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1. Introduction

The EMCview software carries out automated conducted or radiated noise measurements. It currently supports Rigol spectrum analyzers. All relevant CISPR (= EN550xx) conducted and radiated noise measurement settings are pre-configured in the current version.

2. Installation

Download and install the VISA driver package from the National Instruments website.

Create a directory into which you copy *EMCview.exe*. Execute *EMCview.exe* to install the software. Copy the license file into the same directory as *EMCview.exe*. Click *EMCview.exe* within your program directory to run the program.

Important: in case of the DSA815, the firmware version must be V00.01.16 or higher. If the firmware is older, update the Spectrum Analyzer firmware first.

PC-requirements: Windows 7, 8, 10; min 4MB RAM

The window may be too large for laptops with a tiny display. In order to use EMCview on such computers, start *EMCview.exe* with parameter **s**. This parameter will add scrolling bars to the window.

3. Projects

In EMCview, any EMC standards is represented by one or more projects. A project summarizes all configurations necessary to carry out measurements. It consists of limit files, segment files, a cable file, a LISN file, an antenna file, an amplifier file and various settings such as graph boundaries, trace colors, and settings for peak measurements.

Limit files: configuration containing the frequency dependent limit values given in the corresponding standard.

Segment files: spectrum analyzer settings such as start and stop frequency, sweep time, resolution bandwidth, detector, attenuator and preamplifier settings. Refer to the CISPR16 standard or to the Tekbox document *Pre Compliance Conducted Emission Measurements V1_1.pdf* for more detailed information. Radiated noise measurements often cover a wide frequency span and require different antennas for different frequency ranges. Consequently, it makes sense to split segment files. Segment files for radiated noise typically cover 150kHz -30MHz, 30MHz-300MHz, 300MHz-1GHz, 1GHz – 1,5GHz (DSA815 frequency range), etc.

LISN files: insertion loss of the LISN over frequency, entered in dB with negative sign. Use LISN files also to implement conversion from dB μ V to dB μ A for conducted noise measurements with RF current probes.

Antenna files: antenna factor of the antennas used for radiated noise measurement; converts the dB μ V measured by the spectrum analyzer into dB μ V/m

Cable files: insertion loss of cables between DUT and spectrum analyzer

Amplifier files: amplifiers gain in the signal path, if any

These files can be created or edited either with a built in editor in the **Setup Menu** or with any text editor. The files are located in the **src** subdirectory.

Project files for conducted noise measurements have file names starting with CN_*.prj. Project files for radiated noise measurements with antennas start with RN_*.prj. Project files for radiated noise measurements with TEM cells start with TC_*.prj.

Refer to the applicable standards for more details and insight. Standards and corresponding limits may change over time. Tekbox does not take any liability for the validity of the limits and other settings in the preconfigured projects.

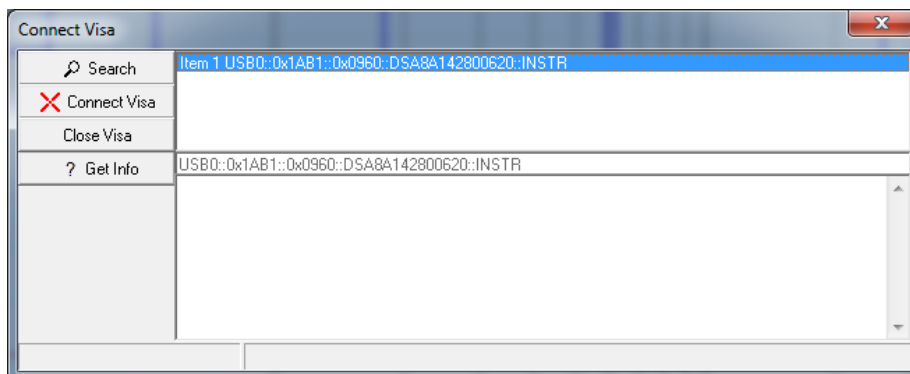
4. Workspace

The screenshot shows the EMCview software interface with several key areas highlighted by red arrows and labels:

