

MCS Manual

User guide

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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 1.2.1 of the software released in May 2012, 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 XP/Vista/7, MacOS X 10.6 or higher, Linux
- Intel Core2 or AMD Athlon 64 CPU with 1.5 GHz or more. A Dual- or Quadcore CPU is not required, but recommended.
- minimum of 2 GB memory
- 100 MB free disk space (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 privileges 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. It is recommended that you confirm the installation of the USB driver despite the warning (the driver is not certified by Microsoft).

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. recent 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 privileges) 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.

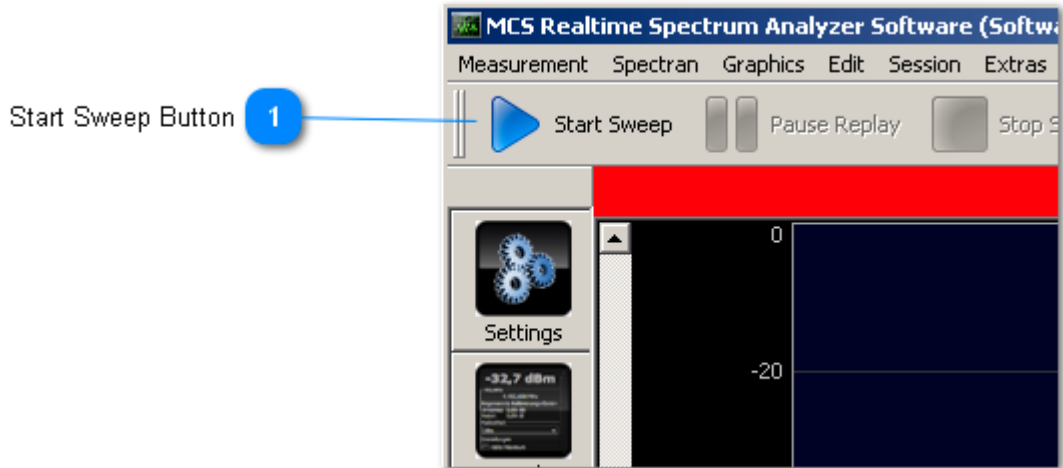
Getting Support

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

Quickstart

Basic instructions to get a measurement running.

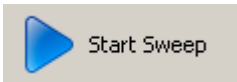
Connect to Device



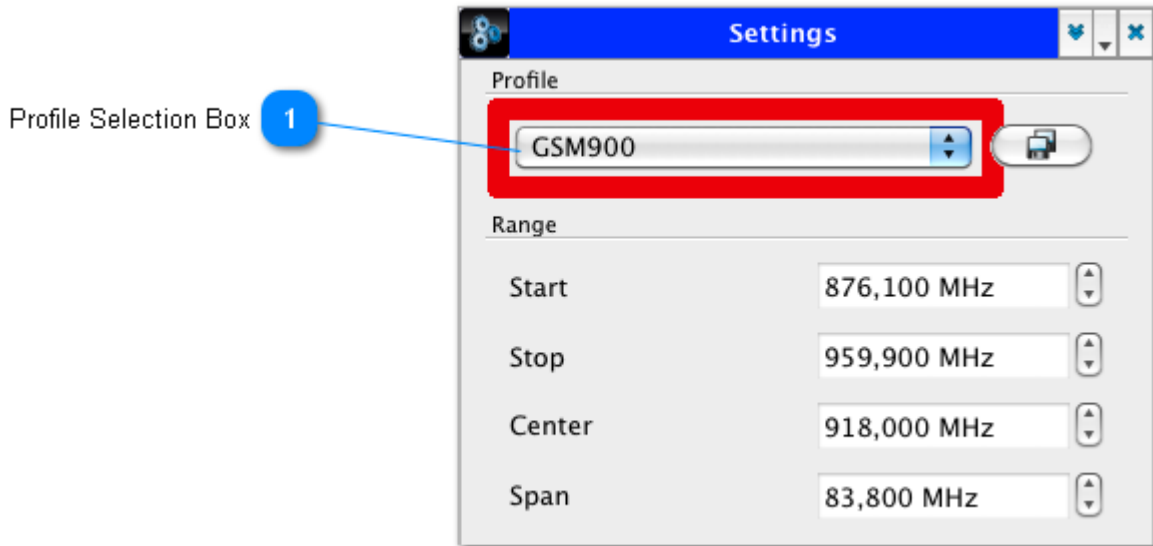
After starting the MCS software simply power on your Spectran device and click the [Start Sweep](#) button. If there is more than once device connected to your system you can use the connection manager (via the [Connect](#) menu entry) to connect and disconnect each device separately. For more details 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.

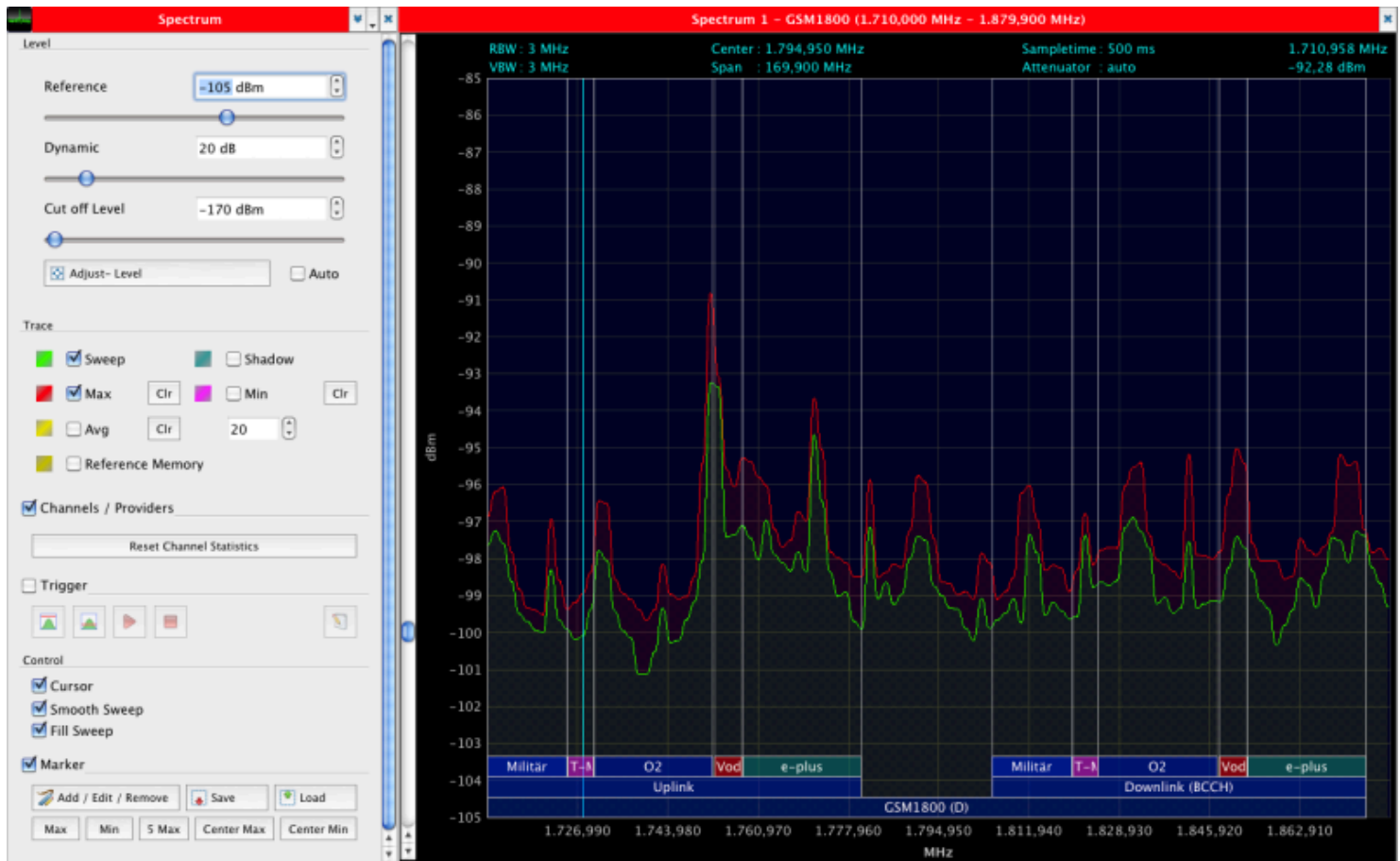


Setup Graphics Parameters

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" is shown, but you can also enable/disable graphs for minimum, maximum and average values.

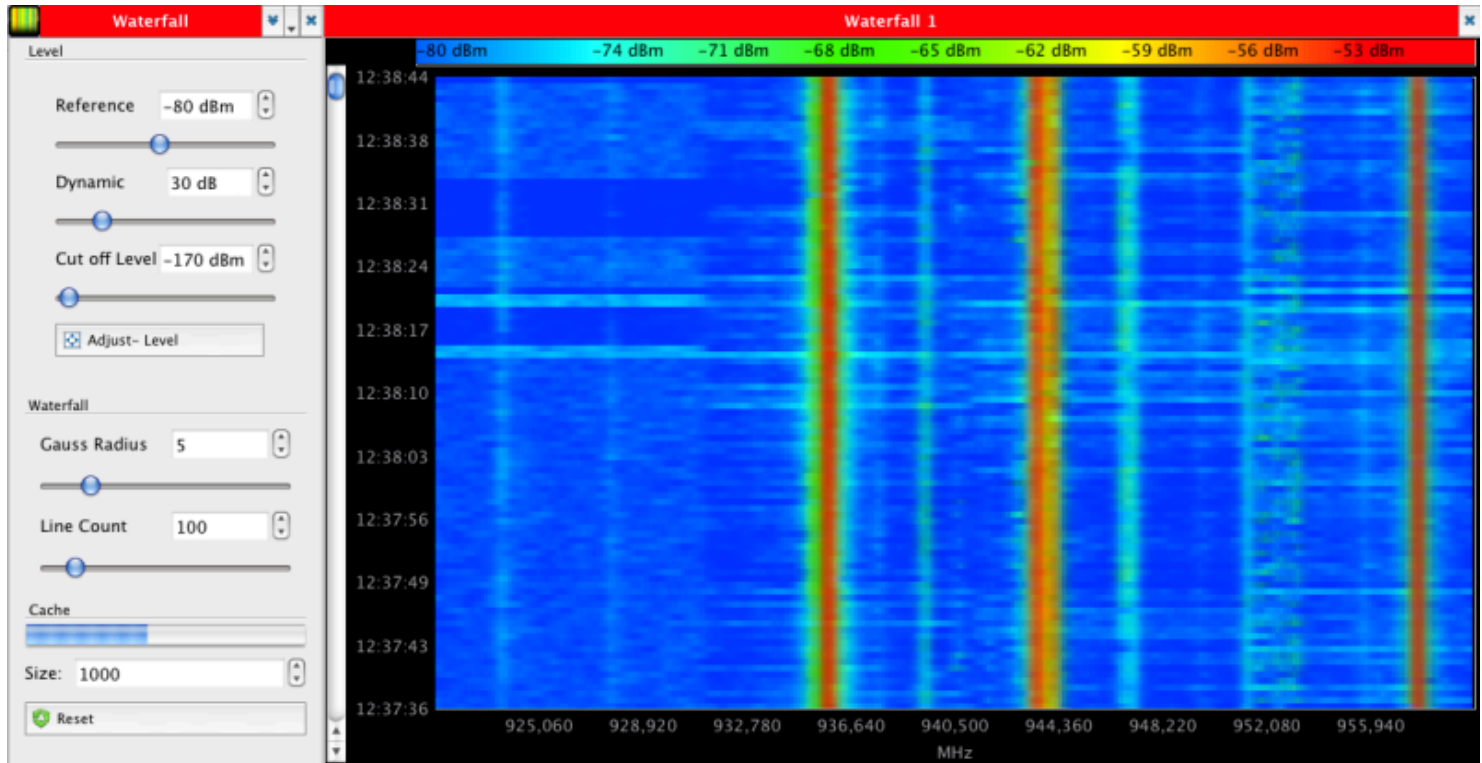
If the [Channels / Providers](#) option is checked a semi-transparent overlay is shown in the graph that displays the allocated frequencies based on the selected sweep profile.

Please read [Spectrum Control and View](#) for a more detailed explanation of all available settings.

Setting Up Waterfall View

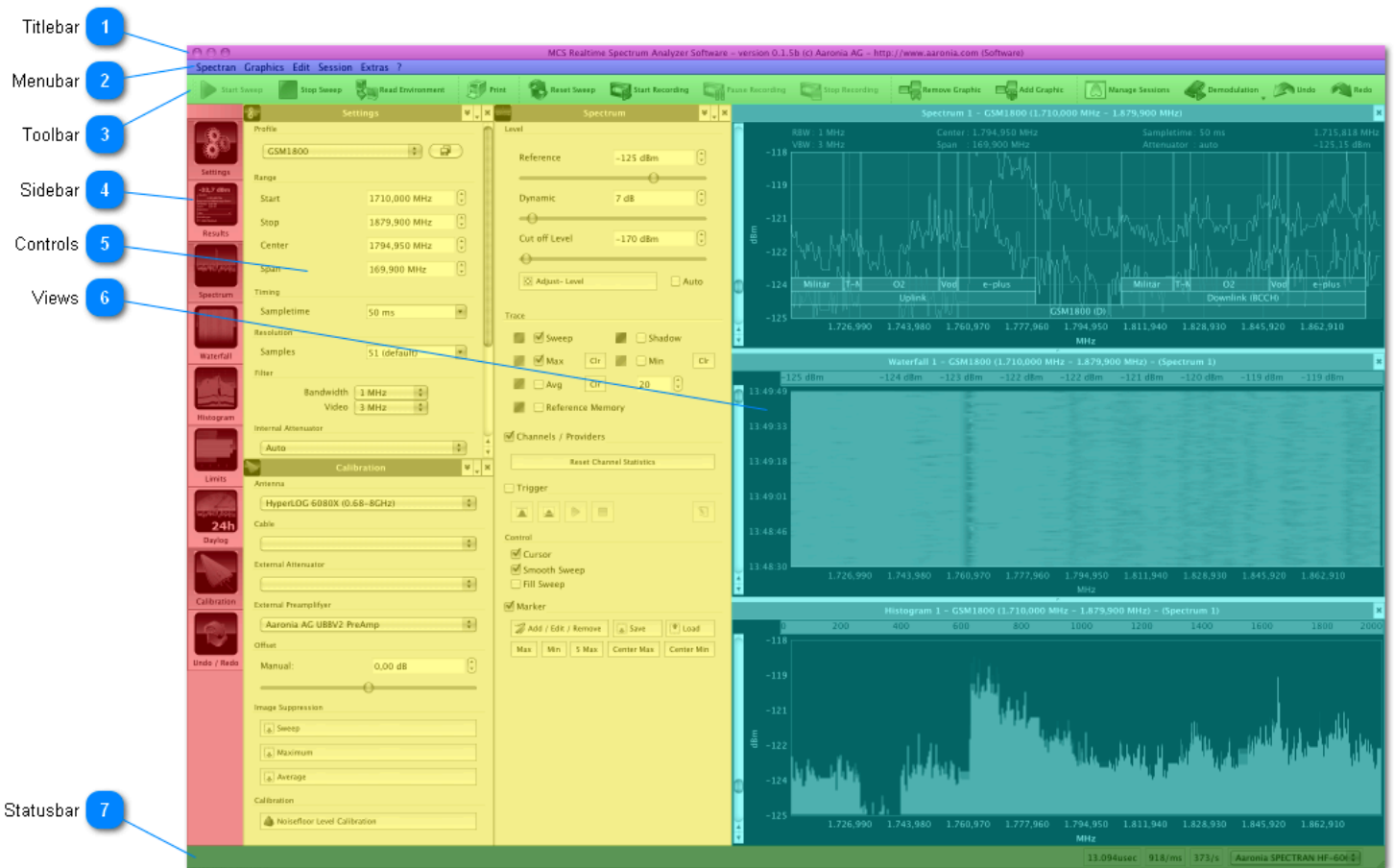
Unlike the Spectrum view the Waterfall view is not enabled by default when you start the MCS. To open it you can either use the [Add Graphic](#) button in the toolbar and select the "Add Waterfall" entry from the popup menu, or simply click on the "Waterfall" button in the sidebar to open the [Waterfall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

MCS Realtime Spectrum Analyzer Software - version 0.1.5b (c) Aronia AG - http://www.aronia.com (Software)

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
- Whether 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

Spectran Graphics Edit Session Extras ?

3 Toolbar

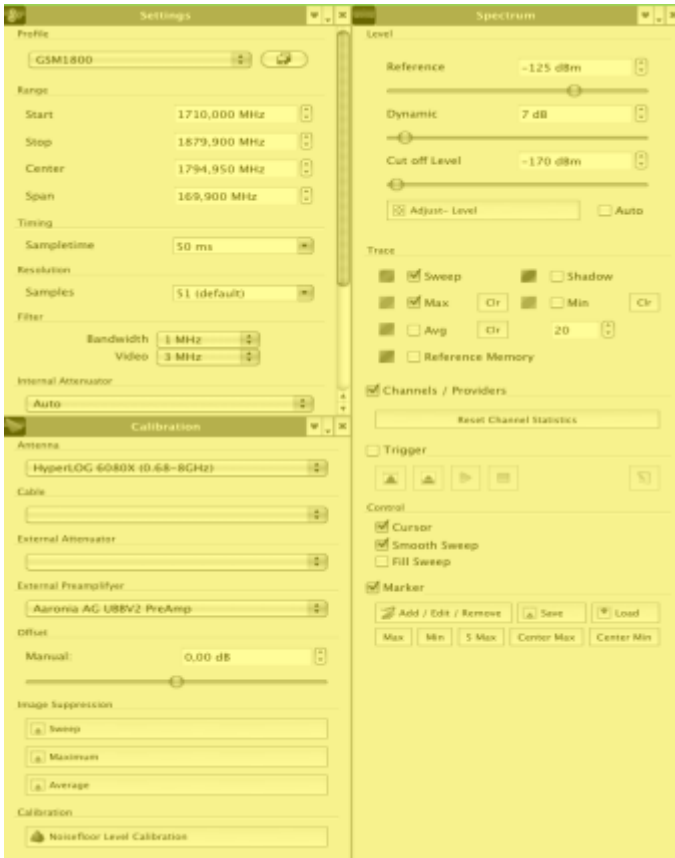
The Toolbar provides direct access to some of the more common actions that are contained in the different menus of the Menubar. Unlike the [Menubar](#) the Toolbar can be adjusted in size and location, by using the context menu. Just right-click on a free area (where no button is) of the Toolbar, and 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 rearrange 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.

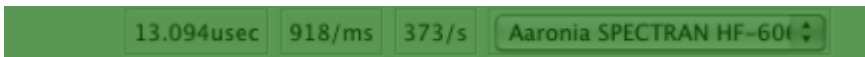
6 Views



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.

