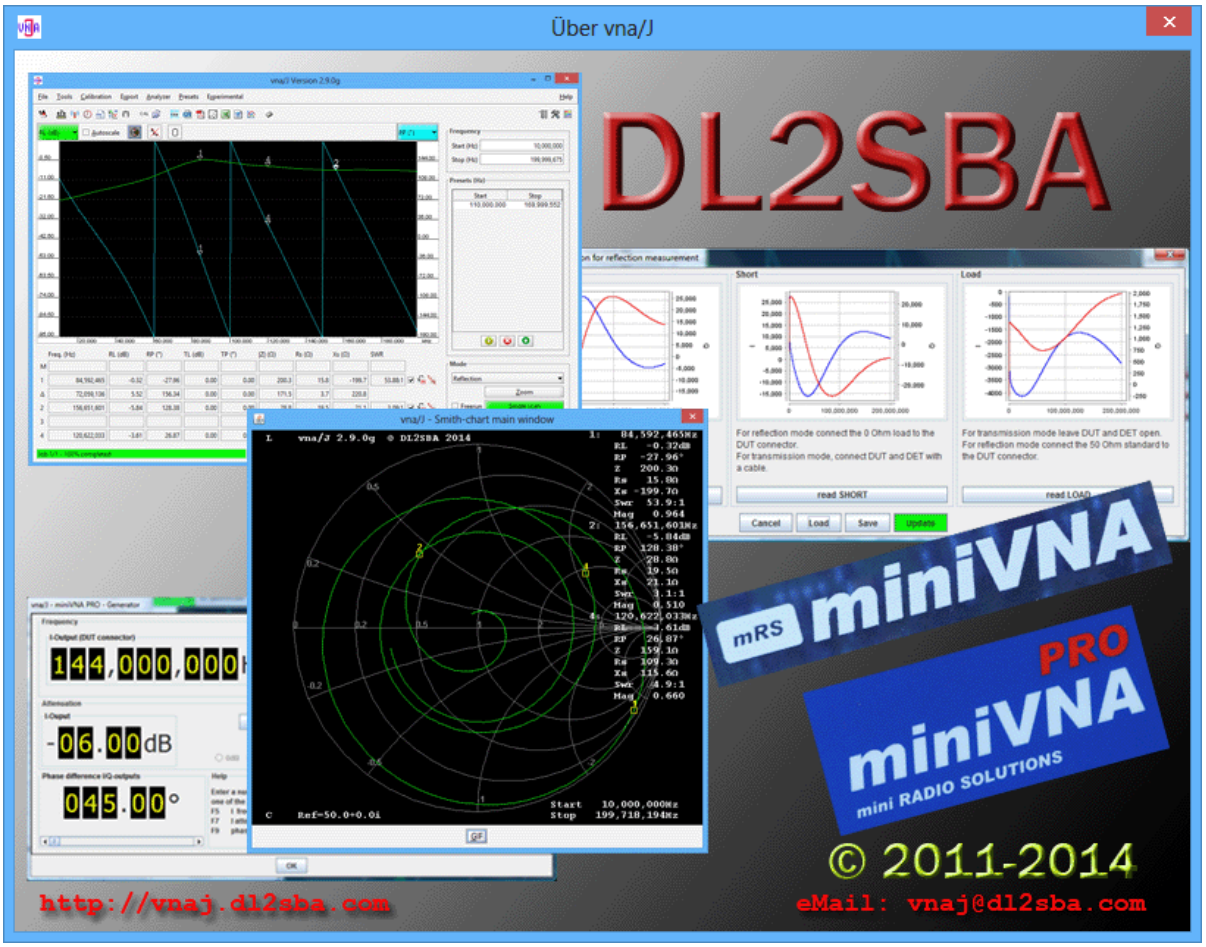

vna/J 3.1.4
User guide

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Changes

Version	Date	Changes
2.0.2	14.02.2010	Updated for new GUI and functions
2.1.0	15.02.2010	Update new logic for calibration. Extended overview
2.1.3	17.02.2010	Added first version of sample section Added hints and tips section. Statusbar updated.
2.2.0	18.02.2010	Generator support explained. Driver info dialog added. DDS calibration explained.
2.2.1	19.02.2010	Minor corrections
	20.02.2010	Extensions
2.3.2	23.02.2010	Extended description
2.4.0	26.02.2010	Shortcut for calibration loading New marker panel Automatic scaling on scales Cable measurement extended
2.4.1	28.02.2010	Added description for scheduler
2.4.3	05.03.2010	GUI further described. Custom scaling added. Automatic reloading of calibration data added.
2.4.4	12.03.2010	Fixed scheduler problem with multiple executed tasks. Added search functions to SWR, loss and phase marker. Added colour setup dialog for diagram area. Added export into S-parameter file.
2.4.10	09.04.2010	Added descriptions for Data-analysis- and Smith-chart-dialogs. Added JAVA section for Mac OS
2.4.11	10.04.2010	Corrected bug in "how to launch in a different language" chapter. Changed chapter "enable logging". Updated chapter "Application start Windows"
2.5.0	30.04.2010	Support for miniVNApro enabled
2.5.1	03.05.2010	Detailed frequency calibration for miniVNA PRO. Generator dialog for miniVNA PRO added
2.5.4	08.05.2010	Updated section "Frequency calibration ". Updates section "How to launch in a different language"
2.6.0	06.06.2010	Added - Marker math - Simple-tune dialog - Multi-tune dialog - Network support Updated - Sample calibration sets for miniVNA and miniVNA^{pro} - Error reporting details

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Version	Date	Changes
		- S-Parameter export - Z-Plots export
	11.07.2010	Added - Generator output waveforms - Load raw in main diagram
	05.09.2010	Updated - Installation on 64bit Mac OS X machines
2.6.9	02.11.2010	Updated installation sections for - MS Windows machines - Mac OS X machines
2.6.11	14.11.2010	Moved installation and application-start sections to new installation document. Moved technical details for drivers and network support to new driver development document.
2.6.12	03.01.2011	Corrected links for new website
2.6.14	21.01.2011	Added - Description of over scan feature in calibration section - Special section for miniVNA pro in calibration section - Added measurement sample and simulation to samples section Updated - Description of smith chart - Updated parameter replacement in export section - Updated section describing the analyser menu.
2.7.0	01.02.2011	Changes for V2.7 added
2.7.3	16.03.2011	Updated smith-chart section Updated Data analysis dialog section
2.7.5	27.05.2011	Quick start section updated. Section for Update function updated. Language selection dialog section added. S-Parameter collector section added.
2.8	06.11.2011	Changes added for release 2.8. Major changes in - Driver configuration dialog
	19.11.2011	Some typos corrected. Speedup mode added to image panel section.
	28.02.2012	Updates frequency calibration section.
	10.04.2012	Minor corrections
	02.01.2013	Additional calibration mode described. See chapter "**Fehler! Verweisquelle konnte nicht gefunden werden.**" on page **Fehler! Textmarke nicht definiert.**.
2.8.6	21.03.2013	Detailed calibration section. Detailed export setting sections.
	27.04.2013	Added new dialog "Setup-Scales dialog"
	30.05.2013	Added new parameter {14} to "Export/Settings/Output file"

Version	Date	Changes
2.9.x	26. April 2014	Added command-line parameters (see chapter “Command-line parameters” on page 108)
	13. June 2014	Updated screenshots in chapter “Calibration procedure” on page 90.
3.0.0	9. July 2014	Detailed chapter “**Fehler! Verweisquelle konnte nicht gefunden werden.**” on page **Fehler! Textmarke nicht definiert.**. Detailed chapter “Calibration mode 1” on page 99.
3.0.1	13. December 2014	Detailed chapter “Calibration mode 1” on page 99.
3.0.2	12. January 2015	Detailed chapter “Calibration mode 1” on page 99.
3.0.3	18. January 2015	Updated/added “The image panel” on page 14 "Port extension” on page 26 “Cable loss measurement” on page 65 “Options” on page 105 “Serial port on Linux cannot be opened” on page 130 "No serial ports displayed on Linux” on page 130 “Serial port on Linux cannot be opened” on page 130 “No serial ports displayed on Linux” on page 130
3.0.4	20. January 2015	New parameters in “Comment” on page 49
3.1.3	08. February 2015	Updated chapter “Scales” on page 15 for SWR auto scale. Updated chapter “Marker panel” on page 27 for differences between reflection and transmission mode.
3.1.4	02. March 2015	Calibration mode 1 now supports overscan
	03. March 2015	Further details added to chapter “Measurement basics” on page 86 ff.

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- The numerous users worldwide giving me permanent feedback.
- And last but not least my cat **Ina**, which helped me many times solving complex situations at the keyboard ;-)

Overview

The miniVNA and miniVNApro instruments by mRS *http://www.miniradiosolutions.com* are popular and very useful test instruments.

The miniVNA instrument is a small blue box with two BNC connectors and a USB connector.

The newer miniVNApro is also small blue box now with two SMA connectors and much enhanced precision.

All the control of the instrument is performed by a software application running on a PC.

Many people have contributed to the development of this software, but the focus has been mainly on the Microsoft Windows operating system. There was a Linux based application but this is no longer supported, and the advancement of the various Linux distributions has rendered it inoperable.

I've started in 2007 to develop a control application based on the Java programming language. Initial ideas were taken from the Visual-Basic-Application that was provided by mRS.

Java is a cross-platform language, which allows the identical application binary to run on any supported Java enabled Operating System.

Currently I've tested the application on Windows 98, Windows XP, Windows7, WindowsVISTA, Windwos 8.0, Windows 8.1 and Mac OS X.

Other users have tested it successfully on various Linux flavours.

Remark:

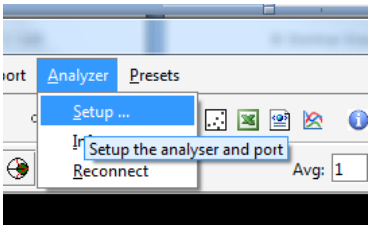
> Not all screenshots in this documentation are taken from the latest application version.
>
> Where it is necessary for understanding, the latest screenshots are used.

This user manual contains the following chapters:

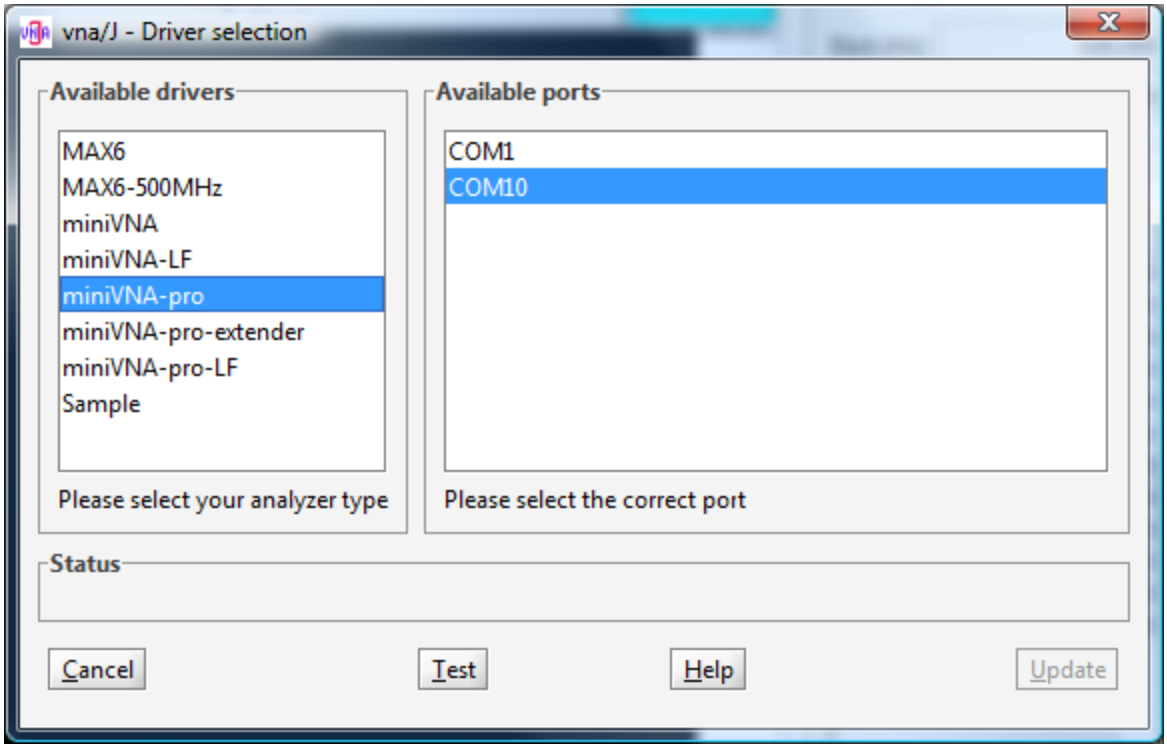
Chapter	Main content	Read before 1st usage
Quick-start guide	Ten steps to do the first measurement	✓
GUI	A detailed description of the user interface	✓
Export	A detailed description, how to export data to images, PDF documents and other file formats.	
Tools	Describes the available tools in the application	
Measurement basic	Basic information of how to do measurements using this application	✓
Calibration	How to get good results	
Application start	How to start this application on various platforms	
Configuration	How to do internal configuration	
Installation	How to install the application on various platforms	
Samples	Shows some measurements taken with the miniVNA	
Hints & Tips	Some useful information	
Driver developer guide	Describes in detail, how to implement custom hardware drivers for this application.	
Links	Where to find more information	

Quick-Start-Guide (Windows/OS X)

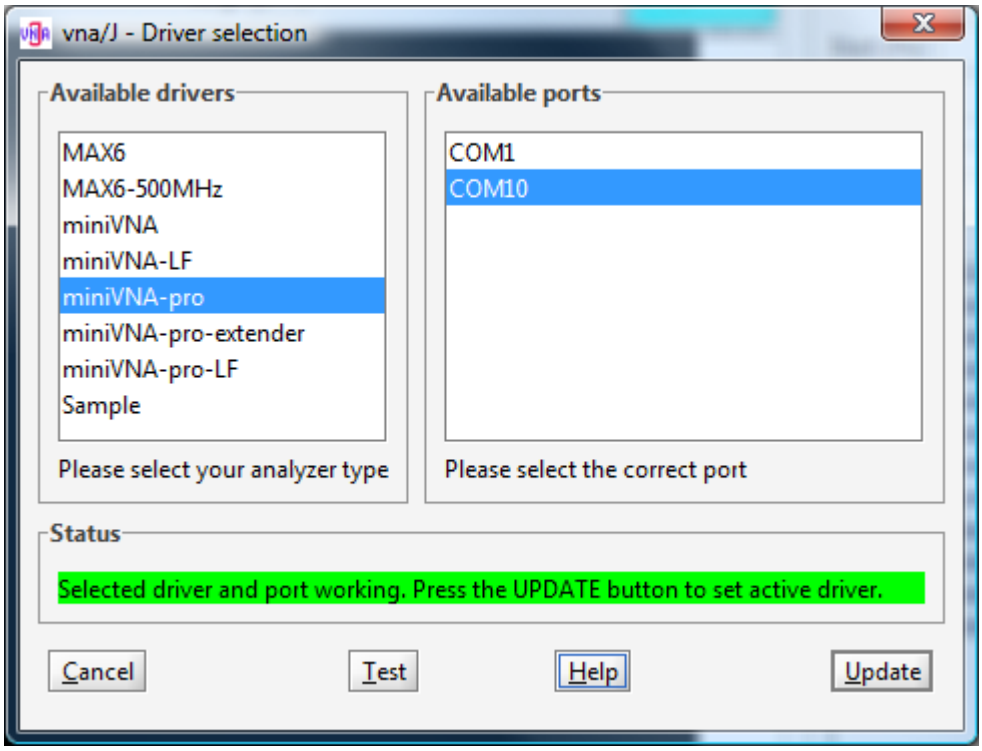
1. Plug-in the miniVNA into a free USB port on your PC.
2. Install the required FTDI serial port drivers for your PC from FTDI http://www.ftdichip.com/Drivers/VCP.htm
3. Download the latest application version from http://vnaj.dl2sba.com
4. Start the application using the command **java -jar vnaJ_X_Y_Z.jar**
5. Select the driver configuration:



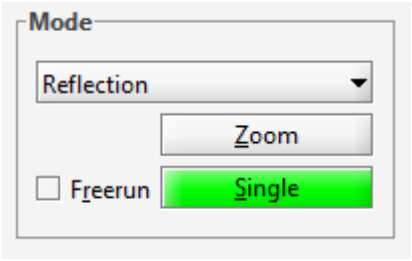
6. Select your analyser type and the used communication port



7. Select the TEST button to confirm the selection.

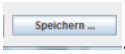


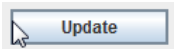
8. If test was run successful simply select UPDATE.

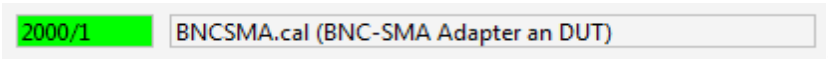
9. Select the mode 

10. Open the calibration dialog via this toolbar button 

11. Follow the instructions for the selected mode.

12. You can save the calibration data via this button  .
    A meaningful filename is proposed.

13. Press 

and the application is ready to work


.

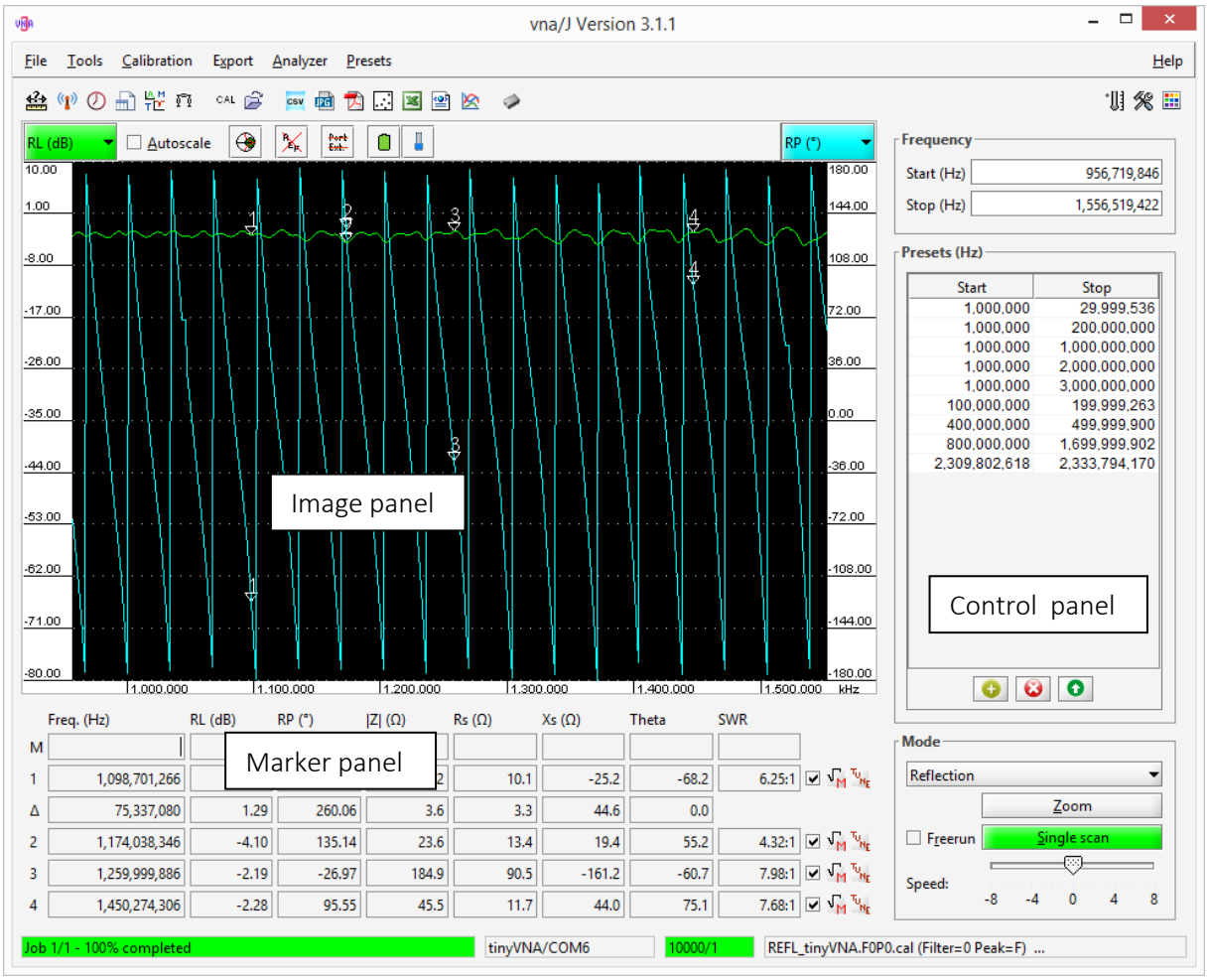
14. Execute your first scan by pressing this button 

.

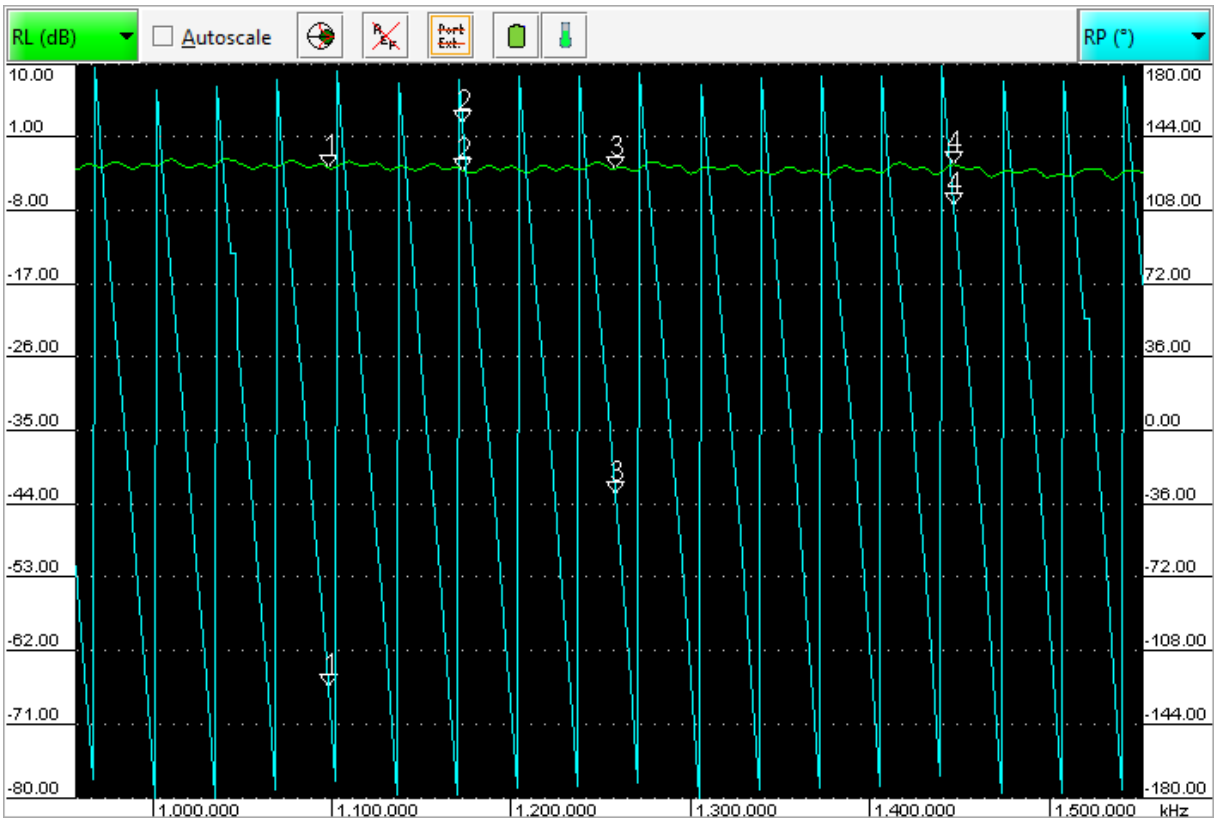
Remark: In case of problems with the above procedure, please be so kind and check the detailed manuals on http://vnaj.dl2sba.com prior to asking for support!

GUI

The applications main window contains the graphical representation of the scanned values in the image panel, as well as the control panel and the marker panel.



The image panel



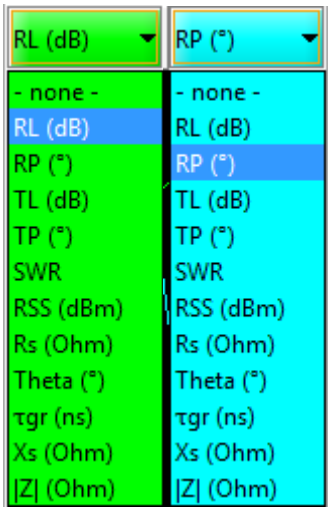
The image panel contains the following parts:

- The scale selection drop down list boxes for the left and right scale.
- The vertical scales matching the selected scale types in the drop down list boxes.
- The frequency scale at the bottom of the image panel.
- The control button for the smith-chart. See chapter “Display Smith-chart” on page 22 for details.
- The reference data control. See chapter “Reference data” on page 24 for details.
- The device supply-voltage control displays the current supply voltage of the analyser. Not supported on some devices.
- The device-temperature control displays the current device temperature. Not supported on some devices.
- The port-extension control. See details in chapter “Port extension” on page 26.
- The display area showing the scanned results from the analyser.

For each tick on the left scale, a dotted line is drawn in the diagram area.

Scales

The scale for the two diagram lines can be selected using the scale dropdowns on top of the image panel.



The colour of the dropdowns reflects the colour of the diagram lines in the image panel. So an easy visual mapping can be done.

Currently the following measurements are available in the scale select dropdown lists:

Name	Content	Auto scale
RL	Display return loss (only for reflection measurements)	✓
RP	Display the phase of the signal for reflection measurement	✓
TL	Display transmission loss (only for transmission measurements)	✓
TP	Display the phase of the signal for transmission measurement	✓
RSS	This is the absolute value of the transmission sensor. (Currently not supported on all analysers)	✓
SWR	Displays the SWR	✓
|Z|	This is the complex impedance of the DUT referred to 50 ohm. |Z| the magnitude of the complex impedance.	✓
Rs	Displays the series equivalent resistance of the load also called Rs	✓
Xs	Displays the series equivalent reactance of the load also called Xs	✓
Theta	The angle of the phase	✓
Tgr	Group delay	✓
- none -	No data is displayed for the corresponding scale	-

Scale-lifecycle

Each scale has currently three states:

State	
Scale set to driver default range	The range of the scale is set to fixed range. The scales Phase and Loss are scaled based on the used driver. The other scales have an identical range independent of the loaded driver.
Scale set to measured values	The user has selected the auto-scale option. The scales range is determined by the measured data. Except the SWR scale, all scales support auto-scaling.
Scale set to custom range	The scale is set to a fixed range. The user must enter the range. The range may not exceed the specified ranges of the scale.

Auto-scaling

Except the SWR scale, all scales are able to scale themselves to the measured data.

Selecting the AUTOSCALE checkbox above the diagram enables this auto scale functionality.

When deselecting the AUTOSCALE box, the scale uses the minimum and maximum values as described in the previous table.

Clicking twice on the deselected AUTOSCALE box can be used to reset both scales to their default values.

The range of a display scale is limited by three factors:

- The absolute maximum or minimum defined per scale type ($MIN_{abs,}$ MAX_{abs})
- The current maximum or minimum values defined in the "Setup-Scales dialog" described on 20. ($MIN_{user,}$ MAX_{user})
- The values entered in the "Custom-scale dialog" as described on page 18 ($MIN_{custom,}$ MAX_{custom})

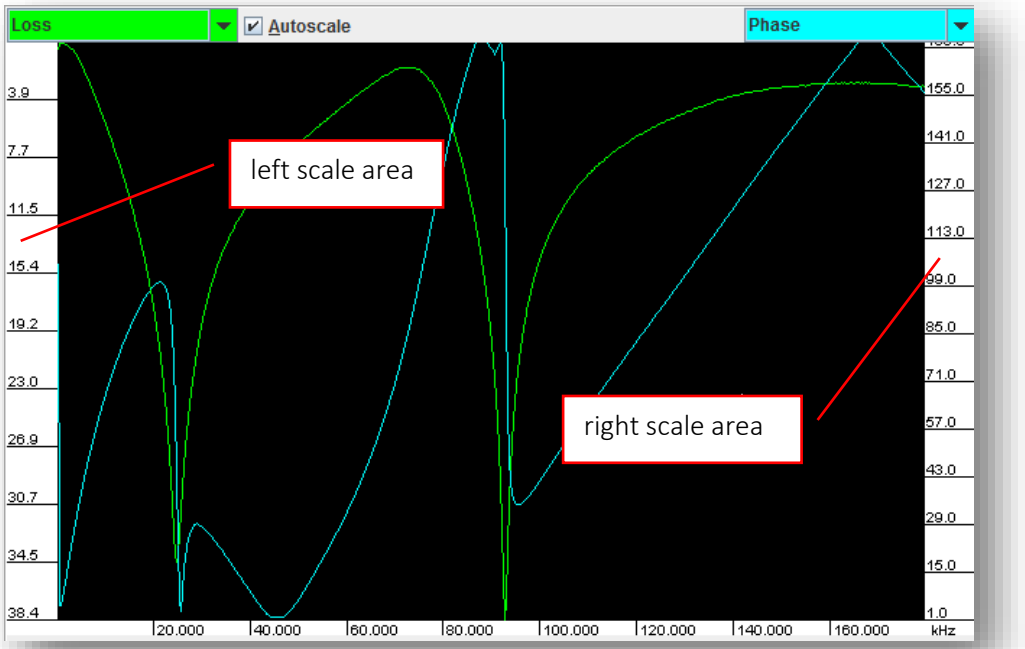
So for each scale value the equation is:

MIN_{abs} <= MIN_{user} <= MIN_{custom} <= current value

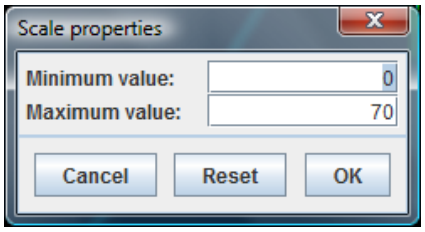
Current value <= MAX_{custom} <= MAX_{user} <= MAX_{abs}

Custom-scale dialog

Except the SWR scale, all scales can be scaled to a user-entered range.



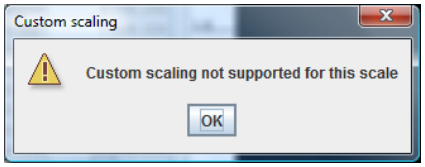
Clicking with the left mouse button on the scale area opens a small dialog, in which the user can enter the minimum (value at top of scale) and the maximum (value at bottom of scale)



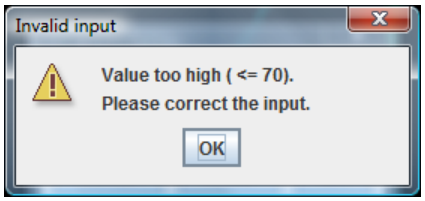
The range, which can be entered in this dialog is controlled by the values, defined in the "Setup-Scales dialog".

The RESET button resets the range to the values defined in the "Setup-Scales dialog".

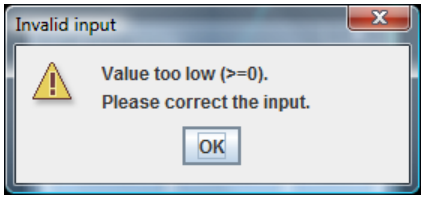
If custom scaling is not supported for this scale, a message is shown:



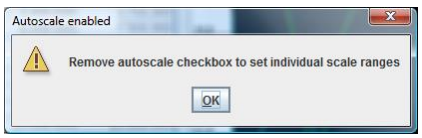
When the entered value is too low for the active scale, a message is displayed showing the maximum value.



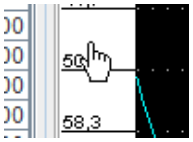
When the entered value is too high for the active scale, a message is displayed showing the maximum value.



Clicking on the scale area, when auto-scaling is enabled notifies the user, to remove first the auto-scaling option.



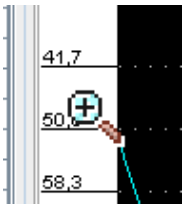
The scale ranges can also be set using the mouse. When the mouse is positioned on a scale area, the mouse cursor turns into a pointing hand.



Two modes are available:

- Zoom-in our zoom-out the scale.
- Move the scale up or down.

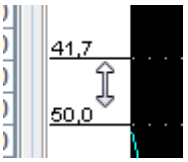
Zoom-mode



Pressing the left mouse button turns the mouse cursor into a magnifier. Moving the mouse with pressed left button inside the scale area up or down increases or decreases the scale range.

… Hard to explain - simply try it.

Move-mode



Pressing the right mouse button turns the mouse cursor into a double arrow. Moving the mouse with pressed right button inside the scale area up or down moves the scales range up or down up to the values given by the selected driver.

… Hard to explain - simply try it.

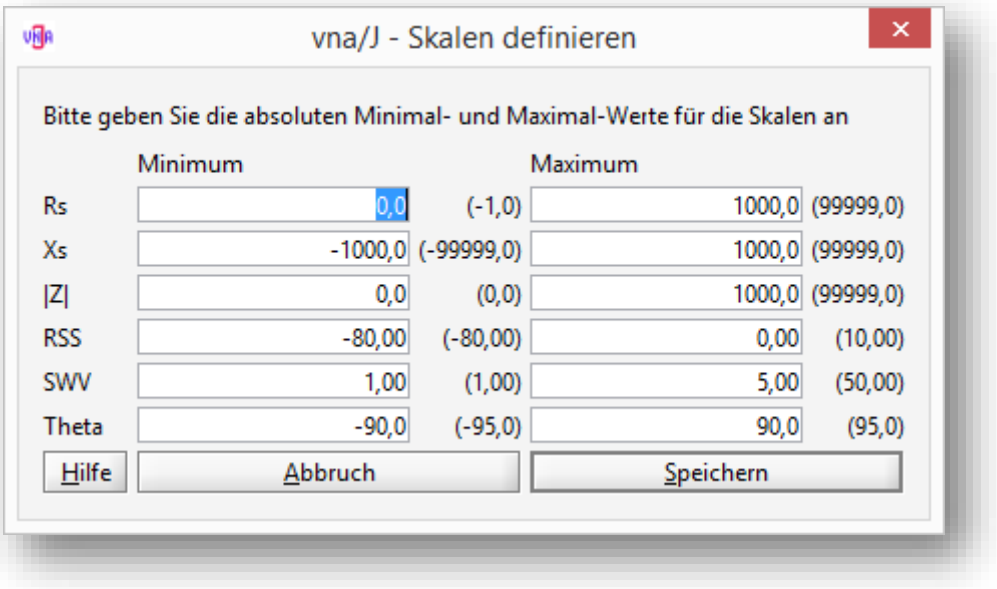
Setup-Scales dialog

In this dialog the user can define the scale ranges for the Rs, Xs, |Z| and RSS scale.

The ranges of the scales RL, TL, RP, TP cannot be changed here, because the absolute ranges are determined by the user analyser.

The range of the SWR range cannot be changed, because SWR values above 10:1 are more or less useless.

Idea is, that the user defines the scale ranges for his usual measurement tasks. When he resets the scale range using the "Custom-scale dialog", the minimum and maximum values are set to values entered in this dialog.



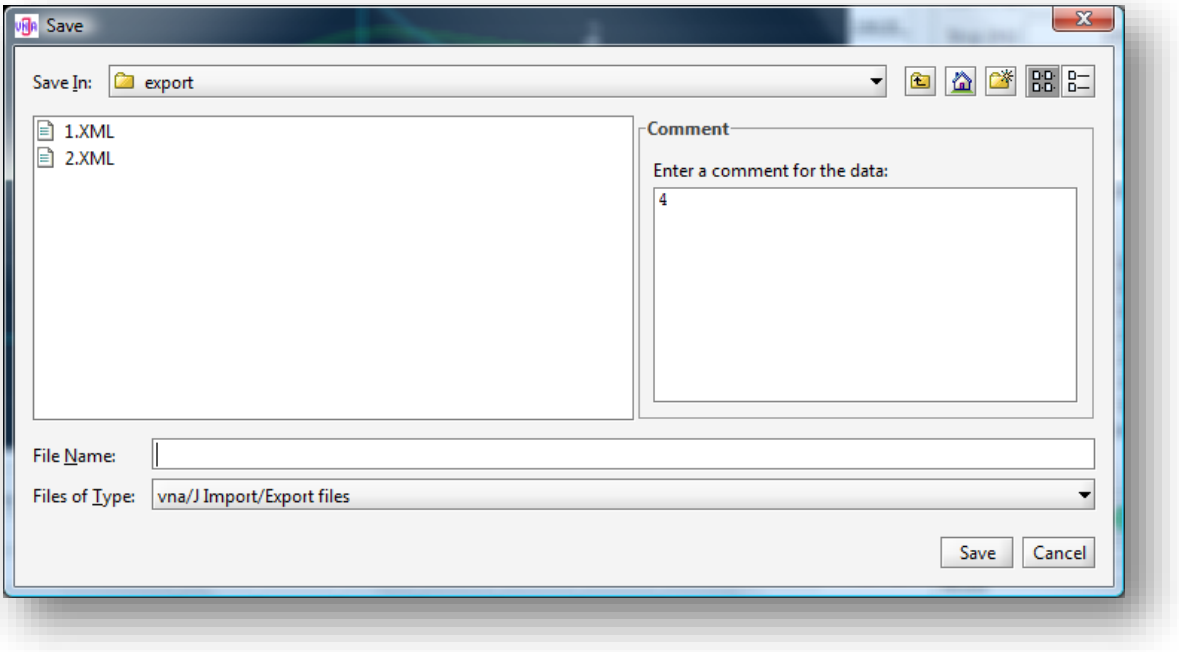
The values in brackets are the absolute maximum or minimum values for this field. There is no further validity checking on this dialog, so be careful. If you get stuck, simply delete the vna/J configuration file.

Clicking the SAVE button, save the ranges to the corresponding scales.

Saving measured data

Since version 2.8 measured data can be saved in various export format as well as in pure XML. This can be accessed via the Export/XML menu or via this toolbar button:

The location of the file can be selected in the default SAVE dialog:



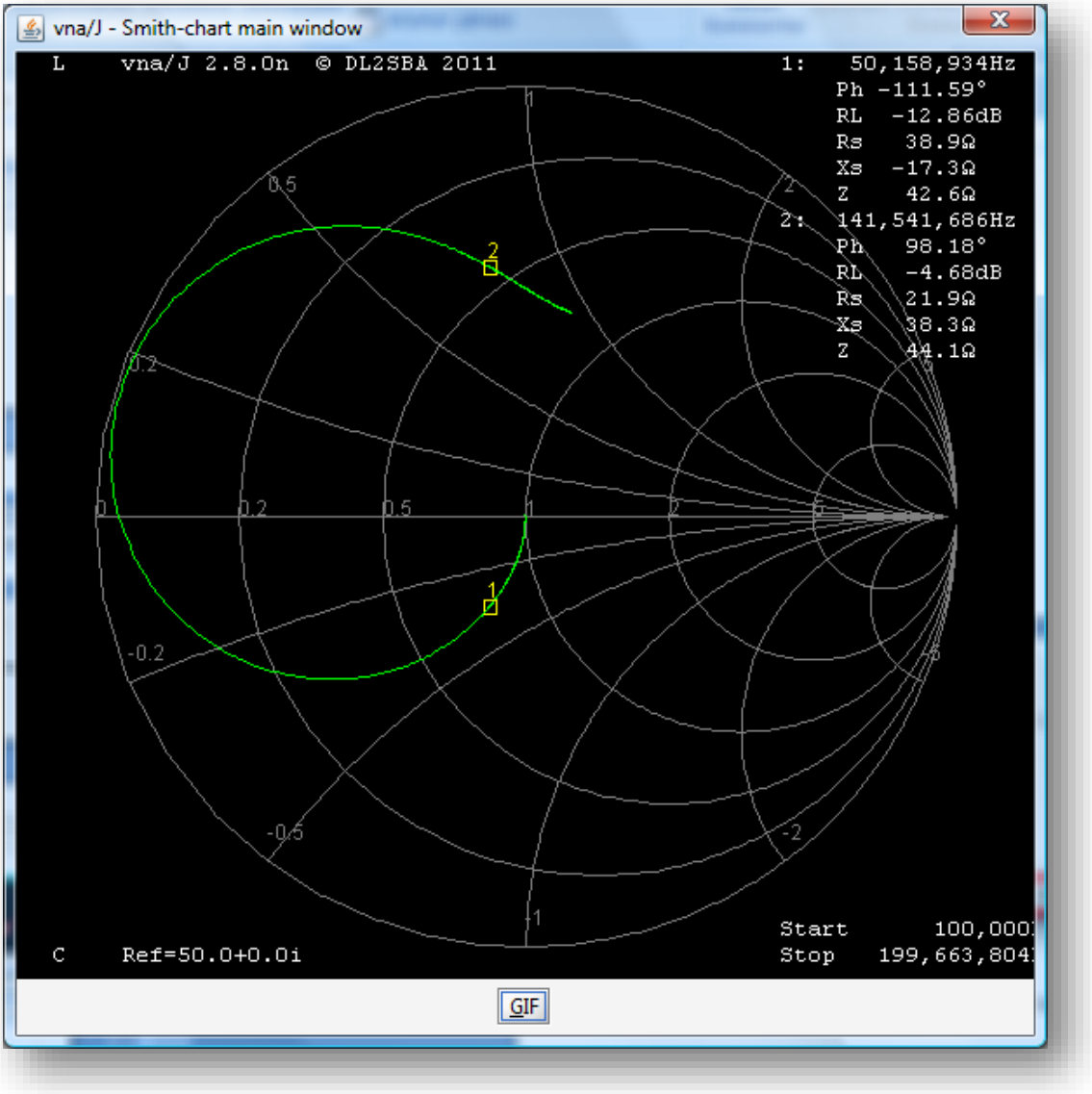
Also a short comment can be entered in the comment box right to the file list.

This data then can be later displayed in the analysis dialog (See chapter "Data analysis" on page 71) or reloaded into the diagram area as reference data (See chapter "Reference data" on page 24).

Display Smith-chart

Selecting the Smith-chart checkbox

Opens a non-modal dialog, which displays the current measured data inside a Smith-chart:



If the markers are selected in the main window, a small rectangle in the marker colour is drawn on the smith-chart and the configured marker data is printed on the right diagram side.

***Note**: The relevant data for a Smith-chart is only available in reflection mode. In transmission mode, the analyser is not capable providing the relevant data.*

*The data in the smith-chart is updated whenever a **new** scan is done in the main window. The marker data is updated, when the markers are moved in the main window.*

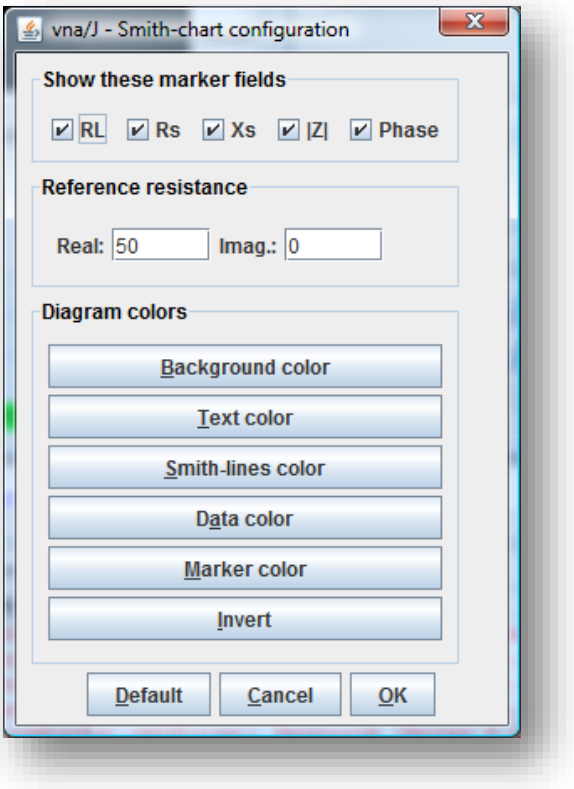
Export to GIF-file

The diagram can be exported using the GIF-button. Selecting this button opens the default SAVE default where the name and location of the diagram can be set.

