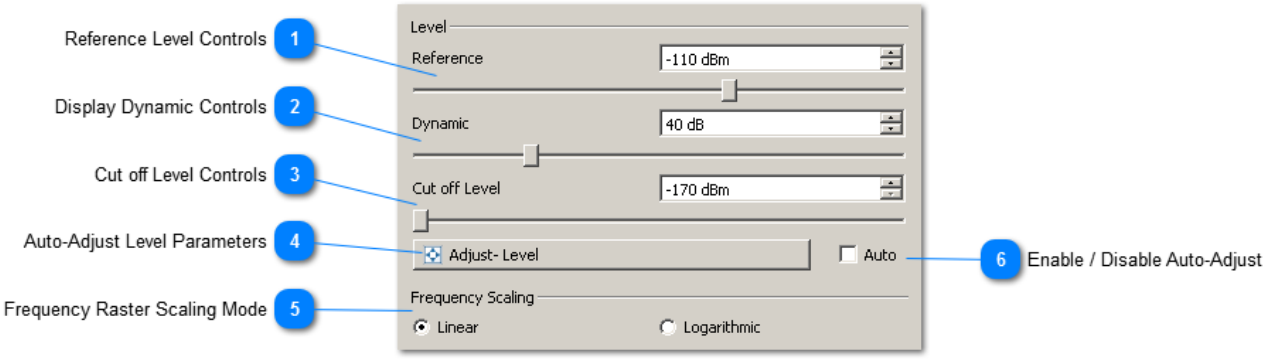
10 Mouse Mode



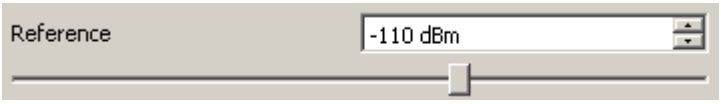
Changes the semantics of mouse actions inside the view:
- Change Parameters: Mouse actions will change device frequency settings
- Zoom: Mouse actions will change only what data is displayed, but won't affect the actual measurement settings.
- Edit Markers: Mouse actions will set/remove/edit markers, device and display settings are unaffected.

11 **Marker Controls**
See Marker Controls

Scaling Controls (1)



1 Reference Level Controls



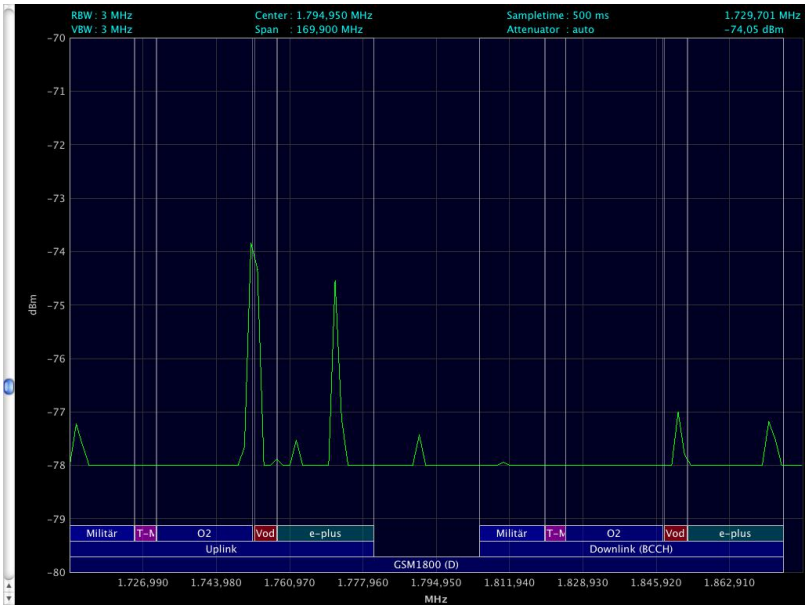
The Reference level determines the bottom display boundary of a measurement. Readings below this value are considered out of scope of a view and will not be displayed.

2 Display Dynamic Controls

The Dynamic range controls the level resolution of each view, and together with the Reference level also the upper display bound (Reference level + Dynamic Range = maximum display value).

3 Cut off Level Controls

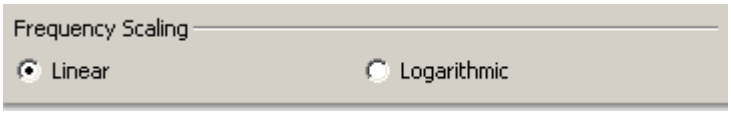
The Cut-off Level is the minimum value that should be used. Any reading below this value will be adjusted. Unlike the Reference level it affects the displayed values instead of the display area, as can be seen in the following image (Reference Level: -80 dBm, Dynamic: 10 dB, Cut off Level: -78 dBm):



4 Auto-Adjust Level Parameters

With the "Adjust-Level" button the MCS tries to adjust the above parameters to optimum values based on current readings (these may be different for each type of view). This function is also available in the context menu of each view that supports it.

5 Frequency Raster Scaling Mode

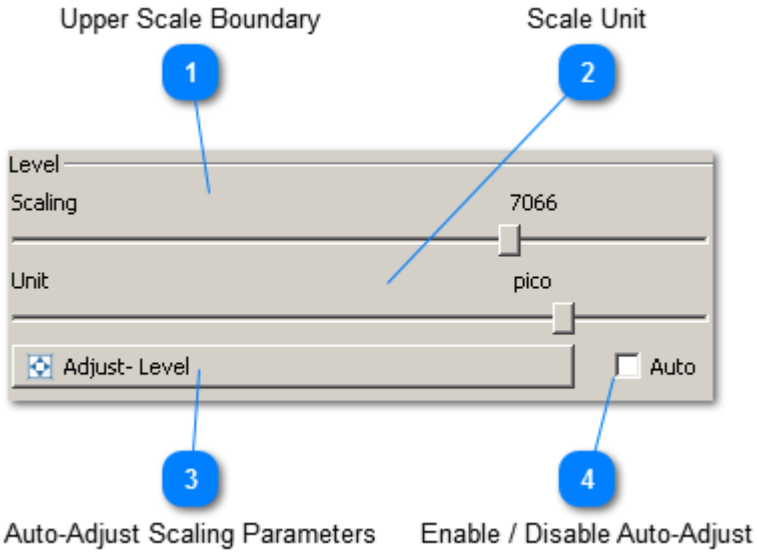


Switch between Linear and Logarithmic rasters on the frequency axis. The logarithmic raster starts at 1 Hz as the imaginary origin to compute the relative positions of raster entries, so if the current sweep settings use a high start frequency and/or a small span frequency the visual difference to the linear raster is very small. Both raster types will create entries at "logical" frequencies, e.g. the logarithmic raster might create entries at 10, 20, 50, 100, 200 and 500 MHz, while the linear raster might use 50, 100, 150, 200, 250, 300, 350, 400, 450 and 500 MHz. The frequency raster will however always include the start- and stop-frequency at the left- and right side of the raster.

6 Enable / Disable Auto-Adjust

If checked the Auto-Adjust Level Parameters will be done after each completed sweep.

Scaling Controls (2)



If the view uses a non-decibel based Display Unit the default level controls will be replaced with an alternate set of scaling controls. Switching back to a decibel based Display Unit will also switch the controls back.

1 Upper Scale Boundary

Sets the *numeric* upper display bound of a view.

2 Scale Unit

Sets the actual Scaling factor, so if for example Scale Unit is "micro", Scale Value is 5000 and Display Unit is Watt the view will show values from 0 to 0.005 Watt, using labels from 0 to 5000 microWatt.

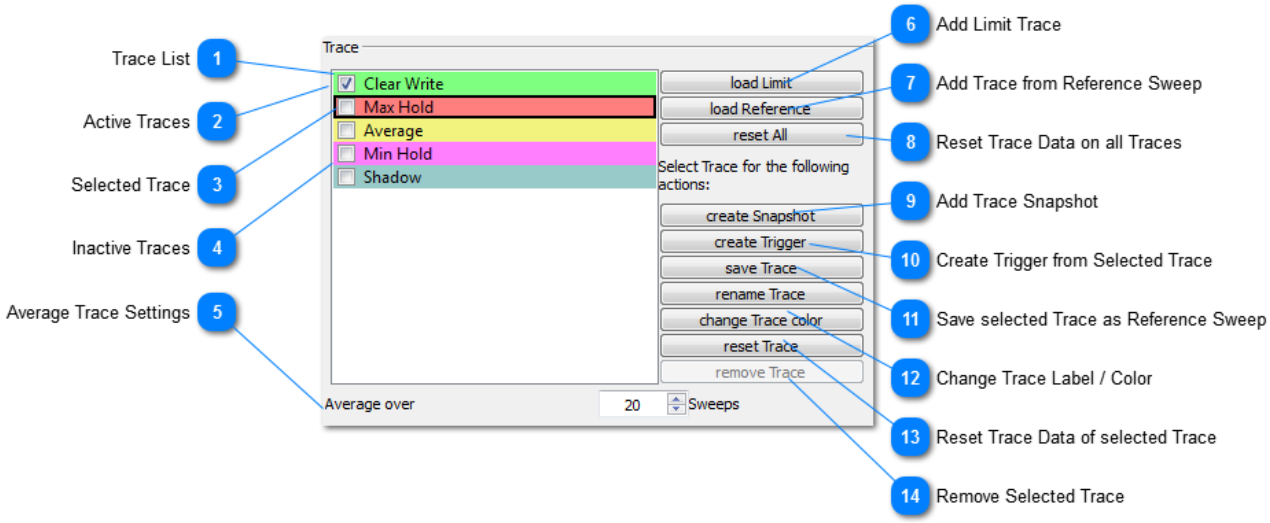
3 Auto-Adjust Scaling Parameters

See Auto-Adjust Level Parameters

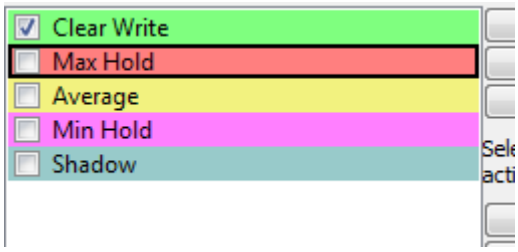
4 Enable / Disable Auto-Adjust

See Enable / Disable Auto-Adjust

Trace List and Controls



1 Trace List



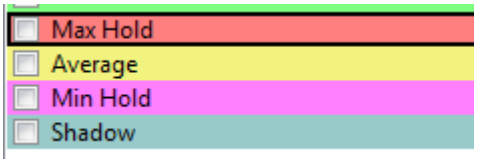
This list show all traces currently available for the selected Spectrum View. Each trace can be activated or deactivated separately using the checkbox on the left. Only activated traces will be displayed in the Spectrum View.

2 Active Traces

3 Selected Trace

The currently selected trace is marked by a bold black frame. Several actions on te right side of the list will operate on the selected trace.

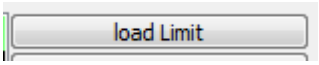
4 Inactive Traces



5 Average Trace Settings

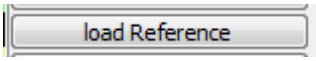
Determines how many sweeps should be used to compute the "Average" trace. Higher values will reduce the influence of individual sweeps on the result, so the average does not change as much, but will require more system ressources. Also old sweeps are discarded if certain memory limits are reached, so at a certain point increasing this value anymore will be without effect.

6 Add Limit Trace



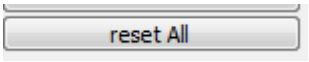
Add a new trace object based on a existing limit definition. Note that as limits are usually only defined for specific frequency ranges and measurement units the trace may not be visible in the Spectrum View if the current sweep parameters aren't compatible. See Limits Control and View for more information about limits.

7 Add Trace from Reference Sweep



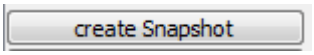
Load a previously saved sweep object and create a new trace from it which can be used as a visual reference to compare different measurements.

8 Reset Trace Data on all Traces



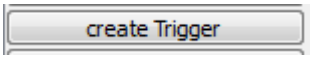
Performs a reset on all traces.

9 Add Trace Snapshot



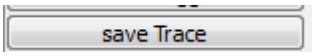
Create a frozen copy of the selected trace which can be used as a visual reference to compare different measurements.

10 Create Trigger from Selected Trace



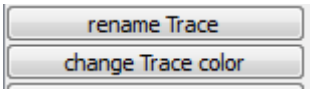
Create a new trigger using the selected trace as limit, see Measurement Triggers

11 Save selected Trace as Reference Sweep



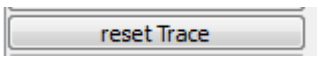
Store the data of the selected trace to a file on disk, so it can be reloaded later, e.g. to compare measurements from different devices.

12 Change Trace Label / Color



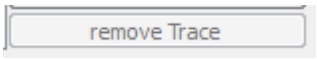
Customize the color or label of the selected trace

13 Reset Trace Data of selected Trace



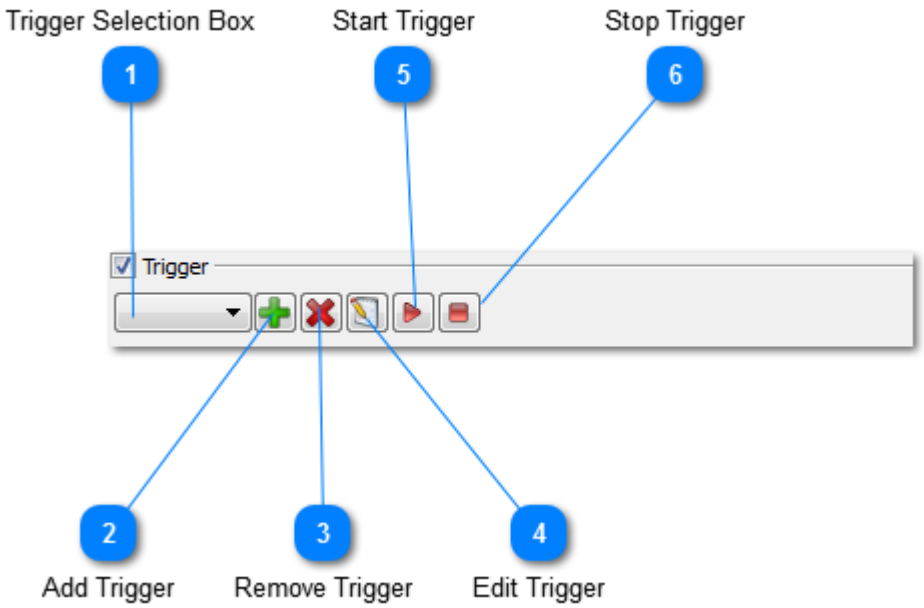
Reset the data of the selected trace (Maximum, Minimum, Average or Shadow).

14 Remove Selected Trace



Remove the selected trace from the trace list and the spectrum view. Only traces added by the user can be removed, default traces can only be deactivated.

Trigger Controls



1 Trigger Selection Box

Select a trigger to start/stop/remove/edit.

2 Add Trigger

Create a new trigger, see Measurement Triggers.

3 Remove Trigger

Remove the currently selected trigger.

4 Edit Trigger

The advanced trigger editor provided a more fine gained trigger control, see Measurement Triggers.

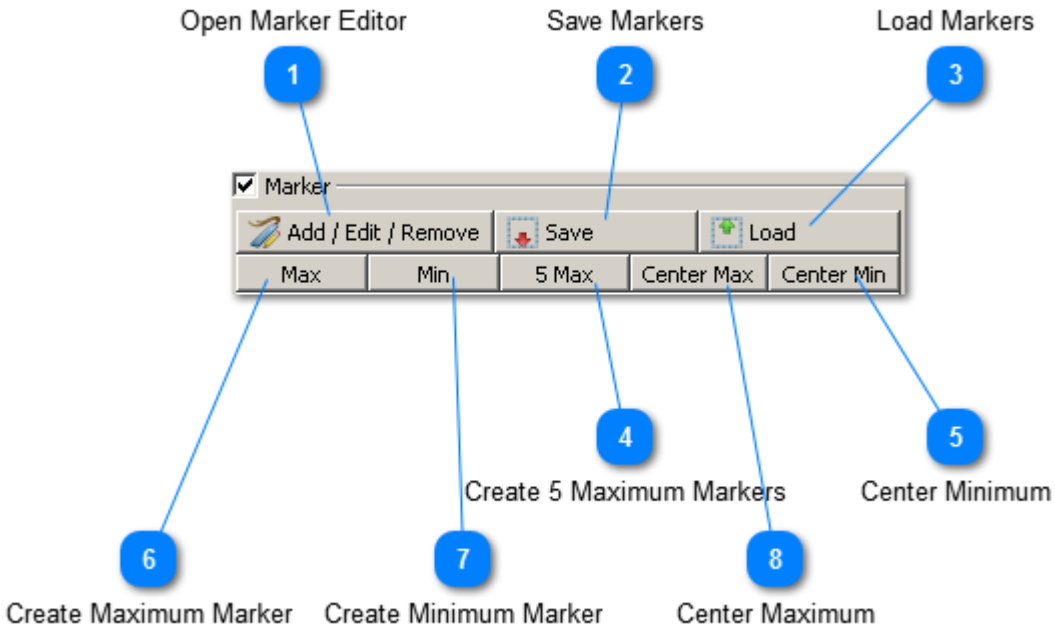
5 Start Trigger

Start listening for events and execute trigger actions if necessary.

6 Stop Trigger

Stop executing trigger actions.

Marker Controls



See Spectrum Markers for details on how Markers work.

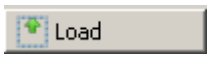
1 Open Marker Editor

Opens the Markers Editor dialog.

2 Save Markers

Store the current marker configuration on disk.

3 Load Markers



Reload a previously stored marker configuration.

4 Create 5 Maximum Markers

Replace the current marker configuration with 5 Maximum markers.

5 Center Minimum

Find the Minimum Peak in the current Spectrum view and set the Center frequency to it. This will reset the current sweep, so the peak may no longer be visible there.

6 Create Maximum Marker

Replace the current marker configuration with a single Maximum marker.

7 Create Minimum Marker

Replace the current marker configuration with a single Minimum marker.

8 Center Maximum

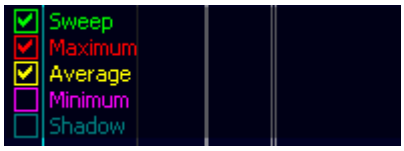
Find the Maximum Peak in the current Spectrum view and set the Center frequency to it. This will reset the current sweep, so the peak may no longer be visible there.

Spectrum View

1 Scrollbar for Reference Level

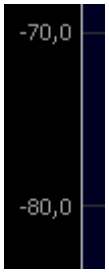
See Reference Level Controls.

2 Trace Legend



Lists the currently available traces in their respective color. You can activate/deactivate traces using the checkbox on the left, but to create / remove traces you have to use the Trace List and Controls in the Spectrum Control.

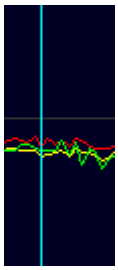
3 Result Value Raster



4 Value Display Unit

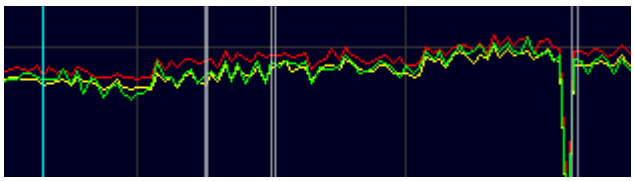
The currently selected unit to visualize result values in this view. You can change this in the Result Control.

5 Sweep Cursor

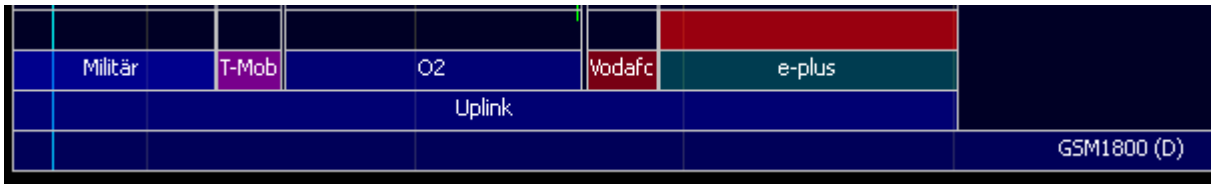


Visual aid that shows where the device is currently sweeping. Can be enabled / disabled in the Spectrum Control.

6 Active Traces



7 Channel Info Overlay



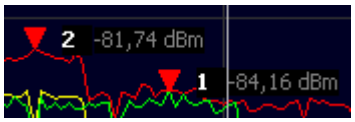
Many sweep profiles include an optional list of associated channels or providers (short channellist from now on) for the specified frequency spectrum. These can be displayed as a graphical overlay. This overlay can be enabled / disabled in the Spectrum Control.

8 Frequency Axis

9 Frequency Display Unit

Shows the unit of displayed frequencies. This is usually "kHz" for NF devices and "MHz" for HF devices.

10 Markers

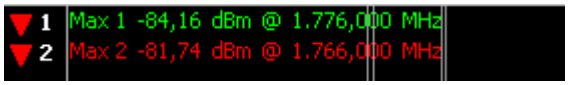


When markers have been added they are displayed as colored triangles within the view, together with an index number to identify them and usually their current measurement value.

11 Sweep Parameters Overview

Displays a brief overview of the most relevant Sweep Parameters. Note that this item will be hidden if there is not enough space in the view to display it without problems.

12 Marker Legend

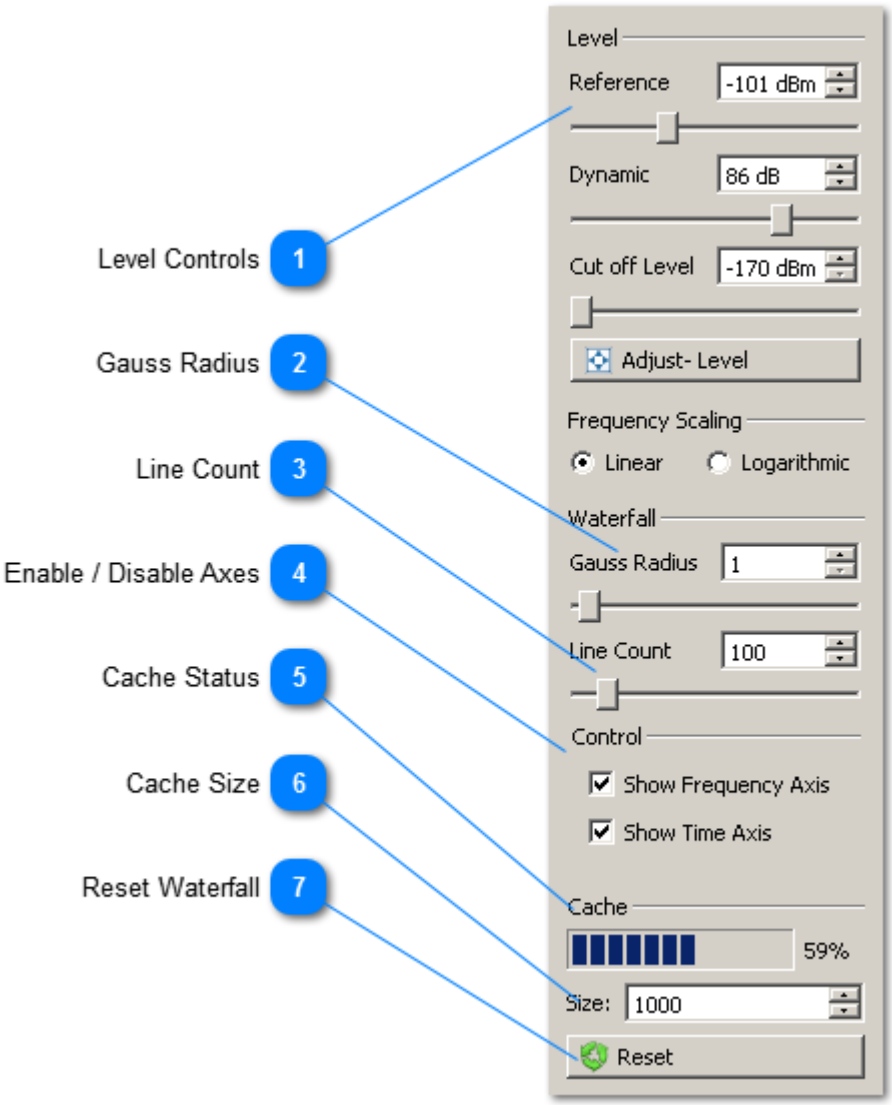


Shows a list of all currently set markers, including their index number, type, measurement value and current frequency. The color of the text depends on which trace the marker is assigned to. A Doubleclick on this area will open the Marker Editor.

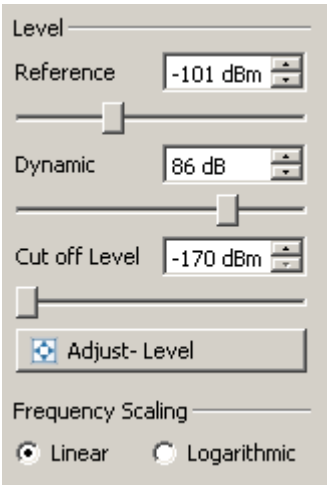
Waterfall Control and View

The Waterfall View projects measurement data as a "heatmap" in both frequency (x-axis) and time (y-axis) domain. This gives a better indication of time-based signals than you can get with the other views.

Waterfall Control

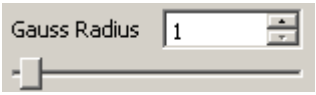


1 Level Controls



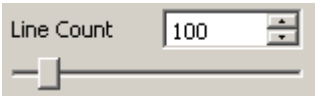
See Scaling Controls (1) and Scaling Controls (2)

2 Gauss Radius



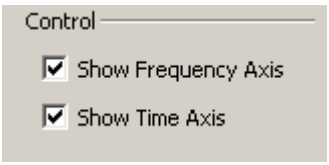
If this is set to a value higher than 1 it enables a graphical blur filter on the waterfall lines, which can be used to smooth small spikes. Note that the filter can require a lot of processing power, so only increase this value if your system can handle it.