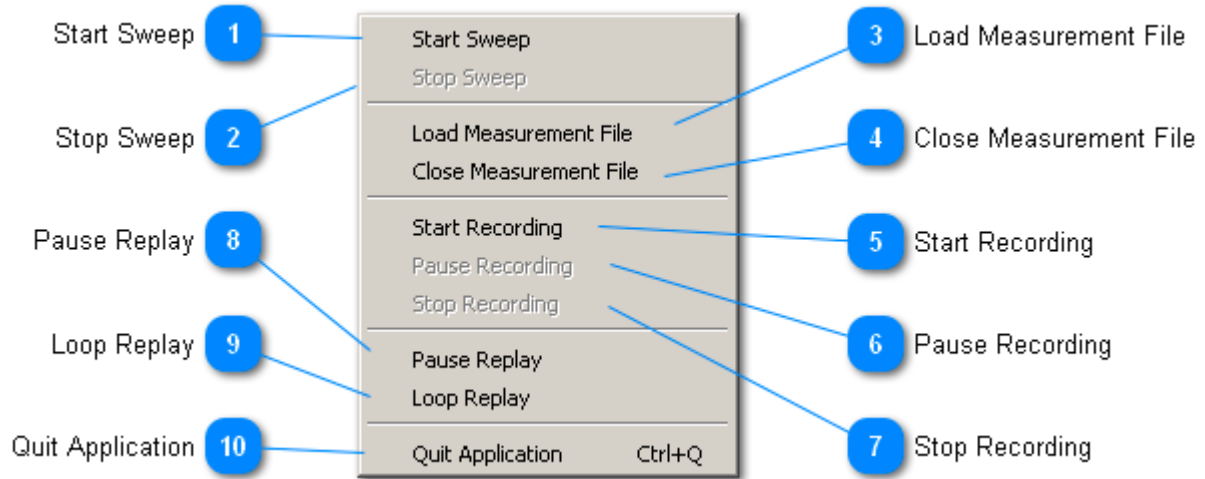
7 Statusbar



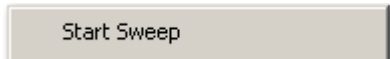
Like in other applications the statusbar displays various informational messages. It also shows some performance data and includes the device selection box to assign different devices to views, see [Managing Multiple Devices](#) for details.

Menu and Toolbar Actions

Measurement Menu



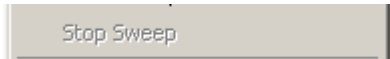
1 Start Sweep



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.

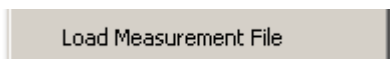
If a device is connected this action then tells it to send measurement data with the current sweep parameters.

2 Stop Sweep



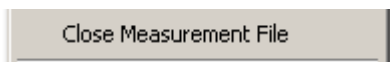
Tells the current device to stop sending measurement data, but does not disconnect it.

3 Load Measurement File



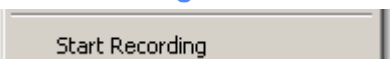
Opens a file selection dialog where you can select a recorded measurement for replay. See [Replaying a Recorded Measurement](#).

4 Close Measurement File



Has the same effect as [Disconnect](#), but only if the current "device" is a replay file.

5 Start Recording



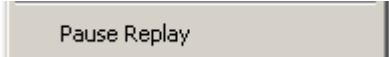
Opens a file dialog to set the target for the recording. The MCS will determine the recording backend to use based on the chosen filename. Some backends (like MDR) may allow you to enter additional information to be stored with the measurement. Note that the recording only starts when all dialogs opened 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 Pause RecordingA rectangular button with a light gray background and a thin border, containing the text "Pause Recording".

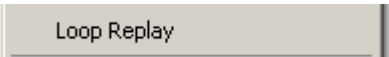
Pauses the current recording, no data will be recorded while pause is enabled. You can resume it by clicking this entry again.

7 Stop RecordingA rectangular button with a light gray background and a thin border, containing the text "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.

8 Pause ReplayA rectangular button with a light gray background and a thin border, containing the text "Pause Replay".

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

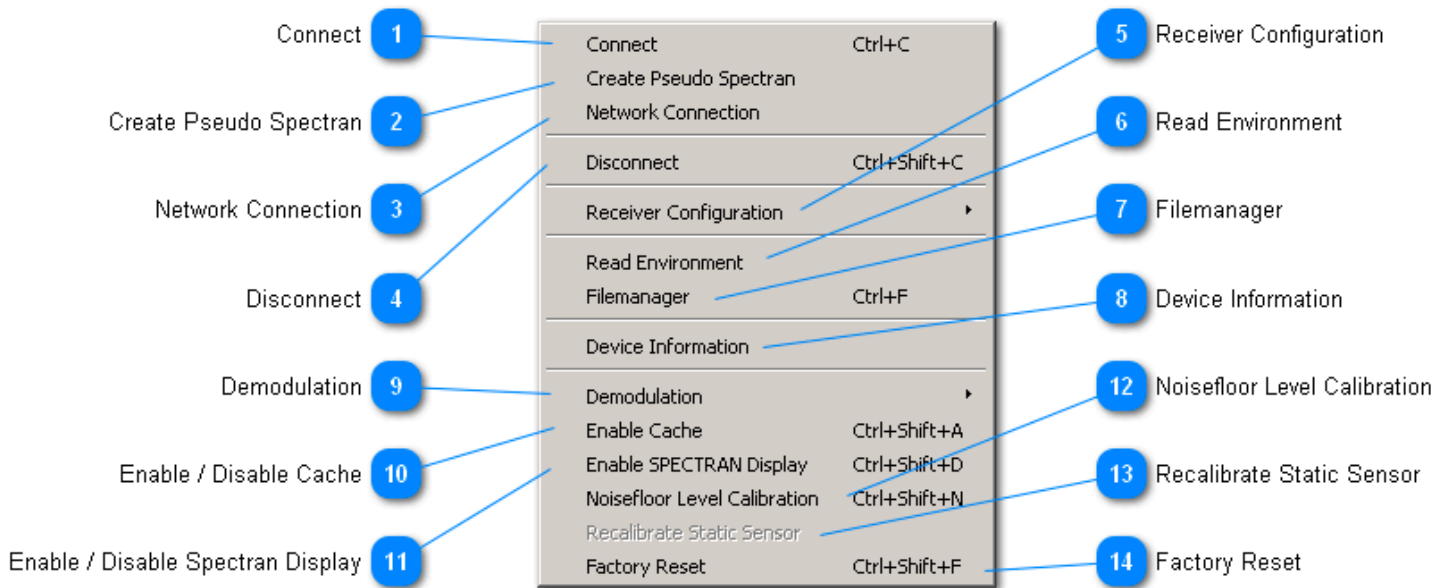
9 Loop ReplayA rectangular button with a light gray background and a thin border, containing the text "Loop Replay".

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.

10 Quit ApplicationA rectangular button with a light gray background and a thin border, containing the text "Quit Application" and "Ctrl+Q".

Stops all recordings, 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 Connect

Connect Ctrl+C

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

Create Pseudo Spectran

See [Multisweep Mode](#)

3 Network Connection

Network Connection

Opens the network connection dialog. See [Spectran Remote Control](#) for details.

4 Disconnect

Disconnect Ctrl+Shift+C

Closes the connection of the current device or replay file. Unlike [Connect](#) 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 lose 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


 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


 Read Environment

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

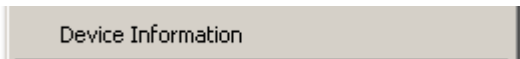
7 Filemanager


 Filemanager

Ctrl+F


Opens the [Spectran Filemanager](#) for the current device.

8 Device Information


 Device Information


Opens a dialog containing [Detailed Device Information](#) for the current device or replay.

9 Demodulation


 Demodulation

Opens a popup menu where you can change the volume of the internal speaker and enable/disable different demodulation modes. See [Signal Demodulation](#) for details.


10 Enable / Disable Cache


 Enable Cache

Ctrl+Shift+A

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

11 Enable / Disable Spectran Display


 Enable SPECTRAN Display

Ctrl+Shift+D

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.

12 Noisefloor Level Calibration


 Noisefloor Level Calibration

Ctrl+Shift+N

Recalibrate the Noisefloor of the current device. See [Calibration Control](#) for details.

13 Recalibrate Static Sensor


 Recalibrate Static Sensor

Opens the [Recalibrate Static Sensor](#) dialog.

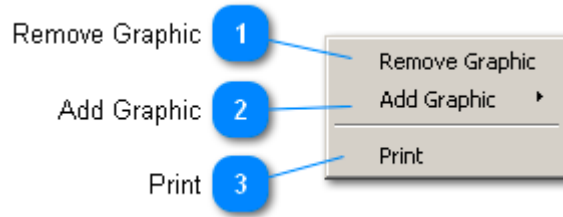
14 Factory Reset

Factory Reset

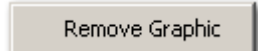
Ctrl+Shift+F

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.

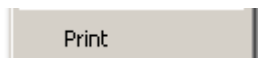
To leave the "Remove Graphics" mode without removing a view press the right mouse button.

2 Add Graphic



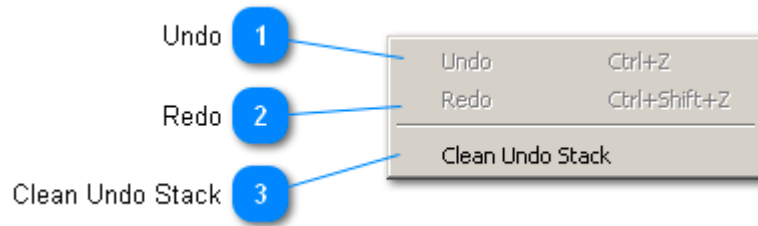
This entry includes a submenu when selected where you can choose what type of view should be added to the view area. This also allows creating multiple views of the same type. The new view will automatically be assigned to the current device if possible.

3 Print



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

Edit Menu



1 Undo



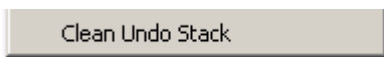
Reverts the listed operation. This may affect graphics parameters and device settings, which could trigger additional effects (like graphics/sweep reset). Not all operations can be undone, so please check that the listed operation is really what you want to be undone.

2 Redo



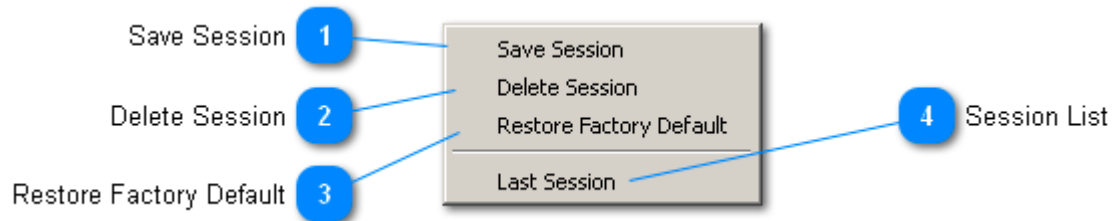
Reverts the last [Undo](#) action, restoring the previous state.

3 Clean Undo Stack

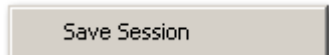


Discards all stored [Undo](#) commands, see [Undo / Redo Control](#) for more details on this.

Session Menu



1 Save Session



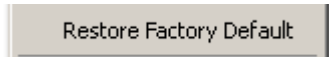
Stores the current state of the MCS and attached devices in a new [session](#).

2 Delete Session



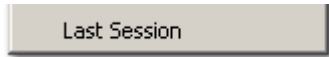
Deletes a selected [session](#).

3 Restore Factory Default



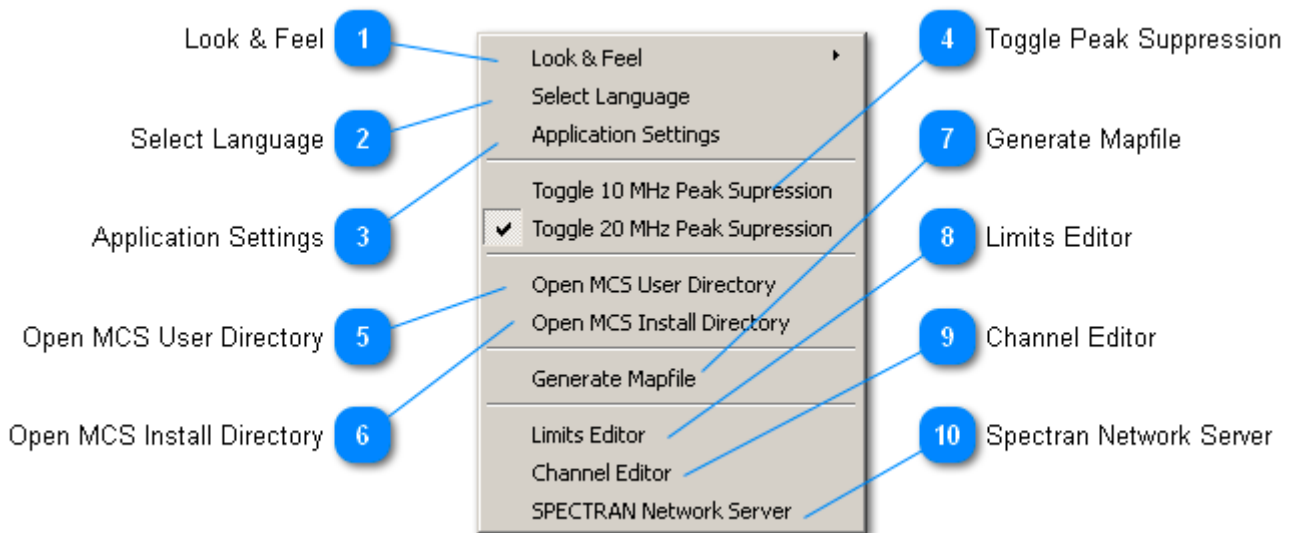
Restore MCS state to factory default settings.

4 Session List

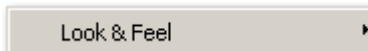


A list of all currently available [sessions](#).

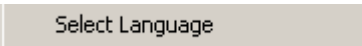
Extras Menu



1 Look & Feel



2 Select Language



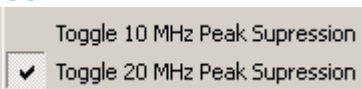
Opens a dialog to select a different translation for the user interface. Note that some elements will only use the new translation after restarting the MCS.

3 Application Settings



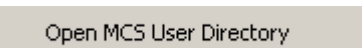
Opens the Settings Dialog. Please refer to [Application Settings](#) for a detailed listing of available settings.

4 Toggle Peak Suppression




In some cases the Spectran hardware reports constant fake signals on 10 or 20 MHz boundaries, which don't actually exist. The MCS can suppress these, but if there is a real signal on or near one 10 or 20 MHz boundary it may also be filtered out. For that reason the "Peak Suppression" can be enabled/disabled with this menu entry, either for every 10 or every 20 MHz.


5 Open MCS User Directory




Opens the MCS User Directory in a file manager (Explorer 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.

6 Open MCS Install DirectoryA screenshot of a menu item labeled "Open MCS Install Directory". The text is centered within a light gray rectangular background.

Opens the MCS Installation Directory in a file manager (Explorer 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.

7 Generate MapfileA screenshot of a menu item labeled "Generate Mapfile". The text is centered within a light gray rectangular background.

Opens the GPX import dialog. See [Generate Google Earth Map](#).

8 Limits EditorA screenshot of a menu item labeled "Limits Editor". The text is centered within a light gray rectangular background.

Opens the [Limits Editor](#).

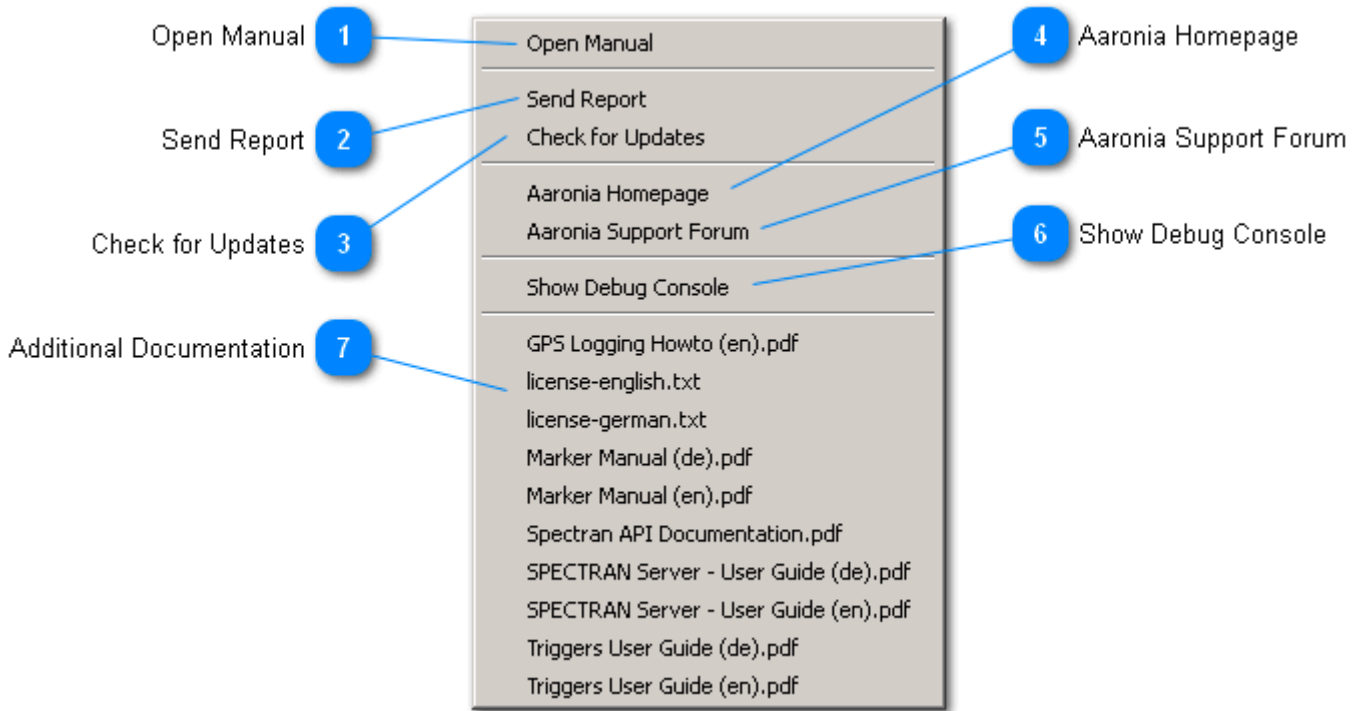
9 Channel EditorA screenshot of a menu item labeled "Channel Editor". The text is centered within a light gray rectangular background.

Opens the [Channel Editor](#).

10 Spectran Network ServerA screenshot of a menu item labeled "SPECTRAN Network Server". The text is centered within a light gray rectangular background.

Opens the [Spectran Network Server](#).

Help Menu



1 Open Manual

Open Manual

Opens the MCS manual in your browser.

2 Send Report

Send Report

With this function you can provide us with feedback, bug reports or feature requests with a simple mail formular. If the "Include Logfiles" option is checked the current logfile is automatically included in the mail, which is very useful when reporting bugs. In case you're sensitive to privacy leaks you can activate the "Anonymous" option to automatically fill fields with standard values. However this does not prevent against other personal data (e.g. your IP address) possibly being tracked by the underlying SMTP protocol.