The size (number of x/y-pixels) of exported image is determined by the size of the Smith-chart inside the dialog. To get higher resolution, simply resize the dialog to the desired size and then use the export function.

Configuration

Clicking inside the diagram can configure the Smith-chart.



Here the data shown for each marker in the smith-chart can be configured. The marker-name and -frequency is always printed.

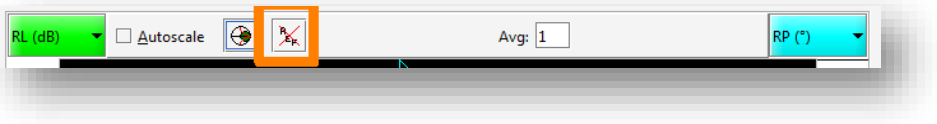
Further the reference resistance can be changed, for which the chart is calculated. The colour of each element on the diagram can be selected using the buttons in the "Diagram colours" box.

***Note**: The changed reference resistance is used only on for the **NEXT** scan.*

Reference data

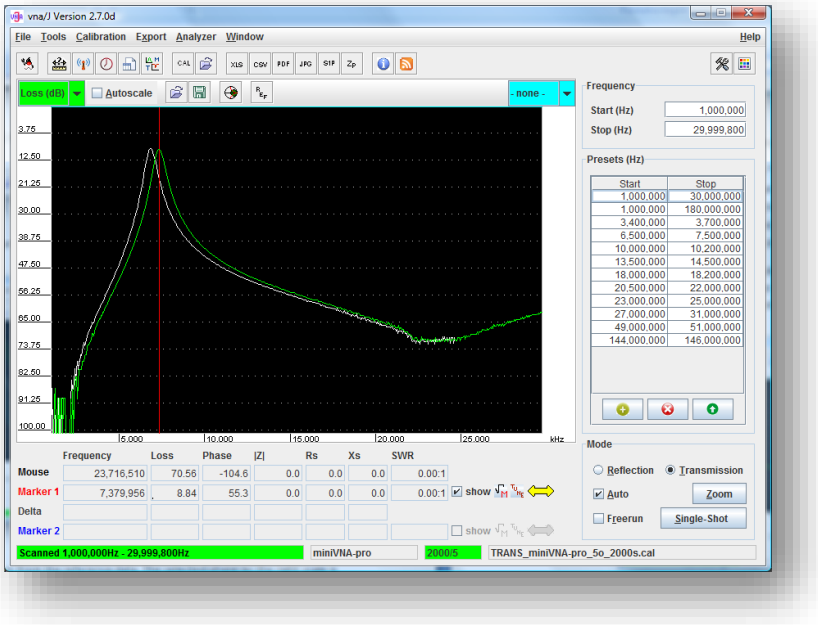
To compare previously measured data with the current measurement, a reference trace can be loaded and displayed in the image panel

Initially no reference data is loaded. This is shown with a crossed-button in the toolbar.



When reference data is loaded, the cross is removed from the toolbar button

And the reference trace is shown in the main diagram in the selected colour (here WHITE) after the next scan.

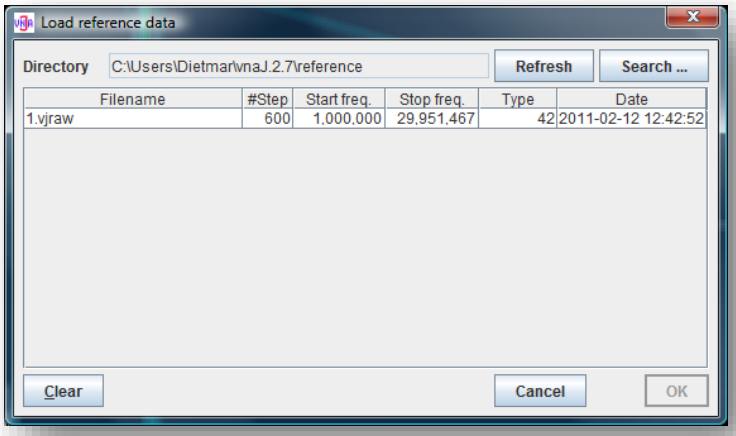


Only the left scale value is drawn from the reference data. The selected phase on the right scale is only drawn from the measurement data.

Note: *The reference data is drawn together with measured data. So after loading a new reference data set, it is displayed after the next executed scan.*

First the reference data is drawn and then the measured data. This means, if the reference data is "covered" by the measured data, no reference trace is visible!

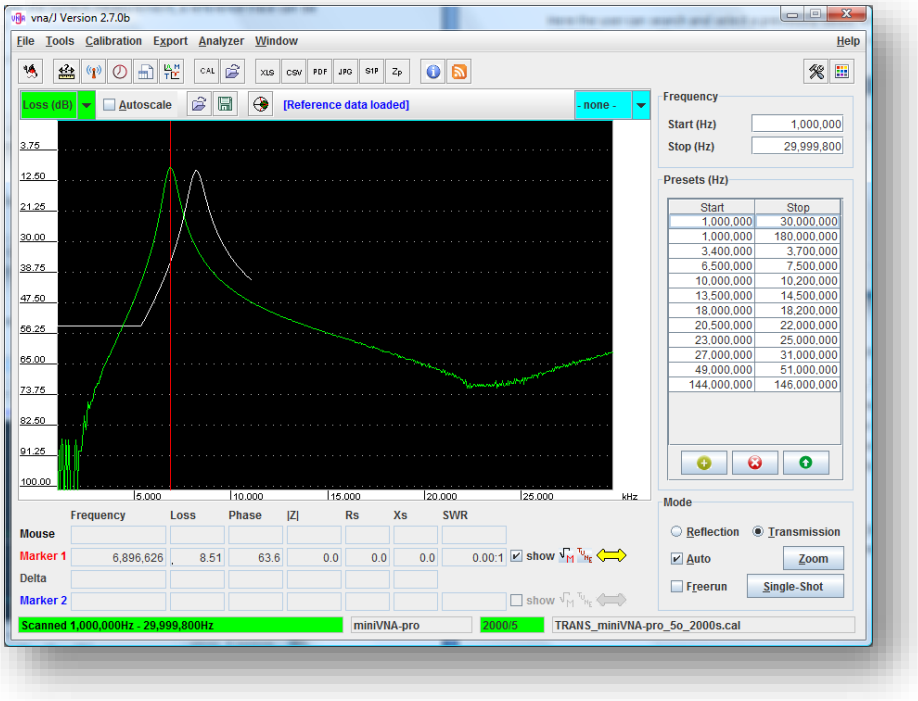
Clicking the reference button opens the "Calibration load dialog". Here the user can search and select a previously saved reference data set (see chapter "Saving measured data" on page 21) or remove the previously loaded reference data set.



In the list all found reference datasets are displayed which were found in the selected directory.

- The directory can be changed using the "Search..." button.
- The content of the selected directory can be re-read using the "Refresh" button
- When a valid reference data set is selected in the list, the "OK" button is enabled.
- Selecting the "OK" button loads the selected reference dataset into diagram panel.
- Selecting the "Clear" button removes a previously loaded reference data set.

When the loaded reference data does not completely cover the measurement range, only the available reference data is drawn. As shown here the reference data is only available from 5.3MHz to 11.3MHz and the measurement scan ranges from 1MHz to 30MHz:



***Note**: Displaying a directory with a lot of reference data files in, can take some time, as every dataset has to be completely read to retrieve all the required information.*

Port extension

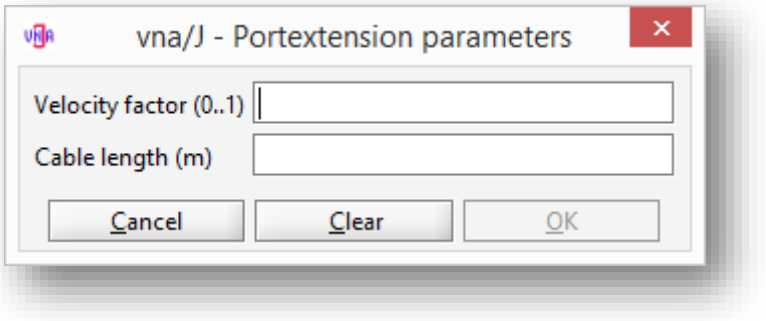
Usually you're running the calibration for reflection measurement with the calibration standards attached to the point, where you later connect the later measurement object.

Sometimes you're not able to reach this point (i.e. the antenna feed point up on a tower), so you can use the port extension calculation to overcome this problem.

If you know the length and velocity factor of the feed line connected between the analyser and the antenna, you can you the port extension function, to get a correct reading at the analyser.

To enable the port extension function click on this icon 

and enter the feed line length and the velocity factor:



If you've entered data into this dialog, the icon is enabled 

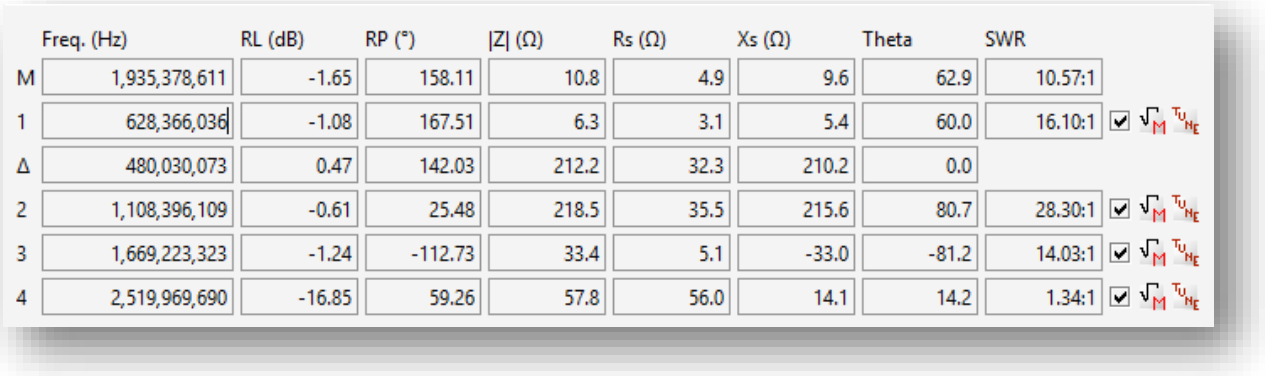
and the port extension calculation is done.

To remove port extension, simply click the button "Clear" in the port extension parameters dialog.

Remark: Currently port extension assumes lossless feed lines – this is sufficient for SWR calculations. More to come later!

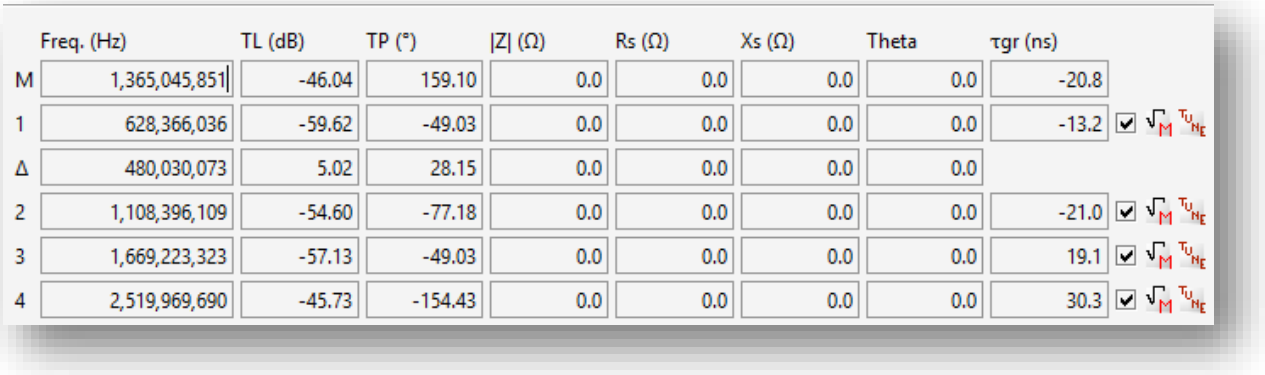
Marker panel

The marker panel displays the actual data of the five markers. The display differs a little bit between reflection mode:



	Freq. (Hz)	RL (dB)	RP (°)	|Z| (Ω)	Rs (Ω)	Xs (Ω)	Theta	SWR
M	1,935,378,611	-1.65	158.11	10.8	4.9	9.6	62.9	10.57:1
1	628,366,036	-1.08	167.51	6.3	3.1	5.4	60.0	16.10:1
Δ	480,030,073	0.47	142.03	212.2	32.3	210.2	0.0	
2	1,108,396,109	-0.61	25.48	218.5	35.5	215.6	80.7	28.30:1
3	1,669,223,323	-1.24	-112.73	33.4	5.1	-33.0	-81.2	14.03:1
4	2,519,969,690	-16.85	59.26	57.8	56.0	14.1	14.2	1.34:1

And transmission mode:



	Freq. (Hz)	TL (dB)	TP (°)	|Z| (Ω)	Rs (Ω)	Xs (Ω)	Theta	τgr (ns)
M	1,365,045,851	-46.04	159.10	0.0	0.0	0.0	0.0	-20.8
1	628,366,036	-59.62	-49.03	0.0	0.0	0.0	0.0	-13.2
Δ	480,030,073	5.02	28.15	0.0	0.0	0.0	0.0	
2	1,108,396,109	-54.60	-77.18	0.0	0.0	0.0	0.0	-21.0
3	1,669,223,323	-57.13	-49.03	0.0	0.0	0.0	0.0	19.1
4	2,519,969,690	-45.73	-154.43	0.0	0.0	0.0	0.0	30.3

Mouse: Displays values, when the mouse cursor is inside the image panel.

Marker 1: Can be set by moving the mouse into the diagram panel and clicking the **left** mouse button. It can be moved using the mouse-wheel.

Delta: Calculates the absolute differences between most of the Marker 1 and Marker 2 data.

Marker 2: can be set by moving the mouse into the diagram panel and clicking the **left** mouse button while pressing the **Shift** key.
It can be moved using the mouse-wheel while pressing the **Shift** key.

Marker 3: can be set by moving the mouse into the diagram panel and clicking the **left** mouse button while pressing the **Control**-key.
It can be moved using the mouse-wheel while pressing the **Control**-key.

Marker 4: can be set by moving the mouse into the diagram panel and clicking the **left** mouse button while pressing the **Shift-Control**-keys.
It can be moved using the mouse-wheel while pressing the **Shift-Control**-keys.

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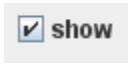
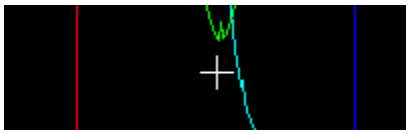
Operations

Un-checking the option button **right** to the marker, removes the marker from the diagram panel.



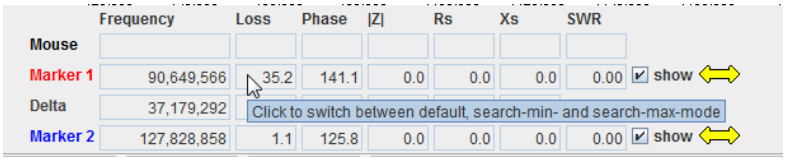
When the mouse is positioned inside the diagram panel, the current values at the mouse position are displayed in the marker named **M.**



The LOSS, PHASE and SWR fields support search mode.

When the search mode is selected, the marker is automatically positioned on the maximum- or minimum-value in the diagram.

The search mode is selected by clicking on the respective fields in marker 1 or marker 2.



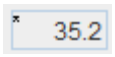
Two search-modes are supported:

- min-search mode

- max-search mode

Min-search mode is indicated by a small * at the lower-left corner of the field:

Max-search mode is indicated by a small * at the upper-left corner of the field:

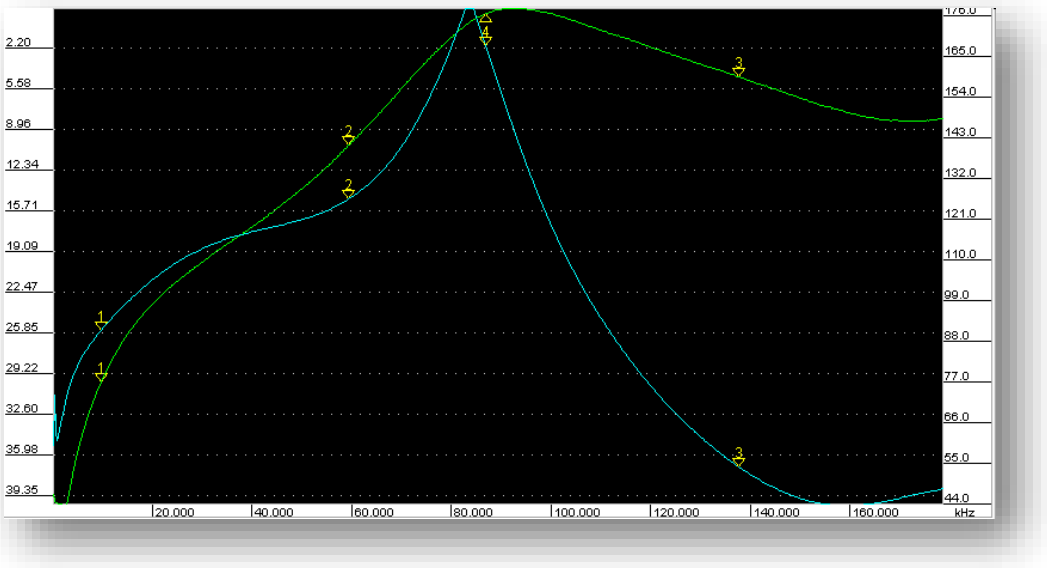


Standard-mode of the marker is enabled, if no * is visible in the field.

Opens or closes the marker math dialog for this marker

Opens or closes the tune dialog for this marker

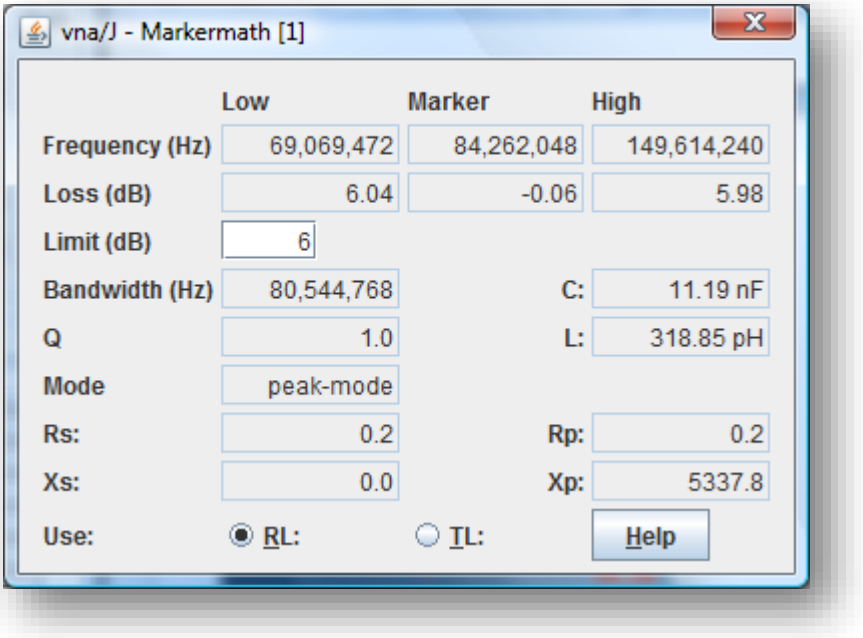
Markers are shown in the diagram as small triangles:

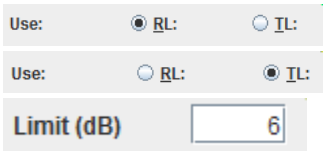


Marker-math dialog

This dialog can be used i.e. to tune an antenna filter to a given centre frequency and a defined bandwidth.

The marker-math dialog is bound to one marker. The data displayed in this dialog is the data of this marker.





To use the reflection loss data for calculation, select this radio button.

To use the transmission loss data for calculation, select this radio button.

Enter the desired bandwidth.

With this dialog, it is possible to measure i.e. the 6dB bandwidth of a band pass or notch filter.

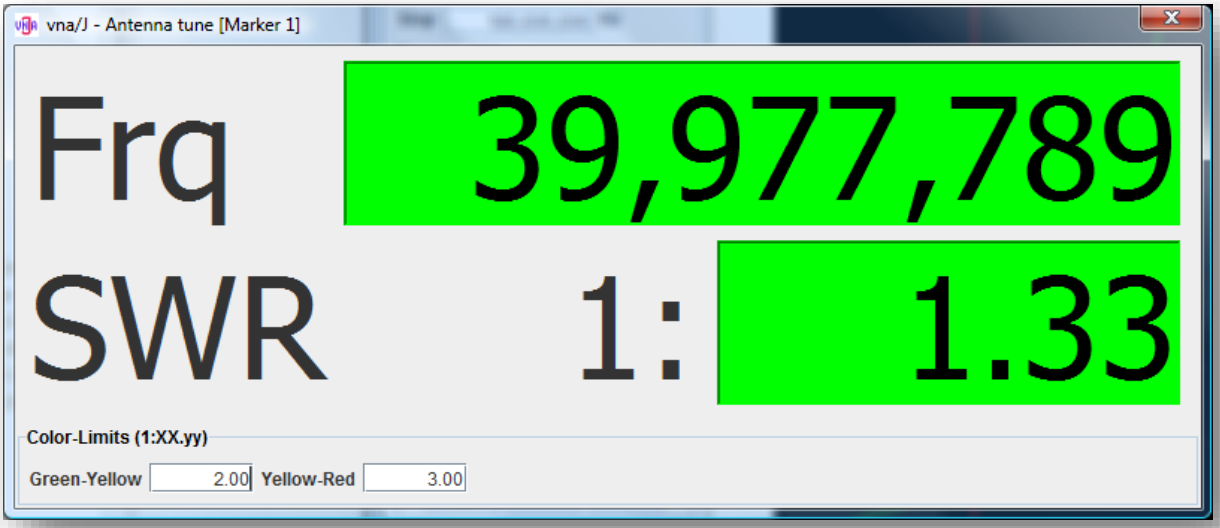
For a simple notch filter the procedure is described in chapter "Transmission mode" on page 114.

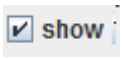
Remark: *The data in the dialog is updated **after** a scan!*

You have to leave the entry field for the "Limit" to activate the new value (i.e. click on dialog background ...)

Tune-dialog

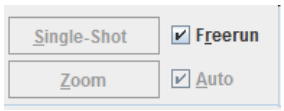
This dialog can be used i.e. to tune an antenna when the PC display is some distance away. The tune dialog is bound to one of the two markers. The data displayed in the tune-dialog is the data of this marker.





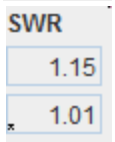
The dialog is available, when the corresponding marker is visible.

The dialog can be displayed by clicking on the toggle button.
The first click opens the dialog; a second click removes the dialog. The position, size and the entered limits are stored separately for each tune dialog.



For a continuous reading ensure, that the free-run mode is enabled.

If you want to display the SWR at a **fixed frequency**, ensure, that the marker search mode is **not enabled**, means no small star is shown in the marker fields.

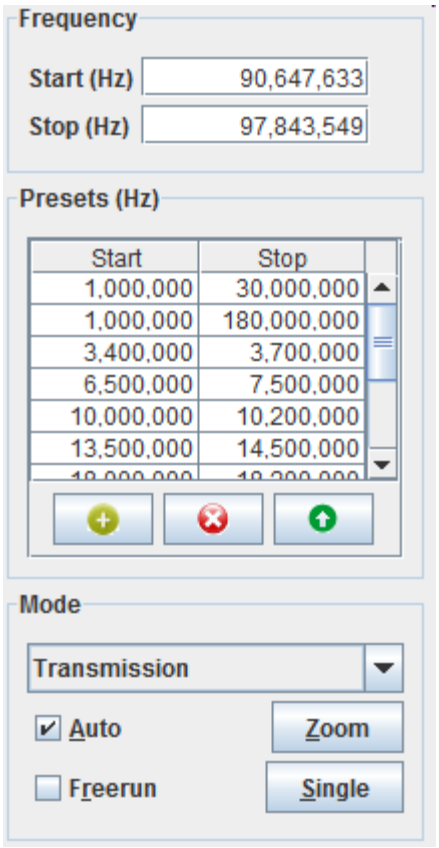


If you want to display the minimum or maximum SWR value in the given scan range, enable the marker search mode for the SWR marker field.

These two fields can control the background colour of the frequency and SWR fields.
The background is green, if the SWR is below the entered value in field **Green-Yellow**. The background is yellow, if the SWR is between **Green-Yellow** and **Yellow-Red**. The background turns red, if the SWR is above the value in the field **Yellow-Red.**

Remark: The Close icon in the dialog does not work!

The control panel



Frequency

In the frequency control panel, you can enter the desired start and stop frequencies for the scan.

The frequencies entered must be between the lower and upper maximum, which the selected analyser device can handle. The range can be checked using the driver info.

You can enter the frequencies in Hz, kHz or MHz

Examples:	144750000	144.750.000 Hz
	144m	144.000.000 Hz
	7200k	7.200.000 Hz

The start frequency should be below the stop frequency.

By double-clicking with the left mouse button on an entry in the presets list, you can quickly set the start/stop frequencies to the desired range. A selected list entry can also be used clicking the  button.

Entries in the presets list can be deleted by selection an entry in the list and clicking this button  .
A currently entered frequency can be added to the list clicking on the  button.

The presets for the common HAM bands are loaded at first application start.

The presets list is stored to the file system and loaded on application start.

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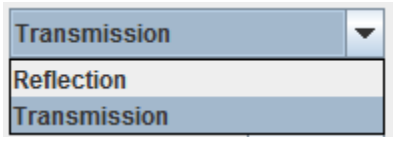
Mode

The available modes for the selected analyser type are displayed in the dropdown combo box.



Selecting the checkbox enables the continuous measurement with the given parameters in the frequency and mode group. If the checkbox is deselected, the scanning of the VNA stops and the pushbutton for single shot is active.

During continuous scanning, most of the menu entries and toolbar buttons are disabled to ensure a correct measurement.

The free run mode can be started using the F11-key.

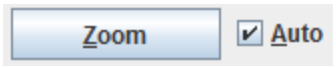
Clicking the button triggers a single scan of the analyser.

A single scan can be also triggered using the F12-key.

Zoom

There are two types of zoom modes supported:

- Min-Max-zoom
- Percentage zoom

If the AUTO checkbox right to the zoom button 

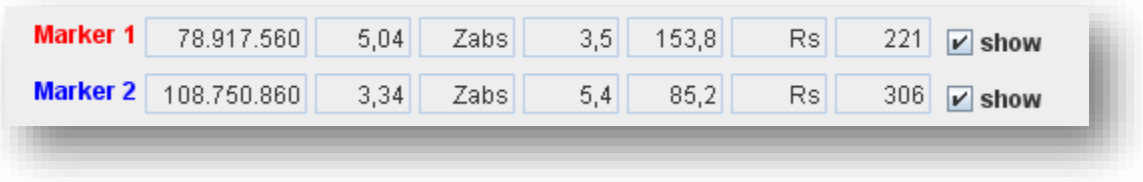
is checked, the analyser automatically performs a scan after the ZOOM button was pressed.

Min-Max-zoom

When both markers are visible inside the diagram, clicking the 

button sets the start and stop frequencies to the range selected by the markers 1 and 2.

Setting the markers to



And clicking the zoom button sets the scan range to these values: 

Percentage-zoom

When only one marker is visible in the diagram, clicking the zoom button zooms into the current diagram with:

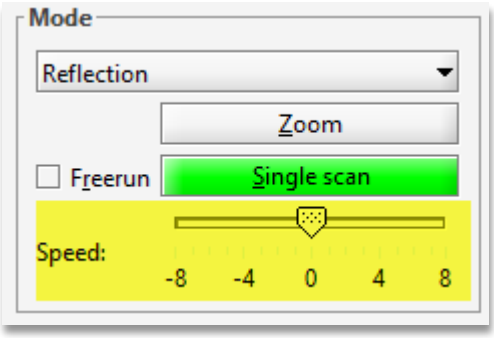
- The centre frequency is the marker frequency
- A frequency range of 20% of the current frequency range.

For example:

- Currently selected scan range from 1MHz to 100MHz. Marker is set to 60MHz.
- Now press ZOOM.
- New scan range is 50MHz to 70MHz with a centre frequency of 60MHz.

Speed selector

The slider bar in the scale select panel can be used to speed up the scan process accepting a reduced precision or can be used to enhance scan precision while reducing scan speed.



The amount of speedup or enhanced precision is displayed in the text field right to the slider bar.

- A value of 0 means no change.
- When moving the slider to the left, enhanced scan precision is selected as described in chapter “Average calculations” on page 34.
- When moving the slider to the right (positive number displayed) the scan speed is enhanced as described in chapter “Speed-up mode” on page 36.

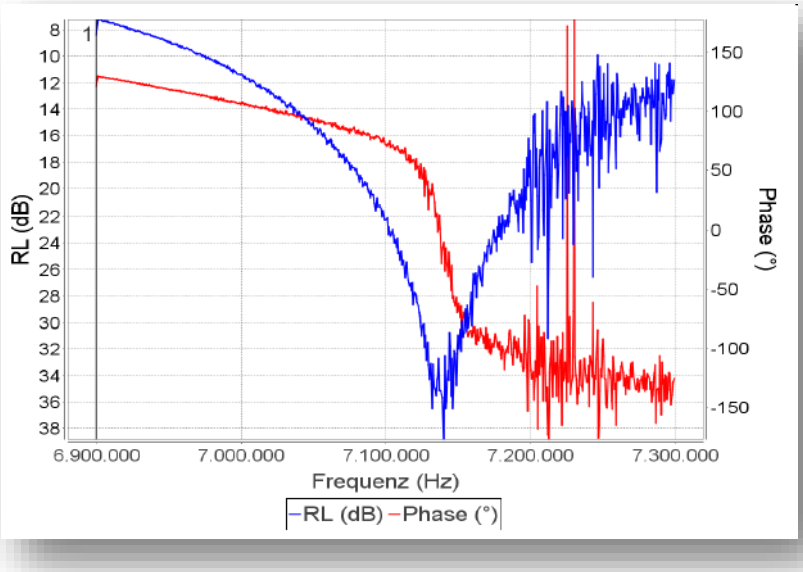
Average calculations

Running multiple scans with the same parameters and calculating the arithmetic mean of the scan results can enhance the scan precision. This helps i.e. to reduce the influence of strong broadcast stations in the 40m band.

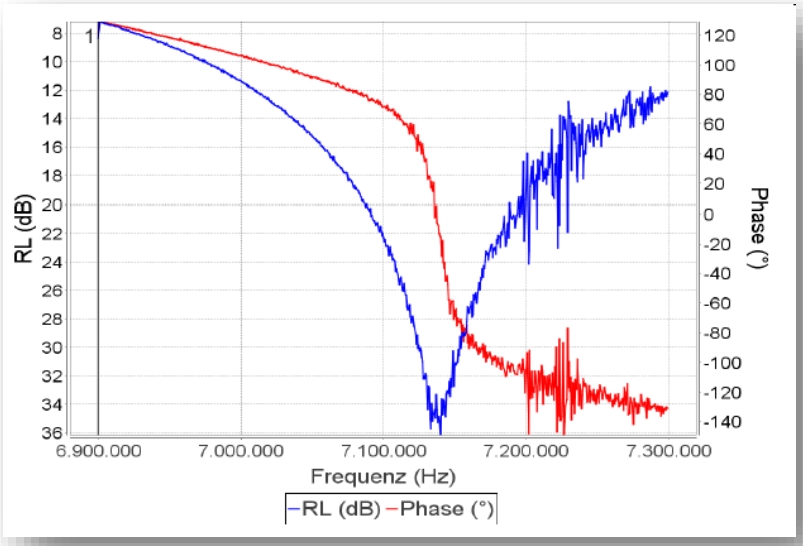
With the slider you can select between one additional scan (-1) and eight additional scans (-8).

Remarks: *The time for executing a scan with one additional scan takes twice the time of a single scan and so on.*
The samples are provided by Detlef, DL7IY and are measured using a miniVNApro and a large cage-antenna (Reuse).

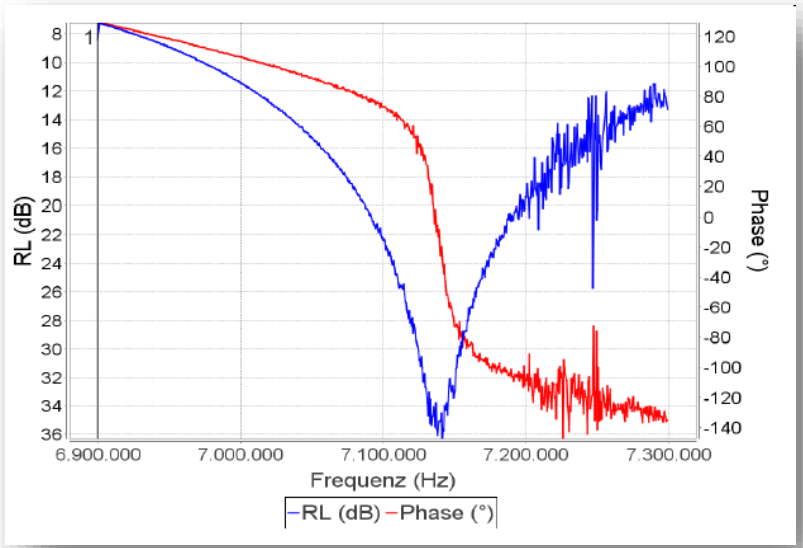
Average 0



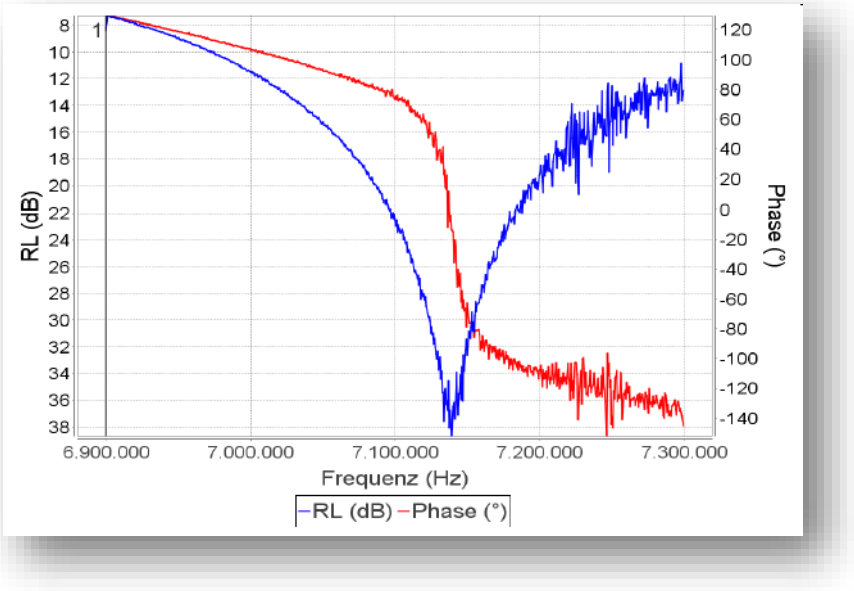
Average 1



Average 3



Average 7



Speed-up mode

The time required to execute one scan is more or less determined by the number of scan points (given by the horizontal size of the diagram window), the data acquisition speed of the analyser and the data transfer speed from the analyser to the host computer.

Under some circumstances this may be a problem, i.e. if you want to tune an RF-filter. Here you require higher scan rates.

One possibility is to reduce the size horizontal size of the scan window. But this is limited; the marker field will become unreadable when the size is too small.

Since version 2.8 of vna/J a so-called speedup is available. You can select speedup by moving the slider to the right until a positive value is displayed right to the slider.

- A speedup value of 0 means no-speedup.
- A speedup of 1 means, that only ½ of the samples is taken and each point is doubled for display.
- Speedups of 2 means, that only 1/3 of the samples are taken and each point is tripled for display.
- And so on …

Sample: Horizontal size of diagram area is 543 pixel

Speedup 0	543 samples in time X
Speedup 1	272 samples in time X/2
Speedup 2	181 samples in time X/3
…	

Due to the reduced number of samples the scan quality is reduced and some step-like artefacts may be visible in the scan. But for i.e. for rough tuning of a filter this is sufficient.

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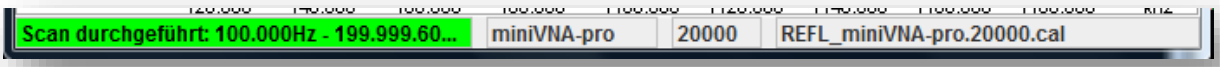
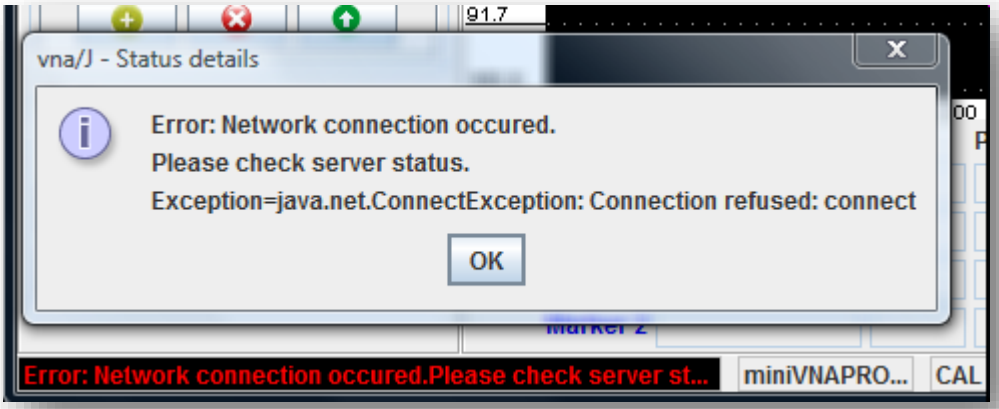
The status bar

The status bar at the bottom of the screen contains four sections:



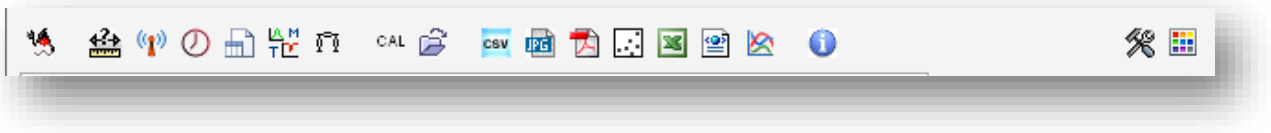
1. In the leftmost section, tool tips for the menu entries and status information of running data acquisitions are displayed. Green or white background for info messages. Red for errors.
2. The selected type of the analyser is displayed here.
3. When calibration data is loaded, here the number of calibration steps and over scans is displayed. If no data is loaded UNCAL is displayed.
4. In the rightmost section, the filename of the currently loaded main calibration dataset together with the files comment is shown.

Remark: If any text displayed in the status bar is not completely visible, simply click on it with the mouse to display a popup dialog, displaying the complete message.



The tool bar

The tool bar below the menu bar contains useful shortcuts to commonly used commands.



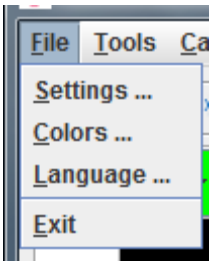
Icon	Description	Menu equivalent
	Exit the application.	FILE/EXIT
	Opens the cable length measurement dialog. For details see chapter "Cable length measurement" on page 64.	TOOLS/CABLELENGTH
	Opens the generator dialog. For details see chapter "Generator" on page 67.	TOOLS/GENERATOR
	Opens the scheduler dialog. Same as menu For details see chapter "Scheduler" on page 67.	TOOLS/SCHEDULER
	Opens the data analysis dialog. For details see chapter "Data analysis" on page 71.	
	Open the multi-tune dialog. For details see chapter "Multi-tune" on page 76.	TOOLS/MULTI-TUNE
	Opens the attenuator pad dialog. For details see chapter "Pad calculator" on page 80	TOOLS/PAD-Calculator
CAL	Opens the calibration dialog. For details see chapter "**Fehler! Verweisquelle konnte nicht gefunden werden.**" on page **Fehler! Textmarke nicht definiert.**	CALIBRATION/LOSS.
	Opens the calibration load dialog. For details see chapter "Loading existing calibration data" on page 95.	CALIBRATION/LOAD
XLS CSV PDF JPG XML S1P	Exports the measured data to a file in the selected format. For details see chapter "Export" on page 44	MENU/XLS, /CSV, /PDF, /JPG, /S-parameter MENU/ZPlots
	Opens the driver info dialog.	ANALYZER/INFO
	Open the application settings dialog. Same as menu. For details see chapter "Configuration" on page 102.	FILE/SETTINGS
	Configure the colours of the diagram area.	FILE/COLORS

The menu bar

File

Here the general settings dialog, the language and the colour configuration dialog can be started.

The application can be closed using the EXIT entry.



Settings

The settings dialog is displayed. See chapter "Editing" on page 104 for details.

Colours

The colour configuration dialog is displayed. For details please see chapter "Colour settings" on page 106.

Language

The language configuration dialog is displayed. See chapter "Language settings" on page 107 for details.

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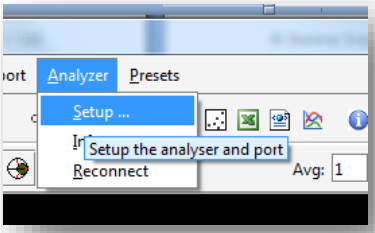
Analyser

Setup

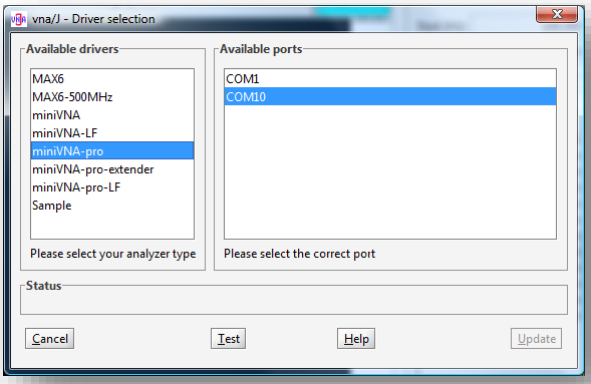
The configuration of the analyser hardware can be found in the analyser menu.



To select the correct analyser type, first connect your analyser to your computer and then select the menu ANALYZER/SETUP.

Now the driver selection dialog is opened.

Select your analyser type in the left list. After selection, the available ports for your analyser are displayed in the right list. Select the correct port for your analyser and press the TEST button.

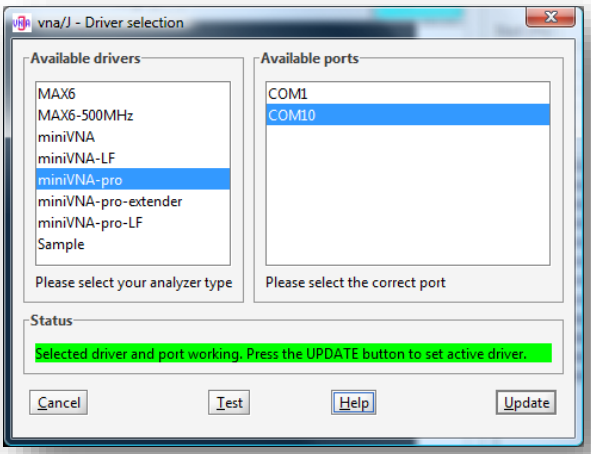


Remark:

The name of the interfaces found on the systems depends on the operation system running.

