True 915MHz Stubby Tuning Guide

TOOLS AND MATERIALS REQUIRED:

NECESSARY

- Stock Stubby
- NanoVNA
- Heat Source (Lighter / Hair Dryer)
- Wire Cutters

OPTIONAL

- 3D Printer (non carbon fiber filament)
- Glue (Snug fit works)
- Pliers

Safety Reminder: When working with heat, open flames, or cutting metal, always wear **eye protection** and appropriate **PPE** (gloves, clothing, etc). Ensure your work area is safe, ventilated, and free of flammable materials, keep a fire extinguisher nearby. Work carefully and stay focused.

STEP ZERO (OPTIONAL): Print & assemble new shell

Pick any shell style from the link below or design your own. Download and print a cap and a shell. Glue the cap in place if needed. All caps and shells mix-and-match except the Hex variant.

(https://www.thingiverse.com/thing:7198770)

PRINT SETTINGS:

- PRINT CAP UPSIDE DOWN
- 0.2MM FIRST LAYER HEIGHT
- 0.1MM LAYER HEIGHT
- **PRINT SLOW 50MM/S**
- PRINT EVERYTHING IN **VASE** MODE
- PRINT EACH PART INDIVIDUALLY
- **DO NOT USE CARBON FIBER FILAMENT**
- NO NEED FOR RAFT OR SUPPORT MATERIAL

PRINTERS VARY IN TOLERANCE, YOU MIGHT NEED TO SCALE FOR A SNUG FIT

FUZZY VARIANT NOTES:

The Fuzzy shell/cap is identical to Classic but includes expanded tolerances to compensate for fuzzy-skin printing.

RECOMMENDED FUZZY-SKIN SETTINGS:
- Outside walls only
- 0.2 mm point distance
- 0.1 mm thickness

STEP ONE: Setting up you NanoVNA

1. Before using your NanoVNA, make sure to calibrate it. This step is essential, skipping it will give you incorrect readings and poorly tuned antennas. Follow the calibration video linked below.
(https://www.youtube.com/watch?v=fld8KtRd4bw)

2. Next, set up the correct display settings on your NanoVNA. To do this follow the steps in the "Display_settings.gif" on the Thingiverse page.
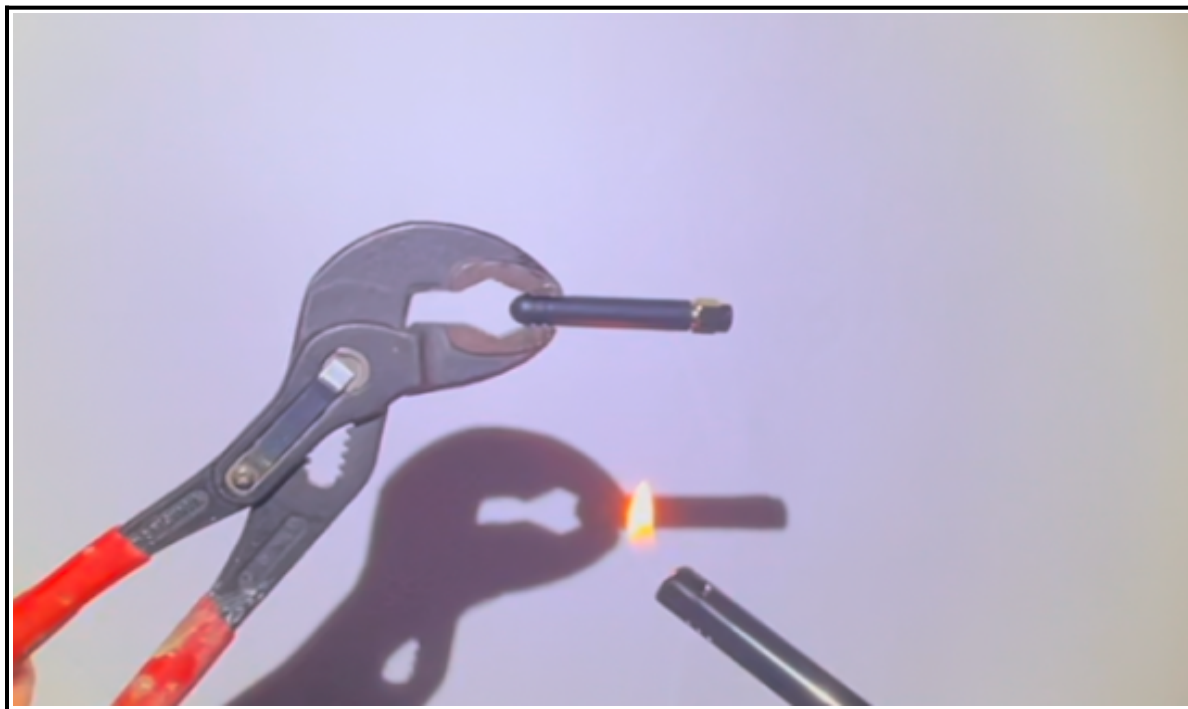(https://www.thingiverse.com/thing:7198770)

STEP TWO: Remove old shell

Gently heat the base of the original shell to soften it **(FIGURE 2)**. Then grip the SMA connector securely and work the shell off with a steady pull and a gentle side-to-side motion.