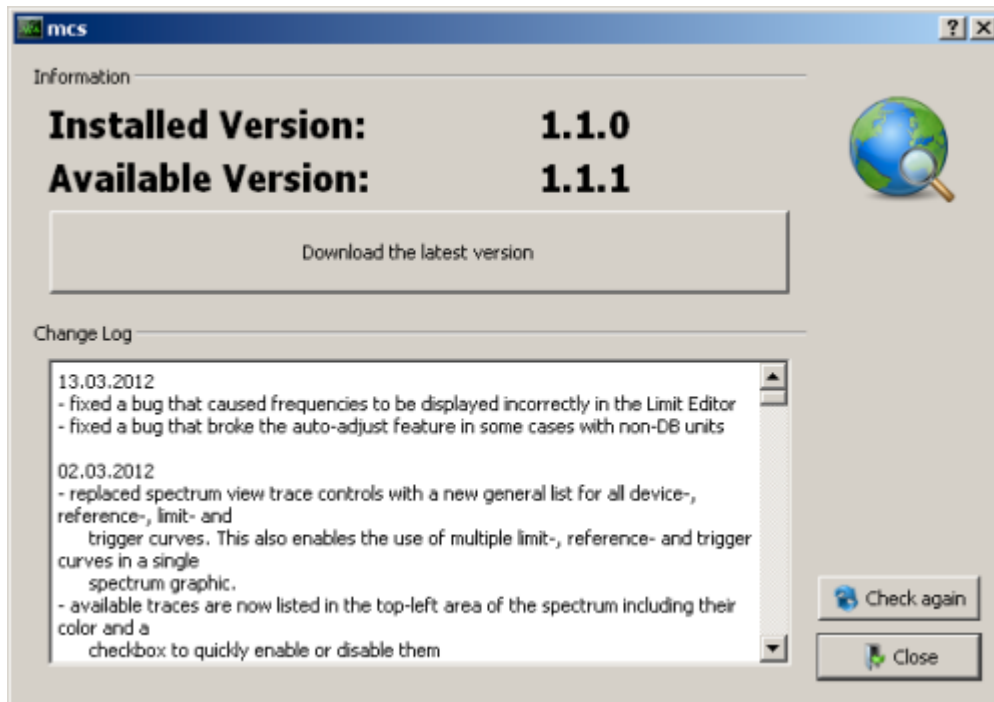
If you want a reply you obviously have to include an email address.

Note that there is no automatic confirmation whether your mail is received, the messagebox only confirms that it has been sent. Esp. when providing an invalid address mail servers may reject the message without notification.

3 Check for Updates

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

Aaronia Homepage

Opens the Aaronia AG homepage in your standard browser.

5 Aaronia Support Forum

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.

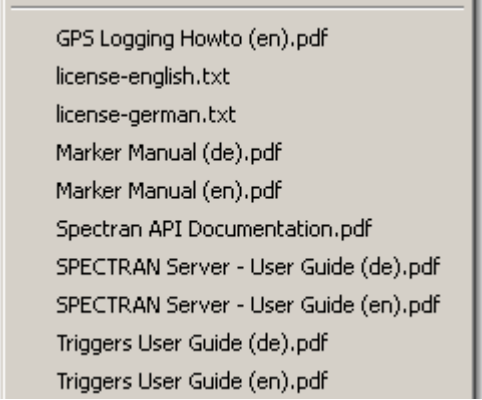
6 Show Debug Console

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

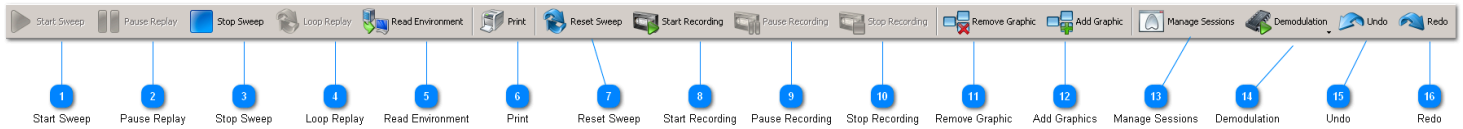
Additional Documentation

A screenshot of a help menu list with a light gray background and a thin border. The list contains ten entries, each on a new line, representing external documentation links.

- GPS Logging Howto (en).pdf
- license-english.txt
- license-german.txt
- Marker Manual (de).pdf
- Marker Manual (en).pdf
- Spectran API Documentation.pdf
- SPECTRAN Server - User Guide (de).pdf
- SPECTRAN Server - User Guide (en).pdf
- Triggers User Guide (de).pdf
- Triggers User Guide (en).pdf

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

Toolbar

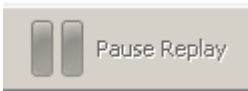


1 Start Sweep



See [Start Sweep menu entry](#)

2 Pause Replay



See [Pause Replay menu entry](#)

3 Stop Sweep



See [Stop Sweep menu entry](#)

4 Loop Replay



See [Loop Replay menu entry](#)

5 Read Environment



See [Read Environment menu entry](#)

6 Print



See [Print menu entry](#)

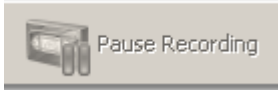
7 Reset Sweep



Restarts the sweep at the start frequency, discarding all data received in this sweep so far. Does not affect data from previous sweeps though.

8 Start Recording

See [Start Recording menu entry](#)

9 Pause Recording

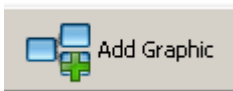
See [Pause Recording menu entry](#)

10 Stop Recording

See [Stop Recording menu entry](#)

11 Remove Graphic

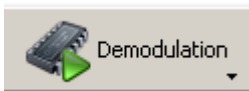
See [Remove Graphic menu entry](#)

12 Add Graphics

See [Add Graphic menu entry](#)

13 Manage Sessions

See [Sessions menu](#)

14 Demodulation

See [Demodulation menu entry](#)

15 Undo

See [Undo menu entry](#)

16

Redo

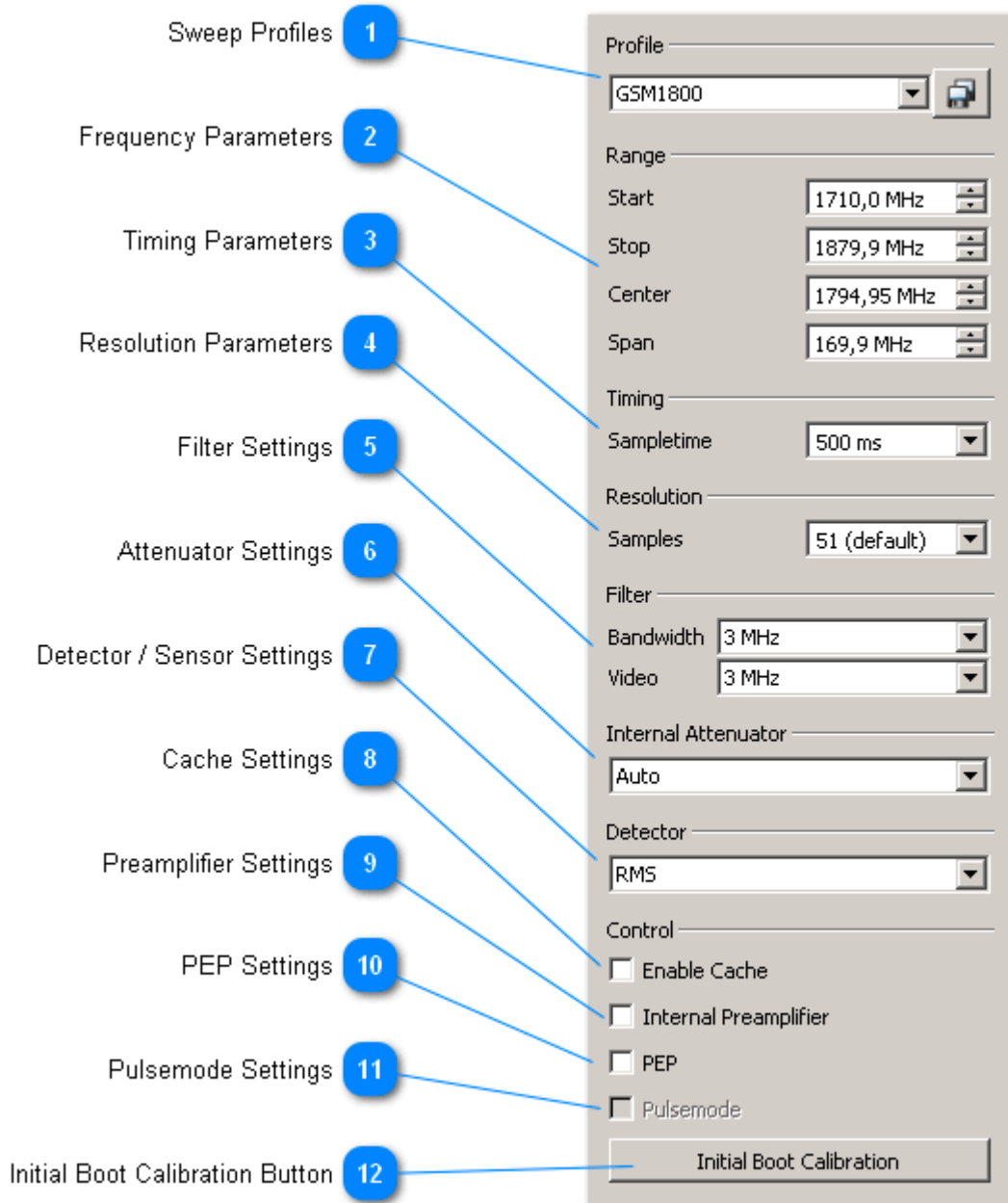


See [Redo menu entry](#)

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 Sweep Profiles



Select a predefined profile to quickly setup all relevant device parameters. With the "Save" button you can create your own profiles based on the current settings.

2 Frequency Parameters

Range

Start 1710,0 MHz

Stop 1879,9 MHz

Center 1794,95 MHz

Span 169,9 MHz

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

- changing the startfrequency will adjust stop- and centerfrequency accordingly
- changing the stopfrequency will adjust the centerfrequency and the frequency span, start frequency will stay the same
- changing the centerfrequency will adjust the start- and stopfrequency
- changing the frequency span will adjust the start- and stopfrequency

Note that changing frequency span or centerfrequency 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.

3 Timing Parameters

Timing

Sampletime 500 ms

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

4 Resolution Parameters

Resolution

Samples 51 (default)

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

Bandwidth 3 MHz

Video 3 MHz

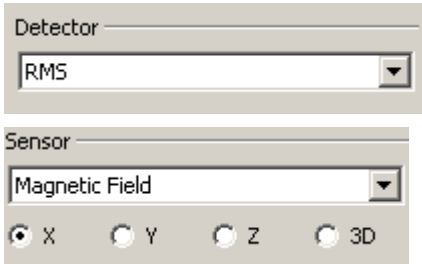
Filter settings, see *Spectran Manual*.

6 Attenuator Settings

Internal Attenuator

Auto

Internal Attenuator settings, see *Spectran Manual*.

7 **Detector / Sensor Settings**

Detector
RMS

Sensor
Magnetic Field

X Y Z 3D

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

8 **Cache Settings**

Enable Cache

Enable the internal SPECTRAN cache to accelerate the sweep

9 **Preamplifier Settings**

Internal Preamplifier

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

10 **PEP Settings**

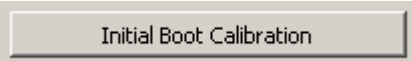
PEP

Not implemented.

11 **Pulsemode Settings**

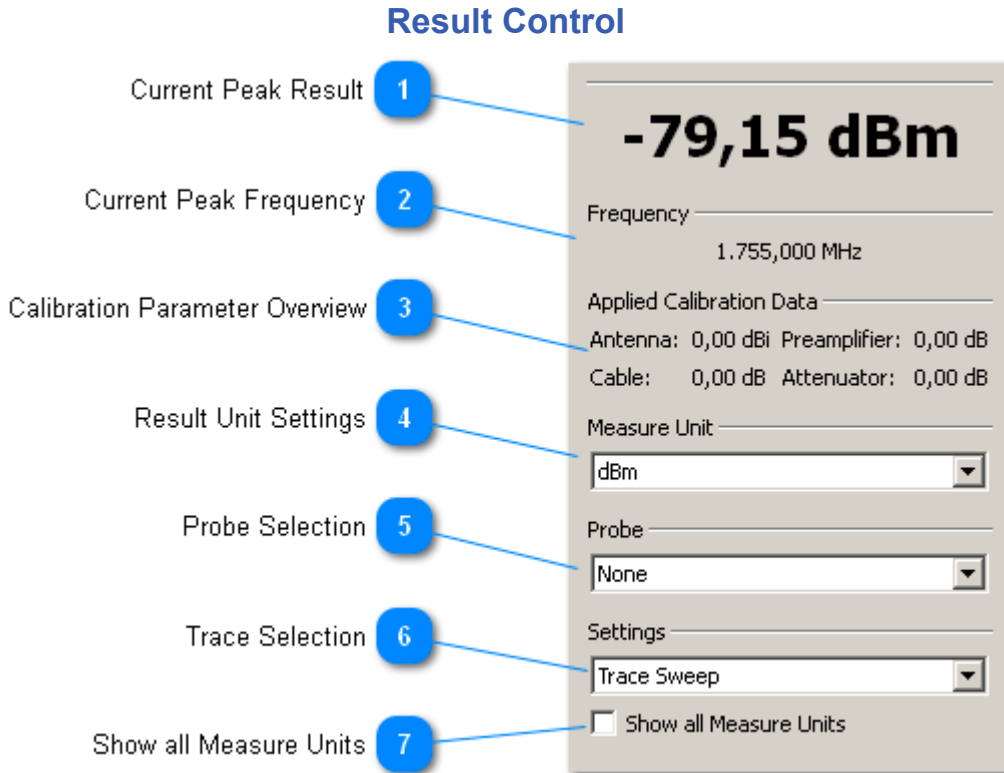
Pulsemode

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

12 **Initial Boot Calibration Button**

Initial Boot Calibration

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



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

-79,15 dBm

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

Frequency _____
1.755,000 MHz

Lists the frequency where the current peak was found.

3 Calibration Parameter Overview

Applied Calibration Data

Antenna:	0,00 dBi	Preamplifier:	0,00 dB
Cable:	0,00 dB	Attenuator:	0,00 dB

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

Measure Unit

dBm

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 Probe Selection

Probe

None

Display the values of the selected probe attached to the current device. Probes work very different compared to antennas as they translate between different physical units. Therefore they are not included with the other calibration options but must be selected separately here. If a probe is selected here the MCS software will retranslate the value reported by the Spectran back into the value and unit that was read by the probe. This translation is currently however limited to the Results control, it is not yet propagated to other views.

6 Trace Selection

Trace Sweep

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.

7 Show all Measure Units

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


The screenshot shows the Spectrum Control dialog box with the following settings and callouts:

- 1** Scaling / Level Controls: Points to the Level, Reference (-110 dBm), Dynamic (40 dB), and Cut off Level (-170 dBm) controls.
- 2** Trace List and Controls: Points to the Trace list containing Sweep, Maximum, Average, Minimum, Shadow, Limit EN55022 Class B, and Snapshot Average.
- 3** Enable / Disable Channel Overlay: Points to the Channels / Providers checkbox.
- 4** Reset Channel Statistics: Points to the Reset Channel Statistics button.
- 5** Trigger Controls: Points to the Trigger checkbox and the Trigger control buttons (Home, Left, Right, Stop, Refresh).
- 6** Enable / Disable Sweepcursor: Points to the Sweepcursor checkbox.
- 7** Enable / Disable Trace Smoothing: Points to the Smooth Sweep checkbox.
- 8** Enable / Disable Trace Filling: Points to the Fill Sweep checkbox.
- 9** Marker Controls: Points to the Marker checkbox and the Add / Edit / Remove button.

Additional controls visible in the dialog include: Adjust- Level, Auto, Frequency Scaling (Linear, Logarithmic), Average over (20 Sweeps), add Limit, add Reference, add Snapshot, save Trace, reset Trace, reset All, remove Trace, and buttons for Max, Min, 5 Max, Center Max, and Center Min.

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**
 Channels / Providers –
Enables or Disables the [Channel Info Overlay](#) and [Channel Statistics Overlay](#)
- 4 Reset Channel Statistics**

Reset the statistical data used by the [Channel Statistics Overlay](#)
- 5 Trigger Controls**
See [Trigger Controls](#)
- 6 Enable / Disable Sweepcursor**
 Cursor
Enables or Disables the [Sweep Cursor](#)
- 7 Enable / Disable Trace Smoothing**
 Smooth Sweep
Switch to a different drawing algorithm to avoid sharp edges on displayed traces.
- 8 Enable / Disable Trace Filling**
 Fill Sweep
Fill the area between each trace and the x-axis.
- 9 Marker Controls**
See [Marker Controls](#)

Scaling Controls (1)

Reference Level Controls 1

Display Dynamic Controls 2

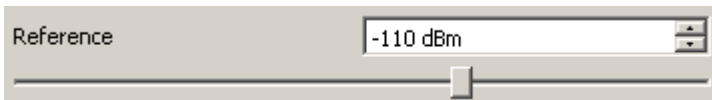
Cut off Level Controls 3

Auto-Adjust Level Parameters 4

Frequency Raster Scaling Mode 5

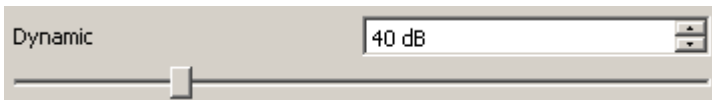
6 Enable / Disable Auto-Adjust

1 Reference Level Controls



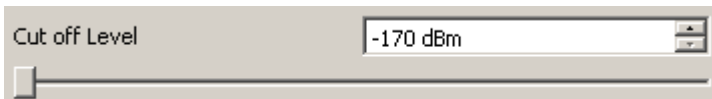
The Reference level determines the bottom display boundary of a measurement. Readings below this value are considered out of scope of a view and will not be displayed.

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).

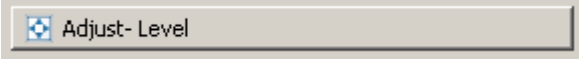
3 Cut off Level Controls



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

A rectangular button with a light gray background and a thin border. On the left side, there is a small square icon containing a four-pointed star. To the right of the icon, the text "Adjust- Level" is displayed in a standard sans-serif font.

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

A control panel for "Frequency Scaling". It features a title bar "Frequency Scaling" at the top. Below the title bar, there are two radio button options: "Linear" and "Logarithmic". The "Linear" option is selected, indicated by a filled circle next to it. The "Logarithmic" option has an empty circle next to it.

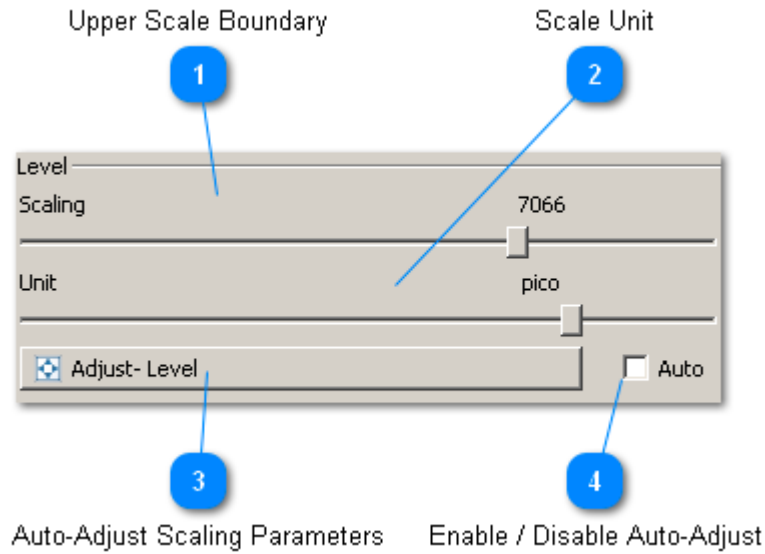
Switch between Linear and Logarithmic rasters on the frequency axis. The logarithmic raster starts at 1 Hz as the imaginary origin to compute the relative positions of raster entries, so if the current sweep settings use a high start frequency and/or a small span frequency the visual difference to the 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

A small rectangular checkbox with a light gray background. To the right of the checkbox, the text "Auto" is displayed in a standard sans-serif font.

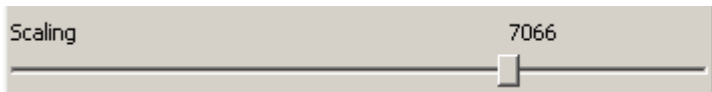
If checked the [Auto-Adjust Level Parameters](#) will be done after each completed sweep.

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



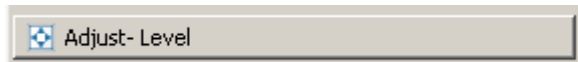
Sets the *numeric* upper display bound of a view.