- Set chart axis boundaries / zoom:** Points to the parameter list on the left side of the window.
- Start / pause / stop measurement:** Points to the play/pause button in the top toolbar.
- measurement configuration files:** Points to the 'MeasureSet' dropdown menu in the top toolbar.
- Settings for the peak re-measurement (final scan):** Points to the 'Peak Measurements Set2' panel at the bottom right.
- Notifications / warnings / error messages:** Points to the 'Messages' panel at the bottom left.
- lists peaks which violate the limits or which are within a set margin of the limit line:** Points to the 'Peaks Set2' panel at the bottom center.
- Re-measures selected peaks using other settings – e.g. quasi peak detector measurement of peaks detected during a measurement of „Set1“:** Points to the 'View (on/off)' panel at the bottom right.
- view / hide traces:** Points to the 'View (on/off)' panel at the bottom right.

5. Connecting to the spectrum analyzer

Launch EMCview and connect the spectrum analyzer to the PC via USB. In the menu line, click **DEVICE**, then **VISA** and **SEARCH**. You should then see the Rigol analyzer listed in the search window. Click at the line with the Rigol Analyzer and then click the **CONNECT VISA** button. You can validate the connection by clicking the **GET INFO** button. Furthermore, you should see a "VISA ok" status message in the very left lower corner of EMCview. Close the window with the **x** button. Do not close it with the **Close Visa** button, as it would disconnect the spectrum analyzer.

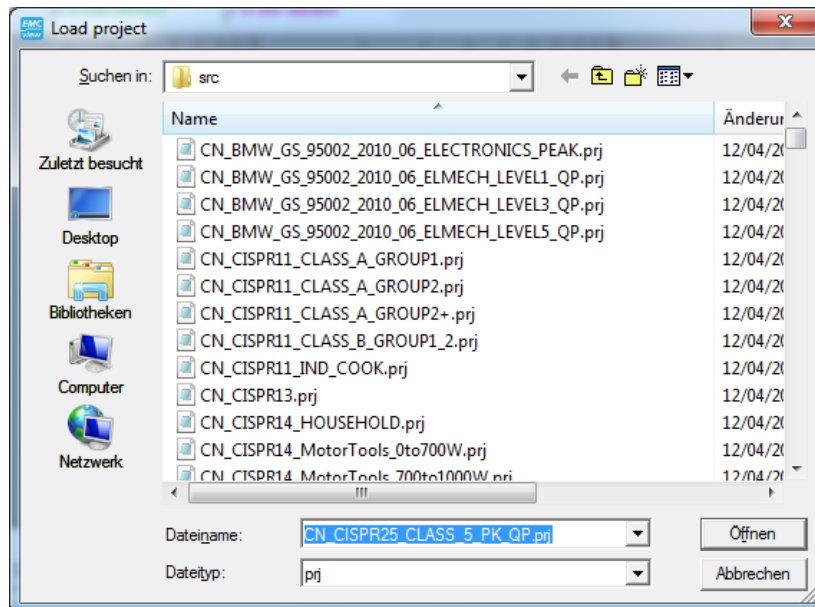


6. Prepare measurements

Click **File, Load Project** and select an appropriate standard for your DUT.

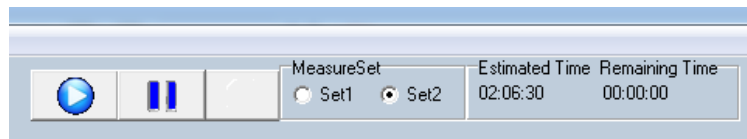
The predefined limit lines and segment files for the selected standard will pop up in the box at the left side of the window. The limit lines will appear in the graph chart.

If you miss any standard, you can create new limit lines, segment files and correction files in the menu **Setup**. Alternatively, you can copy, rename and modify one of the existing files using a text editor.



7. Measurement

After correct set up and configuration, just press the **Play** button at the top of the window. The analyzer will start carrying out the measurement defined in *Segment-Set 1*. The associated limit line is *Limit1*. After the measurement is completed, click the *Set2* button at the top of the window. Press the **Play** button. The analyzer will start carrying out the measurement defined in *Segment-Set 2*. The associated limit line is *Limit2*.



Most project files define Peak or Average measurements as Set1 and Quasi-Peak measurements as Set2.

As Quasi-Peak measurements take much time, an alternative measurement method is available. A peak-scan would only look at frequencies, which come close to the limit or which exceed the limit in Peak or Average mode.

