

NanoVNA

About NanoVNA

NanoVNA is very tiny handheld Vector Network Analyzer (VNA), designed by [edy555*](#), it is a very portable but high-performance vector network analyzer. It is standalone with lcd display, portable device with battery.



Edy555 put his software at <https://github.com/ttrfttech/NanoVNA>
View this [link](#) to get the original design documentation for edy555.

At first, NanoVNA was designed to work at 50kHz-300MHz. NanoVNA's mixer SA612A needs 5V power supply to work properly. The battery can't be driven directly. The original version of NanoVNA needs external USB power supply to work properly. Hugen recreated the NanoVNA based on the schematic of the edy555 and added a DC-DC circuit to allow the NanoVNA to work independently. Hugen tried to extend the measurement frequency using harmonics, allowing the NanoVNA to measure frequencies up to 900MHz. The Hugen version of the hardware and software is available through this [link](#).

You can make or purchase a finished NanoVNA at a low cost. NanoVNA is now the most active vector network analyzer and antenna analyzer project in the community. Usually buying a finished [NanoVNA-H](#) is the most convenient way to get NanoVNA.

Edy555 is updating his software, harmonic extensions have been added, usually a well-made NanoVNA can be acquired better than 40dB dynamics at 900MHz , even we can expand to 1.5GHz, but only 20dB dynamics above 900MHz.

[Cho45](#) adds TDR (Time Domain Reflectometer) functionality to the NanoVNA. Time domain measurements are widely required by the community to quickly measure the length of the coaxial cable and determine the cable fault point by calculating the discontinuous impedance.

Start using NanoVNA

What you need to work

The following are required at a minimum.

- NanoVNA body
- SMA LOAD 50Ω
- SMA SHORT
- SMA OPEN
- SMA Female to Female Through Connector
- SMA Male to Male cable x 2

NanoVNA basics

VNA (Vector Network Analyzer) measures the frequency characteristics of reflected power and passing power of a high frequency network (RF Network).

NanoVNA measures the following elements:

- Input voltage I / Q signal
- Reflected voltage I / Q signal
- Pass voltage I / Q signal

From here we calculate:

- Reflection coefficients S11
- Transmission coefficient S21

The following items that can be calculated from these can be displayed.

- Reflection loss
- Passing loss

- Complex impedance
 - resistance
 - reactance
- SWR

Such.

NanoVNA oscillation frequency

NanoVNA measures the reflection coefficient and transmission coefficient for 101 points in the frequency band to be measured.

The local frequency of NanoVNA is 50kHz to 300MHz. For higher frequencies, use harmonic mode. The fundamental wave is not attenuated even in harmonic mode. The usage modes for each frequency are as follows.

- Up to 300 MHz: fundamental wave
- 300MHz to 900MHz: 3rd harmonic
- 900MHz to 1500MHz: 5th harmonic

Note that there is always a fundamental wave input, especially when checking the amplifier gain.

In either case, the input is converted to an intermediate frequency of 5kHz. The signal is converted from analog to digital at 48kHz sampling. Digital data is signal processed by the MCU.

To do first

Before you can use it, you must first calibrate it. First, calibrate as follows.

- Make sure START is 50kHz
- Make sure STOP is 900MHz
- [Calibrate](#) according to the [calibration method](#)

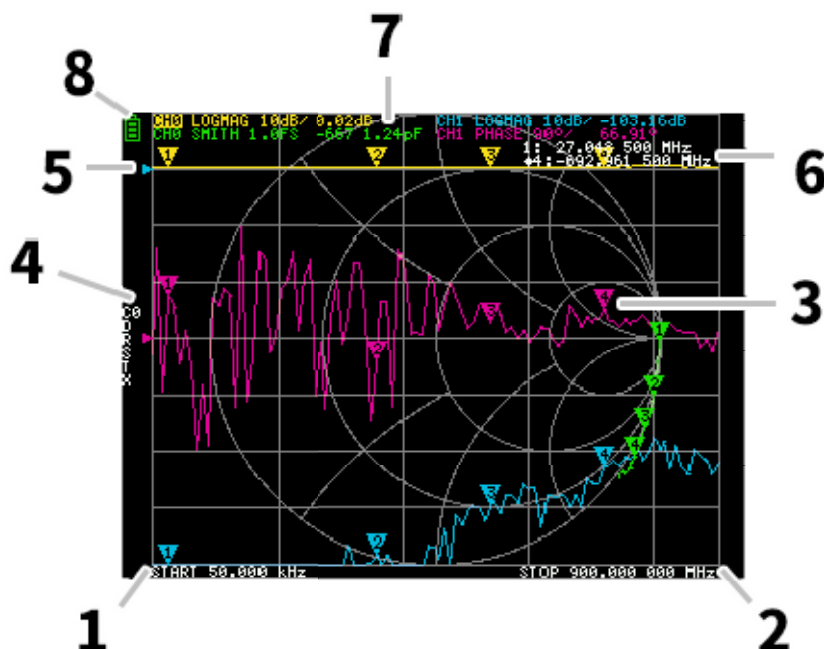
input method

NanoVNA has the following inputs.

- Touch panel long tap
- Lever switch
 - L / L long press
 - R / R long press
 - Push / Push long
- Power slide switch

How to read NanoVNA screen

Main screen



1. START 2. STOP frequency

Each frequency when start / stop is specified is displayed.

3. Marker

The marker position for each trace is displayed. The selected marker can be moved in the following ways.

- Drag a marker on the touch panel
- Long press the lever switch

4. Calibration status

Displays the data number of the calibration being read and the error correction applied.

- C0 C1 C2 C3 C4 : Each indicates that the corresponding calibration data is loaded.
- c0 c1 c2 c3 c4 : Each indicates that the corresponding number of calibration data is loaded, but the frequency range has been changed after loading, indicating that the error correction is using complement.
- D : Indicates that directivity error correction is applied
- R : refraction tracking Indicates that error correction is applied

- S : source match Indicates that error correction is applied
- T : transmission tracking Indicates that error correction is applied
- X : indicates that isolation (crosstalk) error correction is applied

5. Reference position

Indicates the reference position of the corresponding trace. You can change the position with `DISPLAY SCALE REFERENCE POSITION`.

6. Marker status

The active marker that is selected and one marker that was previously active are displayed.

7. Trace status

The status of each trace format and the value corresponding to the active marker are displayed.

For example, if the display is `CH0 LOGMAG 10dB/ 0.02dB`, read as follows.

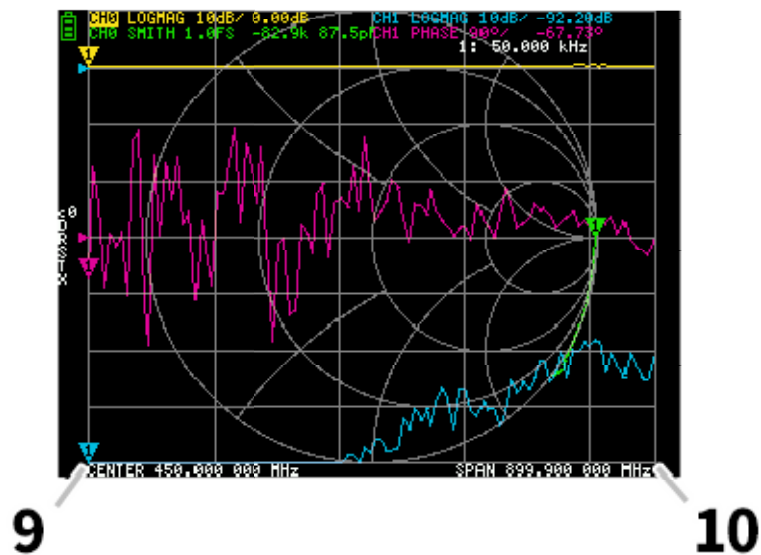
- Channel CH0 (reflection)
- Format LOGMAG
- Scale is 10dB
- Current value is 0.02dB

For active traces, the channel display is reversed.

8. Battery status

When a battery is installed and D2 on the PCB is already mounted, an icon is displayed according to the battery voltage.

Main screen 2

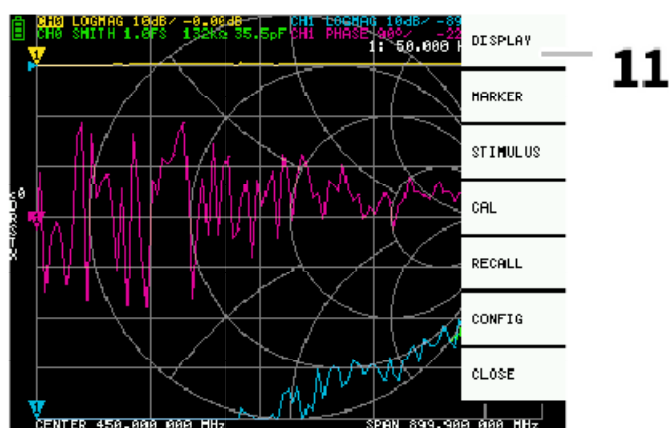


9. CENTER frequency

10. Span

Each frequency when the center frequency and span are specified is displayed.