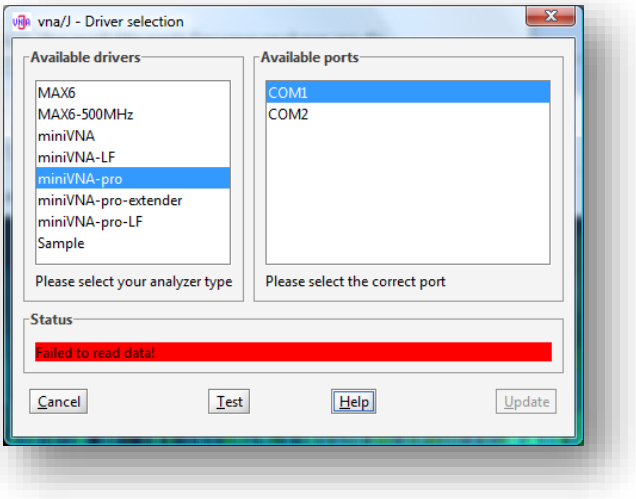
If everything works fine for your analyser, a GREEN message is display in the status area.

Then press the UPDATE button and you're ready to execute scans in the main window.



In case of failure an error message in RED is displayed in the status area.

Then try another of the available ports and check the connection of analyser to your computer.



Info

After selecting the correct hardware, a driver information dialog is available, which shows the hardware specific parameters. This dialog can be also opened using the toolbar button.

Depending on the selected driver a specific dialog is displayed. Please consult the driver guide for the various analysers.

Reconnect …

Since version 2.8 of vna/J a permanent connection is established between vna/J and the connected analyser. This behaviour greatly reduces the problems for Bluetooth-connections on various platforms.
If the connection between the analyser and vna/J is lost while vna/J is running, no further scans can be executed. To reconnect to the analyser select the **Reconnect** menu entry in the **Analyser** menu.

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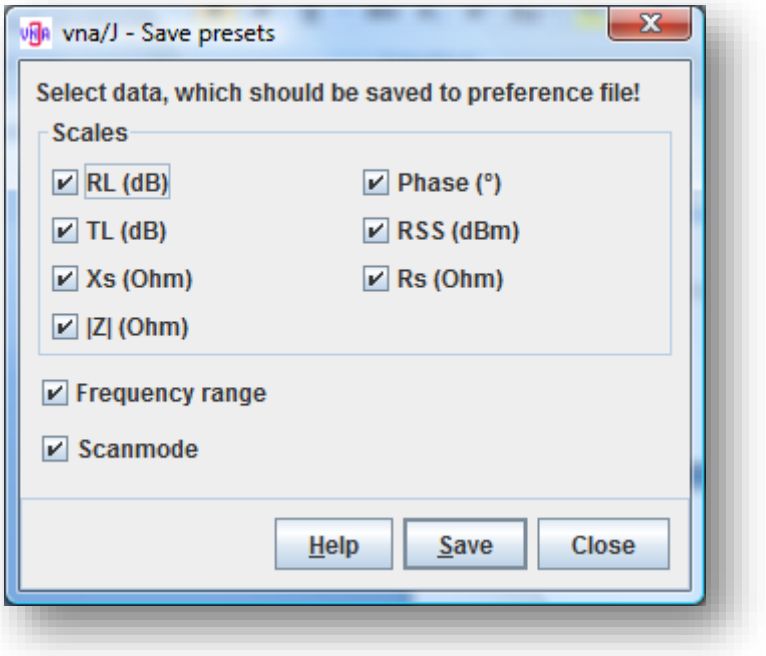
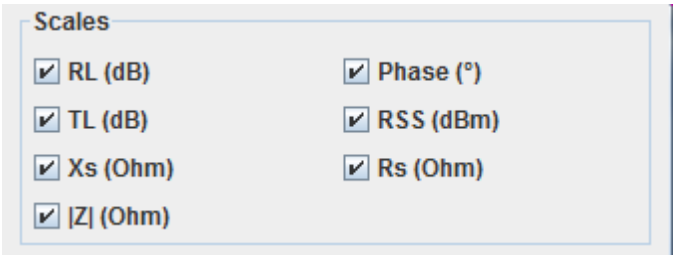
Presets

Save …

Selecting the menu entry PRESETS/SAVE opens this dialog:



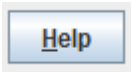
Here the user can select which data should be saved for later recall:



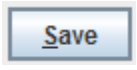
The current minimum and maximum values of the selected scales are saved.

The frequency range entered in the frequency section of the data panel.

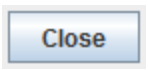
The currently selected mode in the data panel.



Displays a help dialog.



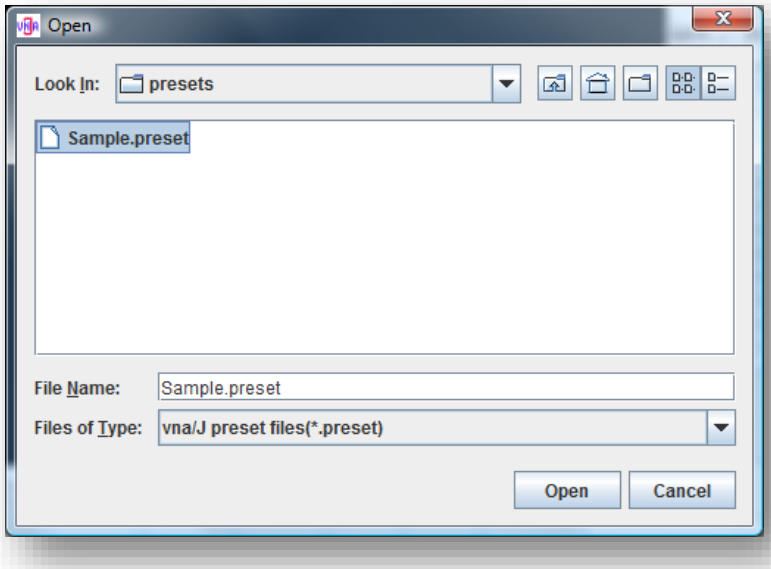
Open the file save dialog where the user enter a new target file name or select an existing file to overwrite.



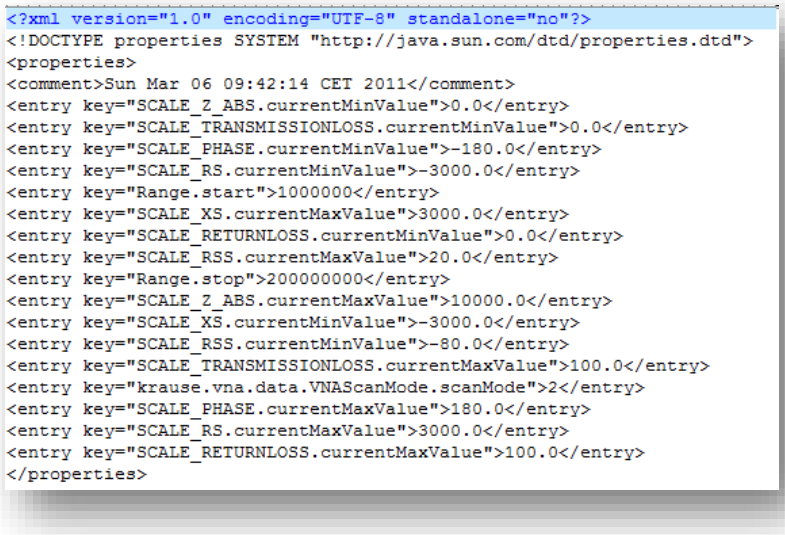
Closes this dialog without saving data.

Load …

A simple file selection dialog is opened and the user can select an existing file to load.



Internal



```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE properties SYSTEM "http://java.sun.com/dtd/properties.dtd">
<properties>
<comment>Sun Mar 06 09:42:14 CET 2011</comment>
<entry key="SCALE_Z_ABS.currentMinValue">0.0</entry>
<entry key="SCALE_TRANSMISSIONLOSS.currentMinValue">0.0</entry>
<entry key="SCALE_PHASE.currentMinValue">-180.0</entry>
<entry key="SCALE_RS.currentMinValue">-3000.0</entry>
<entry key="Range.start">1000000</entry>
<entry key="SCALE_XS.currentMaxValue">3000.0</entry>
<entry key="SCALE_RETURNLOSS.currentMinValue">0.0</entry>
<entry key="SCALE_RSS.currentMaxValue">20.0</entry>
<entry key="Range.stop">200000000</entry>
<entry key="SCALE_Z_ABS.currentMaxValue">10000.0</entry>
<entry key="SCALE_XS.currentMinValue">-3000.0</entry>
<entry key="SCALE_RSS.currentMinValue">-80.0</entry>
<entry key="SCALE_TRANSMISSIONLOSS.currentMaxValue">100.0</entry>
<entry key="krause.vna.data.VNAScanMode.scanMode">2</entry>
<entry key="SCALE_PHASE.currentMaxValue">180.0</entry>
<entry key="SCALE_RS.currentMaxValue">3000.0</entry>
<entry key="SCALE_RETURNLOSS.currentMaxValue">100.0</entry>
</properties>
```

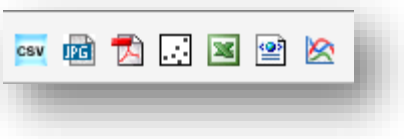
The presets are saved as JAVA property file in XML encoding.

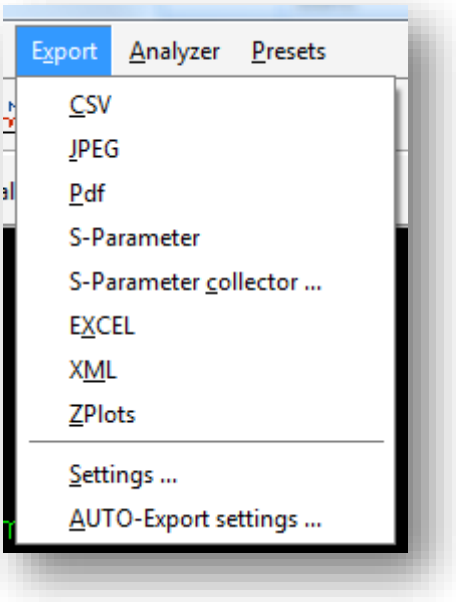
Export

Currently the application supports 4 ways to export the measurement data into an external files:

Format	Comment
CSV	Exports the pure numerical data into a comma-separated file
JPEG	Exports the currently display diagram into a JPEG-compatible file or to the clipboard.
PDF	Exports the currently displayed diagram along with the optional displayed markers
S-Parameter	Export the currently displayed data into an S-parameter (S1P) compatible file.
S-Parameter collector	
EXCEL	Exports the pure numerical data into Microsoft© EXCEL Worksheet.
XML	Exports the currently displayed data into an XML compatible file.
ZPlots	Export the data in a format, that the EXCEL macros ZPlots from AC6LA can directly read and display.

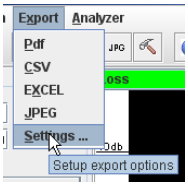
The export functions are available via the EXPORT menu or the corresponding toolbar buttons:

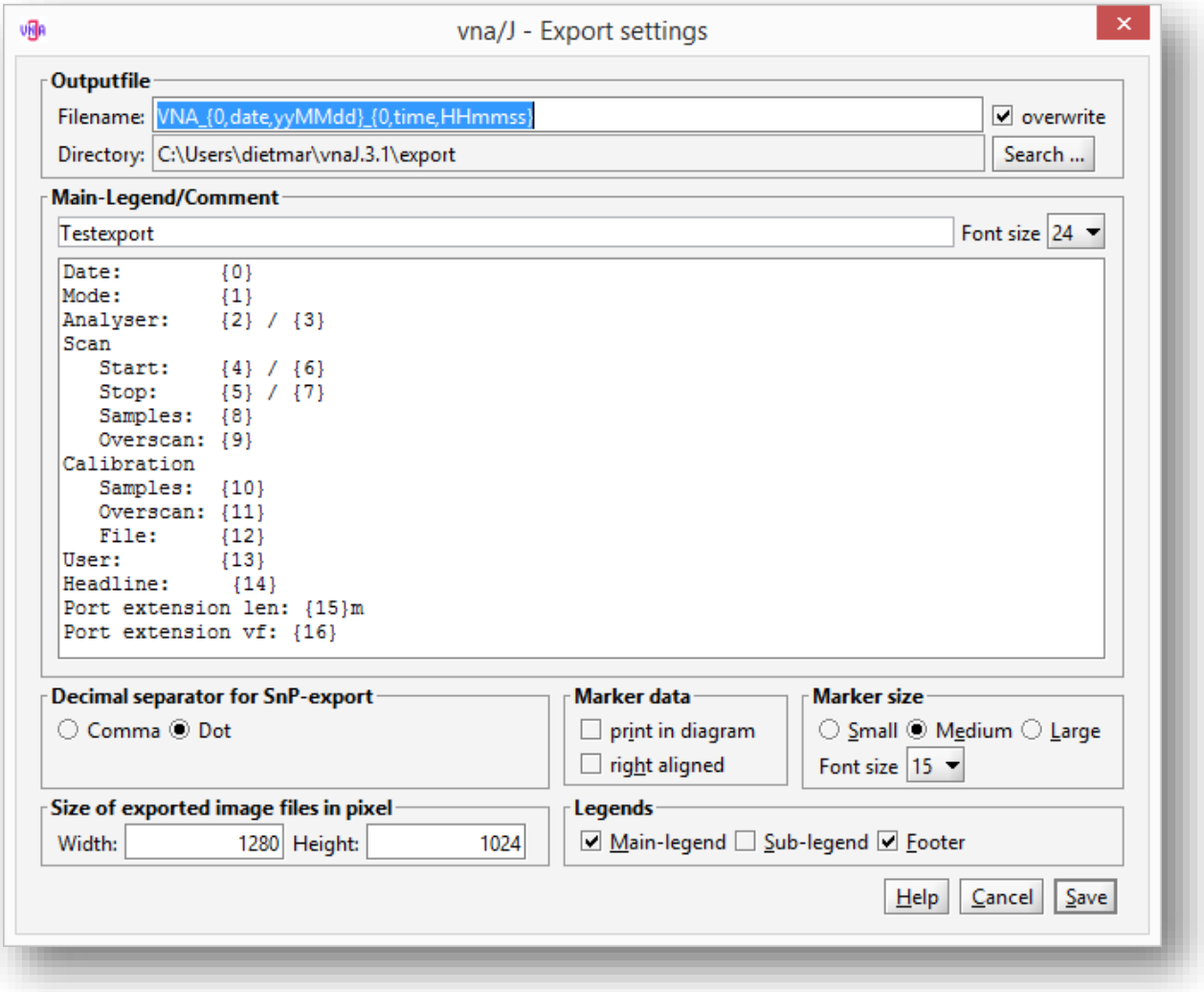




Settings

The settings dialog sets common parameters for all export formats.

It can be reached via the menu entry 



The various fields are described in the following chapters.

Output file → Filename

Here you can enter the name for the exported files. Depending on the export type, the correct file-name extension (XLS, PDF, JPG and CSV) is appended to this name.

As a special feature, the filename supports parameter replacement. The following parameters are supported:

{0} Timestamp (see next chapter)
{1} transmission or reflection mode
{2} short name of the analyser
{3} long name of analyser
{4} start frequency for the scan (without thousand-separators)
{5} stop frequency for the scan (without thousand-separators)
{6} start frequency for the scan (with thousand-separators)
{7} stop frequency for the scan (with thousand-separators)
{8} number of samples of current scan
{9} number of over scans used for this scan
{10} number of samples of used calibration data set
{11} number of over scans contained in this calibration data set
{12} filename of the used calibration data set
{13} user login ID from operation system
{14} The text entered in the "Headline" field
{15} The length entered in the port extension dialog (see chapter “Port extension” on page 26)
{16} The velocity factor from the port extension dialog (see chapter “Port extension” on page 26)

Timestamp

When calling the export function, the current timestamp is provided in parameter {0}. Here are some formatting examples for this timestamp 2010-02-15 17:12:45:

Format	Result
VNA_{0,date,yyMMdd}	VNA_100215.xls
VNA_{0,time , HHmmss }	VNA_171245.xls

The following replacement parameters are currently supported:

Shortcut	Represents	Example	Shortcut	Represents	Example
y	Year	1996; 96	H	Hour in day (0-23)	0
M	Month in year	07	k	Hour in day (1-24)	24
w	Week in year	27	K	Hour in am/pm (0-11)	0
W	Week in month	2	h	Hour in am/pm (1-12)	12
D	Day in year	189	m	Minute in hour	30
d	Day in month	10	s	Second in minute	55
F	Day of week in month	2	a	Am/pm marker	PM
E	Day in week	Tuesday			

Output file → Directory

Here the directory is displayed, into which all export files are written. The directory can be selected using the SEARCH button.

Output file → Overwrite

If the checkbox OVERWRITE is set, an existing file with the same name as the file to be created is overwritten.

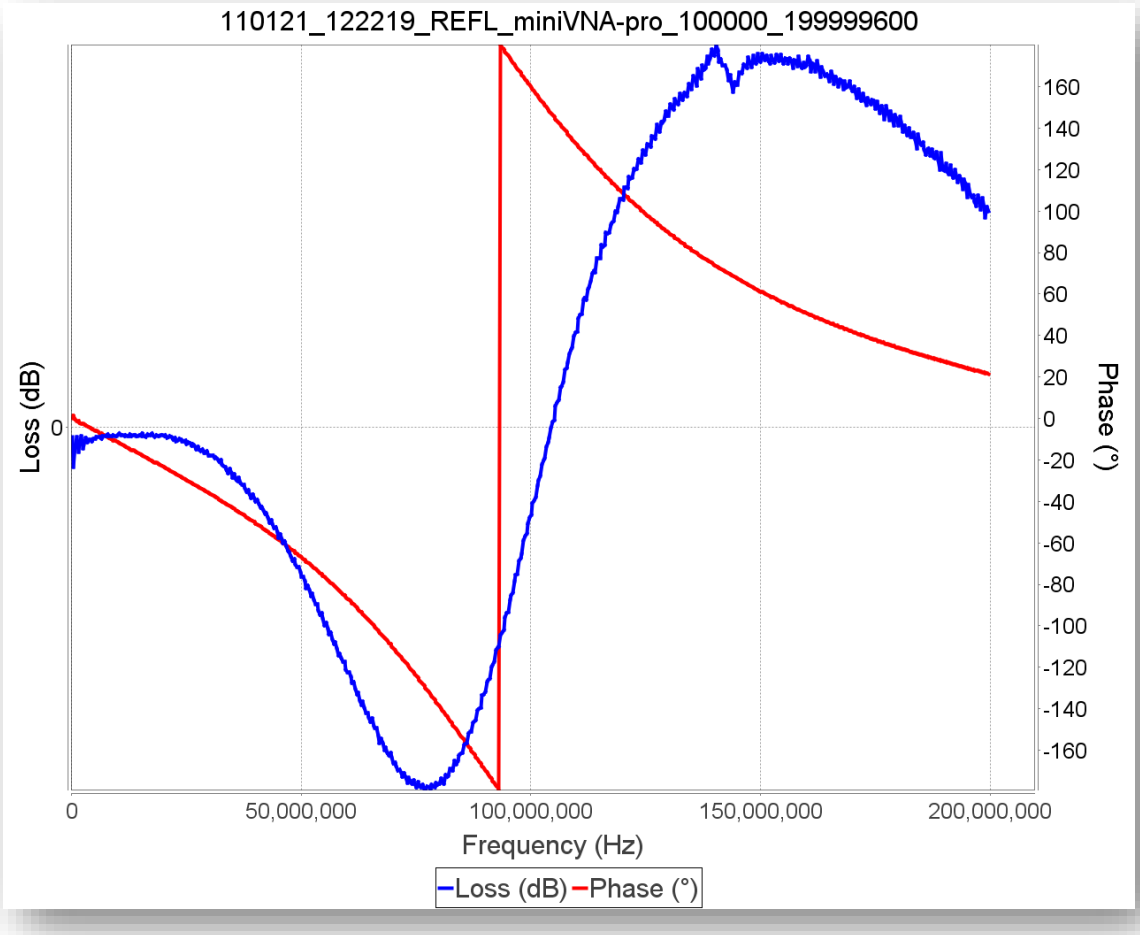
If the checkbox OVERWRITE is not set, a message is shown and you are asked, whether you want to overwrite this file.

Note: *When a part of the filename is dynamic (i.e. inserted date or time parts) the overwrite warning is only shown, when exactly the same filename is already existing at the export location.*

If you plan to use the scheduler to generate automatically export, ensure, that this checkbox is not set or that every time the scan runs, a different filename is generated!

Headline/Comment

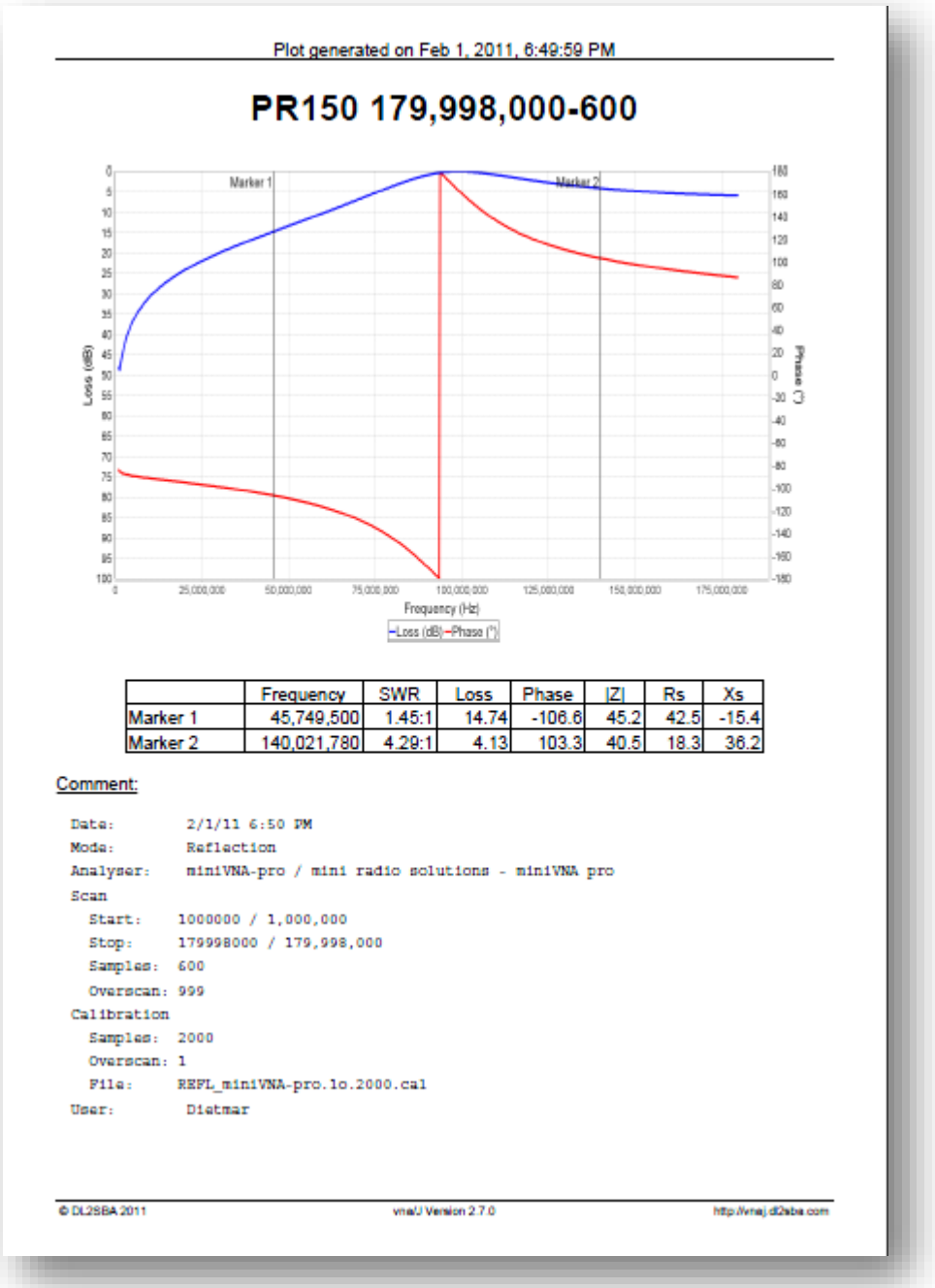
Here you can enter a diagram title, which is displayed in the head section of the exported diagrams (JPG and PDF format).



The same replacement parameters are supported as for the filename field.

Comment

Here you can enter a detailed comment for the measurement, which is printed in the generated PDF-document below the diagram.



Plot generated on Feb 1, 2011, 6:49:59 PM

PR150 179,998,000-600

	Frequency	SWR	Loss	Phase	|Z|	Rs	Xs
Marker 1	45,749,500	1.45:1	14.74	-106.6	45.2	42.5	-15.4
Marker 2	140,021,780	4.29:1	4.13	103.3	40.5	18.3	36.2

Comment:

```
Data:        2/1/11 6:50 PM
Mode:        Reflection
Analyser:    miniVNA-pro / mini radio solutions - miniVNA pro
Scan
  Start:     1000000 / 1,000,000
  Stop:      179998000 / 179,998,000
  Samples:   600
  Overscan:  999
Calibration
  Samples:   2000
  Overscan:  1
  File:      REFL_miniVNA-pro.lo.2000.cal
User:        Dietmar
```

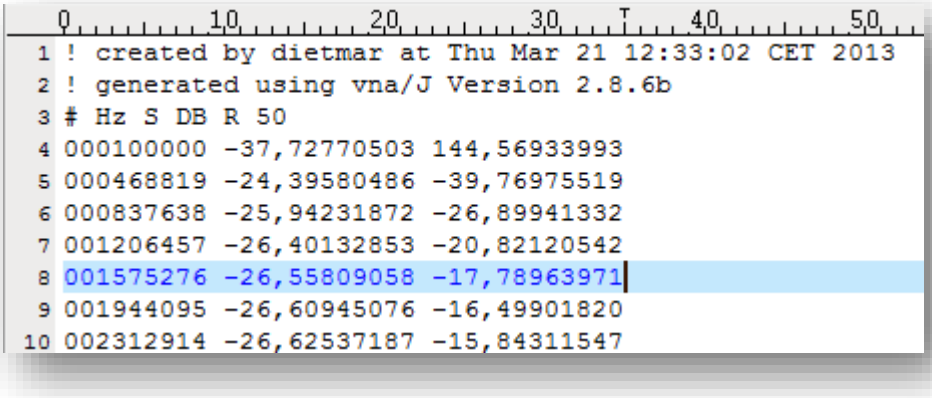

For printing a fixed-space-font is used, so fundamental formatting can be done using SPACES.

The same replacement parameters are supported as for the filename field.

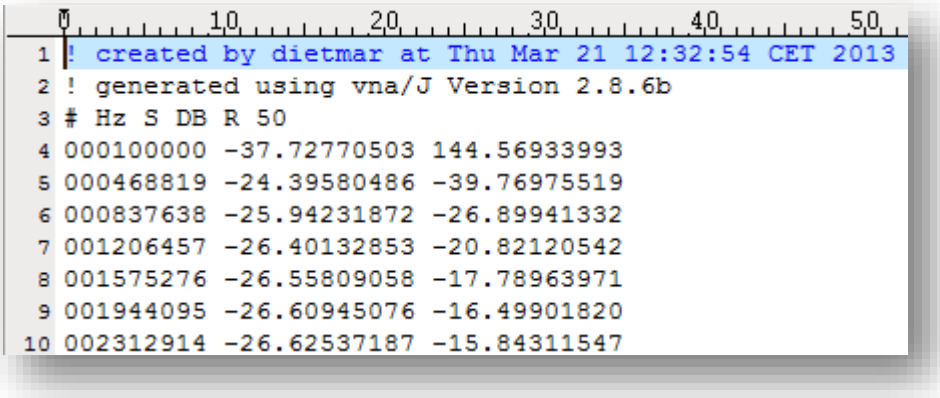
Decimal separator for SnP-export

Here you can specify, whether the numerical values are exported to S-parameter files with either comma or dot as the decimal separator.

Comma separated

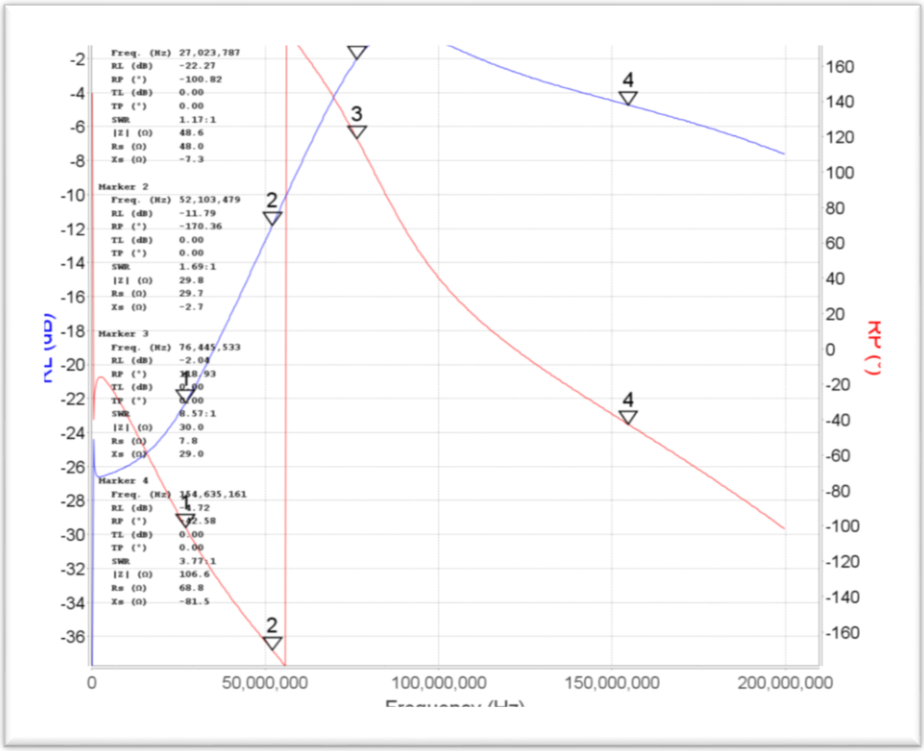


Dot separated

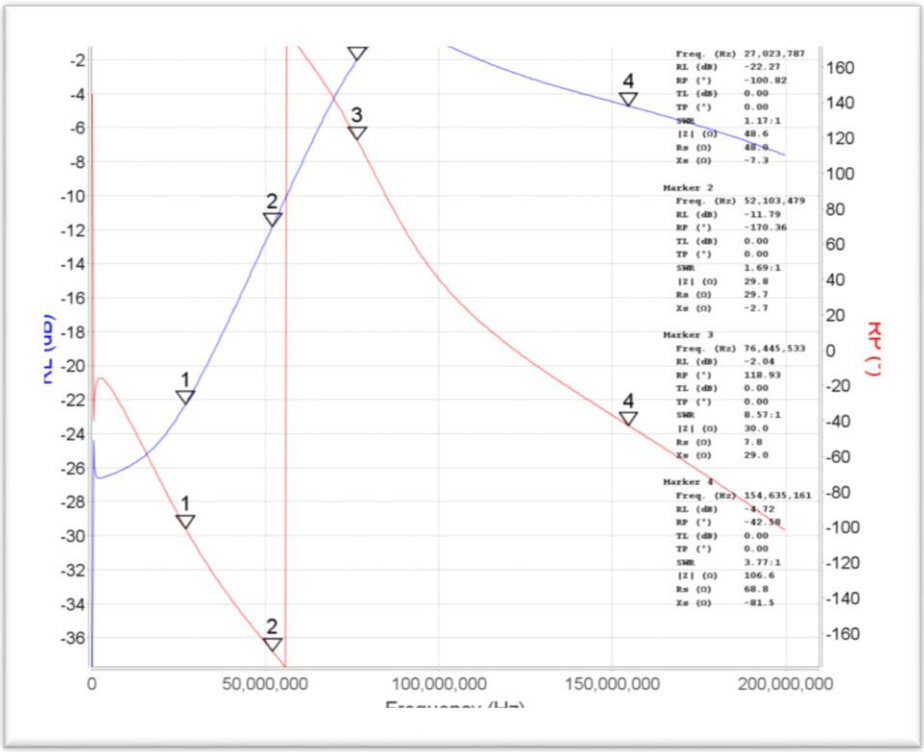


Marker data

Here you can specify whether the marker data is printed inside the diagram area and its location within the diagram area.



Left aligned

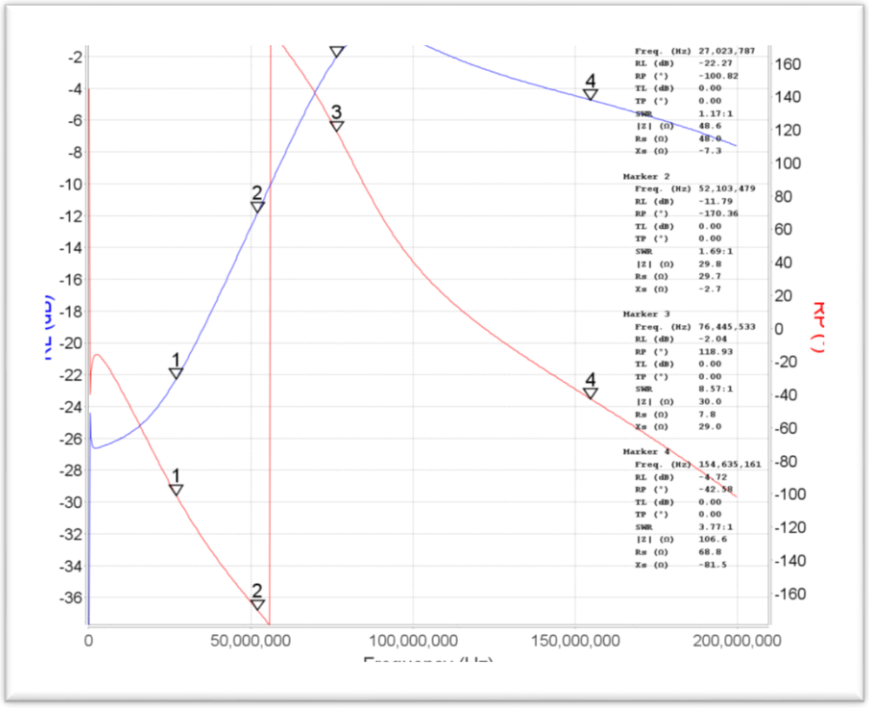


Right aligned

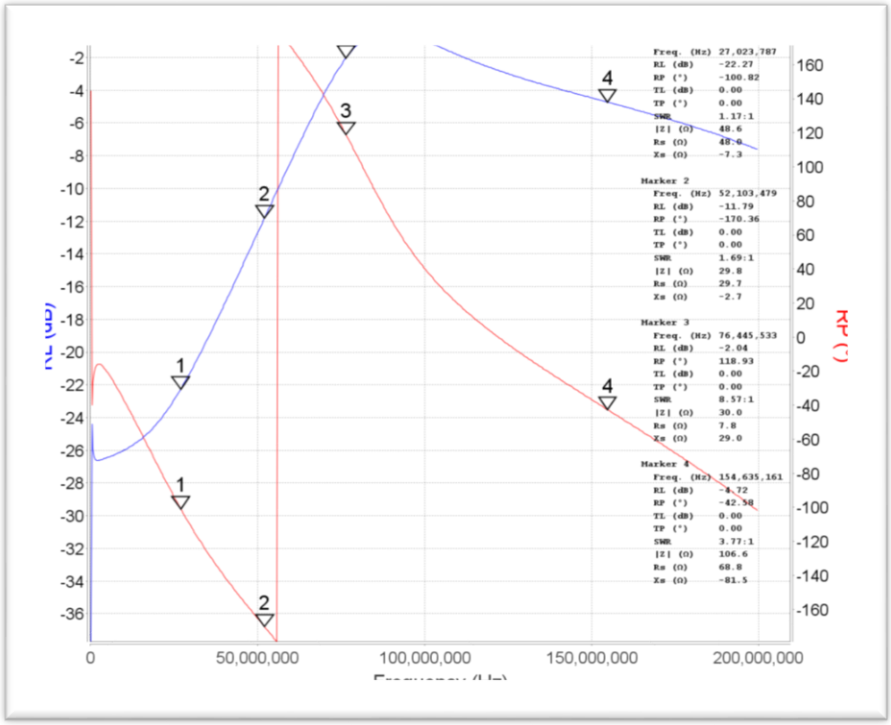
Marker-size

Here you can specify the size of the marker tri-angles in the exported diagrams.

Small



Medium



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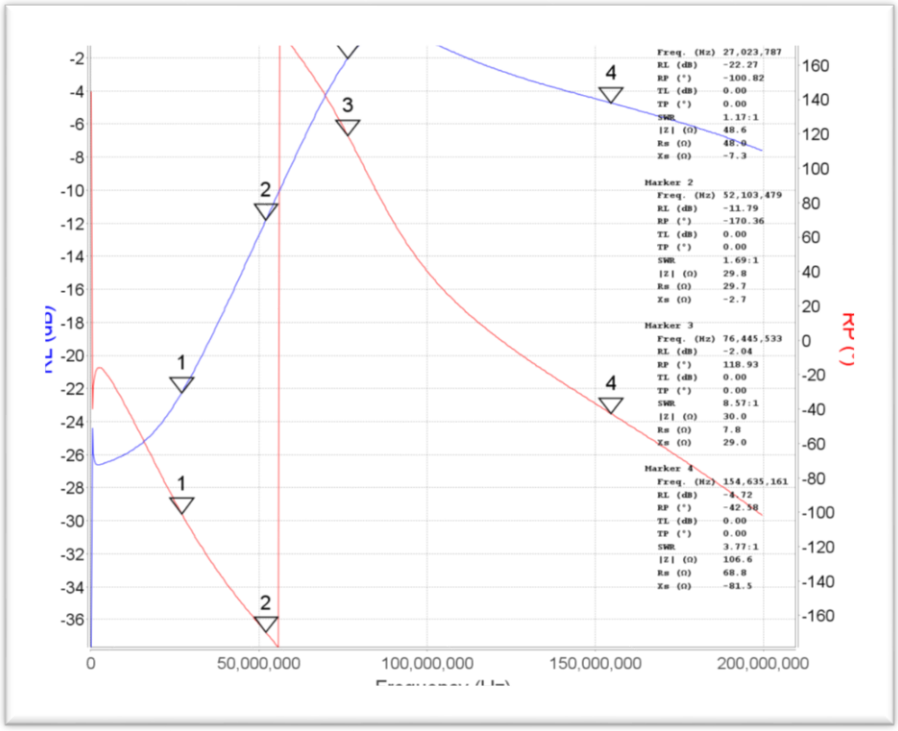
Large

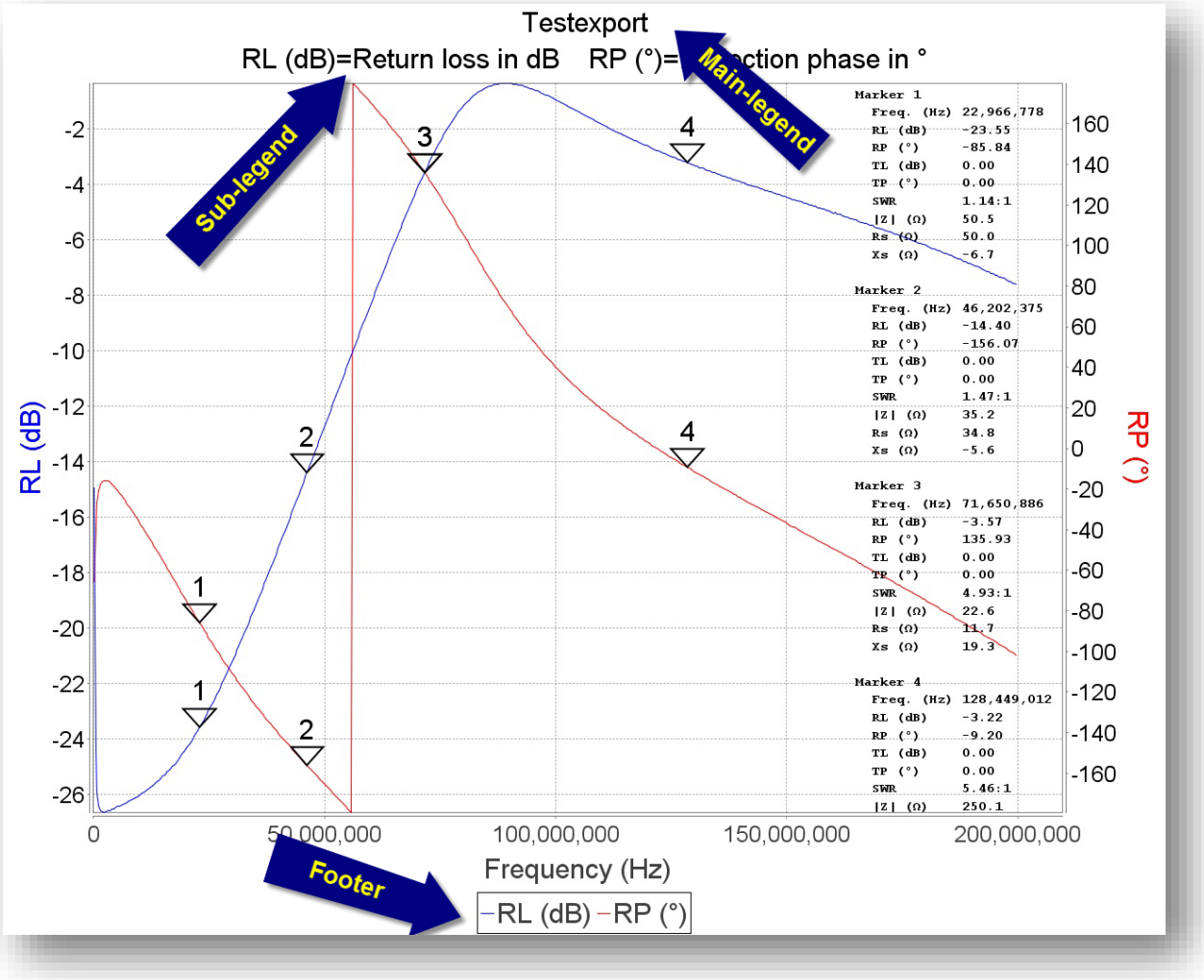

Freq. (Hz) 27,023,787
RL (dB) -22.27
RP (°) -100.82
TL (dB) 0.00
TP (°) 0.00
SWR 1.17:1
|Z| (Ω) 48.6
Rs (Ω) 48.0
Xs (Ω) -7.3
Marker 2
Freq. (Hz) 52,103,479
RL (dB) -11.79
RP (°) -170.36
TL (dB) 0.00
TP (°) 0.00
SWR 1.69:1
|Z| (Ω) 29.8
Rs (Ω) 29.7
Xs (Ω) -2.7
Marker 3
Freq. (Hz) 76,445,533
RL (dB) -2.04
RP (°) 118.93
TL (dB) 0.00
TP (°) 0.00
SWR 8.57:1
|Z| (Ω) 30.0
Rs (Ω) 7.8
Xs (Ω) 29.0
Marker 4
Freq. (Hz) 154,635,161
RL (dB) -4.72
RP (°) -42.58
TL (dB) 0.00
TP (°) 0.00
SWR 3.77:1
|Z| (Ω) 106.6
Rs (Ω) 68.8
Xs (Ω) -81.5
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
160
140
120
100
80
60
40
20
0
-20
-40
-60
-80
-100
-120
-140
-160
0
50,000,000
100,000,000
150,000,000
200,000,000
1
2
3
4
1
2
3
4

Size of exported image file in pixels

Here you can specify the size of the chart in pixels for export formats writing bitmap files (JPEG) to the file system.

Legend

Here you can specify, which legend is printed on the exported charts.