3 Line Count



Sets the maximum number of waterfall lines that will be shown in the view. At higher values each line will use a lesser portion of the view, but each line will always be visible.

4 Enable / Disable Axes



See Spectrum Control

5 Cache Status

Current fill status of the line cache. When this display reaches 100% old lines will be removed, unless they are currently displayed. Once removed a line can no longer be displayed.

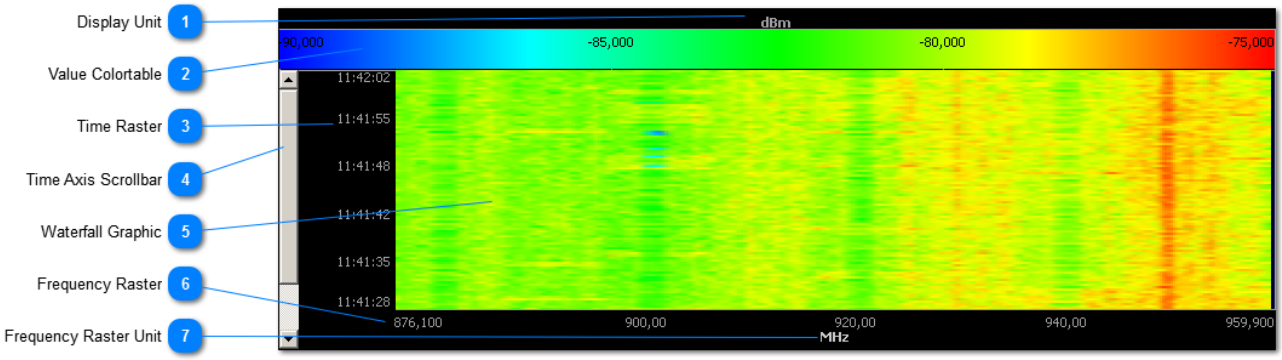
6 Cache Size

Maximum number of waterfall lines that will be stored. Increasing this value will also increase the memory requirements of the software, esp. with long and detailed measurements (like EN compliance tests).

7 Reset Waterfall

Discard all existing data of the waterfall.

Waterfall View



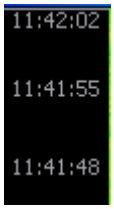
1 Display Unit

See Value Display Unit in Spectrum View.

2 Value Colortable

Use this to check what measurement value is represented by a given color (e.g. green elements in the sample view refer to values around -82 dBm).

3 Time Raster

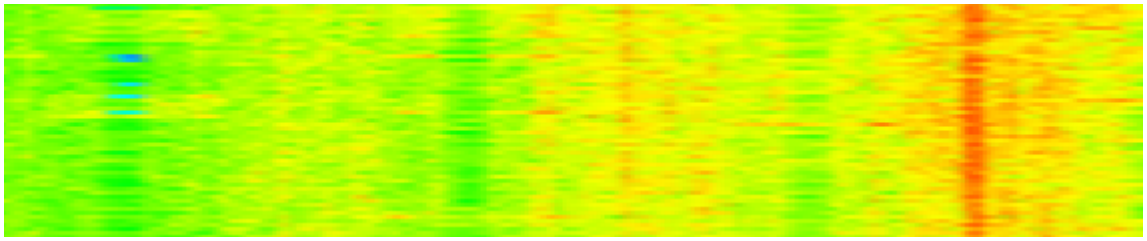


Indicates at which time the data of a given line was recorded. This is continuously updates as more data is recorded (or replayed).

4 Time Axis Scrollbar

If the view has more data than can be displayed with the current settings you can use the scrollbar to display older lines. Note that the display will stop moving if the scrollbar is not at the top setting.

5 Waterfall Graphic



6 Frequency Raster

See Frequency Raster in Spectrum View.

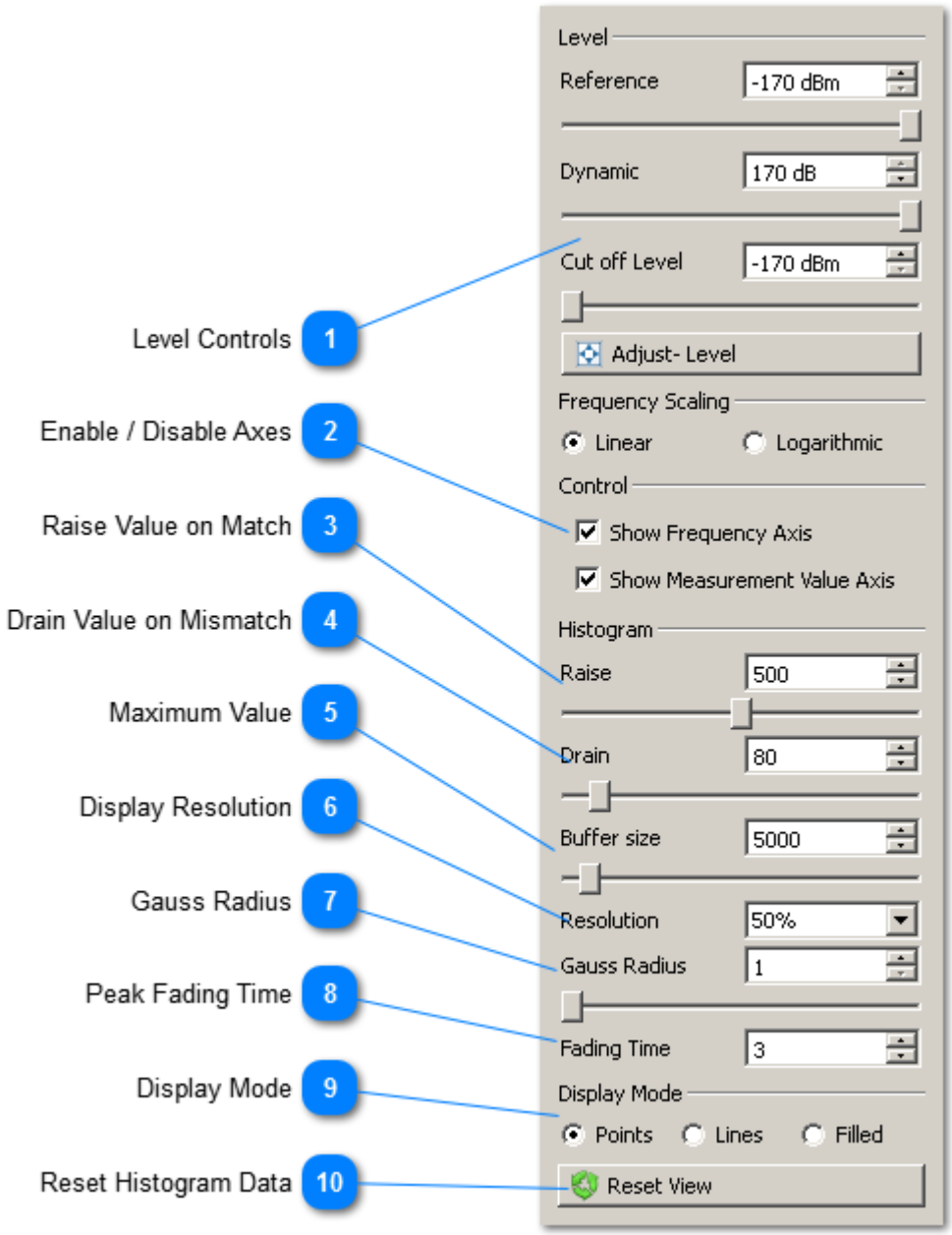
7 Frequency Raster Unit

See Frequency Raster Unit in Spectrum View.

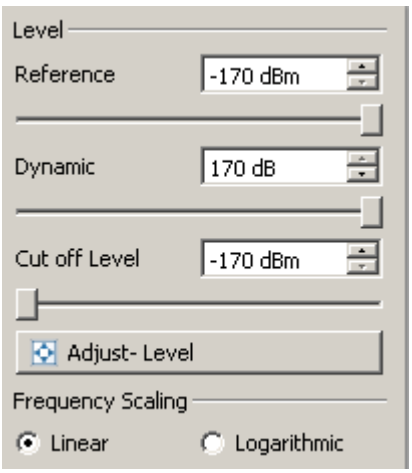
Histogram Control and View

The Histogram View provides a statistical view on how often certain values were measured at each frequency in the measured spectrum. For this the view maintains a 2D matrix where each element represents a certain value- and frequency range (based on sweep parameters, dynamic range, reference level and display resolution of the view). After each completed sweep the matrix elements corresponding to measured values are updated for a "positive hit" while all other elements are updated for a "negative hit", see the explanation of Raise and Drain parameters below.
This matrix is very sensitive to changes, therefore if any of the parameters listed above changes it is recreated and the current statistic is lost.

Histogram Control

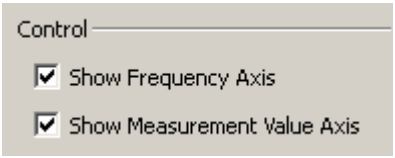


1 Level Controls



See Scaling Controls (1) and Scaling Controls (2). Changing any parameter here will cause a reset of the matrix.

2 Enable / Disable Axes



See Spectrum Control

3 Raise Value on Match

On a "positive hit" a point is increased by this value. Note that this is just an indicator, the exact value is also influenced by the current value of the point (points with high values are increased by a fraction of the value defined here).

4 Drain Value on Mismatch

On a "negative hit" a point is decreased by this value.

5 Maximum Value

Maximum value a point can reach.

6 Display Resolution

Select if the view should use the full physical display resolution for the matrix (so each point in the matrix corresponds to one pixel), or if a less detailed resolution should be used. Higher resultions require more system ressources for obvious reasons, so only increase this if your system can handle it. Increasing the resolution will automatically reset the Gauss Radius to 1 to avoid overloading the system. Changing the resolution in either direction will cause a reset of the matrix.

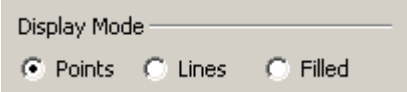
7 Gauss Radius

If set to a value higher than 1 a Gaussian Blur filter is applied on the view. This can consume significant system ressources so only enable it if your system can handle it.

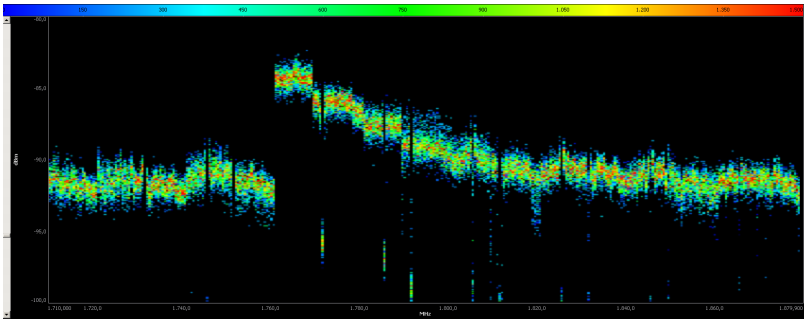
8 Peak Fading Time

On measurements with fast sweeps (or replays) burst signals may disappear almost instantly, this value determines the minimum time (in seconds) a signal is visible in the view.

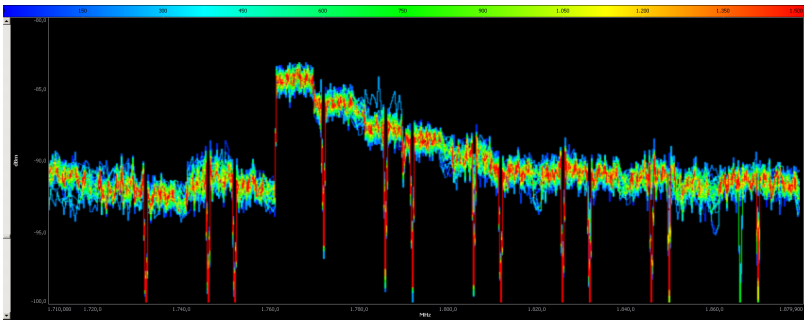
9 Display Mode



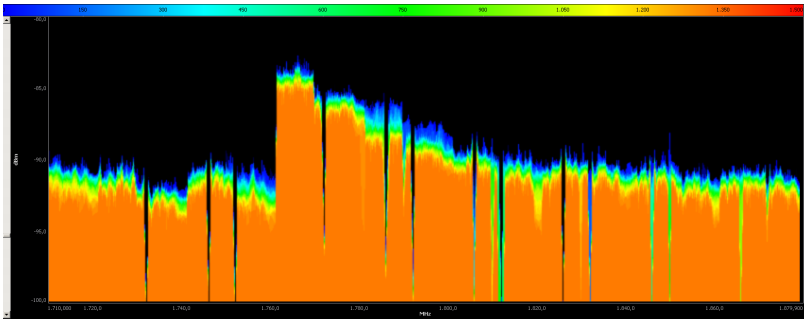
The Histogram View can display data in three different modes:



Points Mode: No interpolation, only actual data points are updated.



Lines Mode: Calculates a line between subsequent points and updates all points on this line.



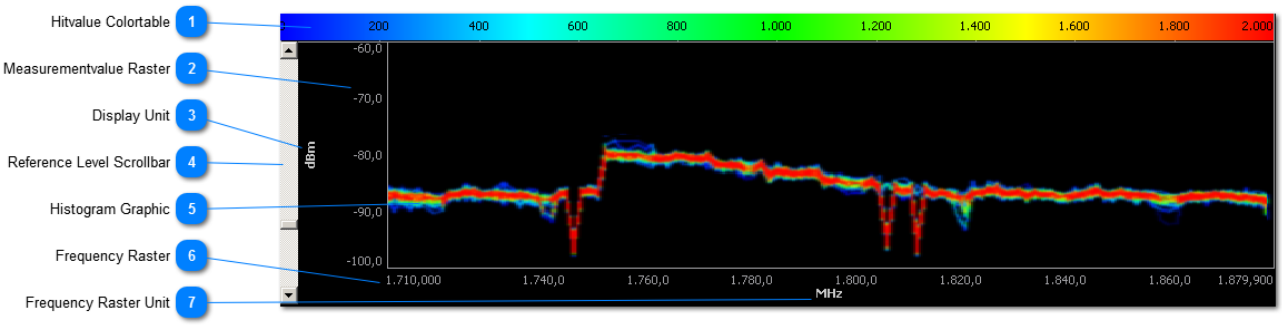
Filled Mode: Like Lines Mode, but also updates all points between the line and the reference level

Changing the Display Mode will cause a reset of the view.

10 Reset Histogram Data

Clear all data and start a new statistic.

Histogram View



1 Hitvalue Colortable

Use this to lookup the approximate value of a given point in the view. In general blue and green points are hit infrequently, while yellow and red points are hit frequently, but this depends on the current Raise, Drain and Maximum Buffer parameters.

2 Measurementvalue Raster

See Measurement Value Raster in Spectrum View.

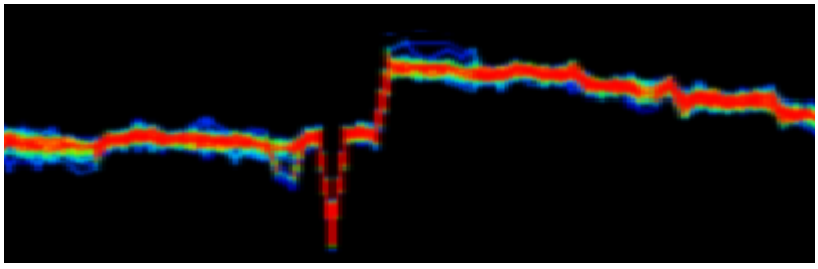
3 Display Unit

See Value Raster Unit in Spectrum View

4 Reference Level Scrollbar

See Scrollbar for Reference Level in Spectrum View.

5 Histogram Graphic



6 **Frequency Raster**

See Frequency Raster in Spectrum View

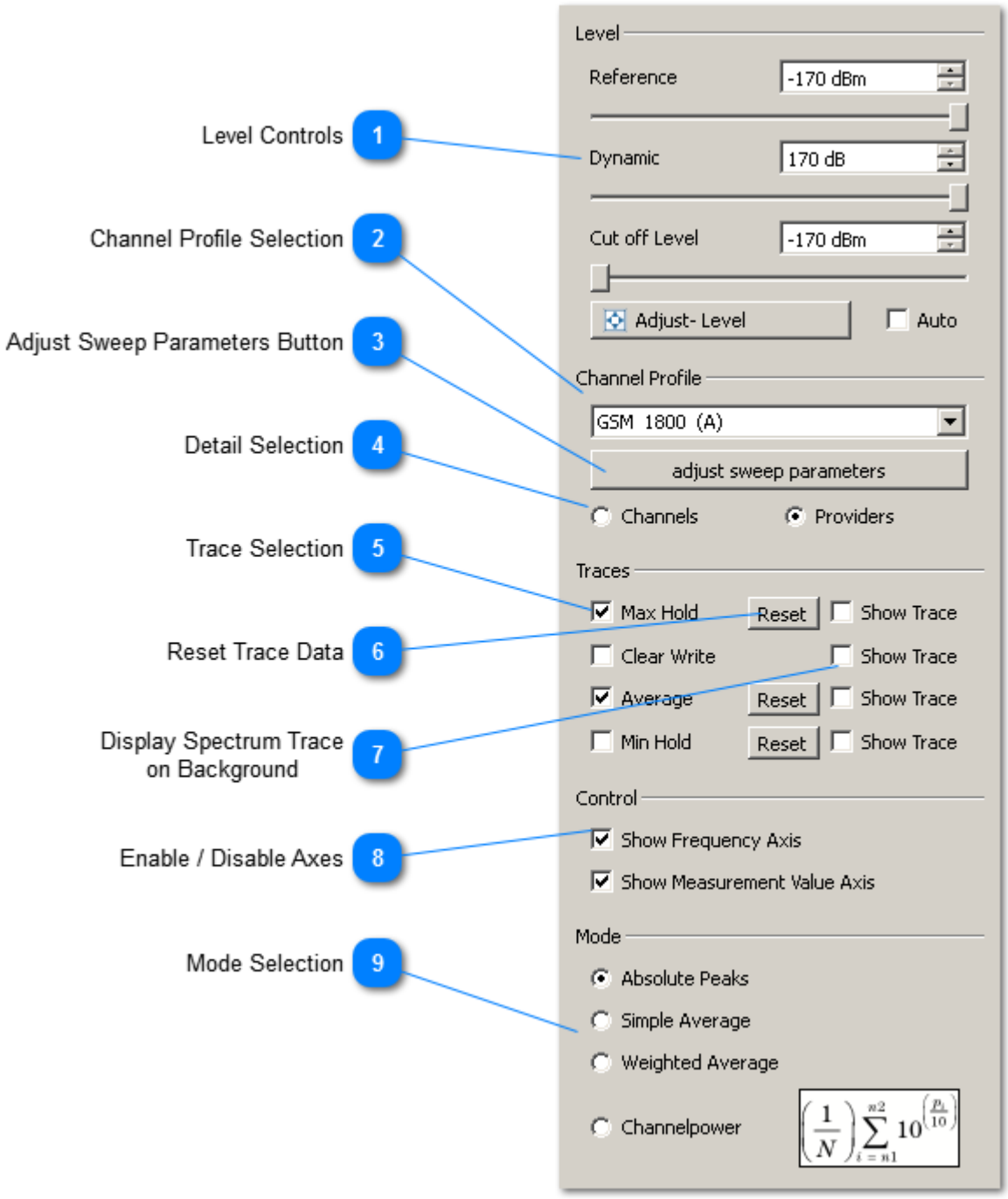
7 **Frequency Raster Unit**

See Frequency Raster Unit in Spectrum View

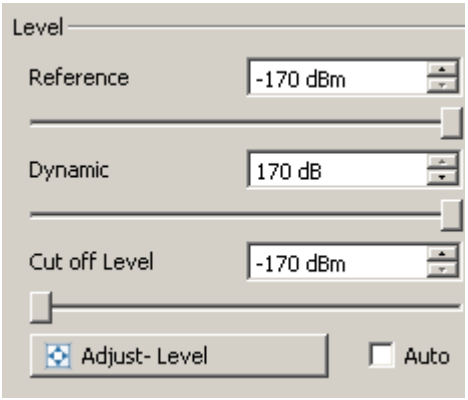
Channelpower Control and View

The Channelpower view is a bargraph plot displaying measurement values within defined channel frequency ranges, calculated from one or more traces. This helps to identify strong or free channels in a given spectrum more easily than the Spectrum View.

Channelpower Control



1 Level Controls



See Scaling Controls (1) and Scaling Controls (2).

2 Channel Profile Selection

Select the channel or provider profile to use for calculating and displaying channelpower values.

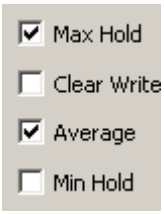
3 Adjust Sweep Parameters Button

Adjusts sweep parameters of the current device so that Start- and Stopfrequency match the selected channel profile.

4 Detail Selection

Selects if bars should be generated for whole provider ranges or for each individual channel separately (e.g. for GSM profiles).

5 Trace Selection

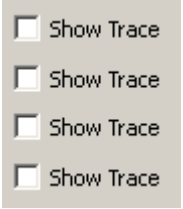


Allows you to use the different traces as base for calculating the channelpower values. Every enabled trace will show up as a segment on the bargraph in the view. Note that enabling "Current" and "Average" at the same time may cause a lot of flickering on the display, esp. on fast sweeps.

6 Reset Trace Data

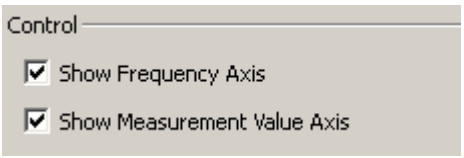
This will reset the data of the associated trace, similar to the same feature in Trace List and Controls.

7 Display Spectrum Trace on Background



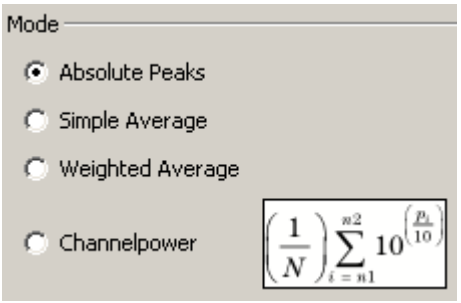
For each trace you can also display the spectrum trace to be displayed in the background of the bargraph. These settings are independent of wether the relevant trace is enabled or not.

8 Enable / Disable Axes



See Spectrum Control

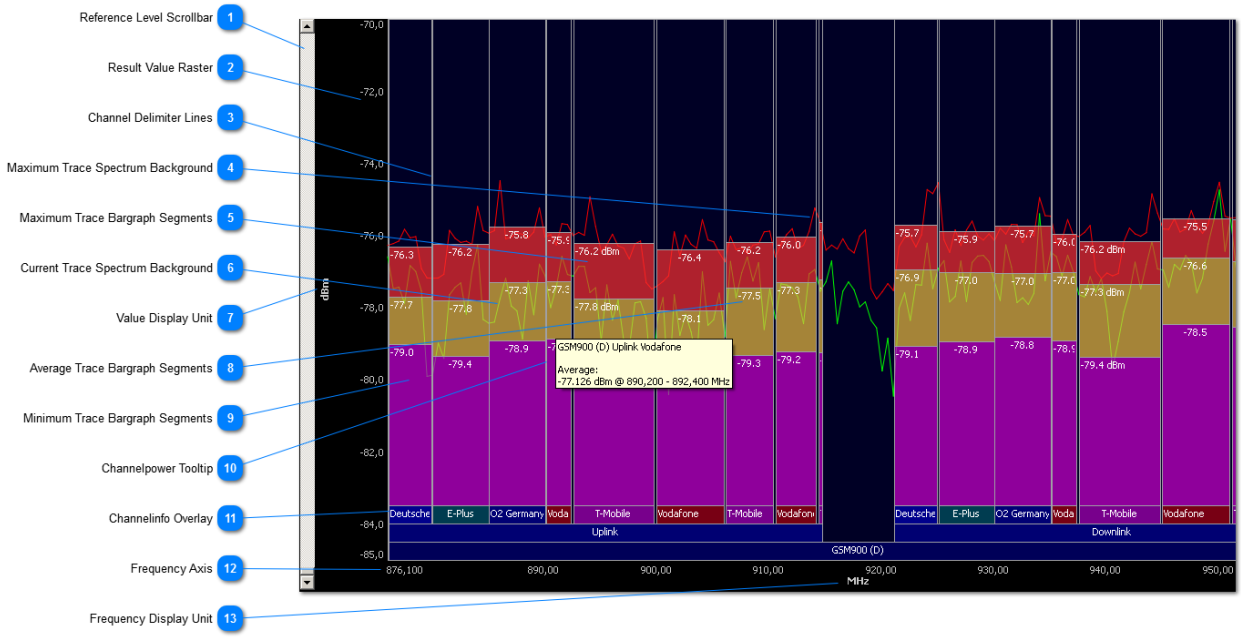
9 Mode Selection



Select one of several calculation modes for generating the channelpower values:

- Absolute Peaks: Simply find the maximum (minimum on Minimum trace) measurement value of the relevant trace within each channel frequency range
- Simple Average: Calculate an average value of all measurement points on the relevant trace within the channel frequency range
- Weighted Average: Like Simple Average, but give values close to the center of the channel a higher weight than those close to the boundaries
- Channelpower: Like Simple Average, but use the Agilent definition and formula for Channelpower.

Channelpower View



1 Reference Level Scrollbar

See Reference Level Scrollbar in Spectrum View.

