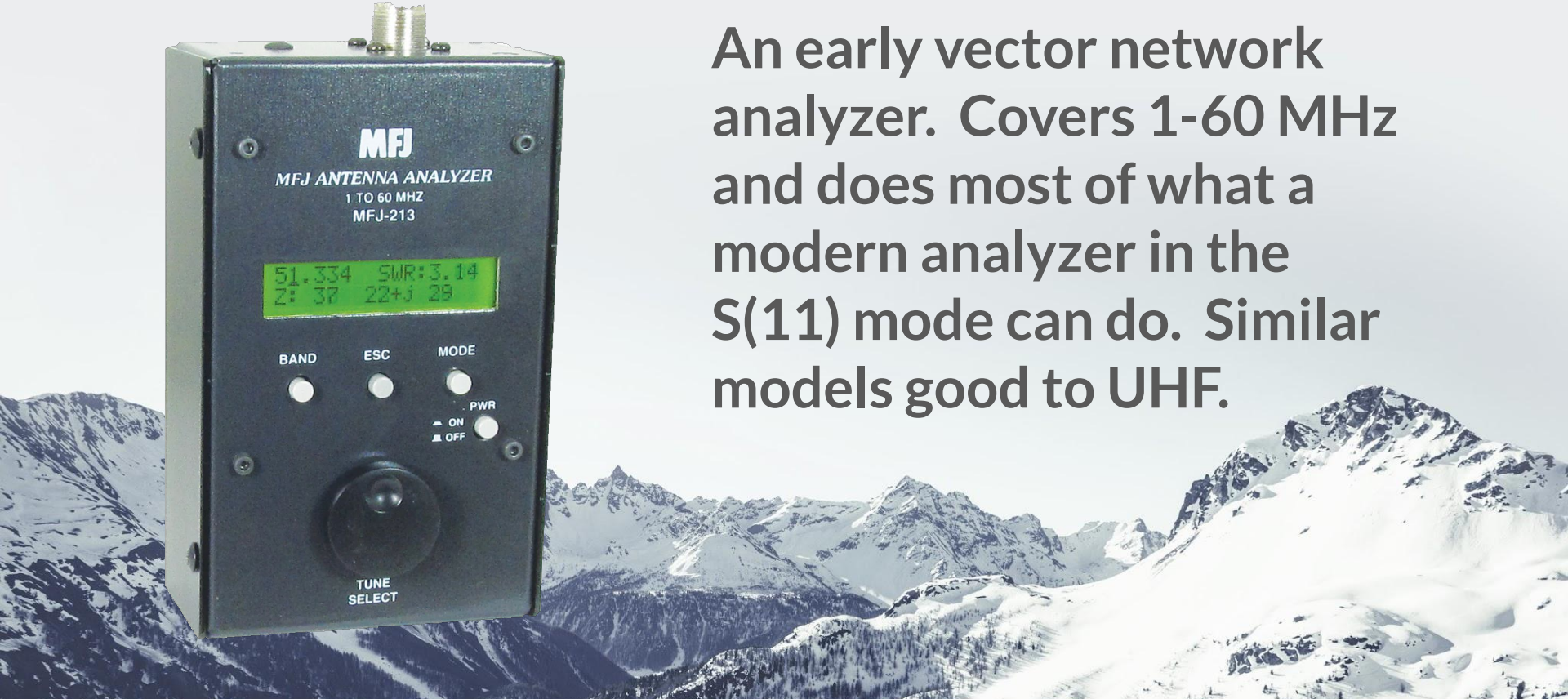
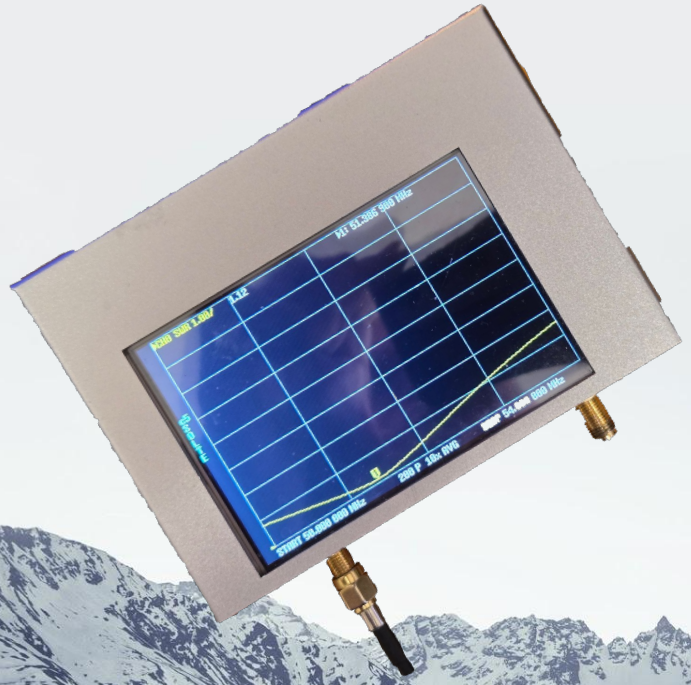
Adventures in the Wilds of VNA Land





An early vector network analyzer. Covers 1-60 MHz and does most of what a modern analyzer in the S(11) mode can do. Similar models good to UHF.