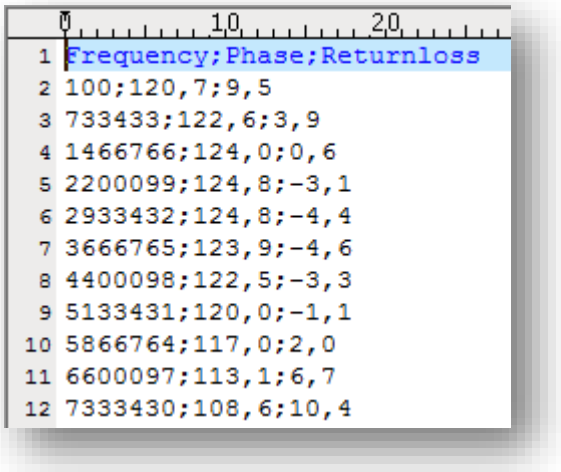


CSV export

Currently only the values … are exported in CSV format.

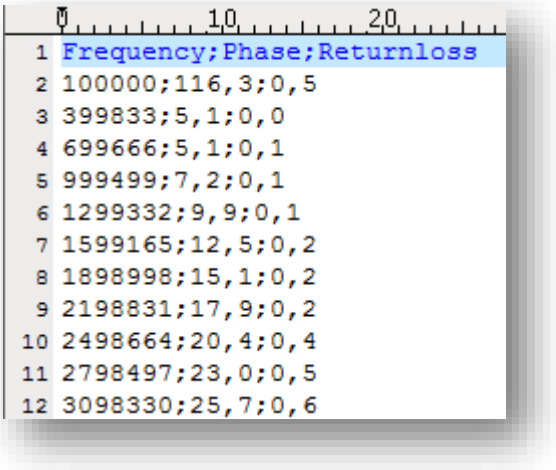
- Frequency
- Phase and
- Loss

For EN/US locales, the comma is used as value separator. The dot is used as decimal separator:



```
1  Frequency;Phase;Returnloss
2  100;120,7;9,5
3  733433;122,6;3,9
4  1466766;124,0;0,6
5  2200099;124,8;-3,1
6  2933432;124,8;-4,4
7  3666765;123,9;-4,6
8  4400098;122,5;-3,3
9  5133431;120,0;-1,1
10 5866764;117,0;2,0
11 6600097;113,1;6,7
12 7333430;108,6;10,4
```

For DE/CH/AT locales, the semicolon is used as value separator. The comma is used as decimal separator.



```
1  Frequency;Phase;Returnloss
2  100000;116,3;0,5
3  399833;5,1;0,0
4  699666;5,1;0,1
5  999499;7,2;0,1
6  1299332;9,9;0,1
7  1599165;12,5;0,2
8  1898998;15,1;0,2
9  2198831;17,9;0,2
10 2498664;20,4;0,4
11 2798497;23,0;0,5
12 3098330;25,7;0,6
```

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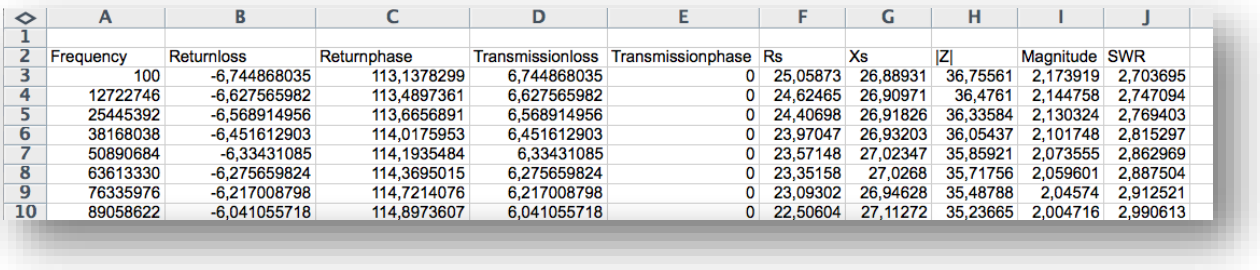
Microsoft© Excel export

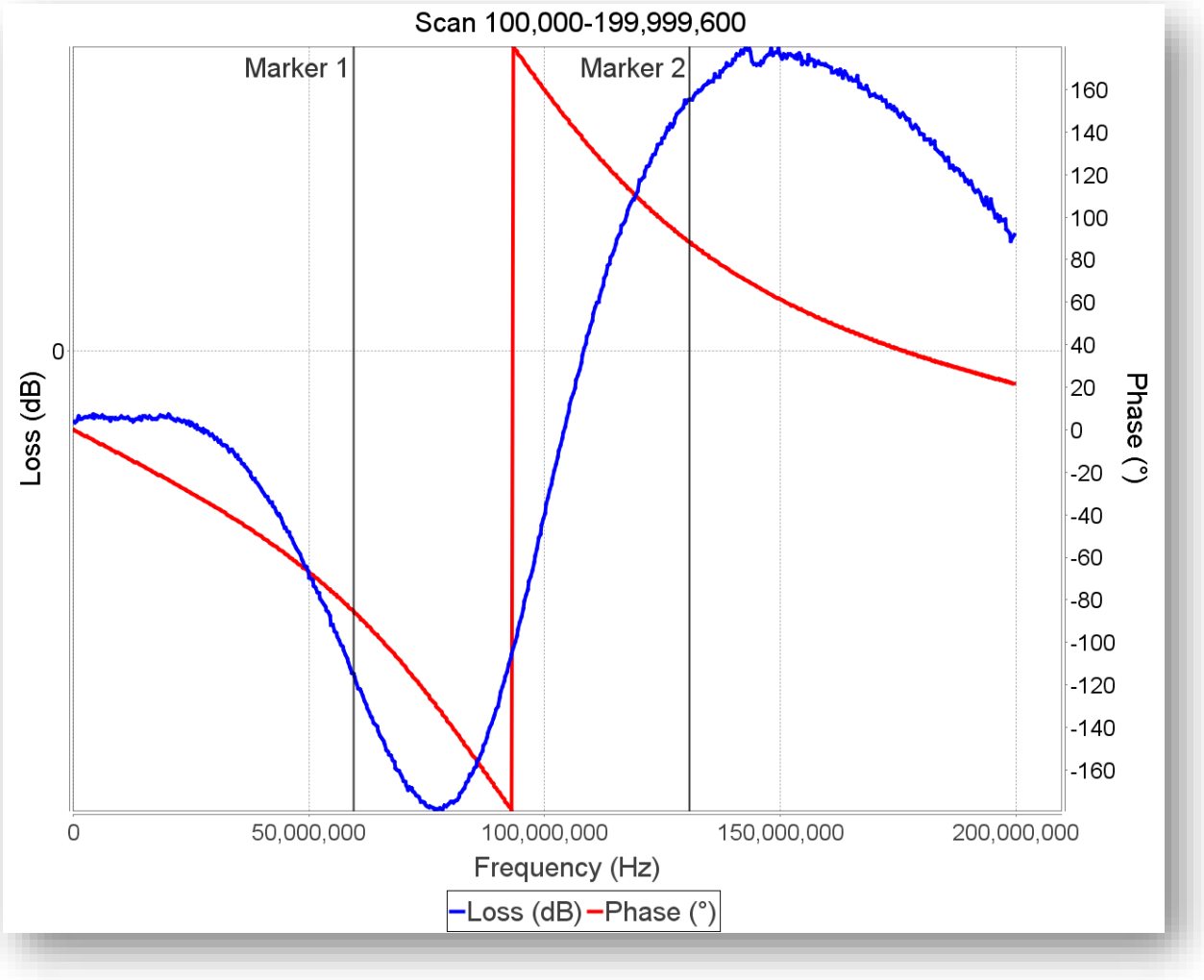
Currently these values are exported to XLS format:

- Frequency
- Return loss
- Return phase
- Transmission loss
- Transmission phase
- Rs
- Xs
- |Z|
- Magnitude
- SWR



	A	B	C	D	E	F	G	H	I	J
1										
2	Frequency	Returnloss	Returnphase	Transmissionloss	Transmissionphase	Rs	Xs	|Z|	Magnitude	SWR
3	100	-6,744868035	113,1378299	6,744868035	0	25,05873	26,88931	36,75561	2,173919	2,703695
4	12722746	-6,627565982	113,4897361	6,627565982	0	24,62465	26,90971	36,4761	2,144758	2,747094
5	25445392	-6,568914956	113,6656891	6,568914956	0	24,40698	26,91826	36,33584	2,130324	2,769403
6	38168038	-6,451612903	114,0175953	6,451612903	0	23,97047	26,93203	36,05437	2,101748	2,815297
7	50890684	-6,33431085	114,1935484	6,33431085	0	23,57148	27,02347	35,85921	2,073555	2,862969
8	63613330	-6,275659824	114,3695015	6,275659824	0	23,35158	27,0268	35,71756	2,059601	2,887504
9	76335976	-6,217008798	114,7214076	6,217008798	0	23,09302	26,94628	35,48788	2,04574	2,912521
10	89058622	-6,041055718	114,8973607	6,041055718	0	22,50604	27,11272	35,23665	2,004716	2,990613

Jpeg export



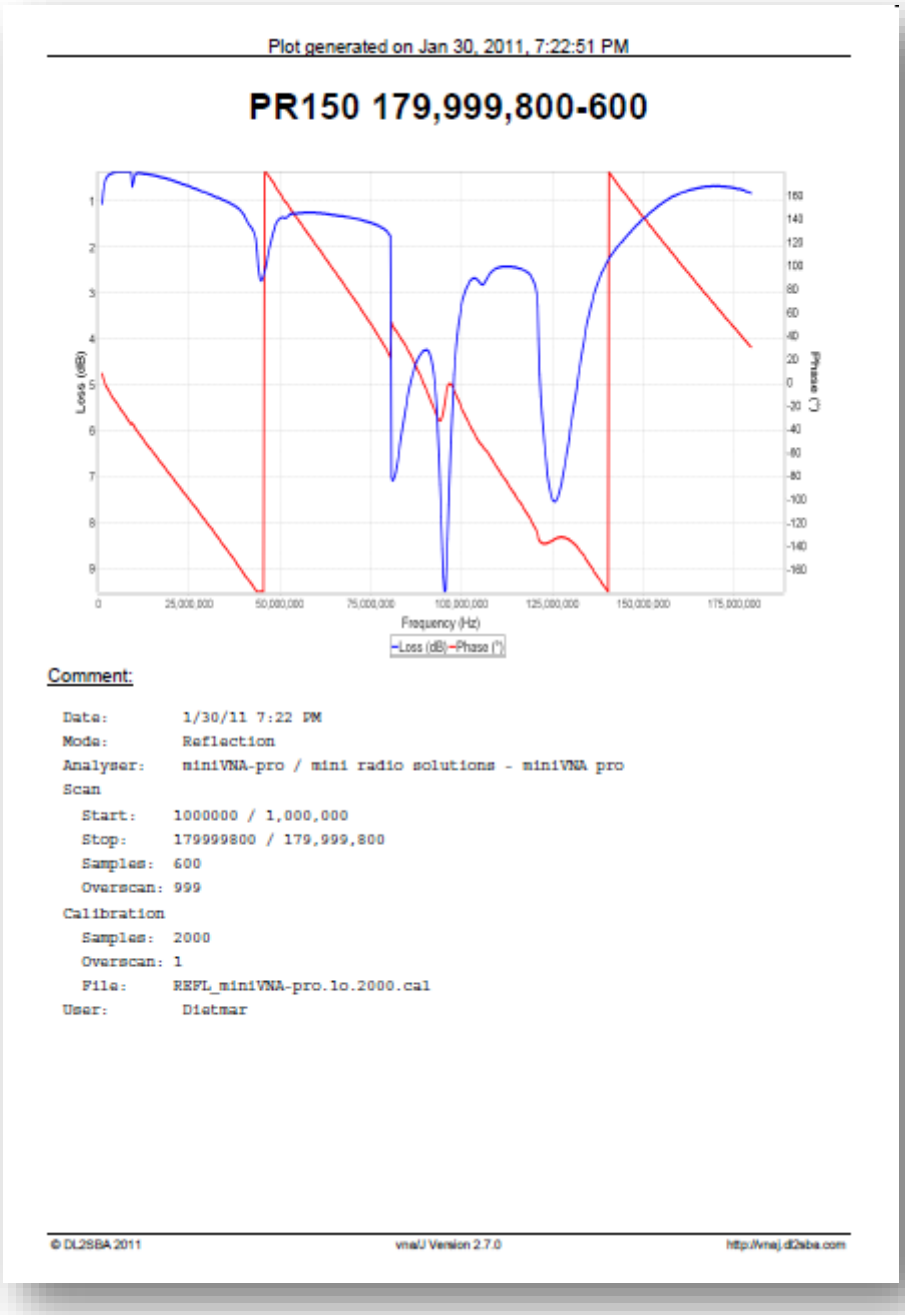
When selecting the menu item or clicking the toolbar button, the diagram is saved in JPEG-format to an external file.

Hint: *When left-clicking the toolbar button with pressed Shift-key on the keyboard, the image is copied to the systems clipboard as image. The image can be inserted in various applications like MS Word etc.*

Most of the screenshots in this document are created this way.

PDF export

Clicking the PDF toolbar button  or selecting the menu entry EXPORT/PDF exports the current displayed data to a PDF document.



Plot generated on Jan 30, 2011, 7:22:51 PM

PR150 179,999,800-600

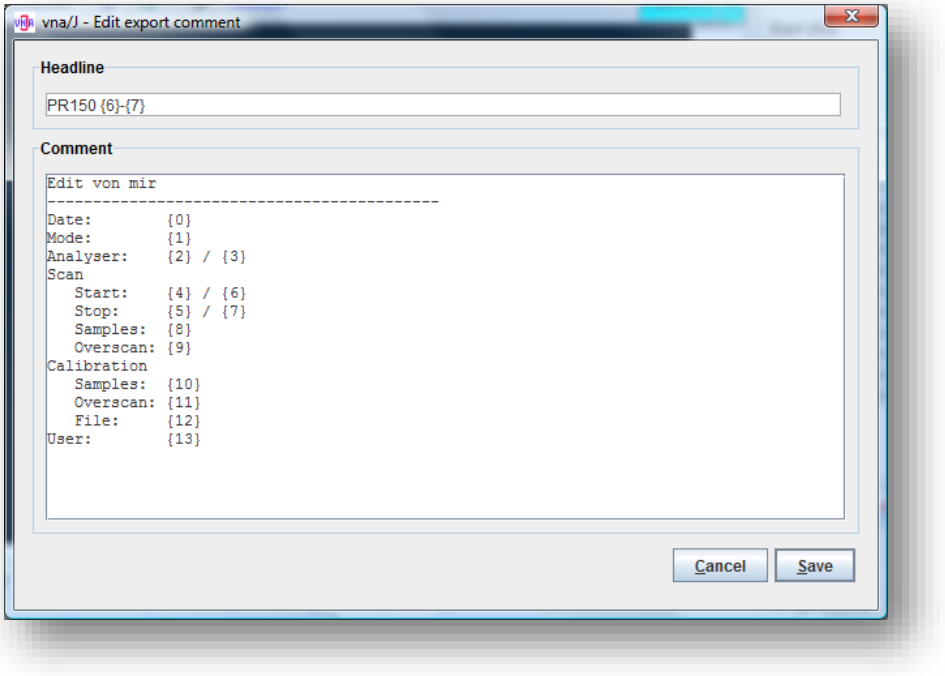
Comment:

```
Data:        1/30/11 7:22 PM
Mode:        Reflection
Analyser:    miniVNA-pro / mini radio solutions - miniVNA pro
Scan
  Start:     1000000 / 1,000,000
  Stop:      179999800 / 179,999,800
  Samples:   600
  Overscan:  999
Calibration
  Samples:   2000
  Overscan:  1
  File:      REFL_miniVNA-pro.lo.2000.cal
User:        Dietmar
```

Options

When the user presses the SHIFT-key and clicks on the toolbar button, the PDF document is generated according the EXPORT settings and then opened in the systems PDF reader application.

When the user presses the CTRL-key and clicks on the toolbar button, the edit dialog for the export text is displayed:



Here the comment and headline fields can be edited. Selecting the "CANCEL"-button aborts the PDF export. Selecting the "SAVE"-button stores the texts in configuration and continues with PDF generation. In general the following behaviour is implemented:

Click on	Shift-Key	Ctrl-Key	Action
PDF-Icon	-	-	PDF generated Dialog with filename of generated output file is shown
PDF-Icon	Pressed	-	PDF generated Generated document is opened in system PDF-reader application
PDF-Icon	-	Pressed	Edit dialog opened Cancel aborts export. Save applies the changes in the edit dialog, creates PDF and shows dialog with filename of generated document.
PDF-Icon	Pressed	Pressed	Edit dialog opened Cancel aborts export. Save creates PDF and opens generated PDF in system PDF-reader application

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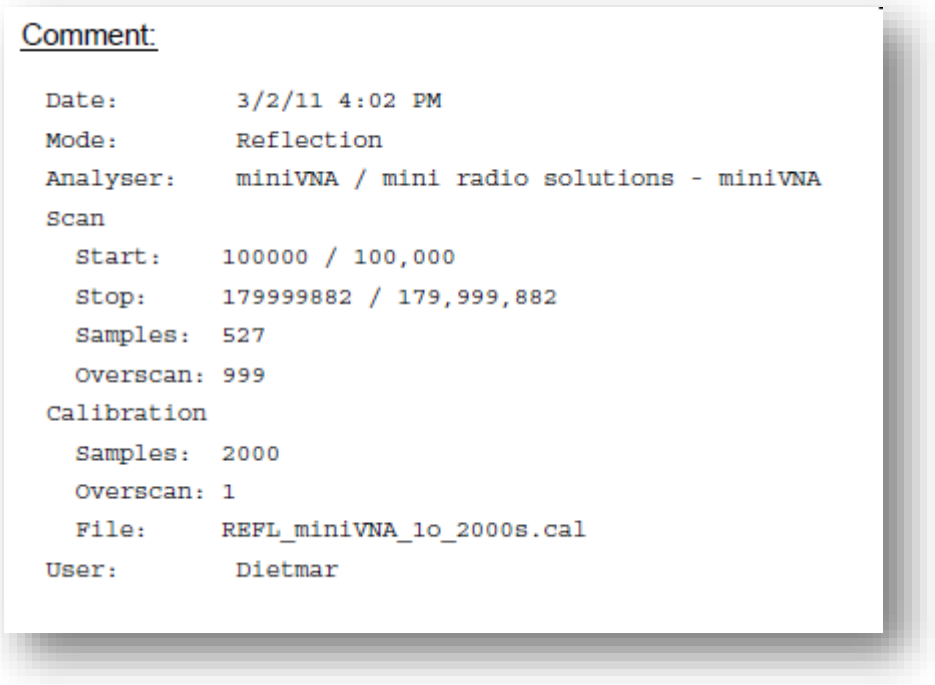
Sample

The comment can be formatted using the export settings described in chapter "Settings" on page 45.



To get this sort of comment field enter this in the export configuration dialog:

```
Date:         {0}
Mode:         {1}
Analyser:     {2} / {3}
Scan
   Start:     {4} / {6}
   Stop:      {5} / {7}
   Samples:   {8}
   Overscan:  {9}
Calibration
   Samples:   {10}
   Overscan:  {11}
   File:      {12}
User:         {13}
```

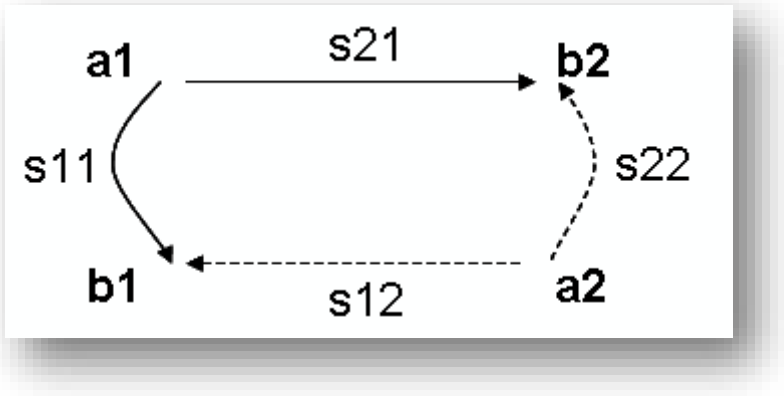
S-parameter export

This function can be used to export the measurement data for 3rd-party applications that require data in Touchstone® File Format Specification format.

Agilent published this format 2002. A detailed specification can be found here:

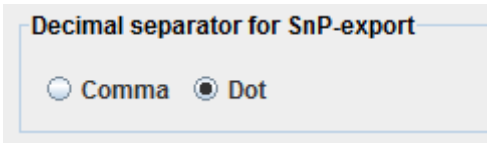
http://www.eda.org/pub/ibis/connector/touchstone_spec11.pdf

The parameters are defined for this model:

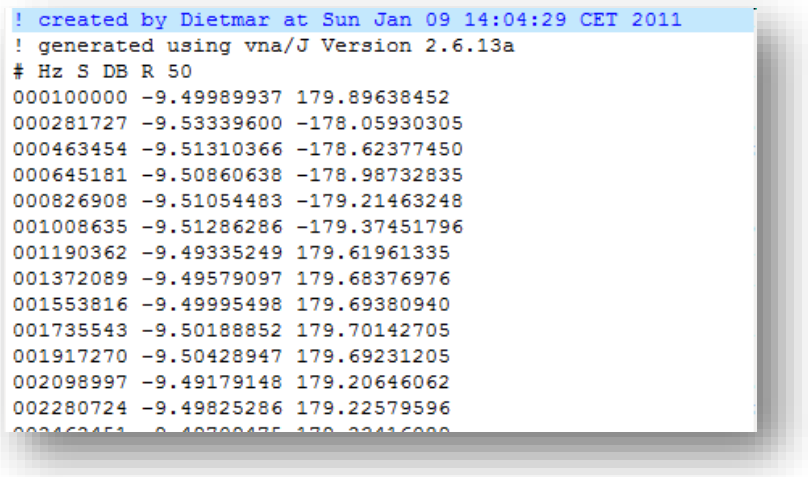


Currently the miniVNA is only capable of measuring the parameter S11 in reflection mode and S21 in transmission mode. The other parameters can only be measured, when manually reversing the DUT/DET connectors.

Remark: The decimal separator used in S-parameter export is NOT determined by the locale of the operating system but by two radio-buttons in the export settings dialog. See also chapter "Settings" on page 45.



S1P-parameter export



```
! created by Dietmar at Sun Jan 09 14:04:29 CET 2011
! generated using vna/J Version 2.6.13a
# Hz S DB R 50
000100000 -9.49989937 179.89638452
000281727 -9.53339600 -178.05930305
000463454 -9.51310366 -178.62377450
000645181 -9.50860638 -178.98732835
000826908 -9.51054483 -179.21463248
001008635 -9.51286286 -179.37451796
001190362 -9.49335249 179.61961335
001372089 -9.49579097 179.68376976
001553816 -9.49995498 179.69380940
001735543 -9.50188852 179.70142705
001917270 -9.50428947 179.69231205
002098997 -9.49179148 179.20646062
002280724 -9.49825286 179.22579596
```

In reflection mode a file with the extension S1P is generated with the following layout:

S2P-parameter export

In transmission mode a file with an S2P extension is generated, having this layout:

```
! created by Dietmar at Sat Jan 15 18:25:27 CET 2011
! generated using vna/J Version 2.6.14
# Hz S DB R 50
000100000 0,00000000 0,00000000 -80,23578137 57,12928109 0,00000000 0,00000000 0,00000000 0,00000000
000433166 0,00000000 0,00000000 -95,32855265 1,43052530 0,00000000 0,00000000 0,00000000 0,00000000
000766332 0,00000000 0,00000000 -94,86099094 35,38237030 0,00000000 0,00000000 0,00000000 0,00000000
001099498 0,00000000 0,00000000 -92,97648596 37,04807005 0,00000000 0,00000000 0,00000000 0,00000000
001432664 0,00000000 0,00000000 -89,57465163 41,86639735 0,00000000 0,00000000 0,00000000 0,00000000
001765830 0,00000000 0,00000000 -87,99524294 50,89351500 0,00000000 0,00000000 0,00000000 0,00000000
002098996 0,00000000 0,00000000 -87,16774724 56,23363292 0,00000000 0,00000000 0,00000000 0,00000000
002432162 0,00000000 0,00000000 -85,34411694 60,74176424 0,00000000 0,00000000 0,00000000 0,00000000
002765328 0,00000000 0,00000000 -84,43999756 62,55547269 0,00000000 0,00000000 0,00000000 0,00000000
003098494 0,00000000 0,00000000 -83,27488260 66,38424641 0,00000000 0,00000000 0,00000000 0,00000000
003431660 0,00000000 0,00000000 -82,38957639 68,21135108 0,00000000 0,00000000 0,00000000 0,00000000
003764826 0,00000000 0,00000000 -81,33380965 70,68546654 0,00000000 0,00000000 0,00000000 0,00000000
004097992 0,00000000 0,00000000 -81,00615524 71,73744515 0,00000000 0,00000000 0,00000000 0,00000000
004431158 0,00000000 0,00000000 -80,10638941 73,33220381 0,00000000 0,00000000 0,00000000 0,00000000
004764324 0,00000000 0,00000000 -79,50912750 75,37084967 0,00000000 0,00000000 0,00000000 0,00000000
005097490 0,00000000 0,00000000 -78,89885552 74,90592187 0,00000000 0,00000000 0,00000000 0,00000000
005430656 0,00000000 0,00000000 -78,21486462 75,70425552 0,00000000 0,00000000 0,00000000 0,00000000
005763822 0,00000000 0,00000000 -77,68663682 76,72801637 0,00000000 0,00000000 0,00000000 0,00000000
006096988 0,00000000 0,00000000 -77,04692131 76,86682799 0,00000000 0,00000000 0,00000000 0,00000000
006430154 0,00000000 0,00000000 -76,76901577 79,19230128 0,00000000 0,00000000 0,00000000 0,00000000
006763320 0,00000000 0,00000000 -76,50695369 78,63688039 0,00000000 0,00000000 0,00000000 0,00000000
007096486 0,00000000 0,00000000 -76,08058443 77,89209831 0,00000000 0,00000000 0,00000000 0,00000000
007429652 0,00000000 0,00000000 -75,48116332 79,30219448 0,00000000 0,00000000 0,00000000 0,00000000
007762818 0,00000000 0,00000000 -75,09469369 79,31937869 0,00000000 0,00000000 0,00000000 0,00000000
```

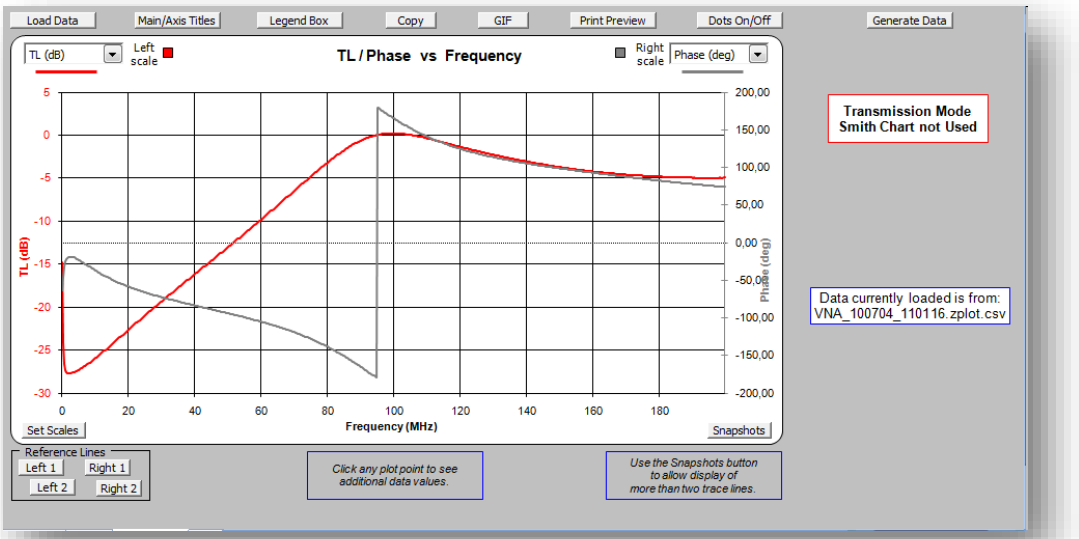
Only the parameter S21 is set in the generated file, all other parameters are set to dummy values, here 0.

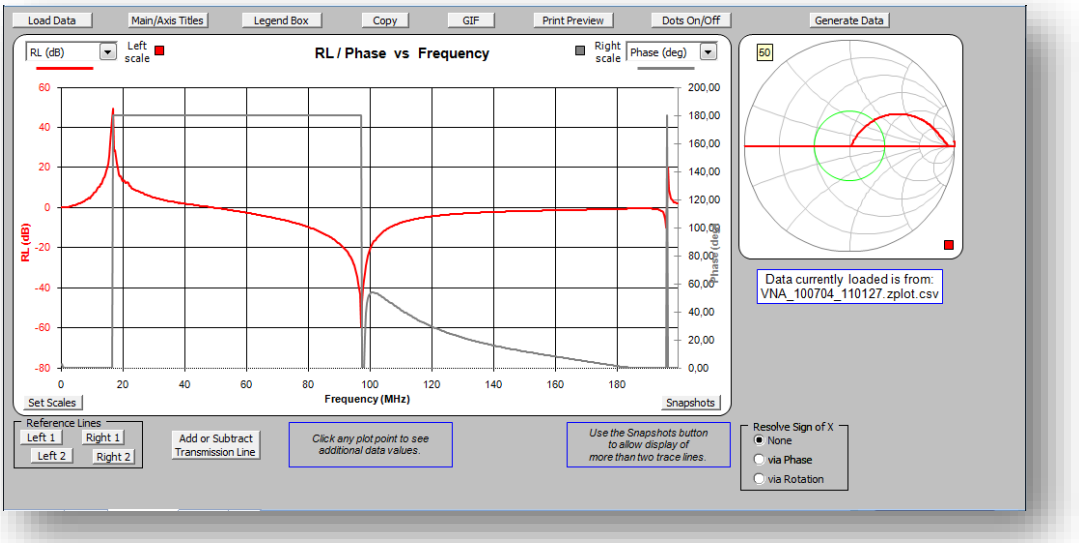
ZPlots export

This function exports the measurement data in a format, which can be read by the popular ZPlots-EXCEL spreadsheet provided by Dan, AC6LA (http://www.ac6la.com/zplots.html). This spreadsheet also displays the correct sign of the phase in the polar plot as well as the Smith chart for the older miniVNA.

The export filename also ends with **.csv**, so that Excel can load it without any renaming.

Importing the data into ZPlots enables the user, to use the features of the ZPlots spreadsheet even with newer MS-Office versions, where the serial port support currently no longer works.





Tools

Currently four tools are available in addition to the network analyser functionality:

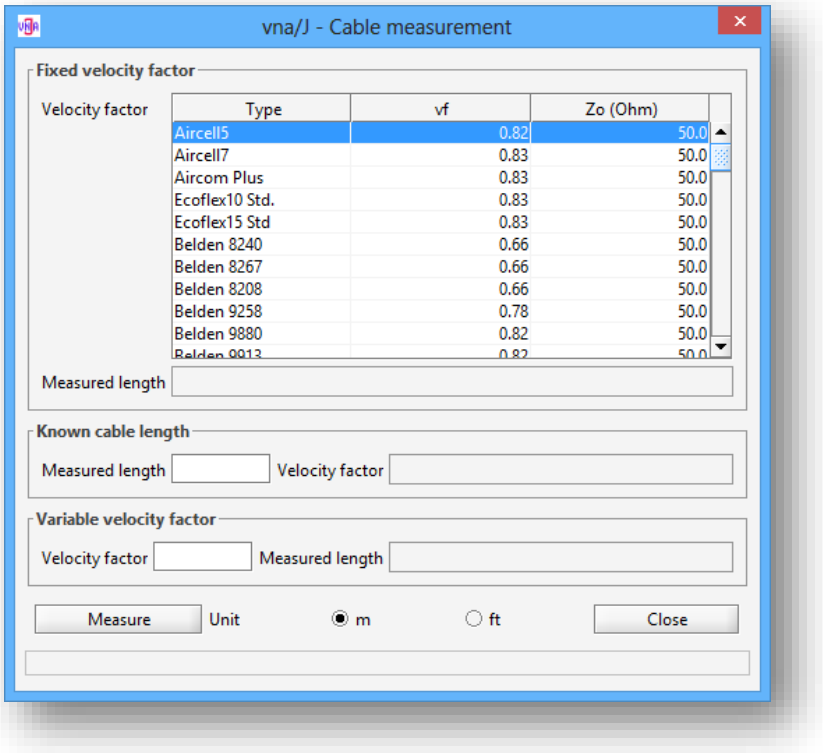
- Determine the length of a coaxial cable of a known type
- Use the miniVNA as a simple HF-signal generator
- Scheduler for measurements
- Display and compare previously saved data

These functions can be reached via the TOOLS menu or the corresponding toolbar buttons:

Cable length measurement

This tool enables the user to

- Determine the length of a coaxial cable with known velocity factor
- Determine the velocity factor of a cable with known length



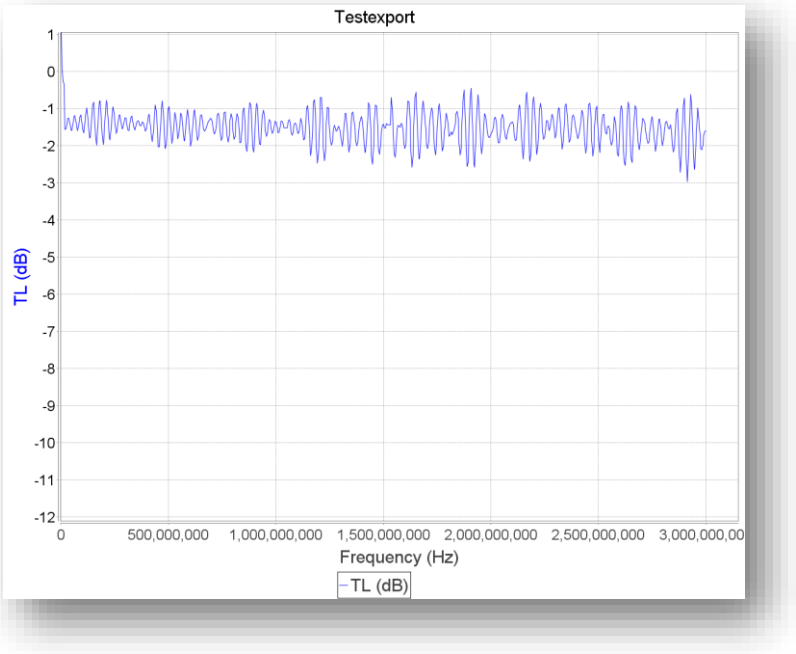
Pressing the MEASURE button starts a full-scale scan of the attached analyser in reflection mode.

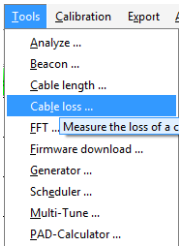
Depending on which values are filled in by the user, the results are calculated:

The length unit can be selected using the radio buttons for **m** and **ft**.

Cable loss measurement

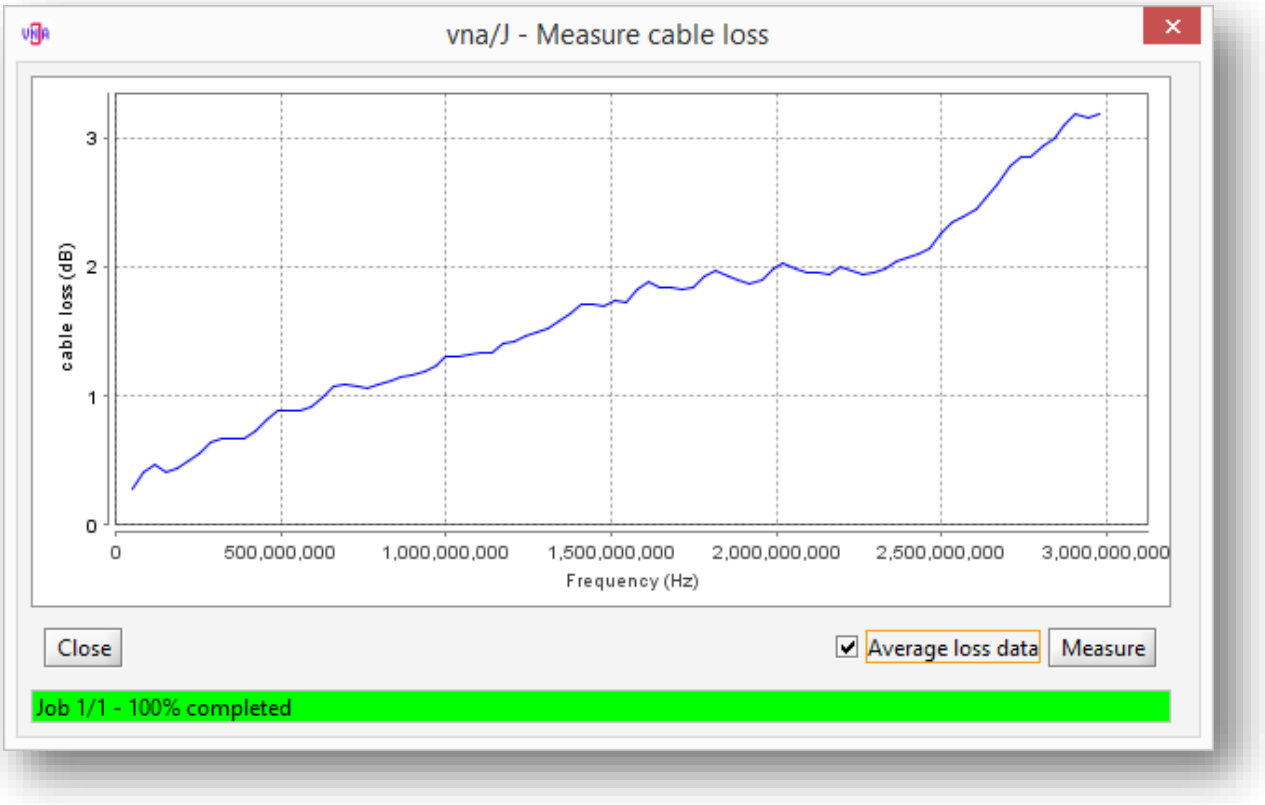
You can measure the loss of a given cable by running a transmission scan with the cable connected between the DUT and DET port of the analyser. This gives a very detailed diagram of the cable loss dependant on the transmission frequency.



If you cannot connect both ends of the cable to the analyser, you can use the 

function to get a diagram for the cable loss.

Connect one end of the cable to the DUT port of the analyser. Leave the other end of the cable open and press the Measure button:

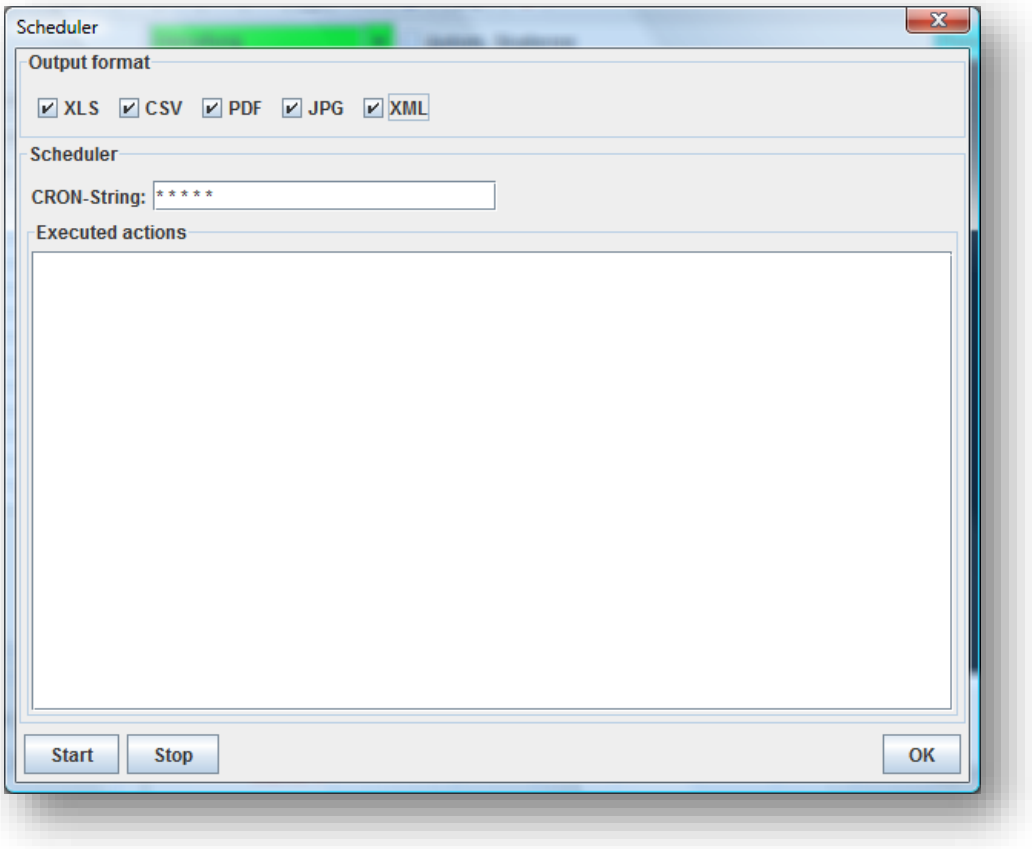


Check  to get smoother reading.

Generator

Please consult the various driver guides for explanations regarding the generator dialog.

Scheduler



General

The scheduler enables the user, to create analyser scans on a regular basis. Therefore the user has to define in which time periods a scan should be done. For details see chapter "Time definition" on page 68.

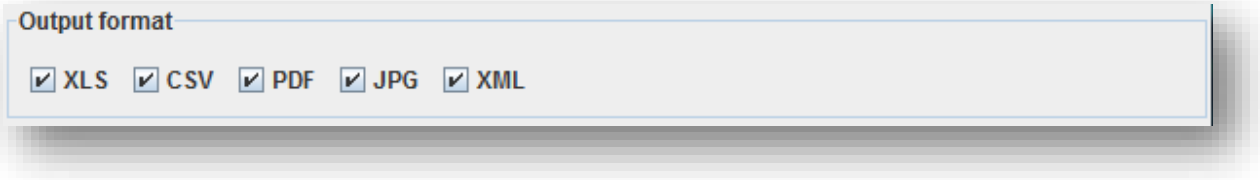
To give reasonable filenames, the user should define a filename pattern in the export settings like this:

`VNA_{0,date,yyMMdd}_{0,time,HHmmss}`

More details on filename pattern see chapter "Output file → Filename**Fehler! Verweisquelle konnte nicht gefunden werden.**" on page 46.

The scheduler is very similar to the popular LINUX CRON daemon, so for detailed information consult the LINUX documentation.

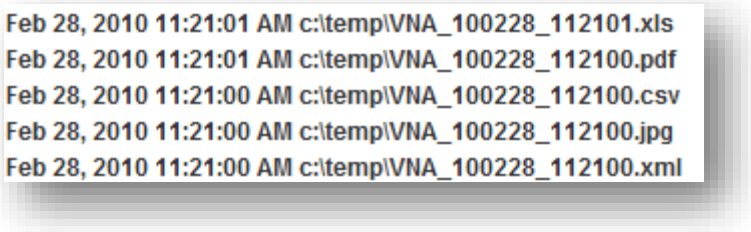
Output format



The same export formats, which are available through the toolbar, are also available for scheduled output generation.

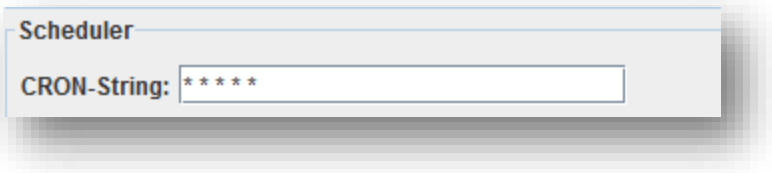
For each selected output format, a separate file is created as defined in the export settings.