Menu screen

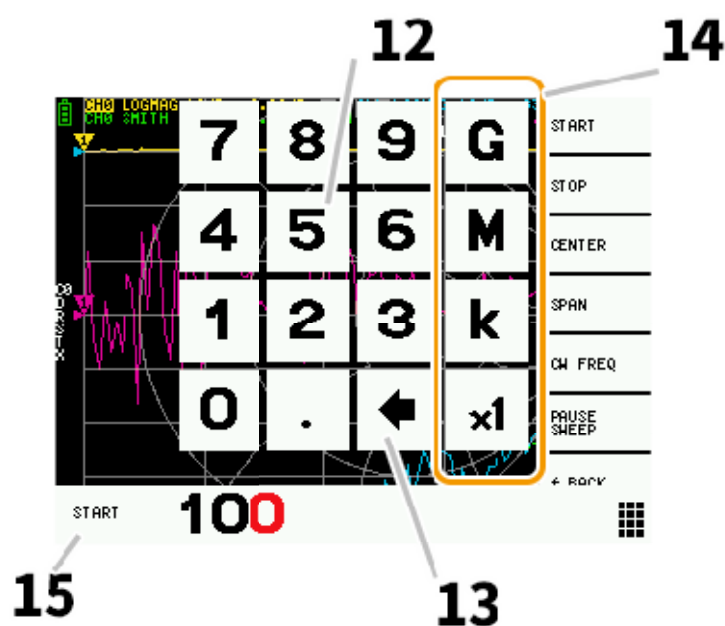


11. Menu

The menu can be displayed by the following operations.

- When a location other than a marker on the touch panel is tapped
- Push the lever switch

Keypad screen



12. Numeric keys

Tap a number to enter one character.

13. Back key

Delete one character. If no character is entered, the entry is canceled and the previous state is restored.

14. Unit key

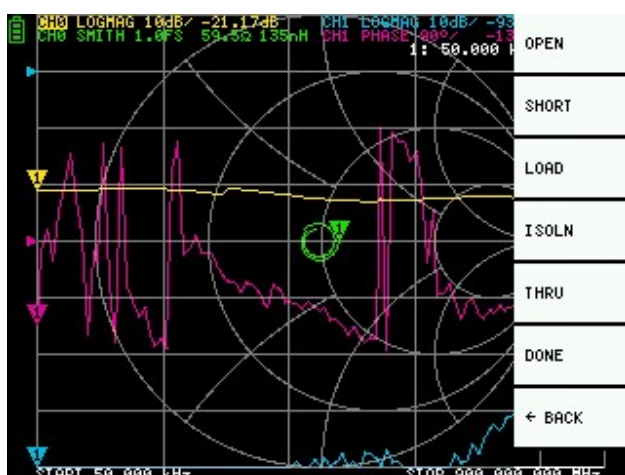
Multiplies the current input by the appropriate unit and terminates input immediately. In case of $\times 1$, the entered value is set as it is.

15. Input field

The name of the item to be entered and the entered number are displayed.

Calibration NanoVNA

Calibration should basically be performed whenever the frequency range to be measured is changed. If the error has been corrected correctly, the calibration status display on the screen will be Cn D R S T X. n is the data number being loaded.



However, NanoVNA can complement the existing calibration information and display to some extent correct. This will happen if the frequency range is changed after loading the calibration data. At this time, the display of the calibration status on the screen is cn D R S T X. n is the data number being loaded.

Reset the current calibration state CAL RESET

Connect OPEN standard to CH0 port and execute CAL CALIBRATE OPEN.

Connect SHORT standard to CH0 port and execute CAL CALIBRATE SHORT.

Connect the LOAD standard to the CH0 port and execute CAL CALIBRATE LOAD.

Connect the LOAD standard to CH0 and CH1 ports and execute CAL CALIBRATE ISOLN. If there is only one load, the CH0 port can be left unconnected.

Connect cables to the CH0 and CH1 ports, connect the cables with the through connectors, and execute CAL CALIBRATE THRU.

End calibration and calculate error correction information CAL CALIBRATE DONE

Specify the data number and save. CAL CALIBRATE SAVE SAVE 0

- Each calibration data must be imported after the display is sufficiently stable.

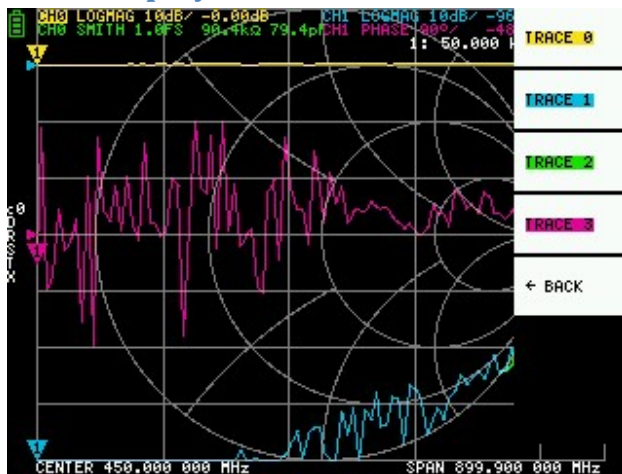
Start measurement

Basic measurement sequence

1. Set the frequency range to be measured
2. Perform calibration
3. Connect the DUT

function

Trace display



Up to four traces can be displayed, one of which is the active trace.

Traces can display only what is needed. To switch the display, select `DISPLAY TRACE TRACE n`.

The following methods can be used to switch the active trace.

- Tap the trace marker you want to activate
- Select `DISPLAY TRACE TRACE n` to display. (If already displayed, it must be temporarily hidden)

Trace format

Each trace can have its own format. To change the format of the active trace, select the format you want to change to `DISPLAY FORMAT`.

The display of each format is as follows.

- `LOGMAG` : Logarithm of absolute value of measured value
- `PHASE` : Phase in the range of -180° to $+180^\circ$
- `DELAY` : Delay

- SMITH : Smith Chart
- SWR : Standing Wave Ratio
- POLAR : Polar coordinate format
- LINEAR : Absolute value of the measured value
- REAL : Real number of measured value
- IMAG : Imaginary number of measured value
- RESISTANCE : Resistance component of the measured impedance
- REACTANCE : The reactance component of the measured impedance

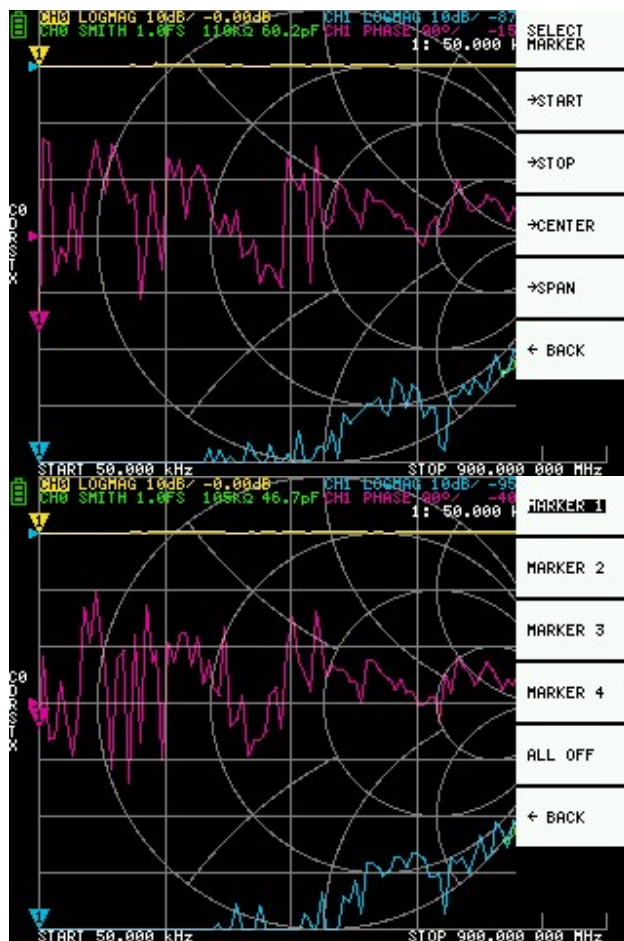
Trace channel

NanoVNA has two ports, CH0 CH1 . The following S parameters can be measured at each port.

- CH0 S11 (reflection loss)
- CH1 S21 (insertion loss)

To change the trace channel, select DISPLAY CHANNEL CH0 REFLECT or CH1 THROUGH .

marker



Up to 4 markers can be displayed. Markers are displayed from `MARKER SELECT` `MARKER` `MARKER n` . When you display a marker, the active marker is set to the displayed marker.

Time domain operation

NanoVNA can simulate time domain measurements by signal processing frequency domain data.

Select `DISPLAY TRANSFORM TRANSFORM ON` to convert measurement data to the time domain. `TRANSFORM ON` is enabled, the measurement data is immediately converted to the time domain and displayed.

The relationship between the time domain and the frequency domain is as follows.

- Increasing the maximum frequency increases the time resolution
- The shorter the measurement frequency interval (ie, the lower the maximum frequency), the longer the maximum time length

For this reason, the maximum time length and time resolution are in a trade-off relationship.

In other words, the time length is the distance.

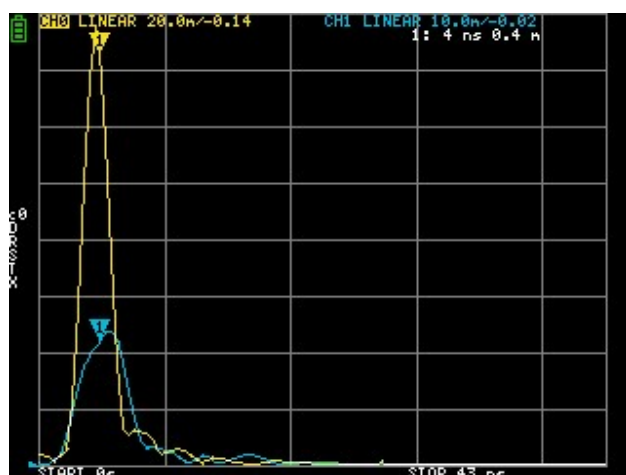
- If you want to increase the maximum measurement distance, you need to lower the maximum frequency.
- If you want to specify the distance accurately, you need to increase the maximum frequency.