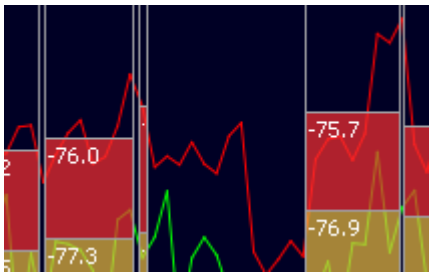
2 Result Value Raster

See Result Value Raster in Spectrum View

3 Channel Delimiter Lines

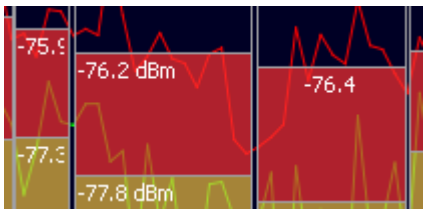
For easier visualisation each channel / provider definition is contained within full-height separator lines.

4 Maximum Trace Spectrum Background



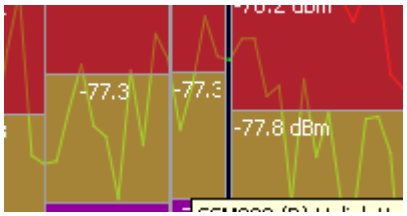
The Maximum Trace displayed as Spectrum trace in the background.

5 Maximum Trace Bargraph Segments



Channelpower values based on the Maximum trace are displayed in red. If the available space allows it they contain the value, unit and trace label as text elements

6 Current Trace Spectrum Background

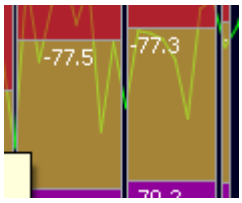


The Current Trace displayed as Spectrum trace in the background.

7 Value Display Unit

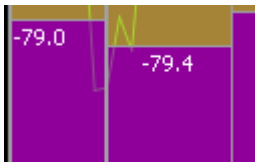
See Value Display Unit in Spectrum View.

8 Average Trace Bargraph Segments



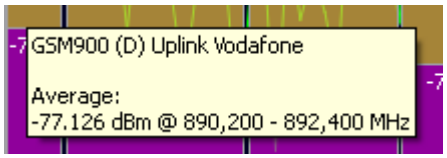
Channelpower values based on the Average trace are displayed in dark yellow. If the available space allows it they contain the value, unit and trace label as text elements

9 Minimum Trace Bargraph Segments



Channelpower values based on the Minimum trace are displayed in purple. If the available space allows it they contain the value, unit and trace label as text elements

10 Channelpower Tooltip



If you move the mouse cursor over a specific bargraph segment a tooltip window will open containing all relevant information about it:

- Name of Channel / Provider for the given segment
- Label of Trace (Maximum, Average, Current, Minimum)
- Channelpower value calculated based on current mode setting
- Frequency of displayed value (for "Absolute Peaks" mode), or frequency range of channel

11 Channelinfo Overlay

This is the same as in the Spectrum View for the selected channel definition.

12 Frequency Axis

See Frequency Axis in Spectrum View

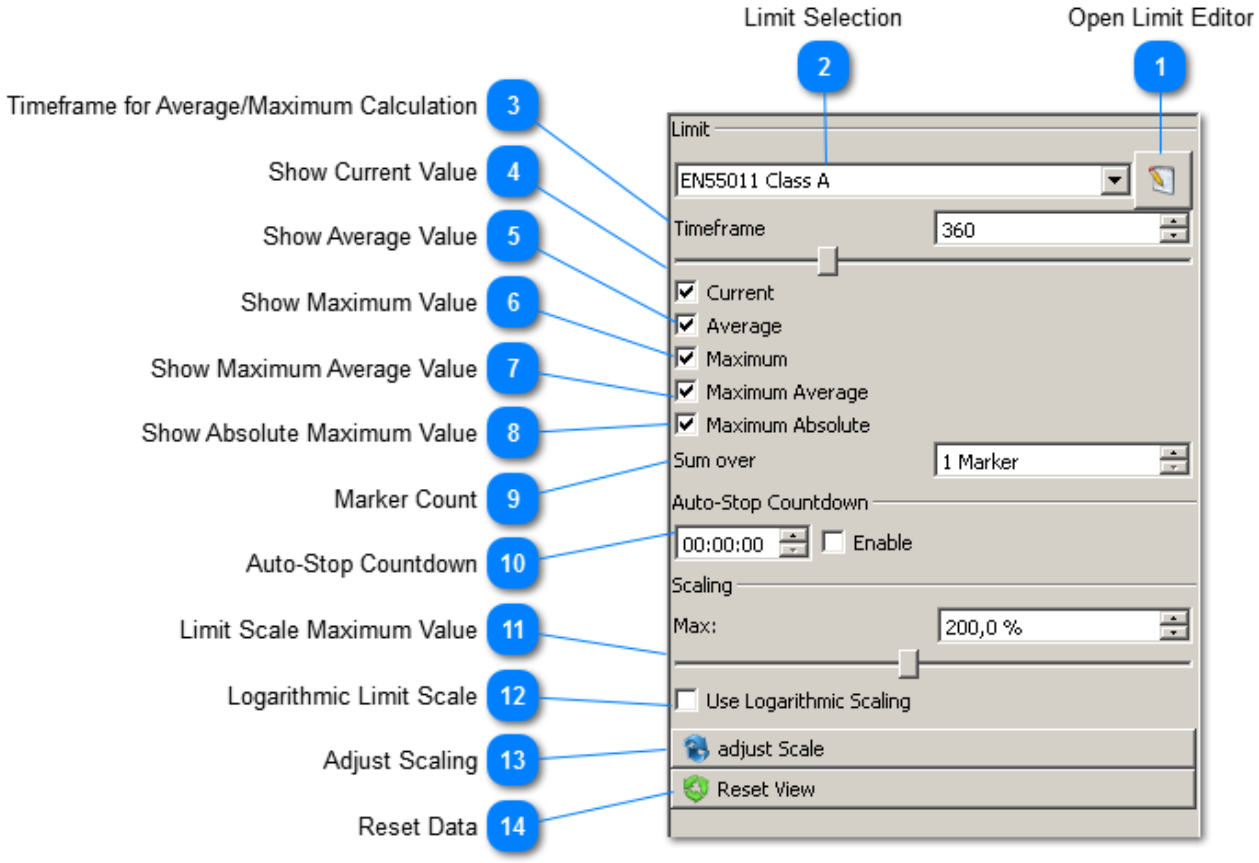
13 Frequency Display Unit

See Frequency Display Unit in Spectrum Control

Limits Control and View

The Limits View allows you to compare your measurements against a predefined set of limit values, for example regulatory limits for device emissions. Note that this view is independent of the Limit Traces that can be displayed in the Spectrum View.
When a limit is selected the Limits View will display how your measurement relates to it. This includes both the current data (last completed sweep) as well as average and maximum values obtained over the whole measurement duration or a specified timeframe. If your measurement does not exceed the defined values the bars in the view will stay green, if one or more values are exceeded they will turn red.
Limits are defined with a specific unit, start- and stop-frequencies. If the current measurement cannot be converted to the unit of the limit, or does not match the specified frequency boundaries, the Limits View will display a corresponding error message.

Limits Control



1 Open Limit Editor

See Limits Editor menu entry.

2 Limit Selection

Select a predefined limit, or use the edit button next to the list to open the Limits Editor to modify existing limits or create new ones.

3 Timeframe for Average/Maximum Calculation

Change the timeframe that is used for some of the limit calculations.

4 Show Current Value

Enable / Disable the comparison of the current sweep with the selected limit.

5 Show Average Value

Enable / Disable the comparison of the average sweep with the selected limit. The average is computed over the chosen timeframe.

6 Show Maximum Value

Enable / Disable the comparison of the maximum sweep with the selected limit. The maximum is computed over the chosen timeframe.

7 Show Maximum Average Value

Enable / Disable the comparison of the maximum average with the selected limit.

8 Show Absolute Maximum Value

Enable / Disable the comparison of the maximum sweep with the selected limit. This uses the absolute maximum over the whole measurement.

9 Marker Count

Instructs the view how many peaks should be used for the calculations. By default only the highest peak is considered, if you change this to e.g. "3 Markers" the view will compute an average over the three highest peaks and use that for the checks, so a single spike will not necessarily cause the limit to be violated.

10 Auto-Stop Countdown

Instruct the view to stop updating after a certain time, which may be useful for example if you're running a complicance test that requires measurements over a specific time interval.

11 Limit Scale Maximum Value

Set the right side of the x-axis to the given value.

12 Logarithmic Limit Scale

Convert the x-axis scaling to a log10 base, so the range from 0% to 10% uses the same amount of space as the range of 10% to 100%, making differences in the first half much more visible.

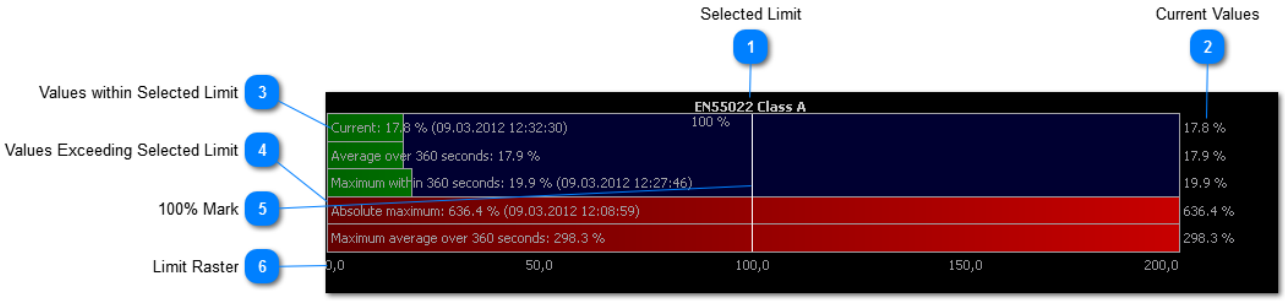
13 Adjust Scaling

Adjust the scaling parameter based on current measurement values.

14 Reset Data

Restart the limit comparison.

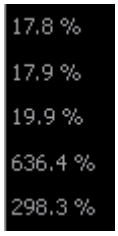
Limits View



1 Selected Limit

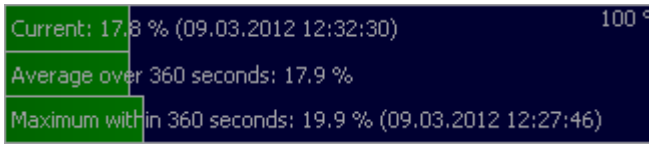
Displays the name of the currently selected limit.

2 Current Values



Displays the values of the different limit comparison bars. The values are identical to those shown on the left side.

3 Values within Selected Limit

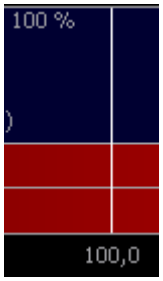


Selected values that stay within the selected limit are shown with a green bar. The displayed text includes the type of value being compared, how the value relates to the limit (in other words: how much the value can increase before violating the limit) and the time when the value was measured.

4 Values Exceeding Selected Limit

Values that violate the selected limit will be shown with a red bar, and have the same text as values within the limit.

5 100% Mark



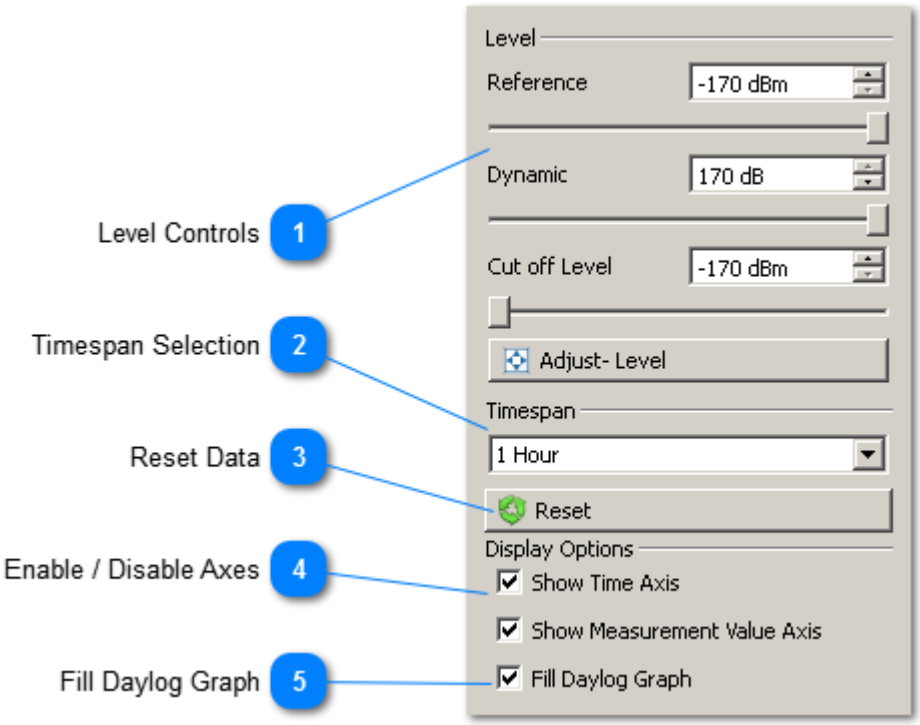
When the selected scaling exceeds 100% a reference marker is shown at the 100% position.

6 **Limit Raster**

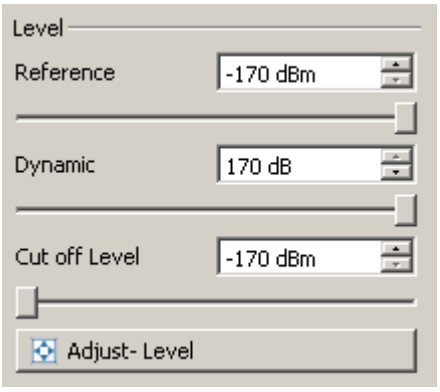
Daylog Control and View

The Daylog View simply displays the measured peak values over a specified timeframe, ignoring the frequency where the peaks were found.

Daylog Control



1 Level Controls



See Scaling Controls (1) and Scaling Controls (2).

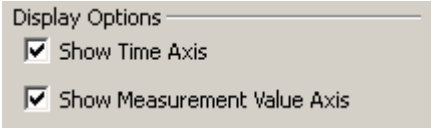
2 Timespan Selection

Select the timeframe that is displayed in the view.

3 Reset Data

Discard existing data and restart recording.

4 Enable / Disable Axes

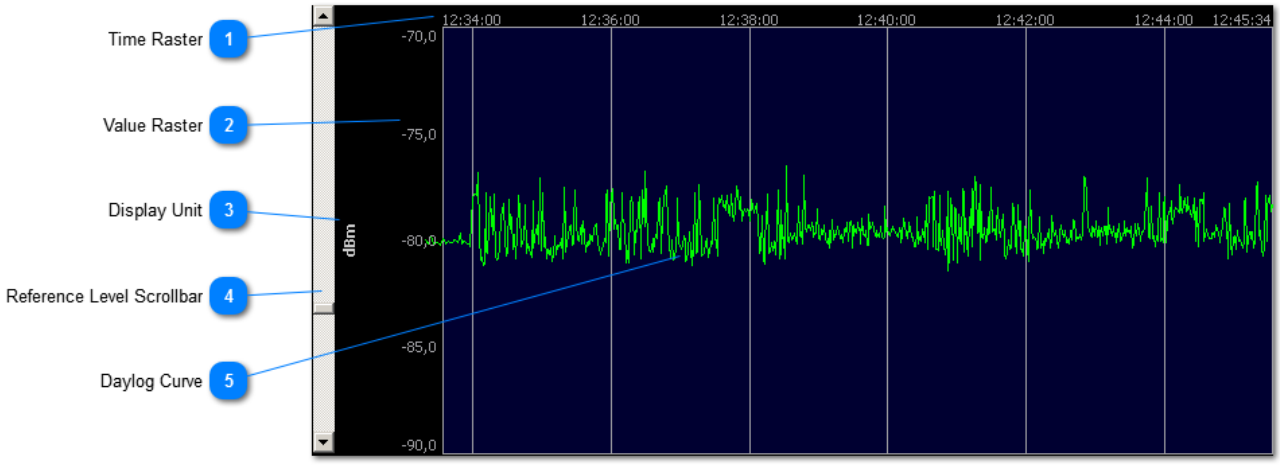


See Spectrum Control

5 **Fill Daylog Graph**

Adds a semi-transparent background filling between the daylog trace and the frequency axis.

Daylog View



1 Time Raster

Indicates at which time each value was measured. This is continuously updates as more data is recorded (or replayed).

2 Value Raster

See Value Raster in Spectrum View

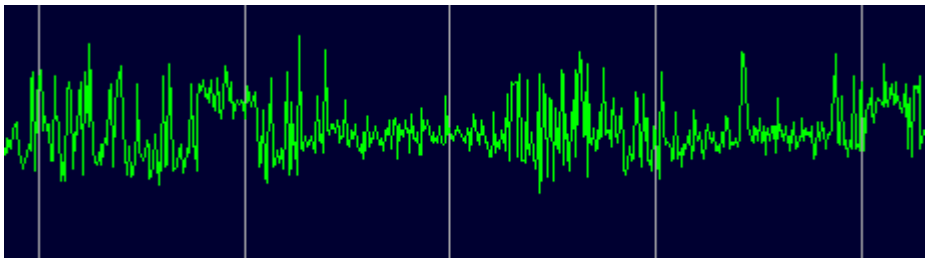
3 Display Unit

See Value Raster Unit in Spectrum View

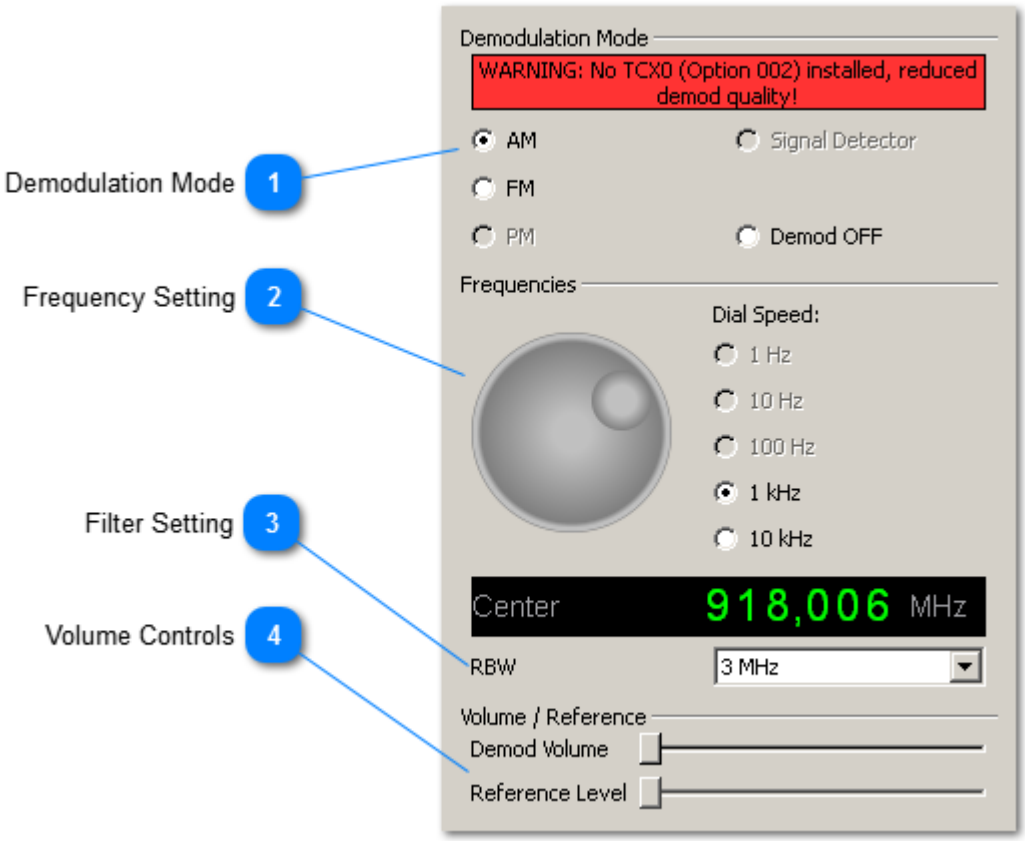
4 Reference Level Scrollbar

See Reference Level Scrollbar in Spectrum View

5 **Daylog Curve**

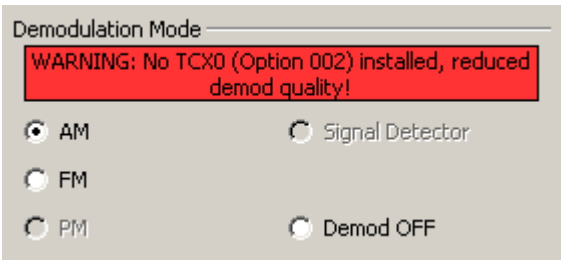


Demodulation Control



The Demodulation control allows you to access the internal demodulation features of a connected Spectran device. When enabled, the demodulated signal will be emitted using the Spectran speaker. See your Spectran manual for details.

1 Demodulation Mode



Selects the current demodulation (amplitude-, frequency- or phase-modulation) or signal detection mode. Demod OFF will disable demodulation and return to normal spectrum data processing.

2 Frequency Setting

Set the center frequency of the modulated signal. The tuning-wheel can be used for fine-tuning the frequency.

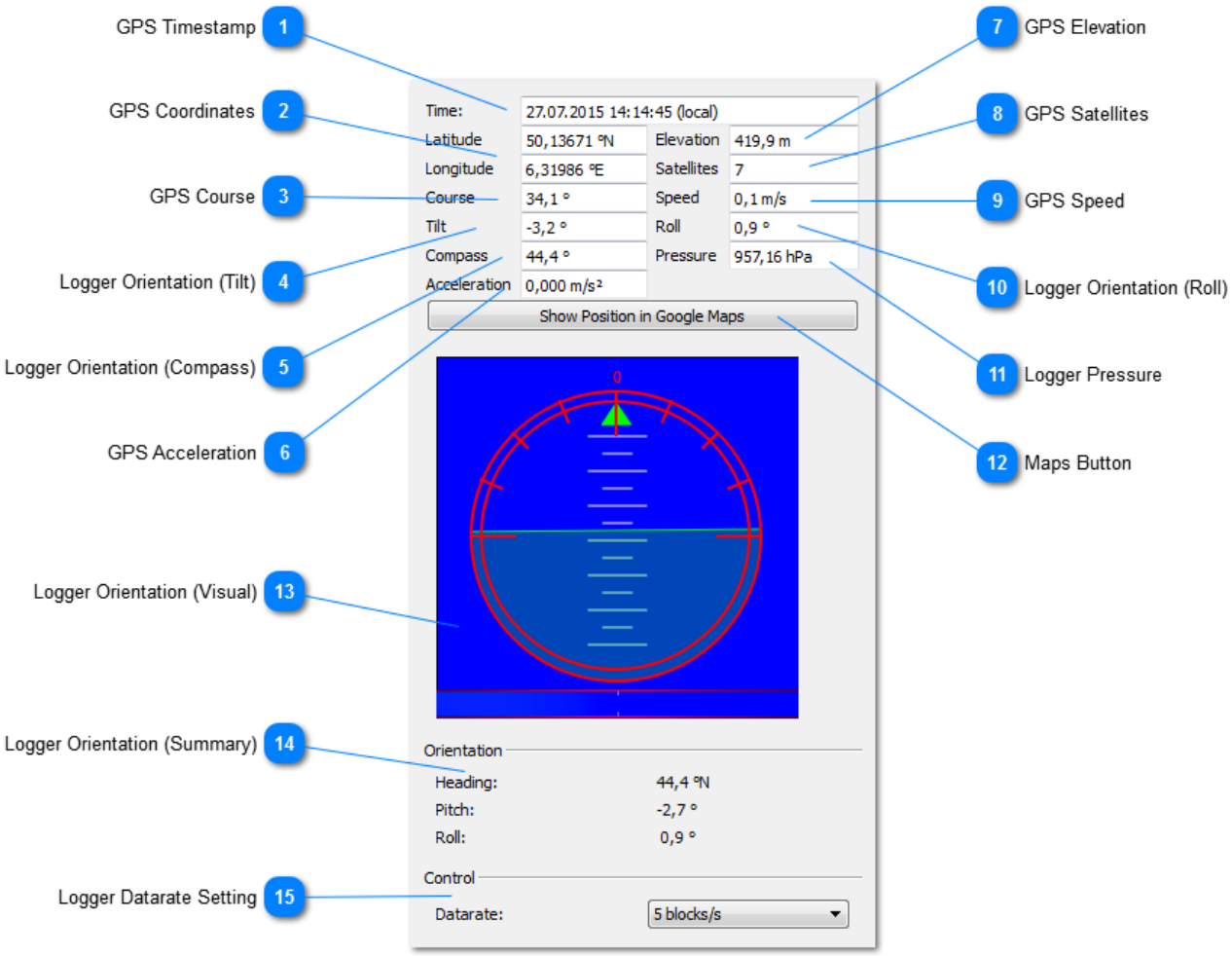
3 Filter Setting

Select the Bandwidth filter to be used.

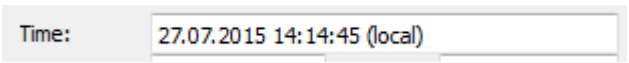
4 Volume Controls

Adjust the speaker volume and the base pitch for the demodulated signal.

GPS Control

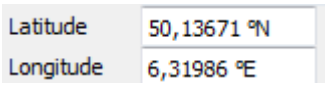


1 GPS Timestamp



The date and time of the last received valid GPS update.

2 GPS Coordinates

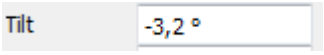


Last coordinates received from GPS sensor.

3 GPS Course

The calculated course based on the last received GPS coordinates. This is only usable when moving at significant speeds.

4 Logger Orientation (Tilt)



The orientation of the logger on the horizontal lateral axis.

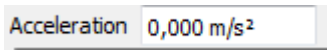
Note: This data is only available when using the external Aaronia GPS Logger.