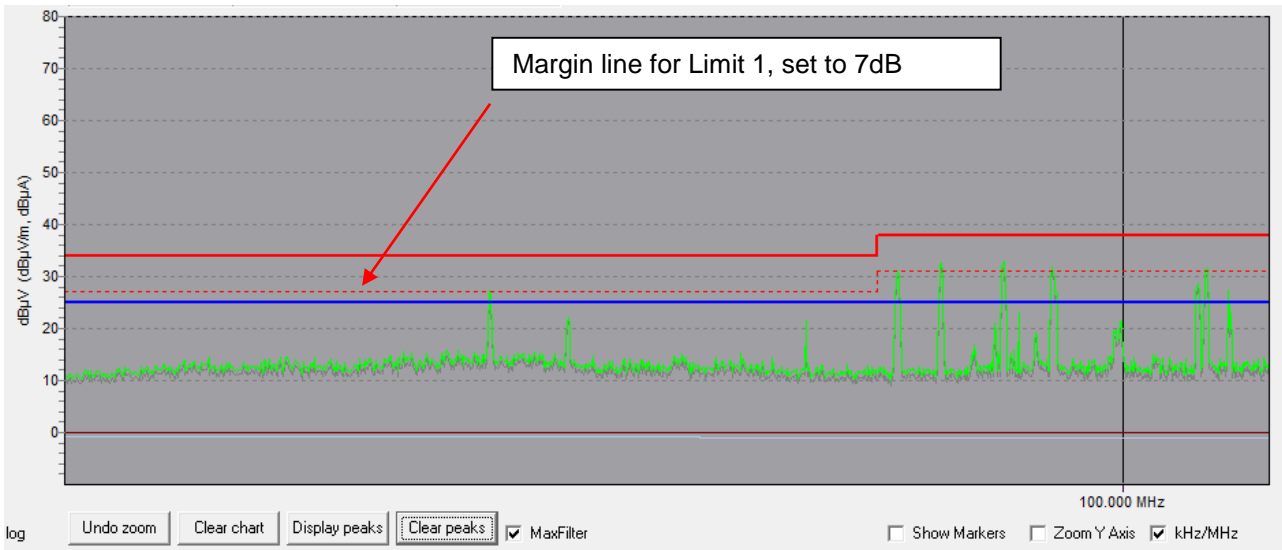
Pressing the **Pause** button interrupts ongoing measurements. The current segment will however be completed, before the measurement pauses. To continue the measurement, press the **Play** button.

8. Peak scan