Time domain bandpass

In bandpass mode, you can simulate the DUT response to an impulse signal.

The trace format can be set to `LINEAR LOGMAG SWR` .

The following is an example of the impulse response of a bandpass filter.

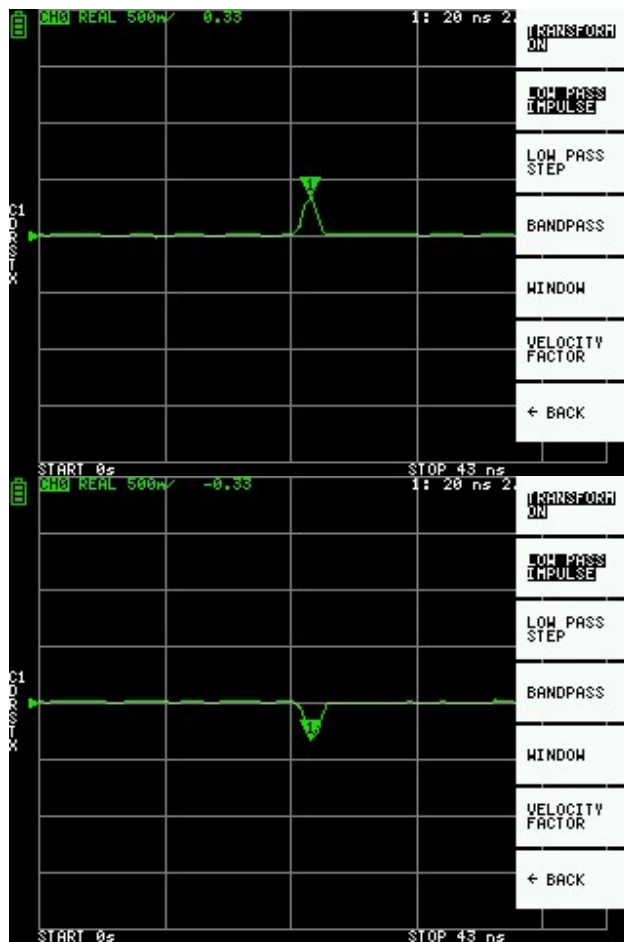


Time domain lowpass impulse

In low-pass mode, you can simulate TDR. In low-pass mode, the start frequency must be set to 50 kHz, and the stop frequency must be set according to the distance to be measured.

The trace format can be set to `REAL` .

Examples of step response in open state and impulse response in short state are shown below.

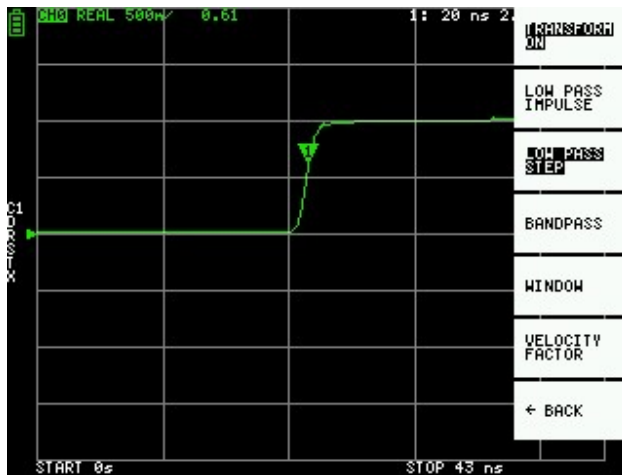


Time domain lowpass step

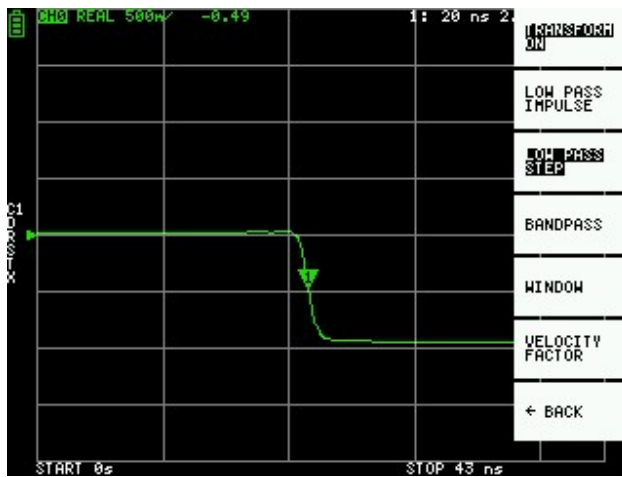
In low-pass mode, you can simulate TDR. In low-pass mode, the start frequency must be set to 50 kHz, and the stop frequency must be set according to the distance to be measured.

The trace format can be set to `REAL` .

open:



short:

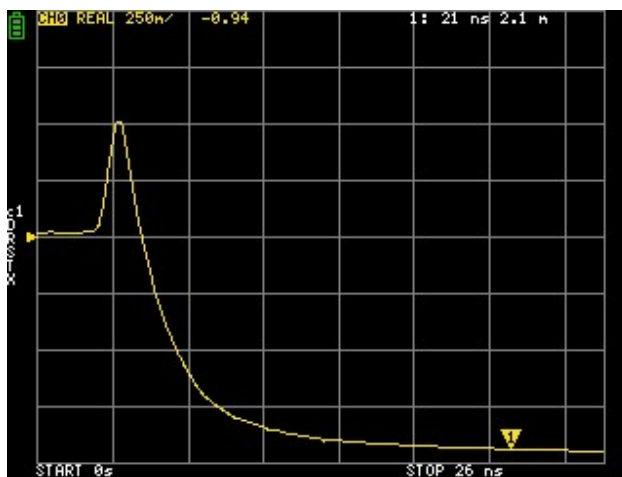


Step response example

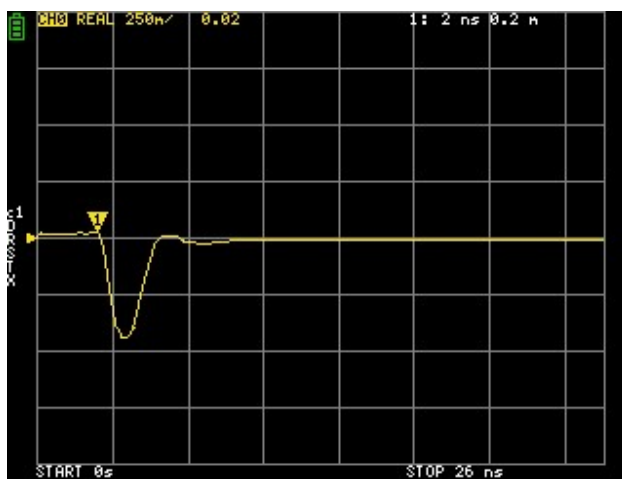
Capacitive short:



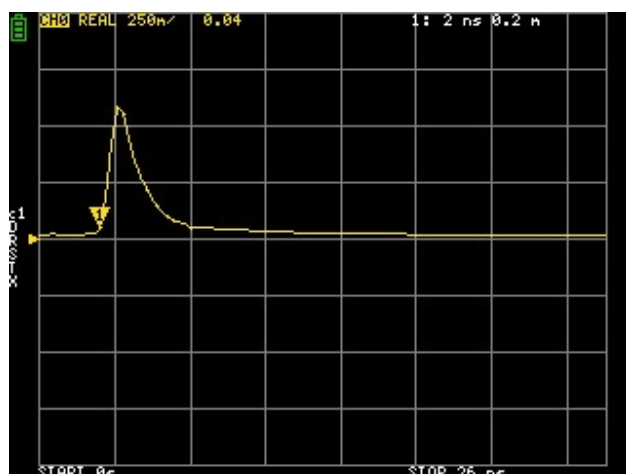
Inductive short:



Capacitive discontinuity (C in parallel):



Inductive discontinuity (L in series):



Time domain window

The range that can be measured is a finite number, and there are minimum and maximum frequencies. A window can be used to smooth out this discontinuous measurement data and reduce ringing.

There are three levels of windows.

- MINIMUM (no window, ie same as rectangular window)
- NORMAL (equivalent to Kaiser window $\beta = 6$)
- MAXIMUM (equivalent to Kaiser window $\beta = 13$)

MINIMUM provides the highest resolution and MAXIMUM provides the highest dynamic range. NORMAL is in the middle.

Setting the wavelength factor in the time domain

The transmission speed of electromagnetic waves in the cable varies depending on the material. The ratio to the transmission speed of electromagnetic waves in vacuum is called the wavelength factor (Velocity Factor, Velocity of propagation). This is always stated in the cable specifications.

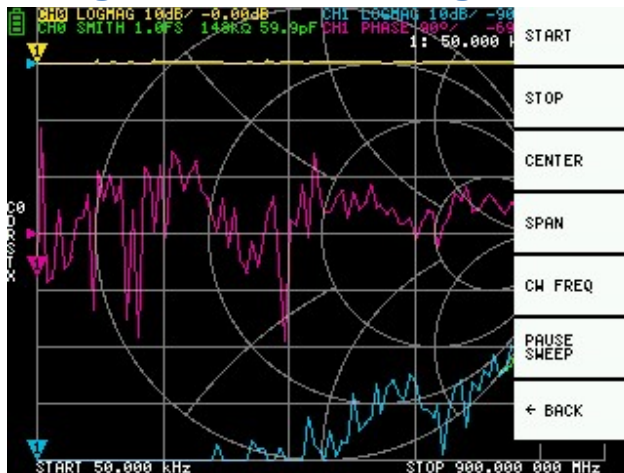
In the time domain, the displayed time can be converted into distance. The wavelength shortening ratio used for distance display can be set with `DISPLAY TRANSFORM VELOCITY FACTOR`. For example, if you measure the TDR of a cable with a wavelength reduction rate of 67%, specify 67 for the `VELOCITY FACTOR`.