5 Logger Orientation (Compass)

The orientation of the logger on the vertical axis, with 0° as north. As the compass is sensitive to local magnetic interference this needs to be calibrated before usage, see your GPS Logger manual for details.

Note: This data is only available when using the external Aaronia GPS Logger.

6 GPS Acceleration

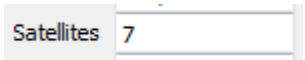


Calculated accereation of the device based on the last received GPS coordinates. This is only usable when moving at significant speeds.

7 GPS Elevation

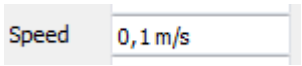
The elevation from sea level as reported by GPS updates.

8 GPS Satellites



The number of GPS satellites reporting data in the last update.

9 GPS Speed



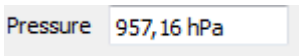
Movement speed based on the last received GPS coordinates. This is only usable when moving at significant speeds.

10 Logger Orientation (Roll)

The orientation of the logger on the horizontal longitudinal axis.

Note: This data is only available when using the external Aaronia GPS Logger.

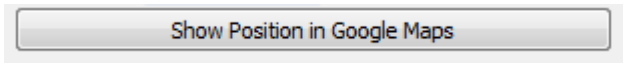
11 Logger Pressure



Air pressure as measured by the barometer of the Logger.

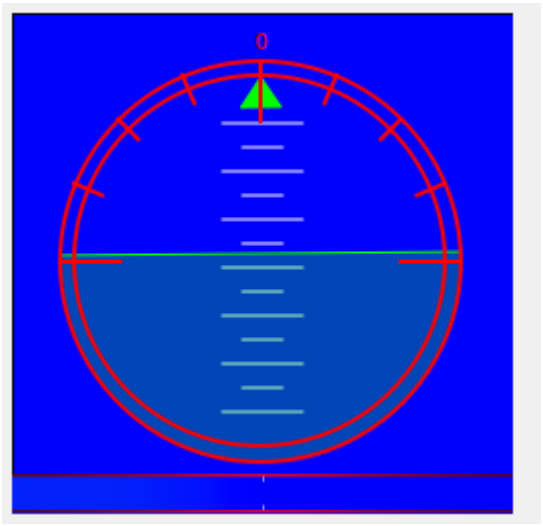
Note: This data is only available when using the external Aaronia GPS Logger.

12 Maps Button



Opens a browser window showing the curent GPS coordinates on Google Maps.

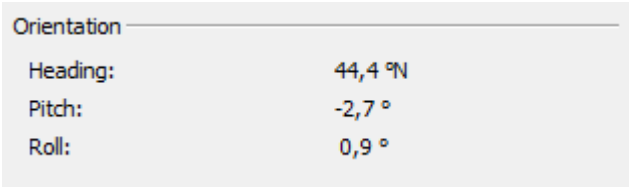
13 Logger Orientation (Visual)



Visual representation of the orientation values (Tilt, Roll and Compass) of the Logger, similar to aviation controls.

Note: This control is only available when using the external Aaronia GPS Logger.

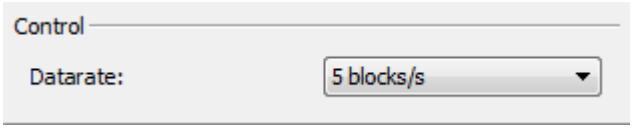
14 Logger Orientation (Summary)



Summary display of orientation values without GPS data for easier reading.

Note: This control is only available when using the external Aaronia GPS Logger.

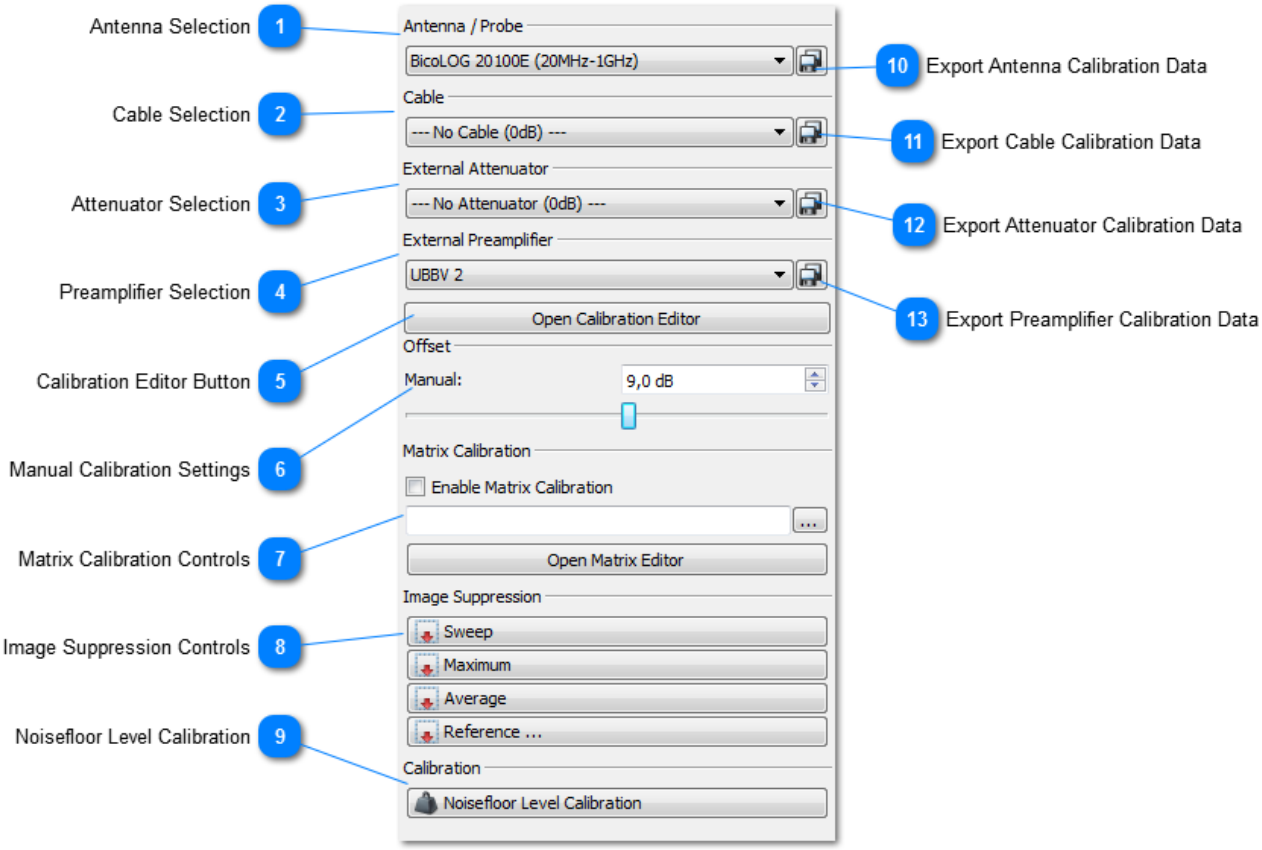
15 Logger Datarate Setting



Controls the interval between updates of the Logger sensors other than GPS. The setting will stay even after disconnect and poweroff of the Logger (so it will be active for offline recording on SD-card), but will be reset to default (10 blocks/s) on the next connect.

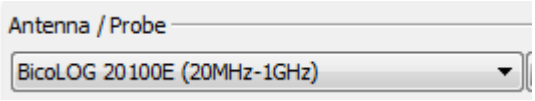
Note: This control is only available when using the external Aaronia GPS Logger.

Calibration Control



With the Calibration Control you can tell the MCS software what Antenna, Cable and other equipment you have connected to your Spectran device, so amplifying and damping effects can be accounted for in the displayed results. If the selected settings do not fully cover the current measurement spectrum there will be a warning sign next to them. When you position the mouse cursor over it it will tell you which frequency range is covered by the selected setting.

1 Antenna Selection

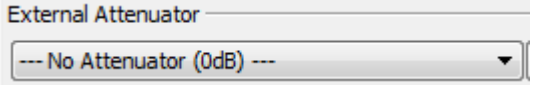


Select the antenna that is attached to the current device. The "save" button on the right will export the calibration table of the current entry as a CSV file for import in external applications.

2 Cable Selection

Select the cable that is attached to the current device. The "save" button on the right will export the calibration table of the current entry as a CSV file for import in external applications.

3 Attenuator Selection

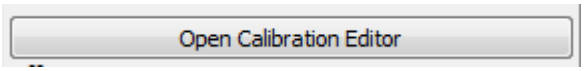


Select the external attenuator that is attached to the current device. The internal attenuator setting is selected in the Settings Control. The "save" button on the right will export the calibration table of the current entry as a CSV file for import in external applications.

4 Preamplifier Selection

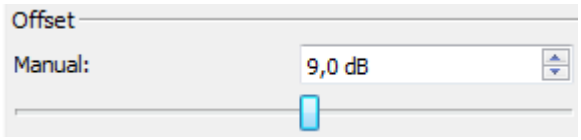
Select the external preamplifier that is attached to the current device. The internal preamplifier of some devices is enabled / disabled in the Settings Control. The "save" button on the right will export the calibration table of the current entry as a CSV file for import in external applications.

5 Calibration Editor Button



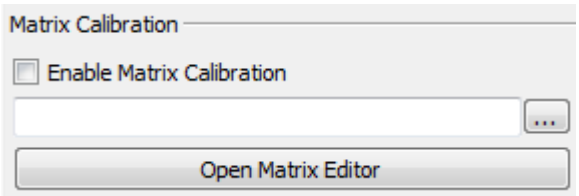
This button opens the calibration editor, where you can add new objects or edit existing ones.

6 Manual Calibration Settings



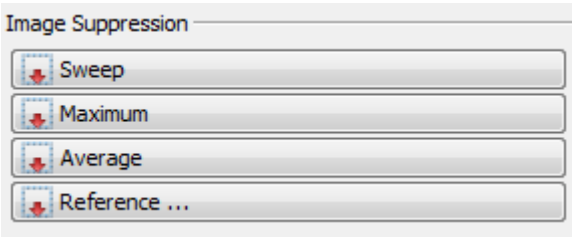
Add a manual offset to all measurement values to compensate for effects or devices not covered by the previous sections above.

7 Matrix Calibration Controls



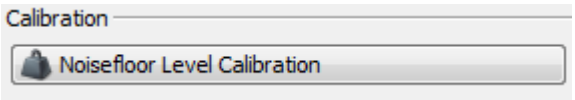
Enable, Load and edit matrix calibration data. See Matrix Calibration for details.

8 Image Suppression Controls



Subtracts the values of the current, maximum, average or a selected reference trace from future measurements. This can be used to visually compare measurements with a reference signal or to remove noise.

9 Noisefloor Level Calibration



Only available for SPECTRAN HF V4 devices. This will overwrite the default calibration with the current environment readings.

This operation cannot be undone! To restore the default calibration the device has to be sent in!

10 Export Antenna Calibration Data

Export the Calibration Data of the currently selected antenna as CSV file.

11 Export Cable Calibration Data

Export the Calibration Data of the currently selected cable as CSV file.

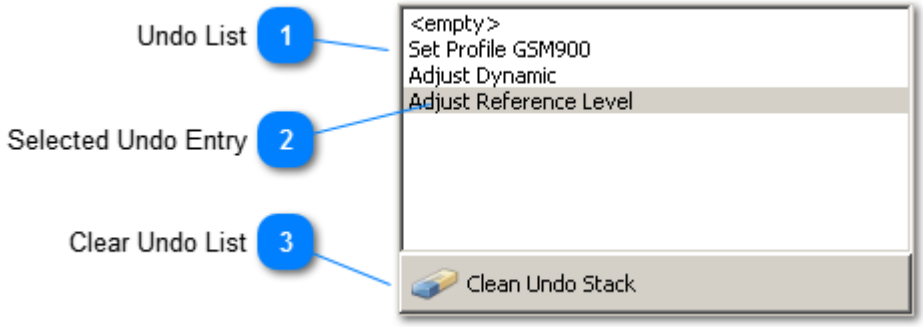
12 Export Attenuator Calibration Data

Export the Calibration Data of the currently selected attenuator as CSV file.

13 Export Preamplifier Calibration Data

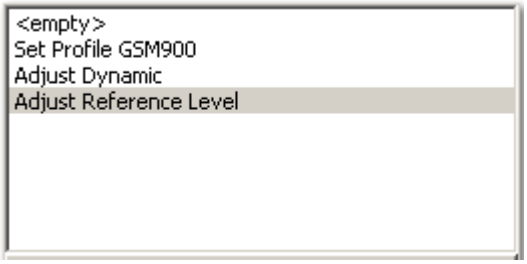
Export the Calibration Data of the currently selected preamplifier as CSV file.

Undo / Redo Control



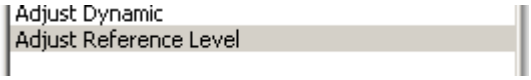
The Undo / Redo Control simply lists the actions that can be undone, allows you to select a certain point to go back to and to clear the list of actions.

1 Undo List



Selecting an entry in the list will undo all listed actions following that entry. If then another entry is selected the entries in between will be undone/redone as necessary.

2 Selected Undo Entry



3 Clear Undo List

Clears the Undo List to avoid actions performed hours ago to clutter the list.

Recording and Replay

Recording a Measurement

Currently the MCS supports two different recording backends:

- MDR: a XML-based format that can be used to record and replay measurements with the MCS. Includes raw measurement data, device parameters and other information to reconstruct a measurement environment. Due to its "raw" nature it is not suited to be directly used with other applications.
- CSV: simple tabular text format that can be imported in other programs like databases, but cannot be read by the MCS itself as it lacks information abour the recording environment. Only includes preprocessed measurement data. *(Note: The generated file might be too large for some applications to handle, for example Microsoft Excel is known to cause problems with large datasets).* When importing the file in another application make sure you use point (.) as decimal separator, semicolon (;) as field separator and comma (,) as 1000-group separator (if you software supports those settings).

In doubt use the MDR format, as you can convert it to CSV later if necessary.

To start a recording simply select the Start Recording menu entry. The MCS will then ask you for a filename for storing the measurement, by changing the filetype you also select the recording backend. For MDR recordings you can provide some additional information in the next dialog to describe the measurement.

Once started you can pause and continue the recording at any time. However if you change any device parameters the recording will automatically be stopped.

When your measurement is finished you can stop the recording with the Stop Recording menu entry.

Replaying a Recorded Measurement

You can use the MCS to replay a previously recorded measurement. A replay acts like a live measurement in most cases, except you cannot change device parameters for obvious reasons. Most other settings (graphics, measurement unit, reference/dynamic, ...) that are not directly dependent on a device can however be adjusted. This allows you to analyze a measurement in different ways while operating on exactly the same dataset. Also a replay can be played back at various speeds, and the speed is only limited by your systems hardware, while live measurements are also limited by the Spectrans performance. This allows it to make a unattended long-time recording while having all analyzer options available on the recorded data in a fraction of the recorded time.

To start a replay simply open a MDR recording using the Load Measurement File menu entry. If there is currently already a replay in progress the MCS will ask you if you want to replace it with the new file. This allows you to either stop the current replay and start the new one instead, or let both replays run side by side. See Managing Multiple Devices for details on how to assign views to each replay.

When a replay is started the MCS will ask you for a delay between sweeps. This can be used to slow down the replay speed, either to give you more time to look at each sweep, or simply to reduce system load. If no delay is specified the sweeps will be played as fast as possible, which can result in the whole measurement (containing possibly many hours of data) being displayed within a few seconds, for short measurements you may even only see the end result.

You can control the replay with the standard Start Sweep and Stop Sweep actions, or with Pause Replay halt it temporarily and resume it later at the same position.

When done you can close the replay with the Close Measurement File menu entry.

Converting from MDR to CSV

The conversion of a MDR recording into a CSV file for importing into external applications is pretty straightforward:

1. record your measurement in MDR format (if not done already)
2. load the recorded measurement into the MCS using the Load Measurement File menu entry.
3. Click "Cancel" when you're asked about the sweep delay. This will start the replay in paused mode, so the environment has been read, but no data has been replayed yet.
4. Start a new recording in CSV format.
5. Resume the paused replay by clicking the Pause Replay button.
6. When the replay is finished stop the CSV recording
7. Import your new CSV file into your external application

Advanced Features

Managing Multiple Devices

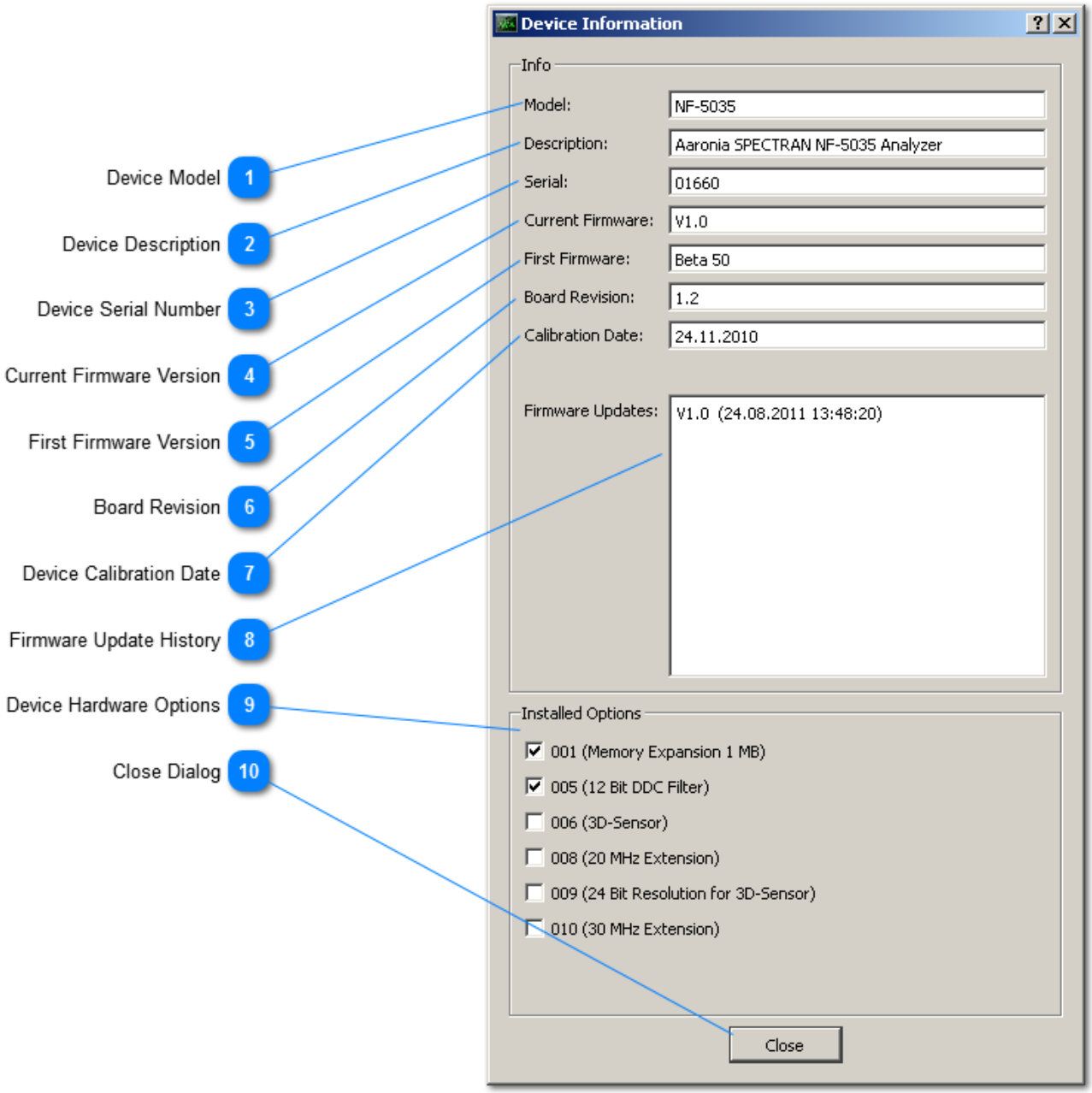
The MCS is capable of handling multiple devices and/or replays simultanously. For connecting more than one device use either the Connect, Network Connection, Create Pseudo Spectran or Load Measurement File menu entries.

At the moment each graphic view can only handle data from a single device. You can select the data source for each view by first activating the view and then selecting the device via the dropdown box in the bottom-right corner. This will display the serial number and model for USB devices, the IP address or hostname for network connections and the recording date for replays.

When the datasource is changed each view will adjust itself to the new parameters. Usually this will involve a complete reset of the views data and adjustments to Reference Level and Dynamic Range.

If a device is disconnected all views associated to it will be assigned to another datasource if possible.

Detailed Device Information



Generally the MCS uses either the device description (including device type and model) or the serial number of a device in the user interface. However sometimes you may need more information about the connected device. For these cases the MCS contains an extensive device information dialog, listing details like board revision or firmware update history. This dialog can be opened with the Device Information menu entry. It is also available in the Firmware Updater.
When opening the dialog on a replayed measurement some fields like Firmware updates are not available, instead some extra information from the recording is displayed.

1 Device Model

Complete model string including device type

2 Device Description

Description as displayed in the connection manager.

3 Device Serial Number

Serial number of the device used to identify it by Aaronia

4 Current Firmware Version

Firmware version currently used on the device.

5 First Firmware Version

Firmware version with which the device was originally programmed

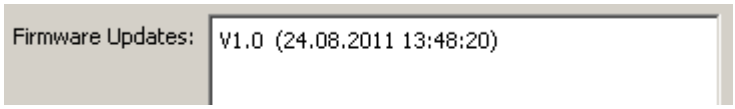
6 Board Revision

Exact version of the device board

7 Device Calibration Date

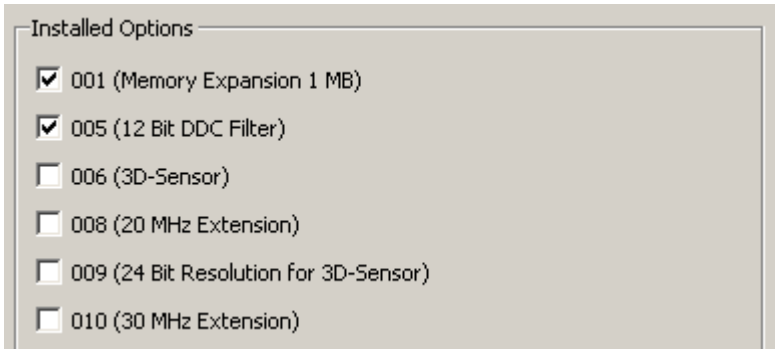
Date when the device was last calibrated completely.

8 Firmware Update History



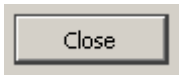
List of all performed firmware updates including date.

9 Device Hardware Options



List of hardware options of this device, marked as checked if the option is installed and unchecked if not installed. The options in this list depend on the current device.

10 Close Dialog



Close the Dialog.

Printing and Screenshots

In addition to the usual screenshot features provided by the operating system the MCS includes two functions to specifically capture the contents of its views. The first function is the Print feature, which outputs all currently visible views to a printer device. Which output devices are available depends on your system configuration. As all views use a dark background by default the MCS allows you to invert the colors used for printing, so color (and therefore ink/toner) usage for the background is minimized.

The other function is that each view contains a "Save Image" entry in its context menu. This will open a file selection dialog where you can specify an image file for creating a static snapshot of the current view.

Note that both functions do not simply create a 1:1 copy of the current screen, but will optimize the view for the chosen target. This may include a more (or less) detailed axis scaling for example.

Spectrum Markers

The MCS software allows you to create an arbitrary number of markers in each spectrum view. Uses for these markers include tracking signal peaks, showing measurement values at specific frequencies or adjusting the sweep to focus on signal anomalies.

Marker Controls

Markers are created, edited and removed with the Marker Controls in the Spectrum Control or the Marker Editor.

Marker Types

There are two general marker types available: fixed markers, that will stay at a given frequency, and dynamic markers that will jump to frequencies containing signal peaks. Both types can additionally take a reference marker to display the delta frequency and value to this reference instead of absolute values. Therefore there is no separate delta marker type like in other spectrum analyzers. Each marker is also assigned to one of the traces available in the spectrum view, like the current sweep trace, max trace or average trace (see Trace List and Controls). This allows to track values just for the current sweep and over time simulatenously.

Manual Creation / Editing

To create markers manually start by clicking the Add / Edit / Remove button in the Marker Controls. This will open the Marker Editor where markers can be added, removed or adjusted.
The marker index and name are auto-generated and cannot be changed. They'll adjust based on the number and types of markers currently set, so make sure you're selecting the right marker when making changes. Markers can display their values in the spectrum view itself, but as this can consume valuable space and hide other objects you can turn it off by deselecting the Display Value option. You can also enable a vertical line highlighting the marker frequency by selecting the Show Line option.
The target frequency of fixed markers can be set manually in the frequency edit field or by using one of the options of the „find“ button. Dynamic markers do not have a target frequency, instead you can select if they should jump to the frequency with the highest („Trace Maximum“) or lowest („Trace Minimum“) value. Creating multiple markers of the same type on the same trace will mark the next lower/higher peak of the trace, so by adding three dynamic Trace Maximum markers on the „Max“ trace you would track the three strongest peaks of the whole measurement.
When you have more than one marker set you can assign a „Delta Reference“ to every marker, which will cause the marker to display the difference to this reference in frequency and value instead of showing absolute values. E.g. instead of „-87.32 dBm @ 576.307 MHz“ you'd see „-4.89 dBm @ +23.650 MHz (Delta Max 1)“. Setting a „Delta Reference" will only affect the display of value and frequency, it does not change any other marker properties.

Loading Saved Setups

At any time you can load a marker setup you've previously saved using the Load button. You can then select a setup you've previously saved. If the spectrum currently has existing markers you will be asked if you want to replace them with the selected setup, or if the setup should be added on top.

Saving Marker Setups

If you're doing similar measurements on a regular interval you probably want to use the same marker setup without having to recreate it everytime. For that you can store the current marker setup on disk using the Save button, and reload it later using the Load button. Note that markers will be stored with their target frequencies and assigned traces, and will be restored with them, so loading a setup on a spectrum with different frequencies and/or active traces might require changing some marker frequencies or traces for them to become active again.