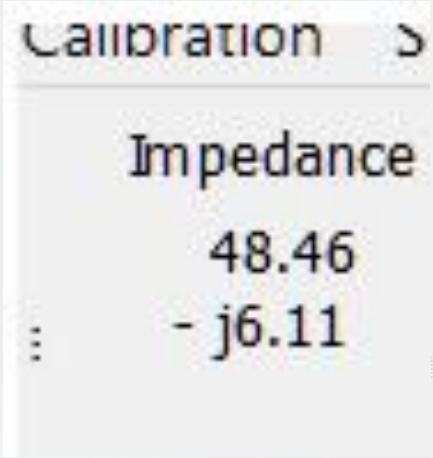


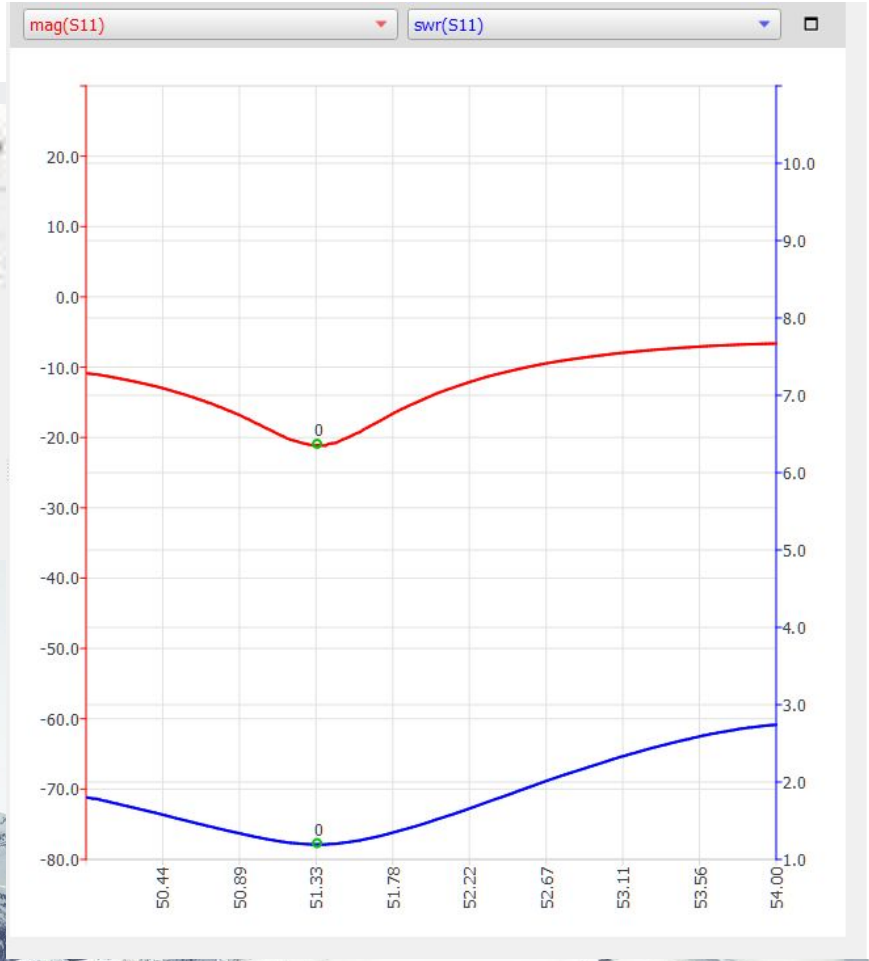
Modern NanoVNA. Small, battery operated, USB interface, and two ports instead of 1. This allows S(21) measurements. Covers up to 4 GHz. This is an SWR plot of a 6 meter antenna.