Set frequency from marker

You can set the frequency range from the marker as follows:

- MARKER →START Sets the active marker frequency to the start frequency.
- MARKER →STOP Sets the active marker frequency to the stop frequency.
- MARKER →CENTER Sets the frequency of the active marker to the center frequency. The span is adjusted to maintain the current range as much as possible.
- MARKER →SPAN Sets the two displayed markers including the active marker to the span. If only one marker is displayed, nothing happens.

Setting the measurement range



There are three types of measurement range settings.

- Setting the start frequency and stop frequency
- Setting the center frequency and span
- Zero span

Setting the start frequency and stop frequency

Select and set STIMULUS START and STIMULUS STOP , respectively.

Setting the center frequency and span

Select and set STIMULUS CENTER and STIMULUS SPAN respectively.

Zero span

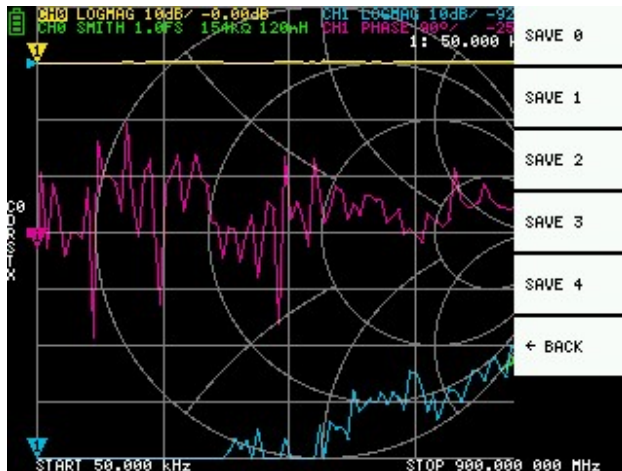
Zero span is a mode in which one frequency is sent continuously without frequency sweep.

Select and set STIMULUS CW FREQ .

Temporarily stop measurement

STIMULUS PAUSE SWEEP is selected, measurement is temporarily stopped.

Recall calibration and settings

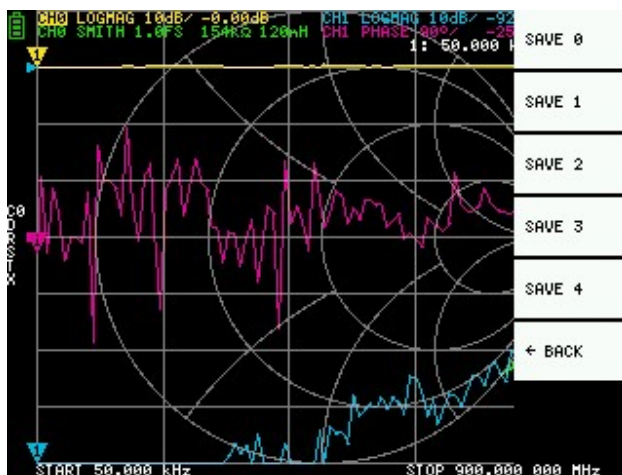


Up to 5 calibration data can be saved. NanoVNA loads number 0 data immediately after startup.

Calibration data is data that includes the following information:

- Frequency setting range
- Error correction at each measurement point
- Trace setting status
- Marker setting status
- Domain mode settings
- Setting the wavelength shortening rate
- electrical delay

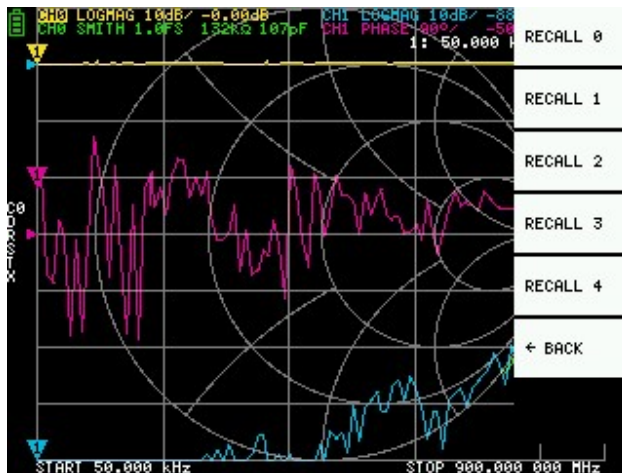
You can save the current settings by selecting `CAL SAVE SAVE n`.



CAL current calibration data can be reset by selecting `CAL RESET`. If you want to recalibrate, you need to reset.

CAL CORRECTION indicates whether error correction is currently being performed. You can select this to temporarily stop error correction.

RECALL the saved settings by selecting RECALL RECALL n .





NanoVNA-Web-Client / WebApp

NanoVNA-Web-Client/WebApp was developed by cho45 and can be used by accessing <https://cho45.stfuawsc.com/NanoVNA/> using the latest version of chrome browser.


Actions


Device


 Disconnect


 Resolution...

Save


 Save As .s1p

 Save As .s2p


 Save Freq Chart As .png


 Capture Device

State

 Calibrate...

About

 Version


 Capacitor


PAUSE

PAN

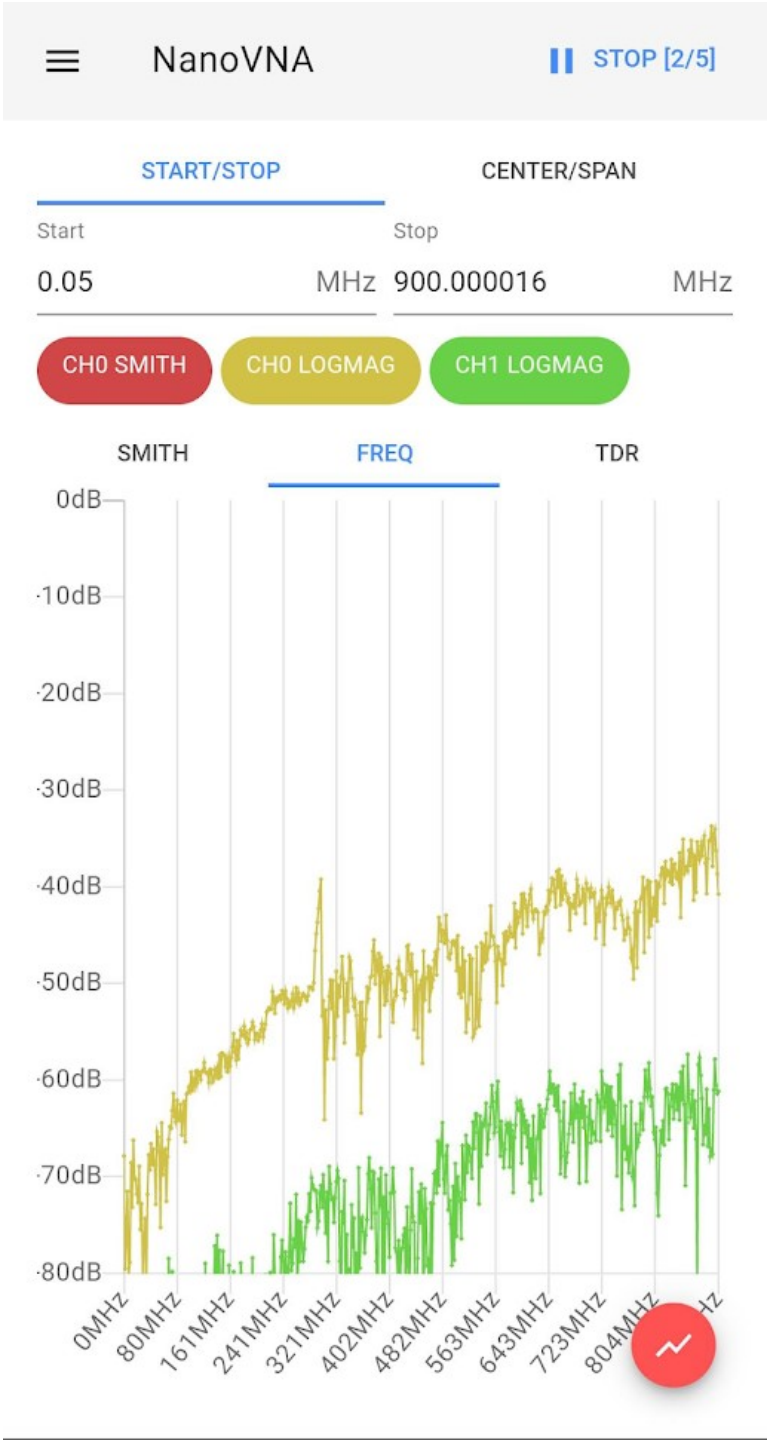
MHz

TDR





10MHz



Android App



Play Store: <https://play.google.com/store/apps/details?id=net.lowreal.nanovnawebapp>

Install latest nightly

<https://github.com/cho45/NanoVNA-Web-Client/releases/tag/latest>

Download *.apk from your android.

notes:

- Uninstall release build before installing latest nightly.