Selecting all checkboxes and specifying a filename patter as described on the previous page gives these filenames:



Time definition

The time definition must be entered in the field name **CRON-String** here:



The time definition consists always of five separate patterns:

Order	Pattern name	Comment	Range
1	Minute pattern	During which minutes of the hour should the task been launched?	0.. 59
2	Hours pattern	During which hours of the day should the task been launched?	0.. 23
3	Days of month pattern	During which days of the month should the task been launched?	1.. 31 L specifies the last day of the month
4	Month pattern	During which months of the year should the task been launched?	1..12
5	Days-of-week pattern	During which days of the week should the task been launched?	0 == Sunday 6 == Saturday

The universal quantifier ***** can be used, to indicate

- Every minute
- Every hour
- Every day
- Every month
- Every weekday

A list of discrete values can be specified using a comma as separator. I.e. "* 0,12 * * *" means execute the task at noon and midnight.

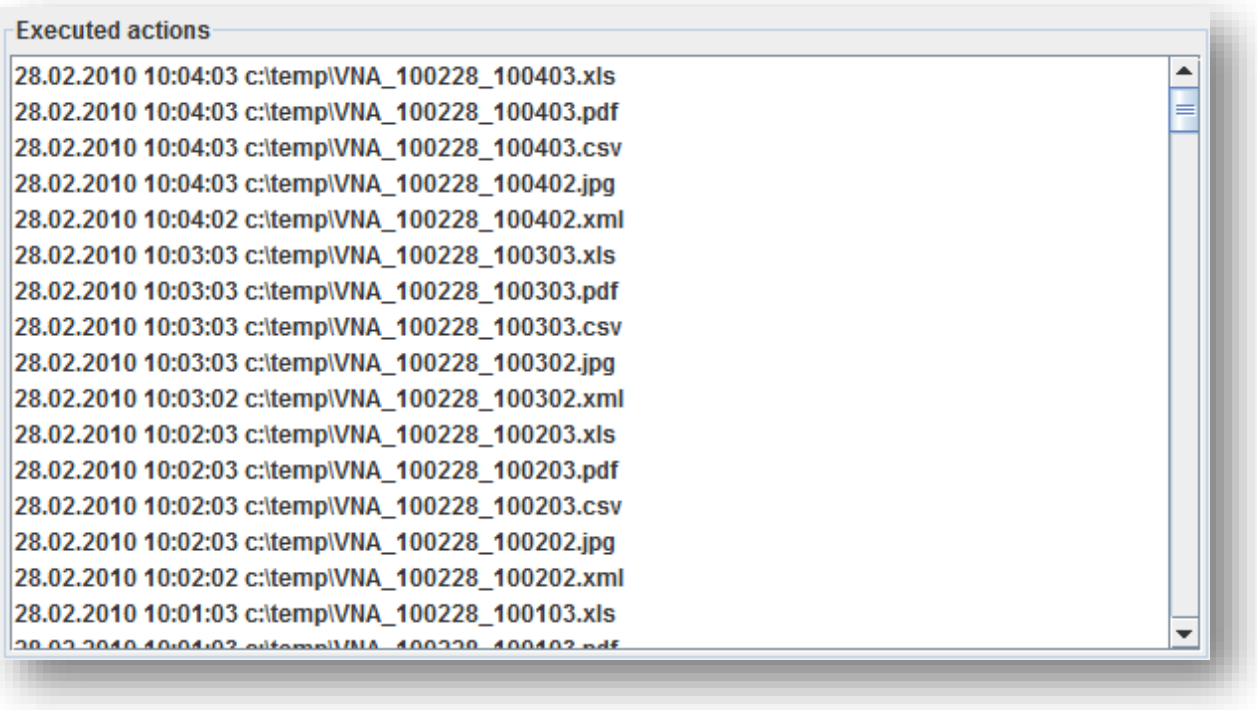
A range of values can be specified using a hyphen as separator. I.e. "0-4 * * * *" means execute the task every minute in the first five minutes of every hour.

A repetitive schedule can be done by using the slash syntax. I.e. */5 * * * * means execute the task every five minutes starting from now.

For more details see http://en.wikipedia.org/wiki/Cron

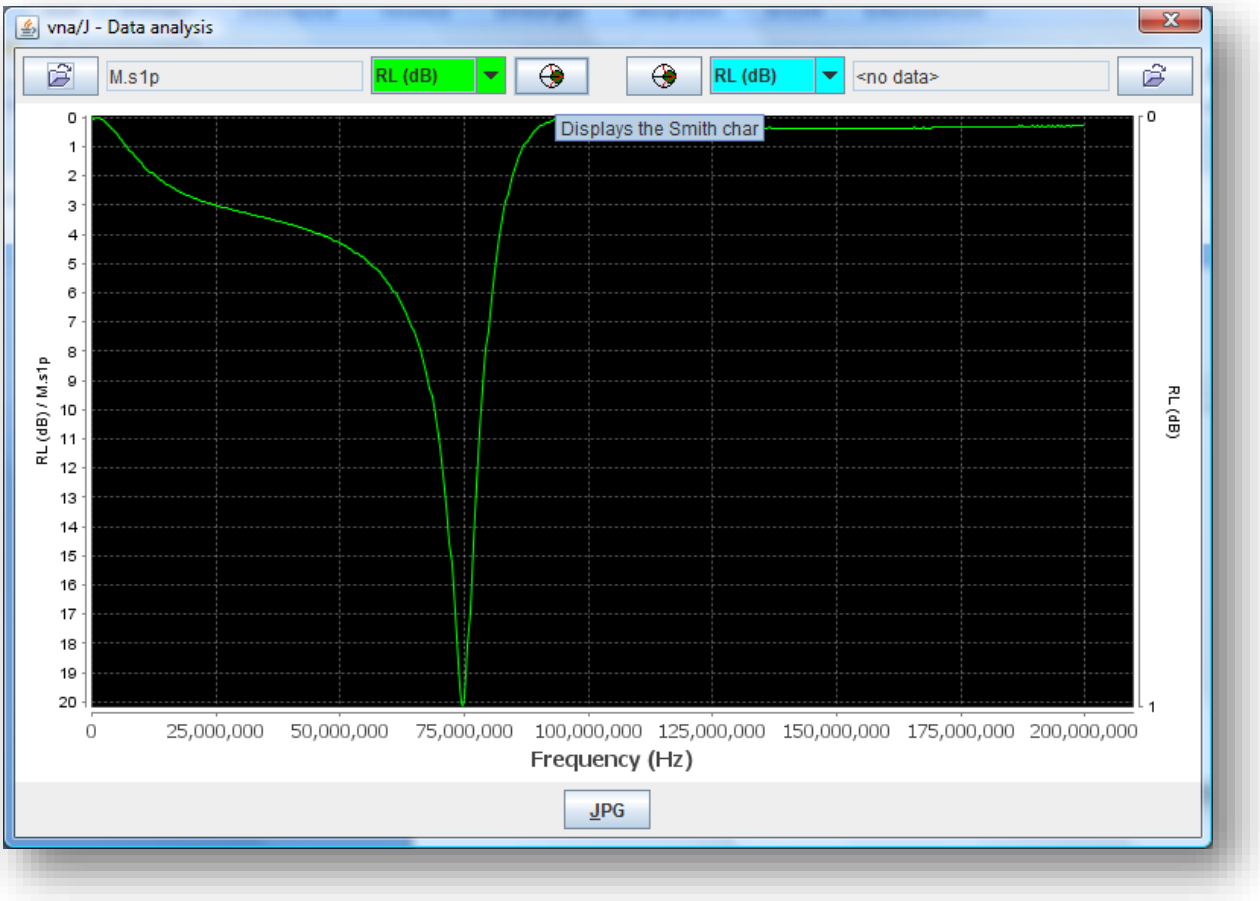
Execution log

Every action that was executed by the scheduler, is reported in the list box:



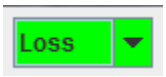
Data analysis

Previously saved data can be later displayed again, using the Data analysis dialog:



Here the user can load up to two previously recorded datasets. The available operations for the datasets are:

Opens the default OPEN-dialog, where the user can select a previously recorded data set.
The name of the loaded data file is then displayed near the open icon.



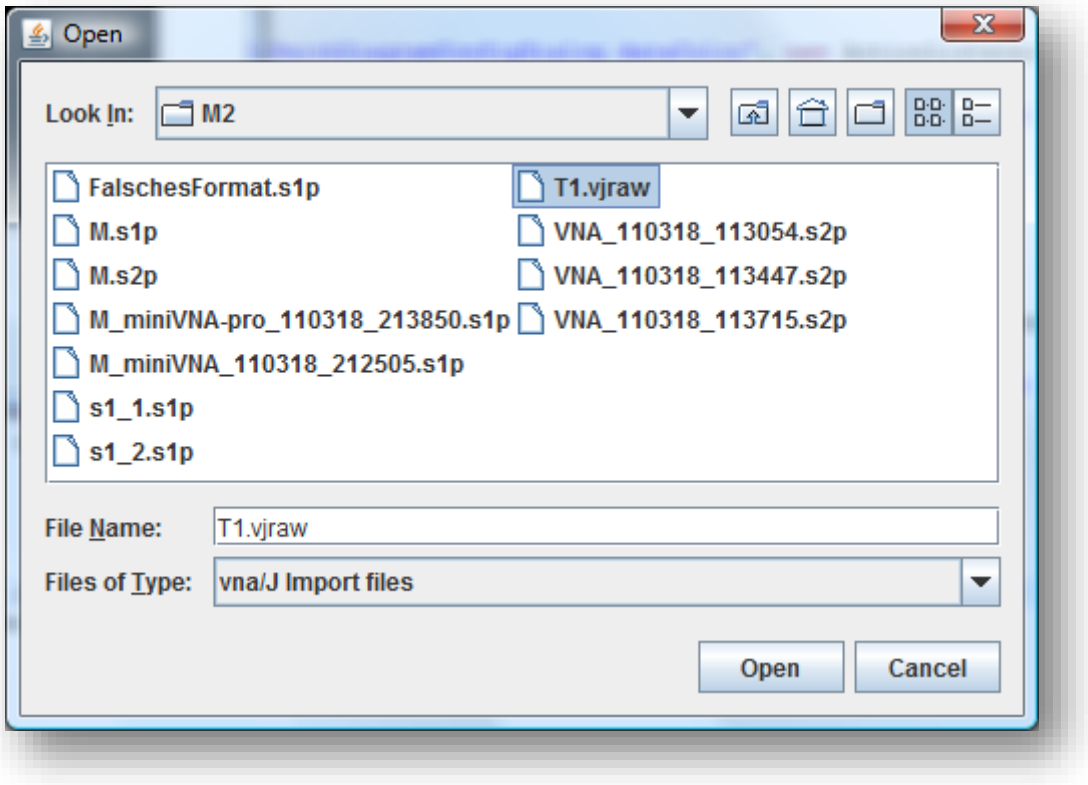
Here the same scales are available as in the main diagram area.

The dataset is displayed inside a Smith-chart in a separate dialog window.
See details in chapter "Display Smith-chart" on page 22.

Export the displayed diagram to a JPEG file.
The size of the exported JPG is set fixed to 1000x800 pixels.

Loading data

Selecting one of the two open buttons shows a general file open dialog where the available files are displayed:



Currently RAW files (*.vjraw) from vna/J and S-parameter files are supported.

VJRAW format

Raw files contain all the information which were available at the point in time of measurement. See chapter "Saving measured data" on page 21. After selecting a RAW-file for loading the data is displayed after loading.

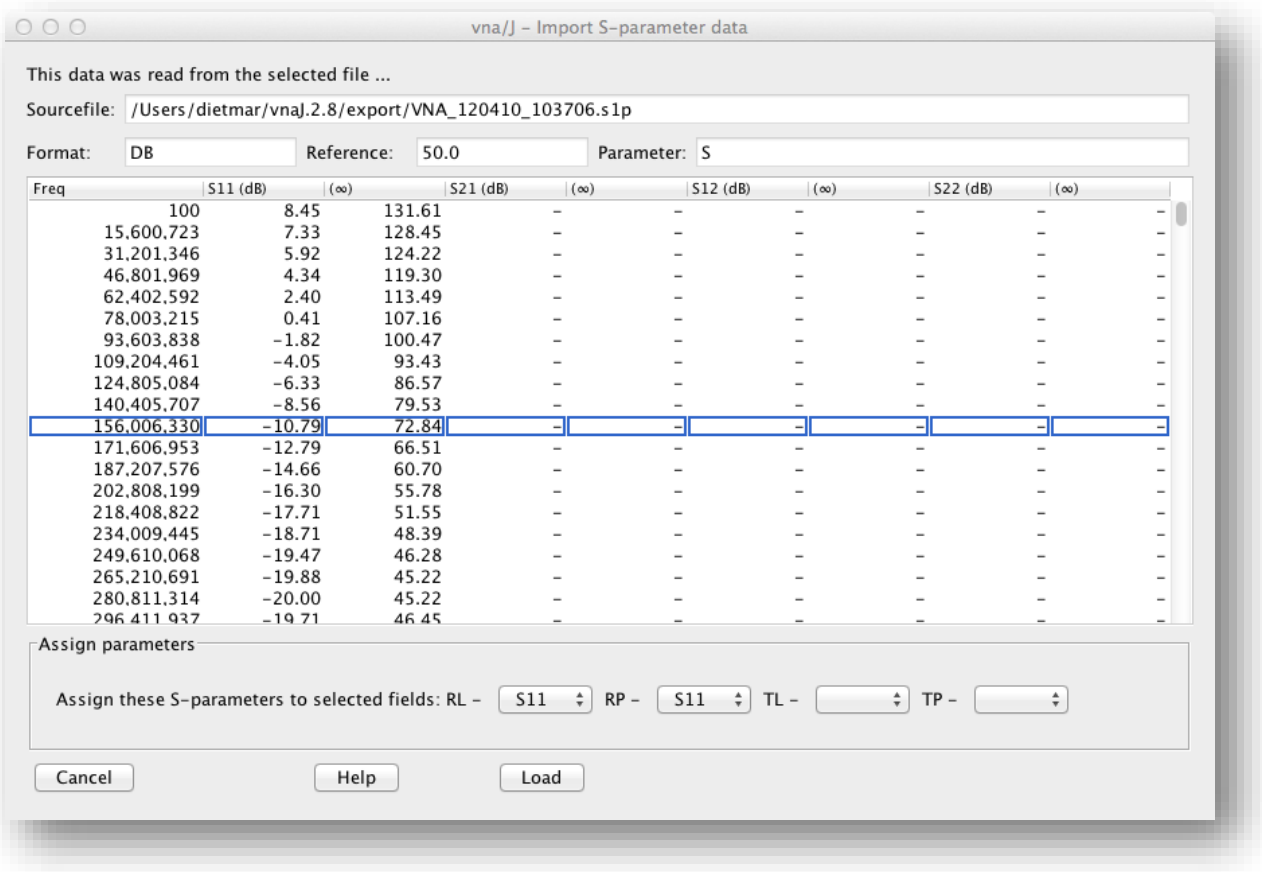
S-parameters

The application supports only properly formatted S-parameter files (see http://www.eda.org/pub/ibis/connector/touchstone_spec11.pdf for details).

Only a subset of this format is supported:

Parameter	S
Format	DB

If the selected file contains valid data, the contained data is displayed:



Here you have to choose, which data from the input file should be mapped to which data parameter inside vna/J.

For this, three dropdown boxes in the "Assign parameters" group are available, where the user can choose which S-parameter is assigned to which parameter in vna/J.

For a S-parameter file with

Only S11 set	Loss part is assigned to RL and the phase part to PHASE
Only S21 set	Loss part is assigned to TL and the phase part to PHASE
S11 and S21 set	Loss part of S11 is assigned to RL and the phase part of S11 to RP.
	Loss part of S21 is assigned to TL and the phase part of S21 to TP.

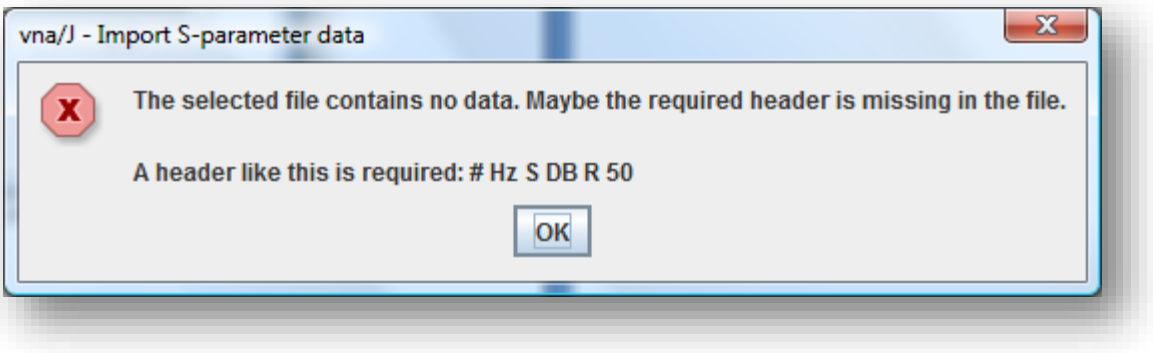
The user can change all these assignments using the dropdown combo boxes below the data table.

After clicking the "LOAD" button, the data is loaded from the file, and the dependent parameters Rs, Xs, |Z| and SWR are calculated.

Note: *For analyser, which do not provide a correct phase sign (like the miniVNA or the MAX6), the calculation of Rs maybe incorrect.*
This may also result in weird curves on the Smith-chart.
This will be fixed in a later version of vna/J.

Error in file format

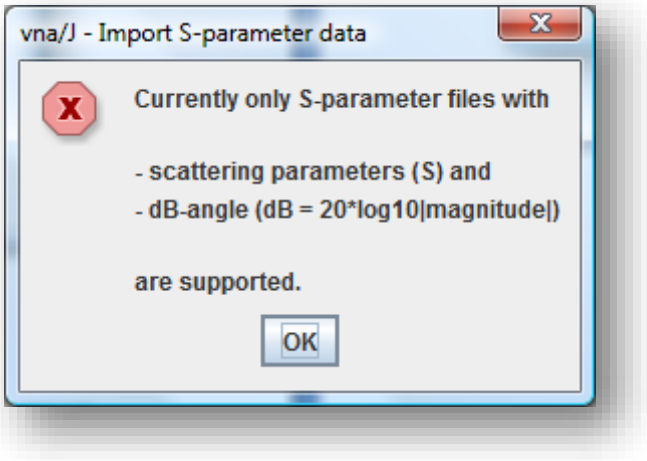
When loading a file without data or without a valid header, this message is displayed:



Please check the file with a standard text editor whether it contains a valid header and any data.

Invalid file content

If the file does not contain the proper S-format data, this message is displayed:



Please try to provide an S-parameter file with different format and parameters.

Multi-tune

The idea of this "multi-tune" dialog is, to support the tuning of multiband antennas or multiband filters inside receivers etc.

The user can create one or more small scan windows with different frequency ranges to cover the necessary spectrum.

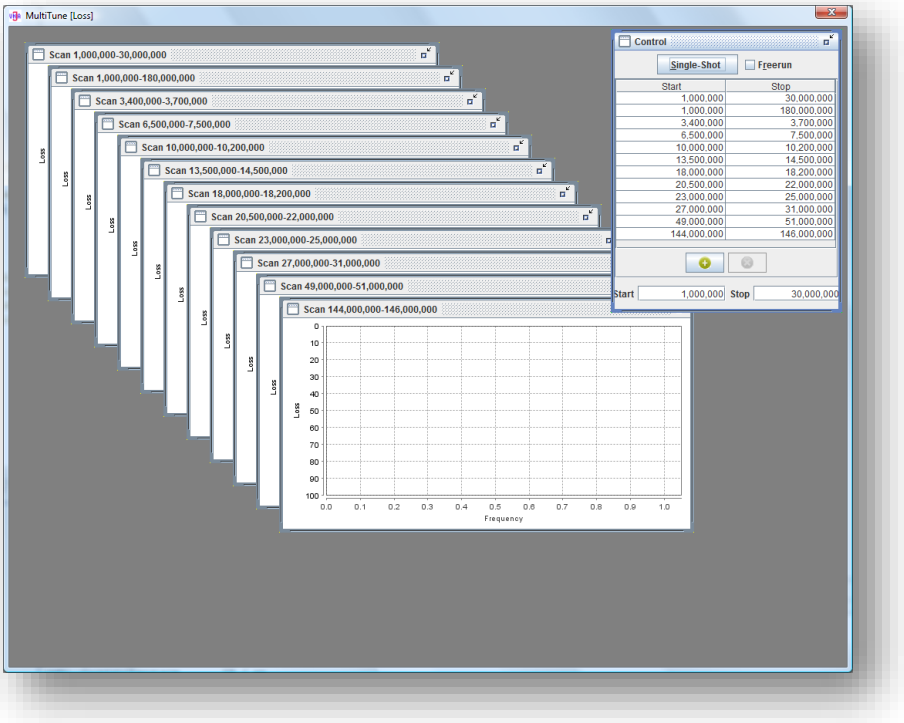
The window can be opened by selecting the menu bar entry TOOLS-MULTI TUNE or the corresponding toolbar button  .

The mode (transmission or reflection) is determined by the selected mode in the main window.

The type of scale displayed is also determined by the scale selected in in the left-scale of the main window.

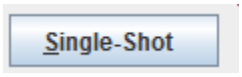
The window is modal to the main window and must be closed selecting the close-icon  in the upper-right corner.

On the very first start of the multi-tune window, the frequency list is populated with the same defaults as the frequency list in the main window:

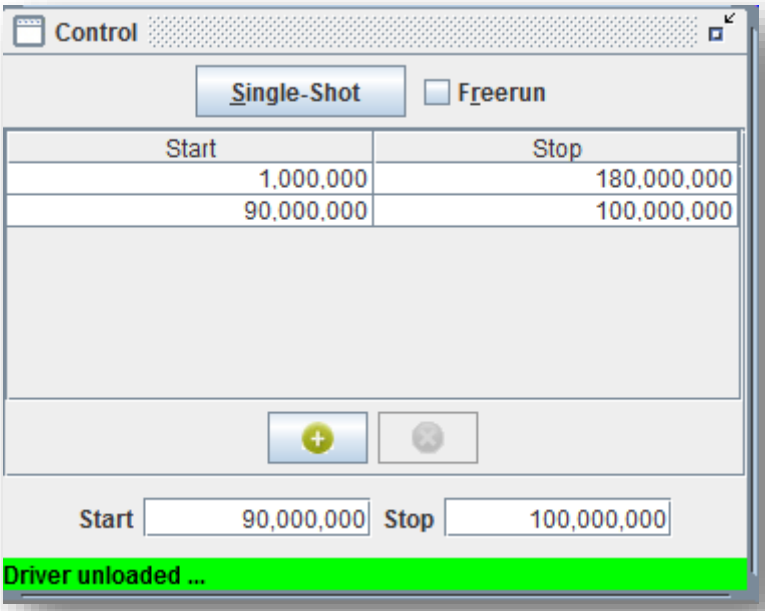


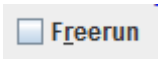
Remark: If port extension is enabled in the main window, the port extension parameters are also applied to each scan in the multi-tune window.

Control window

The window labeled "control" contains a list of scan-ranges that are executed whenever the button 

is pressed.:



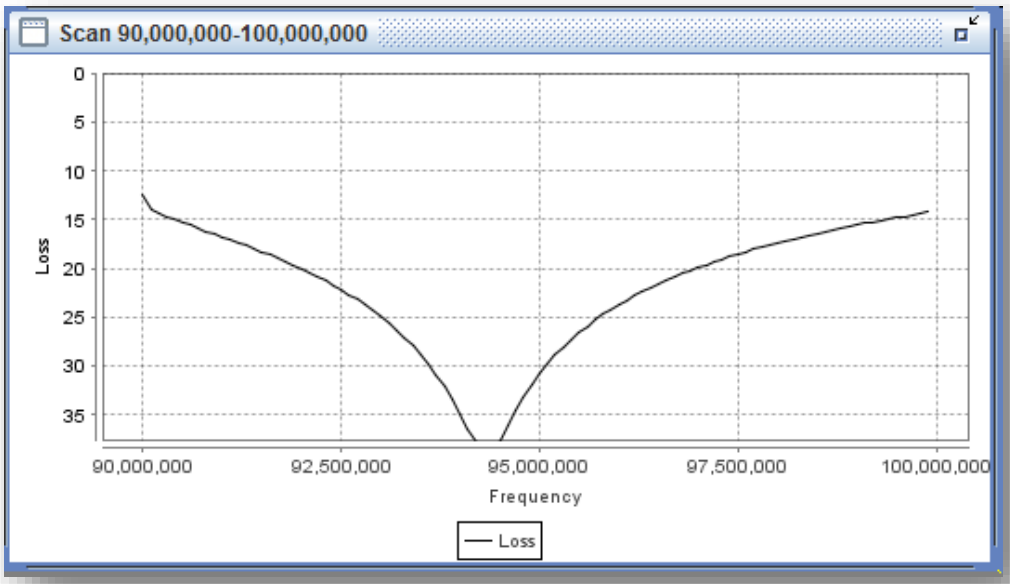
Selecting the checkbox 

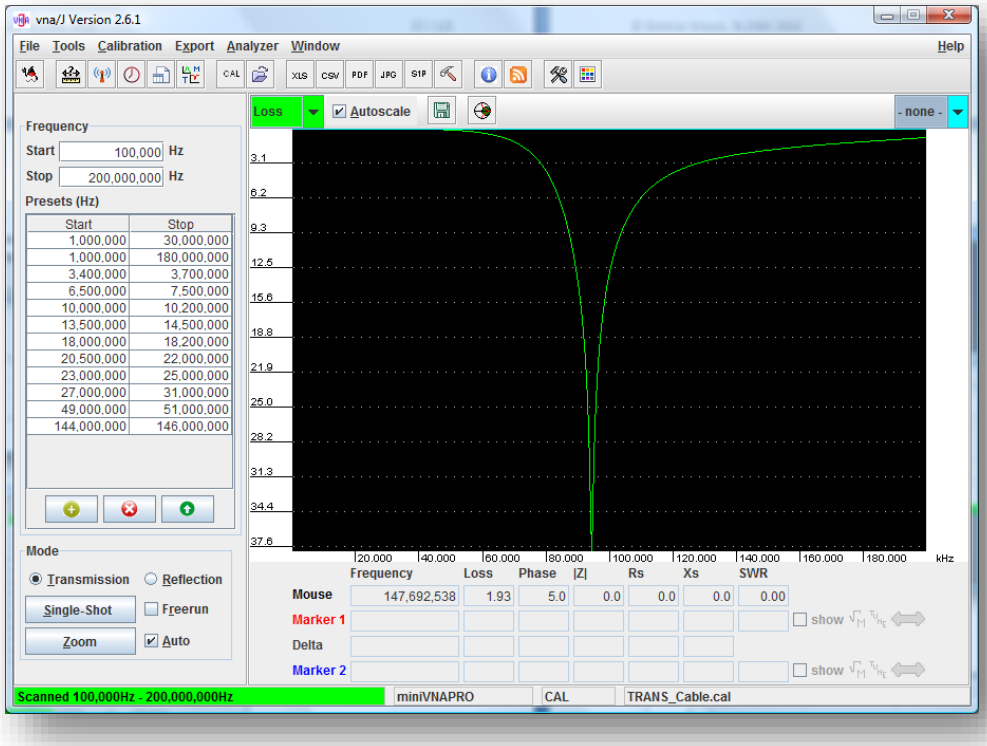
enables a free-running mode, same way as it is handled in the main window.

A new entry can be added to the list by entering the start and stop frequency in the entry fields and pressing the  button. An existing can be deleted by selecting the entry in the list and pressing the  button.

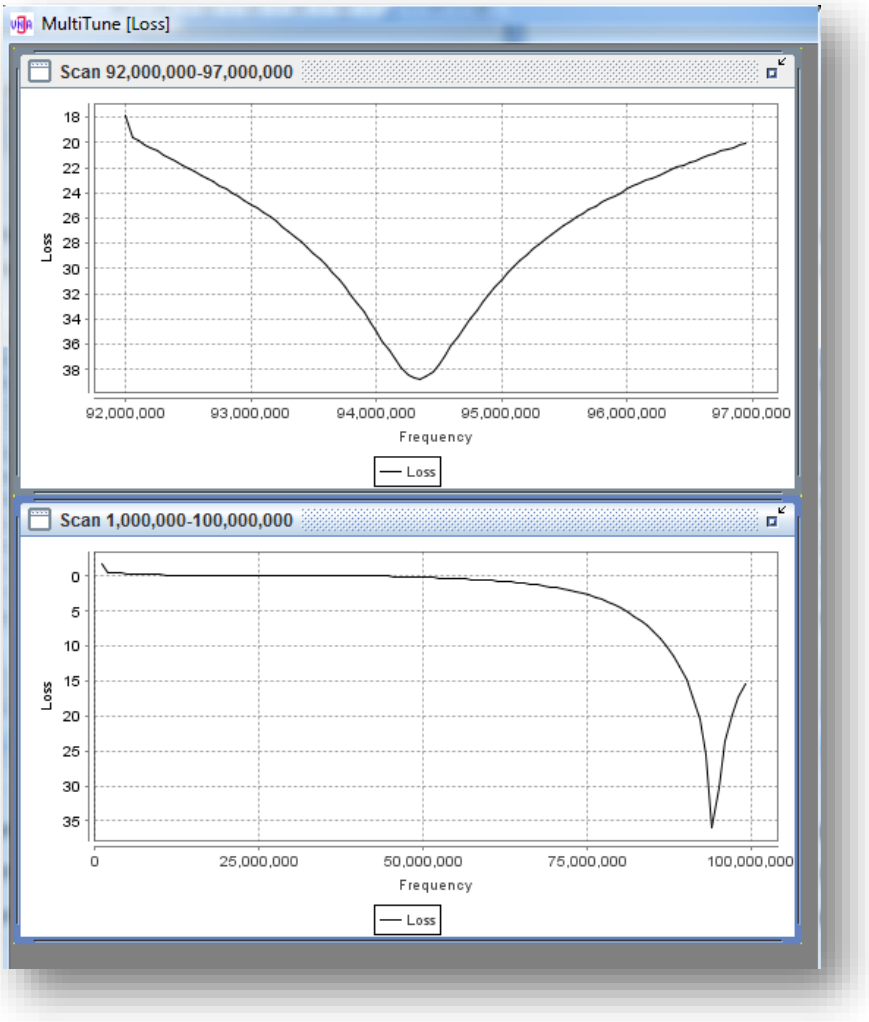
Scan-window

Each scan window contains the data for the given scan range. The measurement parameter (Loss, Phase, SWR, Xs, Rs, |Z|) is determined by the type of the left scale in the main window:





Each of the windows has personal-scaling settings:

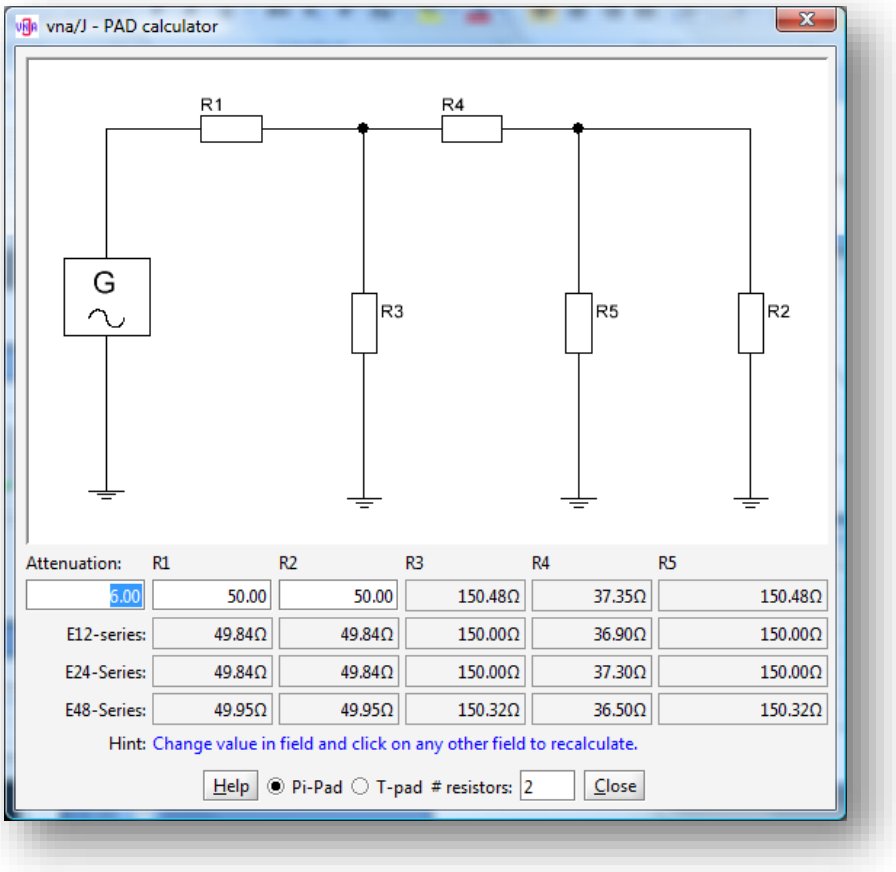


The diagrams support a number of operations like scaling, printing or exporting the data.

Simply click on the diagram area with the right-mouse button and selected the desired option.

Each diagram has its own options. These options are NOT retained when closing and reopening this window!

Pad calculator



Usage

- Enter the requested attenuation in the input field *Attenuation*
- Enter the requested input resistance in the field *R1*
- Enter the requested output resistance in the field *R2*
- Enter the maximum number of resistor which are used to build the exact calculated resistors.
- To switch between T-type and Pi-type pads, use the radio-buttons

Results

- The exact calculated resistor values for R3, R4 and R5 are display right to the entry fields of R1 and R2.
- In the line *E12-Series* the possible resistor values for R3, R4 and R5 are displayed for the resistor series E12.
- In the line *E24-Series* the possible resistor values for R3, R4 and R5 are displayed for the resistor series E24.
- In the line *E48-Series* the possible resistor values for R3, R4 and R5 are displayed for the resistor series E48.
- For each resistor series also the effective input resistance R1 and output resistance R2 are calculated and displayed

Resistor calculation

In the tool tip text of each resistor R3, R4, R5 the combination of 1 to n resistors from this series is displayed.

Let's take this as an example: *Pi-pad, Attenuation=18dB, R1=400Ohm, R2=50Ohm, max. #resistors=2*

- The exact value for R4=552,77Ohm.
- Using the E12-series a 470Ohm resistor in series with an 82Ohm resistor is used
- Using the E24-series a 510Ohm resistor in series with an 43Ohm resistor is used
- Using the E48-series a 536Ohm resistor in series with an 16.2Ohm resistor is used

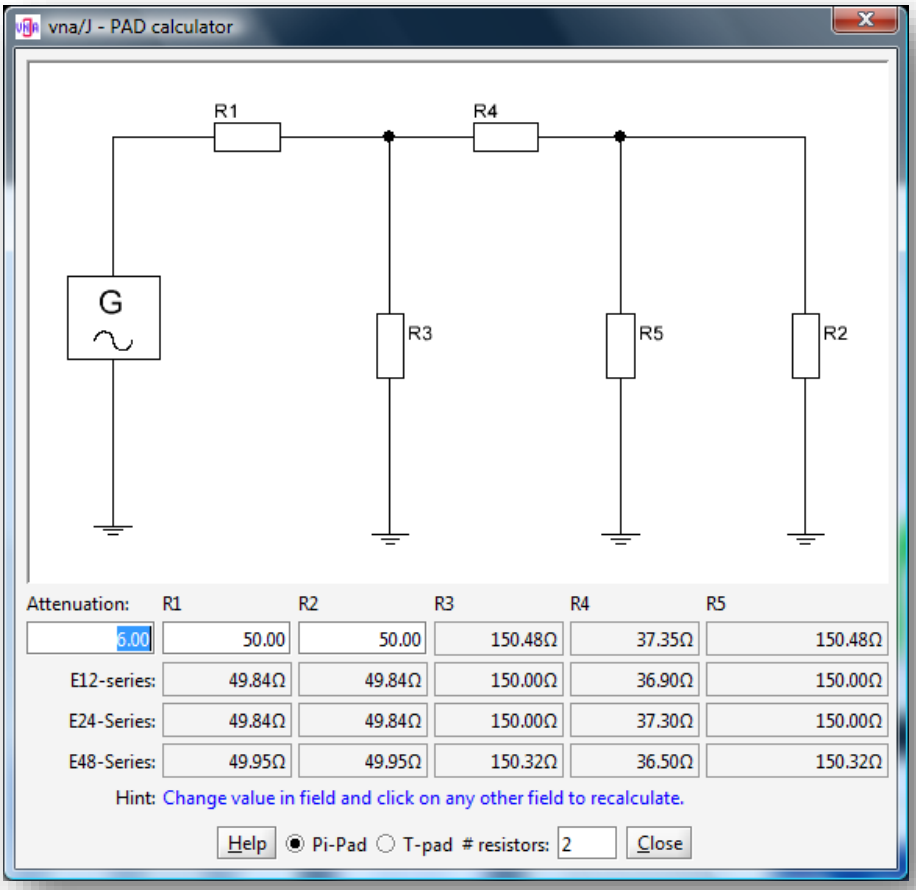
Limits

It is not possible to calculate any combination of attenuation, input- and output-impedance.

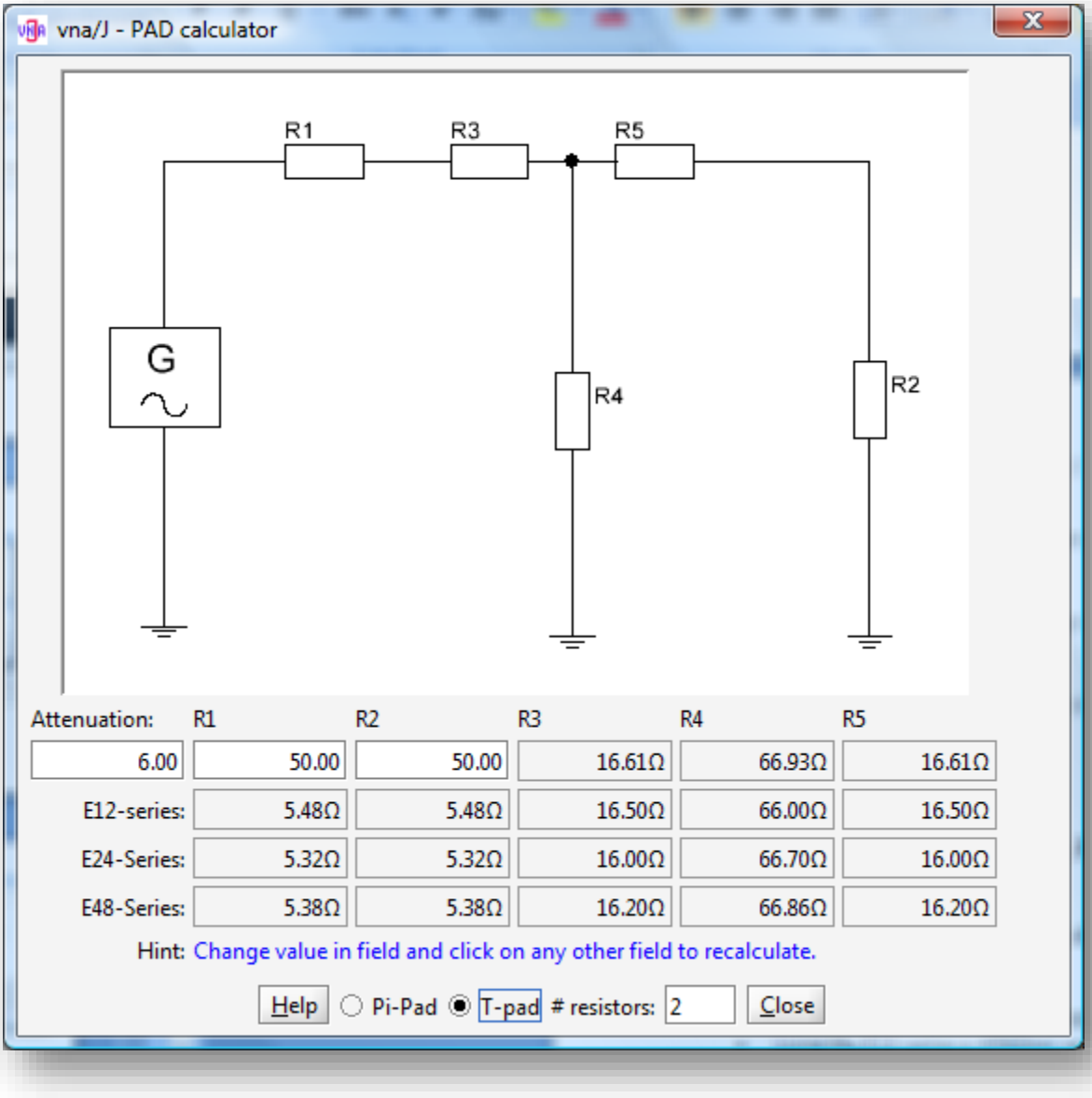
If calculation fails, negative resistor values are displayed.

Samples

Pi-type pad



T-type pad



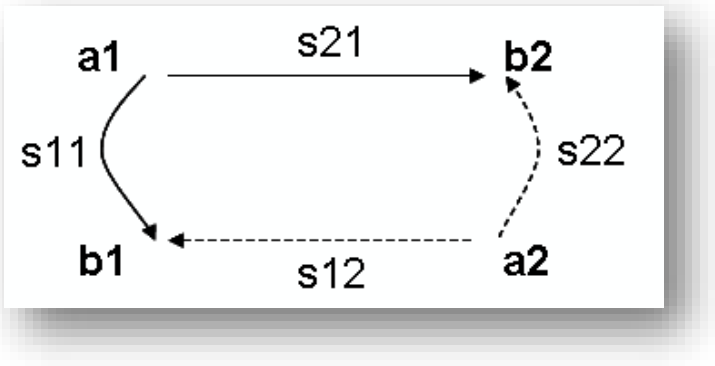
Acknowledgements

This calculation is based on the excellent article from Ulrich Fleischmann, DL9LX in the German magazine CQ DL 2-2011 pp. 115.

S-Parameter collector

As the currently supported analysers support only one measurement mode at a time (reflection or transmission) it is not possible to create an S-parameter file with more than one parameter. This is sufficient for two-pole circuits but for four-pole circuits three parameters cannot be written to the regular S-parameter file (for this type of export see chapter "S-parameter export" on page 61).

To overcome this limitation, the S-parameter collector was introduced. This tool allows the user to create an S-parameter file with up to four parameters. The S-parameters supported by the collector are shown below:



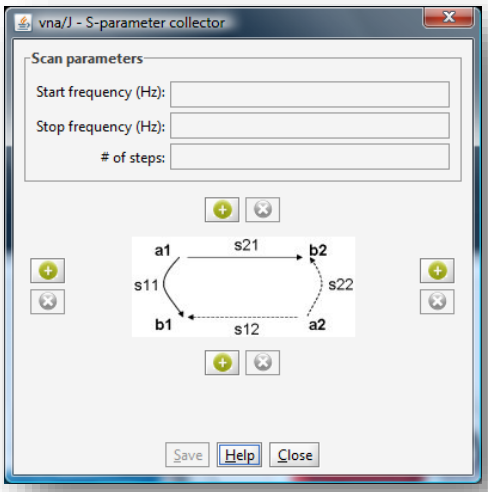
To start your S-parameter collection, simply open the non-modal dialog via the menu EXPORT/S-PARAMETER COLLECTOR.

For each of the parameters connect the analyser to the four-pole circuit according to the type of S-parameter and execute a scan in

- Transmission mode (for S21 and S12) or in
- Reflection mode scan (for S11 and S22).

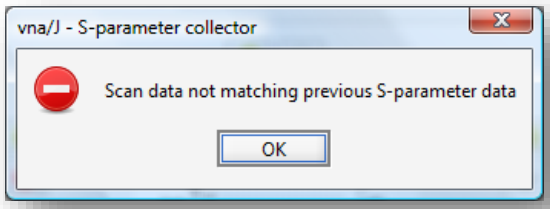
After each scan, the click the corresponding add-button  in the S-parameter collector arranged around the centre graphic.

To overwrite a previously registered scan, simple press again the add-button  and the "old" data is overwritten.



