

# From Mystery Coax to Happy Antennas: Using the Siglent SVA-1015X for Real Amateur Radio Work

Written by Greg, N5XO

Most hams eventually collect enough test gear to make the shack look like NASA had a garage sale. But owning a Spectrum/VNA like the **Siglent SVA-1015X** and actually knowing what to do with it are two different things.

The good news is this: for amateur radio, especially VHF/UHF weak-signal work, the SVA-1015X is not just a fancy screen with expensive knobs. It can answer very practical questions:

*Is my coax bad? Where is the problem? How much signal am I losing before it even gets to the antenna? Is my antenna tuned where I think it is? Why does my station hear like a potato?*

**Note on the screen images:** The displays in this article are realistic training examples showing what the SVA-1015X screen should generally look like. They are not measurements from your specific station. Your readings will vary based on coax type, length, antenna, adapters, calibration, and whether the RF gods are laughing at you that day.

# 1. What the SVA-1015X Does for a Ham

The SVA-1015X is both a **spectrum analyzer** and a **vector network analyzer**.

The spectrum analyzer side looks at signals. It lets you see transmitted signals, harmonics, spurs, noise, modulation, and general RF ugliness.

The VNA side measures networks. That means coax, filters, antennas, preamps, attenuators, duplexers, cavities, and other RF parts.

For this article, we care mostly about three ham-radio jobs:

1. Testing coax loss and cable health
2. Finding faults in coax
3. Testing and tuning antennas
- 4.

## 2. Why Coax Testing Matters

Coax is not just “wire that gets RF from here to there.” It is part of the station.

At HF, you can sometimes get away with ugly coax sins. At VHF and UHF, coax sins become public record.

At 2 meters, 70 centimeters, and especially 23 centimeters, coax loss can quietly destroy your station. You can have a great antenna, a great radio, and a great preamp, but if your coax is lossy, waterlogged, kinked, poorly connected, or simply wrong for the band, your station becomes a very expensive dummy load.

## 3. Measuring Coax Loss with S21

To measure coax loss, you use the VNA's **S21 transmission measurement**. S21 tells you how much signal passes through the cable from one port to the other.

### What You Need

- SVA-1015X
- Short calibration cables/adapters
- The coax under test
- Proper connectors/adapters
- 50-ohm system
- Calibration kit, if available

### Step-by-Step Coax Loss Test

1. Turn on the SVA-1015X and let it warm up for a few minutes.
2. Select **VNA mode**.
3. Select **S21** measurement.
4. Set the frequency range for the band you care about.  
Example: 144 to 148 MHz for 2 meters, 420 to 450 MHz for 70 cm, or 1240 to 1300 MHz for 23 cm.
5. Calibrate the VNA over that same frequency range using the cables and adapters you will use for the measurement.
6. Connect the coax under test between the VNA ports.
7. Read the insertion loss in dB.
8. Compare the measured loss against the manufacturer's coax loss chart.



**Example S21 coax loss sweep.** This is the kind of smooth trace you want to see. Loss gradually increases with frequency. A sharp dip, big ripple, or unexpected deep loss means the cable, connector, adapter, or calibration deserves suspicion.

## How to Interpret Coax Loss

Loss	What It Means
1 dB	Noticeable but often acceptable
3 dB	Half your power is gone
6 dB	Three-quarters of your power is gone
10 dB	90% of your power is gone

If your 100-watt radio feeds a cable with 3 dB of loss, only about 50 watts reaches the antenna. On receive, the same thing

happens in reverse. The weak signal is reduced before it ever reaches the receiver.

That is why mast-mounted preamps matter. The preamp belongs at the antenna, not in the shack, because the goal is to amplify the weak signal before the feedline eats it for breakfast.

## 4. Why You Sweep the Cable

A single measurement at one frequency is useful. A sweep is better.

A sweep shows how the cable behaves across a range of frequencies. A good coax run should show smooth, predictable loss as frequency increases. A bad coax run may show sharp dips, strange peaks, ripple, sudden changes, or resonant-looking behavior.

That is the cable waving a little flag and saying, "Please stop pretending I am fine."