Caution: The SMA connector heats up quickly. **Use gloves or pliers** and handle with caution.

(FIGURE 2)

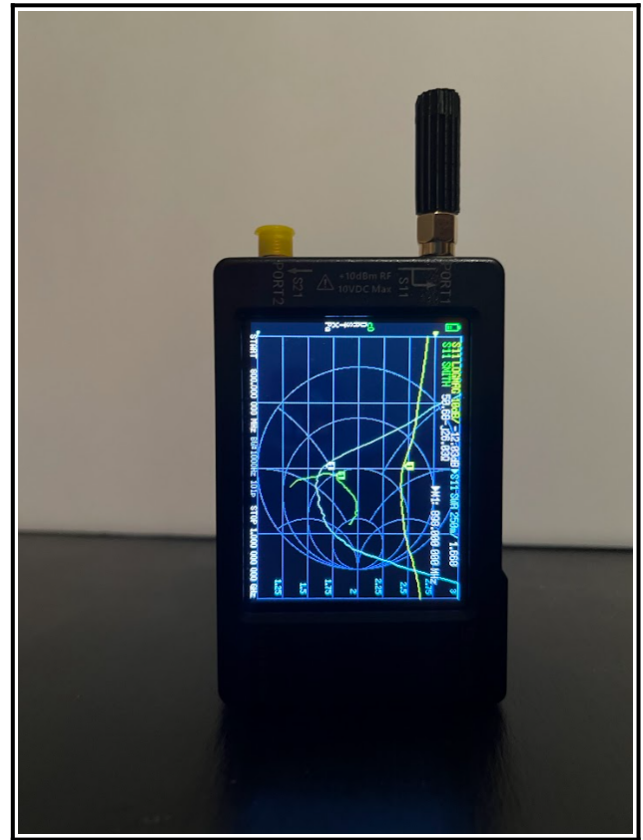**(FIGURE 3)**

OLD SHELL

NEW SHELL

ANTENNA

(FIGURE 4)

STEP THREE: Tune antenna

1. Install the shell: If you're using a custom shell, slide it onto the antenna now. If not, put the original shell back on.
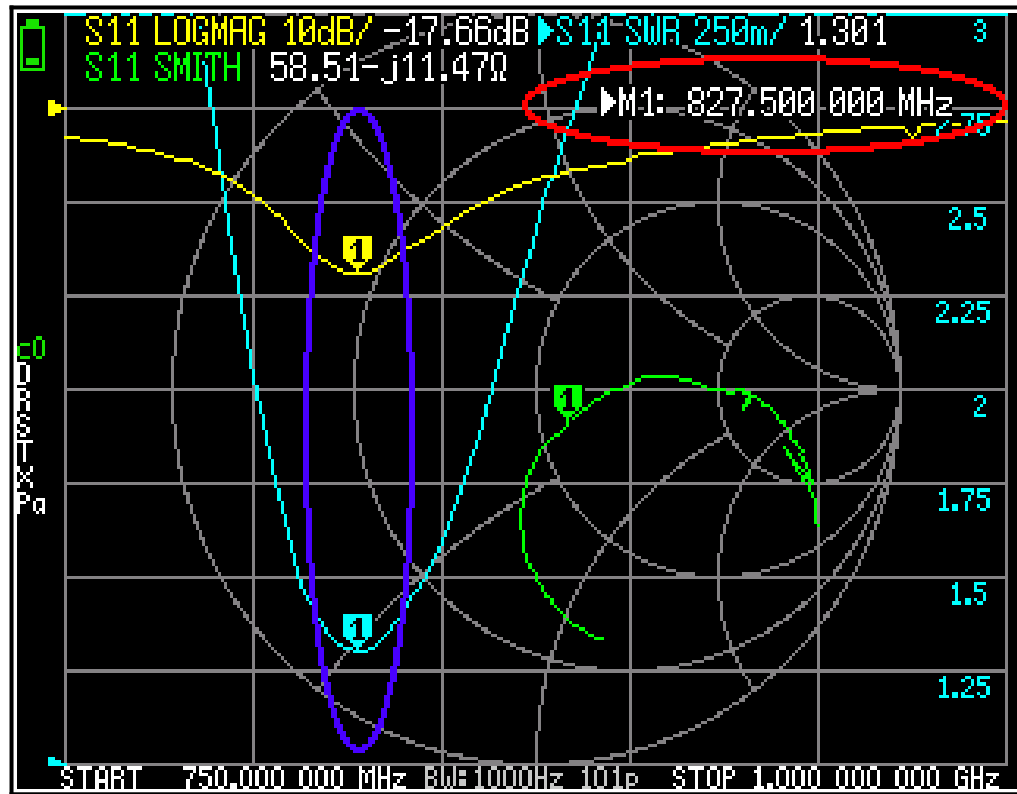
Important: the shell affects tuning, so make sure it's installed during all tuning steps.