2 Scale Unit



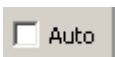
Sets the actual Scaling factor, so if for example Scale Unit is "micro", Scale Value is 5000 and [Display Unit](#) is Watt the view will show values from 0 to 0.005 Watt, using labels from 0 to 5000 microWatt.

3 Auto-Adjust Scaling Parameters



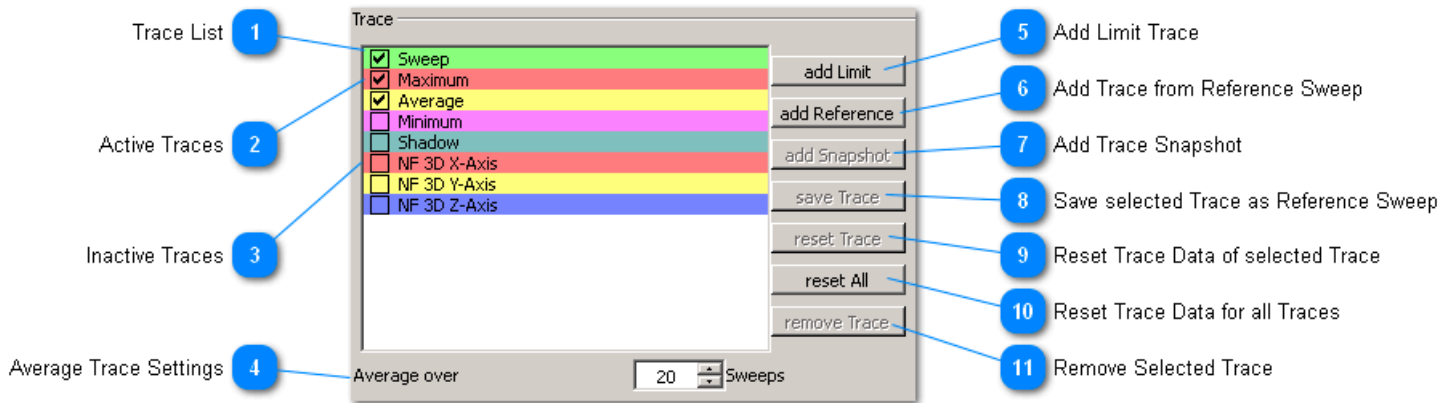
See [Auto-Adjust Level Parameters](#)

4 Enable / Disable Auto-Adjust

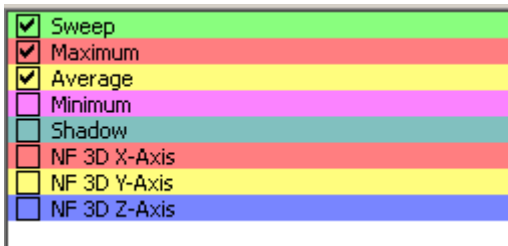


See [Enable / Disable Auto-Adjust](#)

Trace List and Controls

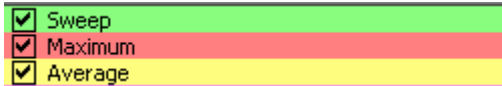


1 Trace List



This list shows 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 Inactive Traces



4 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 resources. Also old sweeps are discarded if certain memory limits are reached, so at a certain point increasing this value anymore will be without effect.

5 Add Limit TraceA rectangular button with a light gray background and a thin border, containing the text "add Limit" in a sans-serif font.

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.

6 Add Trace from Reference SweepA rectangular button with a light gray background and a thin border, containing the text "add Reference" in a sans-serif font.

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.

7 Add Trace SnapshotA rectangular button with a light gray background and a thin border, containing the text "add Snapshot" in a sans-serif font.

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

8 Save selected Trace as Reference SweepA rectangular button with a light gray background and a thin border, containing the text "save Trace" in a sans-serif font.

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.

9 Reset Trace Data of selected TraceA rectangular button with a light gray background and a thin border, containing the text "reset Trace" in a sans-serif font.

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

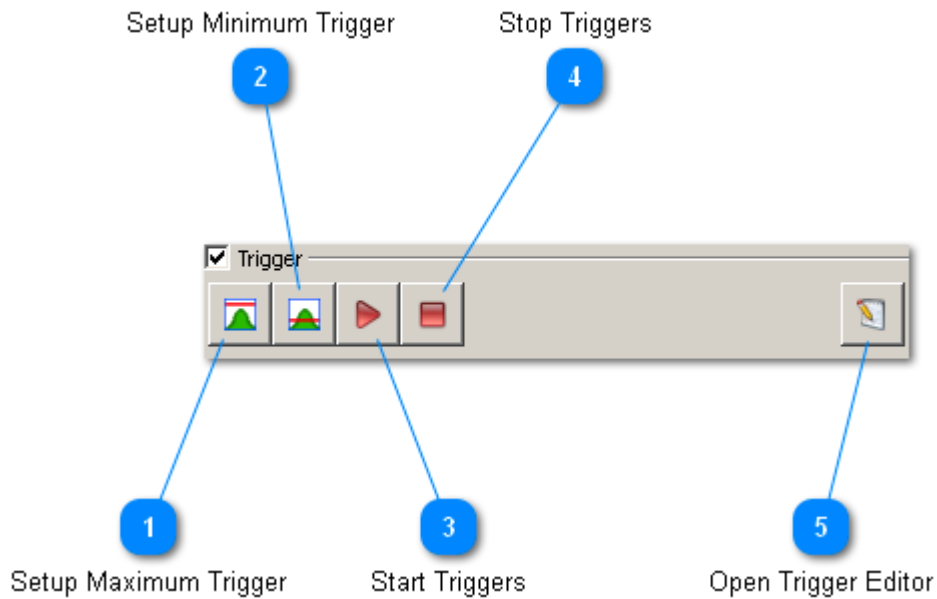
10 Reset Trace Data for all TracesA rectangular button with a light gray background and a thin border, containing the text "reset All" in a sans-serif font.

Performs a [reset](#) on all traces.

11 Remove Selected TraceA rectangular button with a light gray background and a thin border, containing the text "remove Trace" in a sans-serif font.

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 Setup Maximum Trigger



Set up the default maximum trigger. For further information see [Measurement Triggers](#).

2 Setup Minimum Trigger



Set up the default minimum trigger. For further information see [Measurement Triggers](#).

3 Start Triggers



Start listening for events and execute trigger actions if necessary.

4 Stop Triggers



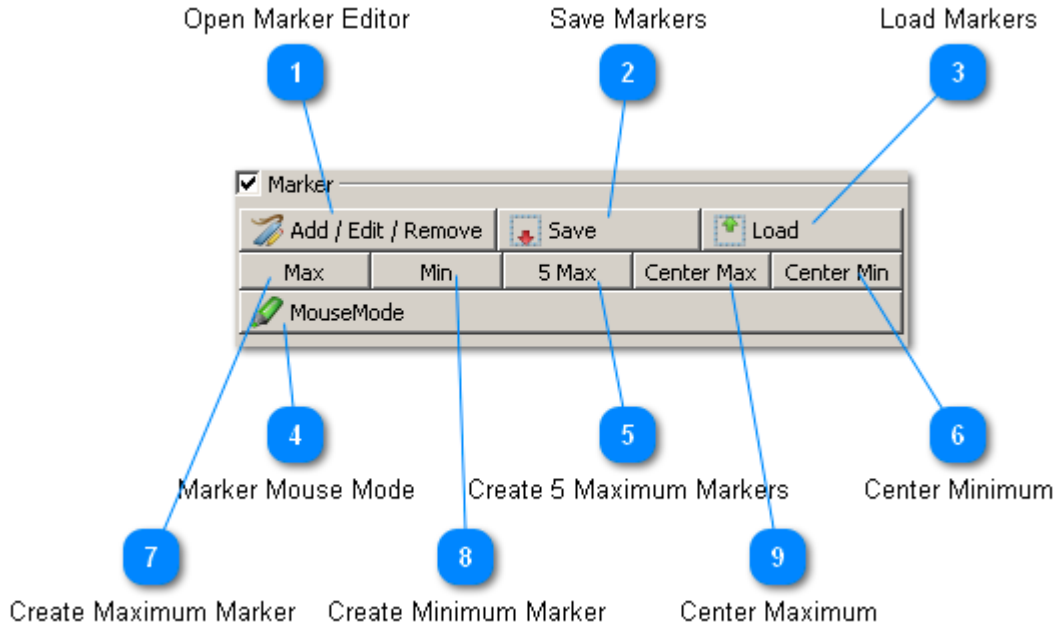
Stop executing trigger actions.

5 Open Trigger Editor



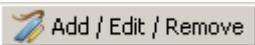
The advanced trigger editor provided a more fine gained trigger control, see [Measurement Triggers](#).

Marker Controls



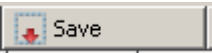
See [Spectrum Markers](#) for details on how Markers work.

1 Open Marker Editor



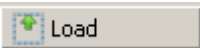
Opens the [Markers Editor](#) dialog.

2 Save Markers



Store the current marker configuration on disk.

3 Load Markers



Reload a previously stored marker configuration.

4 Marker Mouse Mode



Changes the mouse behavior of the Spectrum View to affect markers. If this mode is enabled (button is pressed down) you can no longer change sweep parameters, display dynamic or reference level with the mouse, instead you can modify markers in the following way:

- double-click will create a new fixed frequency marker at the frequency under the mouse position
- right-click on an existing marker will remove that marker
- drag-and-drop horizontally will change the target frequencies of fixed frequency markers
- drag-and-drop vertically can change the assigned trace of any marker: dropping in the top part will assign the marker to the maximum trace, dropping in the bottom section will assign it to the minimum trace. Dropping it in the middle will assign it to either the current or average trace, depending on which is enabled. If the selected trace is not enabled the current trace will be used.

Also while in marker mouse mode the [vertical indicator lines](#) of a marker will show up when the mouse is close to the marker target frequency.

5 Create 5 Maximum MarkersA rectangular button with a light gray background and a thin black border, containing the text "5 Max".

Replace the current marker configuration with 5 Maximum markers.

6 Center MinimumA rectangular button with a light gray background and a thin black border, containing the text "Center Min".


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.

7 Create Maximum MarkerA rectangular button with a light gray background and a thin black border, containing the text "Max".

Replace the current marker configuration with a single Maximum marker.

8 Create Minimum MarkerA rectangular button with a light gray background and a thin black border, containing the text "Min".

Replace the current marker configuration with a single Minimum marker.

9 Center MaximumA rectangular button with a light gray background and a thin black border, containing the text "Center Max".

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

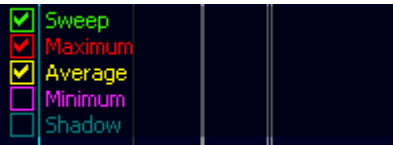


1 Scrollbar for Reference Level



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

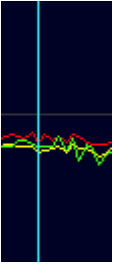


4 Value Display Unit



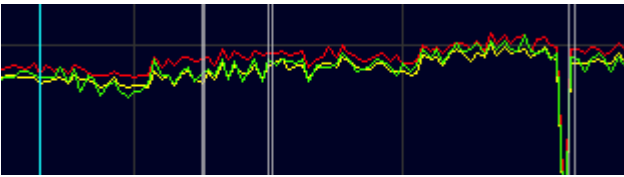
The currently selected unit to visualize result values in this view. You can change this in the [Result Control](#).

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 Statistic Overlay



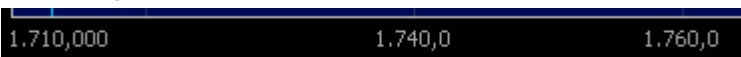
When the [Channel Info Overlay](#) is enabled and at least one Maximum marker exists this extra overlay level is activated. It contains an element for each channel that continuously increases in intensity when a maximum marker stays within its frequency range, and decreases when no marker is present within the channel. It can therefore be used as a visual aid to identify active channels in a given spectrum.

8 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](#).

9 Frequency Axis



10 Frequency Display Unit

MHz

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

11 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.

12 Sweep Parameters Overview

Center	: 1.794,950 MHz	RBW	: 1 MHz	Attenuator	: auto
Span	: 169,900 MHz	VBW	: 3 MHz	Preamplifier	: Disabled
Sampletime	: 500 ms	Samples	: 51	Detector	: RMS

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.

13 Marker Legend

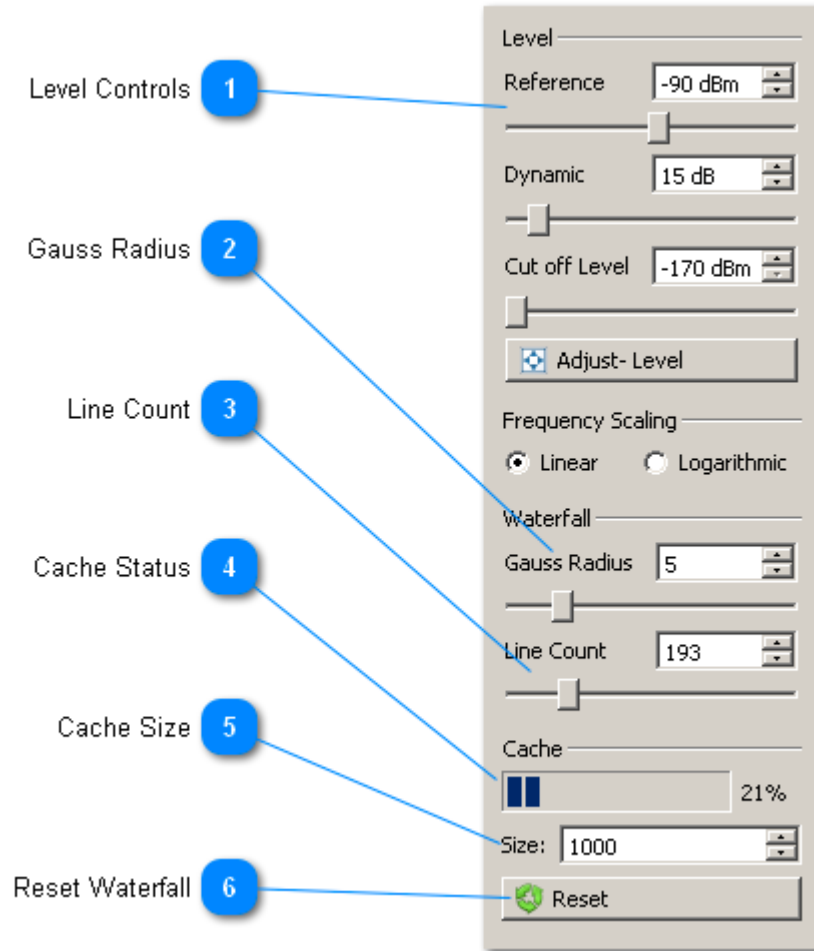
▼ 1	Max 1 -84,16 dBm @ 1.776,000 MHz
▼ 2	Max 2 -81,74 dBm @ 1.766,000 MHz

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.

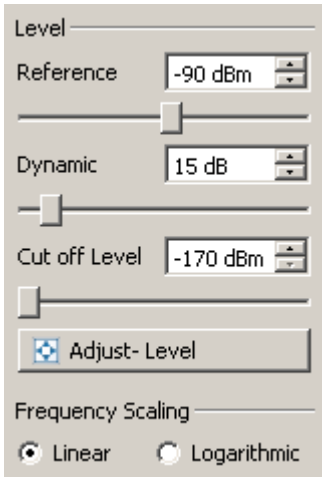
Waterfall Control and View

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

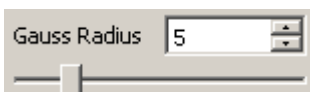


1 Level Controls

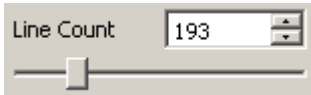


See [Scaling Controls \(1\)](#) and [Scaling Controls \(2\)](#)

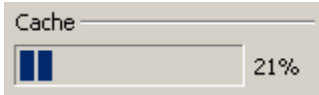
2 Gauss Radius



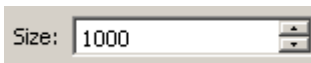
If this is set to a value higher than 1 it enables a graphical blur filter on the waterfall lines, which can be used to smooth small spikes. Note that the filter can require a lot of processing power, so only increase this value if your system can handle it.

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 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.

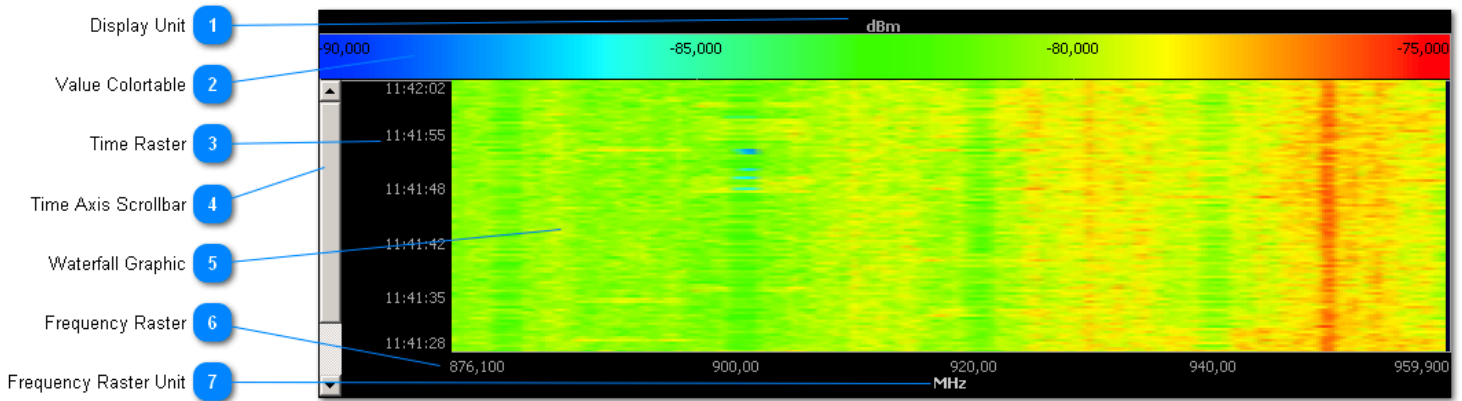
5 Cache Size

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).

6 Reset Waterfall

Discard all existing data of the waterfall.

Waterfall View



1 Display Unit

dBm

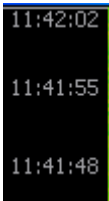
See [Value Display Unit in Spectrum View](#).

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



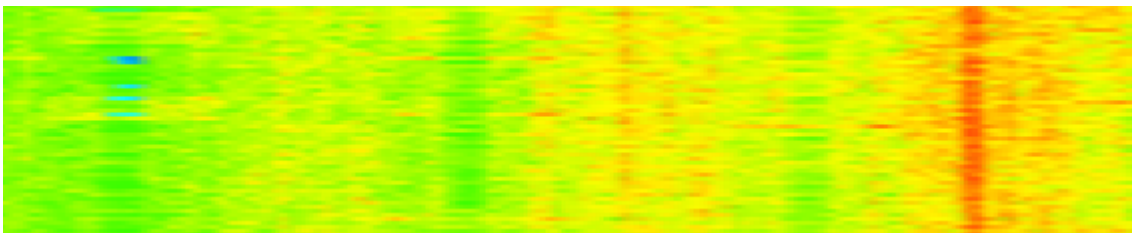
Indicates at which time the data of a given line was recorded. This is continuously updates as more data is recorded (or [replayed](#)).

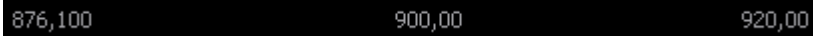
4 Time Axis Scrollbar



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

876,100 900,00 920,00

See [Frequency Raster in Spectrum View](#).