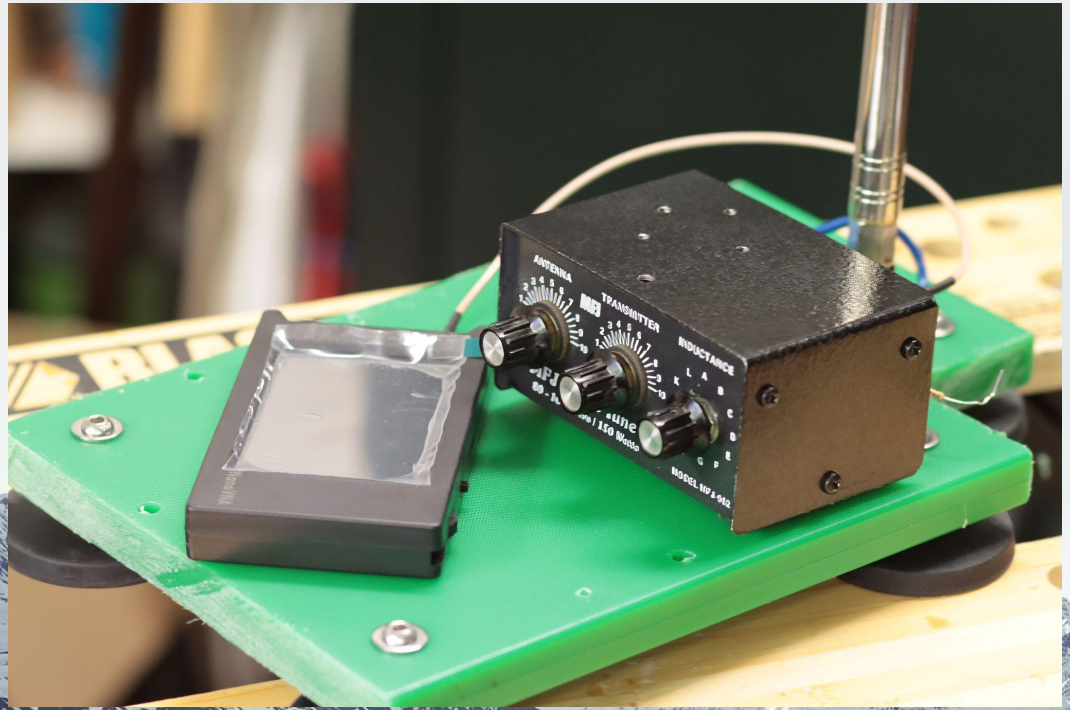
- Antenna length
- Coax stub length
- Sliding tap position
- Kind of a PIA, but easy with VNA

Example of S(11) Measurements





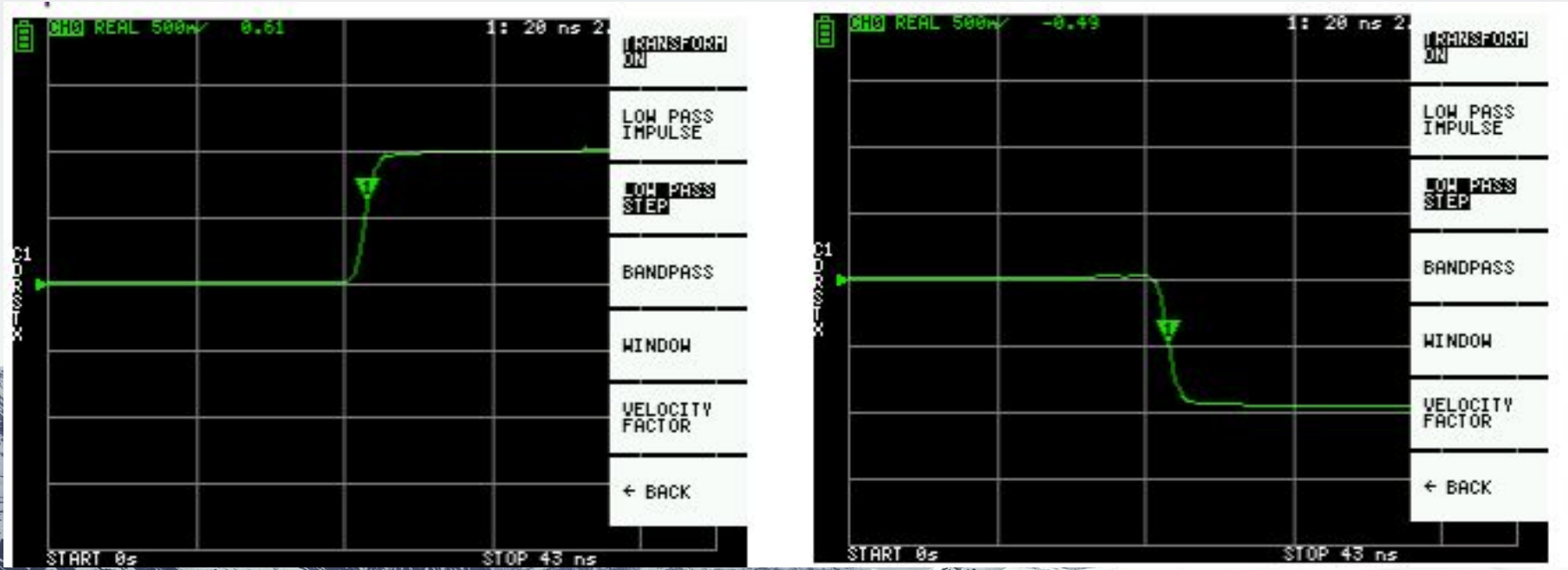
Same 6 meter SWR plot, via USB to computer. Also does return loss.