Marker Frequency Selection

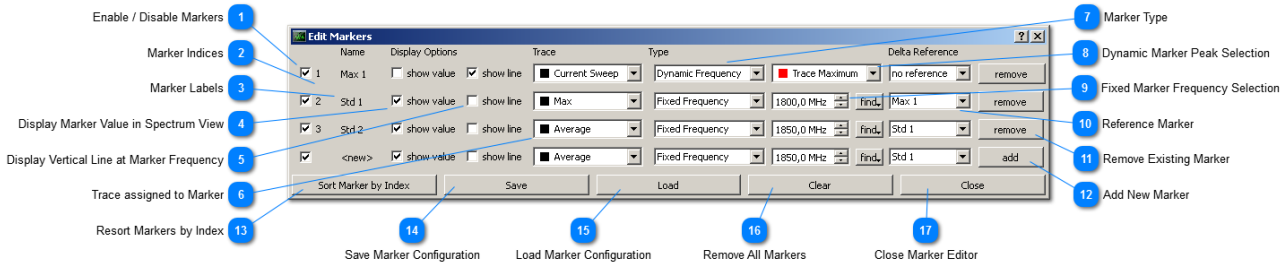
Manually selecting a target frequency for fixed markers is often inconvenient, so there are some options to select a frequency automatically. You can reach those options by clicking the find button in the marker editor. The options available include:

- „center frequency“: This simply sets the marker to the center of the current spectrum
- „find trace maximum“: Selects the frequency of the current peak of the assigned trace, similar to a Dynamic Trace Maximum marker. However once found the marker will stay at that frequency while the Dynamic Marker would jump away once a new peak appears.
-

„find trace maximum left of“: Selects the frequency of the next peak left of the chosen marker. „left of“ means that the selected frequency will be lower than the frequency of the chosen marker.

- „find trace maximum right of“: Selects the frequency of the next peak right of the chosen marker. „right of“ means that the selected frequency will be higher than the frequency of the chosen marker.
- „find trace minimum“: analog to „find trace maximum“, but finds negative peaks.
- „find trace minimum left of“: analog to „find trace maximum left of“, but finds negative peaks.
- „find trace minimum right of“: analog to „find trace maximum right of“, but finds negative peaks.
- „set center to marker frequency“: does not actually select a frequency, but changes the center frequency of the spectrum to the target frequency of the selected marker. This way you can center on peak values by first selecting „find trace maximum“ and then „set center to marker frequency“. Note however that the center change will reset the spectrum data.

Marker Editor



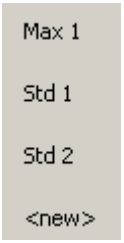
1 Enable / Disable Markers

Each existing Marker can be enabled / disabled individually with the checkbox on the left.

2 Marker Indices

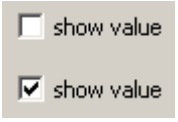
Displays the unique index number of each Marker that will be used in the Spectrum View.

3 Marker Labels



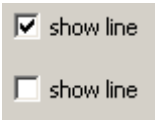
Displays the label that will be used in the Marker Legend in the Spectrum View

4 Display Marker Value in Spectrum View



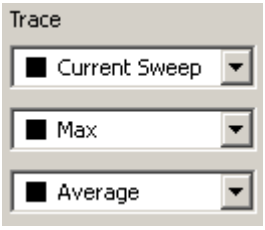
If checked the measurement value of the Marker will be displayed inside the Spectrum View, if unchecked it will only be listed in the Marker Legend.

5 Display Vertical Line at Marker Frequency



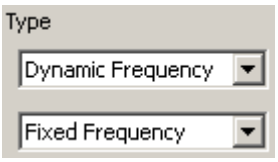
If checked a vertical line is drawn at the current marker frequency, which may help in locating markers.

6 Trace assigned to Marker



Each Marker can be assigned to a specific trace in the Spectrum. For example you can add a Dynamic Maximum Marker to both the Current Sweep and the Maximum trace to keep track of the current and the absolute maximum of a measurement. Note that not all traces are available for marker assignments.

7 Marker Type



Select if the marker should follow peaks (Dynamic Frequency) or just record the value at a given frequency (Fixed Frequency).

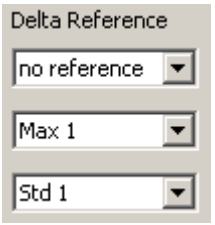
8 Dynamic Marker Peak Selection

For Dynamic Markers you can select if they should follow Maximum or Minimum peaks.

9 Fixed Marker Frequency Selection

You can set the desired frequency for Fixed Markers here, either manually or using one of the options in the "find" menu. See Marker Frequency Selection for details.

10 Reference Marker



Select a Reference Marker that will be used as base for displaying measurement and frequency offsets in the Spectrum View and Marker Legend.

11 Remove Existing Marker

Remove the Marker in this row.

12 Add New Marker

Create a new Marker with the parameters set in this row.

13 Resort Markers by Index

Resort Markers in the editor by ascending index order, so they have the same order as in the Marker Legend.

14 Save Marker Configuration

Store the current Marker configuration on disk.

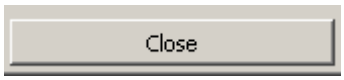
15 Load Marker Configuration

Load a previously stored Marker configuration, either replacing or extending the current setup.

16 Remove All Markers

Remove all currently configured markers.

17 Close Marker Editor



Close the Marker Editor and update the Spectrum View.

Sessions

Sessions are a mechanism to store a specific application setup for later reuse. They include information about active views and controls, their current settings and sweep parameters. This allows you to quickly switch between different measurement setups. Note that when loading a session the stored sweep parameters will only be restored for the devices that were connected when the sessions was created, but will also be used if a device is connected after loading the session.

You can create, load and delete sessions using the Sessions menu.

Measurement Triggers

Triggers are used to automatically respond to certain measurement events like:

- A limit curve was exceeded
- A peak has exceeded a given level
- A peak has dropped below a given level

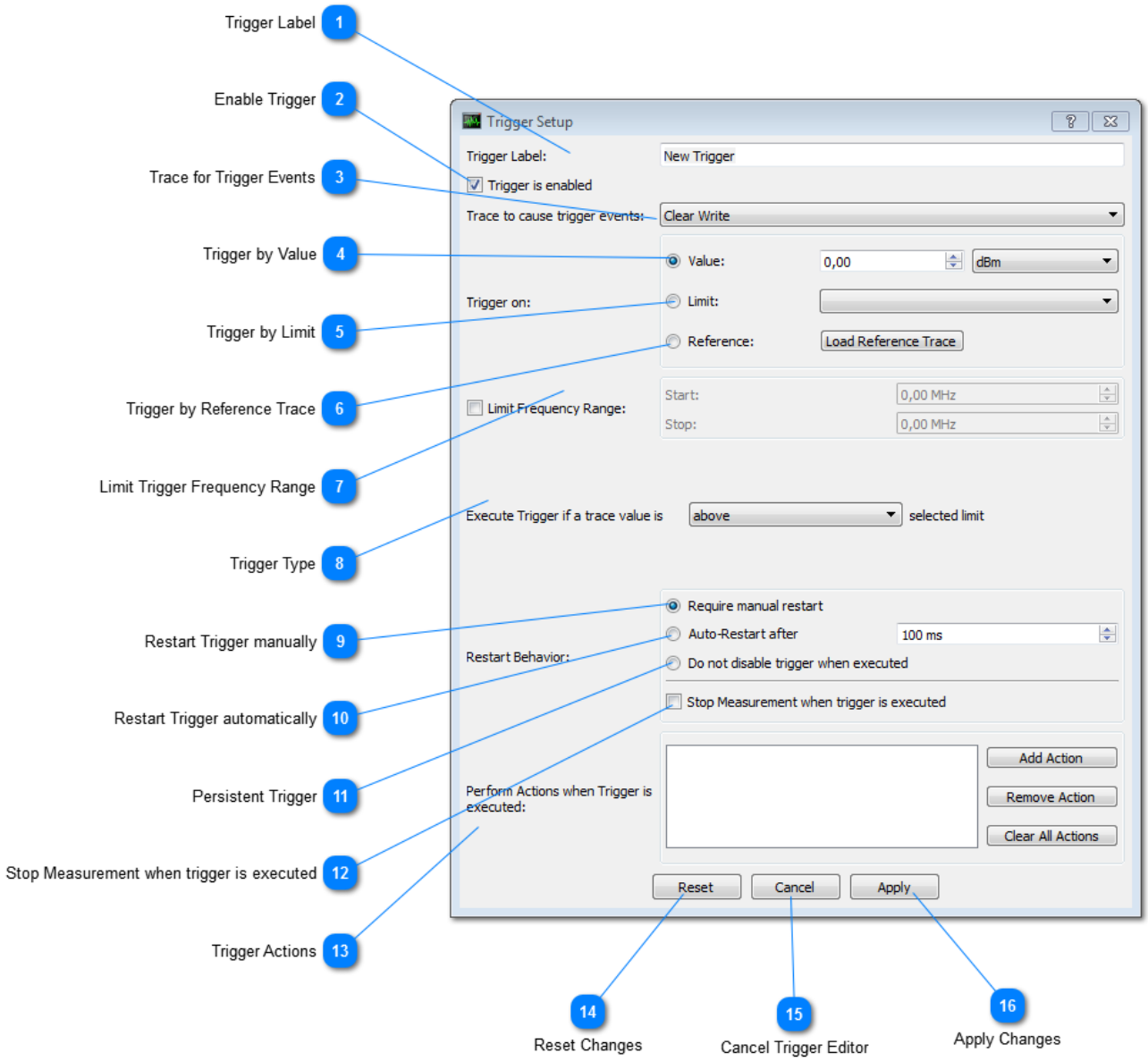
Available automatic actions are:

- Playing a user specified audio file or a default notification signal
- Display a user message in a separate dialog
- Execute a user command
- Create a screenshot of the spectrum when the trigger was executed

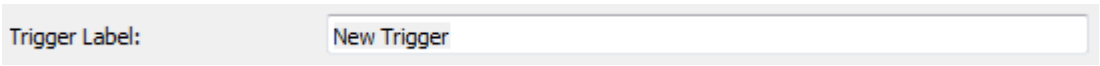
Trigger activation

The trigger controls are available at the Spectrum controller and are disabled by default. To activate the triggers, you have to click the check box left beside the “Trigger” label. Triggers are drawn at the Spectrogram using different colours: Gray is used for triggers that are currently not enabled and were not triggered before. Yellow is used to indicate an active trigger and Red to indicate triggers that were disabled to to being triggered. See the next section for trigger options.

Trigger Editor

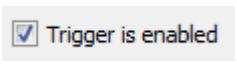


1 Trigger Label



Identifier for the Trigger in the Spectrum View.

2 Enable Trigger

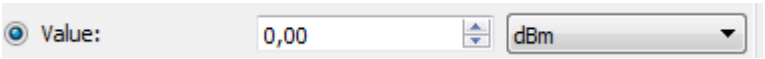


Enable the Trigger after closing the editor. This means it can also immideatly fire a event and be stopped.

3 Trace for Trigger Events

Select the trace that the trigger should operate on.

4 Trigger by Value

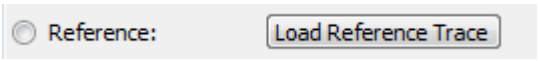


Select a value that the trigger must exceed to cause a trigger event. This is basically the same as selecting a reference trace with a constant level over the whole frequency range.

5 Trigger by Limit

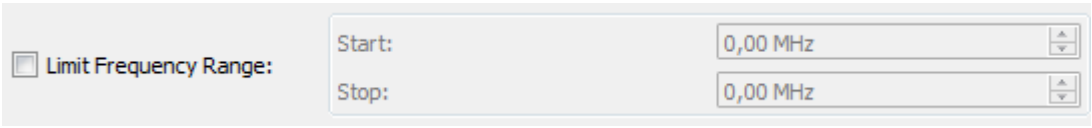
Select a limit that the trigger must violate to cause a trigger event.

6 Trigger by Reference Trace



Select a stored reference trace that the trigger must exceed to cause a trigger event.

7 Limit Trigger Frequency Range

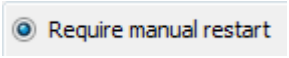


Limit the trigger checks to the specified frequency range. This is on top of an eventual frequency range in the selected limit / reference trace.

8 Trigger Type

Select if the trigger should fire if a value is above or below the specified limit.

9 Restart Trigger manually

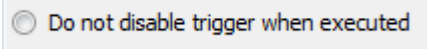


Stops the trigger after an event and only enable it again when manually started. This option ensures that a trigger will not flood the user repeatedly with signals.

10 Restart Trigger automatically

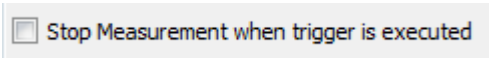
Stops the trigger after an event and restarts it after a specified delay. This can be useful for actions that require no user interaction like screenshots. Please make sure that the delay is longer than the time required to process the specified actions.

11 Persistent Trigger



Do not stop the trigger after an event. This means that it can fire many times within fractions of a second, and all specified actions will be executed each time. There this is not recommended when using any actions that require user interaction as it can effectively block the application. In most cases the automatic restart is a better option.

12 Stop Measurement when trigger is executed



In addition to the trigger restart you can also completely stop the measurement after a trigger event if desired. Though a screenshot action is most likely the better alternative.

13 Trigger Actions

Specify the actions to be performed when the trigger fires. See next section for details.

14 Reset Changes

Undo all changes made to the trigger in the editor, but do not close the editor.

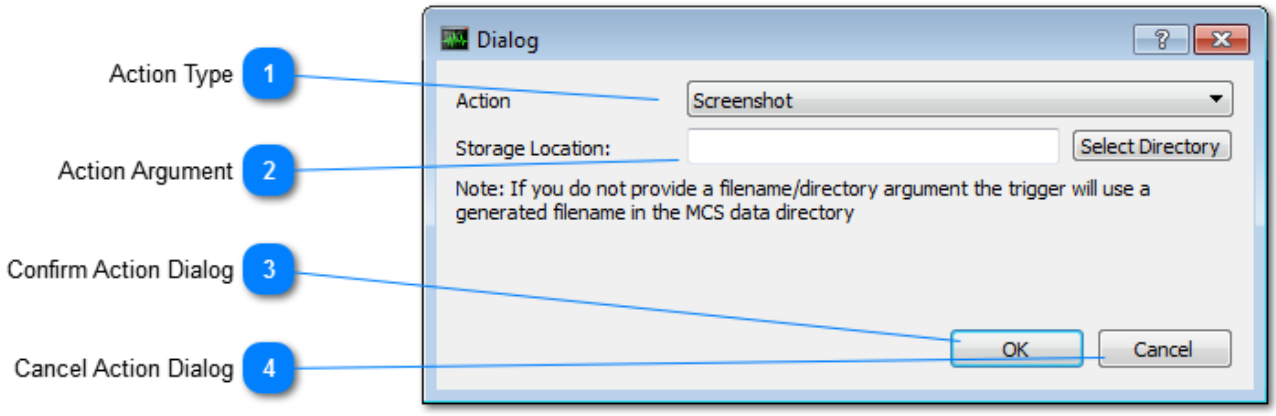
15 Cancel Trigger Editor

Close the trigger editor without applying the changes made. In case of trigger creation the trigger will not be created.

16 Apply Changes

Apply all changes to the edited trigger and close the dialog.

Trigger Action Dialog

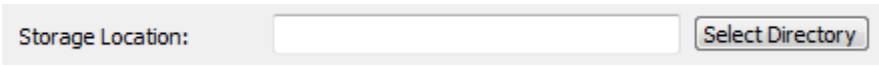


1 Action Type

Select the type of the action to be performed:

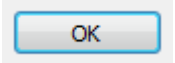
- Command: You can call an external application including arguments with this on each trigger event. Note that you may have to specify the full path to the executable, the application may start in the background and only the specified arguments are given.
- Audio: Plays a soundfile whenever the trigger fires. If no soundfile is specified a standard windows sound is used. Note that only .wav files are supported.
- Message: Display the specified message in a dialog when the trigger fires.
- Screenshot: Create a screenshot of the spectrum view on each trigger event. If a directory is specified a new file with a generated name is created per event, if a filename is specified the previous file will be overwritten. If no location is specified it will default to create new screenshots in the MCS data directory.
- Recording: When the trigger fires the MCS starts recording the measurement at the specified location (see Screenshot for details). If the MCS is already recording a warning message will be displayed.

2 Action Argument



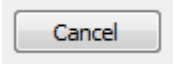
Specify the location, command or message text to be used for the action. This field will change based on the selected action type.

3 Confirm Action Dialog



Add / Modify the action to the trigger and close the dialog.

4 Cancel Action Dialog



Close the dialog without adding / modifying the action to the trigger.

Multisweep Mode

Experimental virtualization feature: Each physical Spectran device can alternate between different settings (e.g. GSM900, GSM1800 and WLAN) by creating separate "pseudo" devices for each profile. The "real" device will switch between those pseudo devices after each completed sweep. Depending on the physical device and the settings of each profile you can almost simultaneously monitor multiple frequency ranges this way. Except for very few exceptions the pseudo devices are completely independent of each other, so changing frequency span or dynamic on one does not affect the others.

To use this feature first change to virtualization mode by using the Create Pseudo Spectran menu entry, this will also create a second virtual device and let you choose a new sweep profile for it. The first virtual device will keep using whatever settings were used on the physical device. You can then create additional devices by extra calls of the same menu entry, and select different profiles for them. Note that after switching to virtualization mode you must disconnect all pseudo devices before you can reconnect to the real device.

This feature is still experimental and may not work reliably, as settings of different pseudo devices can get mixed up over time due to hardware limitations. If you need to measure multiple frequency ranges in parallel regulary it is recommended to use a separate physical device for each.

Generate Google Earth Map

The MCS software can use recordings of an external GPS logging device to merge with previously recorded measurement values. The result can then be imported into a software like Google Earth to show where measurement values have been taken.

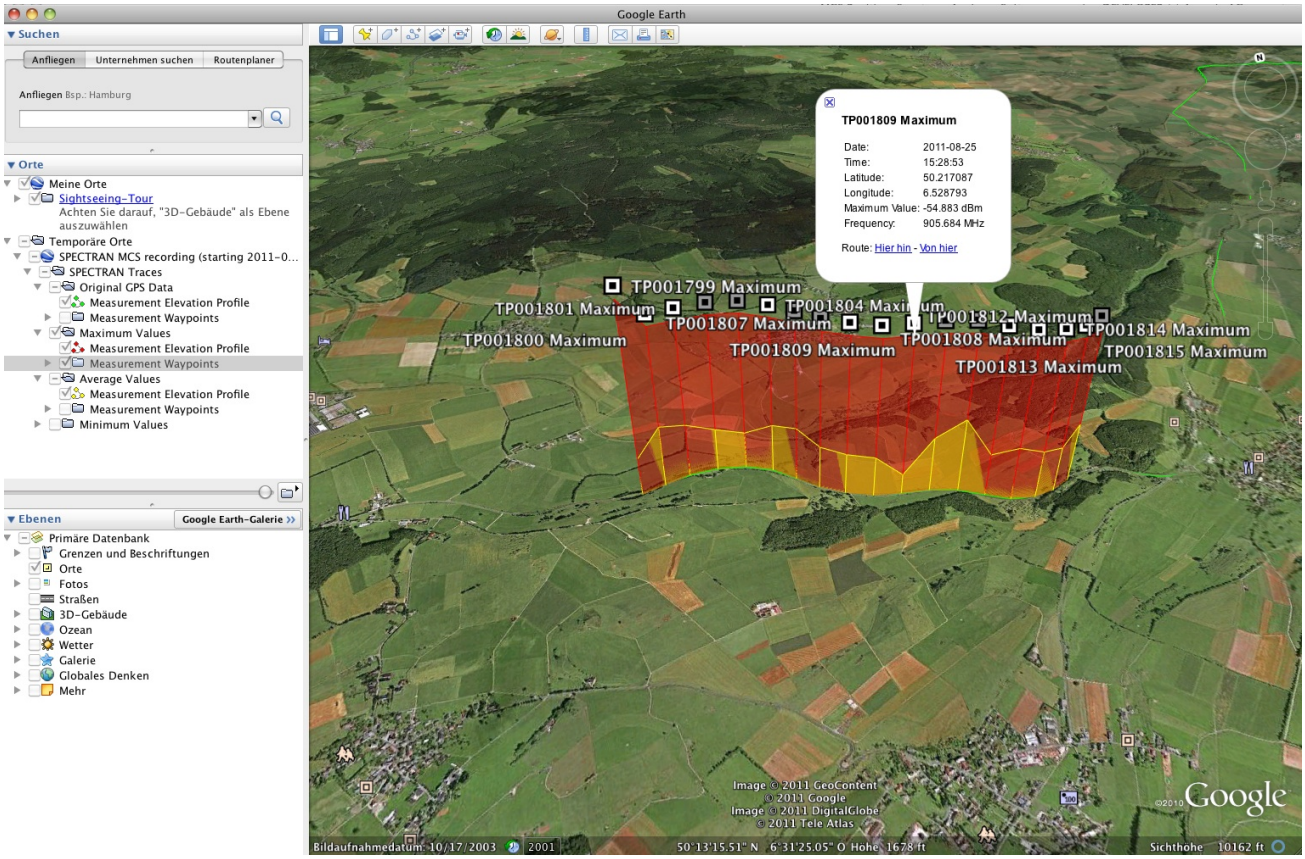
Due to large differences between GPS devices you must manually download the data of your GPS device. When saving the data please make sure you save it in the GPX or NMEA format. If your GPS software does not support that you can try to save it in another format first and use the GPSBabel software to convert it into a GPX file afterwards. Please refer to the GPSBabel documentation for details.
When saving/converting the data also make sure you save the data as „Tracks“. If your software only supports „Routes“ or „Waypoints“ again you can try to use GPSBabel to fix that.

To generate a Google Earth file select the Generate Mapfile menu entry. It will open a dialog where you can select

- the GPX or NMEA file with coordinates,
- the measurement logfile generated by the MCS,
- the output filename for the Google Earth file and
- various options to control how the data will look in Google Earth.

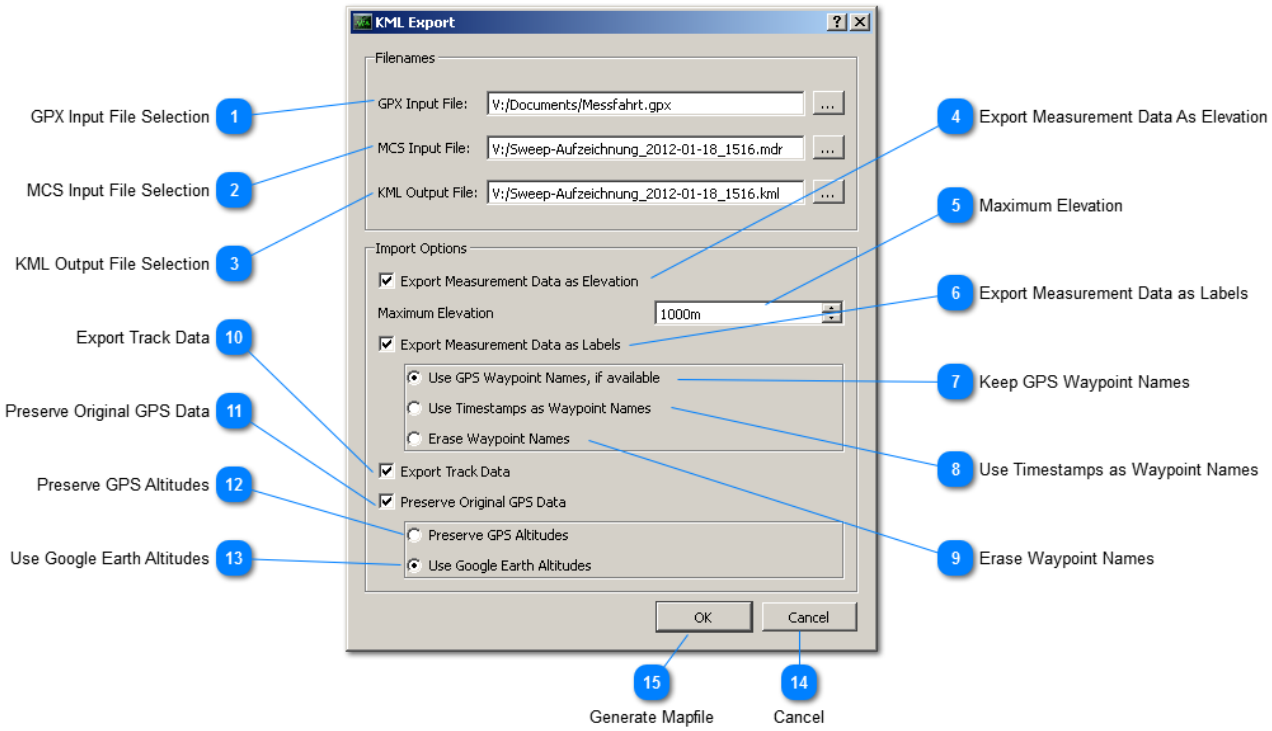
The different export options can be used for example to decide if measurements will be displayed graphically as elevation curve, as text labels at GPS waypoints, or both. By default all data will be exported.
After you confirmed the dialog with the OK button the MCS will try to match entries of the GPX/NMEA file with entries of the measurement logfile and display a messagebox stating how many waypoint entries were used for this. If no matches could be found the timestamps in the two files are probably not compatible.

After all dialogs are closed you can open the generated KML file with Google Earth. It should automatically zoom to the recorded track, though you may have to adjust the camera to locate the measurement elevation curve and labels. In the object browser on the left you can enable and disable specific elements (e.g. disable the waypoints to get a clearer view on the elevation profile). The screenshot below shows how the result might look like.