7 Frequency Raster Unit

MHz

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

The screenshot shows the Histogram Control panel with the following settings and callouts:

- 1 Level Controls:** Points to the Reference (-100 dBm), Dynamic (40 dB), and Cut off Level (-170 dBm) controls.
- 2 Raise Value on Match:** Points to the Raise control (set to 200).
- 3 Drain Value on Mismatch:** Points to the Drain control (set to 10).
- 4 Maximum Value:** Points to the Buffer size control (set to 2000).
- 5 Display Resolution:** Points to the Resolution control (set to 100%).
- 6 Gauss Radius:** Points to the Gauss Radius control (set to 3).
- 7 Peak Fading Time:** Points to the Fading Time control (set to 3).
- 8 Display Mode:** Points to the Display Mode controls (Points, Lines, Filled).
- 9 Reset Histogram Data:** Points to the Reset View button.

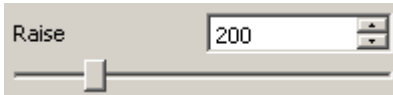
1 Level Controls

The close-up shows the Level Controls section with the following settings:

- Reference: -100 dBm
- Dynamic: 40 dB
- Cut off Level: -170 dBm
- Adjust- Level button
- Frequency Scaling: Linear (selected), Logarithmic

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

2 Raise Value on Match



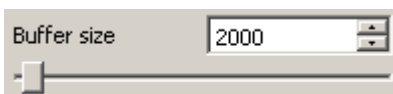
On a "positive hit" a point is increased by this value. Note that this is just an indicator, the exact value is also influenced by the current value of the point (points with high values are increased by a fraction of the value defined here).

3 Drain Value on Mismatch



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

4 Maximum Value



Maximum value a point can reach.

5 Display Resolution



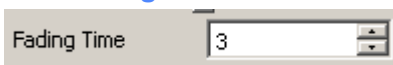
Select if the view should use the full physical display resolution for the matrix (so each point in the matrix corresponds to one pixel), or if a less detailed resolution should be used. Higher resolutions require more system resources for obvious reasons, so only increase this if your system can handle 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.

6 Gauss Radius



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

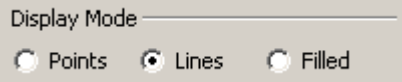
7 Peak Fading Time



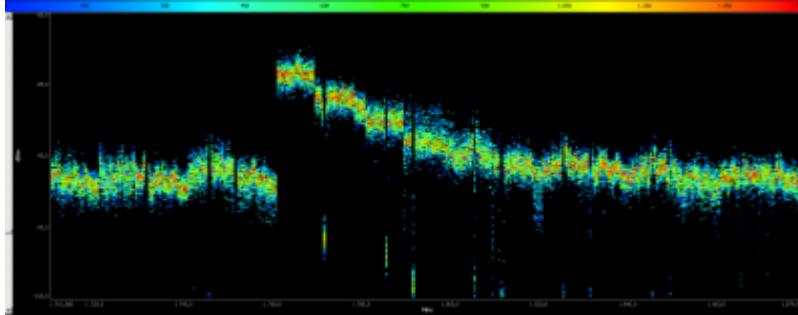
On measurements with fast sweeps (or replays) burst signals may disappear almost instantly, this value determines the minimum time (in seconds) a signal is visible in the view.

8

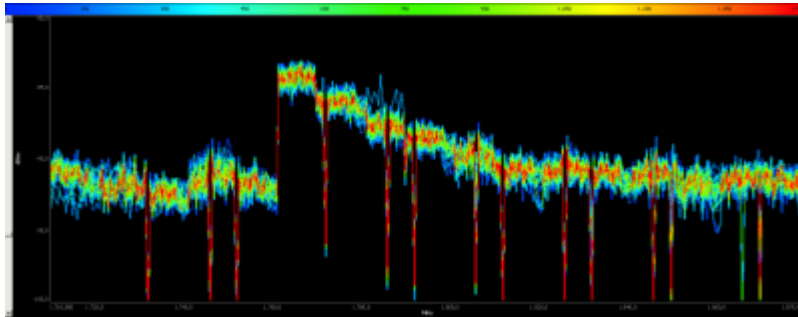
Display Mode



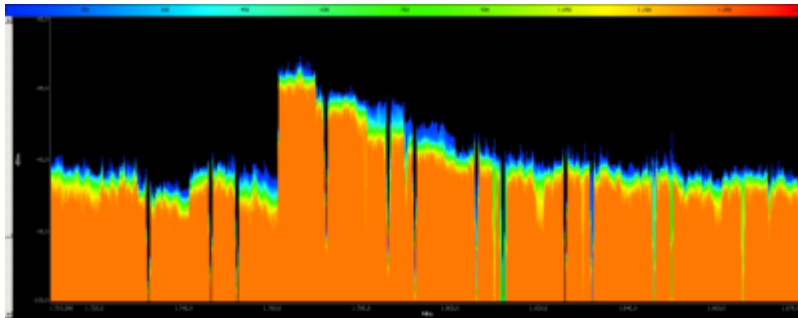
The Histogram View can display data in three different modes:



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.

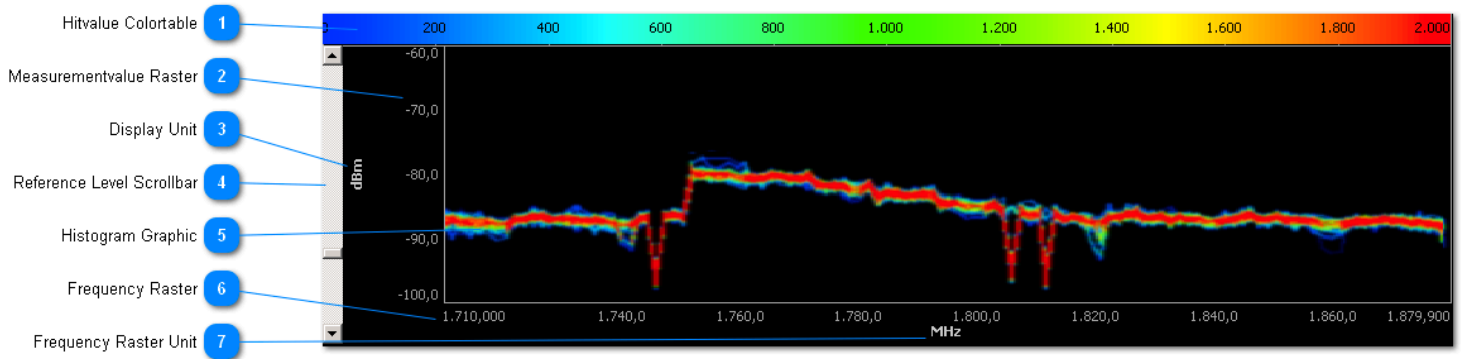
9

Reset Histogram Data

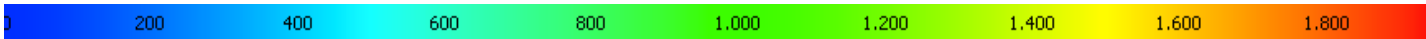


Clear all data and start a new statistic.

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

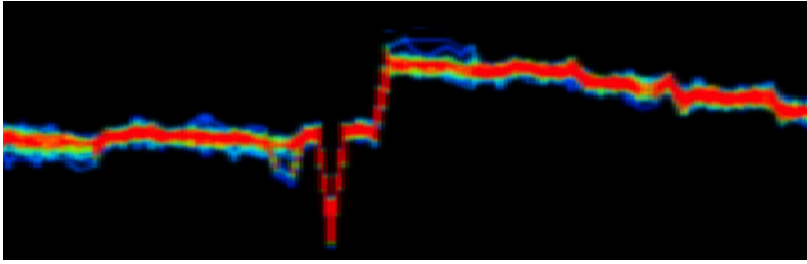


See [Value Raster Unit in Spectrum View](#)

4 Reference Level Scrollbar



See [Scrollbar for Reference Level in Spectrum View](#).

5 Histogram Graphic**6 Frequency Raster**

1.710,000 1.740,0 1.760,0

See [Frequency Raster in Spectrum View](#)

7 Frequency Raster Unit

MHz

See [Frequency Raster Unit in Spectrum View](#)

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

The screenshot shows the 'Limits Control' dialog box. It has a title bar 'Limit' and a dropdown menu showing 'EN55022 Class A'. To the right of the dropdown is a small icon (1). Below the dropdown is a 'Timeframe' field with a value of '360' and a slider (3). Below that are five checked checkboxes: 'Current' (4), 'Average' (5), 'Maximum' (6), 'Maximum Average' (7), and 'Maximum Absolute' (8). Below these is a 'Sum over' field with '1 Marker' (9). Below that is an 'Auto-Stop Countdown' field with '00:00:00' and an 'Enable' checkbox (10). Below that is a 'Scaling' section with a 'Max:' field set to '200%' and a 'Use Logarithmic Scaling' checkbox (11). At the bottom is a 'Reset View' button with a green circular icon (12). A 'Reset Data' button with a green circular icon (13) is located to the left of the dialog box. Labels on the left side of the image point to these numbered callouts: 'Timeframe for Average/Maximum Calculation' (3), 'Show Current Value' (4), 'Show Average Value' (5), 'Show Maximum Value' (6), 'Show Maximum Average Value' (7), 'Show Absolute Maximum Value' (8), 'Client-Area' (9), 'Auto-Stop Countdown' (10), 'Limit Scale Maximum Value' (11), 'Logarithmic Limit Scale' (12), and 'Reset Data' (13). Above the dialog box, 'Limit Selection' (2) points to the dropdown menu and 'Open Limit Editor' (1) points to the icon.

1 Open Limit Editor



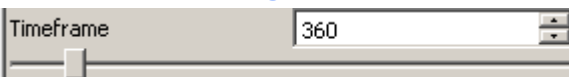
See [Limits Editor](#) menu entry.

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
 Maximum
 

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
 Maximum Average
 

Enable / Disable the comparison of the maximum [average](#) with the selected limit.

8 Show Absolute Maximum Value
 Maximum Absolute
 

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

9 Client-Area

Sum over

1 Marker
 

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

Auto-Stop Countdown

00:00:00 Enable
 


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

11 Limit Scale Maximum Value



Max:

200 %
 

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

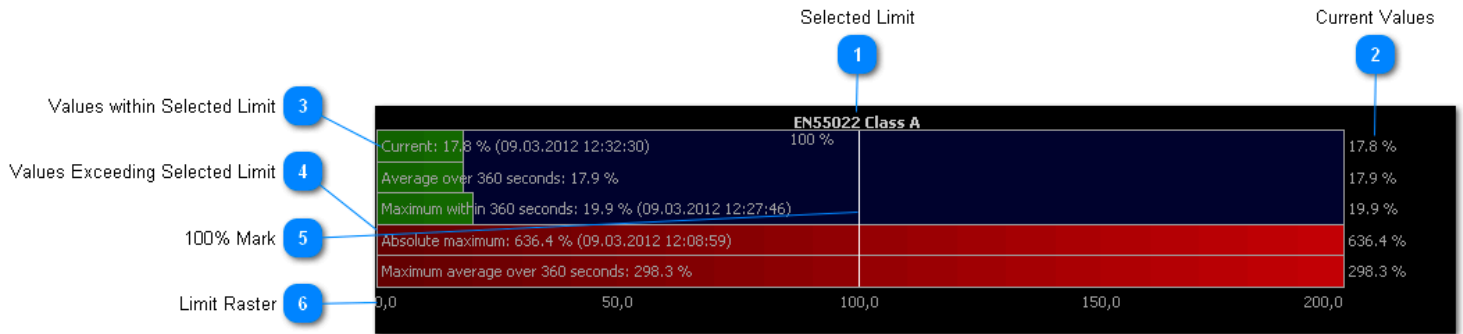
12 Logarithmic Limit Scale
 Use Logarithmic Scaling
 

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 Reset Data
 Reset View
 

Restart the limit comparison.

Limits View



1 Selected Limit

EN55022 Class A

Displays the name of the currently selected limit.

2 Current Values

17,8 %
17,9 %
19,9 %
636,4 %
298,3 %

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

Current: 17,8 % (09.03.2012 12:32:30) 100 %
Average over 360 seconds: 17,9 %
Maximum within 360 seconds: 19,9 % (09.03.2012 12:27:46)

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

Absolute maximum: 636,4 % (09.03.2012 12:08:59)
Maximum average over 360 seconds: 298,3 %

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

100 %
100,0

When the [selected scaling](#) exceeds 100% a reference marker is shown at the 100% position.



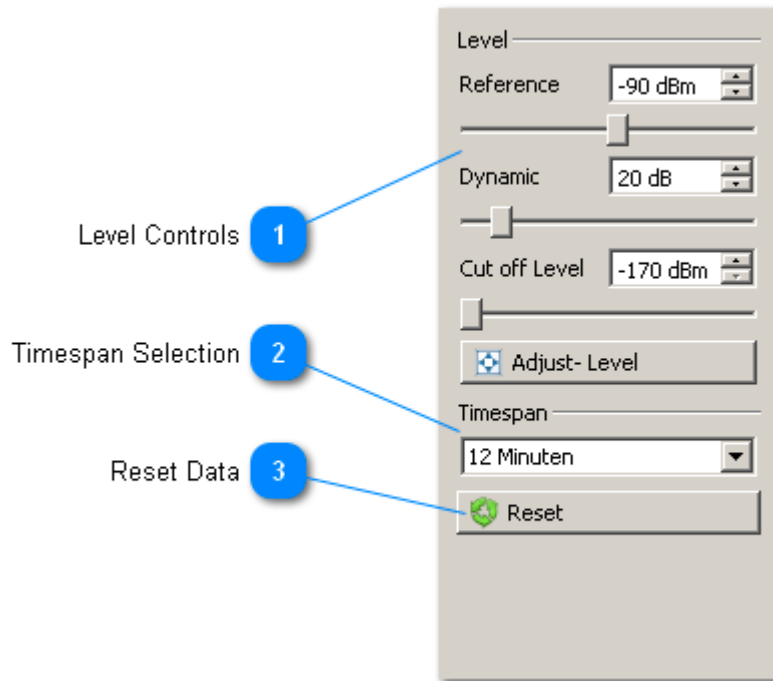
Limit Raster



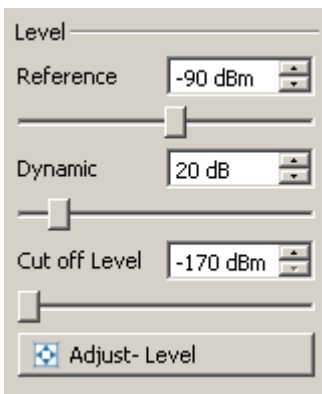
Daylog Control and View

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



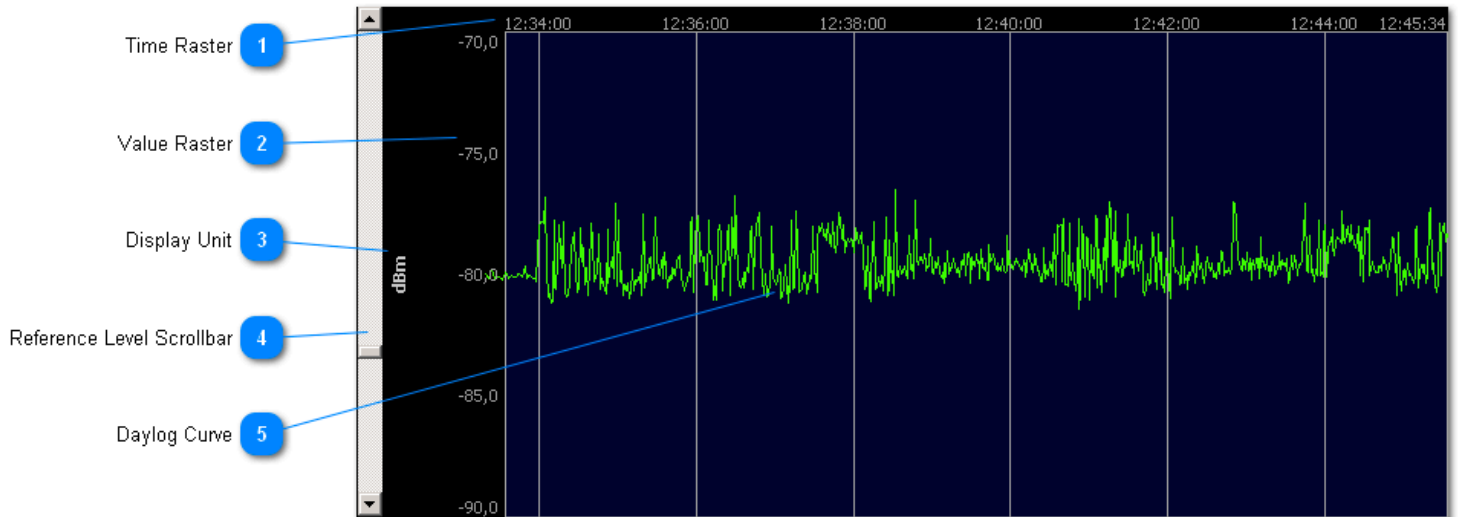
Select the timeframe that is displayed in the view.

3 Reset Data



Discard existing data and restart recording.

Daylog View

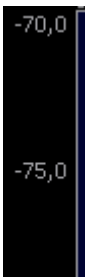


1 Time Raster



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

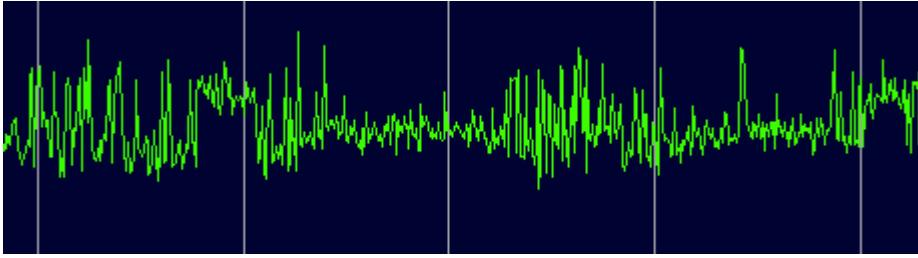


See [Value Raster Unit in Spectrum View](#)

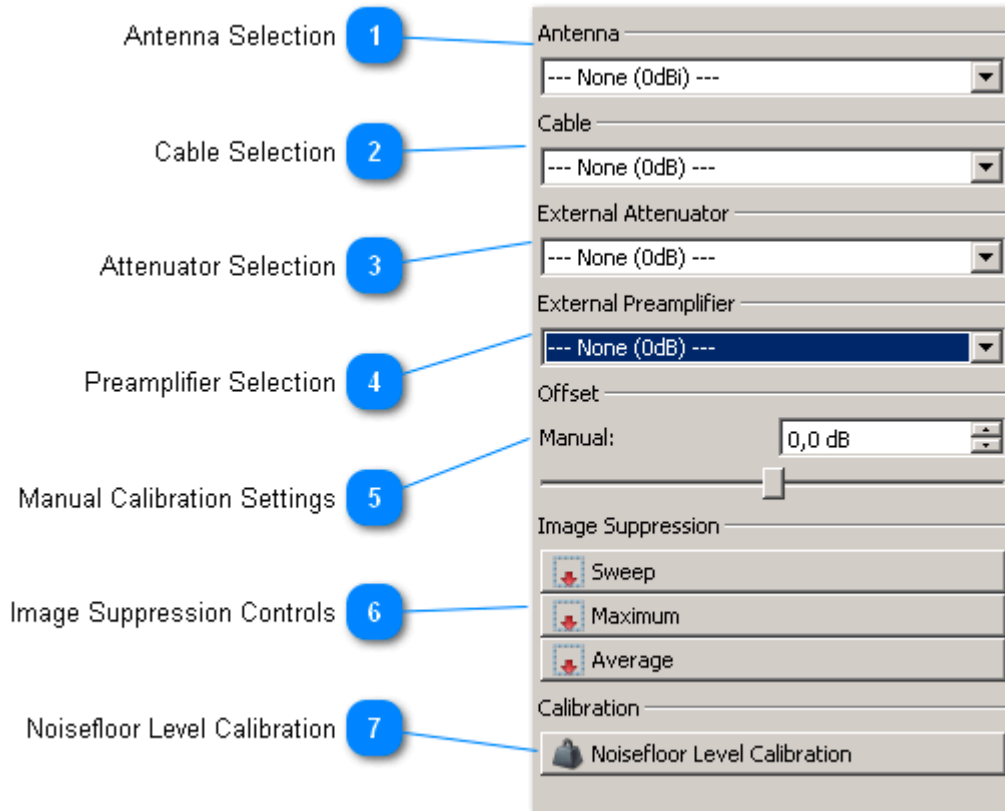
4 Reference Level Scrollbar



See [Reference Level Scrollbar in Spectrum View](#)

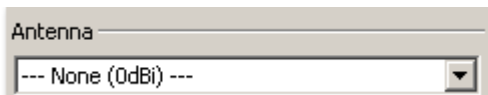
5 Daylog Curve

Calibration Control



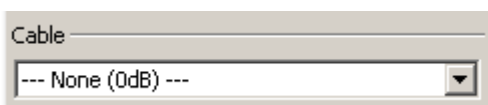
With the Calibration Control you can tell the MCS software what Antenna, Cable and other equipment you have connected to your Spectran device, so amplifying and damping effects can be accounted for in the displayed results. If the selected settings do not fully cover the current measurement spectrum 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



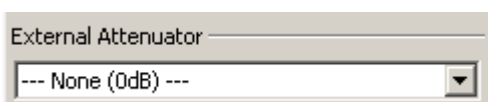
Select the antenna that is attached to the current device.