### Step-by-Step Coax Sweep

1. Select **VNA mode**.
2. Choose **S21**.
3. Set start and stop frequencies. For example, sweep 140 to 150 MHz for a 2-meter system.
4. Calibrate over that exact frequency range.
5. Connect the coax.
6. Use markers at your operating frequencies such as 144.200, 432.100, or 1296.100 MHz.
7. Record the loss readings for future comparison.
- 8.

## 5. Distance-to-Fault: Finding the Bad Spot

Distance-to-Fault, or **DTF**, helps locate problems along a cable. It sends RF energy into the cable and watches for reflections. A fault reflects energy back, and the instrument estimates how far away that fault is.

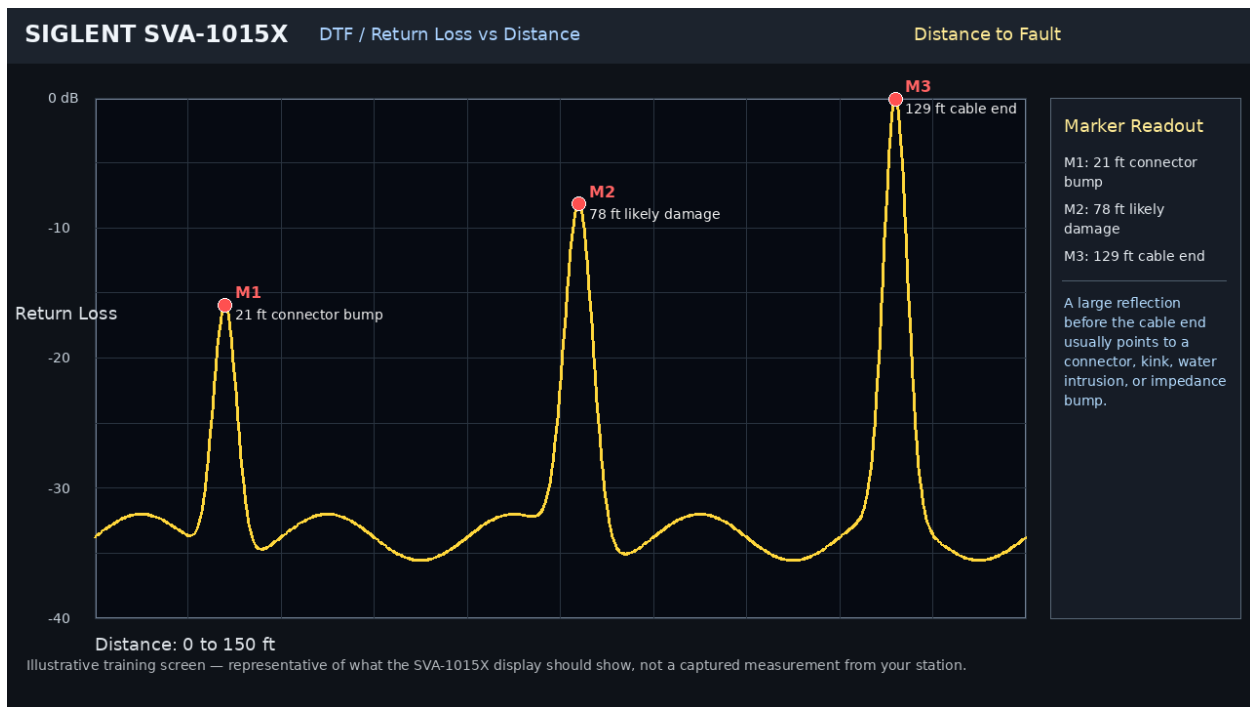
Translation: it tells you where the coax is being stupid.

### When to Use DTF

- SWR suddenly got worse
- Receive performance dropped
- You suspect water in the coax
- A connector may be bad
- A tower cable has been in service for years
- You inherited coax from another ham and therefore trust nothing
- You want to know cable length
- You want to find where the cable is open or shorted

### Step-by-Step DTF Procedure

1. Disconnect the coax from the radio.
2. Disconnect the antenna if possible. For pure cable testing, test only the cable.
3. Connect the cable to the SVA-1015X.
4. Select **Distance-to-Fault** mode.
5. Enter the correct cable velocity factor. This is critical.
6. Set the distance range slightly longer than the cable. For a 100-foot cable, try 125 or 150 feet.
7. Choose Return Loss or VSWR display.
8. Run the sweep.
9. Use markers to identify reflection points.