Please note that the information displayed is only a approximation of the real data as there is some interpolation involved in the export process.

KML Export Dialog



1 GPX Input File Selection

Select the GPX input file that contains the logged coordinates.

2 MCS Input File Selection

Select the MCS input file that contains the recorded measurement data. Both MDR and CSV files can be used here.

3 KML Output File Selection

Select the KML output filename where the generated mapfile should be written.

4 Export Measurement Data As Elevation

Change the altitude of each merged waypoint to the associated measurement value (relative to the defined Maximum Elevation). For example if the minimum measured value was -105 dBm, the maximum value was -55 dBm and the defined maximum elevation is 1000 m, a value of -80 dBm would result in a elevation of 500 m, and a value of -65 dBm in a elevation of 800 m.
If the Preserve GPS Altitudes option is enabled these elevations are added to the existing altitude values.

5 Maximum Elevation

Define the maximum elevation value to be used for visualizing measurement values.

6 Export Measurement Data as Labels

Create labels for each merged measurement record. If disabled you must enable Export Measurement Data as Elevation or the resulting KML file will be empty.

7 Keep GPS Waypoint Names

Use the labels defined in the GPX file also in the KML file. If the GPX file doesn't define any labels the generator will use timestamps instead.

8 Use Timestamps as Waypoint Names

Rename merged waypoints with their timestamp.

9 Erase Waypoint Names

Create waypoints without names.

10 Export Track Data

Create KML track elements for Maximum, Average and Minimum measurements.

11 Preserve Original GPS Data

Copy the original GPS track into the KML file.

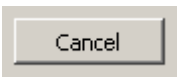
12 Preserve GPS Altitudes

When selected copies the recorded GPS altitude into the KML file. This may put values above or below ground in the viewing application, so you should only enable this when needed.

13 Use Google Earth Altitudes

Let the viewing application use its internal altitudes for each point. This ensures that Measurement Elevations will be displayed correctly (if elevation is zero the point is displayed directly on ground level).

14 Cancel



Close the dialog without performing any processing.

15 **Generate Mapfile**

Read both the GPX and MCS input files and try to merge them, then generate a KML output file with the selected options.

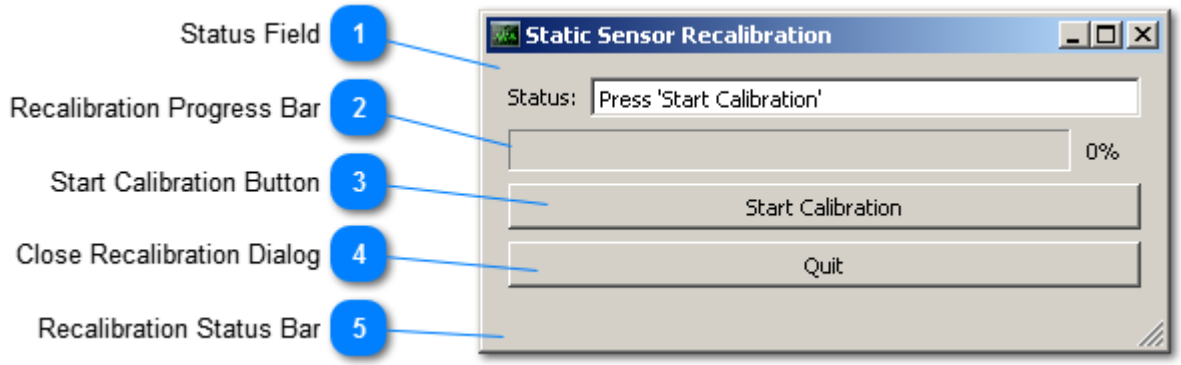
Recalibrate Static Sensor

NF Spectran devices can include an optional 3D Static Sensor to measure magnetic fields. By default this sensor is calibrated at zero-level so you can get absolute readings. In some cases you may however want to see relative readings against a known environment level instead, for those situations the MCS allows you to recalibrate the Static Sensor yourself.

Warning: The recalibration of the MCS will overwrite the default zero-level calibration. The MCS can not restore the default calibration! Therefore use this feature at your own risk!

To start a recalibration select the Recalibrate Static Sensor menu entry. This will show a reminder that this operation is not reversible, and then open the recalibration dialog. Also if the device is currently sweeping it will be stopped. The recalibration process itself can then be started by clicking the Start Recalibration button. It will take several minutes, during that time the device will record the current environment level at all three axes and compute the calibration offsets. While the recalibration is running the device should not be disconnected or powered off. If you click Stop Calibration before the process is complete the MCS will restore the previous calibration offset.
After the recalibration is finished the MCS will reconnect the device and restart the sweep if it was stopped previously.

Static Sensor Recalibration Dialog



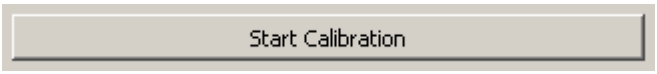
1 Status Field

Displays the current step in the calibration process.

2 Recalibration Progress Bar

Displays the current status of the calibration.

3 Start Calibration Button



Start the calibration process.

4 Close Recalibration Dialog

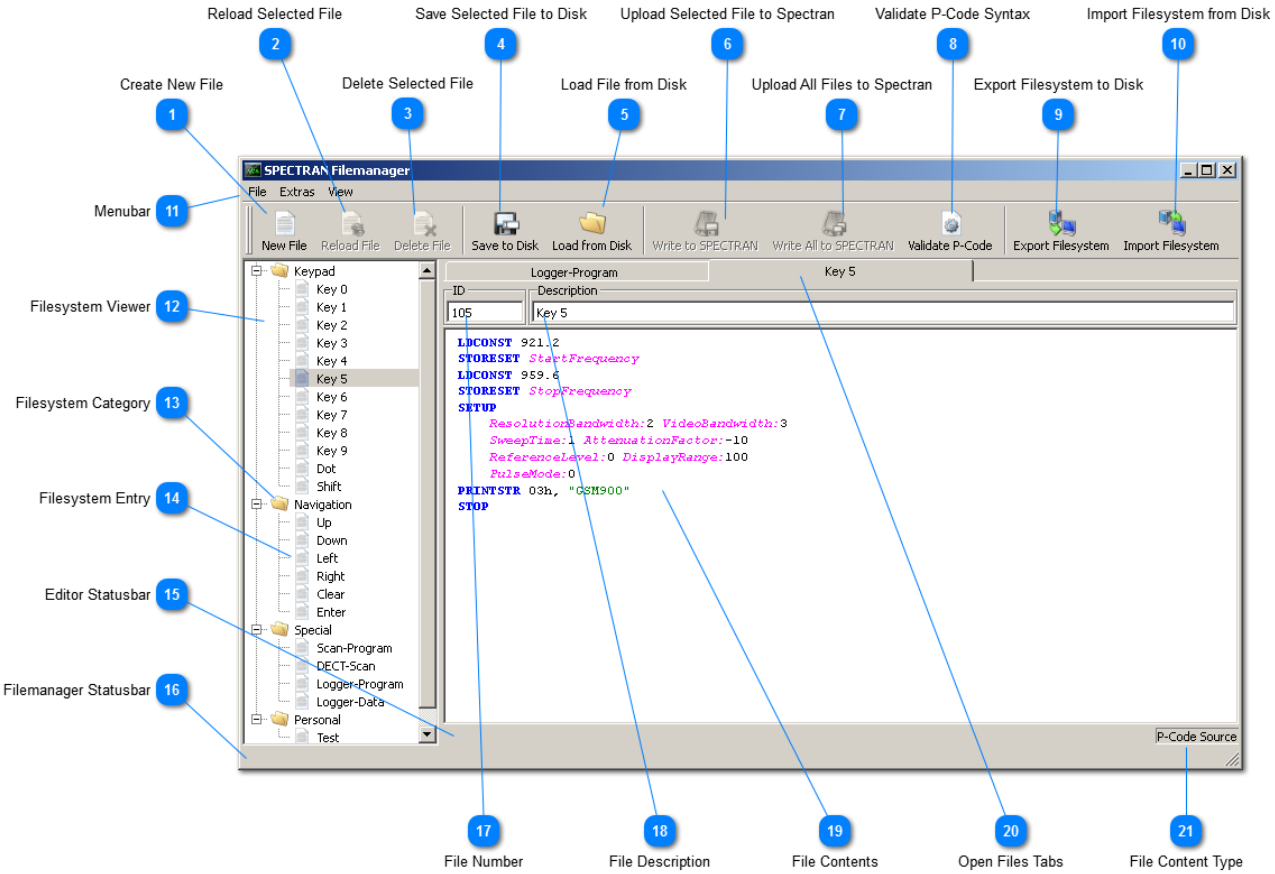
Close the calibration dialog. If the calibration is running this will be renamed to "Stop Calibration".

5 Recalibration Status Bar

Displays various informational messages during the calibration.

Spectran Filemanager

SPECTRAN Filemanager Window



The Spectran Filemanager enables you to reprogram the keyboard of a Spectran device for your use-cases as well as showing the internal log-files in a human-readable format.

1 Create New File

Open a new File with a free file number and a auto-generated description. Note that you have to explicitly upload the file before it exists in the Spectran filesystem.

2 Reload Selected File

Reload the contents of the currently active file from the Spectran filesystem.

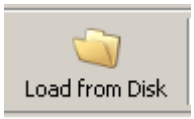
3 Delete Selected File

Remove the currently open file from the Spectran filesystem.

4 Save Selected File to Disk

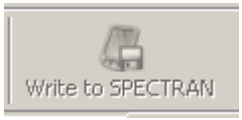
Save the currently open file as ASCII text on disk, so you can open it in your favourite editor.

5 Load File from Disk



Replace the content of the current file with the content from a local ASCII text file.

6 Upload Selected File to Spectran



Compile P-Code and upload the compiled program to your Spectran.

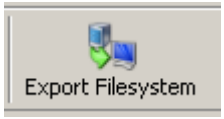
7 Upload All Files to Spectran

Compile all currently open P-Code files and upload the programs to your Spectran.

8 Validate P-Code Syntax

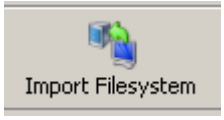
Check the current file for P-Code syntax errors.

9 Export Filesystem to Disk



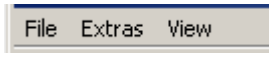
Export selected parts of the Spectran filesystem as binary image on disk for backup purposes.

10 Import Filesystem from Disk



Import a binary filesystem image from disk to restore previously exported files. Files that were not included in the export image will not be restored, removed or otherwise modified.

11 Menubar



Contains all toolbar actions. The "Extras" menu also includes an entry to rescan the Spectran filesystem for modifications which might be required if it was modified by another application than the MCS.

12 Filesystem Viewer

Lists the available files (usually P-Code programs) in the Spectran filesystem.

13 Filesystem Category

Each file is listed in one of several predefined categories, for example the "Navigation" group contains the programs for the arrow, "Clear" and "Enter" keys. Files created by users are listed in the "Personal" category.

14 Filesystem Entry

Each P-Code program in the filesystem is listed with its description.

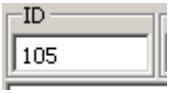
15 Editor Statusbar

Messages from editing the currently open file are listed here

16 Filemanager Statusbar

Global messages from the Filemanager are listed here.

17 File Number

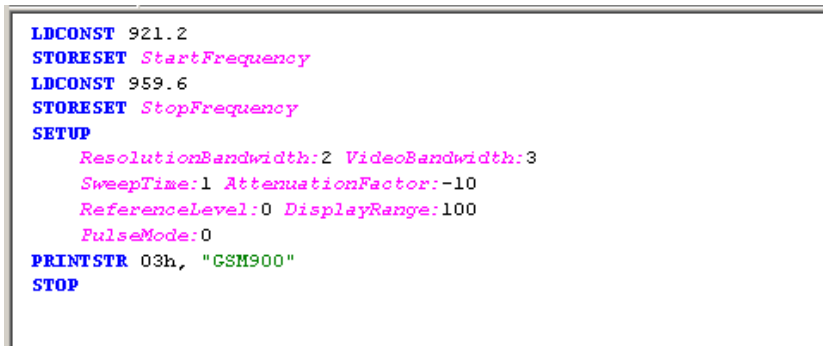


Every file in the Spectran filesystem must have a unique ID number, as the Spectran has no concept of filenames. Also certain ID number ranges are reserved for internal purposes.

18 File Description

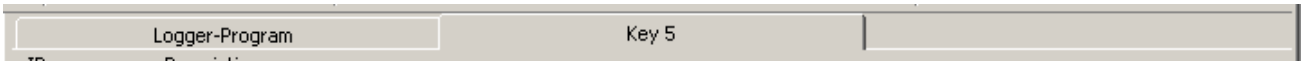
With the MCS Spectran Filemanager you can assign each file a user-friendly description. This is a MCS specific feature, so the description may not be available in other applications.

19 File Contents



Displays the actual file content in a human-readable format, usually as P-Code source or logdata.

20 Open Files Tabs



The tabs allow you to jump between multiple open files.

21 File Content Type

Shows the display format of the current file. This will be one of "P-Code Source", "Logger Data" or "Hexadecimal".

Spectran Remote Control

While the primary use of the MCS is to display data from USB-connected devices it can also be used to connect to Spectran devices over the network. This feature is available with our RSA class of spectrum analyzers that can be accessed by the MCS over a TCP/IP network connection.

Simply create a network connection with the Network Connection menu entry, enter or select the hostname or IP address of the RSA system, select the port where the server is configured to listen and click connect. For security reasons a username / password authentication si required as one RSA system can be accessed by multiple MCS instances at the same time. If all went right the MCS establishes a network connection to the RSA and you can use it almost like a USB connected device. There are a few limitations however:

- Some low-level features may not work correctly.
- Data may be buffered by the network, so the display can "jump".
- External tools like Firmware Updater will not see the network connection.
- Network connections over IPv6 are untested.

Matrix Calibration

Since version 1.9.6 the MCS supports a new feature for fine-calibration of Spectran devices, the so-called Matrix Calibration. As the name implies it allows to specify an offset for basically any frequency/value coordinate to compensate for device-specific deviations from the actual signal level.

To generate such a matrix with minimum effort you need two reference traces: one with the known signal level and one with the regular Spectran data. The first can be easily created manually with the MCS matrix calibration editor, the second can be obtained directly from the MCS by using the existing maximum, current or average traces, or loading a previously saved reference trace. You can even include several such pairs in a single matrix to define different offsets for different power levels.

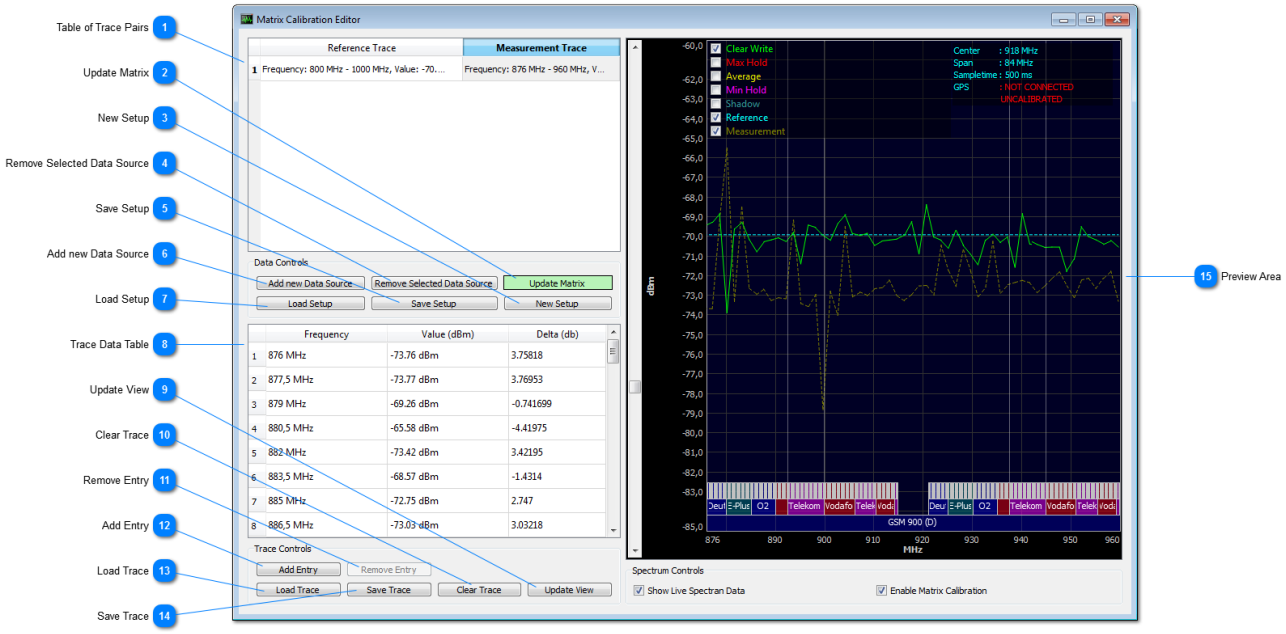
To generate a matrix calibration just follow these steps:

1. Setup the desired measurement parameters in the MCS
2. Open the "Calibration" control in the MCS
3. Click the "Open Matrix Editor" button
4. In the new window, click "Add new Data source"
5. Select the newly created cell in the "Reference Trace" column in the top-left area of the editor window
6. Click "Add entry" in the lower-left section to add a new datapoint to the reference trace
7. Enter the known frequency and power levels of your signal source in the created cells of the lower table
8. Repeat step 6+7. If you have a fixed power level over the whole frequency range you only need two entries at the start and end frequencies, otherwise you can define as many intermediate points as needed. The editor will interpolate power levels between frequency points.
9. Select the empty cell in the "Measurement Trace" column in the upper table
10. Click "Load Trace" in the lower-left section to load either a previously stored reference trace or one of the current Spectran traces. The lower table will show the actual values and the difference to the previously defined reference trace at each frequency. Both traces will also be shown in the preview window on the right side.
11. Click "Update Matrix" to generate the actual offset matrix. Depending on frequency range and the number of points in both traces this can take a few seconds or more.
12. If you click "Enable Matrix Calibration" in the lower-right section of the window you can now see the effect of the calibration.
13. Click "Save Setup" to store the matrix calibration for later use

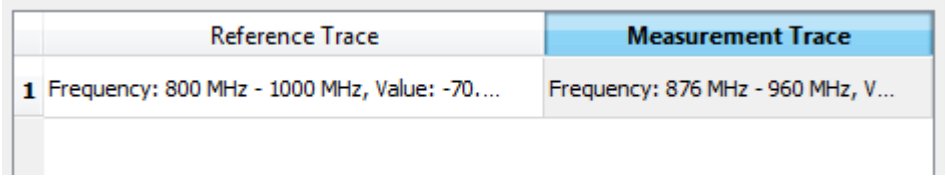
Please note that the matrix calibration does have some restrictions:

- The Spectran may behave differently on different measurement settings, so the calibration is only valid when using the same settings as used for the reference trace
- The MCS peak suppression may interfere with the matrix calibration. This may cause internal electronic interference to show up when using the matrix calibration.
- It requires a known power-level over the whole frequency range to work. In the future a automatic calibration with our upcoming signal generator is planned but not available yet.

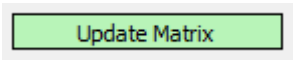
Matrix Calibration Editor



1 Table of Trace Pairs

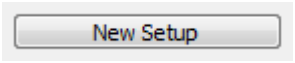


2 Update Matrix



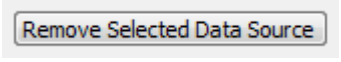
Update / Generate the actual calibration matrix from the specified parameters. This button will be red if the matrix is out of date and green if it is current.

3 New Setup



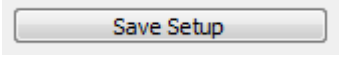
Clear the matrix and all data entered for a fresh start.

4 Remove Selected Data Source



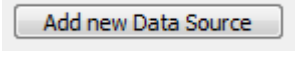
Remove the selected trace pair and all data associated with it.

5 Save Setup



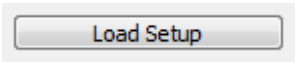
Save the matrix including parameters to a specified file.

6 Add new Data Source



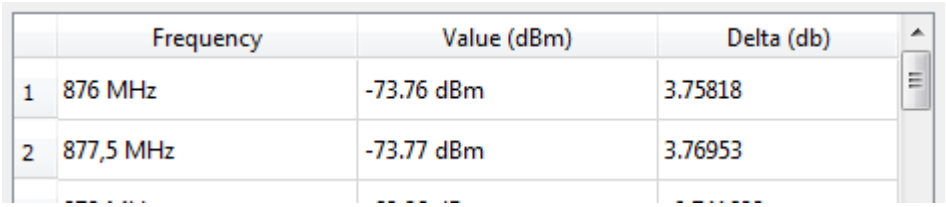
Add a new trace pair line to the matrix configuration.

7 Load Setup



Load a previously stored matrix configuration.

8 Trace Data Table



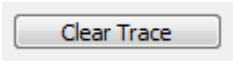
	Frequency	Value (dBm)	Delta (db)
1	876 MHz	-73.76 dBm	3.75818
2	877,5 MHz	-73.77 dBm	3.76953

Shows the points of the selected trace, including the calculated difference at each point to the corresponding measurement/reference trace. Each Frequency and value can also be edited.

9 Update View

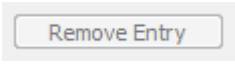
Force an update of the preview area. By default it is only updated when trace selection changes.

10 Clear Trace



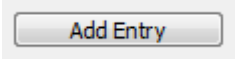
Clear the configured data of the currently selected trace.

11 Remove Entry



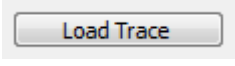
Remove the selected frequency / value pair.

12 Add Entry



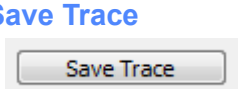
Add a new frequency / value pair.

13 Load Trace



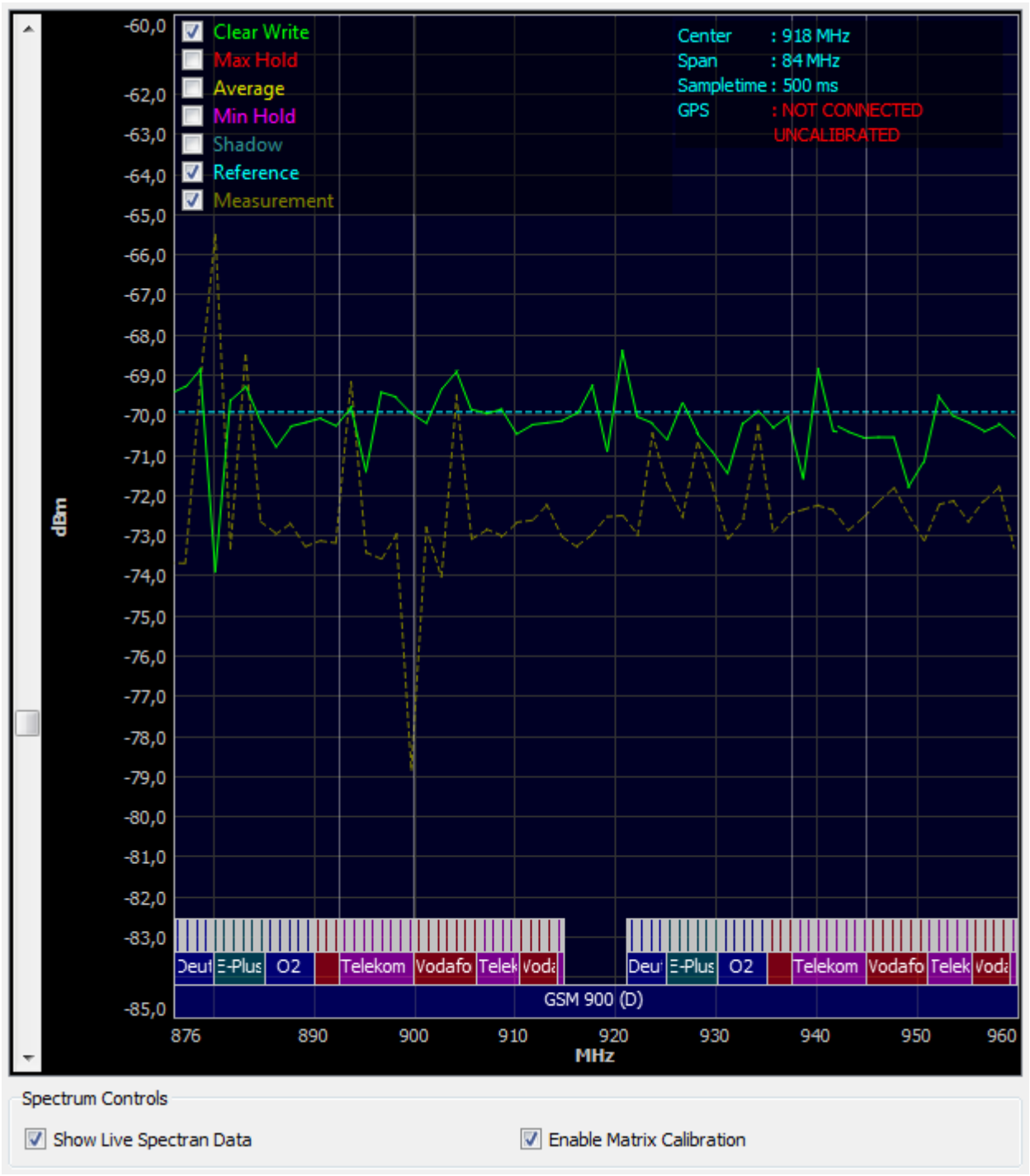
Load data from an existing trace into the table. This can be either a stored reference trace or data from the currently connected Spectran device.

14 Save Trace



Store the currently selected trace as a reference trace file.

15 Preview Area



Shows the currently selected trace pair in a spectrum view. If "Show Live Spectran Data" is selected the view will also display the current measurement data. If "Enable Matrix Calibration" is enabled you can directly see the effect of the current matrix calibration (Note: if the matrix is outdated this option will perform an automatic update which can take a bit).