2 Cable Selection



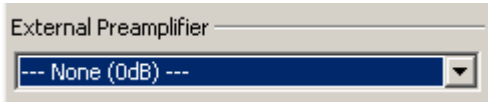
Select the cable that is attached to the current device.

3 Attenuator Selection



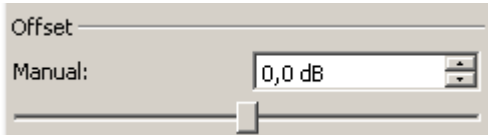
Select the external attenuator that is attached to the current device. The internal attenuator setting is selected in the [Settings Control](#).

4 Preamplifier Selection



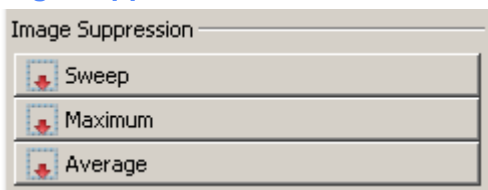
Select the external preamplifier that is attached to the current device. The internal preamplifier of some devices is enabled / disabled in the [Settings Control](#).

5 Manual Calibration Settings



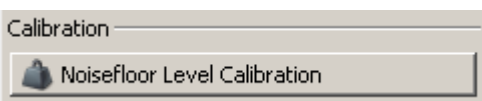
Add a manual offset to all measurement values to compensate for effects or devices not covered by the previous sections above.

6 Image Suppression Controls



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

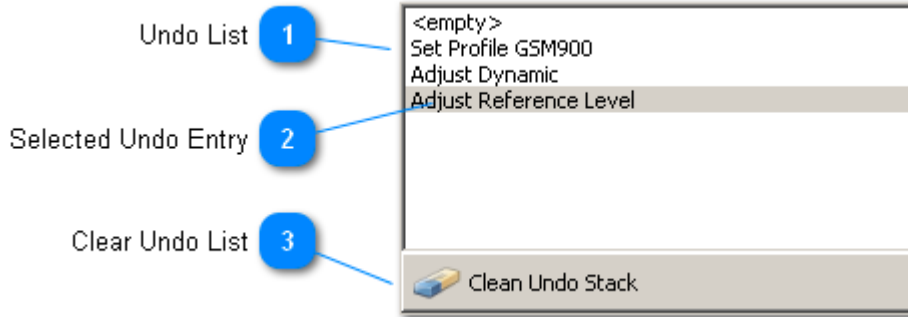
7 Noisefloor Level Calibration



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

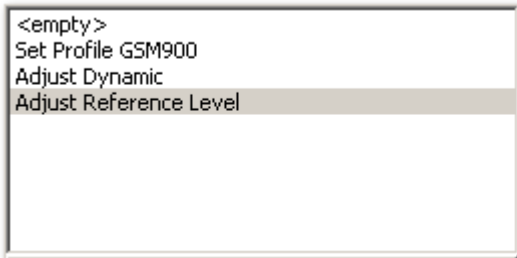
This operation cannot be undone! To restore the default calibration the device has to be sent in!

Undo / Redo Control



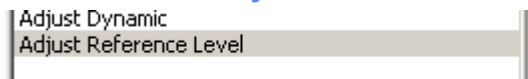
The Undo / Redo Control simply lists the actions that can be undone, allows you to select a certain point to go back to and to clear the list of actions.

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 about 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.

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 simultaneously. 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

The screenshot shows the 'Device Information' dialog box with the following fields and callouts:

- 1** Device Model: Points to the 'Model' field containing 'NF-5035'.
- 2** Device Description: Points to the 'Description' field containing 'Aaronia SPECTRAN NF-5035 Analyzer'.
- 3** Device Serial Number: Points to the 'Serial' field containing '01660'.
- 4** Current Firmware Version: Points to the 'Current Firmware' field containing 'V1.0'.
- 5** First Firmware Version: Points to the 'First Firmware' field containing 'Beta 50'.
- 6** Board Revision: Points to the 'Board Revision' field containing '1.2'.
- 7** Device Calibration Date: Points to the 'Calibration Date' field containing '24.11.2010'.
- 8** Firmware Update History: Points to the 'Firmware Updates' text area containing 'V1.0 (24.08.2011 13:48:20)'.
- 9** Device Hardware Options: Points to the 'Installed Options' list.
- 10** Close Dialog: Points to the 'Close' button at the bottom right.

The 'Installed Options' list includes:

- 001 (Memory Expansion 1 MB)
- 005 (12 Bit DDC Filter)
- 006 (3D-Sensor)
- 008 (20 MHz Extension)
- 009 (24 Bit Resolution for 3D-Sensor)
- 010 (30 MHz Extension)

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

Model:

Complete model string including device type

2 Device Description

Description: Aaronia SPECTRAN NF-5035 Analyzer

Description as displayed in the connection manager.

3 Device Serial Number

Serial: 01660

Serial number of the device used to identify it by Aaronia

4 Current Firmware Version

Current Firmware: V1.0

Firmware version currently used on the device.

5 First Firmware Version

First Firmware: Beta 50

Firmware version with which the device was originally programmed

6 Board Revision

Board Revision: 1.2

Exact version of the device board

7 Device Calibration Date

Calibration Date: 24.11.2010

Date when the device was last calibrated completely.

8 Firmware Update History

Firmware Updates: V1.0 (24.08.2011 13:48:20)

List of all performed firmware updates including date.

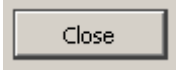
9 Device Hardware Options

Installed Options

- 001 (Memory Expansion 1 MB)
- 005 (12 Bit DDC Filter)
- 006 (3D-Sensor)
- 008 (20 MHz Extension)
- 009 (24 Bit Resolution for 3D-Sensor)
- 010 (30 MHz Extension)

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.

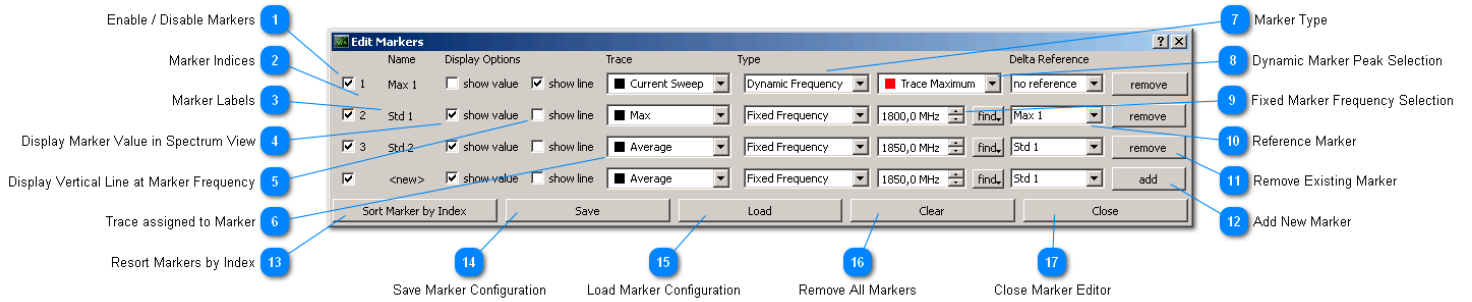
Marker Frequency Selection

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:

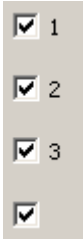
- „center frequency“: This simply sets the marker to the center of the current spectrum
- „find trace maximum“: Selects the frequency of the current peak of the assigned trace, similar to a Dynamic Trace Maximum marker. However once found the marker will stay at that frequency while the Dynamic Marker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

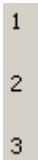


1 Enable / Disable Markers



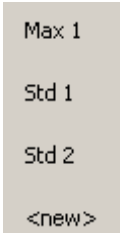
Each existing Marker can be enabled / disabled individually with the checkbox on the left.

2 Marker Indices



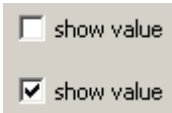
Displays the unique index number of each Marker that will be used in the [Spectrum View](#).

3 Marker Labels



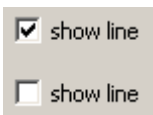
Displays the label that will be used in the [Marker Legend](#) in the Spectrum View

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 IndexA rectangular button with a light gray background and a thin black border, containing the text "Sort Marker by Index" in a standard sans-serif font.

Resort Markers in the editor by ascending index order, so they have the same order as in the [Marker Legend](#).

14 Save Marker ConfigurationA rectangular button with a light gray background and a thin black border, containing the text "Save" in a standard sans-serif font.

Store the current Marker configuration on disk.

15 Load Marker ConfigurationA rectangular button with a light gray background and a thin black border, containing the text "Load" in a standard sans-serif font.

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

16 Remove All MarkersA rectangular button with a light gray background and a thin black border, containing the text "Clear" in a standard sans-serif font.

Remove all currently configured markers.

17 Close Marker EditorA rectangular button with a light gray background and a thin black border, containing the text "Close" in a standard sans-serif font.

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.

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.

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 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.

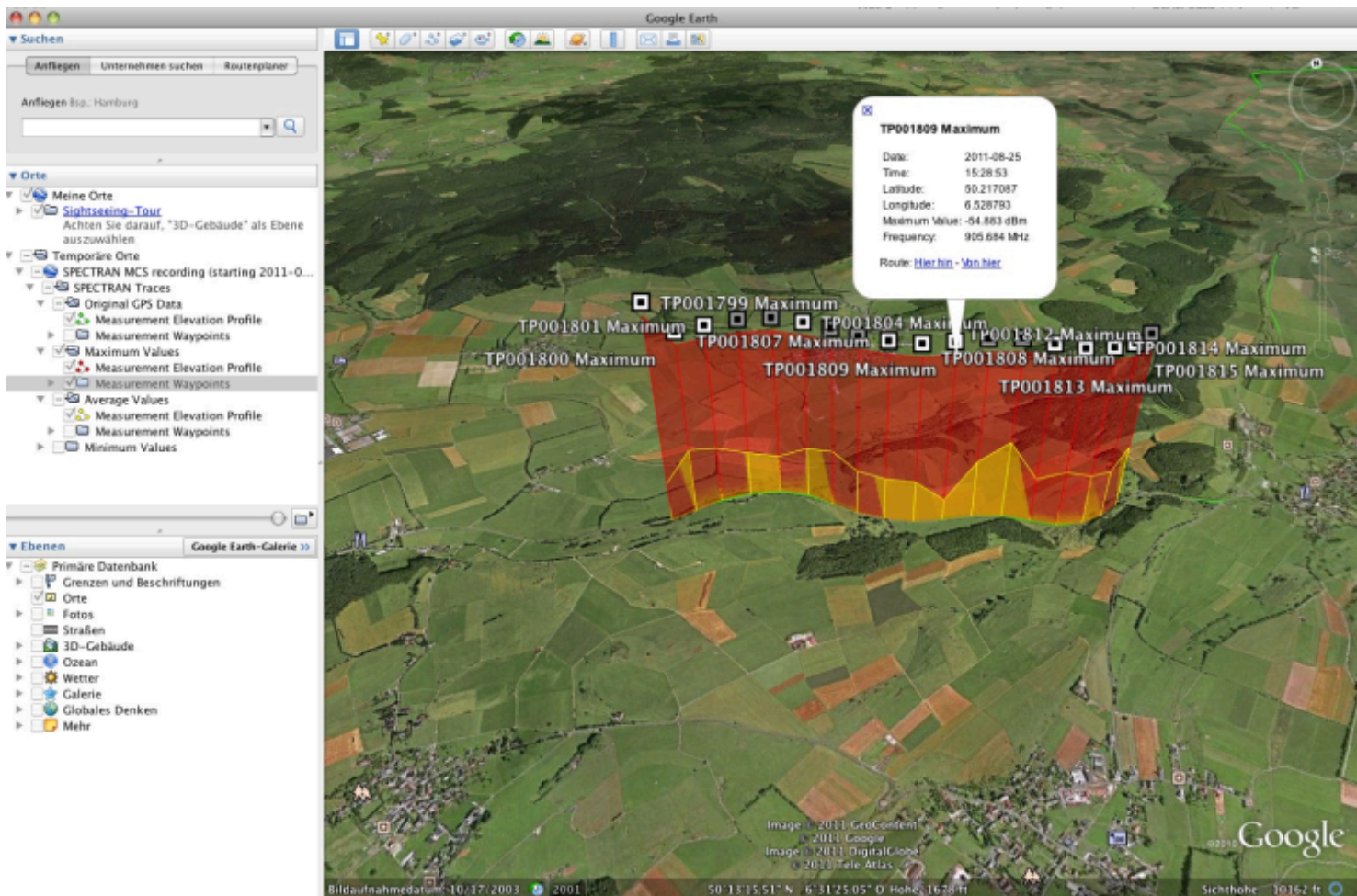
To generate a Google Earth file select the [Generate Mapfile](#) menu entry. It will open a [dialog](#) where you can select

- the GPX 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.

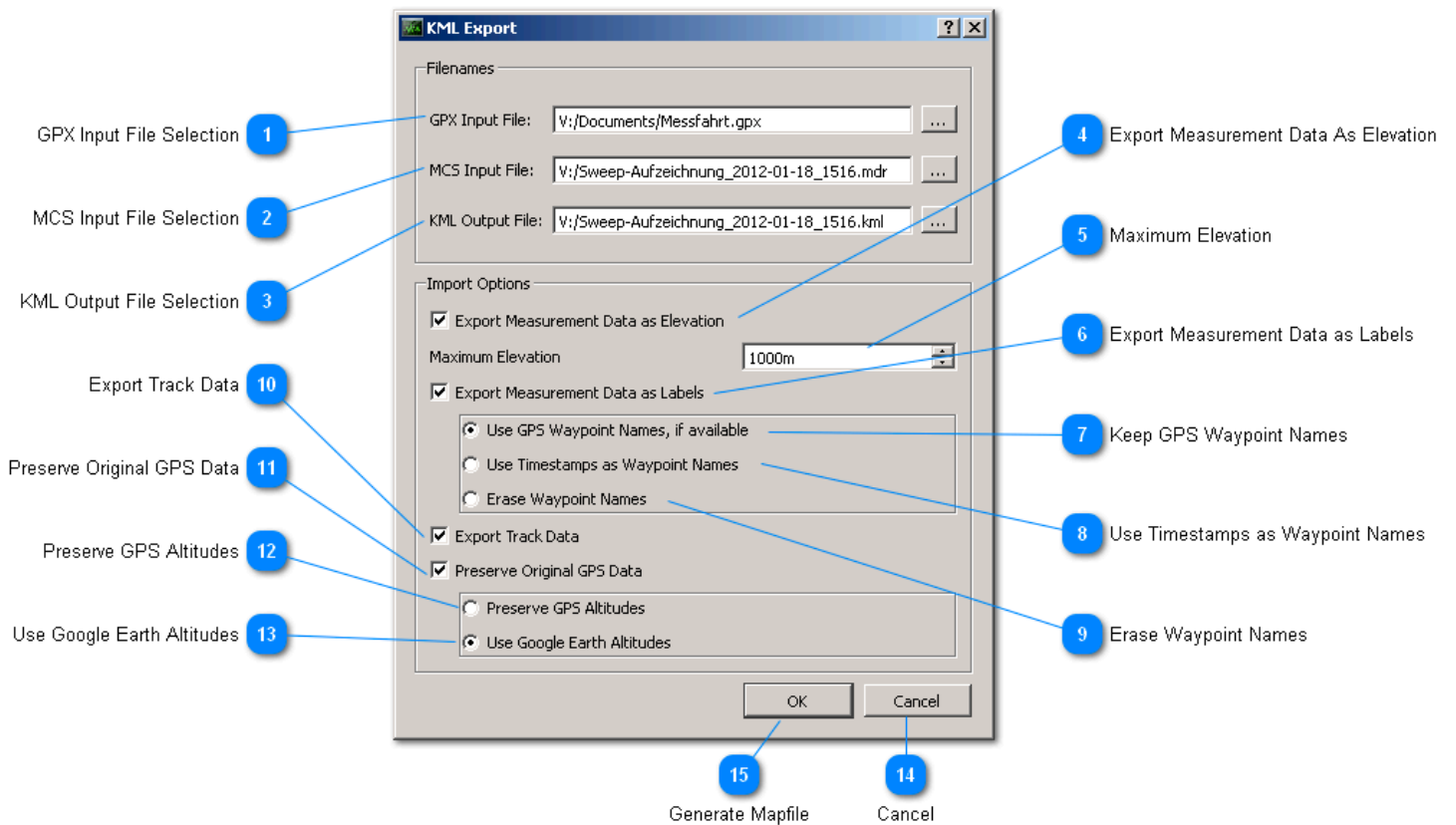
After you confirmed the dialog with the [OK](#) button the MCS will try to match entries of the GPX file with entries of the measurement logfile and display a messagebox stating how many GPX entries were used for this. If no matches could be found the timestamps in the two files are probably not compatible.

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

GPX Input File: ...

Select the GPX input file that contains the logged coordinates.

2 MCS Input File Selection

MCS Input File: ...

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

KML Output File: ...

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

4 Export Measurement Data As Elevation

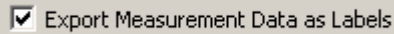
Export Measurement Data as Elevation

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 ElevationA screenshot of a software interface showing a text input field labeled "Maximum Elevation" with the value "1000m" entered. The field has a small dropdown arrow on the right side.

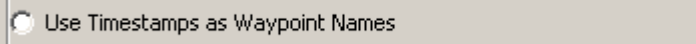
Define the maximum elevation value to be used for [visualizing measurement values](#).

6 Export Measurement Data as LabelsA screenshot of a software interface showing a checkbox labeled "Export Measurement Data as Labels" which is checked.

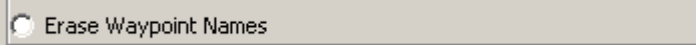
Create labels for each merged measurement record. If disabled you must enable [Export Measurement Data as Elevation](#) or the resulting KML file will be empty.