Get the source code or participate in the development, please follow this project

<https://github.com/cho45/NanoVNA-Web-Client>

NanoVNASaver

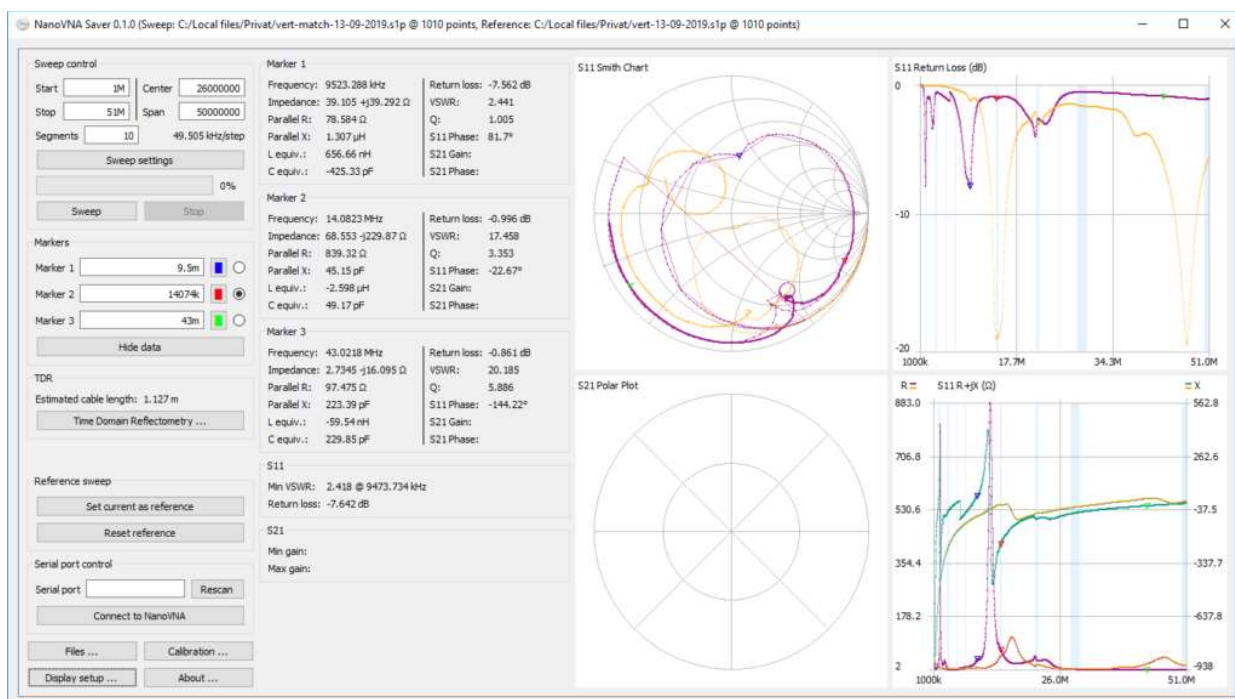
NanoVNASaver is developed by Rune B. Broberg. It is a multiplatform tool to save Touchstone files from the NanoVNA, sweep frequency spans in segments to gain more than 101 data points, and generally display and analyze the resulting data.

Introduction

This software connects to a NanoVNA and extracts the data for display on a computer, and for saving to Touchstone files.

Current features:

- Reading data from a NanoVNA
- Splitting a frequency range into multiple segments to increase resolution (tried up to >10k points)
- Averaging data for better results particularly at higher frequencies
- Displaying data on multiple chart types, such as Smith, LogMag, Phase and VSWR-charts, for both S11 and S21
- Displaying markers, and the impedance, VSWR, Q, equivalent capacitance/inductance etc. at these locations
- Displaying customizable frequency bands as reference, for example amateur radio bands
- Exporting and importing 1-port and 2-port Touchstone files
- TDR function (measurement of cable length)
- Display of both an active and a reference trace
- Live updates of data from the NanoVNA, including for multi-segment sweeps
- In-application calibration, including compensation for non-ideal calibration standards
- Customizable display options, including "dark mode"
- Exporting images of plotted values

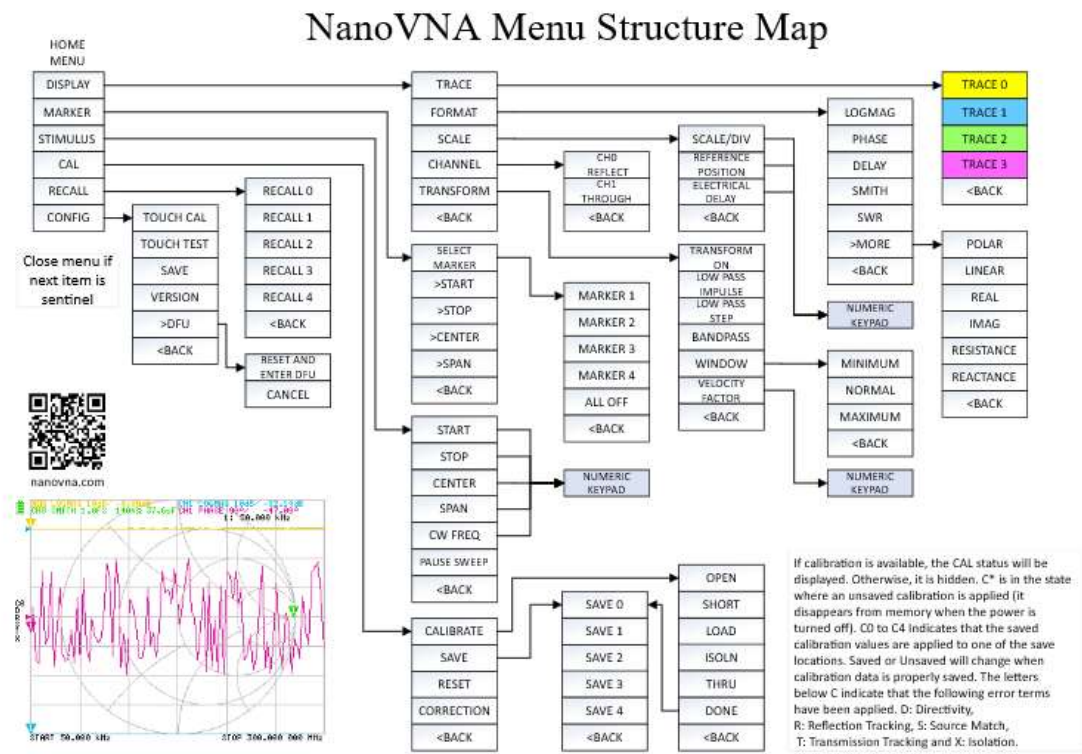


Download

Download it from github.

<https://github.com/mihtjel/nanovna-saver/releases>

NanoVNA Menu Structure Map



*



TT

edy555


Crude code farmer

Hokkaido, JAPAN

Compiled by sp5ela

NANOVNA Saver

[Advent update](#)

 [mihtjel](#) released this 13 days ago

This release is a minor update to the 0.2.0 release:

New feature: Capacitance and Inductance charts

These new charts display the calculated series equivalent Capacitance and Inductance against frequency.

New feature: Panning and modified zooming

You can now hold the middle mouse button to pan a zoomed chart, or hold shift or control to only zoom the value or frequency axis when zooming using the mouse wheel.

Moving markers using the arrow keys

After placing a marker on a chart by clicking with the mouse, it's now possible to move the marker immediately using the arrow keys.

Experimental feature: Port extension/Offset delay

The calibration window has a new experimental feature. You can set an offset delay, which I'm told is useful for compensating for cables used when measuring without doing a full calibration. The value is applied immediately when changed, and is not connected to the other calibration features. Feedback on this feature is specifically requested.

Additionally, a number of bugfixes have been made, based on your feedback - Thank you! A lot of tidying has happened on the back end of the code, as well as the introduction of some automatic testing - thanks to Holger Müller and David Hunt!

As ever, I look forward to hearing all your feedback and suggestions!

[Zoom, zoom, zoom!](#)

 [mihtjel](#) released this on 12 Nov · [106 commits](#) to master since this release

New feature: Zooming

This release adds the ability to "zoom" on the frequency-based charts: Use your mouse's scroll wheel to zoom in and out - or hold the control button and drag a box on the chart to zoom into.

New chart type: Group Delay

Group delay can now be displayed as a chart, and can also be enabled for the marker data display for both S11 and S21.

New chart type: Permeability

A new chart, R/ω & X/ω , is available for determining permeability characteristics of toroids. Thanks to David, F4HTQ, for requesting and helping out with this.

Logarithmic Y-scale:

The VSWR and Permeability charts now have the option of having the Y-scale shown as Linear or Logarithmic.

Changes to markers:

- Now able to display Group Delay for S11 and S21
- Markers can be filled or "hollow"
- Markers can be shown centered, or with the point at the tip
- Markers can be locked from mouse control by selecting the radio button next to "Show/Hide data"

Time-delay reflectometry:

- Min/max impedance values can be manually set
- There's a movable marker to measure distance in the TDR chart

New scaling function for values:

Holger Müller, DG5DBH, contributed new code to show values more correctly, using SI-prefixes. David Hunt provided further changes to avoid losing precision when displaying frequencies for sweep settings.

Also included: Several bug fixes!

As ever, I look forward to hearing about any feedback, suggestions and bugs!

[Configurable markers and impedance analysis](#)

 [mihtjel](#) released this on 5 Nov · [148 commits](#) to master since this release

This release, after a short break in the release schedule, offers a few new features and improvements:

Configurable Markers

There are a number of new configuration options for markers:

- The size of the markers can be changed under Display Setup,
- Marker numbers can be displayed in the charts,
- Marker data box headings can be coloured or not, depending on user preference,
- The data displayed for markers is now configurable

Impedance Analysis

The Time Domain Reflectometry window now has a display of an impedance transform, showing the calculated impedance of the transmission line the NanoVNA is looking at from the calibration plane onwards.

New analyses - and automatic running

The Analysis window has two new analysis options, peak search and VSWR analysis. It also adds the option to run the analysis automatically whenever new data is acquired, for example for adjusting filters.

Frequency display changed

DG5DBH kindly sent me updated functions to display frequencies on GitHub. You can still enter frequencies in the manner you are used to, as Hz, kHz or MHz, but now calculated or read frequencies should more consistently be displayed in a nicely formatted way.