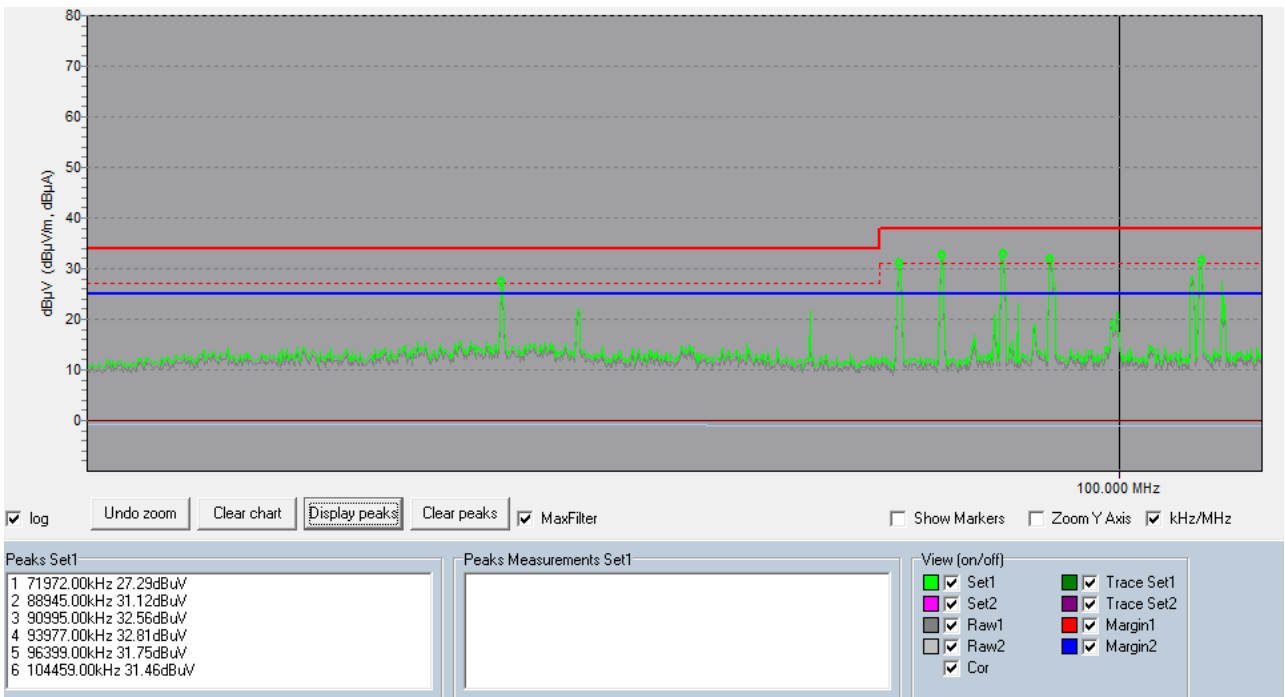
Any measurement value of the Set1 run that violates the limit line, is indicated with a small bubble on top of the peak. In fact, if several consecutive measurement values violate the limit lines, only the highest value will be marked.