**Example Distance-to-Fault display.** Marker M1 shows a connector bump near the shack end, M2 shows a likely problem around 78 feet, and M3 shows the cable end. A big reflection before the end of the cable is usually not your friend.

## Reading the DTF Display

Display Clue	Possible Meaning
Reflection at cable end	Normal open/short/termination point
Reflection near beginning	Bad connector, adapter, or jumper
Reflection partway down	Damage, water, crushed coax, or impedance bump
Multiple reflections	Connector issues, bad sections, or impedance changes
Low return loss / high VSWR	Strong reflection; investigate

DTF is not magic. It gives clues. You still need to inspect connectors, weatherproofing, and the cable itself. That means yes, you may still have to climb the tower. Sorry. The laws of physics remain rude.

## 6. Testing Antennas with S11

When testing antennas, the VNA helps measure SWR, return loss, resonant frequency, impedance, resistance, reactance, bandwidth, and tuning direction.

This is where the SVA-1015X becomes very useful. Instead of guessing, trimming, guessing again, and mumbling things not allowed on repeater nets, you can actually see what the antenna is doing.

### SWR Explained

SWR stands for **Standing Wave Ratio**. It tells you how well the antenna system impedance matches the transmitter's expected 50-ohm load.

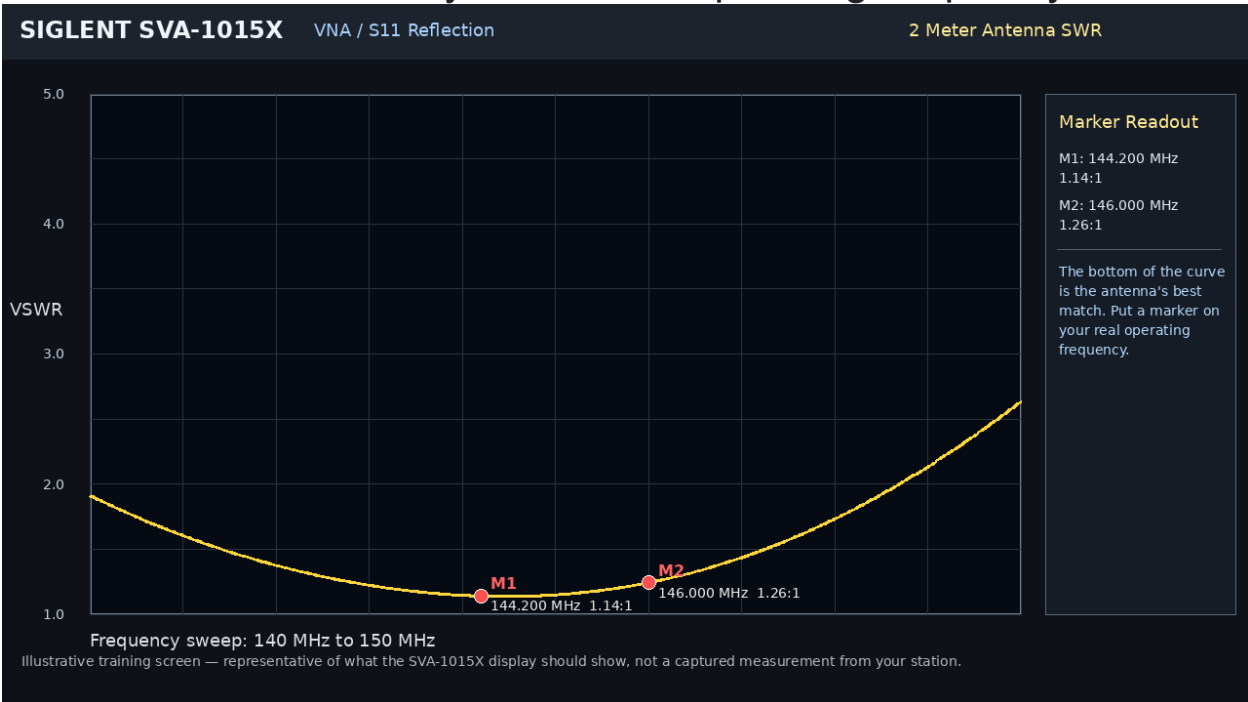
SWR	Meaning
1.0:1	Perfect, unicorn territory
1.2:1	Excellent
1.5:1	Very good
2.0:1	Usually usable
3.0:1	Needs attention

Higher	Stop and investigate
--------	----------------------

Do not worship SWR. A dummy load has great SWR and makes a terrible antenna. SWR matters, but it is not the whole story.