For those running from the Python source, "scipy" is now a required library! Running "pip install ." should fetch it automatically.

Feedback and bug reports are very welcome!

[All the markers you need!](#)

 [mihtjel](#) released this on 23 Oct · [199 commits](#) to master since this release

This release adds a number of new features, some bug fixes, and some internal reorganisation:

Adding markers:

You can now add or remove markers, allowing you as many as you can fit on your screen. In fact, the software does not stop there: You can even add markers which you can't fit on your screen!

New charts:

A number of new chart types have been added, allowing you to plot $|Z|$, $|S_{11}|$ and $|S_{21}|$ in linear format, S_{11} and S_{21} logarithmic on the same chart at the same time, and the raw S_{11} and S_{21} real/imaginary S-parameter values.

Calibration updates:

The calibration assistant has become more talkative, and should be better at telling you what has gone wrong when it won't apply a calibration. When applying a new calibration, or applying after changing to a different calibration standard set, the previous sweep is immediately updated to show the effect of the new values. This should be useful for finding the right values for calibration standard sets.

Bugfixes:

Line thickness and point size should now load correctly and apply to charts after you restart the software.

SWR marker colours should similarly also load correctly.

The software should now be able to run and attempt to check for updates, and not crash when you don't have an internet connection.

I hope these features and updates are useful to the community!

[Popout charts and VSWR markers](#)

 [mihtjel](#) released this on 16 Oct · [220 commits](#) to master since this release

This release adds a couple of much requested features:

Popout charts

All charts can now be popped out as separate windows: Right click them, and select "Popout chart" to get a copy of it. As a side effect of implementing this, the main window can now also contain multiple charts of the same type. Want a zoomed in version of an existing chart next to it? Now you can.

VSWR markers

Under Display setup, you now have the option of adding a number of VSWR markers, to be shown on both the S11 Smith chart, the S11 Return Loss chart, and obviously the S11 VSWR chart. The colour can be selected, and you can add however many you need. The markers are saved between startups.

Logarithmic frequency span

All frequency-dependent charts can now be changed to show logarithmic frequency span instead of linear. Right click, select Frequency axis, and choose linear or logarithmic.

Shortcuts

You can now start a new sweep by pressing Ctrl-W, or stop a sweep by pressing Escape while within the main window.

Line thickness and point size

Line thickness and point size can now be configured within the Display setup window. Default values are 1 pixel for lines, 2 pixels for data points.

Additionally, there are minor changes, such as -60 dB points being automatically estimated from -10 dB and -20 dB points when doing filter analysis, and a number of bugfixes and stability improvements.

I look forward to hearing your feedback on the software, and I hope you enjoy using it!

[Firmware support fixes](#)

 [mihtjel](#) released this on 11 Oct · [312 commits](#) to master since this release

This version primarily implements a new hardware abstraction layer, which allows the software to identify the correct commands to use for scanning with the various firmware versions.

It also includes a new "About" window, which shows the NanoVNA firmware version, if available.

Also included is a new function to automatically check if there are new versions of NanoVNA-Saver available, either on program start, or from a button in the About window.

Other changes:

- Additional colour for secondary reference traces, for the R+jX chart
- A first version of a bandstop filter analysis function
- Updated octave/decade roll-off for filters to show the roll-off between -10dB and -20dB
- New load/save boxes for S1P and S2P files, which should now automatically set the extension for these files.

I look forward to hearing your feedback!

[Analysis mode](#)

 [mihtjel](#) released this on 8 Oct · [335 commits](#) to master since this release

Welcome to release 0.1.1 of NanoVNA-Saver!

New features:

- Analysis mode. Analyse low-pass, high-pass and band-pass filters directly within the application. Finds -3 dB, -6 dB and -60 dB points.
- Sweeping of bands. Select the band you want to sweep from the sweep settings window to quickly get the band limits set as sweep limits.
- Phase chart can now be "unwrapped" to show a continuous change of phase (rather than jumping from +180 to -180 degrees).
- Calibration standard sets can now be deleted.
- Charts can now be zoomed in further, with min/max values no longer limited to integers.

Bug fixes:

- Return Loss and Gain charts should no longer be offset from the true values.
- Slowed down sweeping to not go foul of NanoVNA firmware 0.2.2 limitations. (A new fix will be out soon which will increase speed again for supported firmware versions).

I look forward to hearing the feedback from you all!

[Calibration standards, stability improvements and screenshots](#)

 [mihtjel](#) released this on 2 Oct · [356 commits](#) to master since this release

This release primarily includes a number of improvements to the stability of the software. Users should see fewer crashes after upgrading, and several parts of the code have been improved to make them easier to maintain and keep free of errors.

New features include the ability to save calibration standard sets, for those users who have characterized sets, as well as the ability to save images of charts with data directly by right clicking.

The save/load functionality for calibration files has been reworked, and there is now a field for notes, which are saved and loaded along with the file.

The phase charts now support display limits on the data and frequency span.

Touchstone files from RFSim99 should now be imported correctly, and I am told there is also a method available to export compatible Touchstone files from Elsie.

I look forward to hearing the feedback and suggestions from the community!

[Scaling for plots, band display in plots and calibration assistant](#)

 [mihtjel](#) released this on 27 Sep · [386 commits](#) to master since this release

This release of NanoVNA-Saver offers a number of new features, all of which have been widely requested.

First of all, there's now the option of scaling the plots: right click them for a menu, where it's possible to set the maximum and minimum values for the frequency and data axes. Sadly not yet ready for the polar plots, and mouse control of zoom is also pushed to a future release.

Second, it's now possible to have "bands" displayed in the frequency based plots: Select "Display setup" to find the option for this. The default data is for amateur radio bands - or you can put in your own.

Thirdly, the calibration procedure has received a new "calibration assistant": A series of popup messages prompting you to switch between calibration standards, and code to automatically sweep them for you and store the results.

Finally, there's as always a number of bugfixes and stability improvements. I look forward to hearing what you all think about this 0.0.12 release!

[Averaging, resistance/reactive chart and small screen improvements](#)

 [mihtjel](#) released this on 22 Sep · [408 commits](#) to master since this release

This release brings averaging as a new feature: Press "Sweep settings" to select between running a single sweep (of optionally multiple segments), a continuous (live) sweeping of the range, or to average several sweeps from the NanoVNA. You can configure how many averages to make, and optionally, how many of the sample points to discard, based on which deviate the most from the rest, and are least likely to contribute signal.

Also added is a new Resistance/Reactance chart, which shows both the R and X component of $R+jX$. This brings the challenge of showing two traces for the same data - added is therefore the option of picking a secondary colour for sweeps under "Display settings".

There are further improvements to UI sizing, meaning the interface now fits - tightly - on a 1366x768 screen, at least on Windows.

A few quality of life improvements made it in: Press escape in any of the pop out windows to close them instantly. The calibration window now shows more clearly when the source of calibration data is loading from a file, and also the number of points loaded. A few crash bugs were fixed.

I look forward to hearing feedback from all of you!

[Quality of Life and Debug Logging](#)

 [mihtjel](#) released this on 18 Sep · [417 commits](#) to master since this release

0.0.10 offers a number of quality of life changes:

- Customizable background/foreground colours
- Adjustable font size
- More settings are saved to the settings file

There's a couple of new features/changes:

- Loading of Magnitude-Angle Touchstone files
- TDR readout in feet and inches in the TDR window
- Debug logging (-d to enable, and/or -D to log to a file)

And finally, bugfixes to bugs you all have reported since 0.0.9.

[NanoVNA-Saver, Friday Edition](#)

 [mihtjel](#) released this on 13 Sep · [437 commits](#) to master since this release

This edition has focused a lot on the markers: You can now pick which marker to control using the mouse by radio buttons; and if you hold shift, you can drag around the nearest marker on the charts. The markers have their own data readout panel, which can be hidden, if you want more room to marvel at the charts. They also now have more data display options, including Q and parallel equivalent R and C/L. Additionally, when you enter a marker frequency manually, the markers are updated immediately, without needing to press enter.

Sweep controls now include a center/span option, and both start/end and center/span update the other fields as you update them.

Some of the TDR functionality has been moved to a separate window (selecting cable types), and now also shows a graph of response vs distance.

An icon was added, and in the true tradition of VNA software, it features a Smith chart. Of course.

Lastly, support for high-resolution monitors was improved.

Feedback, suggestions and bug reports welcome as always!

[Continuous sweeping and saved settings](#)

 [mihtjel](#) released this on 10 Sep · [454 commits](#) to master since this release

This version introduces a brand new feature, continuous sweeping. Have the app continuously load new data from the NanoVNA - either as one sweep updated often, or multiple sweeps, updated in sequence.

It also introduces saving of settings. The settings saved are window size, colours selected, charts selected for display, dark mode and line mode.

Minor changes:

- Markers now display the frequency of the data point they use
- Many more cable types are available for TDR (Thanks, Larry!)
- There is an early version of a "quality factor" chart.

As always, comments, suggestions and bug reports are VERY welcome.

[Sunday Night NanoVNA](#)

 [mihtjel](#) released this on 8 Sep · [465 commits](#) to master since this release

Offers new display settings, including a setting to show lines between data points, and a dark mode for night time VNA work.

Includes a beta version of calibration using imperfect calibration standards. If you requested this, and know how to test it - please do!

Supports loading of Touchstone files in kHz, MHz and GHz (still only real/imag, though - not magnitude/angle)


Mouse control of "mouse marker" is now in the Smith/Polar charts as well.

Bugfixes!