Application Settings

Auto Check for Software Updates

When enabled (the default) the MCS will check for available updates on each start.

Restore Geometry and State on Startup

If enabled (the default) the MCS will try to open at the same position and size it had when it was closed.

Scrollable Controller Windows

Enables (default) or disables optional scrollbars in each control. When scrollbars are disabled and a control is activated that exceeds the current window height the MCS will try to resize the window so the complete control is visible, and will prevent you from making the window smaller than the control.

Enable Hardware Renderer

Enable or disable (default) optional OpenGL graphics acceleration. This can significantly improve performance in some cases, but can cause problems when your graphics drivers don't fully support OpenGL acceleration, and may also decrease display quality in some circumstances.

Enable Renderer Antialiasing

If enabled views will render their contents with aliasing enabled, which can improve display quality and readability of text elements. This may however decrease performance.

Result Scaling Level

In the Result Control if the peak value to be displayed is less than this setting it will be rescaled to a different unit. For example if the measured value is 0.05 Watt and this setting is set to 10, the displayed value will be 50 milli Watt. If the setting is 100, the displayed value would be 50000 micro Watt.

Restore State when Loading Sessions

Same as "Restore Geometry and State on Startup" above, but applies when loading a session instead of startup.

Sidebar Icon Size

Controls the size of the icons in the Sidebar.

Sidebar Button Style

Controls how the sidebar buttons are displayed: 0 = Icons only, 1 = Text only, 2 = Text beside Icons, 3 = Text below Icons.

Enable Mouse Control of Spectrum

When enabled (the default) allows you to change sweep frequency parameters and display range and reference in the Spectrum View around by dragging the x- or y-axis with the mouse, or by selecting an area within the graph ("Rubberband" selection). Also a double-click at a given point will activate the zero-span mode where only a single frequency is measured. If disabled mouse control in the Spectrum View is mostly disabled except for checkboxes and scrollbars.

Use dynamic Color for Channel Display

When enabled sections in the Channel Info Overlay that do not have a specific color assigned to them will use a dynamically chosen color. If disabled (the default) sections without specific color are drawn in dark blue.

Peak Suppression Enabled

If enabled (the default) the MCS will automatically enable the Peak Suppression for new device connections, using the given filename as source. You can still disable it manually later though. When disabled Peak Suppression has to be enabled manually.

Sweep Buffer Size

Sets the maximum size of the internal sweep data buffer for each device (in MegaByte), which is for example used to compute the average trace of the measurement. When newly arriving data does not fit within the defined buffer size old data will be dropped to avoid excessive memory usage.
The default value should be more than sufficient for any use case, however if using multiple devices in parallel and/or other memory-intensive views (like Waterfall or Histogram), or when using other applications in parallel on systems with limited memory it may be useful to reduce this value to maintain performance. Even at minimum value the buffer should be large enough for all typical use cases.

Start Profile (HF / NF)

Selects the standard profile to be used when connecting a HF / NF Spectran device.

Tools

The MCS is usually delivered in a package with several other related utility applications. Most of them can be started from either within the MCS or by external means (like the Windows Start menu). However no matter how you start them they do operate independent of the MCS, so for example they cannot operate on a device that is connected in the MCS, nor can the MCS directly read data created or modified in one of the editor applications without a restart.

Spectran Firmware Updater

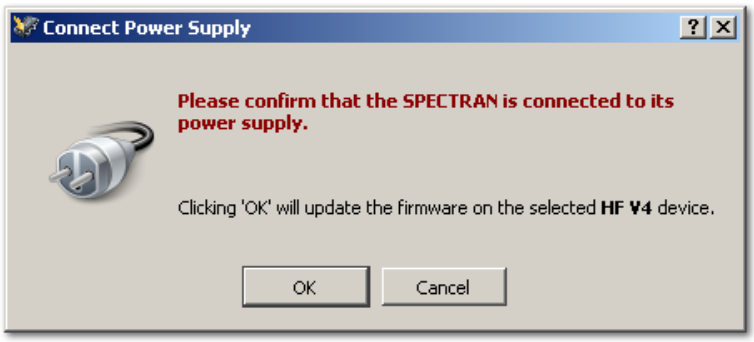
The Spectran Firmware Updater is a utility application to upload new firmware versions to USB-connected Spectran devices, replacing previous commandline tools. It can also report diagnostic information to properly identify a connected device.

For technical reasons the Spectran Firmware Updater is currently only available for Windows systems.
The Firmware Updater is also available as a standalone package on the Aaronia website that is updated independent of the MCS. The standalone version is usually more tested than the one included in the MCS.

After starting the Firmware Updater it will automatically check your system for connected Spectran USB devices. If it finds exactly one device (see below) it will show the detected device information in the various information fields in the main window and recommend a specific firmware version as update. **Please verify that the displayed information is correct before proceeding with the update!** Due to a multitude of different device configurations, operating systems, device drivers and even usb cables it is possible that the program identifies the device incorrectly, which can result in the wrong firmware being selected. **Using the wrong firmware will likely render the device inoperable or cause other problems.** If you're certain that the device was identified correctly and the correct firmware version has been selected you can then start the update process. The program will then guide you through the different steps. After the update is finished you can close the application, or connect a different device and repeat the process by triggering a rescan.
Note: For technical reasons the update process can only work correctly if *exactly one* Spectran USB device is connected to the system. If more than one (or no) device is connected the program will display an error message when scanning the device list.

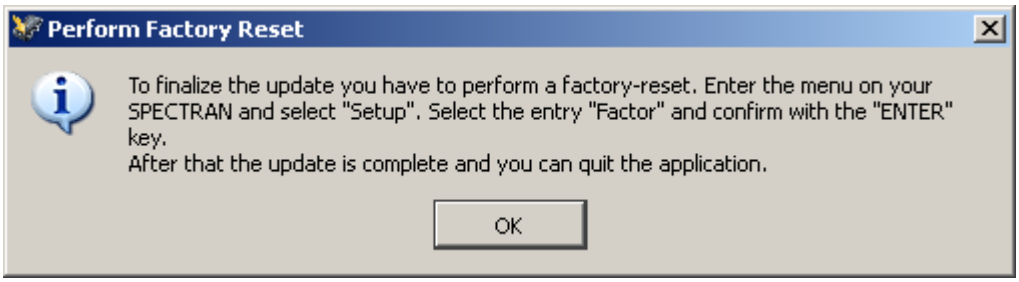
Firmware Update Process

The update process is started by clicking the Perform Firmware Update button in the main window. This will perform various sanity checks that may require confirmation, like when attempting to downgrade the firmware or using a firmware that the program considers incompatible with the current device. At the very least you have to confirm that the device is connected to a power supply to minimize the risk of power loss during the update. Confirmation of these checks is required for the actual update to start.

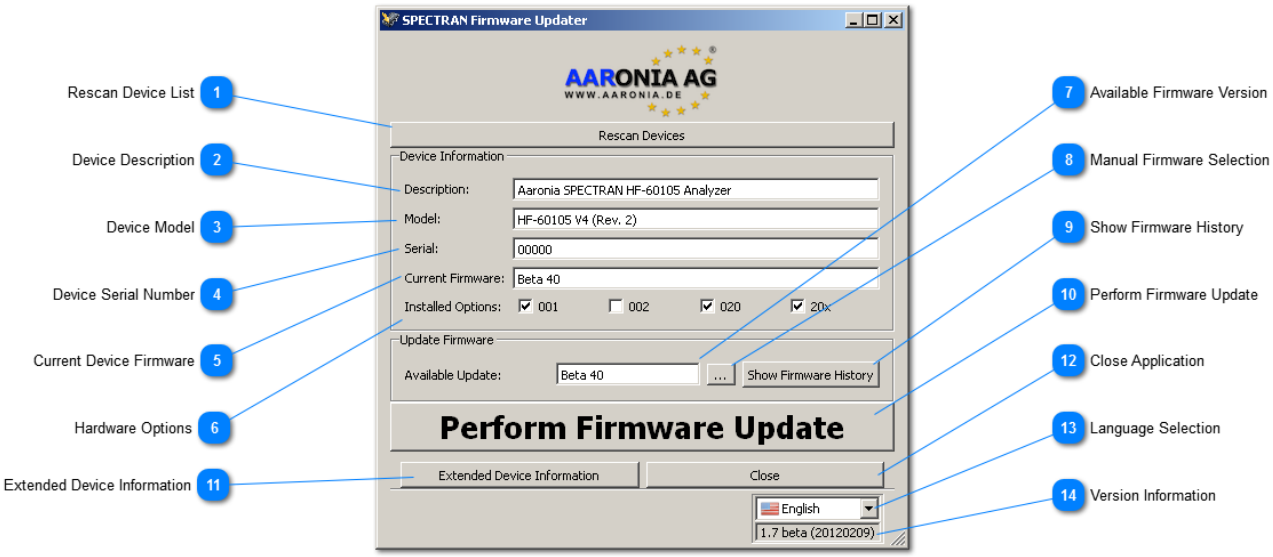


When started a new dialog will be displayed to show the current status, and any errors that may be encountered. While the update is performed it is recommended to not use other applications on the system to minimize the risk of interference or operating system problems. When the update dialog is finished the new firmware is loaded on the device and the device will automatically power off. It is however necessary to power the device on again to let the program properly register and activate the new firmware. If you skip this step for any reason the device will use the new firmware, but will still report the previous version, and **there will be no way to identify the current firmware version without completely restarting the update procedure**.

As a last step it is strongly recommended to perform a factory reset of the device, to ensure that hotkey assignments and other settings are fully updated.



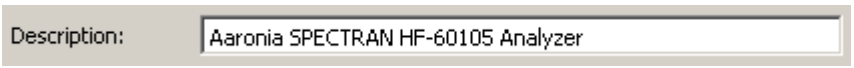
SPECTRAN Firmware Updater Window



1 Rescan Device List

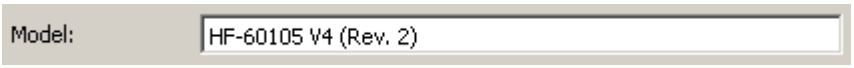
Force a rescan of the currently connected devices.

2 Device Description



Description of the device as shown in the Windows Device Manager

3 Device Model



Complete device model name. Please specify this when contacting Aaronia support.

4 Device Serial Number

The serial number of the connected device.

5 Current Device Firmware

The version number of the firmware currently running on the device as detected by the Firmware Updater.

6 Hardware Options

Lists the options currently installed in the device. You can lookup the numbers on the Aaronia website or use the Extended Device Information dialog to get the names of each option.

7 Available Firmware Version

Lists the version that will be used when performing a firmware update.

8 Manual Firmware Selection

Allows to override the automatic Firmware selection and select another firmware included in the Updater.

Warning: Using the wrong firmware can make your device unusable, requiring a hard reset. Only use this option when instructed to do so by the Aaronia support.

9 Show Firmware History

This will open a new dialog listing all changes between firmware versions.

10 Perform Firmware Update

Start the actual update process.

11 Extended Device Information

Open the Detailed Device Information dialog for the selected device.

12 Close Application

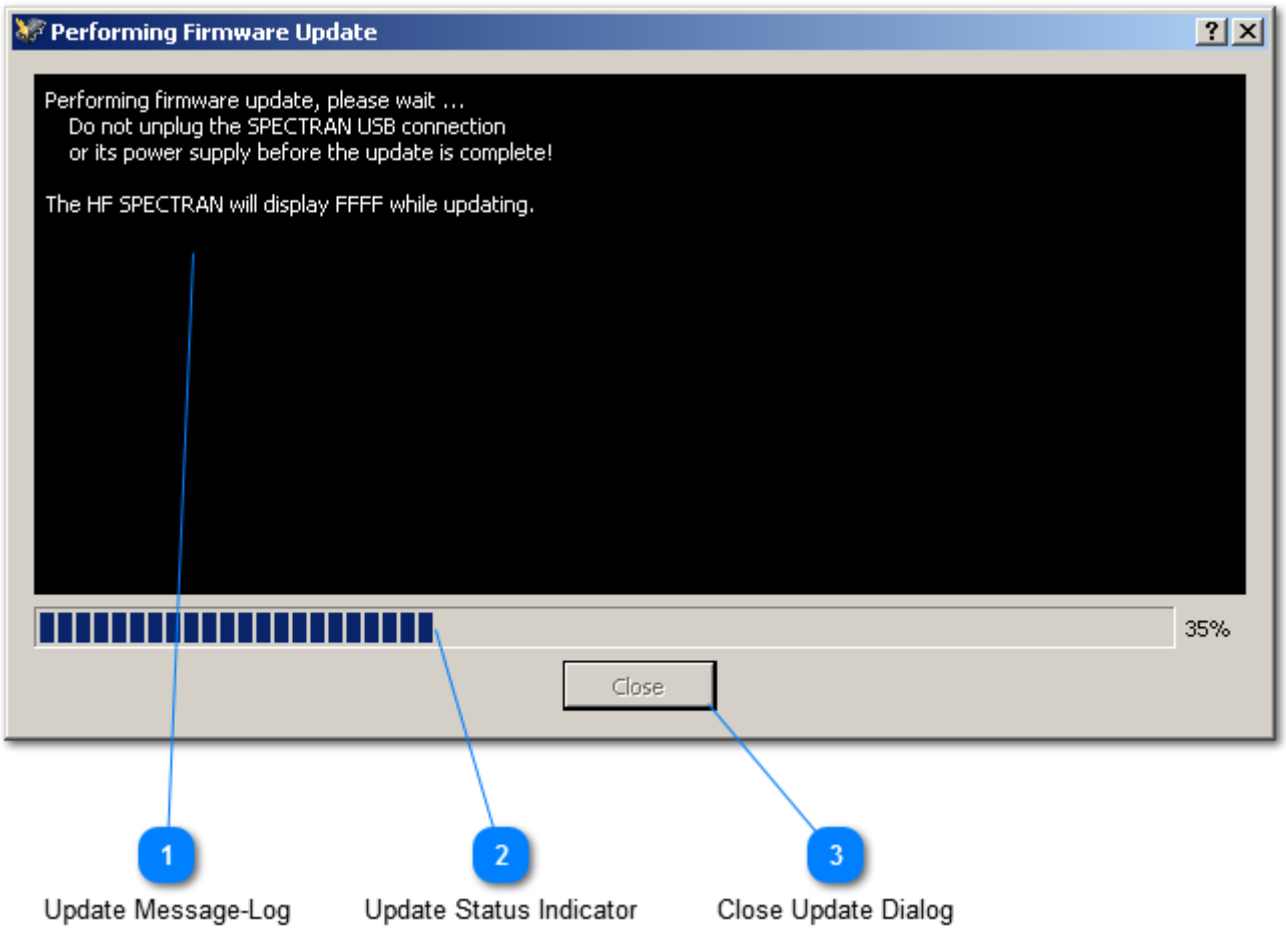
13 Language Selection

You can change the language of the user interface in this combobox.

14 Version Information

Shows the full version of the Firmware Updater. Always specify this when reporting problems.

Update Progress Dialog



1 Update Message-Log

Shows informational and error messages about the update process.

2 Update Status Indicator

Indicate the current progress status of the update.

3 Close Update Dialog

Close the Update Dialog after the update is finished or an error has occured. While the update is running this button is disabled as interrupting the process will break the device.

Hardware Reset

Short Instructions

A wrong or not completed firmware update can be restored as follows:

1. Open the battery compartment and disconnect the battery in the device (pull the plug)
2. Disconnect charger from SPECTRAN
3. Connect the SPECTRAN via USB to the PC
4. Connect the charger to the SPECTRAN
5. Hold the ENTER key and press the ON button at your SPECTRAN once. SPECTRAN now starts an emergency program and logs on to the PC. The SPECTRAN starts but on the screen there is no indicator.
6. Now you can start a new firmware update. If it is completed, press the MENU button and the the CLEAR button directly. Don't forget to make a Factory-Reset (You can find it in the SPECTRAN menu, menu point "Setup" and run the entry "Factor" by pressing the ENTER-button). Don't use the LCS software for updating!

Now the device should work properly again.

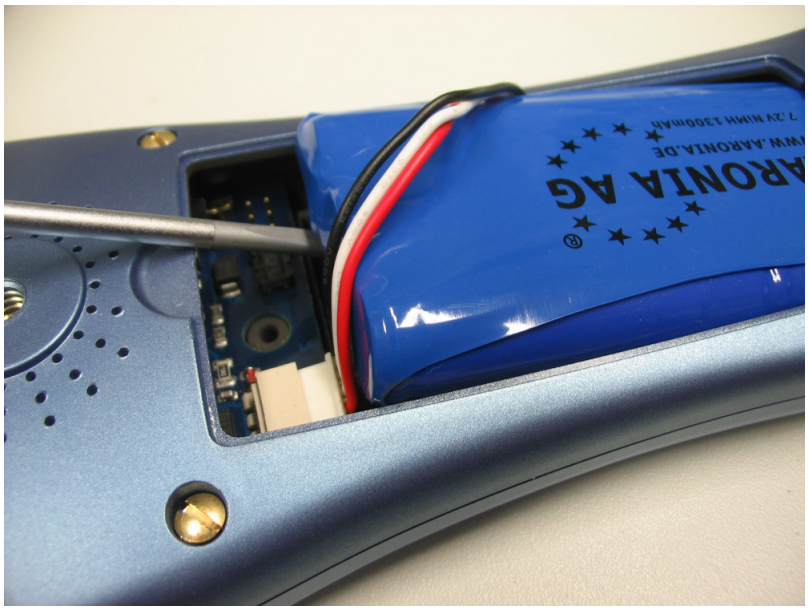
Detailed Instructions

A wrong or not completed firmware update may cause your device to not boot anymore. By following these instructions you can reset your SPECTRAN after a bad firmware update to its default configuration. Please follow the instructions exactly.

Open the battery box

To open the battery compartment you will need an ordinary screwdriver. Loosen the screw on the battery compartment cover until this can be removed easily.
You now have access to the battery itself and the connection of the SPECTRAN battery (see picture).

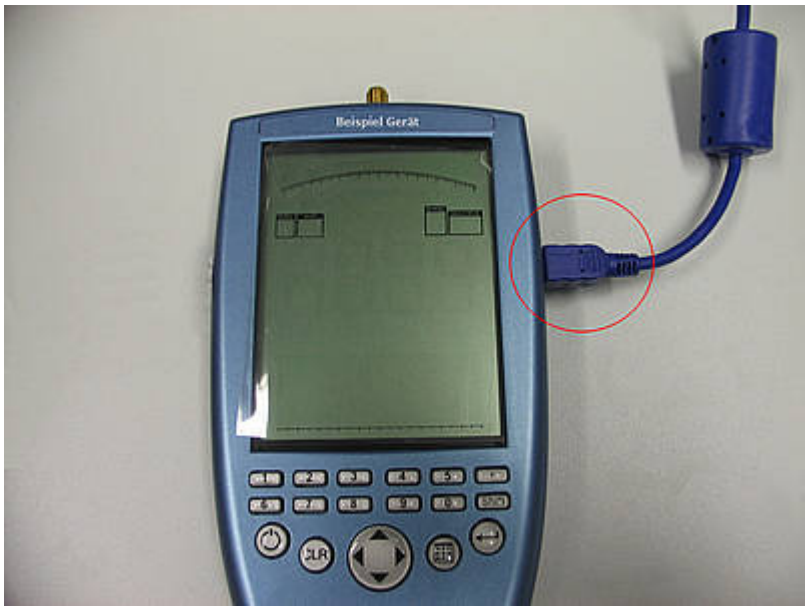
Disconnect the battery from the SPECTRAN

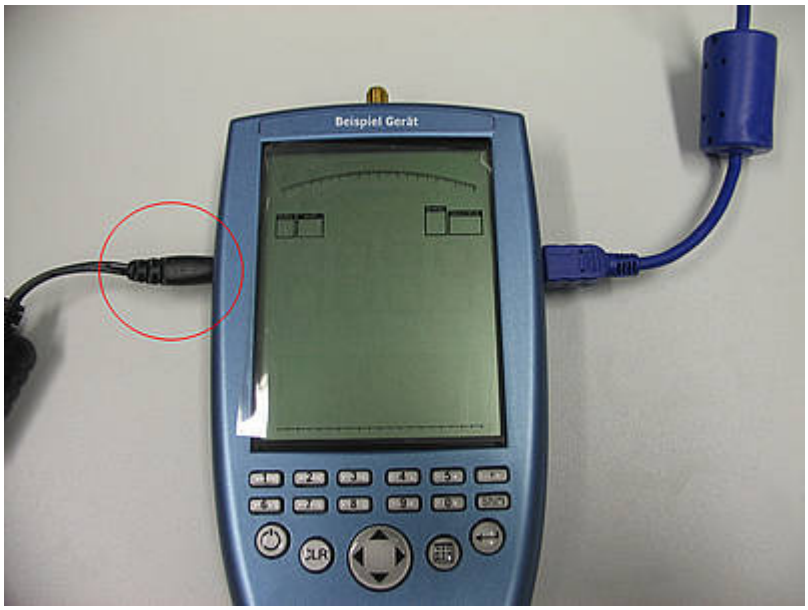


Unplug the charger from the SPECTRAN first. To disconnect the battery in the device, it must be lifted carefully with a screwdriver. It is important that the front edge of the battery is over the plug. So it is possible to pull the plug backward under the battery in the next step.
Unplugging the battery from the board requires some dexterity (the same applies when inserting).

Hold with one hand the raised battery. Now take the screwdriver and push the plug from the socket under the battery. If the plug is completely disconnected from the socket, the cable can be attached on to the battery.

Connect SPECTRAN to the PC





Connect the SPECTRAN via USB cable to the PC. Then connect the charger / power supply to make sure that your SPECTRAN can be turned on.

The emergency program

To start the emergency program, simultaneously press the "ENTER" and "ON " button. The SPECTRAN now starts an emergency program and logs on to the PC. Please note that during the emergency program there is no indicator on the display!

Firmware-Updater

Either start the already installed Firmware Updater or download (if not already done) the standalone version and unzip it into any directory. Open the "exe" file and the updater will start. On Windows Vista / 7 systems, an administration dialog can appear. In this dialog you have to click the "OK" button.

After starting, the updater should identify your SPECTRAN devices automatically. Please click the Perform Firmware Update button to start the update process and follow the instruction of the updater.

If the process is complete turn on the unit and press directly the MENU button and then the CLEAR button.

At the end of the updates you must perform a factory reset. Go to your SPECTRAN menu and select the entry "Setup". Then select the item "Factor" and confirm with the ENTER key.

The device should now work properly.

Finally, connect the battery and close the battery compartment.

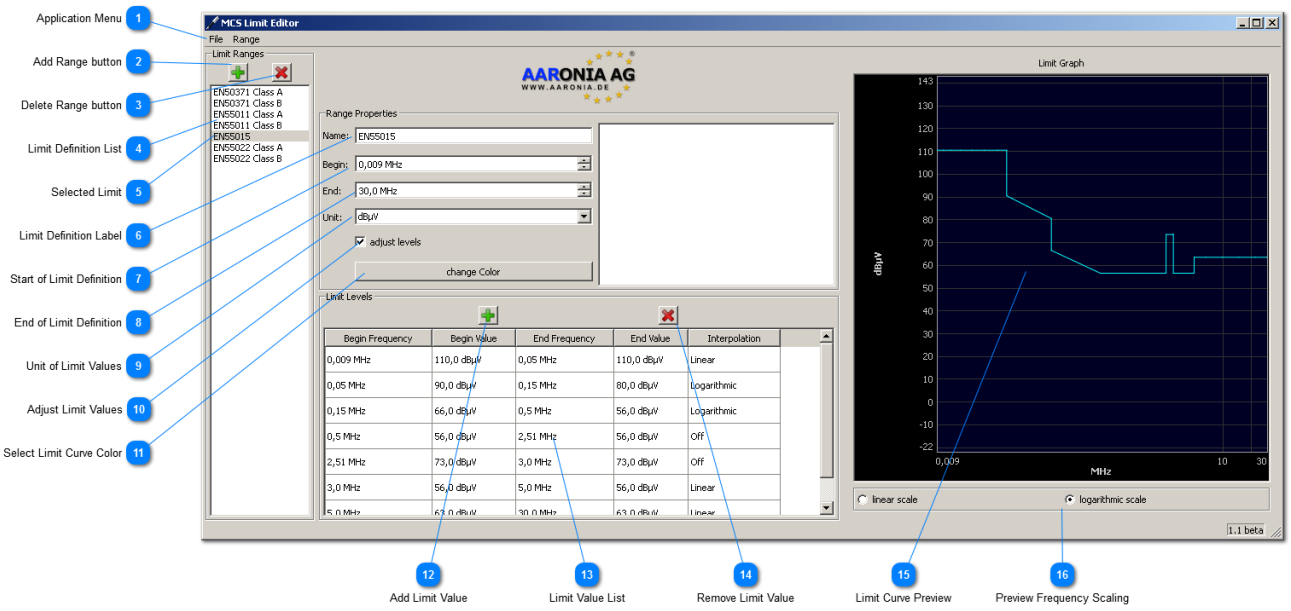
Limits Editor

The Limits Editor is a tool that allows you to modify the MCS database of emission limits definitions used by the Spectrum- and Limits View. You can access it either the same way you started the MCS, or from within the MCS using the Limits Editor menu entry. Note though that either way the limits editor is an external application, and the MCS may not be able to detect such changes automatically by itself, so you may have to restart it to reload the database.

Storage Locations

When you edit the limits database it is very important where you save your changes, as the MCS only looks for it in specific locations. The default database is located within the MCS application directory and should not be modified, as any changes will be overwritten if a new MCS version is installed. A modified limits database must be located within a `data` folder in the MCS User directory, and must be named `limits.xml`. For example if your MCS user directory is `C:\Users\myname\MCS` you should save your changes under `C:\Users\myname\MCS\data\limits.xml` or the MCS won't see them.