Portable rig with no tuner control. What to do? Cheap VNA supplies signal (~¼ mW) and SWR readout. Easy to adjust tuner, and then switch to transceiver cable.

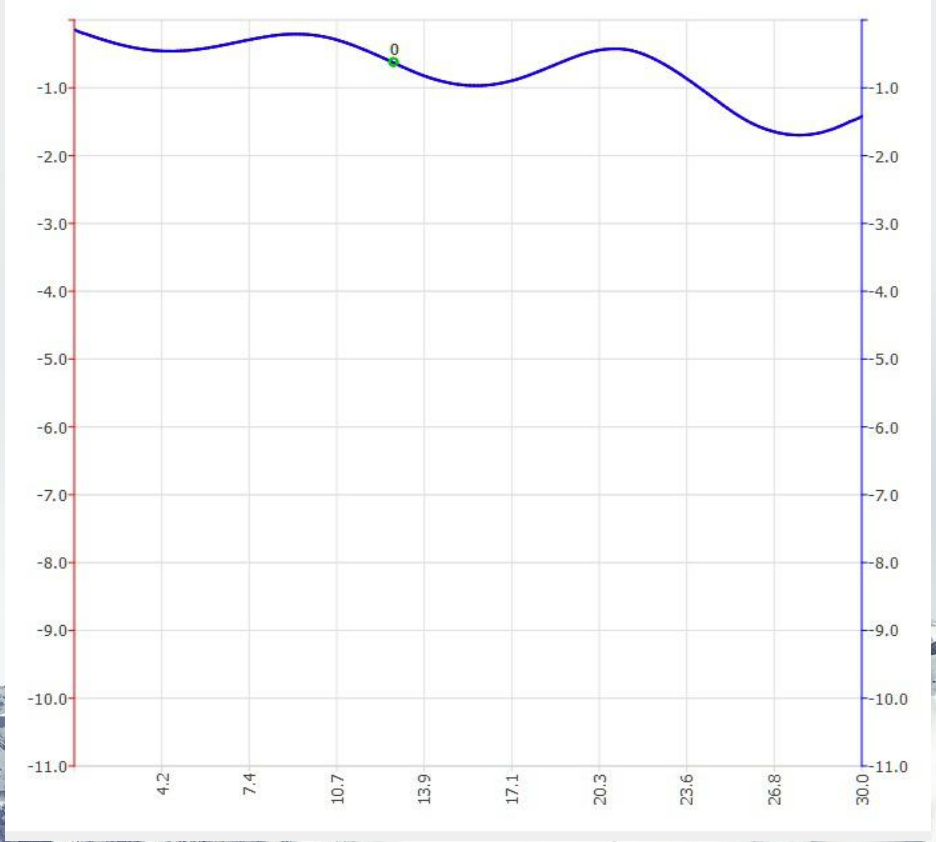
Example of S(11) Measurements

Time Domain Reflectometer

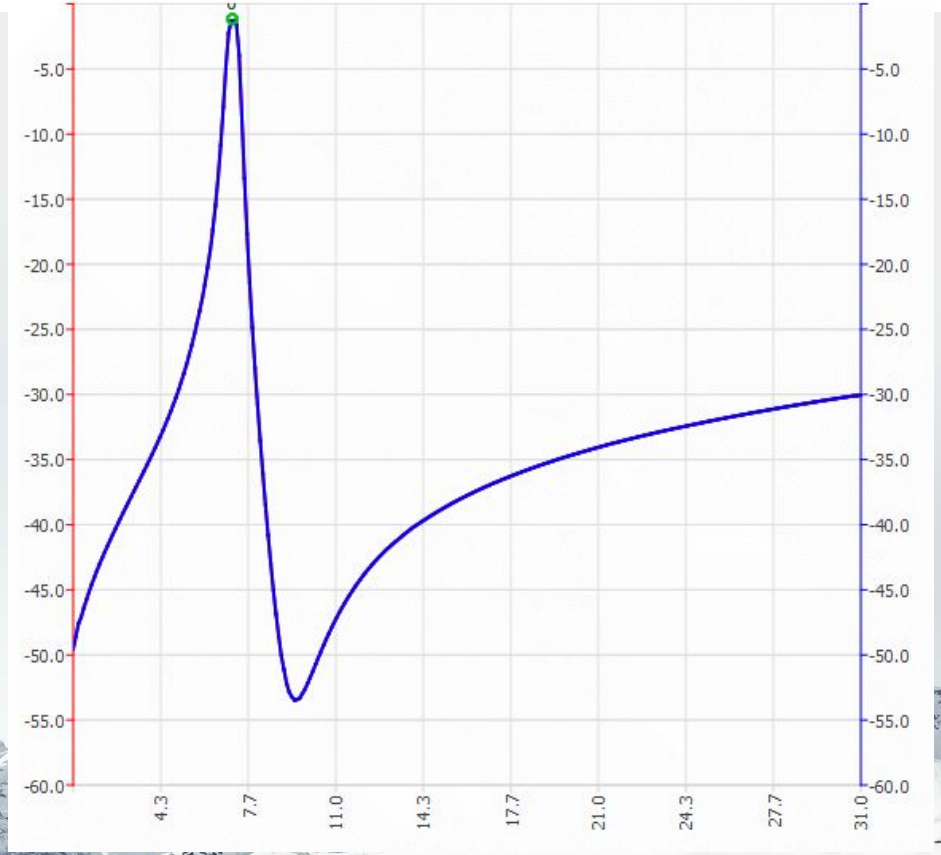


Example of S(21) Measurements

Signal from Port 1 arriving at Port 2 via 50 ft of old RG-58.