7 Keep GPS Waypoint NamesA screenshot of a software interface showing a radio button labeled "Use GPS Waypoint Names, if available" which is selected.

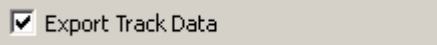
Use the labels defined in the GPX file also in the KML file. If the GPX file doesn't define any labels the generator will use timestamps instead.

8 Use Timestamps as Waypoint NamesA screenshot of a software interface showing a radio button labeled "Use Timestamps as Waypoint Names" which is unselected.

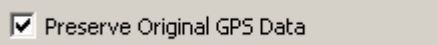
Rename merged waypoints with their timestamp.

9 Erase Waypoint NamesA screenshot of a software interface showing a radio button labeled "Erase Waypoint Names" which is unselected.

Create waypoints without names.

10 Export Track DataA screenshot of a software interface showing a checkbox labeled "Export Track Data" which is checked.

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

11 Preserve Original GPS DataA screenshot of a software interface showing a checkbox labeled "Preserve Original GPS Data" which is checked.

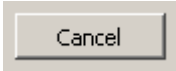
Copy the original GPS track into the KML file.

12 Preserve GPS AltitudesA screenshot of a software interface showing a radio button labeled "Preserve GPS Altitudes" which is unselected.

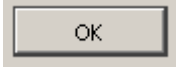
When selected copies the recorded GPS altitude into the KML file. This may put values above or below ground in the viewing application, so you should only enable this when needed.

13 Use Google Earth AltitudesA screenshot of a software interface showing a radio button labeled "Use Google Earth Altitudes" which is selected.

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

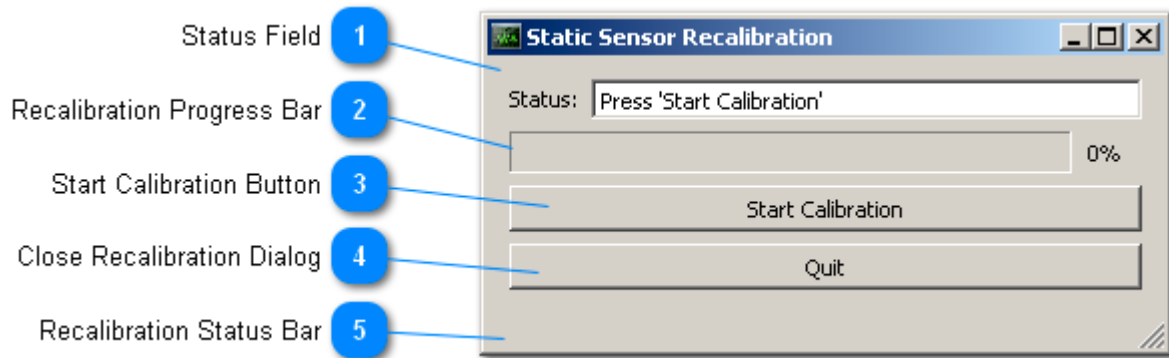
NF Spectran devices can include an optional 3D Static Sensor to measure magnetic fields. By default this sensor is calibrated at zero-level so you can get absolute readings. In some cases you may however want to see relative readings against a known environment level instead, for those situations the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

Status: Press 'Start Calibration'

Displays the current step in the calibration process.

2 Recalibration Progress Bar

0%

Displays the current status of the calibration.

3 Start Calibration Button

Start Calibration

Start the calibration process.

4 Close Recalibration Dialog

Quit

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

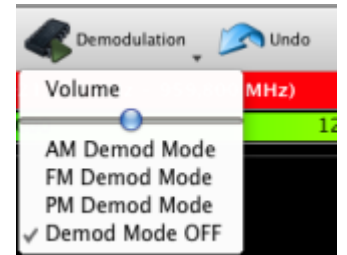
5 Recalibration Status Bar

Displays various informational messages during the calibration.

Signal Demodulation

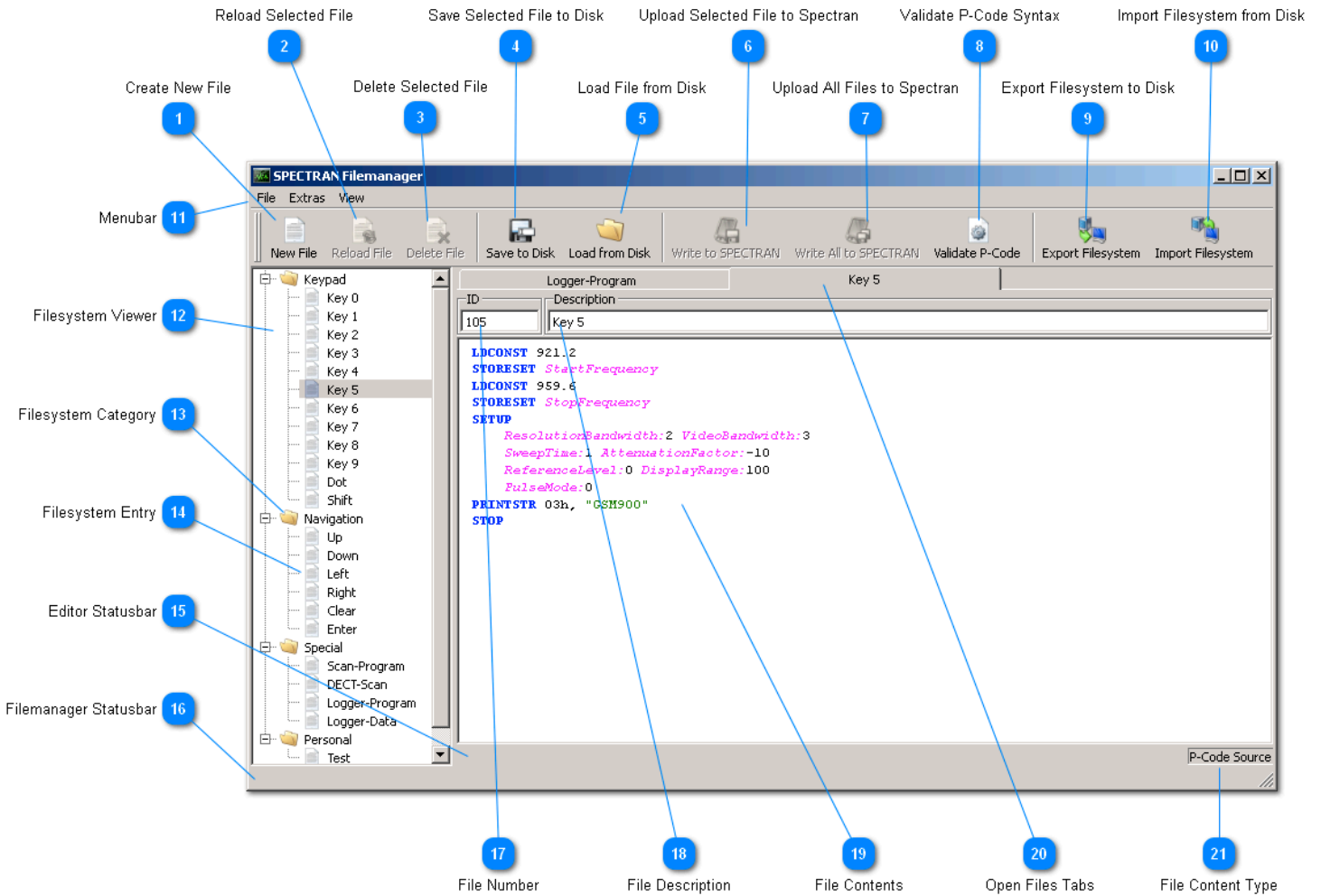
Most Spectran devices provide one or more demodulation modes to output signals over the internal speaker. These can be selected with the [Demodulation](#) menu, there you can also control the volume of the speaker. Please see your Spectran Manual for details on the different demodulation modes.

While demodulation is enabled the device will not send measurement data to the MCS, so views will not be updated until demodulation is disabled.



Spectran Filemanager

SPECTRAN Filemanager Window



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.

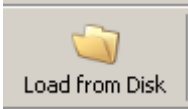
3 Delete Selected File



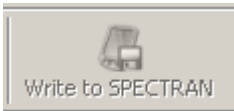
Remove the currently open file from the Spectran filesystem.

4 Save Selected File to Disk

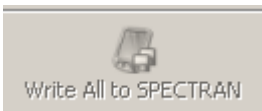
Save the currently open file as ASCII text on disk, so you can open it in your favourite editor.

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

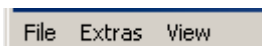
Check the current file for P-Code syntax errors.

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



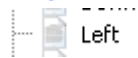
Lists the available files (usually P-Code programs) in the Spectran filesystem.

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



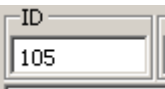
Messages from editing the currently open file are listed here

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



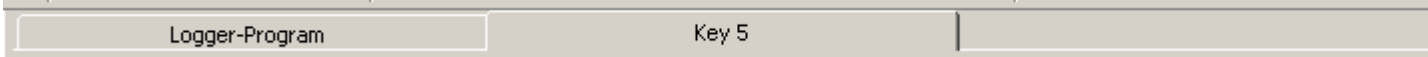
With the MCS Spectran Filemanager you can assign each file a user-friendly description. This is a MCS specific feature, so the description may not be available in other applications.

19 File Contents

```
LDCONST 921.2
STORESET StartFrequency
LDCONST 959.6
STORESET StopFrequency
SETUP
  ResolutionBandwidth:2 VideoBandwidth:3
  SweepTime:1 AttenuationFactor:-10
  ReferenceLevel:0 DisplayRange:100
  PulseMode:0
PRINTSTR 03h, "GSM900"
STOP
```

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

P-Code Source

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. For this the Spectran must be connected to a system that runs the [Spectran Network Server](#) and 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 system running the [Spectran Network Server](#), select the port where the server is configured to listen and click connect. If all went right the MCS establishes a network connection to the Spectran Server 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.

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.

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. You can assign specific colors to sections using the [Channel Editor](#).

Peak Suppression Enabled

If enabled (the default) the MCS will automatically enable the [Peak Suppression](#) for new device connections. 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.

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.

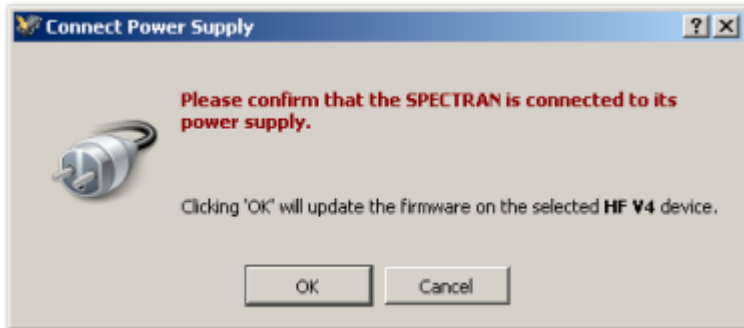
For technical reasons the Spectran Firmware Updater is currently only available for Windows systems. The Firmware Updater is also available as a [standalone package on the Aaronia website](#) that is updated independent of the MCS.

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](#).

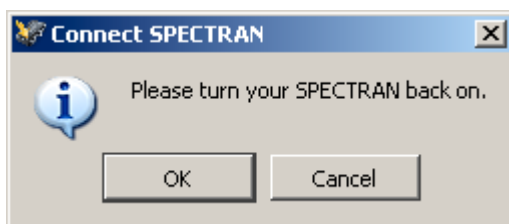
Note: For technical reasons the update process can only work correctly if *exactly one* Spectran USB device is connected to the system. If more than one (or no) device is connected the program will display an error message when scanning the device list.

Firmware Update Process

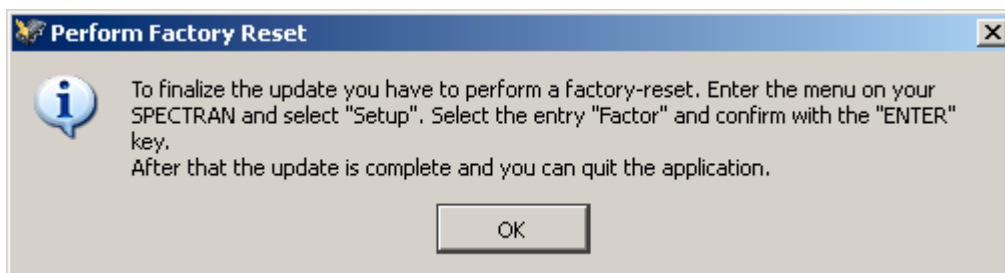
The update process is started by clicking the [Perform Firmware Update](#) button in the main window. This will perform various sanity checks that may require confirmation, like when attempting to downgrade the firmware or using a firmware that the program considers incompatible with the current device. 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.



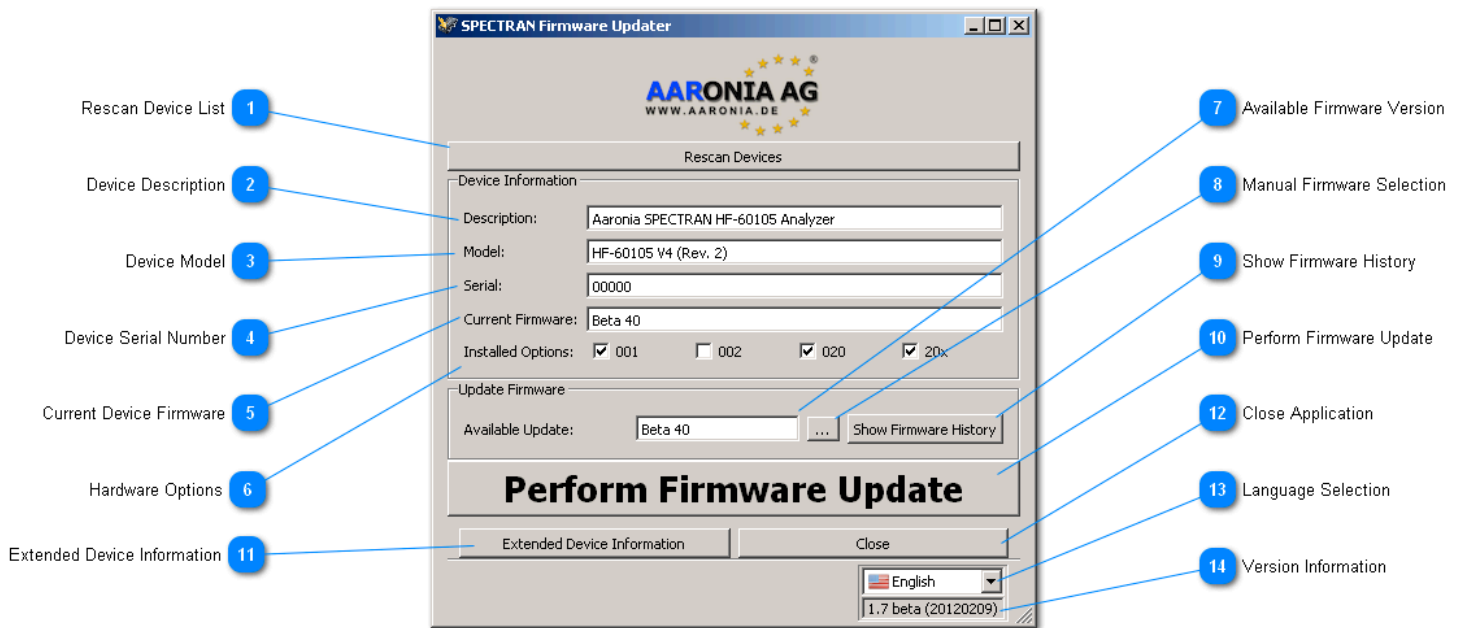
When started a new [dialog](#) will be displayed to show the current status, and any errors that may be encountered. While the update is performed it is recommended to not use other applications on the system to minimize the risk of interference or operating system problems. When the update dialog is 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.**



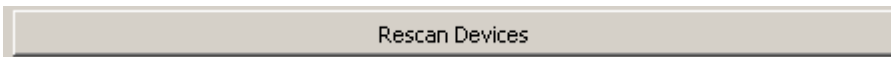
As a last step it is strongly recommended to perform a factory reset of the device, to ensure that hotkey assignments and other settings are fully updated.



SPECTRAN Firmware Updater Window



1 Rescan Device List



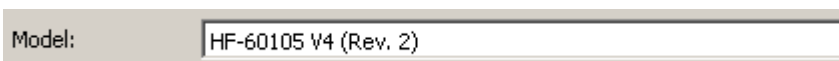
Force a rescan of the currently connected devices.

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



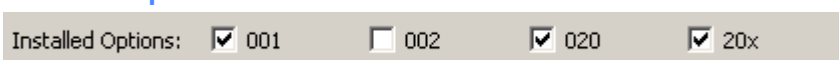
The serial number of the connected device.

5 Current Device Firmware

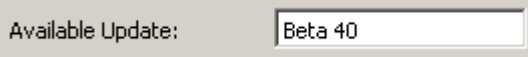


The version number of the firmware currently running on the device as detected by the Firmware Updater.

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

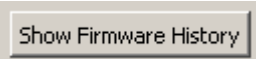
Available Update:

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

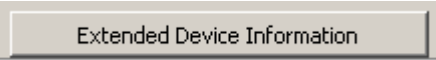
Show Firmware History

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

10 Perform Firmware Update

Perform Firmware Update

Start the actual [update process](#).

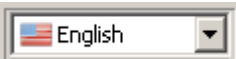
11 Extended Device Information

Extended Device Information

Open the [Detailed Device Information](#) dialog for the selected device.

12 Close Application

Close

13 Language Selection

English

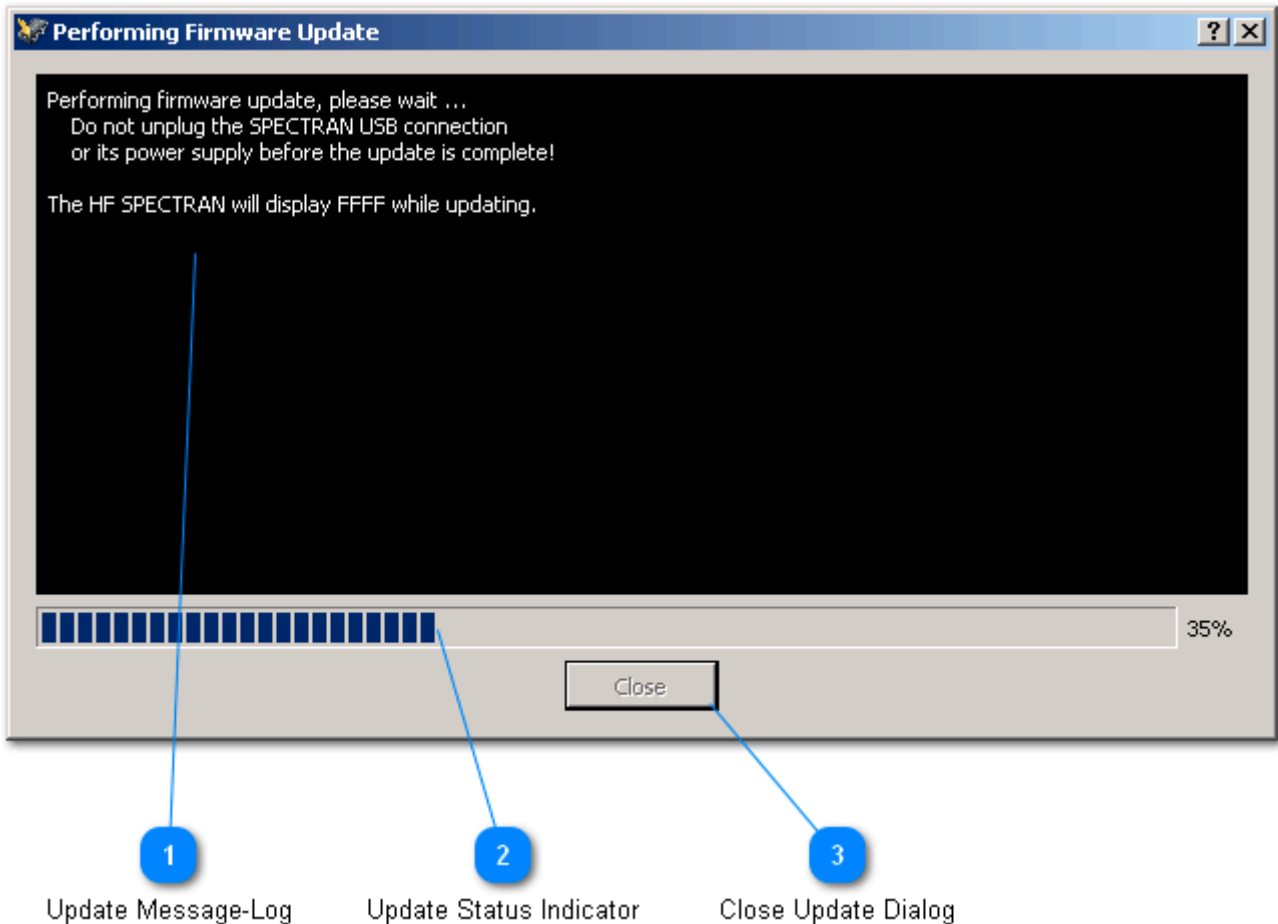
You can change the language of the user interface in this checkbox.

