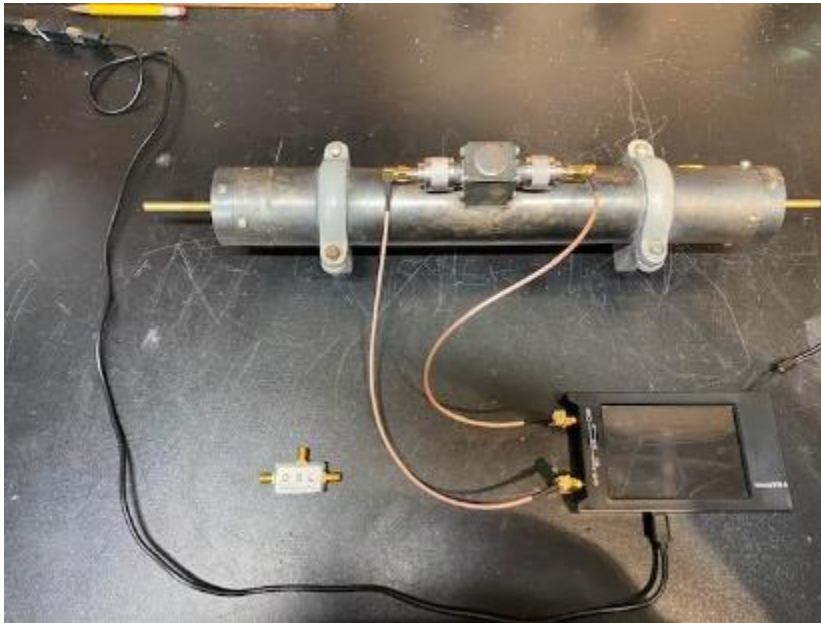


NanoVNA Part III by Barry Rushford - VE6BGR

The NanoVNA Part Three – Using NanoVNA Saver Software and Tuning a Bandpass Filter

The following provides an introduction to using the NanoVNA Saver software on a



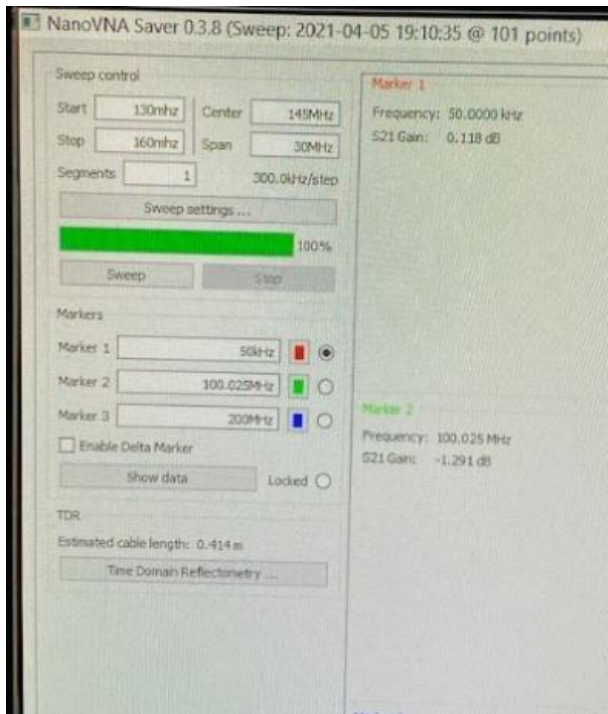
PC and the steps for setting up the software, calibrating the VNA from the software program and using the display functions and markers to obtain the required results. In going through this explanation, I will use an example of tuning an RF 2m filter and the different way of displaying and interpreting the results.

Setting up the Software

The software can be downloaded for free from <https://github.com/NanoVNA-Saver/nanovna-saver> and selecting download under the code tab. This will be a zipped file which must be unzipped and stored in a file location that is easy to find. Run the executable file and the software should load but, this can take a minute or so and patience is a virtue here. Once the software is up and running, close the Saver software program and connect the NanoVNA to your computer via a USB cable and start the VNA. Your computer, if running Windows 10, should automatically detect the VNA. The next step is to connect the VNA to a serial port by selecting the NanoVNA selection in the Serial port control dropdown box and selecting CONNECT. If connected, the display on your VNA should go blank and you should see a sweep on the display graph on the PC. The two screen shots below show the top and bottom left portions of the main screen setup area.