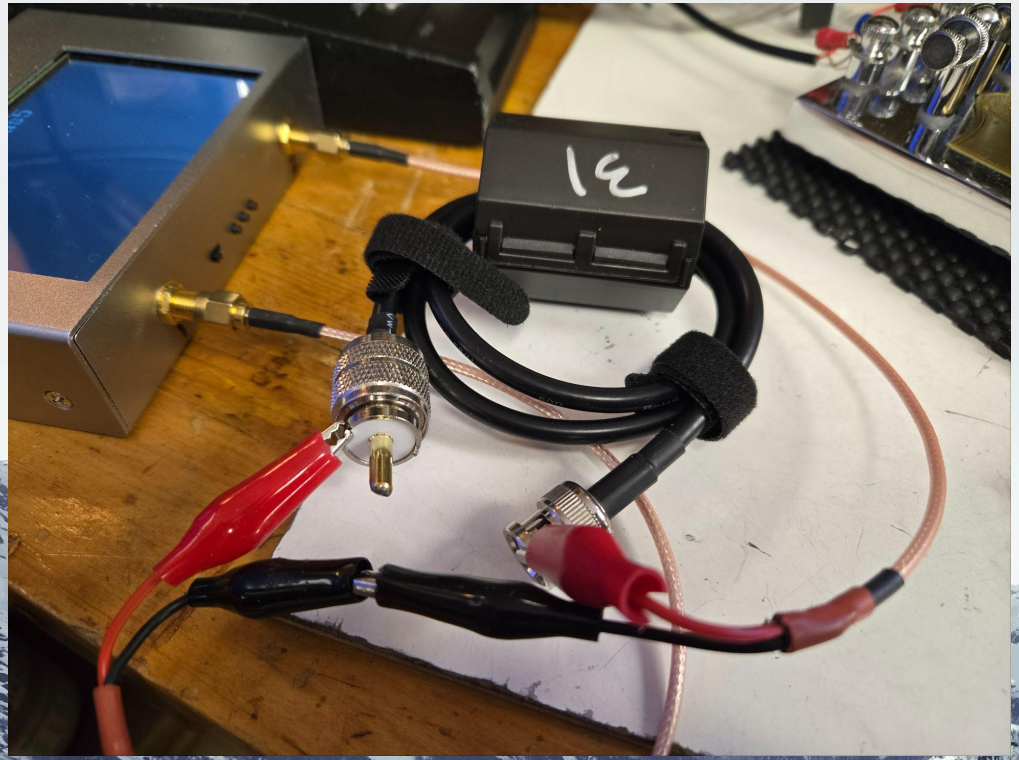


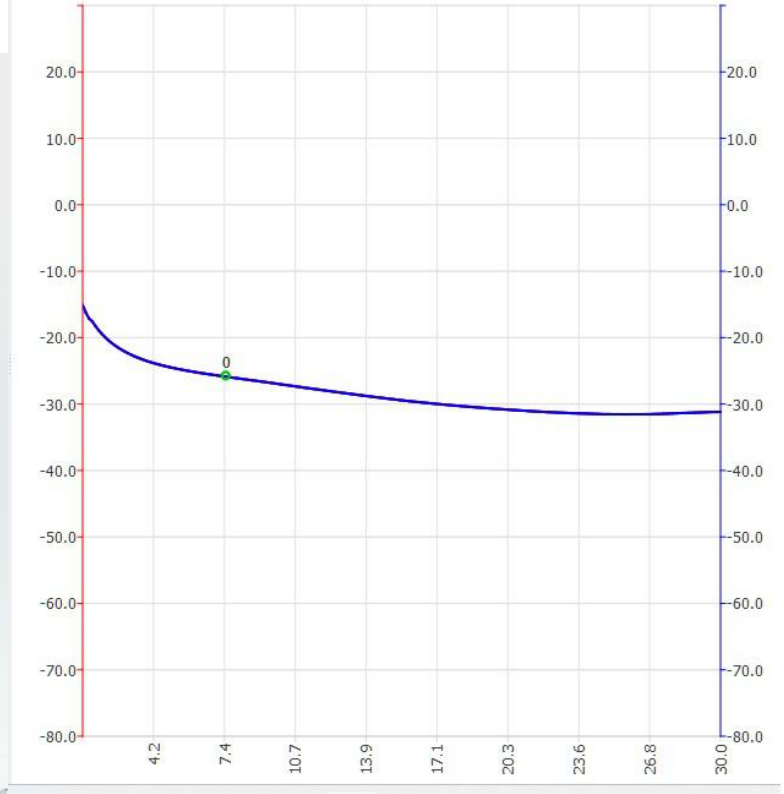
Example of S(21) Measurements



Signal from Port 1 arriving at Port 2 via a small LC filter for a receiver front end.