## Step-by-Step Antenna SWR Test

1. Disconnect the antenna from the radio.
2. Connect the antenna feedline to the SVA-1015X VNA port.
3. Select **VNA mode**.
4. Choose **S11**.
5. Set the sweep range. For a 2-meter antenna, try 140 to 150 MHz.
6. Calibrate at the end of the test cable.
7. Select SWR format.
8. Sweep the antenna.
9. Find the lowest SWR point.
10. Place a marker at your desired operating frequency.



**Example S11 antenna SWR sweep.** The low point is near 144.200 MHz, which is right where a 2-meter weak-signal operator wants it. If

the low point is below your target frequency, the antenna is usually too long. If it is above your target, the antenna is usually too short.

## 7. Tuning the Antenna

If the antenna's lowest SWR point is too low in frequency, the antenna is usually electrically too long.

If the lowest SWR point is too high in frequency, the antenna is usually electrically too short.

Problem	Likely Fix
Resonance below desired frequency	Shorten antenna
Resonance above desired frequency	Lengthen antenna
SWR good but frequency wrong	Adjust element length
SWR bad everywhere	Check feedpoint, match, ground, balun, coax construction
SWR changes when coax moves	Common-mode current or bad connector

Make small adjustments. Do not attack the antenna with bolt cutters like it owes you money.

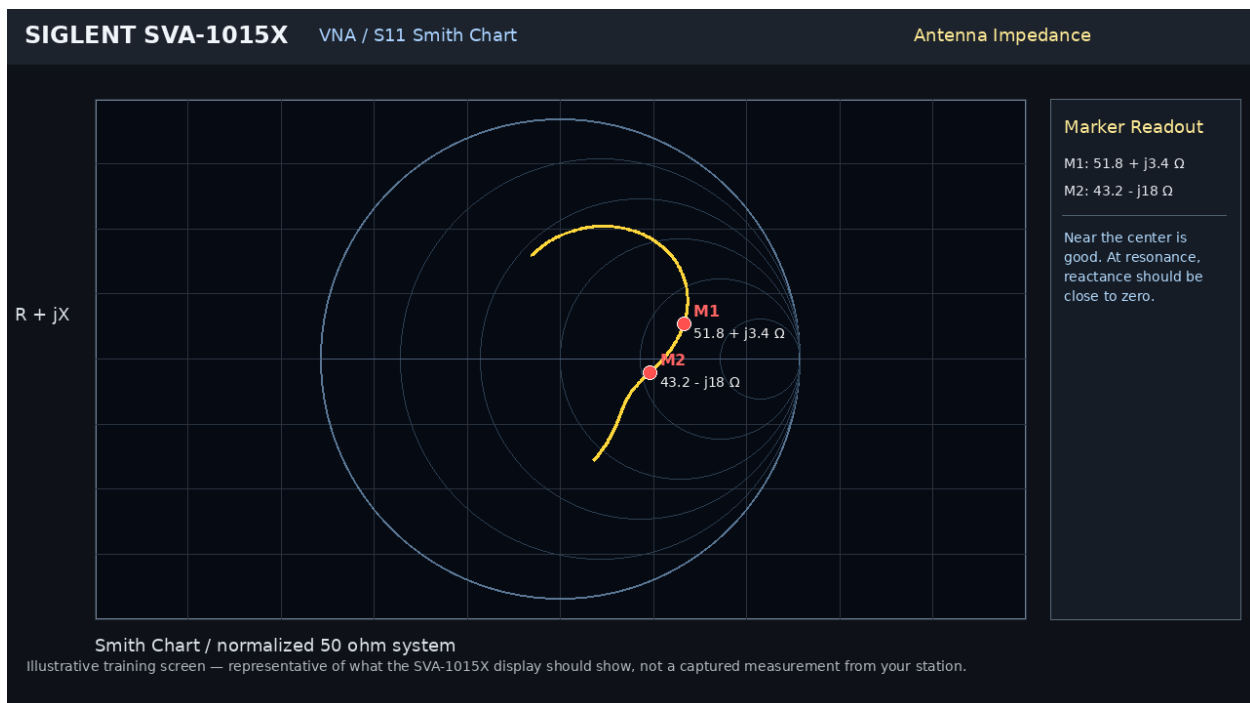
## 8. Using the Smith Chart

The Smith chart looks intimidating, like something left behind by aliens who enjoyed algebra. But it is extremely useful.