[New options for displaying charts, and quality of life upgrades](#)




 [mihtjel](#) released this on 5 Sep · [482 commits](#) to master since this release

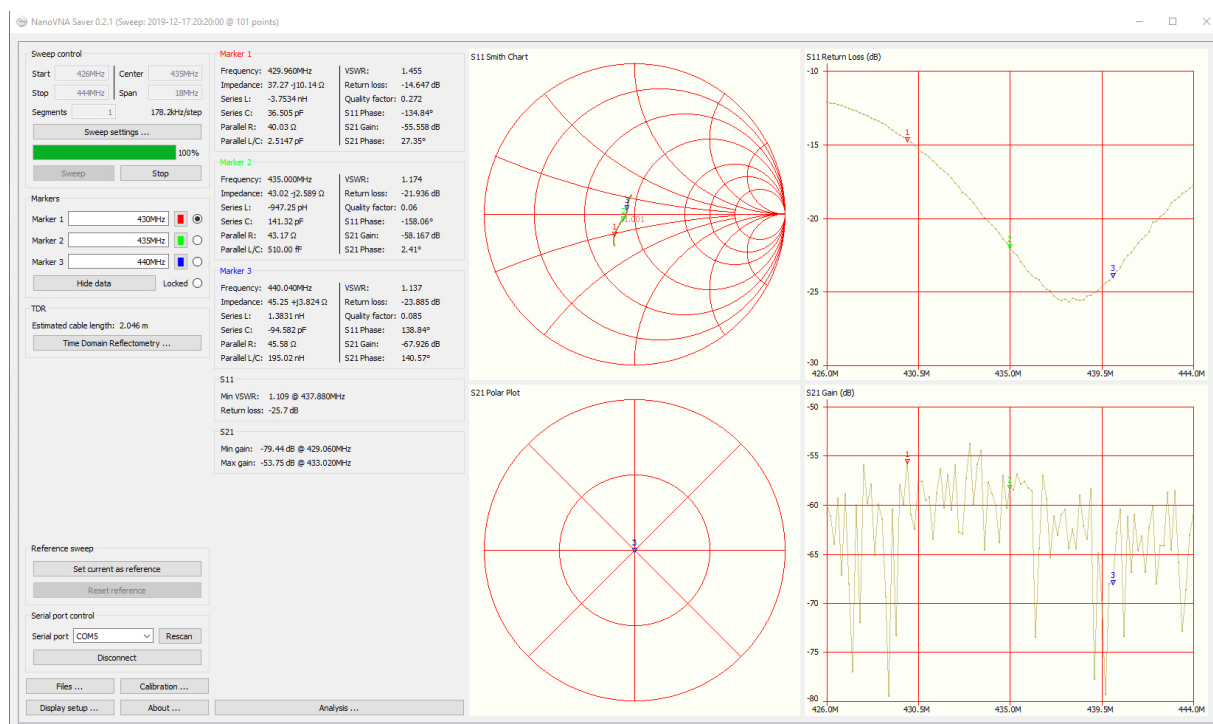
This version supports selecting which charts to display where, and displaying as little as one, or as many as 6 simultaneous charts. It adds phase charts and VSWR charts. The application window title now displays the source of sweep and reference, as well as the number of points. The markers now display a reactive equivalent in nF or nH, as applicable.

- Added 32-bit build
- [Latest and greatest! New UI! New markers! 2-port calibration!](#)
-  [mihtjel](#) released this on 4 Sep · [490 commits](#) to master since this release
- Today's release (Yes, it really is daily at this point) has a bunch of new features, a new layout, and a better internal structure to support "pip" for installing.
- A mouse-controlled marker is now available, and all markers have a Better graphic to show them more clearly.
- 2-port 1-path calibration is now available in the application, and calibrations can be saved and loaded.
- The UI has been changed in an attempt to further adapt for small screen users.
- I thank Ohan and Olgierd, who have both contributed code to this release.

[For smaller screens, and with more features](#)

 [mihtjel](#) released this on 3 Sep · [505 commits](#) to master since this release

- Main window is now scrollable for small monitors
 - File-handling is in a separate pop-out window
 - A basic mouse-adjustable cursor has been added to log-mag charts
 - In-app 1-port calibration is now available
 - Automatically finds relevant serial ports
 - Touchstone files can now be imported as sweeps as well as reference
 - [Reference sweeps](#)
 -  [mihtjel](#) released this on 2 Sep · [515 commits](#) to master since this release
 - This release adds the ability to store the result of a sweep as a reference, or to load a Touchstone 1-port or 2-port file as a reference sweep, to be displayed along with live data from the NanoVNA.
 - [TDR and 2-port Touchstone files](#)
 -  [mihtjel](#) released this on 1 Sep · [529 commits](#) to master since this release
 - This release adds the popular feature of time-domain reflectometry, allowing for measurement of cable lengths. It also adds support for 2-port Touchstone files.
 - [First public release](#)
 -  [mihtjel](#) released this on 30 Aug · [541 commits](#) to master since this release
 - This is a very early first public release version of the NanoVNASaver. Use at your own risk.
- Exporting function fixed in update a.



Saver main screen. Hand-held 70cm antenna by SP5ELA.

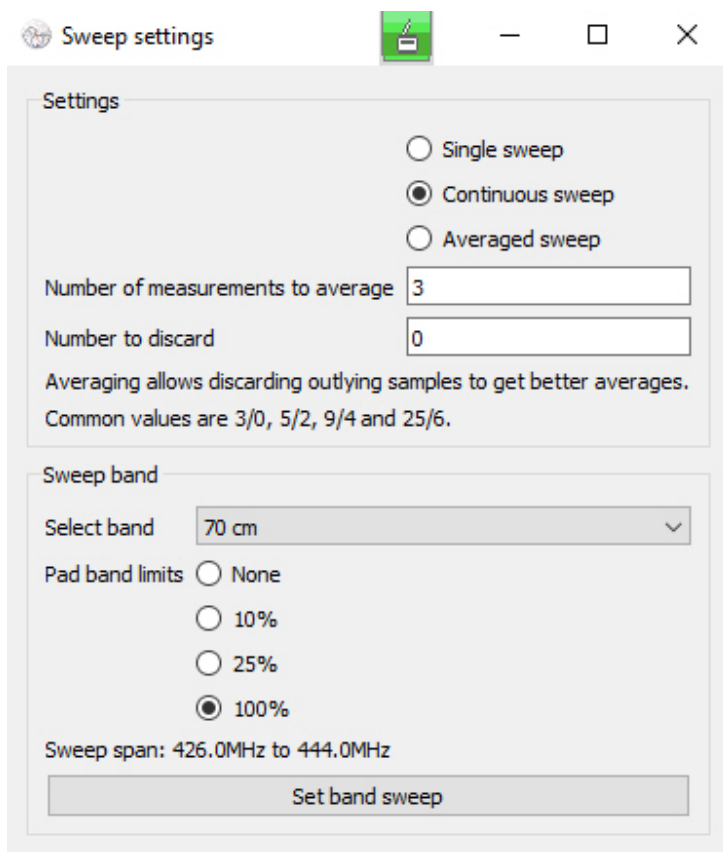
```

nanovna-saver-v0.2.1.exe
NanoVNASaver 0.2.1
Copyright (C) 2019 Rune B. Broberg
This program comes with ABSOLUTELY NO WARRANTY
This program is licensed under the GNU General Public License version 3

See https://github.com/mihtjel/nanovna-saver for further details
Settings: C:/Users/Zygi/AppData/Roaming/NanoVNASaver/NanoVNASaver.ini
2019-12-17 19:11:00,680 - NanoVNASaver.Hardware - ERROR - Exception while reading data 1: ClearCommError failed (OSError
(22, 'The I/O operation has been aborted because of either a thread exit or an application request.', None, 995))
Traceback (most recent call last):
  File "NanoVNASaver\Hardware.py", line 111, in readValues
    File "site-packages\serial\serialwin32.py", line 273, in read
serial.serialutil.SerialException: ClearCommError failed (OSError(22, 'The I/O operation has been aborted because of eit
her a thread exit or an application request.', None, 995))
2019-12-17 19:11:00,680 - NanoVNASaver.SweepWorker - WARNING - Read no values
2019-12-17 19:11:00,680 - NanoVNASaver.Hardware - ERROR - Exception while writing to serial port (sweep 426000000 444000
000 101): WriteFile failed (PermissionError(13, 'The device does not recognize the command.', None, 22))
Traceback (most recent call last):
  File "NanoVNASaver\Hardware.py", line 131, in writeSerial
    File "site-packages\serial\serialwin32.py", line 315, in write
serial.serialutil.SerialException: WriteFile failed (PermissionError(13, 'The device does not recognize the command.', N
one, 22))
2019-12-17 19:11:00,680 - NanoVNASaver.Hardware - ERROR - Exception while writing to serial port (resume): WriteFile fai
led (PermissionError(13, 'The device does not recognize the command.', None, 22))
Traceback (most recent call last):
  File "NanoVNASaver\Hardware.py", line 131, in writeSerial
    File "site-packages\serial\serialwin32.py", line 315, in write
serial.serialutil.SerialException: WriteFile failed (PermissionError(13, 'The device does not recognize the command.', N
one, 22))

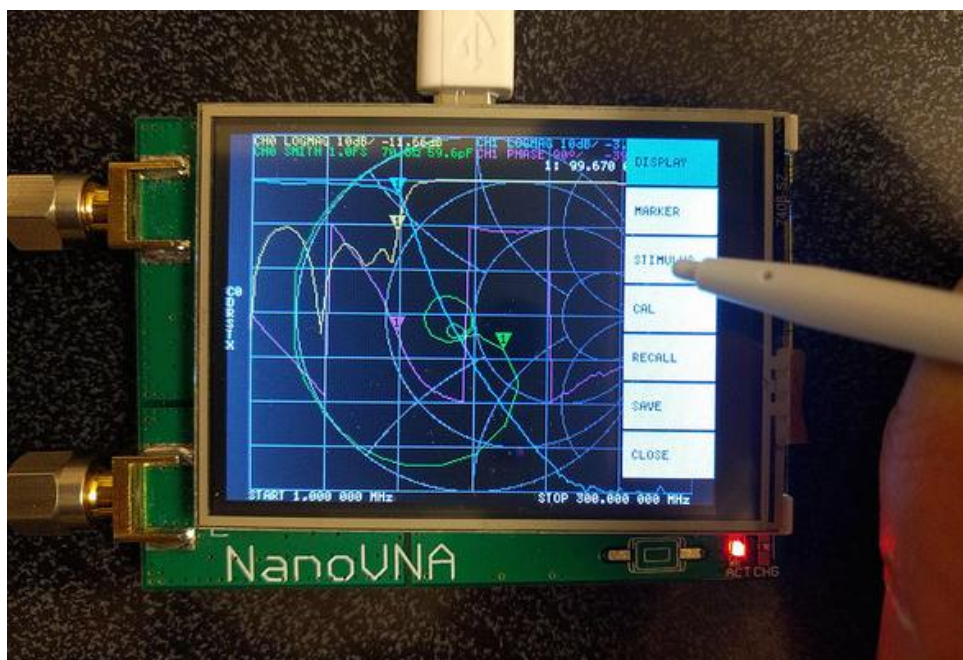
```