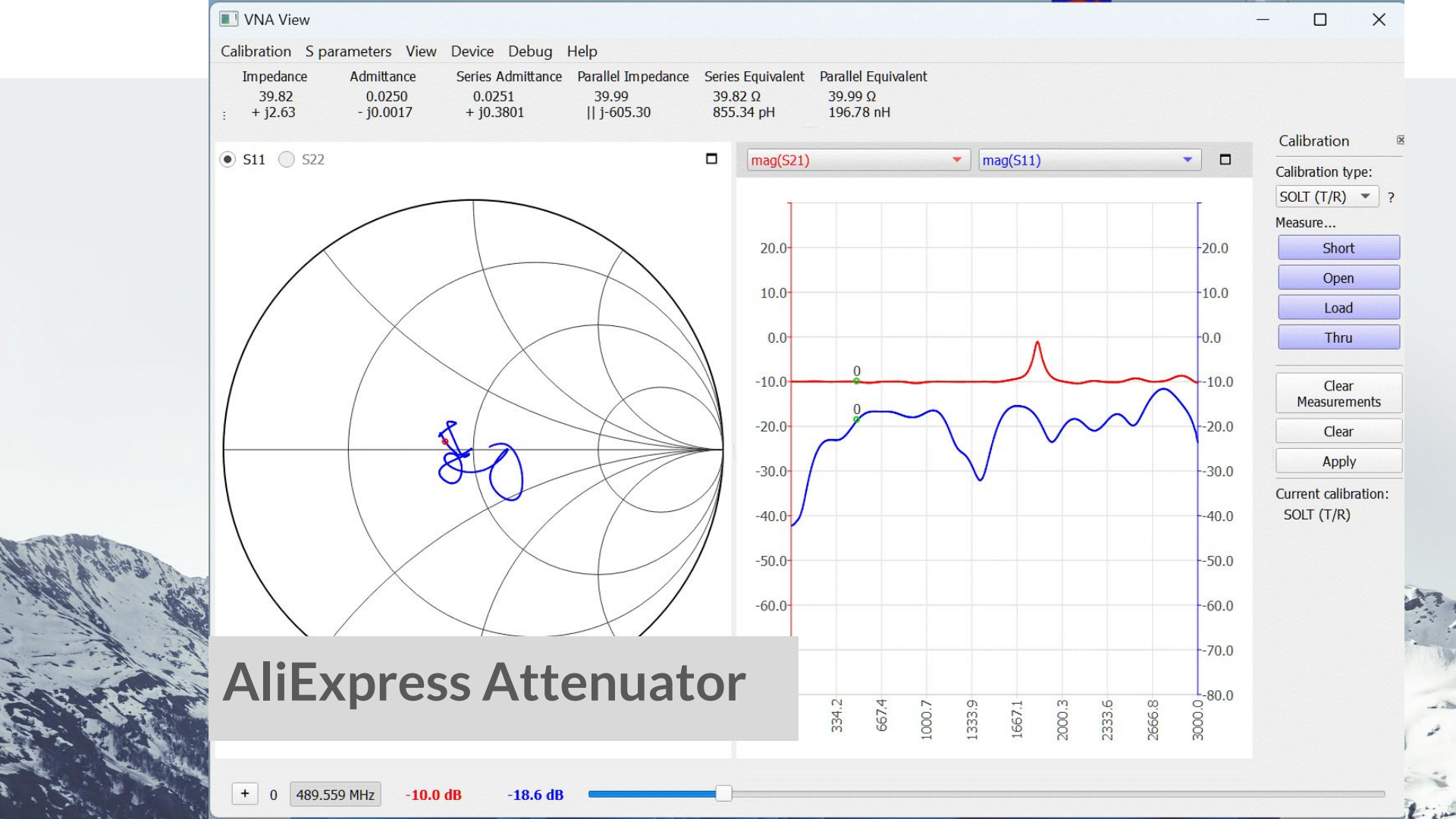
Example of S(21) Measurements





Three Loops Through Large Snap-On Ferrite

dB Loss vs. Frequency

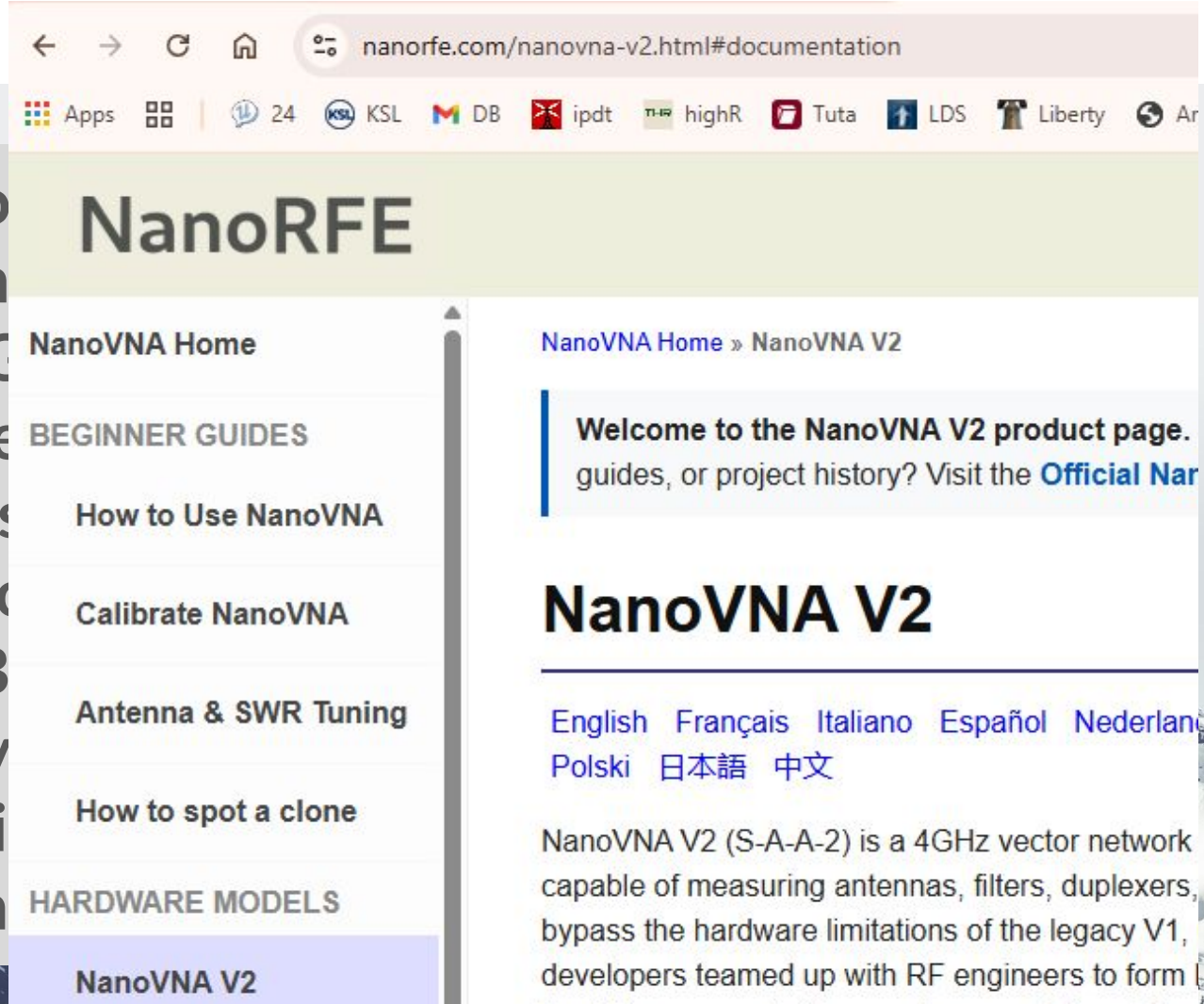

VNA View
Calibration S parameters View Device Debug Help
Impedance Admittance Series Admittance Parallel Impedance Series Equivalent Parallel Equivalent
39.82 0.0250 0.0251 39.99 39.82 Ω 39.99 Ω
+ j2.63 - j0.0017 + j0.3801 || j-605.30 855.34 pH 196.78 nH
S11 S22
mag(S21) mag(S11)
20.0 10.0 0.0 -10.0 -20.0 -30.0 -40.0 -50.0 -60.0 -70.0 -80.0
334.2 667.4 1000.7 1333.9 1667.1 2000.3 2333.6 2666.8 3000.0
Calibration
Calibration type:
SOLT (T/R)
Measure...
Short
Open
Load
Thru
Clear Measurements
Clear
Apply
Current calibration:
SOLT (T/R)
+ 0 489.559 MHz -10.0 dB -18.6 dB
AliExpress Attenuator