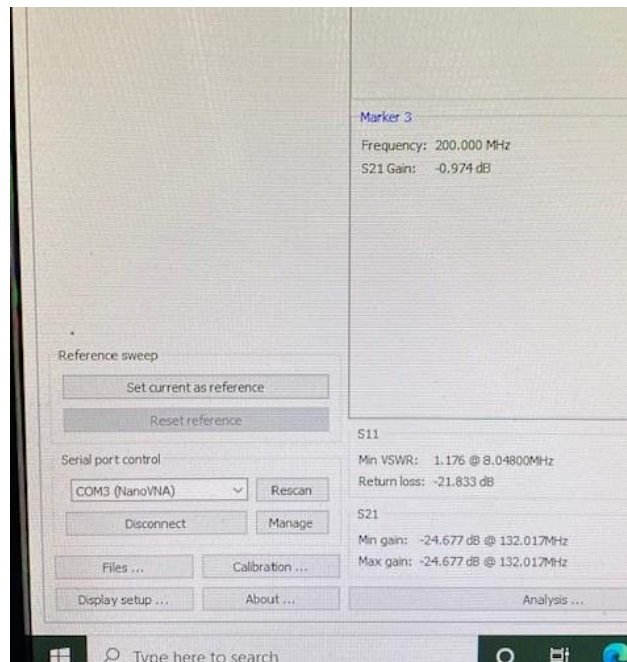
Calibration

Once again, it is necessary to calibrate the NanoVNA for the specific type of measurement that you are undertaking. The following describes how I have done this for tuning the RF filter.



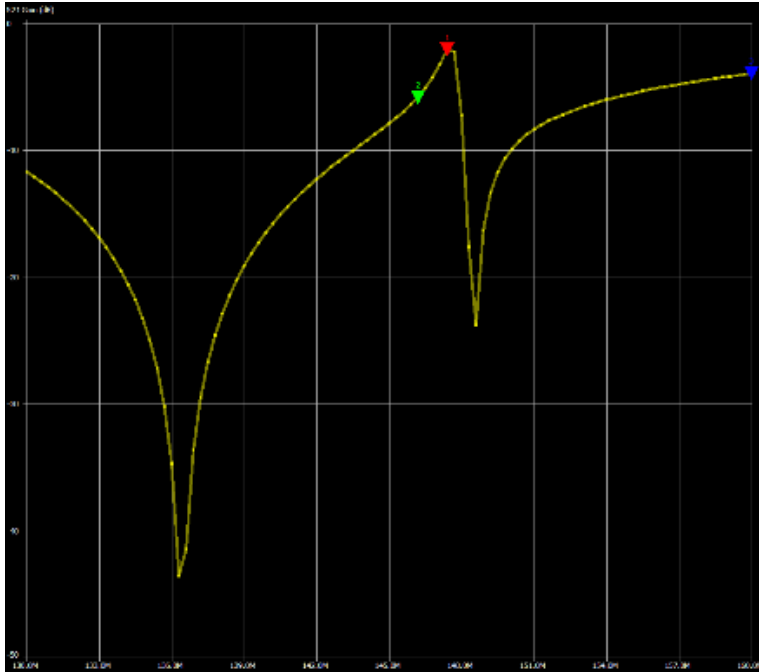
1. Select the cables that you are going to use for sweeping the filter and attach one to each port on the VNA (CH0 an CH1)
2. On the SAVER screen, set the START and STOP frequencies that you will be using for sweeping the filter (130Mhz and 160Mhz in this example). Note that you must include an m, Mhz, or e to the 6th power so that the software knows what frequency you are using.
3. Go to the bottom left of the screen and select Calibration
4. I would suggest using the Calibration Assistant on this next page as it makes calibration process quite easy to follow. Also, note the calibration will

require the Through and Isolation steps and you will be asked if you want to do this. Once the calibration is completed, save it by selecting Save Calibration and giving it a file name that accurately describes how the unit was calibrated (130Mhz-160Mhz 12 in coax CH0 and CH1). This file will be stored on your computer at a location that you choose and will have a .cal extension. The calibration file can then be reloaded and used at any time in the future as long as all the parameters for the calibration are kept the same such as the



same cables and frequency settings. Also, you will have to set the START and STOP frequencies on the main screen to the same as used in the calibration.