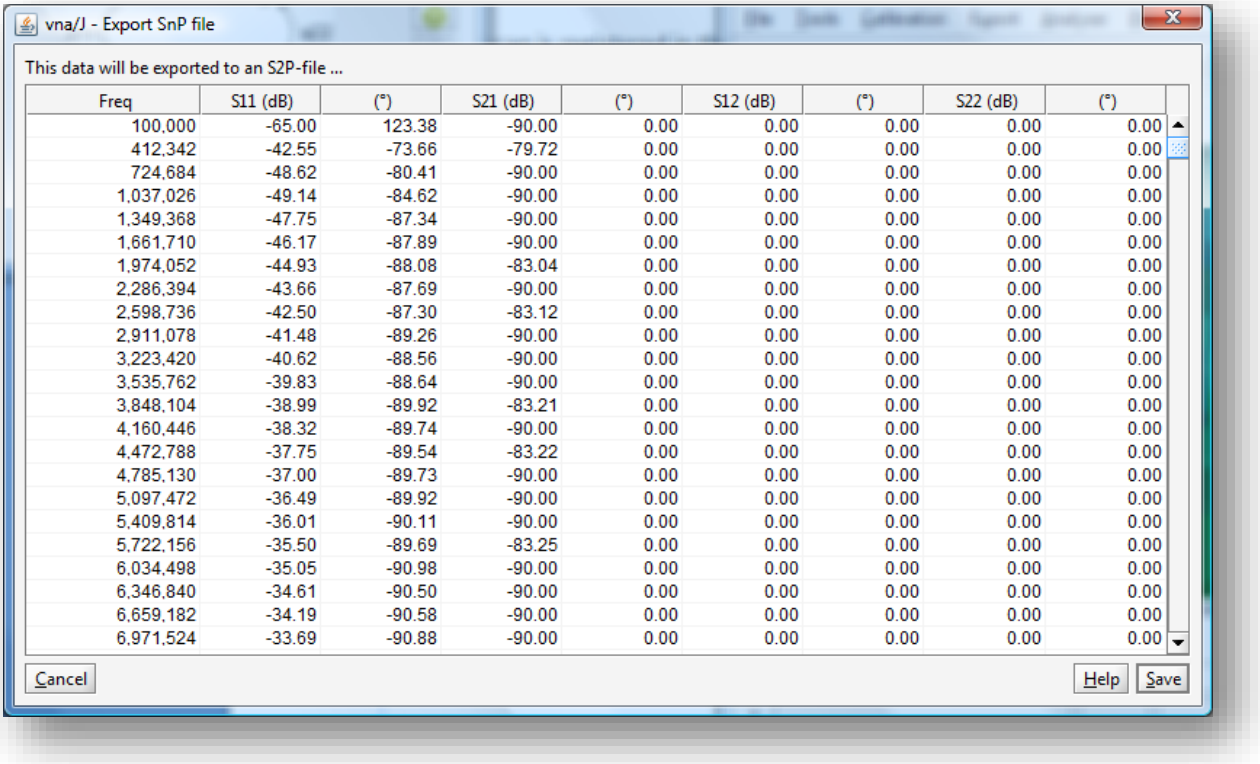
When a scan is registered in the collector, the delete-button  becomes active and the scan base parameters are displayed in the top group:

Each following scan must match these base parameters else an error message is displayed and the data is not added to the collection.

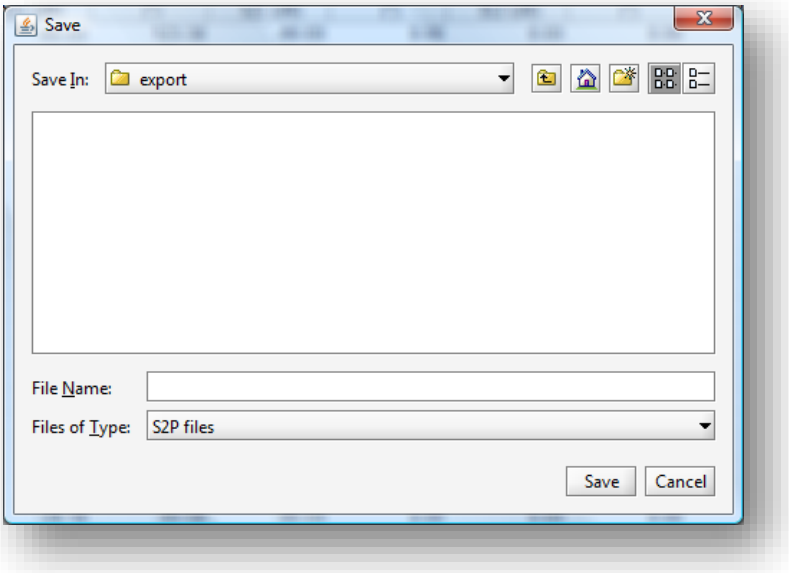


If you want to change the base parameters, simply delete all previous collected scan by selecting all the active delete-buttons 

After acquiring the required data, simply select the SAVE button. The previously registered data is presented in an overview dialog. Here you can check your measurement data.



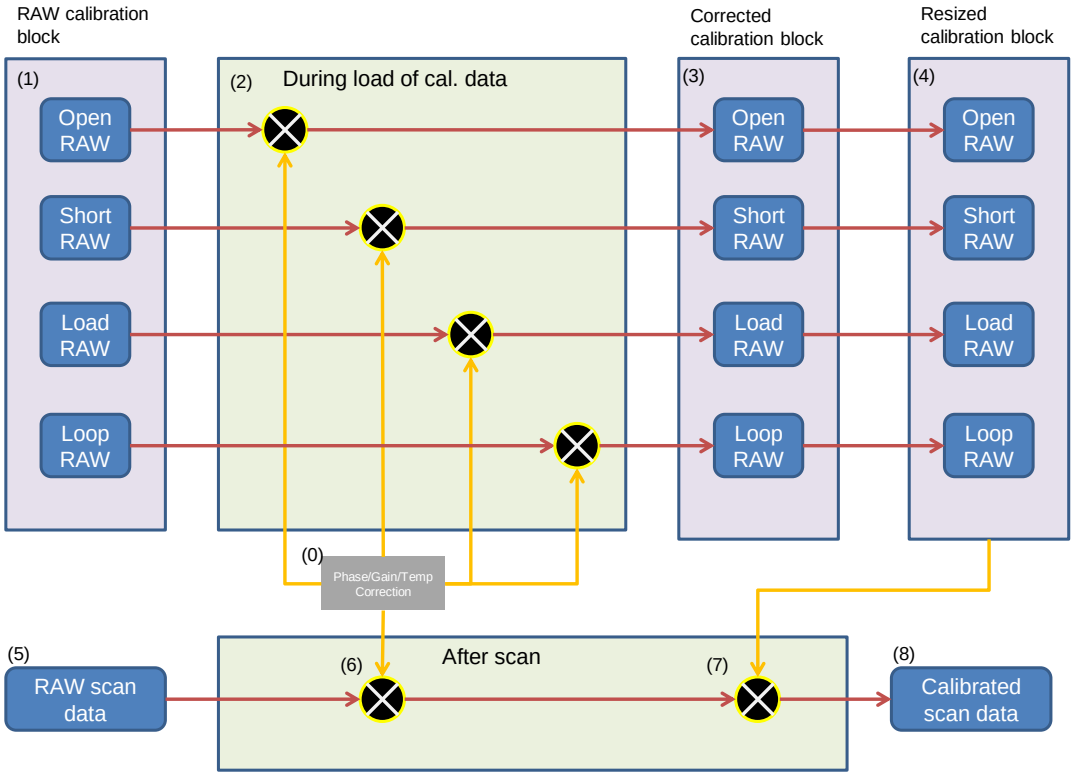
If the data matches your requirements select the SAVE button and enter the name of the S-parameter file in the now opened default file save dialog:


Save
Save In:
export
File Name:
Files of Type:
S2P files
Save
Cancel

Measurement basics

To get reliable measurement data, for all supported analyser a set of calibration data is required to calculate the calibrated data from the raw data read from the analyser.

The following pictures gives a rough overview how calibration of raw data is implemented inside vna/J:



Before a scan can be executed a **raw calibration block** or file[1] (1) is loaded from the calibration disk folder. With some system constants (0) and some additional formulas (2) from this raw calibration data a **corrected calibration block** (3) is created.

The raw (1) as well as the calibrated (3) block cover the whole frequency range of the analyser. These calibration blocks may contain thousands of calibration points. Depending, how the calibration data was created.

When the image panel is first displayed (or resized), a so called **resized calibration block** (4) is calculated from the corrected calibration block (3). This corrected calibration block contains as many samples as the image panels pixel width. So for each pixel in the image panel, exactly one calibration point is available for calibrating the raw sample (5) from the analyser.

After executing a scan, the raw scan data (5) from the analyser is corrected with some constants (6). Then for each raw sample a calibrated sample is calculated (7) and stored as one **calibrated sample**. This calibrated sample is then displayed inside the image panel or exported into files for further processing.

[1] How to create such a calibration file check chapter “Calibration procedure” on page 90.

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As you can see, all calibration data is matching exactly one specific analyser. Means, the calibration data carries the specific hardware properties of this analyser. That's the reason, why I do not provide any calibration data for download. Not all men are equal – the same applies too for analysers ;-)

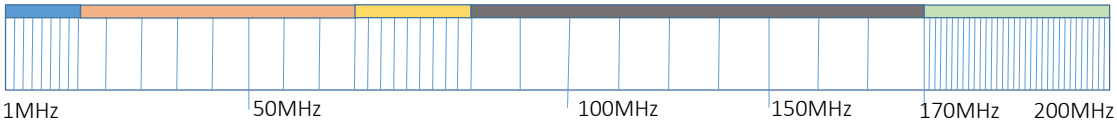
Depending of the analyser type and mode, a number of calibration data sets is needed:

Analyser	Mode	OPEN	SHORT	LOAD	LOOP
miniVNA, MAX6	Transmission	-	-	-	✓
	Reflection	✓	-	-	-
miniVNApro, miniVNAtiny	Transmission	✓	-	-	✓
	Reflection	✓	✓	✓	-

Now let me explain the algorithm, how to create a resized calibration block from the corrected calibration block. Let's assume, the user is using an analyser with a frequency range from 1MHz to 200MHz and has created a raw calibration block in calibration mode 1 with five calibration ranges:

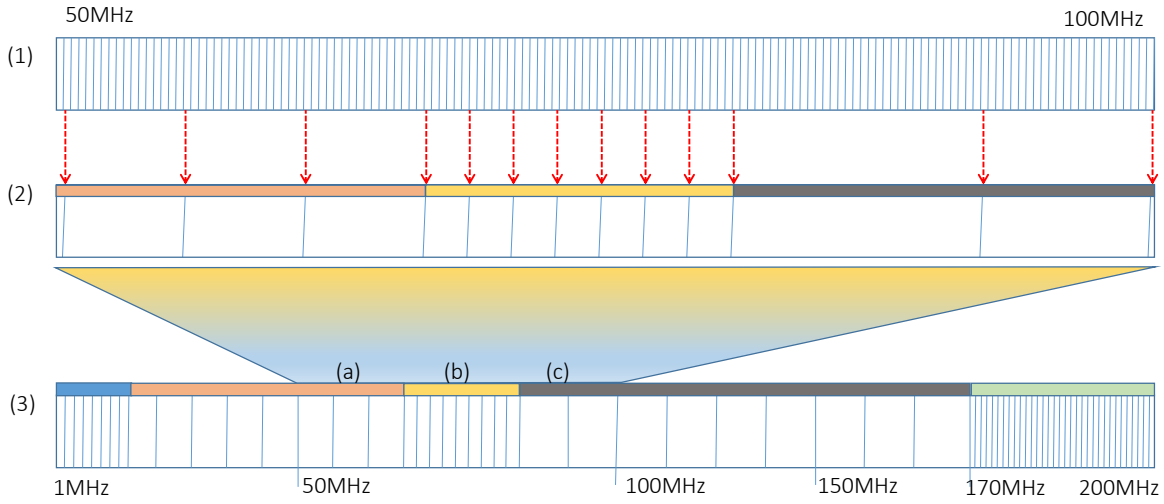
#	Frequency from	Frequency to	Steps
1	1.000.000Hz	9.999.999Hz	10
2	10.000.000Hz	69.999.999Hz	8
3	70.000.000Hz	79.999.999Hz	9
4	80.000.000Hz	169.999.999Hz	9
5	170.000.000Hz	200.000.000Hz	20

Visualized, it looks like this:



Remember, the raw calibration block as well as the corrected calibration block contain the equal number of calibration points.

Now the user wants to execute a measurement scan from 50MHz to 100MHz. The horizontal size of the image panel is assumed with 50 Pixels (these many vertical lines in the image below).



After reading the raw scan data (1) from the analyser, a resized calibration block (3) is created from the corrected calibration block (3). Now you can see, that the calibration data for the raw samples are taken from three different ranges of the corrected calibration block (3).

This leads to a relatively course calibration where the calibration data is from range (a), a finer calibration where the calibration data is from range (b) and a really course calibration where the calibration data is from range (c).

For the analysers with a frequency range up to 200 MHz it is sufficient to create raw calibration block with i.e. 2.000 samples. So each calibration samples covers abt. 100 kHz.

If we are using the same number of steps for an analyser with a range up to 3 GHz each step now only covers about 1.5 MHz.

So if you now want to measure i.e. a 40m antenna, the complete 40m band will be covered with only one calibration step and will probably lead to false results. That's the reason, why calibration mode 1 was introduced. For details on mode 1 check chapter "Calibration mode 1" on page 99.

Storage

Location

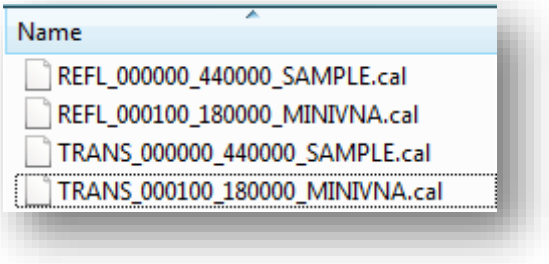
The **raw calibration dataset** can be stored (see "Saving calibration data" on page 94) and retrieved from your local disk (see "Loading existing calibration data" on page 95).

The calibration files are stored in the following location on your local hard disk:

Platform	Location
Windows XP	C:\Einstellungen und Dokumente\<UserName>\vnaJ.2.9\calibration
	C:\documents and settings\<UserName>\vnaJ.2.9\calibration
Windows VISTA, 7, 8	C:\Benutzer\<UserName>\vnaJ.2.9\calibration
	C:\users\<UserName>\vnaJ.2.9\calibration
Mac OSX	/Users/<UserName> /vnaJ.2.9/calibration
SUSE Linux 11	/home/user/<UserName>/vnaJ.2.9/calibration

Format

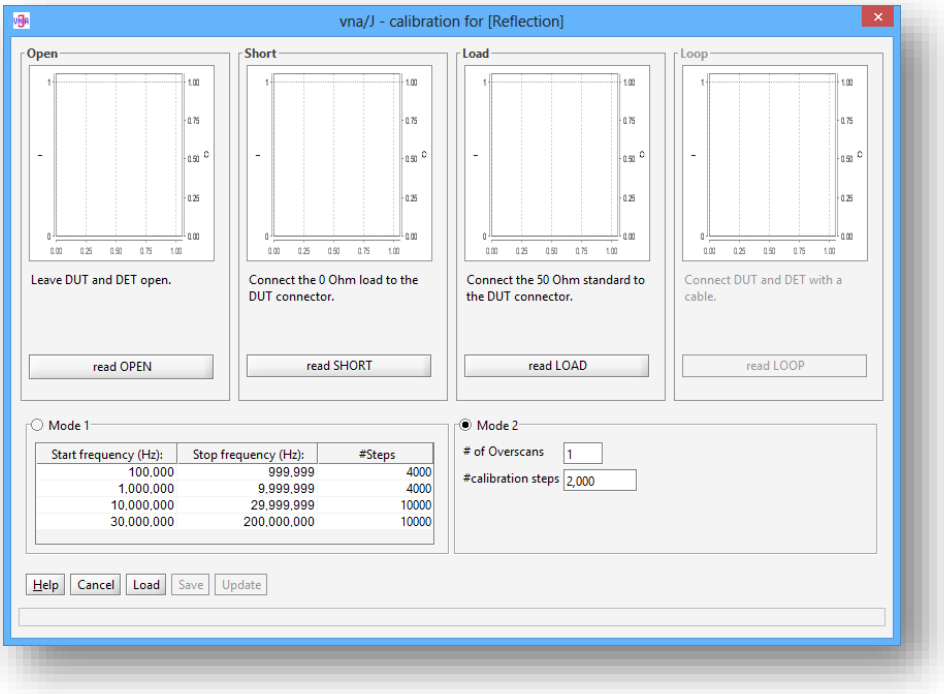
The calibration files are stored binary on the file system with the extension **.cal**.

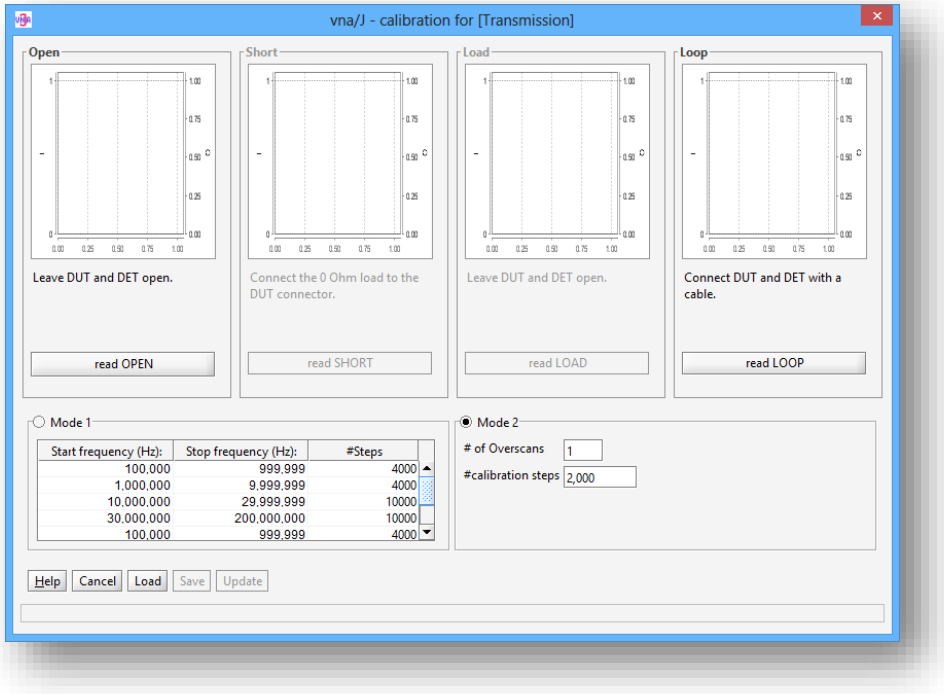


Basically this is a JAVA internal representation of the raw calibration data.

Calibration procedure

The calibration dialog is opened by selecting the menu CALIBRATION/LOSS or the corresponding button in the toolbar. In the title bar of the calibration dialog, the currently selected mode is always displayed.





There are four diagram areas on this dialog. Depending of the selected mode and analyser type, one or more diagram areas are enabled for usage.

For every visible diagram, a measurement must be made to create a valid main calibration dataset. When all the required calibration data has been created, the SAVE button gets enabled and the UPATE button receives a green background to indicate, that a complete main calibration dataset is now recorded.

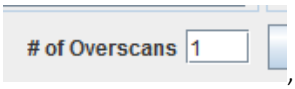
The created main calibration dataset can now be used in the application by simply pressing the UPDATE button, which will also close the dialog.

If one or more curves do not match the expectations simply rerun the needed calibration by pressing the button below the diagram again.

When closing the dialog using the UPDATE button, the calibration status in the status bar is updated.

Over scan

To get smoother scans when the measured object s resistance is near one of the calibration references (means i.e. the measured resistance is 50Ohm real which is identical with the reference value 50Ohm) an over scan feature was added.

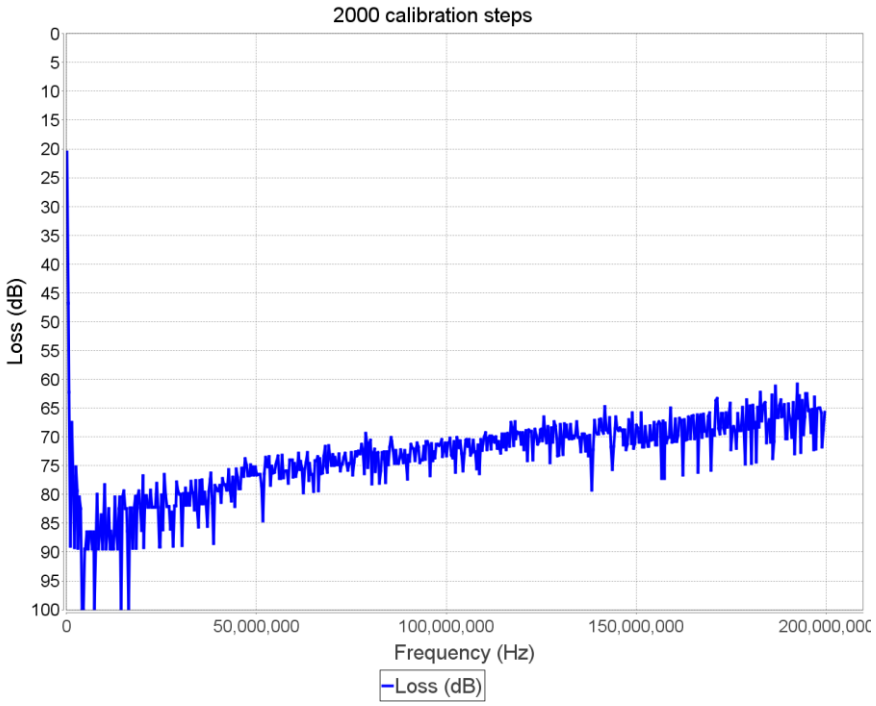
In the calibration dialog exists an input field 

, where the number of scans can be entered. This number of scans is executed when one of the read button is pressed. The final calibration data is calculated using the arithmetic mean of all scans executed.

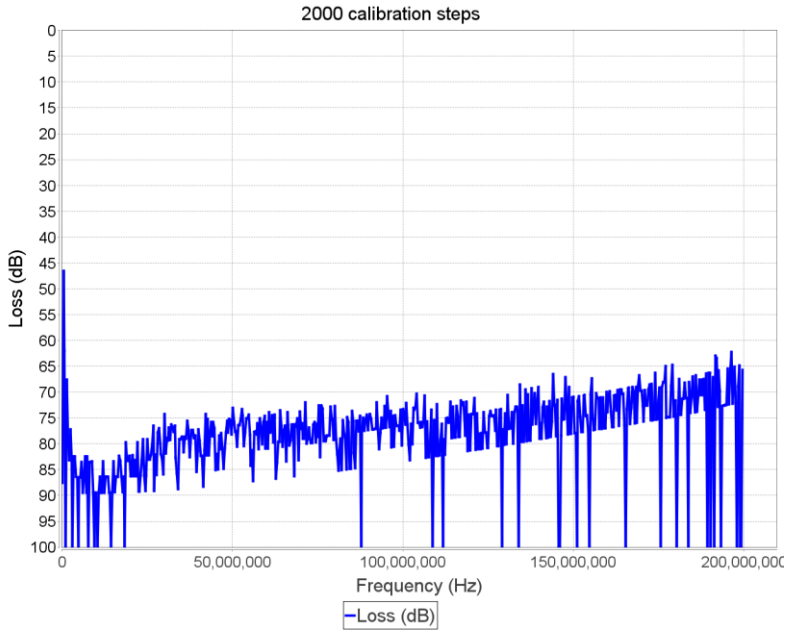
The higher the number, the smoother the calibration data is.

The results are explained here with a 50Ohm resistor connected to DUT in reflection mode.

2.000 calibrations points and 5x over scan



2.000 calibration points and 1x over scan



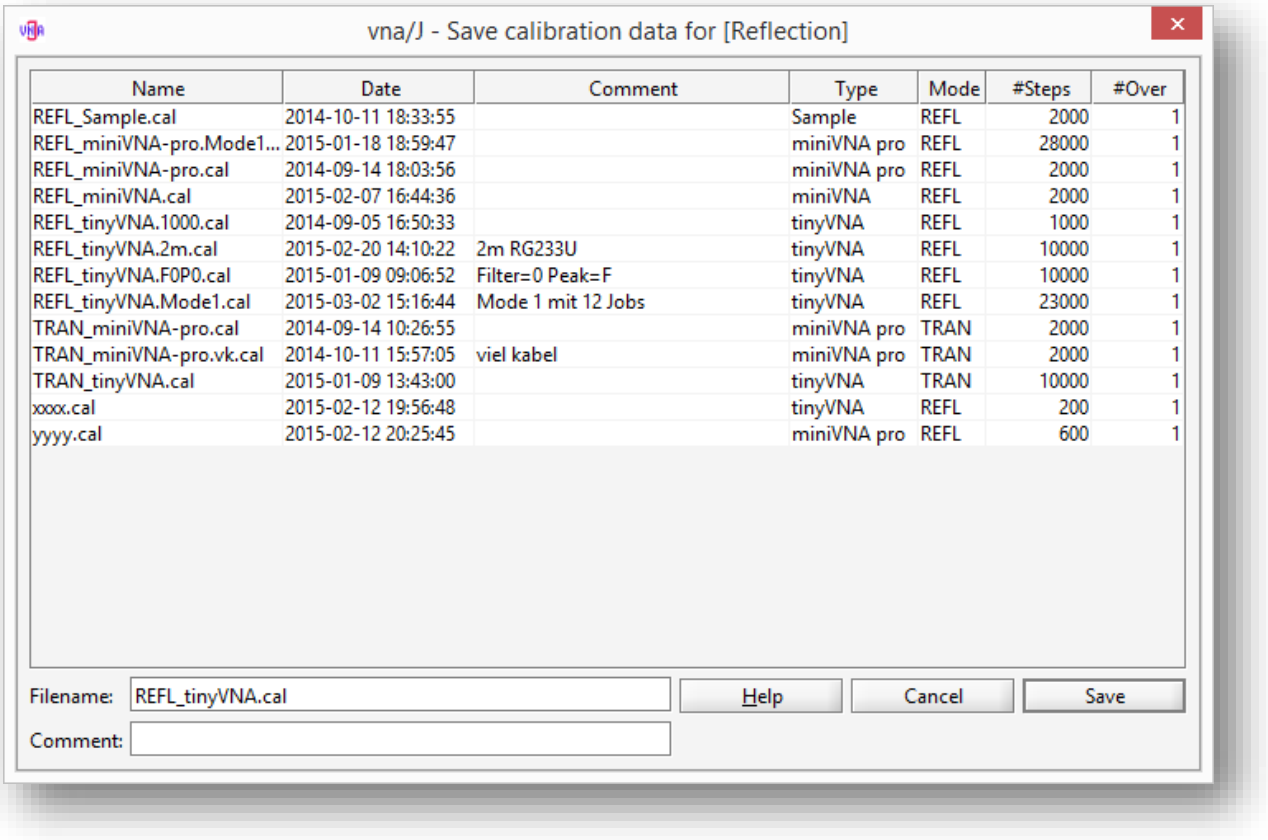
Remark: *The time needed to create an i.e. 5x over scan is about 5 times the duration needed for a 1x over scan.*

The resulting calibration data file contains no information how many over scans where used during creation

Using over scan makes only sense for the miniVNA$^{pro+extender}$ or the miniVNA^{tiny}. For the miniVNA or the miniVNA^{pro} the raw data is clear enough.

Saving calibration data

After creating a complete calibration data set in the calibration dialog, it is possible to save this calibration data set for later use by pressing the SAVE button. This opens this dialog:



In the upper list, all existing calibration files are listed for information.

The filename of the new calibration files is pre-set. This filename is constructed following this pattern:

`<Mode>_<Type>.cal`

Mode	REFL | TRANS
Type	miniVNA |miniVNA-pro | …

The user can overwrite the name.

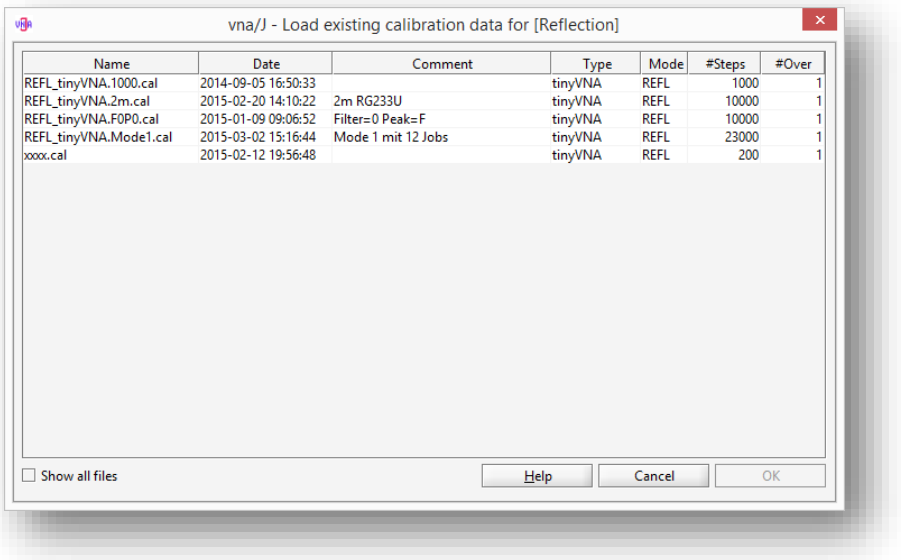
***Note**:* *When an already existing file is selected, a warning is shown and when confirming it, the existing file is overwritten.*

Loading existing calibration data

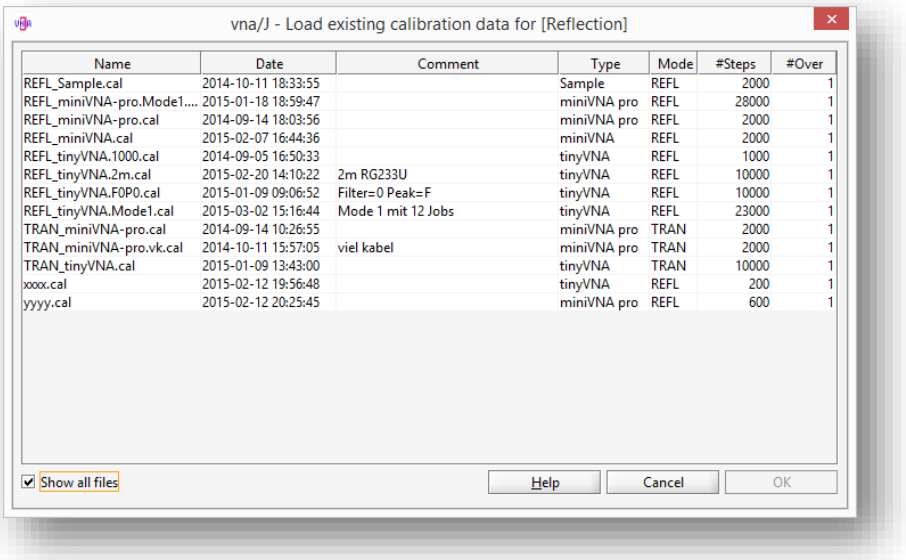
Existing calibration data files can be loaded via the OPEN icon 

in the toolbar or inside the calibration dialog, it is also possible to load a previously saved calibration data file.

When pressing the LOAD button inside the calibration dialog, a special selection dialog opens, which shows detailed information on matching calibration files in the preferred directory.

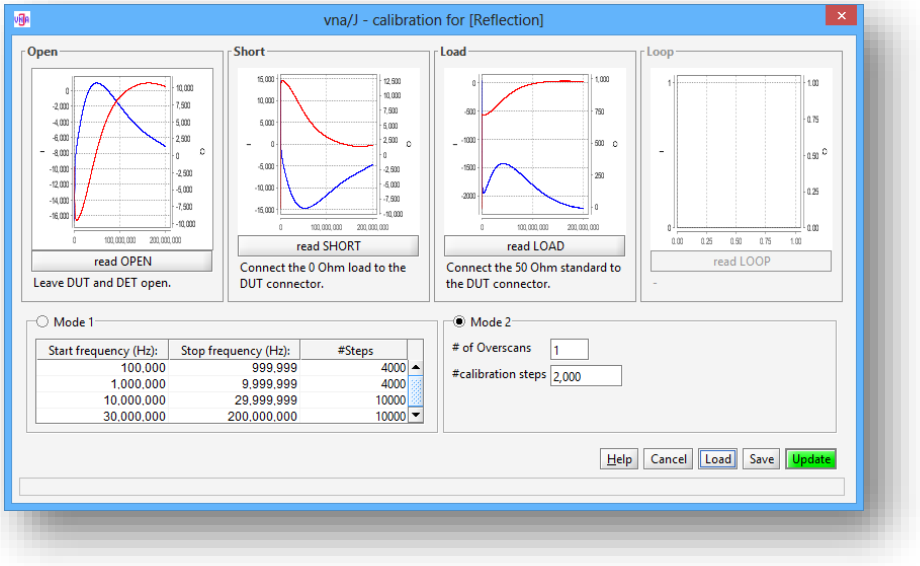


When selecting the SHOW ALL FILES checkbox, all calibration files in the preferred directory are displayed:



***Note**: The number shown in the column **#Over** is only valid, if the calibration data was created suing calibration mode 2.*

When the selected entry matches the current configuration (mode, analyser type) the OK button is enabled. Pressing the OK button loads the selected calibration data into the calibration dialog:



The calibration points are recalculated based on the current formulas implemented in the application to ensure also correct loading after update to internal mathematics. Check the beginning of chapter “Measurement basics” on page 86 ff.

Note: *The type column displays the internal number of the selected driver and is just for information purposes.*

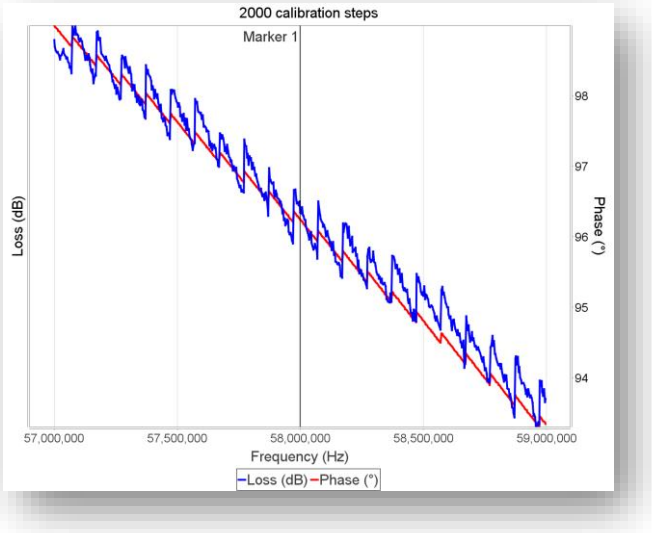
It is only possible to load calibration data sets that exactly match the selected hardware in the aspects of analyser-type, frequency-range, reflection or transmission mode and number of calibration steps.

Scan quality

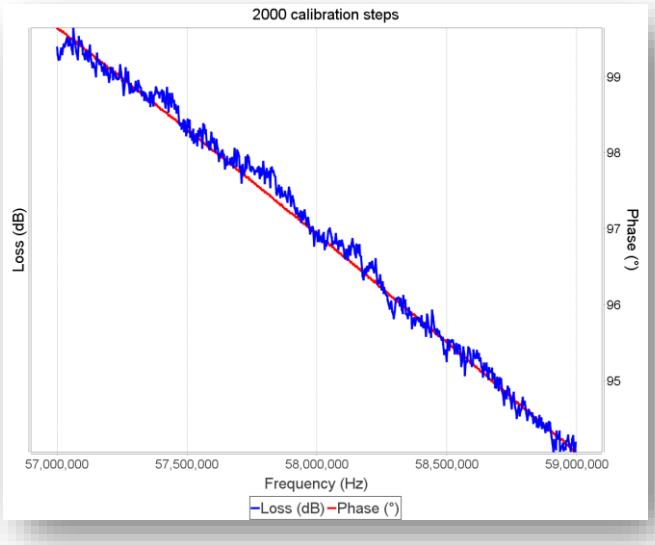
The number of calibration steps has a direct impact on the quality of small scan-ranges.

Let's take the default number of 2.000 steps. This gives a frequency span of about 100 kHz per calibration step for an analyser frequency span from 1-200MHz.

So when we execute a scan from i.e. 57 MHz to 59 MHz this range is covered by 20 calibration points.



If the number of calibration steps is increased to 20.000 steps. This gives a frequency span of about 10kHz per calibration step. Now the same range is covered by 200 calibrations points This results in a far more smooth measurement curve.



***Note**: For some drivers, the number of calibration steps can be set in the driver info dialog. Please consult the various driver guides for details.*

Calibration modes

Starting with release 2.8.5d of vna/J there are two modes for the calibration:

Mode 1 Depending on the analyser type, the maximum scan range of the analyser is divided into 1 or more ranges with different number of calibration steps. This results in enhanced resolution in these scan ranges.

Mode 2 This mode uses a fixed number of calibration steps in maximum scan range of the analyser. For some analyser types, the number of steps can be changed in the driver info dialog.

Presets

The following tables shows the scan ranges depending on the analyser type and calibration mode.

Analyser	Mode 1			Over	Mode 2		
	Start	Stop	Steps	scan	Start	Stop	Steps
miniVNA	100.000	180.000.000	20.000	1	100.000	180.000.000	2.000
miniVNA-LF	15.000	1.000.000	4.000	1	15.000	1.000.000	2.000
miniVNA-pro	100.000	999.999	4.000	1	100.000	180.000.000	2.000
	1.000.000	9.999.999	4.000	1			
	10.000.000	29.999.999	10.000	1			
	30.000.000	180.000.000	10.000	1			
miniVNA-pro Ext	10.000.000	139.999.999	2.000	1	100.000	180.000.000	2.000
	140.000.000	149.999.999	2.000	1			
	150.000.00	419.999.999	1.000	1			
	420.000.000	449.999.999	2.000	1			
	450.000.000	1.099.999.999	1.000	1			
	1.100.000.000	1.500.000.000	2.000	1			
miniVNA-pro LF	15.000	1.000.000	20.000	1	15.000	1.000.000	2.000
miniVNA-Test	100.000	2.400.000.000	20.000	1	100.000	2.400.000.000	2.000
MAX6	100.000	180.000.000	20.000	1	100.000	180.000.000	2.000
MAX6-500	100.000	500.000.000	20.000	1	100.000	500.000.000	2.000
Sample	100	9.999.999.999	20.000	1	100	9.999.999.999	2.000
miniVNA-tiny	1.000.000	30.999.999	10.000	2	1.000.000	3.000.000.000	2.000
	31.000.000	48.999.999	500	1			
	49.000.000	52.999.999	2.000	2			
	53.000.000	142.999.999	500	1			
	143.000.000	147.999.999	2.000	2			
	148.000.000	428.999.999	500	1			
	429.000.000	441.999.999	2.000	2			
	442.000.000	1.229.999.999	500	1			
	1.230.000.000	1.310.999.999	2.000	2			
	1.311.000.000	2.199.999.999	500	1			
	2.200.000.000	2.599.999.999	2.000	2			
	2.600.000.000	3.000.000.000	500	1			

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Calibration mode 1

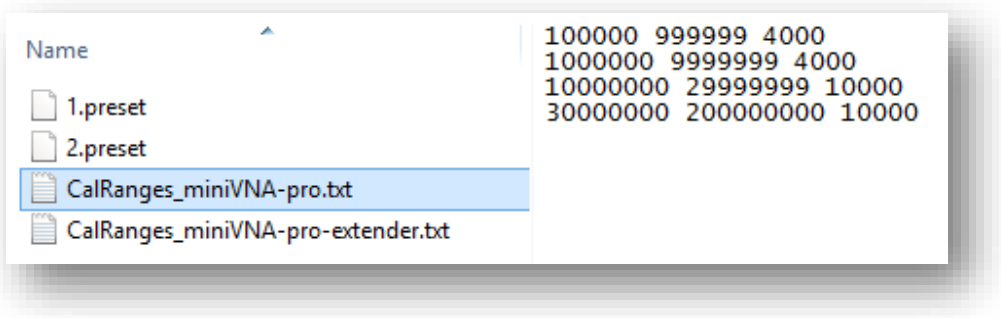
These scan ranges can be changed by the user by editing a simple text file. The driver specific text-file is created when the calibration dialog is first opened. The filename depends on the short-name of the driver. The file is located in the presets directory of vna/J.

The text-file must contain lines with triples containing three values:

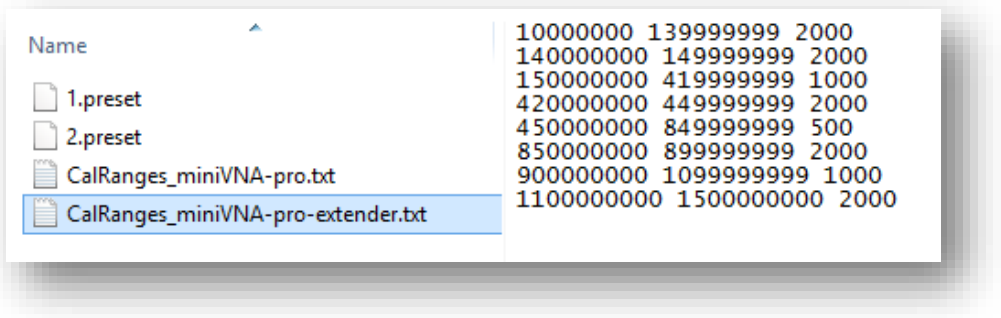
[start-frequency]*blank*[stop-frequency]*blank*[number of steps]*blank*[#overscan]

- The frequency must be within the range of the driver. You can check the minimum and maximum frequency in the driver info dialog. The frequency values must be in Hertz.
- The ranges must cover the complete frequency range of the driver.
- The number of steps must be within the range of 100 and 20.000.
- The number of overscan must be between 1 and 10
- The ranges must be listed in ascending order
- The ranges must contain no gaps and no overlap.

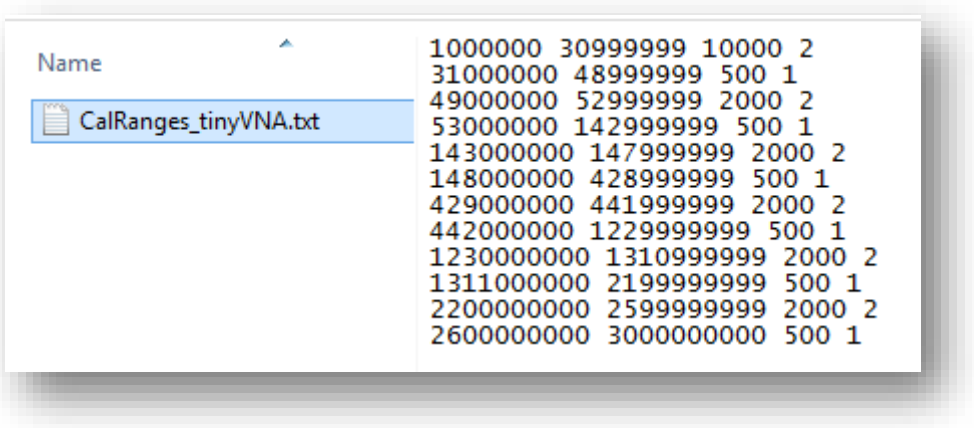
For the driver of the miniVNA^{pro}, the file looks like this:



For the driver of the miniVNA^{pro} with the extender, the file looks like this:



For the miniVNA^{tiny}, the default file looks like this:



The files are loaded during application start of vna/J. If vna/J detects an error in a file, it replaces this file with a default file and renames the corrupt file to *.bak.