14 Version Information

1.7 beta (20120209)

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

Update Progress Dialog



1 Update Message-Log

Performing firmware update, please wait ...
Do not unplug the SPECTRAN USB connection
or its power supply before the update is complete!

The HF SPECTRAN will display FFFF while updating.

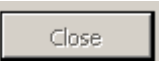
Shows informational and error messages about the update process.

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 occurred. 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.

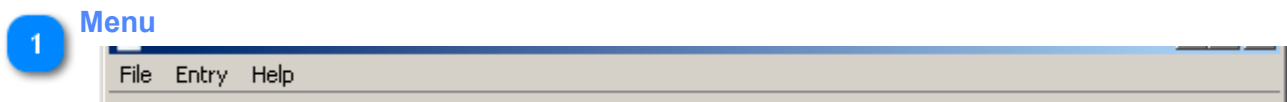
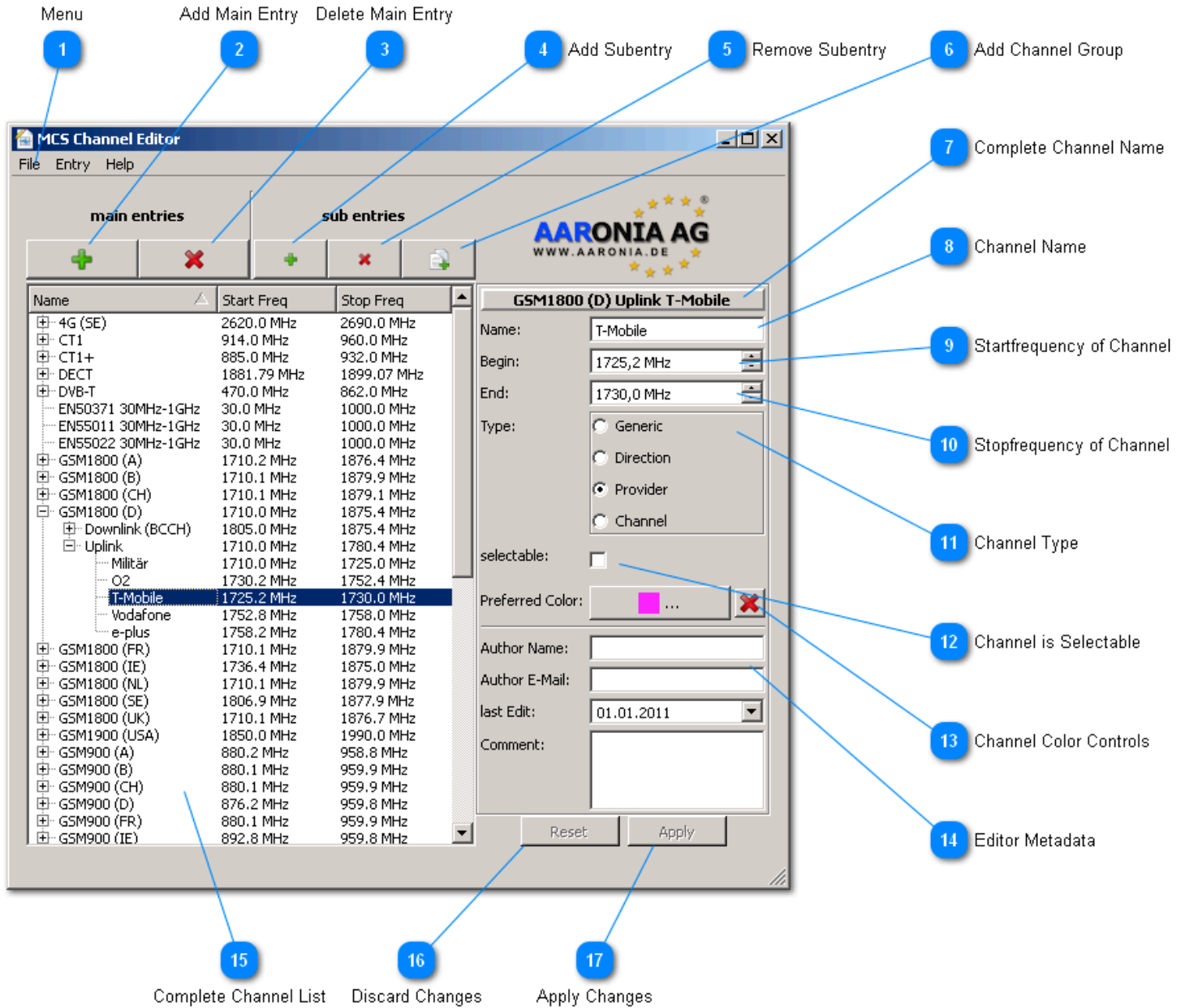
Channel Editor

The Channel Editor is a tool that allows you to modify the MCS database of channel and provider definitions used by the [Channel Info Overlay](#). You can access it either the same way you started the MCS, or from within the MCS using the [Channel Editor](#) menu entry. Note though that either way the channel editor is an external application, and you have to restart the MCS to load a modified channelinfo database (also see below on "storage locations").

Storage Locations

When you edit the channelinfo 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 channelinfo database must be located within a `data` folder in the [MCS User directory](#), and must be named `channelinfo.xml`. For example if your MCS user directory is `C:\Users\myname\MCS` you should save your changes under `C:\Users\myname\MCS\data\channelinfo.xml` or the MCS won't see them.

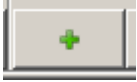
Channel Editor Window



Create a new toplevel entry.



Remove the selected entry.

4 Add Subentry

Add a new channel entry with the selected entry as parent.

5 Remove Subentry

Remove the selected entry.

6 Add Channel Group

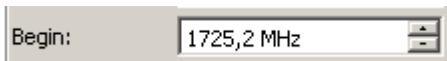
Open the Channel Group Creation dialog to create a group of channel definitions by startfrequency and channel width (for example: create 20 channels starting at 25 MHz, and each channel being 0.5 MHz wide).

7 Complete Channel Name

Display the full name of the selected channel entry, generated by the simple names of the entry and its parent entries.

8 Channel Name

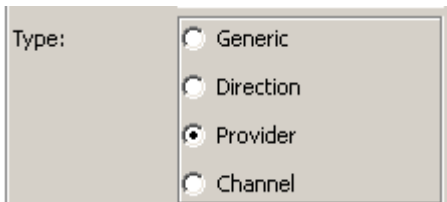
The simple name of the selected channel entry.

9 Startfrequency of Channel

Frequency where this channel definition starts.

10 Stopfrequency of Channel

Frequency where this channel definition ends.

11 Channel Type

The type of channel being defined. This can affect how the entry is later displayed / positioned in the [Channel Info Overlay](#).

12 Channel is Selectable

 selectable:

Controls if the current entry should show up for selection in the Spectrum Control (Note: the relevant control is hidden in current MCS versions. Channels are currently activated based on selected [sweep profiles](#))

13 Channel Color Controls

 Preferred Color: ... ✖

Select or remove a specific color (like the Provider Logo color) to the current channel entry to be used in the [Channel Overlay](#).

14 Editor Metadata

Author Name:	<input type="text"/>
Author E-Mail:	<input type="text"/>
last Edit:	01.01.2011 ▼
Comment:	<input style="width: 100%; height: 40px;" type="text"/>

Optional extra information about the author of the current channel entry. This information is not used by the MCS.

15 Complete Channel List

Name	Start Freq	Stop Freq
⊕ 4G (SE)	2620.0 MHz	2690.0 MHz
⊕ CT1	914.0 MHz	960.0 MHz
⊕ CT1+	885.0 MHz	932.0 MHz
⊕ DECT	1881.79 MHz	1899.07 MHz
⊕ DVB-T	470.0 MHz	862.0 MHz
EN50371 30MHz-1GHz	30.0 MHz	1000.0 MHz
EN55011 30MHz-1GHz	30.0 MHz	1000.0 MHz

All currently existing channel entries are listed in this tree structure, including their respective [start-](#) and [stopfrequencies](#).

You can sort the list by name or frequency using the table headers.

16 Discard Changes

If you modified the current channel entry you can discard your changes with this button.

17 Apply Changes

Apply your changed to the current channel entry. Note that you still have to save the file to make the changes permanent.

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 you have to restart the MCS to load a modified limits database (also see below on storage locations).

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

Limit Description

Limit Curve Preview

Limit Value List

Add Limit Value

Remove Limit Value

Application Menu 1

Add Range button 2

Delete Range button 3

Limit Definition List 4

Selected Limit 5

Limit Definition Label 6

Start of Limit Definition 7

End of Limit Definition 8

Unit of Limit Values 9

Adjust Limit Values 10

Select Limit Curve Color 11

Limit Levels

End Frequency	Value	Interpolation
230,0 MHz	0,000316228 V/m	Off
1000,0 MHz	0,000707946 V/m	Off

1 Application Menu

File Range

2 Add Range button



Add a new limit definition range.

3 Delete Range button



Remove the selected limit definition.

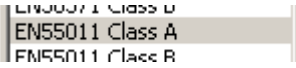
4 Limit Definition List

```

EN50371 Class A
EN50371 Class B
EN55011 Class A
EN55011 Class B
EN55022 Class A
EN55022 Class B
  
```

List of currently defined limit definitions

5 Selected Limit



Currently selected limit definition.

6 Limit Definition Label

Name: EN55011 Class A

Name of the current limit definition.

7 Start of Limit Definition

Begin: 30,0 MHz

Frequency where the limit definition begins.

8 End of Limit Definition

End: 1000,0 MHz

Frequency where the limit definition ends.

9 Unit of Limit Values

Unit: V/m

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

adjust levels

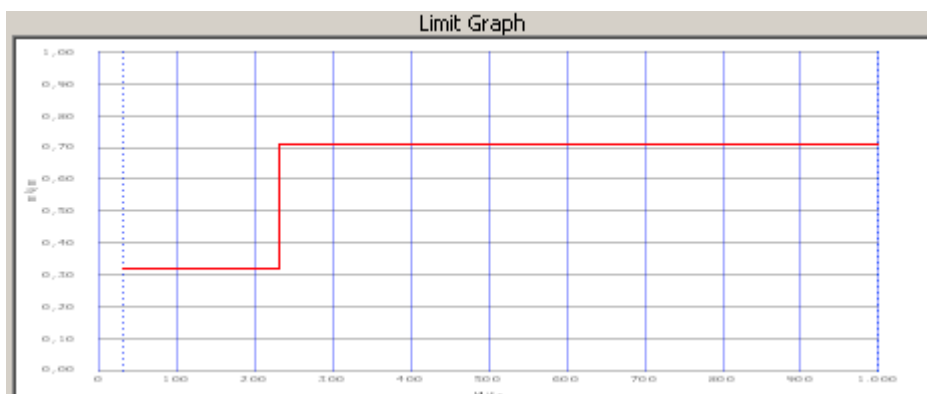
When enabled, the editor will automatically convert existing limit levels when the [unit](#) is changed.
Warning: converting to another unit and then converting back will not always result in the original values.

11 Select Limit Curve Color

change Color


Select a specific color to be used for the [Spectrum View Limit Curve](#).

12 Limit Curve Preview



A simple preview how the Limit curve of the current definition would look in the [Spectrum View](#), using an auto-generated raster. It is currently not possible to adjust the display parameters of this preview.

13 Limit Description



You can provide an informational description about the limit definition here.

14 Limit Value List

End Frequency	Value	Interpolation
230,0 MHz	0,000316228 V/m	Off
1000,0 MHz	0,000707946 V/m	Off

List of different levels defined in the currently selected range, including the frequency up to which the level should be used (the start frequency is selected automatically based on the other levels), the maximum value that may be measured and whether the limit should interpolate actual limit values based on the current frequency (currently only a linear interpolation is available), so that instead of jumping from one level to another there is a smooth transition.

To edit a value simply double-click on it.

15 Add Limit Value



Add a new limit level

16 Remove Limit Value



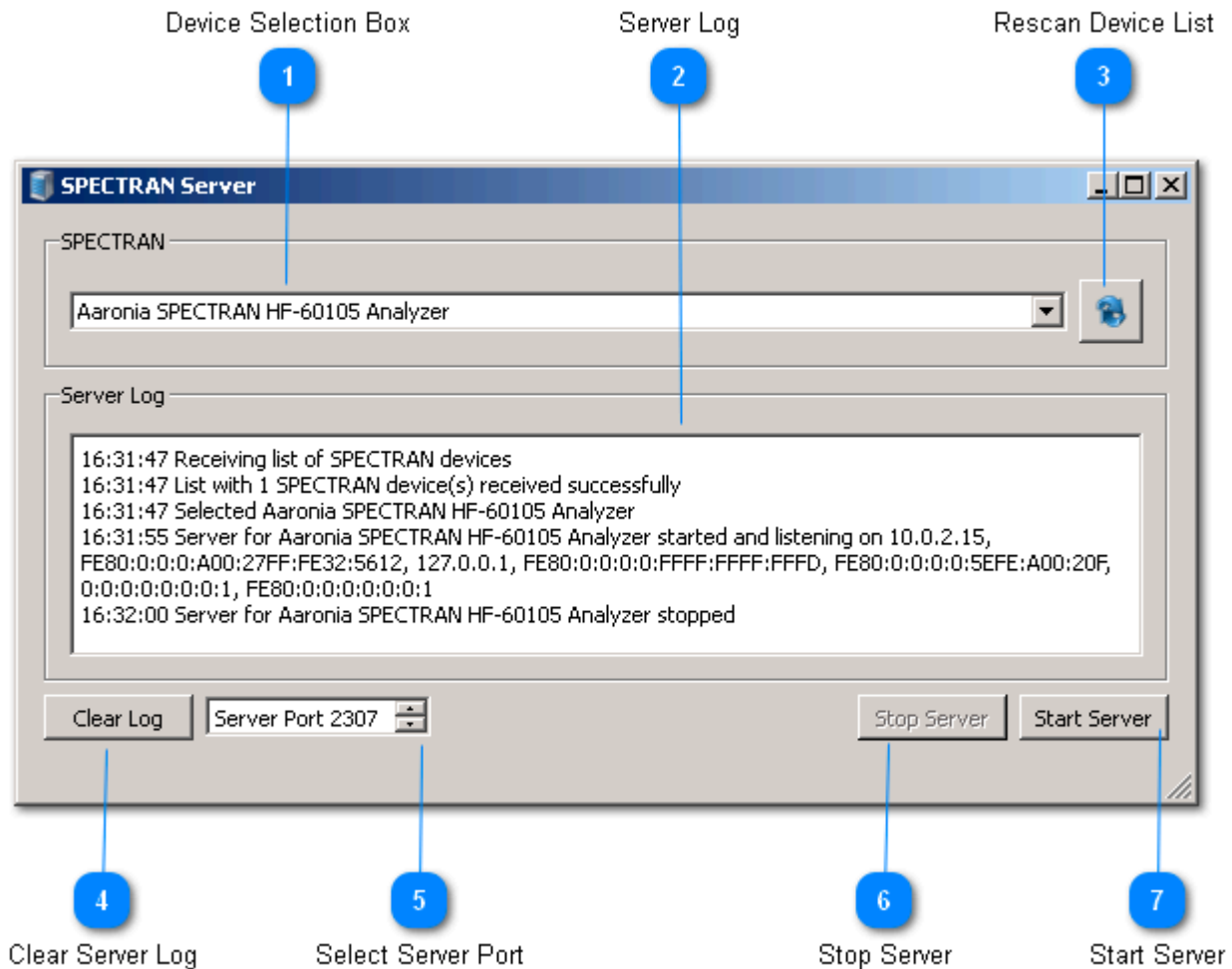
Remove the selected limit level.

Spectran Network Server

The SPECTRAN Server application is used to allow access to a SPECTRAN device over a standard TCP/IP network connection, which can be used to remote control the device from another computer on the network.

*Note: There is no authentication mechanism or encryption available for this system, so **only use this on a fully trusted network that is not accessible from the outside**. As the software communicates directly with the USB driver it could be possible for an attacker to compromise your system. Ask your network administrator (if available) for permission before using this software.*

SPECTRAN Server Window

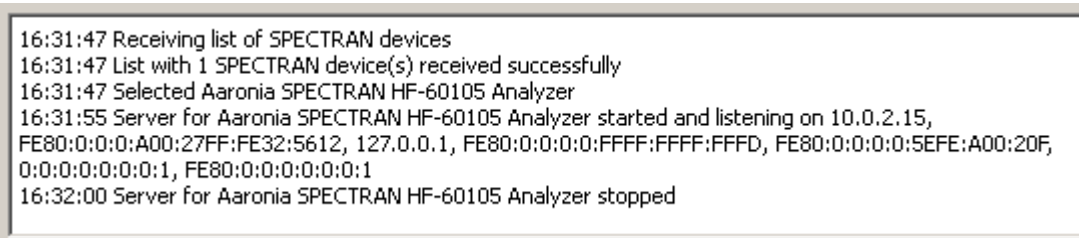


1 Device Selection Box



A list of available SPECTRAN devices from which you can select the device to be made available on the network.

2 Server Log

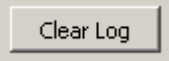


Log of various Server messages.

3 Rescan Device List



Refresh the list of available devices. You must click this button after connecting / disconnecting or enabling / disabling SPECTRAN devices to / from your PC.

4 Clear Server LogA rectangular button with a light gray background and a thin border, containing the text "Clear Log" in a standard sans-serif font.

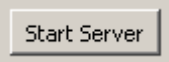
Clear the [Server Log](#) window.

5 Select Server PortA rectangular dropdown menu with a light gray background and a thin border. The text "Server Port 2307" is displayed on the left, and a small downward-pointing arrow is on the right.

If necessary you can adjust the TCP port where the Server waits for connections here. One case where this is required is when running Servers for multiple devices on the same system. You must use the same port number when establishing a [network connection](#) with the MCS.

6 Stop ServerA rectangular button with a light gray background and a thin border, containing the text "Stop Server" in a standard sans-serif font.

Stop the SPECTRAN server

7 Start ServerA rectangular button with a light gray background and a thin border, containing the text "Start Server" in a standard sans-serif font.

Start the SPECTRAN server. While the server is running do not try to access the selected device with other programs (like the MCS or the Firmware Updater).