You can define a margin with respect to a limit line. The SW would then indicate peaks, which cross the margin.

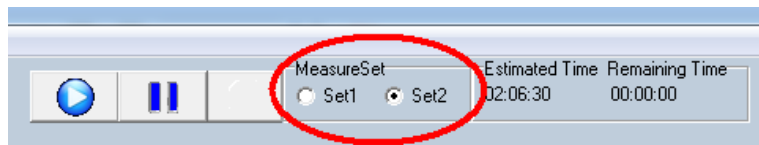
Enter the margin with positive sign to create a dashed line offset below the limit line. Margins with negative sign can be created as well.



By default, the margins are set to 0, so any peak crossing the limit line would be indicated. Setting margin1 to e.g. 7dB would select all peaks coming within 7 dB close to the limit line of the graph measured with Settings1. Peaks crossing the margin line or limit line can be listed in the in the **Peaks window** by pressing the **Display peaks** button.

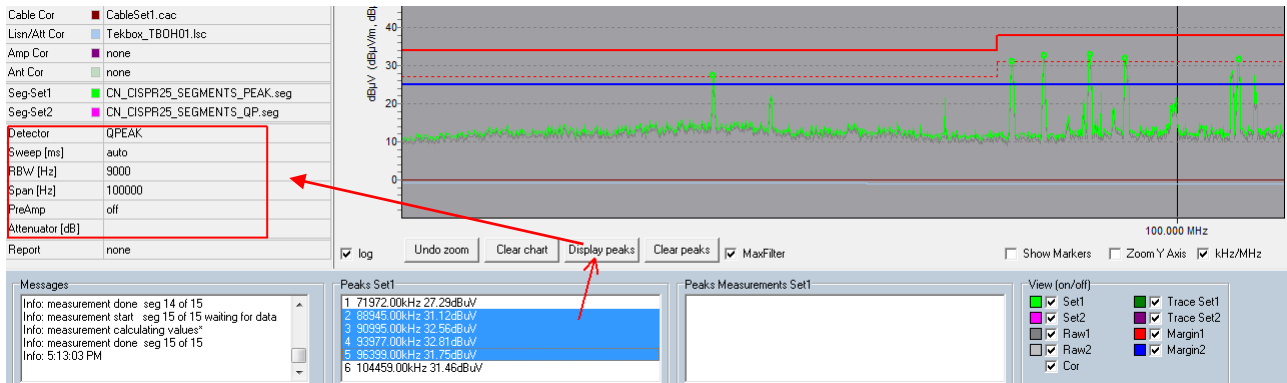


In order to display peaks for the second graph, change **MeasureSet** to set 2

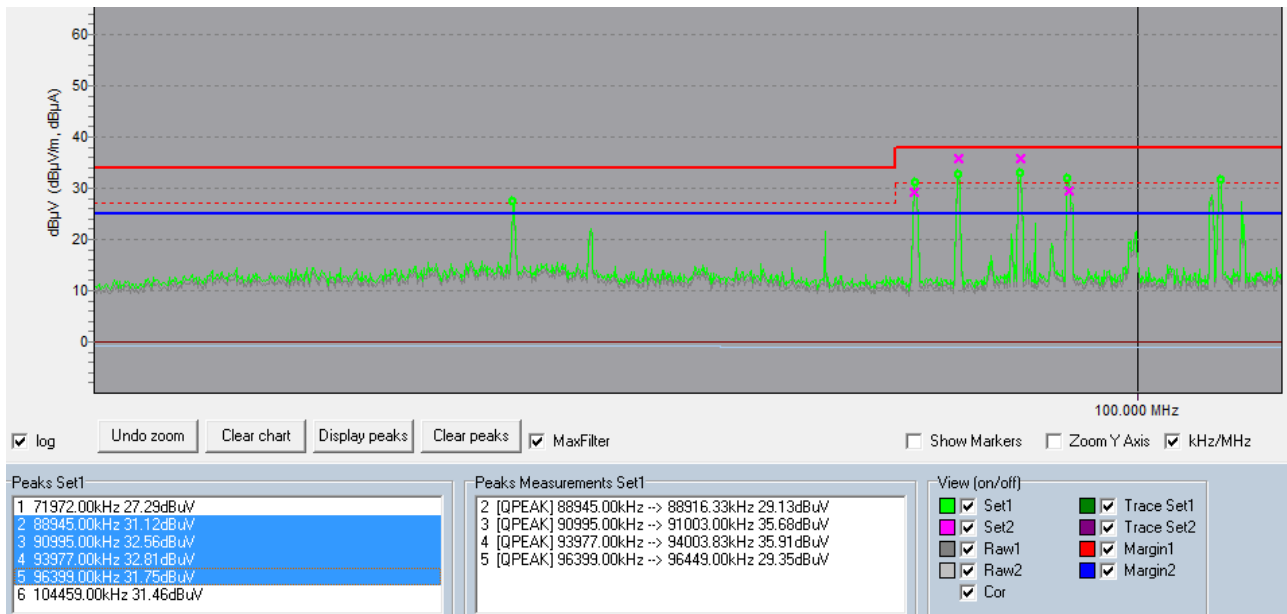


9. Final scan / peak re-measurement

Select any peaks from the list by pressing the **Ctrl** button and select it with the left mouse button. Then click the right mouse button and click **Measure**.