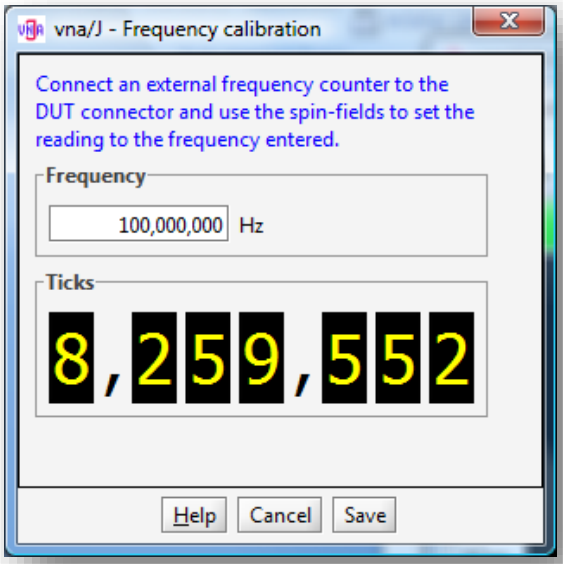
Hint: If you get stuck in using these user-defined scan ranges, simply delete the corresponding file in the pre-set folder of vna/J

Frequency calibration

The calibration can be done easily using a frequency counter connected to the DUT port.

Execute the following steps:

1. Open the frequency calibration dialog (menu CALIBRATION/FREQUENCY)



2. Connect a frequency counter to the DUT (or the TX on the Extender) connector of the analyser.
3. Enter the desired calibration frequency in the input field. At start-up, the half of the maximum frequency is pre-set. The frequency input field has the same behaviour as the start/stop fields in the main window.
4. Fine tune the frequency with the frequency digits, until the entered frequency is displayed on the external frequency counter
5. Close the dialog with the SAVE button.

***Remark**:* *The calibration value is stored for the selected analyser type. This can be checked also in the driver information dialog.*

When closing the application, the correction value is saved to the file system and will be reloaded whenever this driver is loaded.

If you get stuck somewhere during the frequency calibration, simply leave this dialog, open the driver info dialog, press there the RESET button and go back to the calibration dialog to start over.

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Configuration

All configuration data is stored in a user specific folder on the file system. No entries are made to the system registry or any other system configuration files.

All configuration and calibration files can be found here:

Platform	Location
Windows XP	C:\Einstellungen und Dokumente\<UserName>\ vnaJ.2.9
	C:\documents and settings\<UserName>\ vnaJ.2.9
Windows VISTA	C:\Benutzer\<UserName>\ vnaJ.2.9
	C:\users\<UserName>\ vnaJ.2.9
Windows 7	C:\Benutzer\<UserName>\ vnaJ.2.9
	C:\users\<UserName>\ vnaJ.2.9
Windows 8	C:\Benutzer\<UserName>\ vnaJ.2.9
	C:\users\<UserName>\ vnaJ.2.9
Mac OSX	/Users/<UserName> / vnaJ.2.9
SUSE Linux 11	/home/user/<UserName>/vnaJ.2.9

Remark: If you want to delete everything, simply delete the vnaJ directory, the used JAR-file and everything is gone.

Storage location

The settings for the vna/J application are stored inside an XML-file named vna.settings.xml.

This file is created after first application start and successful termination and contains a set of valid parameters.

Platform	Location
Windows XP	C:\Einstellungen und Dokumente\<UserName>\ vnaJ.2.9\config
	C:\documents and settings\<UserName>\ vnaJ.2.9\config
Windows VISTA	C:\Benutzer\<UserName>\vna.2.9\config
	C:\users\<UserName>\ vnaJ.2.9\config
Windows 7	C:\Benutzer\<UserName>\vna.2.9\config
	C:\users\<UserName>\ vnaJ.2.9\config
Windows 8	C:\Benutzer\<UserName>\vna.2.9\config
	C:\users\<UserName>\ vnaJ.2.9\config
Mac OSX	/Users/<UserName> / vnaJ.2.9/config
SUSE Linux 11	/home/user/<UserName> / vnaJ.2.9/config

Additional configuration files may be created inside this directory.

See also chapter "Options" on page 105.

Changing location

The storage location can be changed by specifying a user-defined directory when calling vna/J.

The basic command line for calling vna/J is:

```
java -jar vnaj.2.9.0jar
```

Adding this parameter

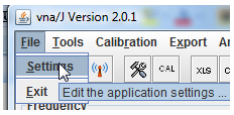
```
java -Duser.home=c:/temp -jar vnaj.2.9.0jar
```

stores all vna/J data inside the folder c:/temp.

Editing

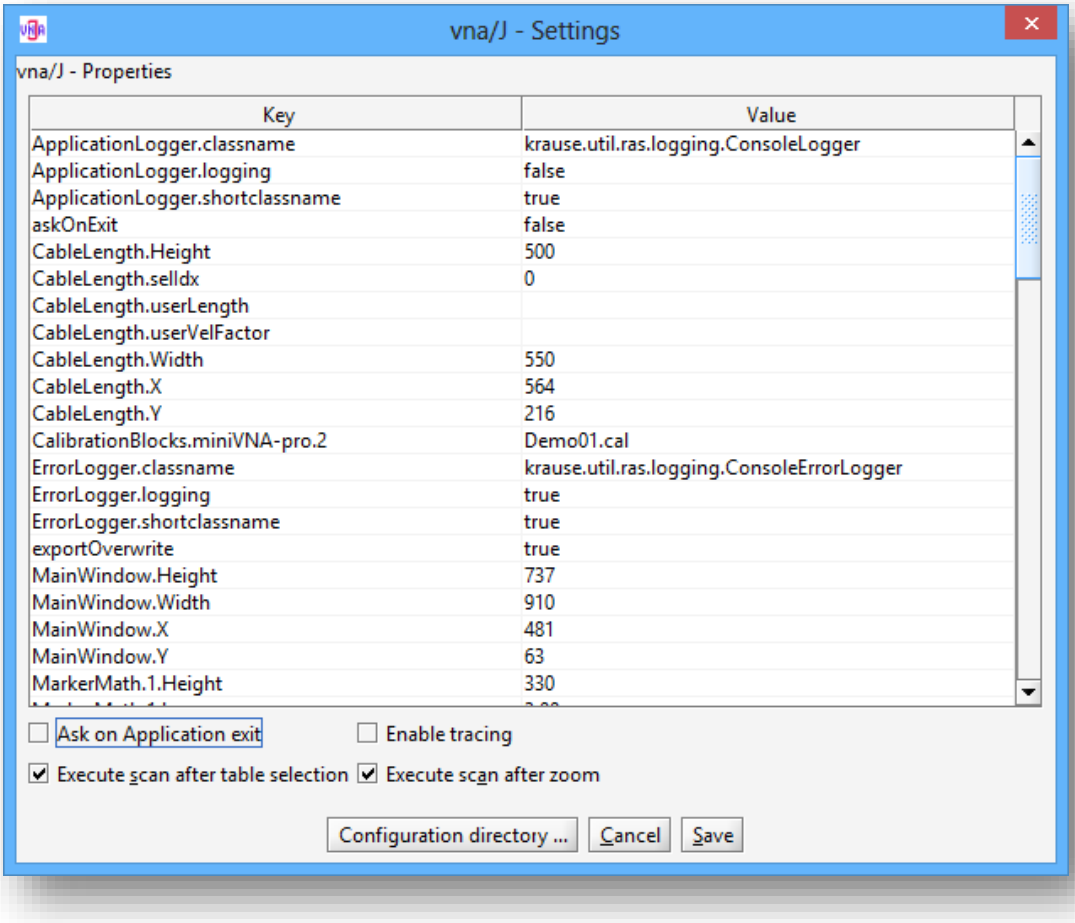
CAUTION: Make changes inside the configuration window with care! When the application does not work correctly, first try to delete the configuration files and start from scratch.

See chapter "Application does not start" on page 134

You can open the configuration dialog via the menu entry 

or this toolbar button 

The internal configuration variables for the vna/J application are then displayed:



When finished, click the Save button, to write it to the active configuration set. The configuration data is saved to disc when you close the application.

Clicking the Cancel button, reverts all changes and closes the window.

Options

Configuration directory ... Clicking the buttons directly opens the systems file browser on the configuration directory of vna/J.

☐ Ask on Application exit Setting this checkmark opens a confirmation box when user wants to close the application.

☐ Enable tracing Enables error logging. This is usually only needed for debugging purposes.

***Hint**: Enabling tracing may affect the overall application performance*

☑ Execute scan after table sel When this option is selected, a scan is automatically started, when a new frequency pair is selected in the presets table.

☑ Execute scan after zoom When this option is selected, a scan is automatically started with the new scan range after the Zoom button is pressed.

☑ Show bandmap in diagrar Shows the amateur radio bands inside the image panel

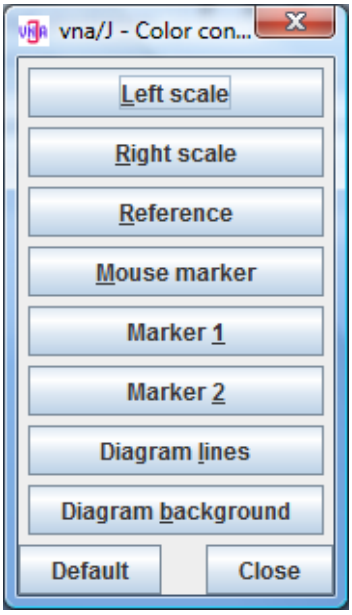
Colour settings

The colours used in the diagram area can be customized by the user.

Clicking on the toolbar icon  or using the FILE/COLORS menu entry opens the colour configuration dialog:

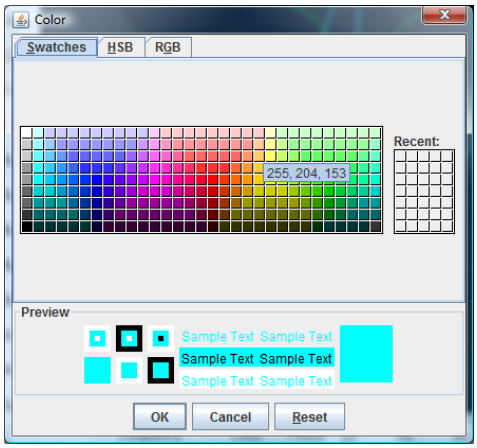
Here the user can change the colours of the following image panel components:

- The colour used to draw the values for the scale selected in the left dropdown list.
- The colour used to draw the values for the scale selected in the right dropdown list.
- The colour of the MOUSE marker text field. As the mouse marker is not drawn on the diagram, this sets only the colour of the marker name.
- The colour of MARKER 1. This sets the colour that is used to draw it on the diagram as well as the name of the marker.
- The colour of MARKER 2. This sets the colour that is used to draw it on the diagram as well as the name of the marker.
- The colour of the horizontal dotted-lines in the diagram
- The background colour of the diagram area.



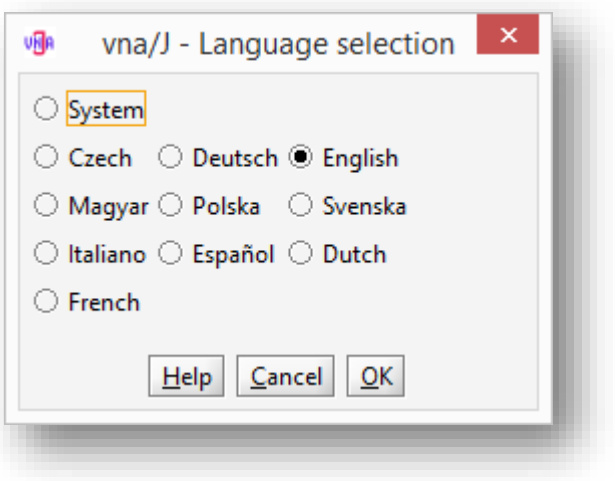
Clicking the OK button uses the selected colours, updates the image panel and saves them to the configuration file on application termination.

Clicking on one of the buttons opens a colour selection dialog, where the user can fine-tune the colour of the selected element.



Language settings

The application currently supports these languages:



Usually the language for the application is determined automatically based in the environment under which the application is running. Means; launching the application on a Windows© PC with locale GERMAN, all messages, GUI elements and formatting will be done in German.

If this detection does not work correctly or you want to force the application to start in a specific language, the language can be set using this dialog.

- Selecting a specific language means, after an application restart, the selected language is used as application language despite the locale of the platform on which vna/J is running.
- Select the "System" option means, that the application language is determined by the locale of the platform on which vna/J is running.

Remark: If someone has some spare-time, he can provide translations for his native language. To get a basic idea, what has to be done, check the "Translation Guide" on http://download.dl2sba.com/vnaj/manuals/Translation/TranslationGuide.pdf .

Simply send me an email to vnaj@dl2sba.de and I will provide you the necessary files.

A very limited number of hams already have contributed their work to the ham community - feel free to be one of them - see chapter “Acknowledgements” on page 8.

Command-line parameters

vna/J support a number of command-line parameters via the standard parameter procedure for JAVA execution.

Basically these parameters are passed via the –D option of the JAVA virtual machine.

```
java -Duser.home=c:/temp
     -Duser.language=en
     -Duser.region=US
     -jar vnaJ.2.9.1.jar
```

In the above example

- the home directory of vna/J is set to “c:\temp”
- the user language is set to English
- the user region is set to the united states

Supported parameters

The following parameters are supported:

Parametername	Usage
user.home	Points to the directory, where the root directory for vna/J is located. You can use the path-delimiter “/” on all platforms including Windows. See also info in chapter “Storage location” on page 102.
user.language	Sets the users language to one of the supported languages. See details in chapter “Language settings” on page 107 and below this table.
user.region	Sets the users region to one of the supported regions. See details in chapter “Language settings” on page 107 and below this table.
configfile	Overrides the name of the main configuration XML file. See also chapter “Storage location” on page 102.
http.proxyHost	Specify the proxy server for accessing the update site behind a proxy server. See chapter “Behind a proxy server” on page 113.
http.proxyPort	Specify the proxy server port for accessing the update site behind a proxy server. See chapter “Behind a proxy server” on page 113.

Remark: The parameter names are case-sensitive!

Supported region and language codes

The following combinations of language and region are supported:

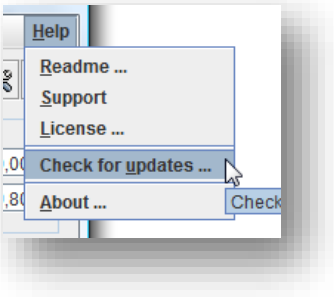
user.region	user.language	Remark
US	en	Texts and messages are displayed in English. Numbers and timestamps are formatted in English.
DE	de	Same for Germany
HU	hu	Same for Hungary
PL	pl	Same for Poland
SE	sv	Same for Sweden
IT	it	Same for Italy
ES	es	Same for Spain
NL	nl	Same for the Netherlands

Remark: The parameter values are case-sensitive!

If you are missing a language, please check chapter “Language settings” on page 107 :-)

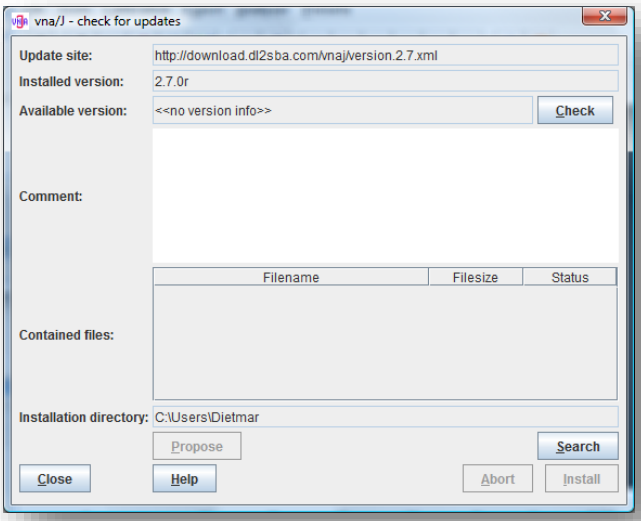
Update

Starting with version 2.7 an update check function is included in vna/J.



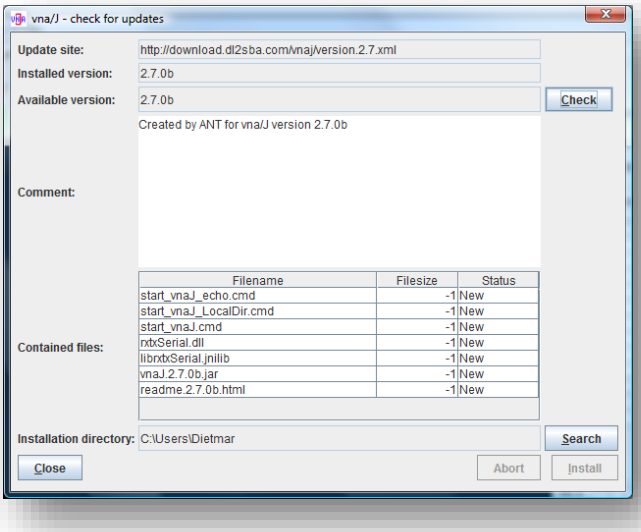
Selecting the "Check for updates" menu entry open the update dialog of vna/J.

Initially only the current version of vna/J, here "2.7.0r" is displayed.



Selecting the "Check" button reads a version information file from the vna/J download website.

- A short description of the new version is displayed in the "Comment" field.
- All includes files in this version package are displayed in the list.



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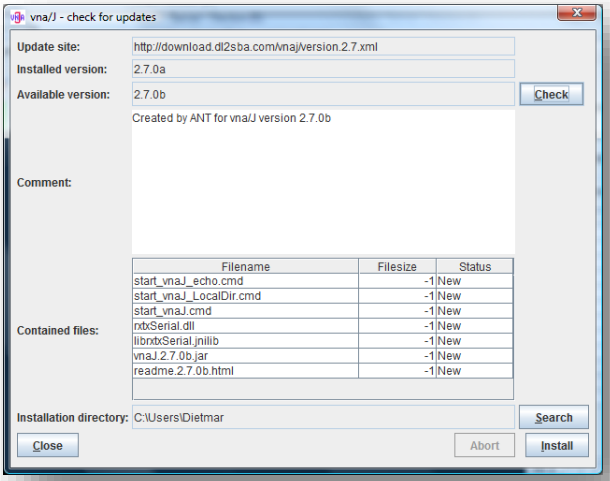
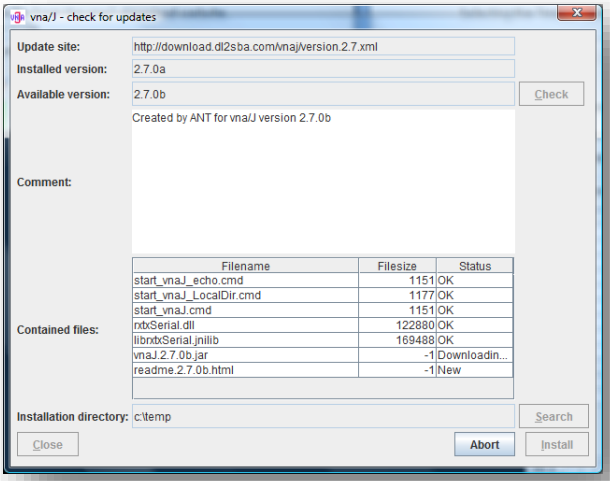
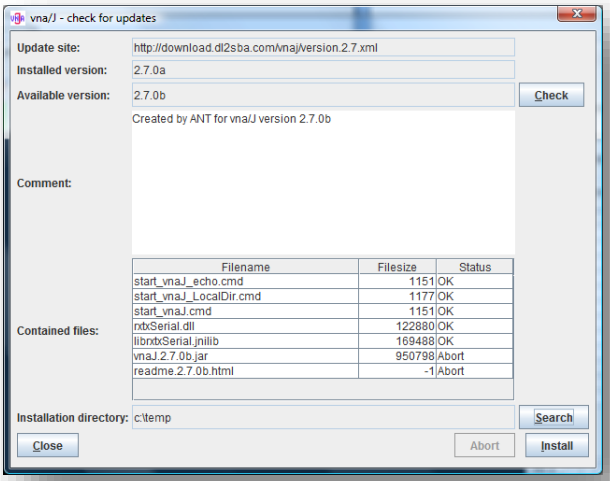
If the version on the website is newer then the currently installed version, the "Install" button is enabled.



Selecting the "Install" button starts the download of all the files contained in this version package.



The download status of each file is displayed in the list. The download can be aborted clicking the "Abort" button. All further downloads are aborted:



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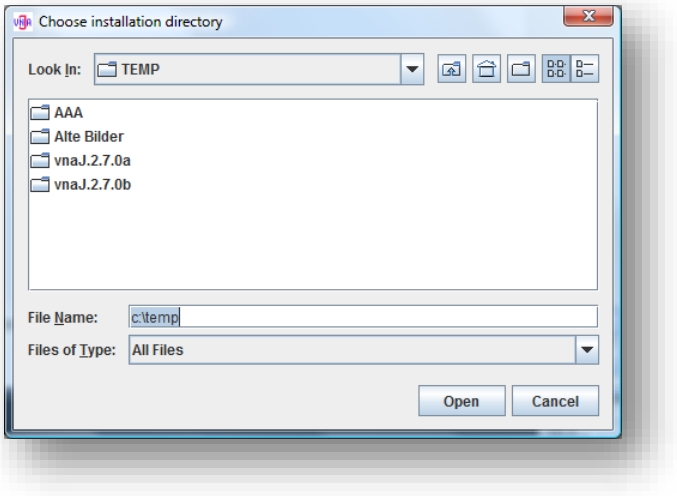
The location, where the downloaded files are stored is displayed in "Installation directory" and can be changed using the "Search" button.

Selecting the PROPOSE button, sets the installation directory name to the parent directory of the currently running application and appends the version identifier displayed in field **available version.**

After successfully downloading the new version, it can be started as described in the installation manual.



Note: *During checking for a new version and downloading this new version, NO information is transmitted to any website! Only the file, displayed in the field "Update site" is downloaded and all files described in this file are downloaded to the selected location.*

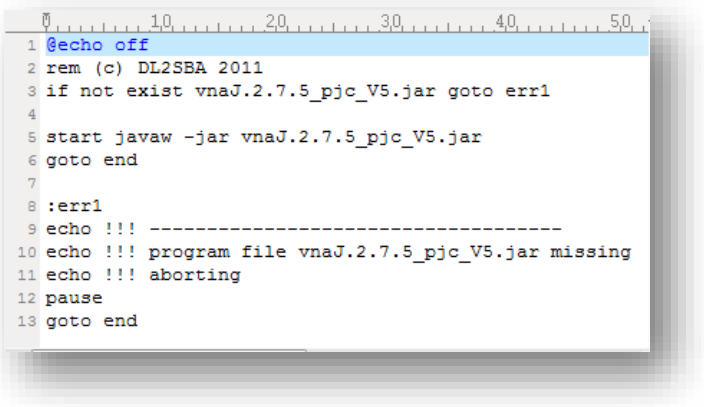
It is strongly recommended to download any version update into a separate directory on the local machine to avoid any version issues. Use the PROPOSE button to create a new directory name.

Do NOT download any new version to the directory where the currently running version is installed!

Behind a proxy server

If you are running vna/J behind a proxy server (see http://en.wikipedia.org/wiki/Proxy_server) that is not transparent to the user, you have to provide additional information during the start of vna/J.

A good place to provide this information is the start_vnaj.cmd provided in the download area:



```
@echo off
rem (c) DL2SBA 2011
if not exist vnaJ.2.7.5_pjc_V5.jar goto err1

start javaw -jar vnaJ.2.7.5_pjc_V5.jar
goto end

:err1
echo !!! -----------------------------------
echo !!! program file vnaJ.2.7.5_pjc_V5.jar missing
echo !!! aborting
pause
goto end
```

You have to ask your system administrator for these parameters:

- name or IP-address of your proxy server
- IP-port on the proxy server

In my example the values are **webcache.mydomain.com** as the address of the proxy server and **8080** as the IP-port of the proxy server. So edit the cmd-file to:

```
@echo off
rem (c) DL2SBA 2011
if not exist vnaJ.2.7.5_pjc_V5.jar goto err1

start javaw -Dhttp.proxyHost=webcache.mydomain.com -Dhttp.proxyPort=8080 -jar vnaJ.2.7.5_pjc_V5.jar
goto end

:err1
echo !!! -----------------------------------
echo !!! program file vnaJ.2.7.5_pjc_V5.jar missing
echo !!! aborting
pause
goto end
```

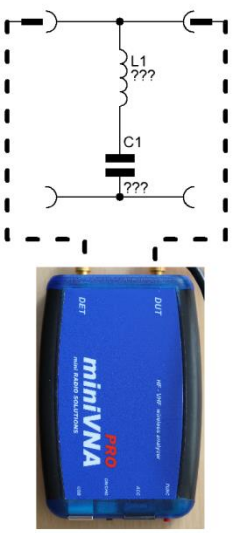
***Hint**: If you are running Linux or Mac OS, you can copy the part after "start …" into your command window and execute vna/J manually.*

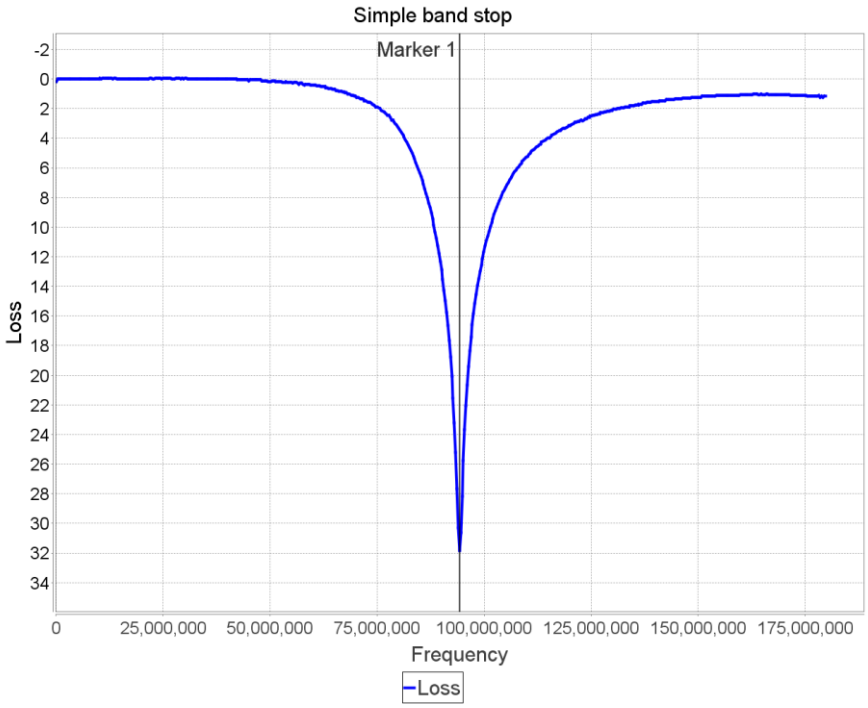
***Note:** I do not store this information anywhere inside vna/J or transmit it to the update website. If your proxy server requires some kind of authentication data, you have to download the files manually from my website http://vnaj.dl2sba.com as this will be never supported by vna/J.*

Samples

Transmission mode

We have a simple serial LC filter used as a band stop. This gives a measurement curve with vna/J:

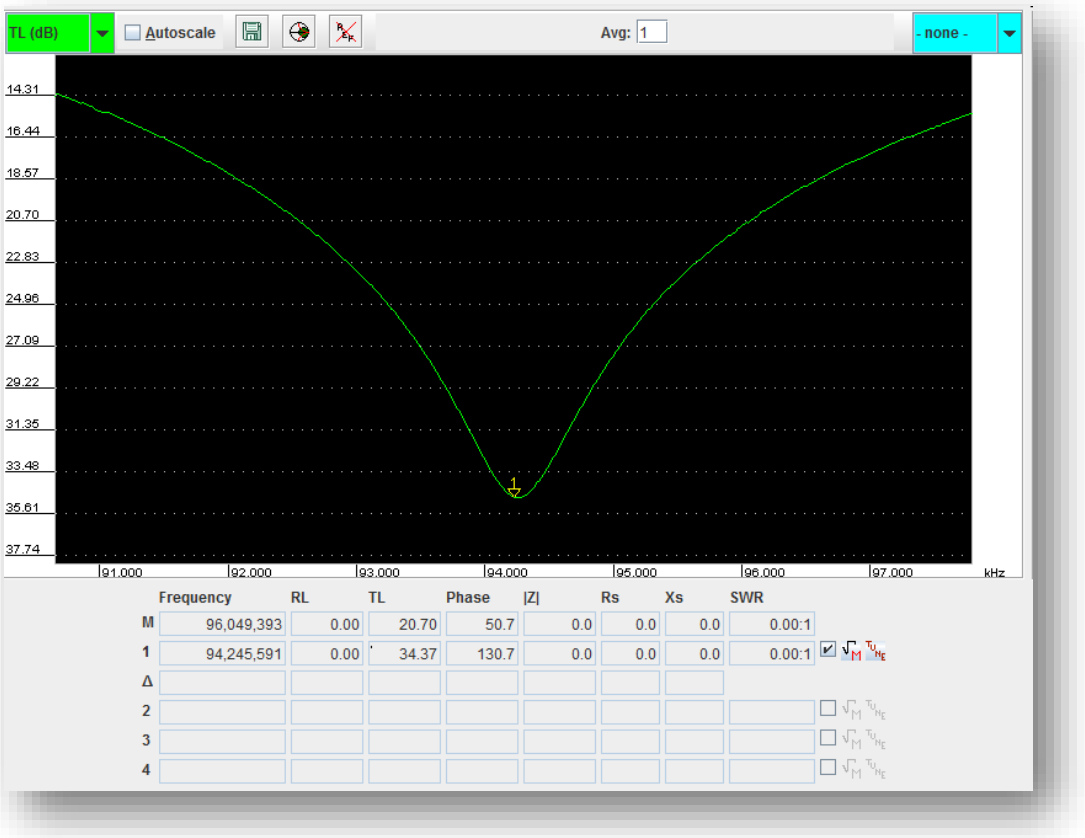




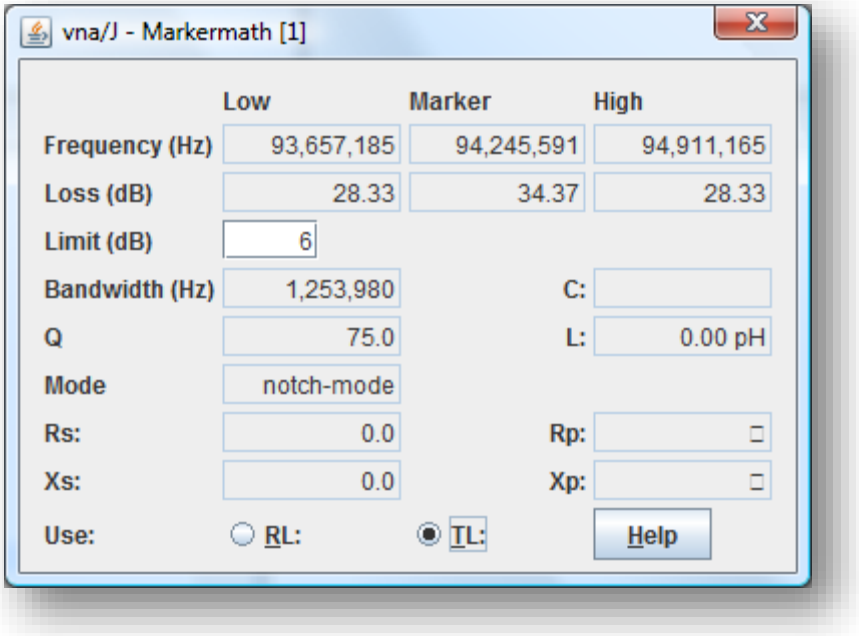
To measure the data for this filter, follow this procedure:

- Switch to transmission mode.
- Switch to free-run mode to get constant updates of the values.
- Click on the diagram area with the left-mouse button
- Select the MAX-search mode for the loss field of marker 1
- Click the math-symbol for marker 1.

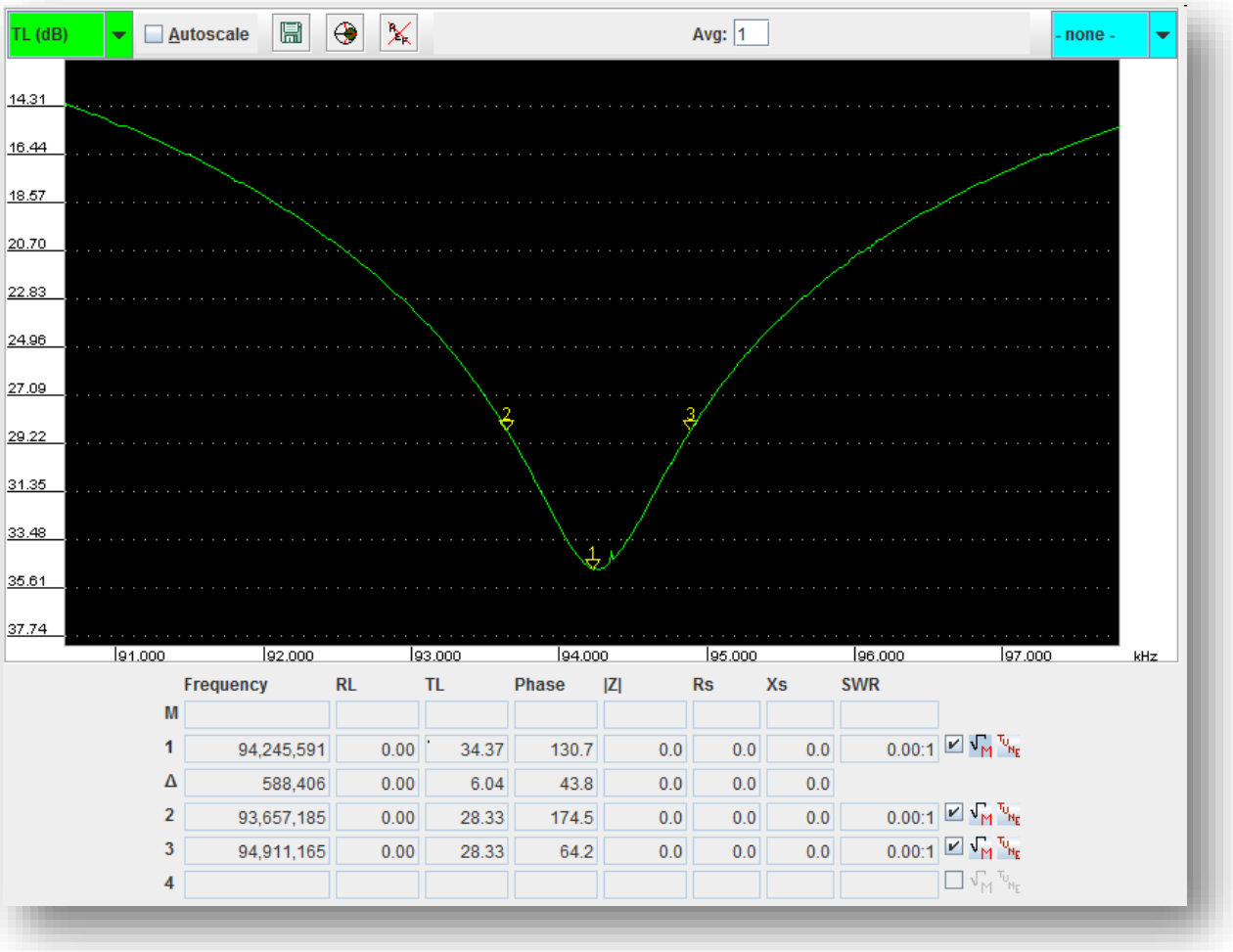
The main window should look like this:



and cursor 1 should be set to the maximum transmission loss, here about 34dB at 94.2 MHz. The marker-math dialog should display these values:



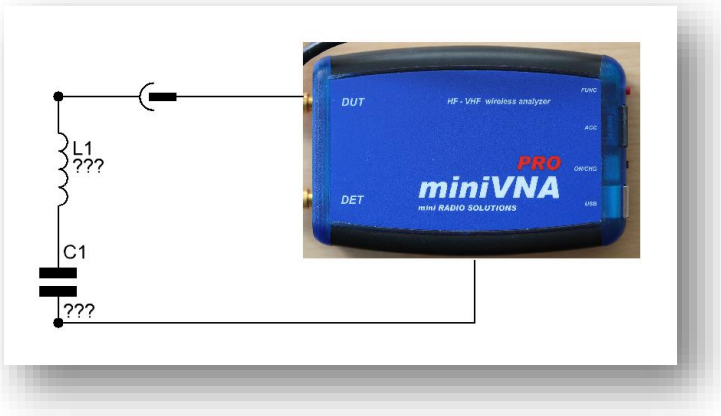
This can be verified using the markers 2 and 3 manually:



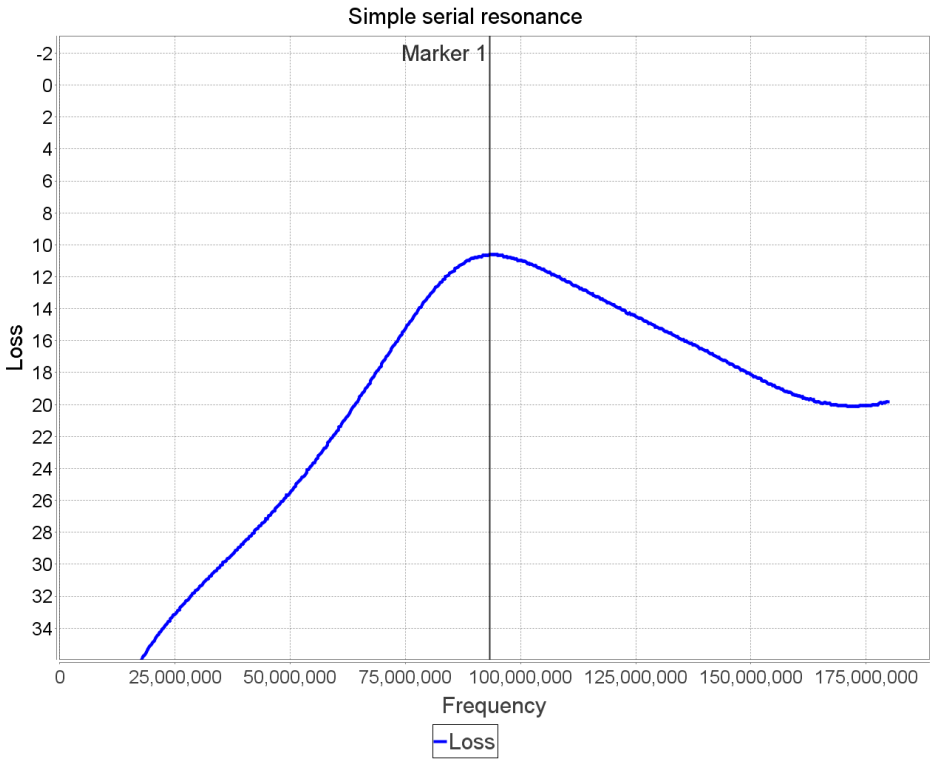
	Frequency	RL	TL	Phase	|Z|	Rs	Xs	SWR
M								
1	94,245,591	0.00	34.37	130.7	0.0	0.0	0.0	0.00:1
Δ	588,406	0.00	6.04	43.8	0.0	0.0	0.0	
2	93,657,185	0.00	28.33	174.5	0.0	0.0	0.0	0.00:1
3	94,911,165	0.00	28.33	64.2	0.0	0.0	0.0	0.00:1
4								

Reflection mode

We have a simple serial LC circuit connected to DUT.



This gives a measurement curve with vna/J.



To measure the data for this circuit, follow this procedure:

- Switch to reflection mode
- Switch to free-run mode to get constant updates of the values.
- Click on the diagram area with the left-mouse button
- Select the MAX-search mode for the loss field of marker 1
- Click the math-symbol for marker 1.