5. Close the calibration screens and on the main screen, select Sweep settings. The main item here is to select Continuous Sweep as we will be tuning and adjusting a filter. Single Sweep will be useful for other types of measurements that only require a single sweep. There are several other settings that can be set on this screen but for purposes here, Continuous Sweep is all that needs to be set. Close this screen and return to the main screen.
6. Select Display Setup from the tab on the bottom left of the main screen. This is where the desired displays are setup. As many as 6 different displays can be viewed simultaneously with as many as 21 different views available for each display (mind boggling). For this example, I have selected only one display to be active (other 5 set to None) and I have chosen S21 gain for the desired view of sweeping the filter. At this point we can set up the markers that we wish to utilize by Selecting Add on the Markers heading. I have setup three markers for this example so that I can view the center frequency and two skirt frequencies of the filter. The Marker information is displayed in the second column of the main page. Also, under Markers, the Settings tab allows you to set the information you desire to see at the marker positions. For this example, I have chosen only Frequency and S21 Gain to keep it simple. There are 25 different parameters that you can select for the markers if desired (once again mind boggling). There are several other settings that can be adjusted on the Display Setup page to make viewing the display as useful as possible. Close the Display Settings page and return to the main screen.
7. Select Sweep on the main page and if all has gone well, you will see the sweep of the filter, the location of the markers and in the second column, the information from the markers. You can change the position of the markers on the sweep by selecting the marker color that you want to move and then move it to the desired location with the mouse pointer. Note that the information in column 2 changes for that marker corresponding to the new location. Also, by “right clicking” on the graph, you can adjust the axis values and save the sweep as a file on your computer. Also, if you do a START/STOP frequency change, you may have to select Reset to change the graph scale to match the new frequencies.
8. You are now able to start tuning the filter if this is your intent. Because we set the Sweep Setting to Continuous, you will see the changes in the displayed waveform as you tune. Please note however, the refresh time on the display is a bit slow so patience is required to see the results of your

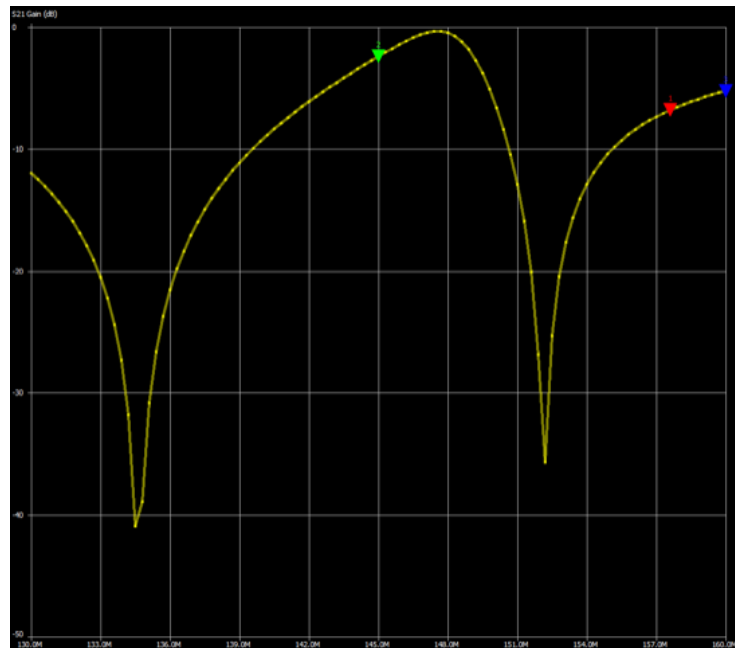


adjustments. I have found 1 to 2 seconds is normal but depends on many factors in the setup that you chosen.

The two scans above show the RF filter I have been using for this demo. The scan on the left shows the waveform before tuning and the scan on the right is after tuning. I have tried to tune this filter in the 2m band, but it appears that it is originally designed for a higher frequency. To get a decent bandpass curve at 2m, the

tuning curve becomes extremely broad (wide as a barn door comes to mind). However, it does demonstrate that the NanoVNA in conjunction with the Saver software is an especially useful tool for sweeping filters.

As you can likely see, the power of the NanoVNA is enhanced greatly with the utilization of the NanoVNA Saver software and as you will observe, I have only provided an introduction to using this software. The sheer number of different measuring functions and display options can be overwhelming, but I have found that by determining what you want to measure and then focusing on how the software can meet this need, much of the complexity can be ignored. Practicing and “playing” with this software will greatly enhance its usefulness and as well, there are several online articles and YouTube videos that can aid in getting the results you are after.



Please let me know if there are any upgrades or errors that should be included in this article. Do not hesitate to give me a call if you are having any problems with getting this software to work for you and I will try my best to help.

Barry Rushford VE6BGR