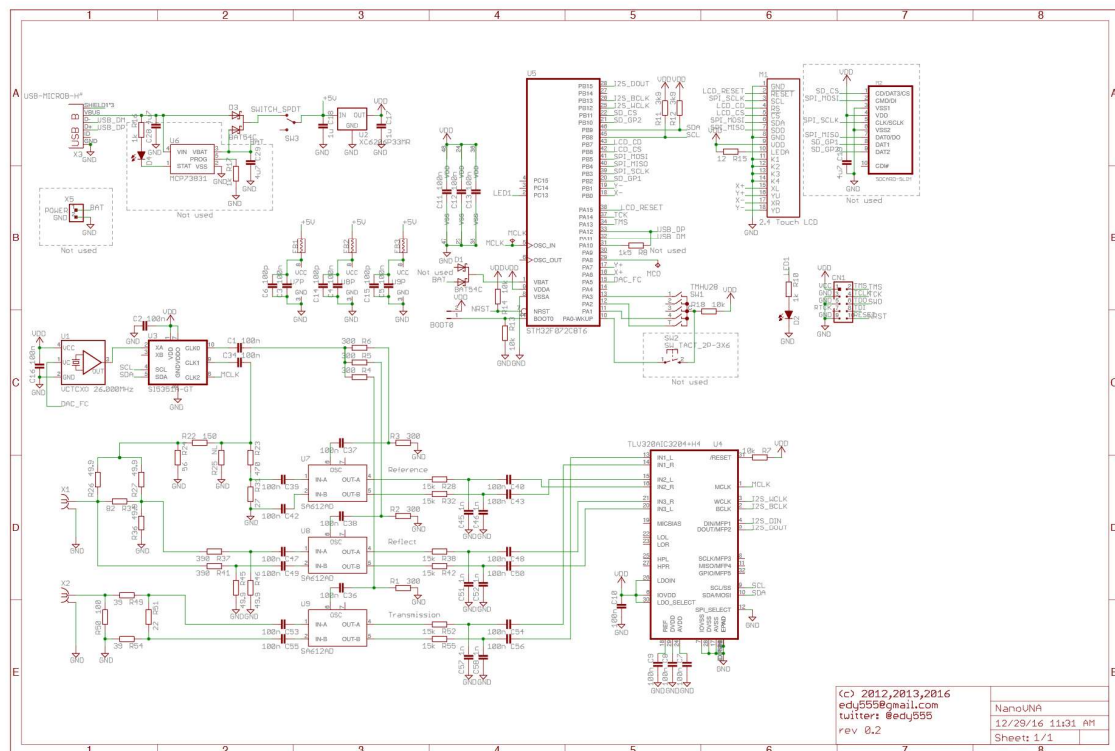
System window



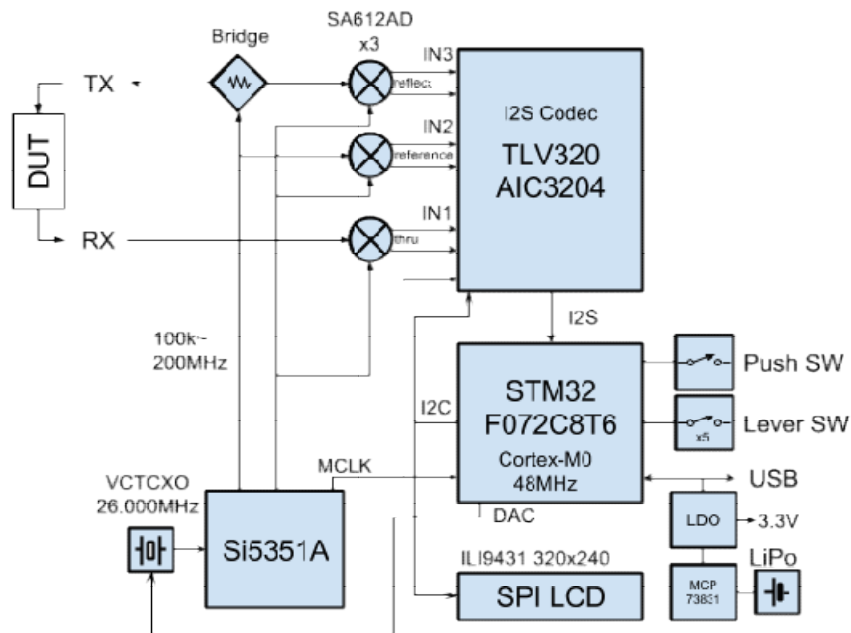
Band selection

Documentation:

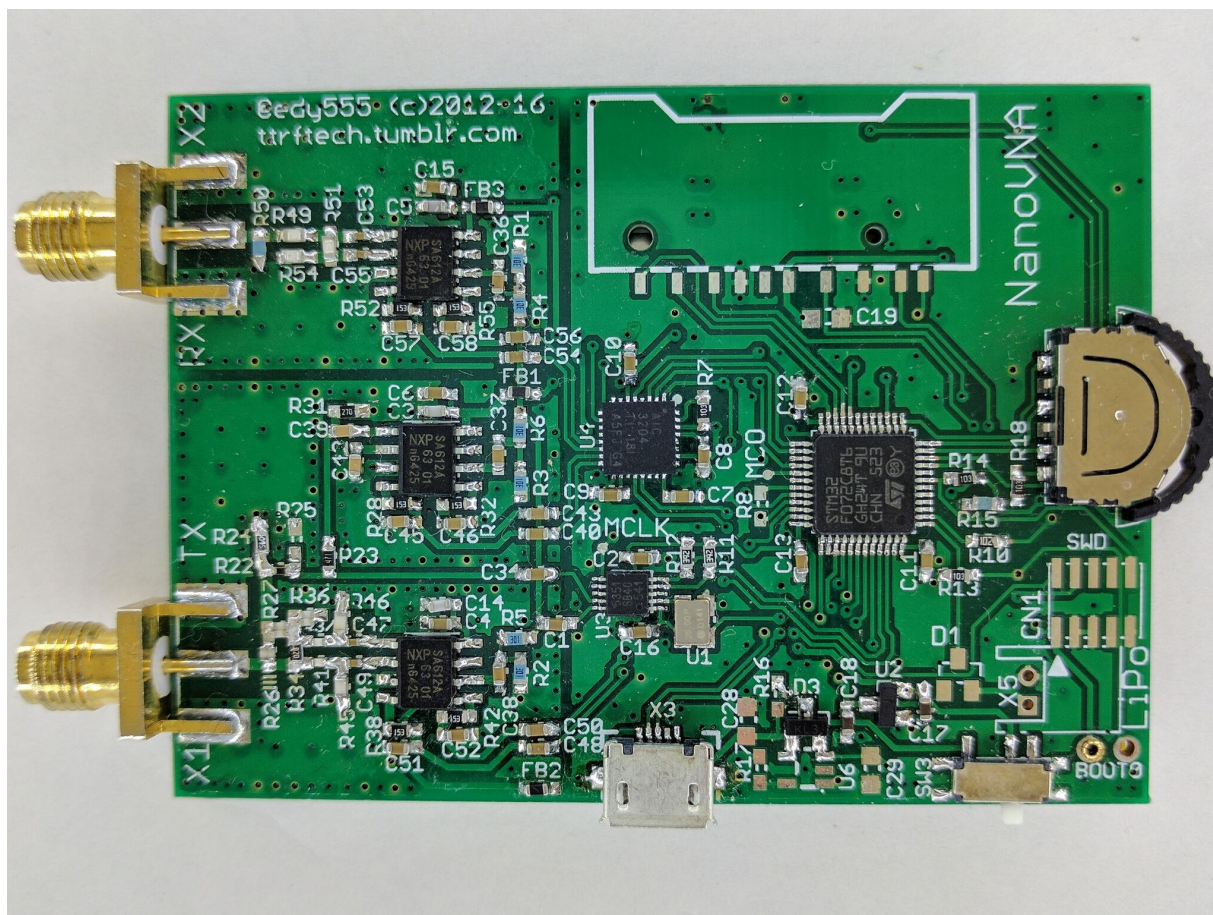




Schematic diagram



Block diagram



nanoVNA PCB

Links:

NanoVNA Project:

<https://github.com/ttrftech/NanoVNA>

NanoVNA instructions (MANUAL):

<http://nanovna.com/>

NanoVNA Saver:

<https://github.com/mihtjel/nanovna-saver/releases>

SP5ELA, Dec17, 2019