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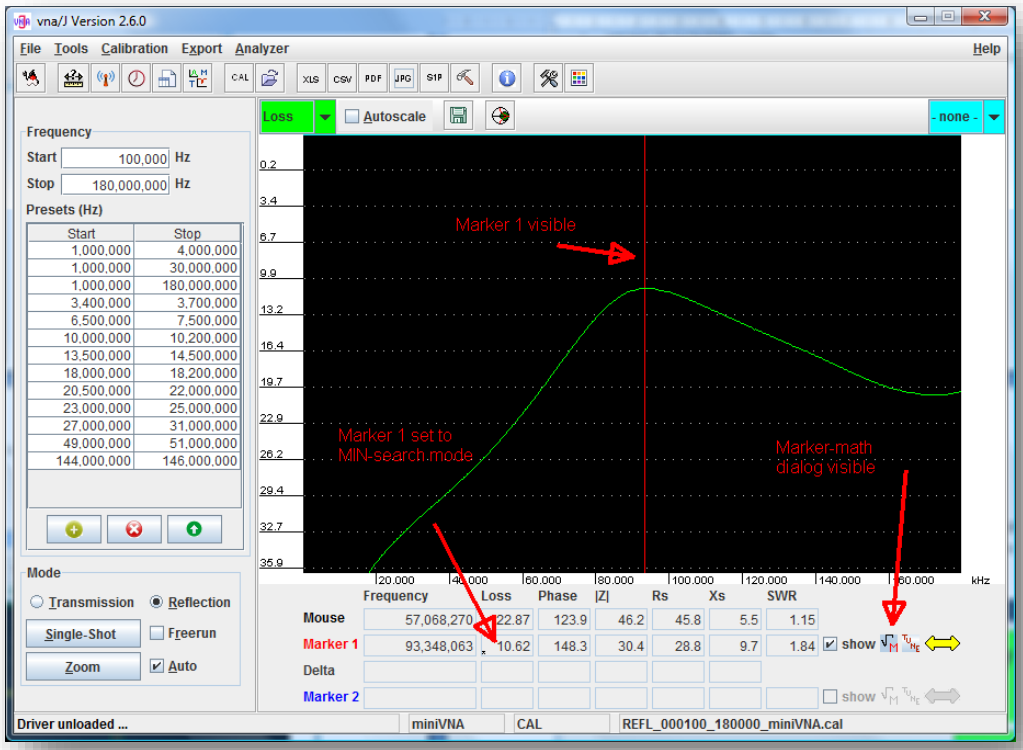
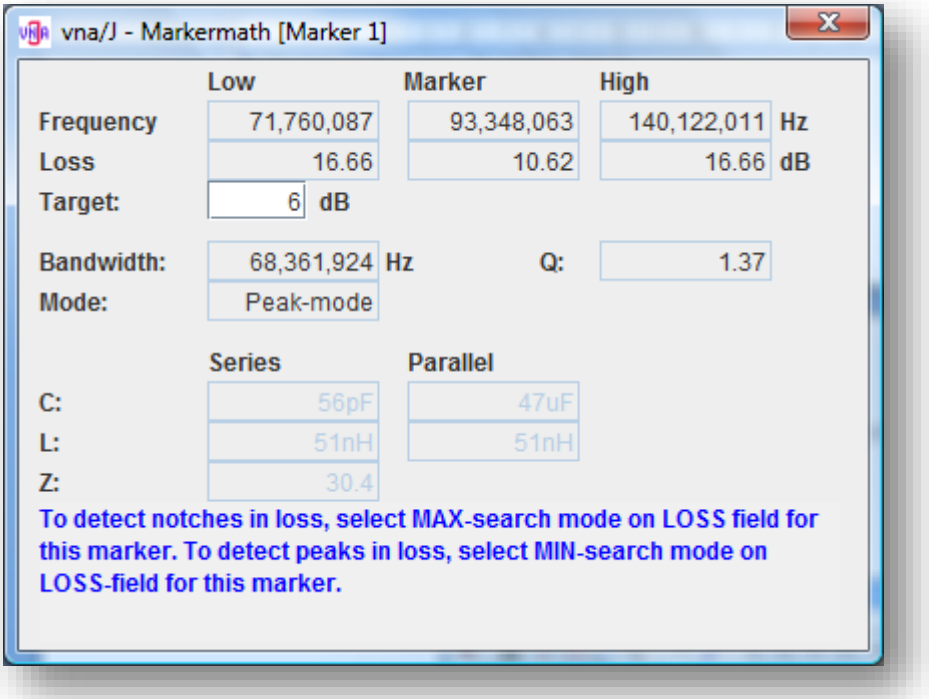
The main window should look like this:

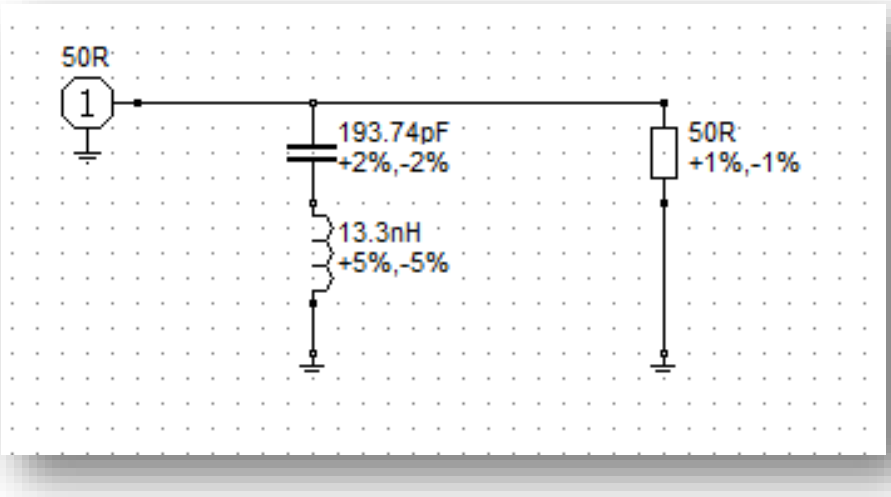


and the marker-math dialog should display these values:

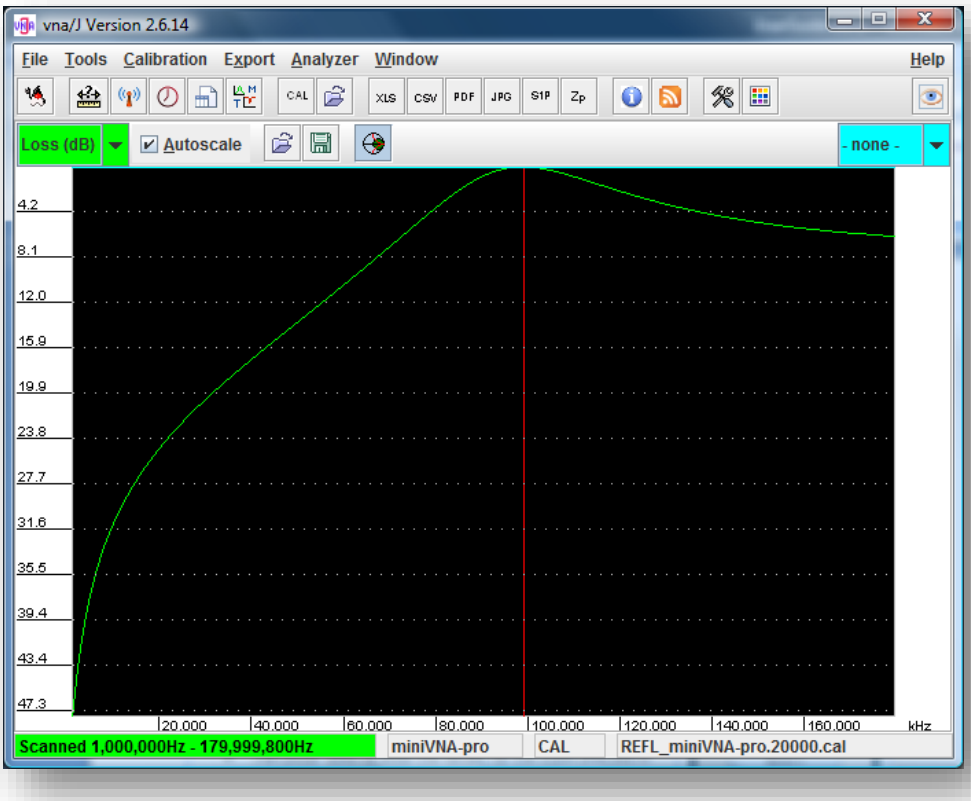


Comparison with simulation

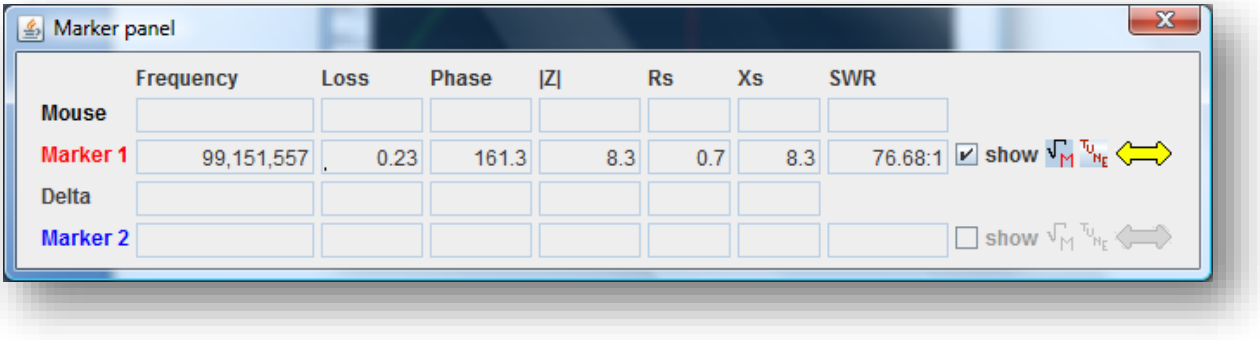
I've build up this simple circuit:



where (1) is the miniVNA pro. Using vna/J with the miniVNA pro I'll get this scan:

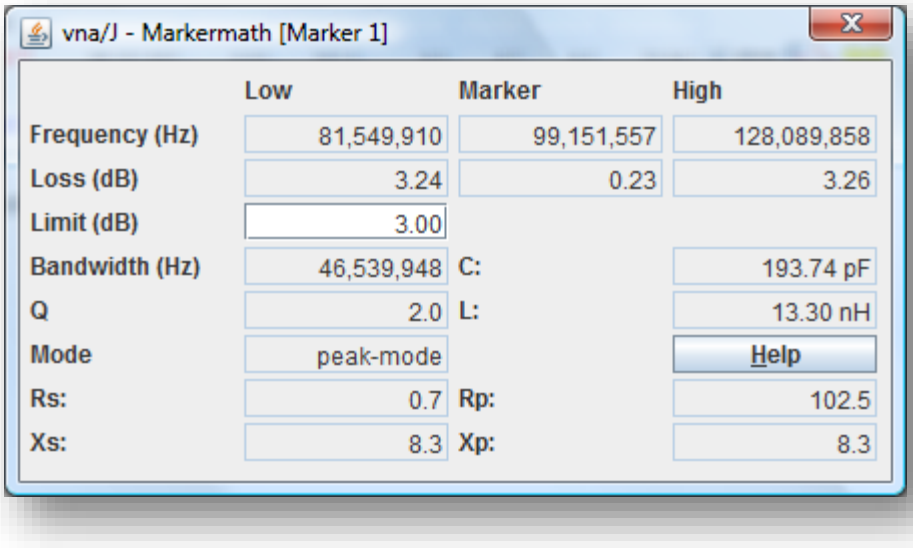


Setting the search-mode of cursor 1 to minimum

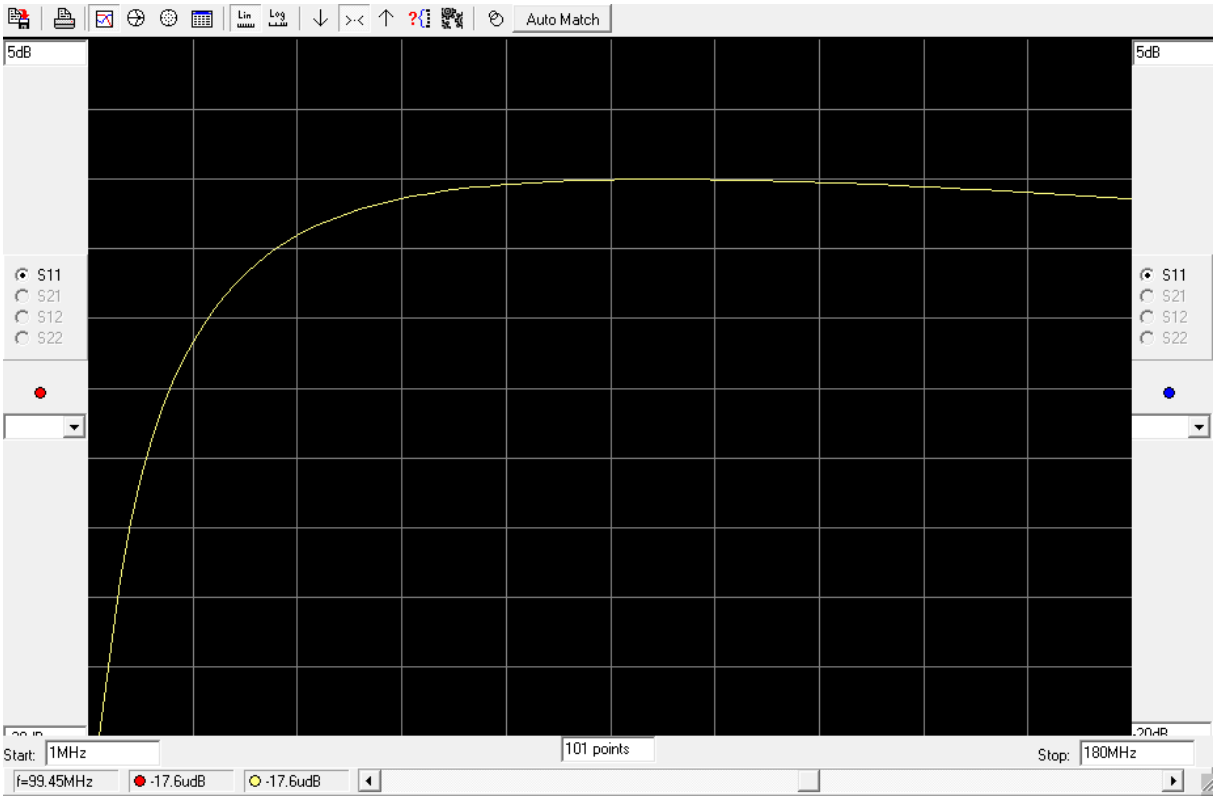


it automatically sets cursor 1 to 99.15 MHz - the minimum loss.

Opening the cursor-math dialog for cursor 1 gives this:



When I enter now the values for C=193,74pF and L=13,3nH I get this simulation inside RFSim99:



As you can see, the minimum loss is also at about 99,45MHz ☺

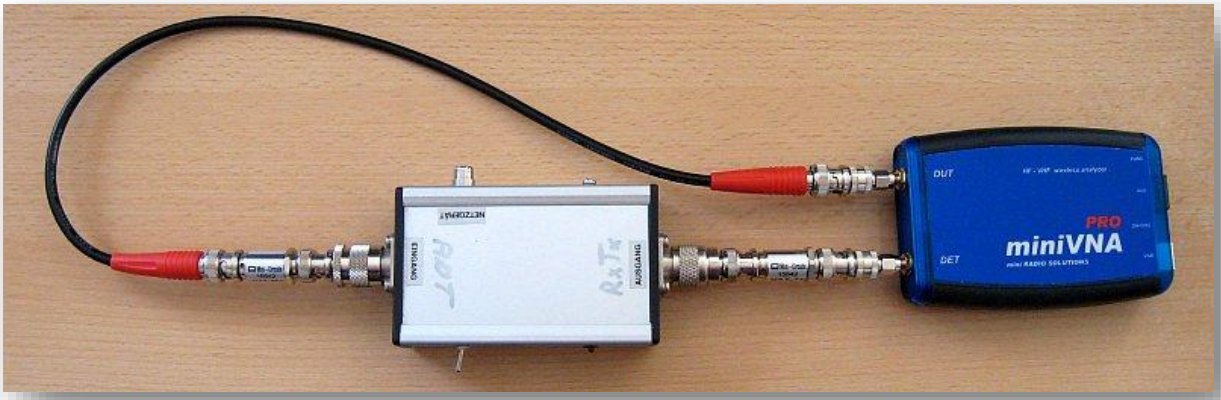
RFSim99 can be found here:

http://elektronikbasteln.pl7.de/rfsim99-filter-berechnung.html

Measuring an 144MHz pre-amplifier

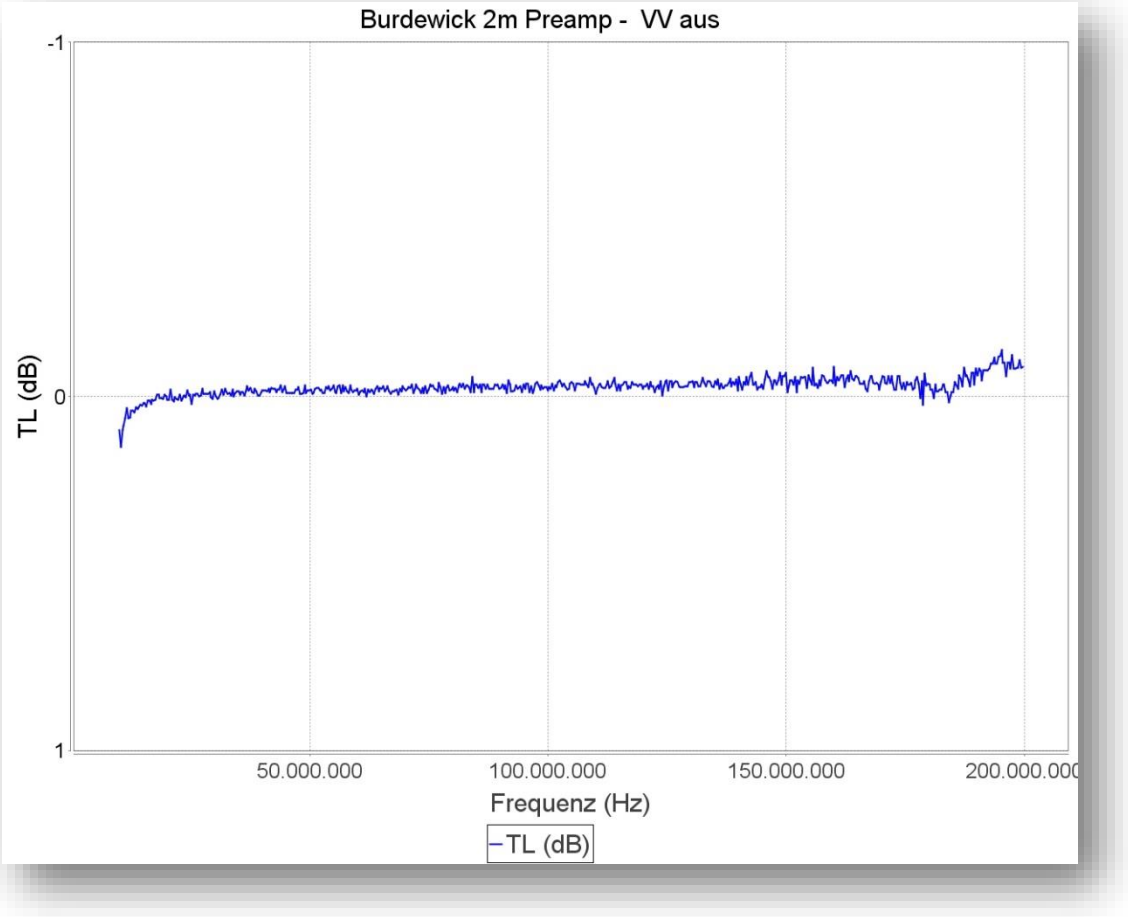
Idea is to measure amplification and frequency response of an older 2m preamp from the German company Burdewick:

The basic measurement setup was this:

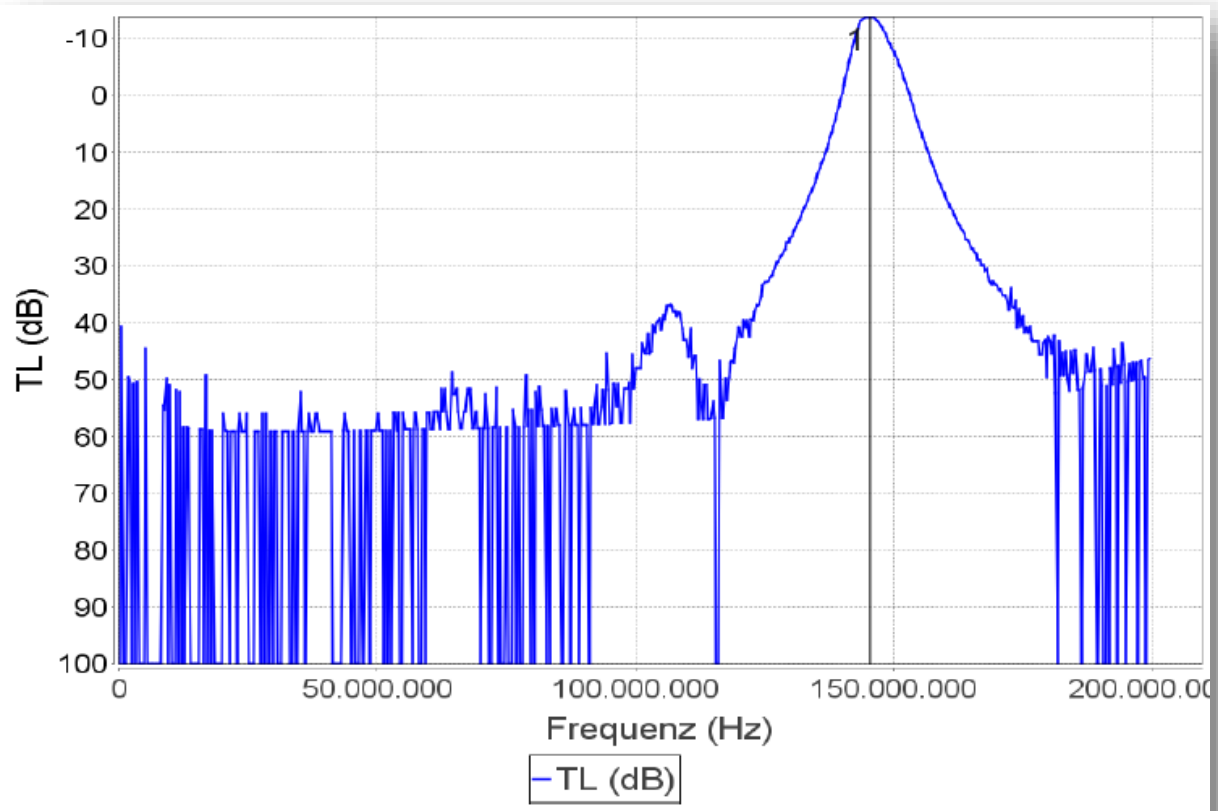


To reduce the output power of the miniVNApro a 20dB pad is connected between the DUT-output and the preamp in. Between the preamp out and the DET-input a 10dB pad is connected.

First a transmission calibration is executed without the preamp but with both pads in sequence as this the basic system attenuation. This results in a flat scan:

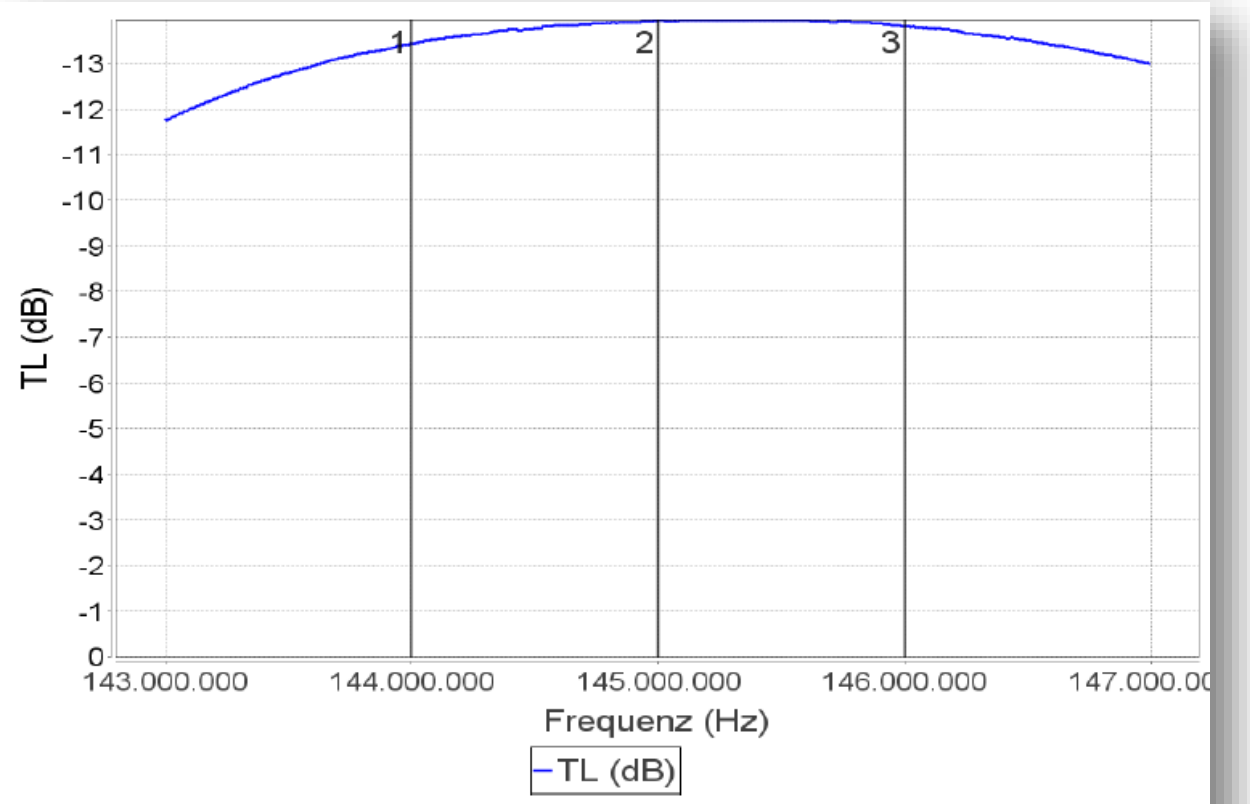


Now connecting the powered preamp between the two pads gives this transmission scan:



Marke	Frequenz	SWV	RL	TL	Phase	|Z|	Rs	Xs
1	145.360.376	0,00:1	0,00	-13,81	104,1	0,0	0,0	0,0

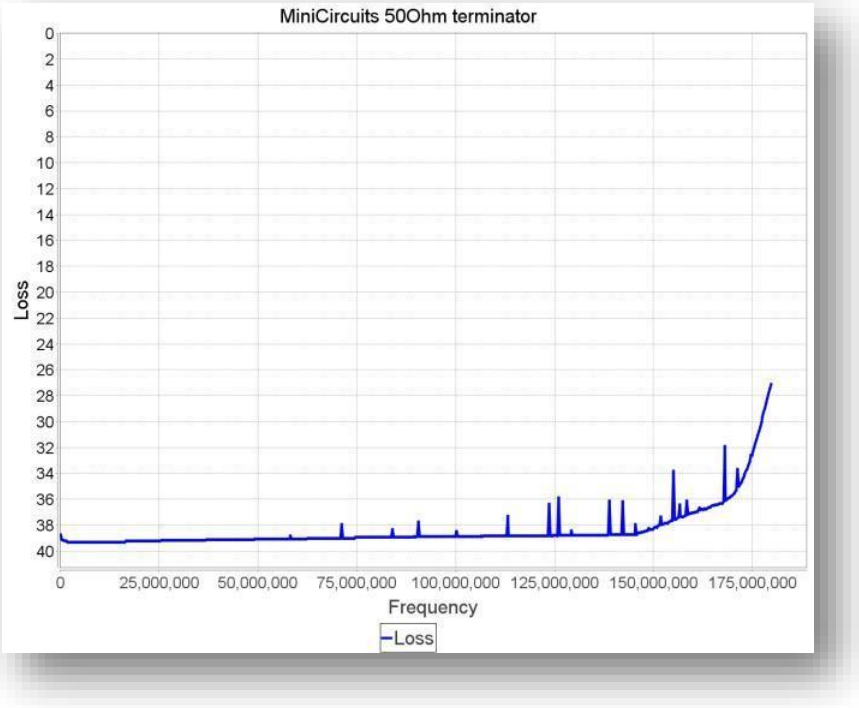
Zooming to the interesting frequency range from 143 to 147MHz shows directly the amplification of the preamp of about 13dB.



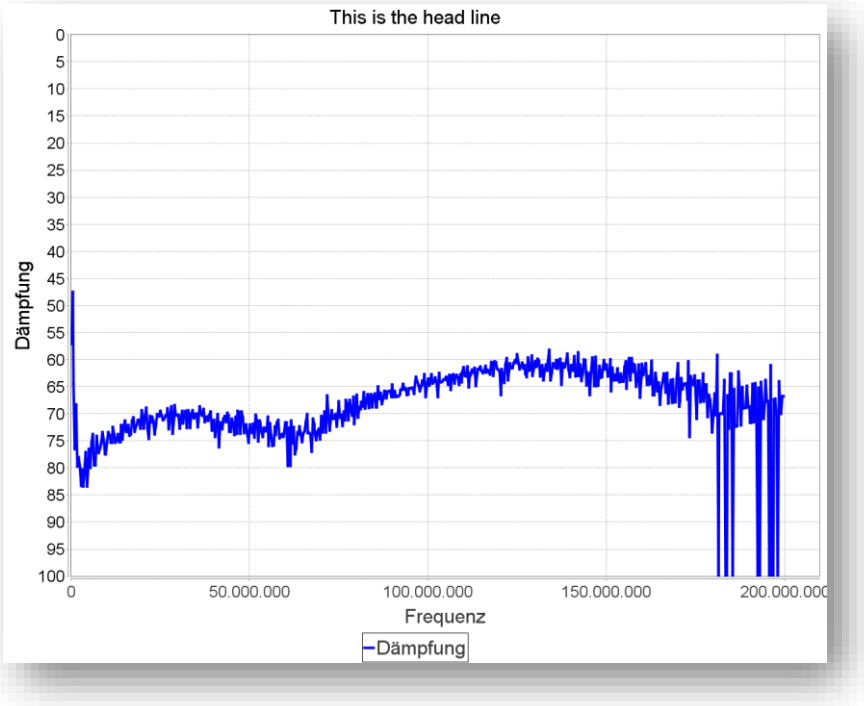
Marke	Frequenz	SWV	RL	TL	Phase	|Z|	Rs	Xs
1	143.999.900	0,00:1	0,00	-13,43	153,4	0,0	0,0	0,0
2	144.999.800	0,00:1	0,00	-13,94	116,9	0,0	0,0	0,0
3	145.999.700	0,00:1	0,00	-13,82	82,3	0,0	0,0	0,0

MiniCircuits 50Ω terminator

miniVNA

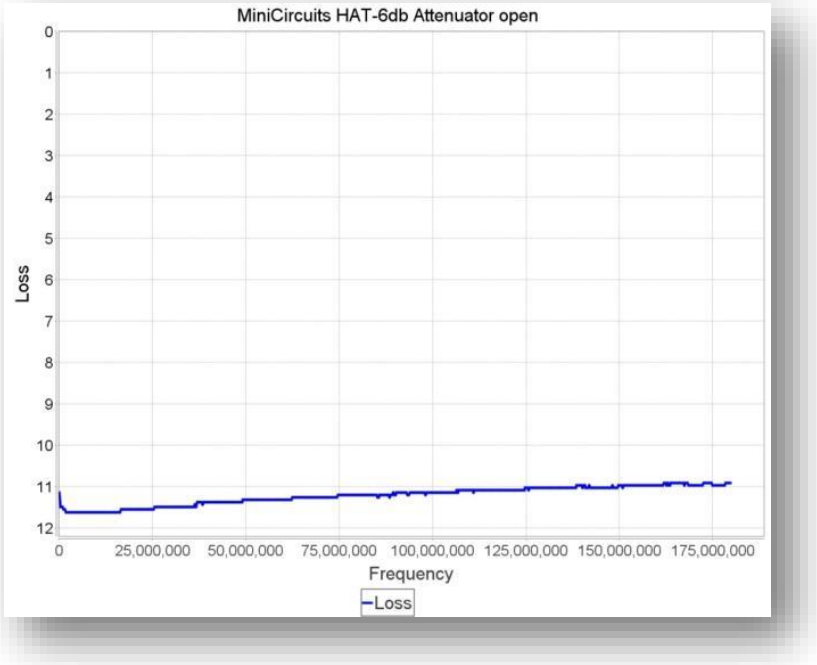


miniVNA PRO

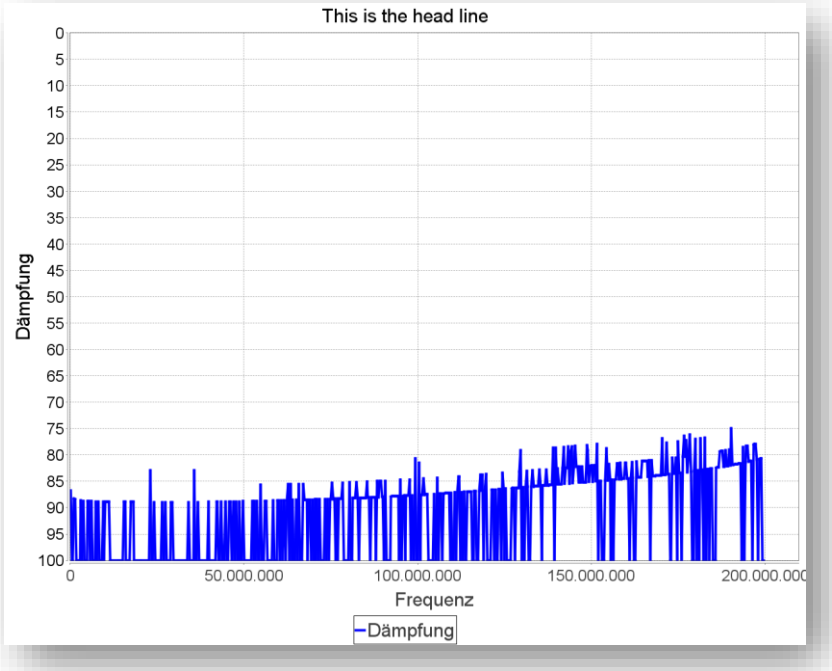


MiniCircuits HAT-6dB attenuator open end

miniVNA

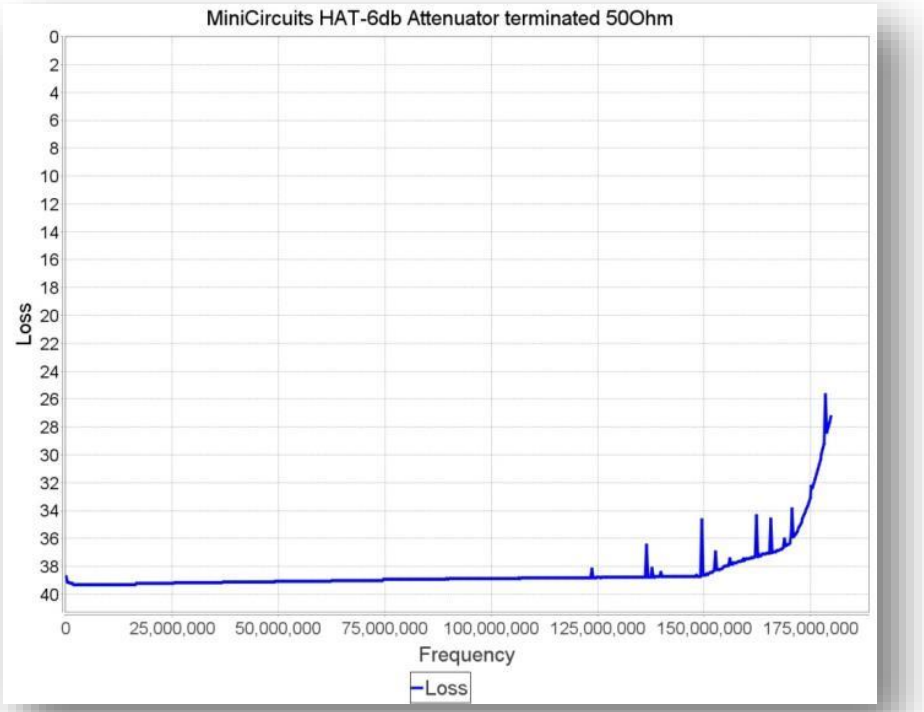


miniVNA PRO

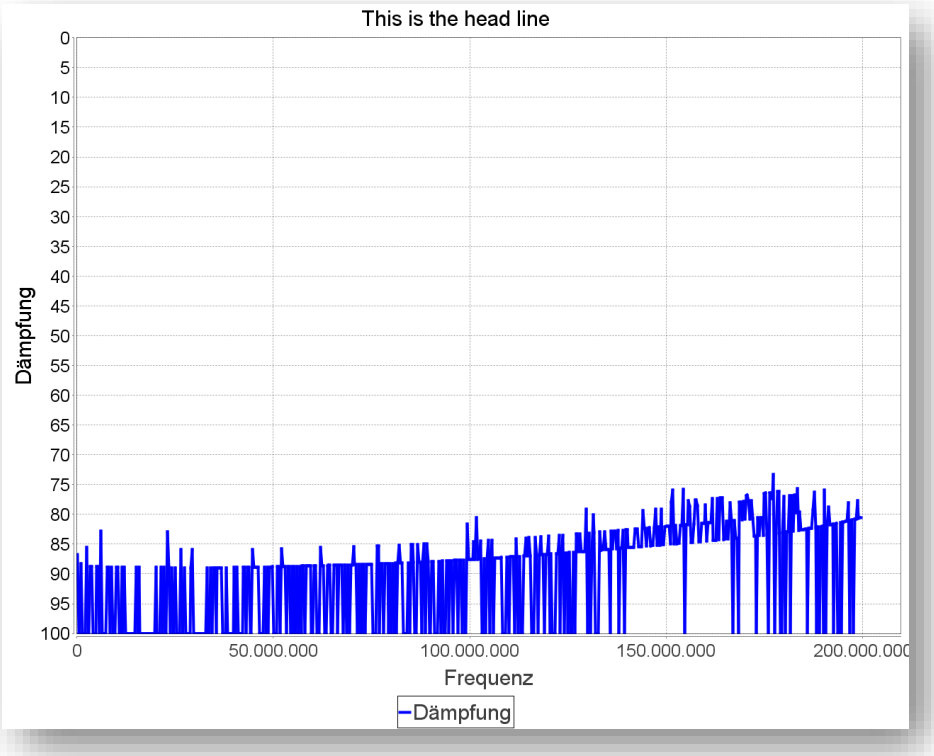


MiniCircuits HAT-6dB attenuator terminated 50Ohm

miniVNA



miniVNA PRO



Hints and tips

Error: No data character received: 0 0 missing - displayed in status bar

Reason: This indicates, that the VNA is currently not responding on the selected port.

This may happen, if the VNA is plugged into different USB-port. On some operation systems now another COM-port is assigned to the VNA.

Solution: Please select the correct port, to which your VNA is connected. See also chapter "Setup" on page 40.

Changing location for configuration data

The default storage location is described in chapter "Storage location" on page 102.

The storage location can be changed by specifying a user defined directory when calling vna/J.

Adding this parameter

```
java -Duser.home=c:/temp -jar vnaj.2.7.0jar
```

stores all vna/J data inside the folder c:/temp.

Running from a removable media

It is possible to run vna/J from a removable media, i.e. a memory stick. This media then can be used to launch vna/J on another machine if the following prerequisites on the other machine are satisfied:

- A JAVA runtime environment is installed
- The FTDI drivers are installed

Copy all files from the local installation directory to a directory on the removable media.

Create yourself a start-up script (Windows-batch file, Linux-shell script) to launch vna/J with this command:

```
java -Duser.home=./config -jar vnaj.2.7.0jar
```

Where "./config" is the name of the directory where all vna/J configurations are stored.

You can also copy the calibration files from local machine (/*.cal) to the calibration directory on the removable media.

How can I change the number of samples for a scan?

The number of samples is directly linked to the horizontal size of the image panel. If you need more samples (finer resolution) resize the vna/J windows accordingly.

Serial port on Linux cannot be opened

If you're running vna/J on Linux and you have problems using the selected serial port, try to add your Linux user to the user-groups **tty** and **dialout**. This sometimes fixes the problem.

No serial ports displayed on Linux

If you're running vna/J on Linux and no serial ports are displayed in the Setup-dialog, Pekka (OH2BSC) found a solution for his environment and posted it on the YAHOO Group[2].

1. *When I tried to open the analyzer window and choose the device I didn't get any list of available ports. This was solved by installing the genuine Oracle Java. I used these instructions:*

   http://www.webupd8.org/2012/01/install-oracle-java-jdk-7-in-ubuntu-via.html

   I didn't delete the icedtea jre or openjdk since the process defines Oracle Java 1.7 as a default java. However I restarted the system, just in case.

2. *Everything seemed to be OK, I was able to use the latest version 3.1.0 and all other versions I tried. Unfortunately when I tried to use vnaJ the next day, after shutting down my laptop for the night, no version beyond 2.8.6f worked anymore. I was able to open the software and choose the analyzer, I could see the port but when I tried to activate the port (clicking the Test button) I saw the error message "Failed to open port". When trying to activate the port, an error message also appeared in my syslog telling, that org.freedesktop.xxx... could not be activated because nss-myhostname was not installed.*

   nss-myhostname seems to be a more stable solution to maintain host names in ubuntu than the normal /etc/hosts. So I installed the file libnss-hostname from ubuntu repository and now it seems the problem is solved. More info about nss-myhostname can be found here:

   http://0pointer.de/lennart/projects/nss-myhostname/

   I have tried to verify this solution by installing several versions of vnaJ on two computers, one desktop running 32bit Intel and a laptop running 64bit AMD, both running Ubuntu 14.04LTS. Both seem to be working now without any hiccups.

[2] https://groups.yahoo.com/neo/groups/analyzer_iw3hev/conversations/topics/7251

Reporting a problem

If you encounter any problems with vna/J please provide me the following details in your error report. Without these information, I cannot assist you effectively.

Operating system

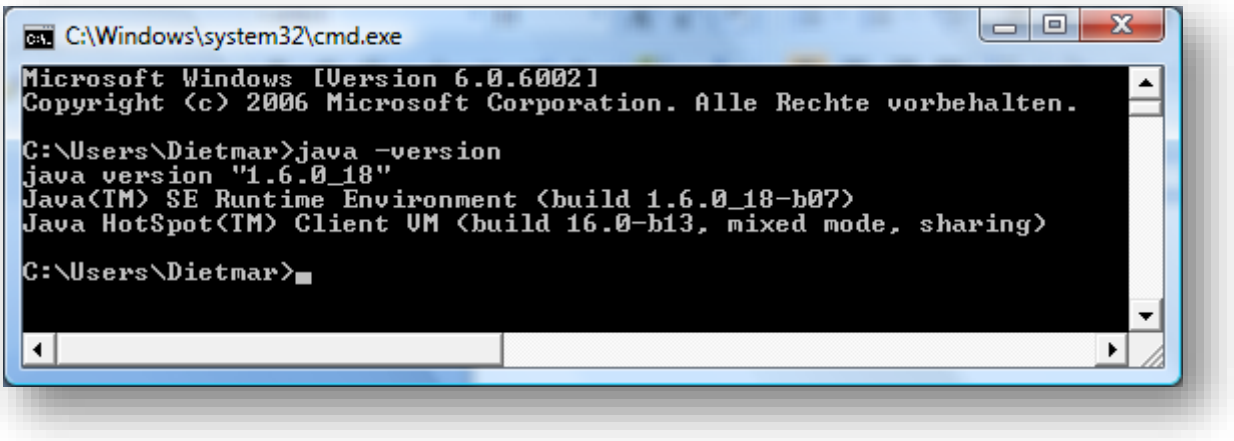
Provide me some details regarding the operating system you're using (i.e. Type, Name, Version, Patch level ...)

JAVA environment

Open a command shell in your operating system and enter the following command:

```
java -version
```

This should give you a display like this:



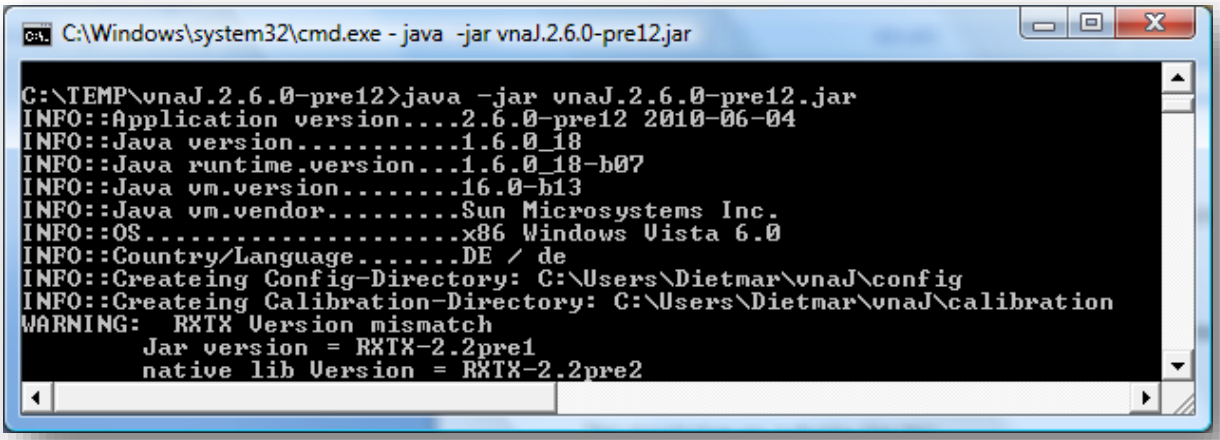
Send me the information displayed after you've entered the command.

vna/J startup info

Open a command shell in your operating system and enter the following command:

```
java -jar vnaJ.2.7.0.jar
```

Replace the name of the jar-file with the one, you're using. This should give a display like this:



Send me the information displayed after you've entered the command.

vna/J

Send me screenshots of the errors, you've found in the application with a detailed description, how I can reproduce this problem.

Enable logging

To debug problems using this application, it may be sometime necessary to enable the build in logging of the application.

Please follow these steps:

1. Open a command line window and navigate to the directory, where you've stored the JAR-file.
2. Launch the application by entering

   ```
   java -jar vnaJ????.jar 1>trace.txt 2>error.txt
   ```

   in the command line window.

   Note: Replace ??? with the current name of the JAR you are currently using.
3. Now the application should start as usual.
4. Open the settings dialog (menu FILE/SETTINGS)
5. Check the box "Enable tracing"
6. Close the settings dialog using the "Save" button
7. Now try to reproduce the failure etc.
8. When finished reproducing the error, reopen the settings dialog.
9. Uncheck the box "Enable tracing"
10. Close the settings dialog using the "Save" button
11. Close the application via the menu FILE/EXIT
12. Send the files trace.txt and error.txt together with a detailed description of your environment (hardware, software …) and the found problem to vnaj@dl2sba.de.
13. … hope ☺

Application does not start

First of all, try to remove all previously created configuration information.

This can be easily done, by renaming the configuration directory as outlined in chapter Configuration on page 102 to a different name (i.e. vnaJ.2.9 to vnaJ.2.9.old)

When the application is restarted, the directories are recreated and the settings are initialized with default values.

Links

http://vnaj.dl2sba.com

My homepage for vna/J

http://groups.yahoo.com/group/analyzer_iw3hev

An active YAHOO group related to the miniVNA as well as the miniVNA PRO.

In the files sections under **Files > Subjects - Off Topic - (Brainstorming) > SUSE Install for DL2SBA app.** find a detailled guide how-to install the stuff on UBUNTU as well as SUSES Linux versions.

http://www.miniradiosolutions.com

Company that produces the miniVNA as well as the miniVNA PRO

http://max6.pl

Company that produces the MAX6

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English

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