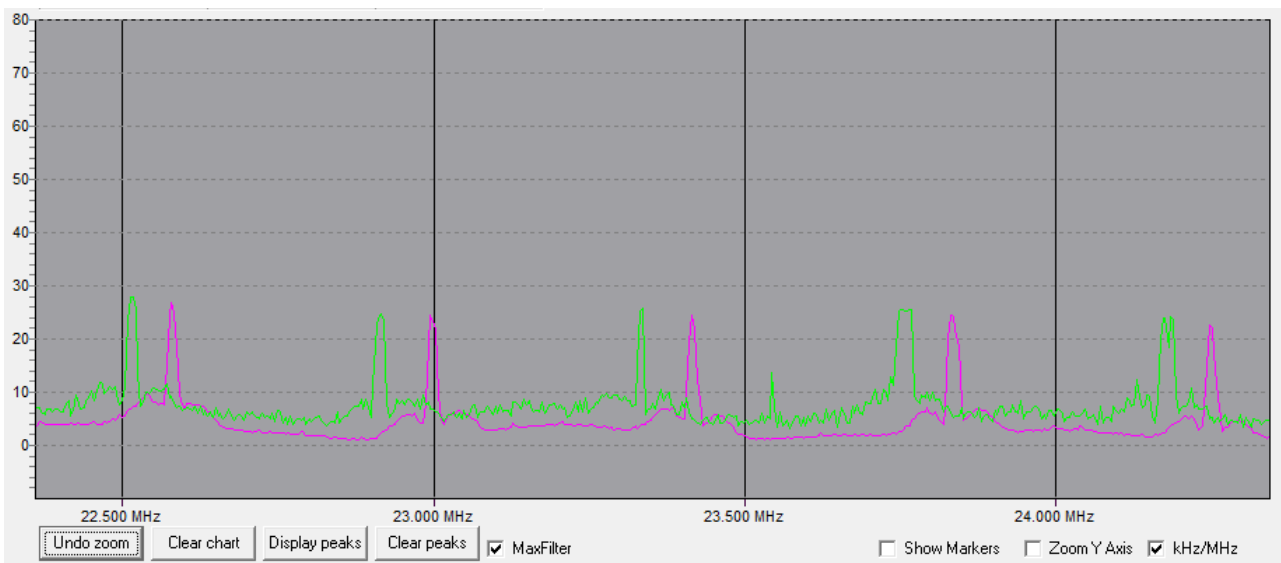


The software will then re-measure, using the selected peaks as center frequency and using the detector, sweep time, RBW, Span and PreAmp settings defined in the control box. This feature is a short cut to make a fast Quasi Peak measurement for selected peaks, instead of making a time consuming full span QP measurement.



The Peaks Measurements box then displays the results of the fast quasi peak measurement. In addition, the graph shows a cross at the respective frequency and level.

Consider the span setting of the peak re-measurement, with respect to a potential drift of the peaks. The higher the drift over time (e.g. drift of the frequency of a switched mode regulator), the wider make the span. The software will scan the measurement values of the entire span for the highest peak. Consequently, the frequency of the re-measured peak may deviate from the initial peak frequency. The capability of setting a Span for a peak re-measurement is an essential feature of EMCview, often missed by similar tools.



Above an example to illustrate the purpose of the span setting. Harmonics of a switched mode regulator, which drifted over the time that passed between carrying out the peak measurement (green graph) and the quasi peak measurement (purple graph). If measured at exactly the peak frequencies of the green graph, it would completely miss the signals when re-measuring with quasi peak detector. However, by setting a span of 200 kHz, the quasi peak signal will be measured correctly

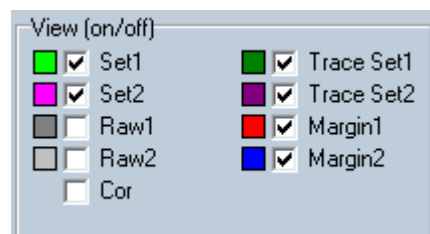
10. View / hide graphs

The graph window can display several traces:

Set 1	corrected graph of the measurement defined by Seg-Set1 and Limit1
Set 2	corrected graph of the measurement defined by Seg-Set1 and Limit1
Raw 1	raw data of Set1 – no LISN, cable, etc. correction
Raw 2	raw data of Set2 – no LISN, cable, etc. correction
Cor	correction data of LISN, cable, etc.
Trace Set1	imported data from previous measurement to overlay for comparison purpose
Trace Set2	imported data from previous measurement to overlay for comparison purpose
Margin1	margin with respect to Limit1
Margin2	margin with respect to Limit2

Hide or view traces using the tick boxes in the lower right corner of the window.

Configure colors of traces, limit lines and the background of the graph window in the **Setup** menu, **edit colors**.



11. Zoom graphs

You can zoom or set the boundaries of the graph by entering frequency and amplitude values into the boxes **Chart Start[Hz]**, **Chart Stop[Hz]**, **High[dBμV]**, **Low[dBμV]**. Press the TAB button or click another box to confirm the entered values. During an ongoing measurement, access to the control box is disabled. Alternatively, you can use the mouse and pull a rectangle in the graph section. When zooming with the mouse, you can **Undo Zoom** with a button under the graph window. You can also switch between **linear** and **logarithmic** frequency axis. When zooming in very deeply, the display may be changed automatically to