It shows impedance as resistance and reactance. For antenna work, it helps answer:

- Is the antenna close to 50 ohms?
- Is it inductive?
- Is it capacitive?
- Is resonance above or below where I want it?
- Is the matching network doing its job?

At resonance, reactance is near zero. That means the  $jX$  part is close to zero. Something like  $50 + j0 \Omega$  is excellent. Something like  $25 + j35 \Omega$  means resistance is low and the antenna is inductive. Something like  $90 - j40 \Omega$  means resistance is high and the antenna is capacitive.



**Example Smith chart display.** The center of the chart represents a good 50-ohm match. The marker near  $51.8 + j3.4 \Omega$  is very close to ideal. The further away the trace wanders, the more the antenna system is asking for help.

SWR says, “Something is wrong.” The Smith chart says, “Here is what kind of wrong.”

## 9. Practical 2-Meter Yagi Example

You have a 2-meter SSB yagi for 144.200 MHz.

1. Set the SVA-1015X to VNA mode.
  2. Select S11.
  3. Sweep 140 to 150 MHz.
  4. Calibrate at the test cable end.
  5. Connect the antenna.
  6. Display SWR.
  7. Put a marker at 144.200 MHz.
  8. Check the lowest SWR point.
  9. Switch to Smith chart.
  10. Confirm impedance near 50 ohms and reactance near zero.
- If lowest SWR is at 142.500 MHz, the antenna is too long. If lowest SWR is at 146.500 MHz, the antenna is too short. If SWR is ugly across the whole band, check the feedpoint, matching system, coax jumper, choke, and connector.

Also check for operator error. That is the most common part in the station.

## 10. Safety: Do Not Transmit Into the Analyzer

**Important:** Do not connect a transmitter directly to the SVA-1015X unless you are using proper attenuation and know exactly what power level is reaching the input. Spectrum analyzer inputs are easy to damage. Your 100-watt radio and your analyzer input should not be introduced without adult supervision and a large attenuator.

## 11. Good Measurement Habits

- Use good adapters.
- Use short, known-good test jumpers.
- Calibrate over the same frequency range you intend to measure.
- Calibrate at the measurement plane, usually the end of the test cable.
- Do not trust a measurement made through a pile of mystery adapters.
- Take notes so you can compare future results.

## 12. What Good Looks Like

### Good Coax

- Expected loss for its length and frequency
- Smooth loss curve
- No strange ripple
- No unexpected reflections
- Clean DTF result
- Stable readings when gently flexed

### Good Antenna

- SWR minimum near desired operating frequency
- Reasonable bandwidth
- Impedance near 50 ohms
- Reactance near zero at resonance
- Stable readings
- No wild changes when coax is moved

## Final Thoughts

The Siglent SVA-1015X is one of those tools that moves a ham from guessing to knowing.

For the average amateur, it helps answer simple but important questions:

*Is my coax good? Is my antenna tuned? Is my feedline eating my signal? Is the problem at the shack, the tower, the connector, or the antenna? Did I just spend three hours blaming propagation when the real problem was a \$4 adapter?*

For VHF/UHF weak-signal work, this matters even more. On 2 meters, 70 cm, and 23 cm, small losses become big losses fast. A properly tested feedline and antenna system can be the difference between “nothing heard” and “new grid worked.”

The SVA-1015X will not make you a better operator by itself.

But it will remove a lot of mystery from your station.

And in ham radio, every mystery you remove leaves more time for the important things — like calling CQ on 144.200, arguing about coax, and explaining to repeater users that yes, horizontal polarization is still a thing.

**Written by Greg, N5XO**