Limit Editor Window



1 Application Menu

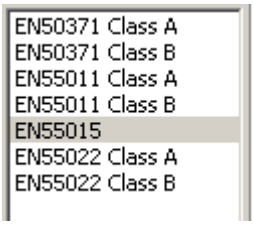
2 Add Range button

Add a new limit definition range.

3 Delete Range button

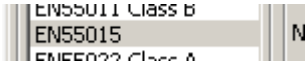
Remove the selected limit definition.

4 Limit Definition List



List of currently defined limit definitions

5 Selected Limit

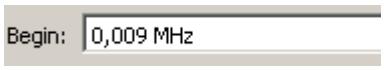


Currently selected limit definition.

6 Limit Definition Label

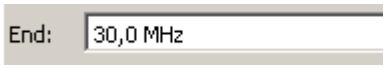
Name of the current limit definition.

7 Start of Limit Definition



Frequency where the limit definition begins.

8 End of Limit Definition



Frequency where the limit definition ends.

9 Unit of Limit Values

Unit in which the limit values are defined. The MCS will convert measurement values to this unit for comparison when possible.

10 Adjust Limit Values

When enabled, the editor will automatically convert existing limit levels when the unit is changed.
Warning: converting to another unit and then converting back will not always result in the original values.

11 Select Limit Curve Color

Select a specific color to be used for the Spectrum View Limit Curve.

12 Add Limit Value

Add a new limit level

13 Limit Value List

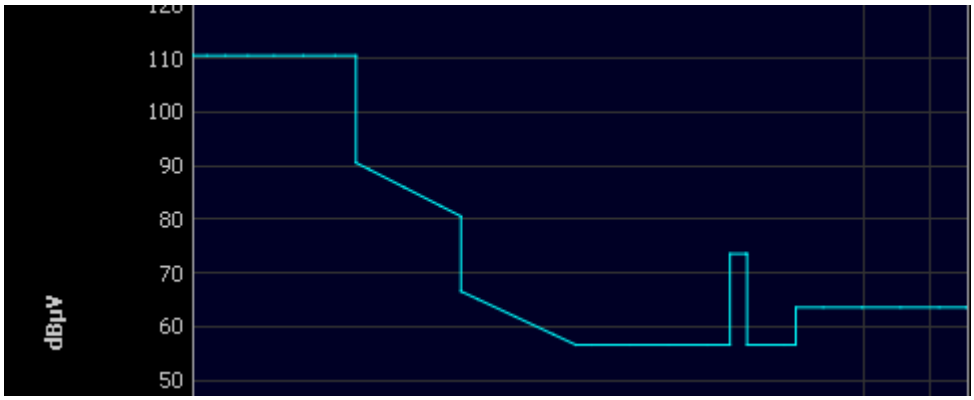
Begin Frequency	Begin Value	End Frequency	End Value	Interpolation
0,009 MHz	110,0 dBµV	0,05 MHz	110,0 dBµV	Linear
0,05 MHz	90,0 dBµV	0,15 MHz	80,0 dBµV	Logarithmic
0,15 MHz	66,0 dBµV	0,5 MHz	56,0 dBµV	Logarithmic

List of different levels defined in the currently selected range. The limit value for a given frequency will be interpolated based on the given Frequencies, Values and Interpolation mode.

14 Remove Limit Value

Remove the selected limit level.

15 Limit Curve Preview



A simple preview how the Limit curve of the current definition would look in the Spectrum View.

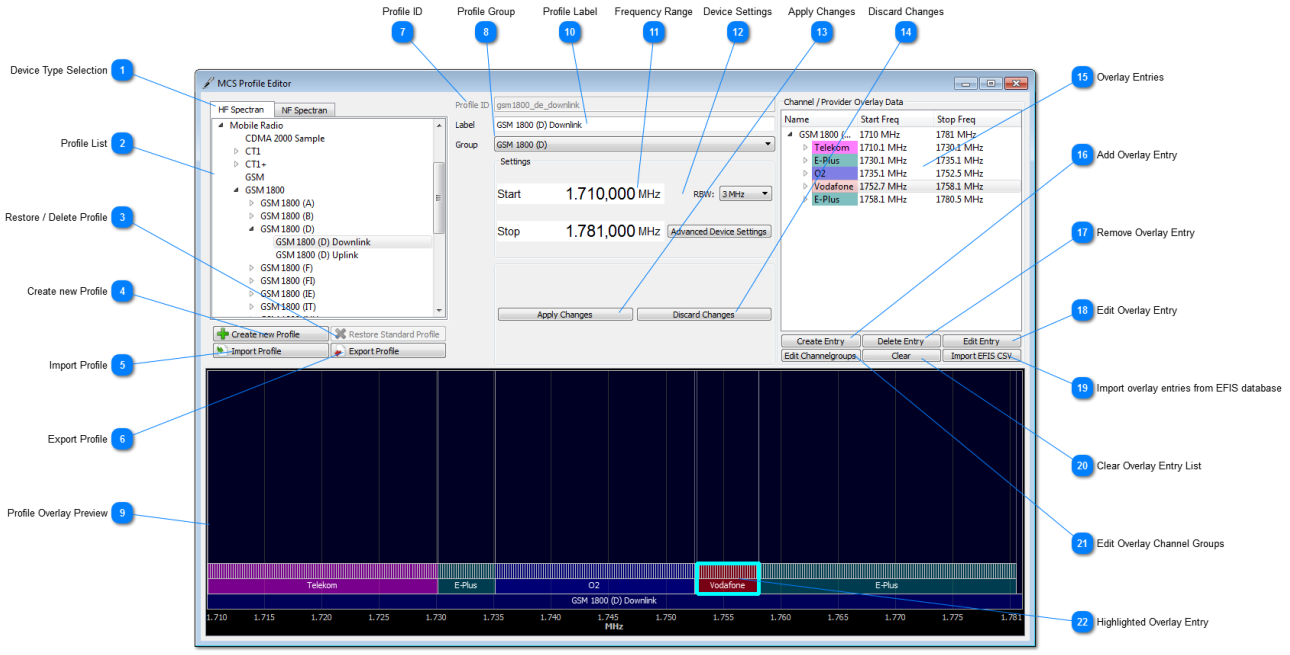
16 Preview Frequency Scaling

Selects linear or lagarithmic scaling of the limit graph preview.

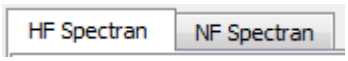
Profile Editor

The Profile Editor can edit and create measurement profiles for the MCS. These profiles contain device settings to be used, and can also include information for the provider overlay in the Spectrum View.

Profile Editor window

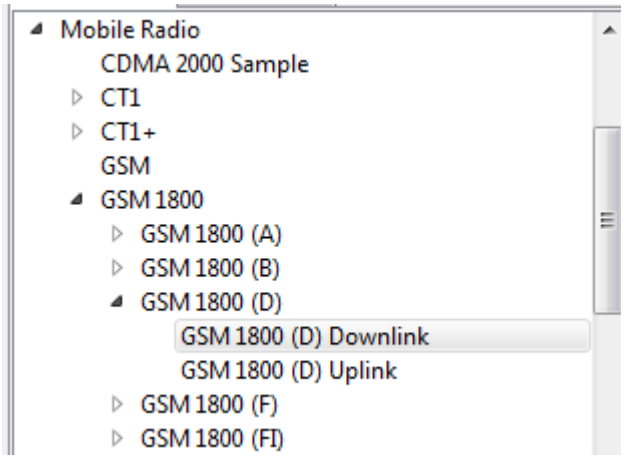


1 Device Type Selection



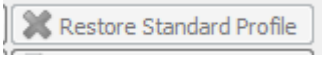
To avoid confusion in the MCS, profiles are separated between HF and NF devices. Use the tabs to select the wanted group.

2 Profile List



Lists all currently available profiles in a tree structure. Some entries may be simple placeholders used for grouping and not contain any meaningful information (like "Mobile Radio" in the screenshot).

3 Restore / Delete Profile

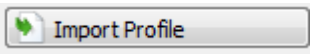


This button will either undo all modifications done to a standard profile, or simply delete a custom profile, based on which type of profile is selected.

4 Create new Profile

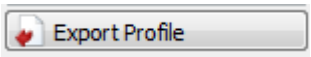
Creates a new subprofile under the currently selected profile.

5 Import Profile



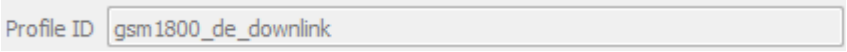
Imports a profile from an external file.

6 Export Profile



Exports the current profile into a single self-contained file that can be used for exchange and reimport.

7 Profile ID

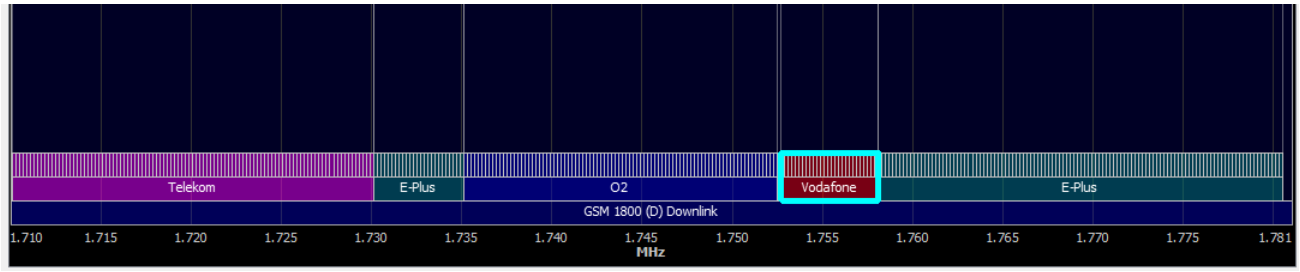


This is the internal profile ID. It is specified or generated during profile creation and cannot be modified. Each profile must have a unique profile ID.

8 Profile Group

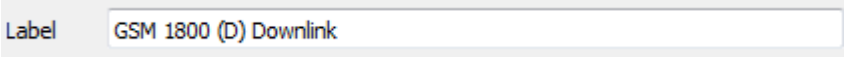
Specifies the group / category in the profile list where this profile should appear.

9 Profile Overlay Preview



This area shows how the currently selected profile will look in the Spectrum View when used in the MCS.

10 Profile Label



This is the name that will be used to identify the current profile.

11 Frequency Range

Sets the Start- and Stopfrequency that should be set on the Spectran when this profile is selected. See Settings Control for usage information.

12 Device Settings

Opens a table with additional device settings to be applied when the profile is selected in the MCS. The RBW can be selected directly.

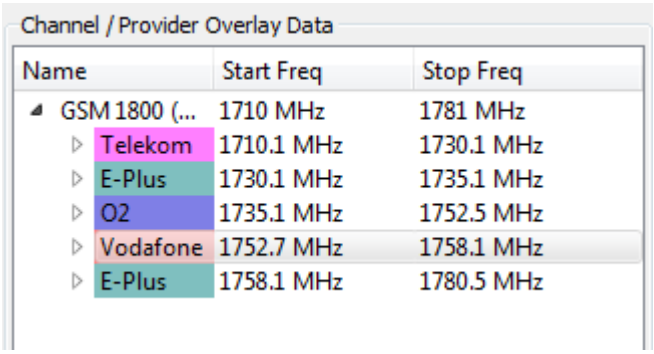
13 Apply Changes

Changes to profiles are temporary until confirmed with this button.

14 Discard Changes

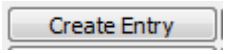
Reverts all non-confirmed changes to the current profile.

15 Overlay Entries



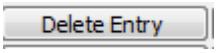
Lists the various overlay entries that can be displayed in the Spectrum and Channelpower View. This is typically used to mark frequency ranges used by specific service providers or channels within the current profile.

16 Add Overlay Entry



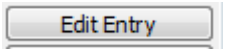
Creates a new overlay entry under the currently selected one.

17 Remove Overlay Entry



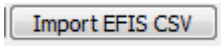
Removes the currently selected overlay entry.

18 Edit Overlay Entry



Opens the Overlay Entry Editor to modify the selected overlay entry.

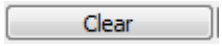
19 Import overlay entries from EFIS database



As the frequency allocation especially for mobile communication is constantly changing you can update it with data exported from the EFIS database that is maintained by the european mobile radio operators. For that you'll have to perform a "Right of Use" search on the www.efis.dk website and export the results as CSV, then import that file into the profile editor using this button. You'll then have a choice to either replace or extend the existing overlay entries with this data.

Note: The EFIS database is a third-party product and in no way associated with Aaronia AG. It may change or stop functioning without notice, and Aaronia AG cannot provide any support for using it.

20 Clear Overlay Entry List



This will remove all overlay entries from this profile, only the base entry for the full frequency range will remain.

21 Edit Overlay Channel Groups

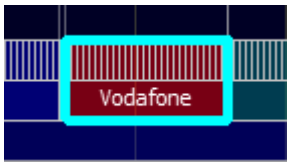
Often a frequency range contains a large number of channels with similar characteristics (width, spacing, naming scheme, ...). The channel groups feature allows to specify a large number of channels en-bloc instead individually entering each:

	Start Frequency	Channel Count	Channel Width	Space between Channels	Start Numbering at	Increment Numbers by
1	935.1 MHz	12	200 kHz	0 Hz	1	1
2						

- Start Frequency: The frequency of the first channel in the group, defaults to the start frequency of the selecte overlay entry
- Channel Count: How many channels should be generated
- Channel Width: The frequency span covered by a single channel
- Space between Channels: The spacing between two channels, defaults to 0 Hz. You can specify a negative value to create overlapping channels.
- Start Numbering at: The number to be used for the first channel in this group, defaults to 1
- Increment Numbers by: Specifies how subsequent channels will be named. By default channel numbers will simply be increased by 1. You can specify a negative number to generate decreasing channel numbers.

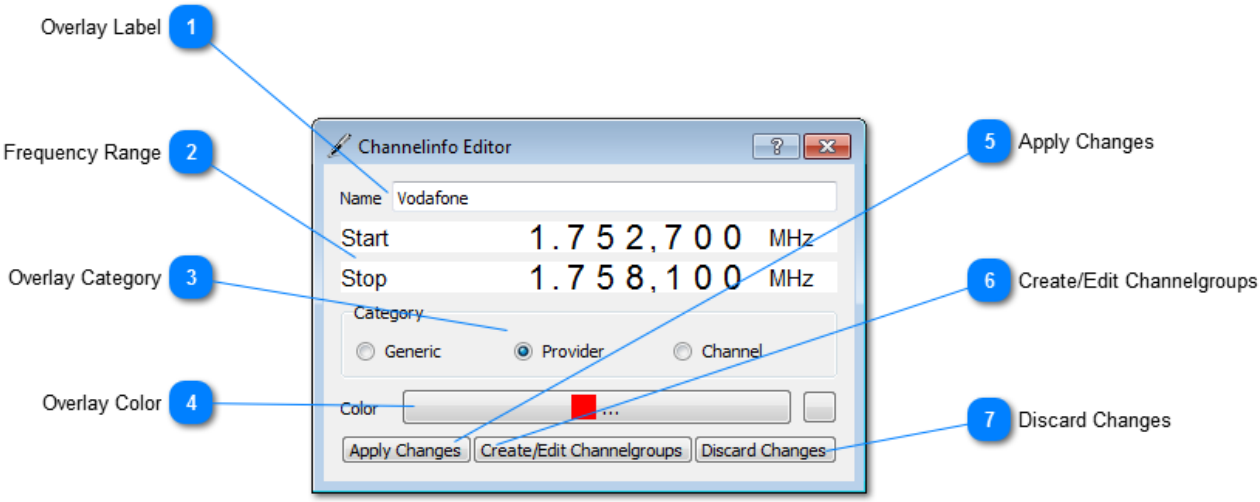
The example above would generate 12 channels named 1 to 12 in the frequeny range of 935.1 MHz to 937.5 MHz with no gaps between them.

22 Highlighted Overlay Entry

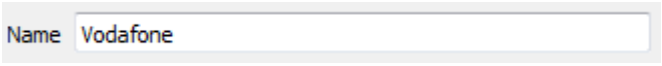


If a overlay entry is selected it and its children will be highlighted in the preview graph.

Overlay Editor

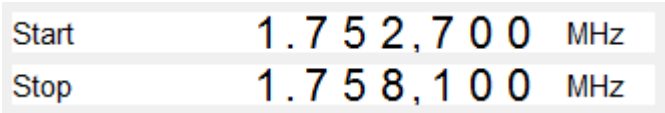


1 Overlay Label



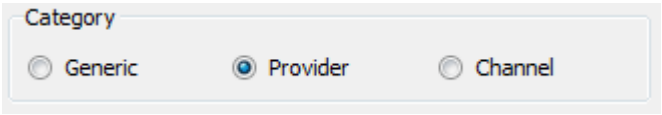
The name used to identify this entry. Typically the name of the band, provider, channel or application covered.

2 Frequency Range



Frequency range to be covered by this entry.

3 Overlay Category

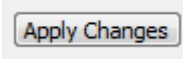


Hint for the application what is described by this overlay entry. This is used by the Channelpower view.

4 Overlay Color

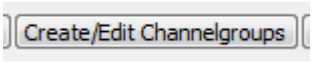
Specify a color to be used when visualizing this overlay entry. The small button on the right will reset this entry to the internal default.

5 Apply Changes



Apply changes and close this window.

6 Create/Edit Channelgroups



Create a channelgroup below this overlay entry. See Channelgroup Editor for details.

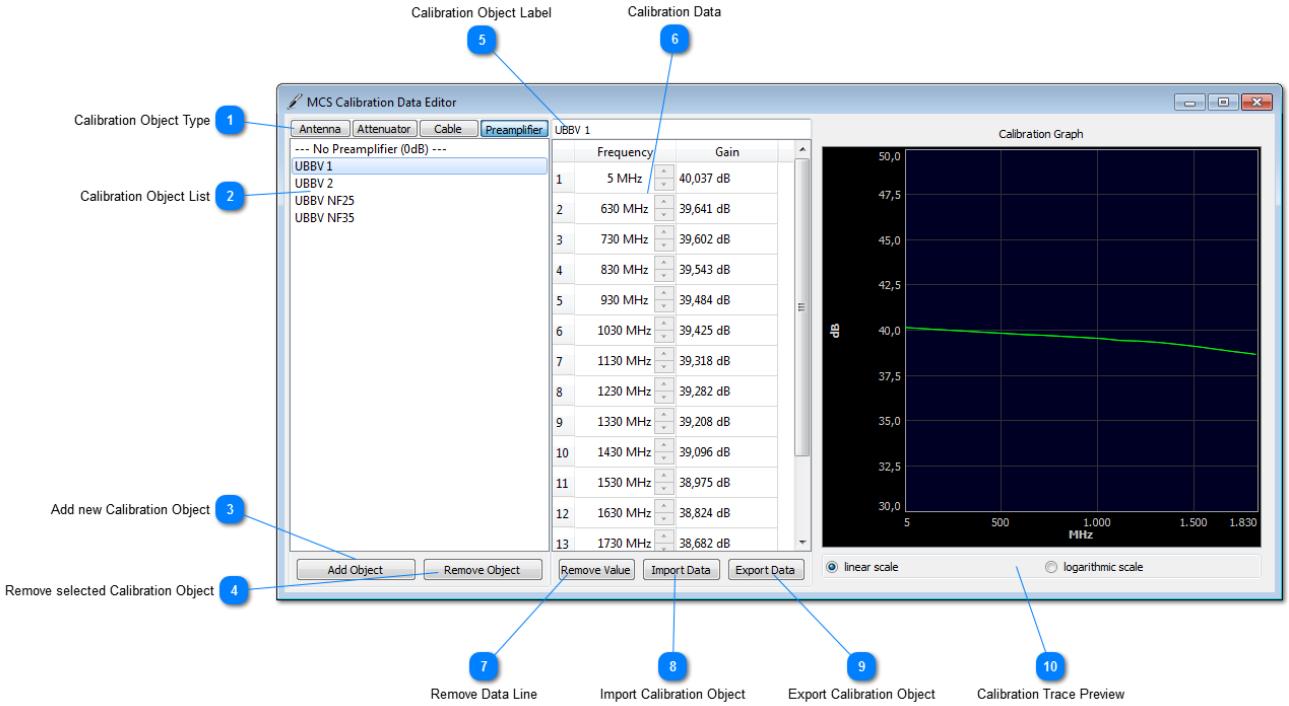
7 Discard Changes

Discard all changes and close this window.

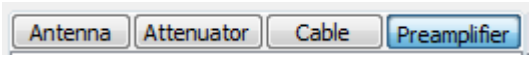
Calibration Editor

With the calibration you can modify and create calibration profiles for external equipment connected to the Spectran, to normalize the readings in the MCS.

Calibration Editor Window

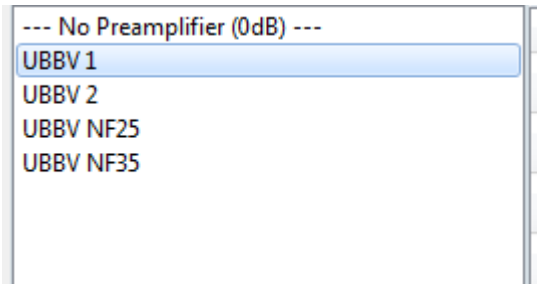


1 Calibration Object Type



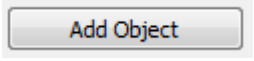
The MCS supports four different types of calibration objects that can be used in parallel. The attenuator, cable and preamplifier groups have no intrinsic semantics attached (the values are simply added to the Spectran readings), so you could use them for other equipment types as well. The antenna group may be treated special in unit conversions.
You can use the buttons to list the different object types in the list below.

2 Calibration Object List



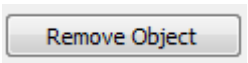
Listing of the available objects of the selected calibration types. The topmost entry is the setting for "not attached".

3 Add new Calibration Object



Create a new calibration object of the current type.

4 Remove selected Calibration Object

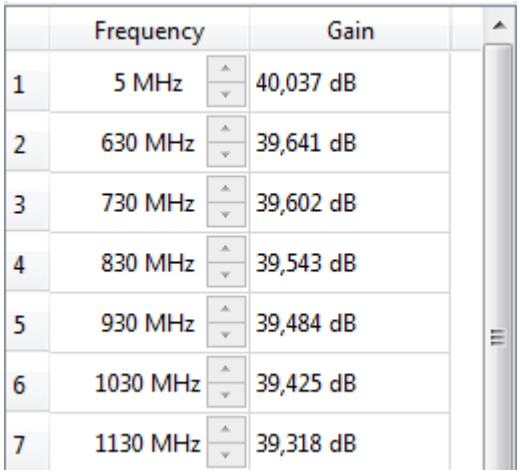


Remove the selected calibration object from the database.

5 Calibration Object Label

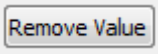
The name under which the object will appear in the MCS.

6 Calibration Data



A list of calibration values to be used at specific frequencies.

7 Remove Data Line

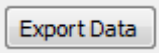


Remove the selected frequency and gain value from this object.

8 Import Calibration Object

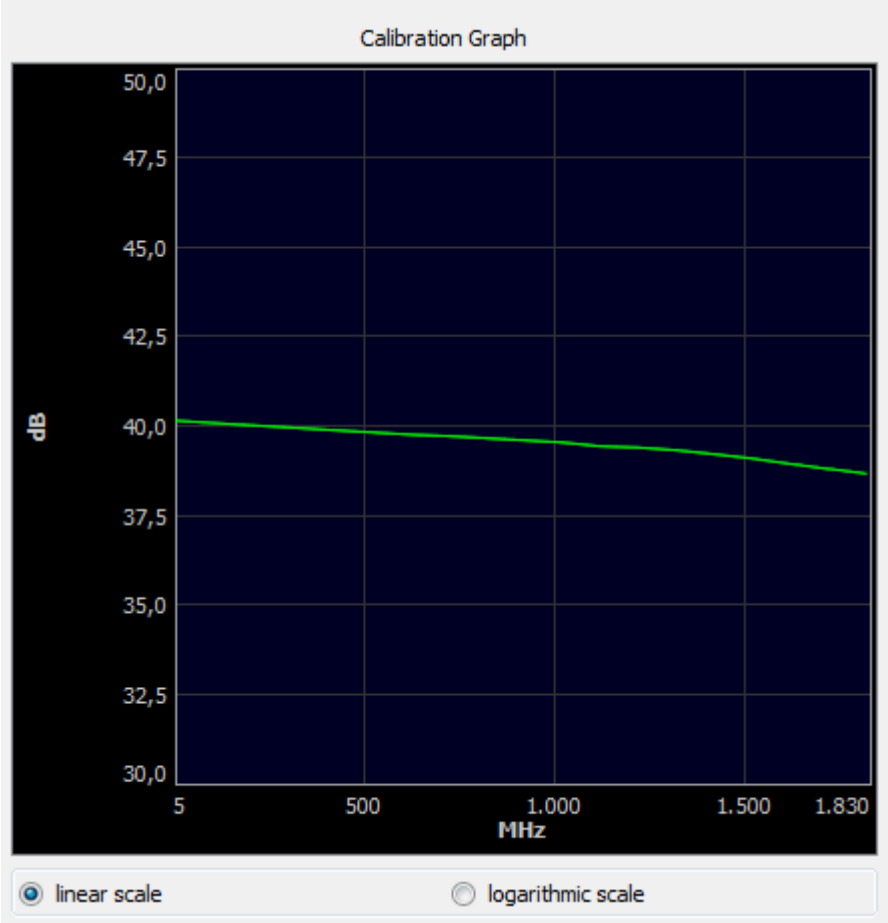
Import a calibration object from an external file.

9 Export Calibration Object



Export a calibration object to an external file.

10 Calibration Trace Preview



Shows a preview of the effect the current calibration object would have on a measurement. The frequency and value ranges are scaled automatically based on the available data. You can switch between a logarithmic and linear scaling for the value axis.