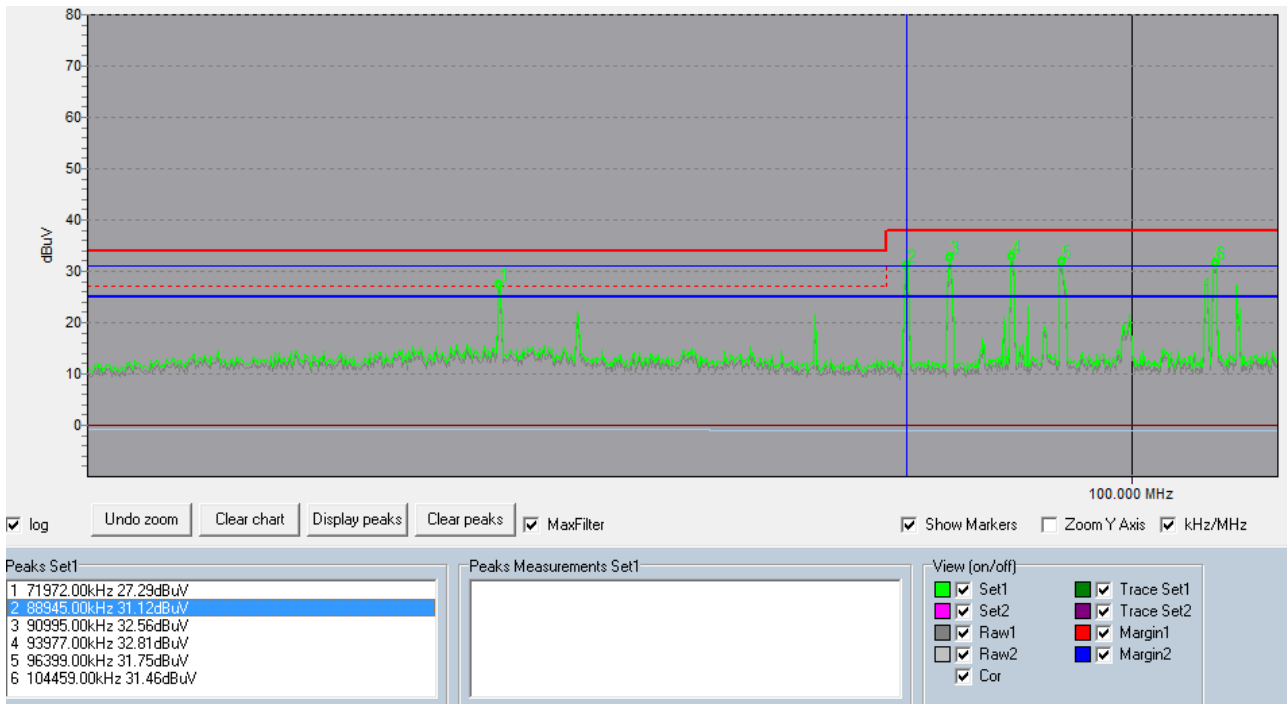
linear frequency display in order to get a useful grid. Switching to logarithmic frequency axis is not possible then, unless you **Undo Zoom**.

Parameter	Value
Chart Start[Hz]	9000
Chart Stop[Hz]	30000000
High[dBuV]	120
Low[dBuV]	-11
Limit1	<input type="checkbox"/> none
Limit2	<input type="checkbox"/> none
Margin1[dB]	0
Margin2[dB]	0
Cable Cor	<input type="checkbox"/> none
Lisn/Alt Cor	<input type="checkbox"/> none
Amp Cor	<input type="checkbox"/> none
Ant Cor	<input type="checkbox"/> none
Seg-Set1	<input type="checkbox"/> none
Seg-Set2	<input type="checkbox"/> none
Detector	QPEAK
Sweep [ms]	auto
RBW [Hz]	9000
Span [Hz]	200000
PreAmp	off
Attenuator [dB]	10
Report	none

To restrict zooming to the y-axis, click the Y-axis check box.

12. Markers

Clicking **Show Markers** adds the corresponding peak number of the peak list to the graph. Double clicking any marker in the list will place a cross hair.



13. Saving graphs and measurement results

Save data in **File** menu, **Utilities**, **Save Chart**. The chart (graph) of any measurement can later be reloaded into EMCview clicking **Load Chart**. Clicking Load Chart overwrites any graph present on the screen. Reload and overlay older measurements to a fresh measurement for comparison purpose by clicking **Load Reference Trace** in the same menu. This feature adds (overlays) one or two more graphs to the existing measurement or chart.

Click **Save as MetaFile** to save chart screen shots.

Click **Save as CSV File** to save the measurement result as table.

14. Create Reports

Click **Setup**, **Edit Report**. Click **Clear** and then enter the report details. Click **Save** and enter a file name.

In order to print the report, click **File**, **Utilities**, **Print Report**. If you want to keep the report as a file, print using a pdf writer.

15. History

Version	Date	Author	Changes
V 1.0	20.04.2017	Mayerhofer	Creation of the document