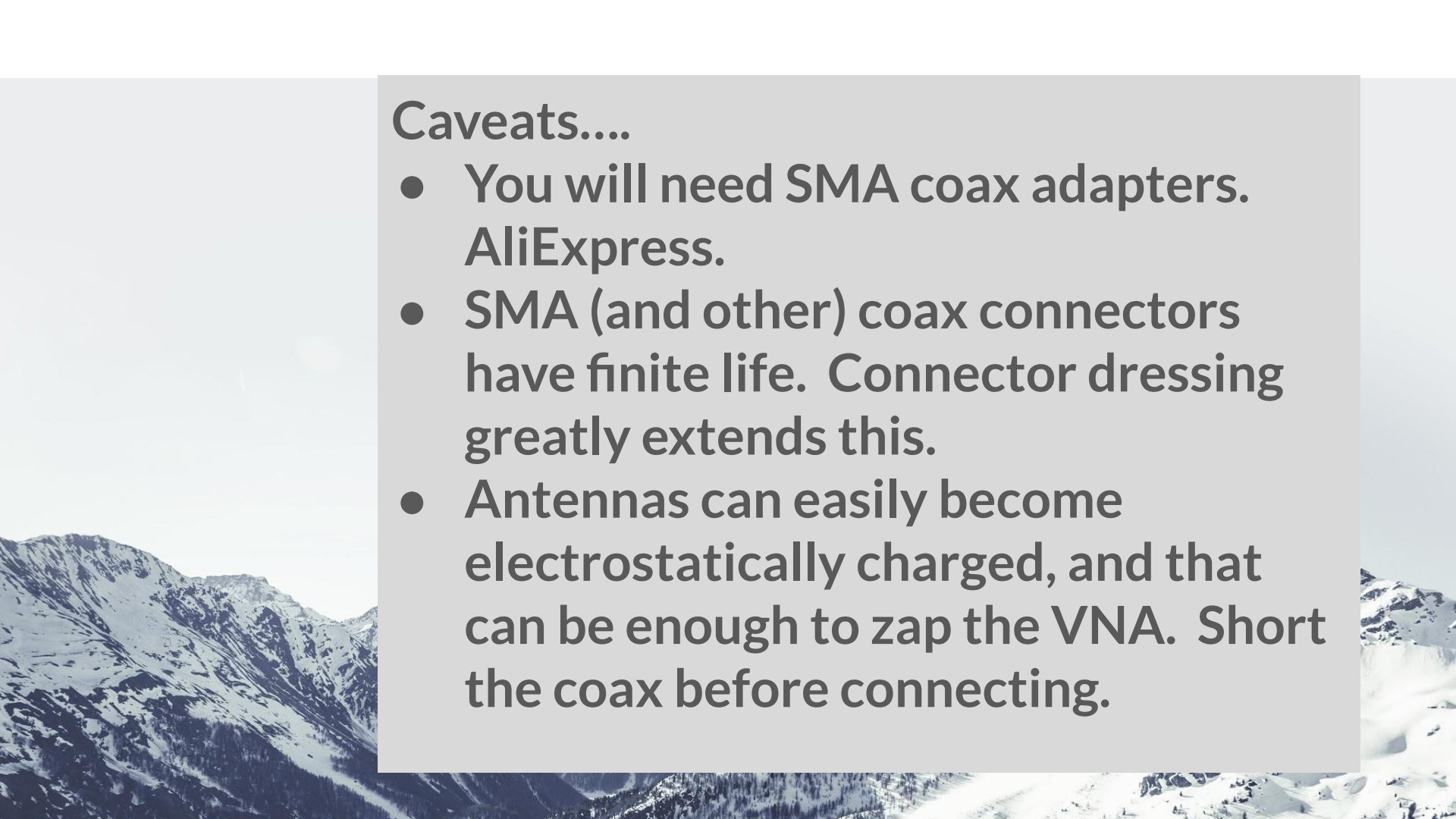
Issues to consider…..

- Frequency range. The VNA shown works up to 4 GHz.
- Measurement speed. Some models are much faster than others.
- Dynamic range. Example shown can do up to 90 dB.
- Stability. Low cost versions may only hold calibration for 30 minutes. Example shown holds calibration for months.
- Number of points per sweep. Low cost = 100 points

Issues to co

- Frequen
  up to 4 G
- Measure
  much fas
- Dynamic
  to 90 dB
- Stability
  calibrati
  shown h





Caveats….

- You will need SMA coax adapters. AliExpress.
- SMA (and other) coax connectors have finite life. Connector dressing greatly extends this.
- Antennas can easily become electrostatically charged, and that can be enough to zap the VNA. Short the coax before connecting.

Questions?