2. Connect to NanoVNA S11 port (FIGURE 4). If you followed the display setup video from the Thingiverse page, you should see a dip on the chart (shown as the purple circle in **FIGURE 5**). This dip is the frequency your antenna is currently tuned to.

3. Check frequency: Use the scroll wheel on top of the NanoVNA to move the marker to the lowest point of the dip. In the top-right corner of the screen you'll see the frequency in MHz that your antenna is currently tuned to. (red circle in **FIGURE 5**) Meshtastic uses 902–928 MHz depending on your local mesh settings, a good target is 915 MHz; tune to your exact mesh frequency if known.
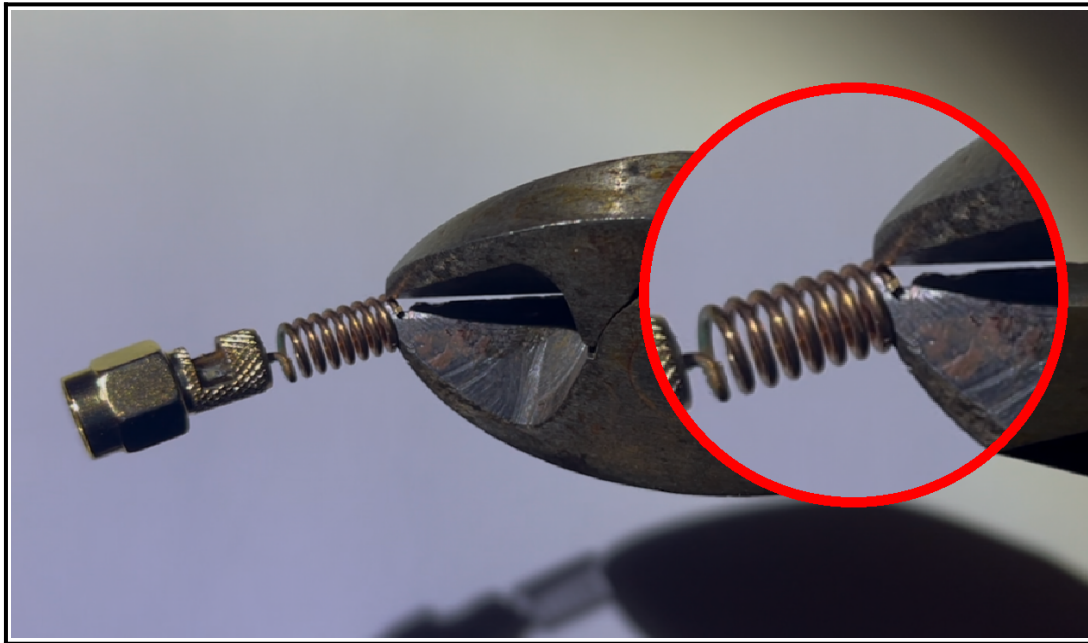
(FIGURE 5)

 Important: For the most accurate readings, keep the NanoVNA 2–4 feet away from metal objects and position the antenna vertically.

   4. Trim the antenna if necessary: The NanoVNA shows this antenna is actually tuned around 827 MHz (purple & red circle in **FIGURE 5).** To bring it to the proper 915 MHz, we need to shorten the antenna. Disconnect the antenna from the NanoVNA and remove the shell. Then trim about 1–2 mm from the top of the antenna coil as shown in **FIGURE 6.**

(FIGURE 6)

5. Check and repeat: After trimming the antenna, reinstall the shell and reconnect it to your NanoVNA. Move the marker to the lowest point of the dip and note the frequency. If it isn't 915 MHz, repeat the trimming and checking process until the dip aligns with 915 MHz.

 Important: Trim the antenna **slowly and carefully**. Cutting too much cannot be undone and will shift the frequency too high. Always trim in small increments and check the frequency after each cut.

STEP FOUR: Final Assembly

Once your antenna's lowest dip aligns with 915 MHz **(FIGURE 7)** or your local frequency, tuning is complete. Attach the shell to the SMA base with glue if needed, or leave snug. That's it, your antenna is tuned and ready to use!!

(FIGURE 7)
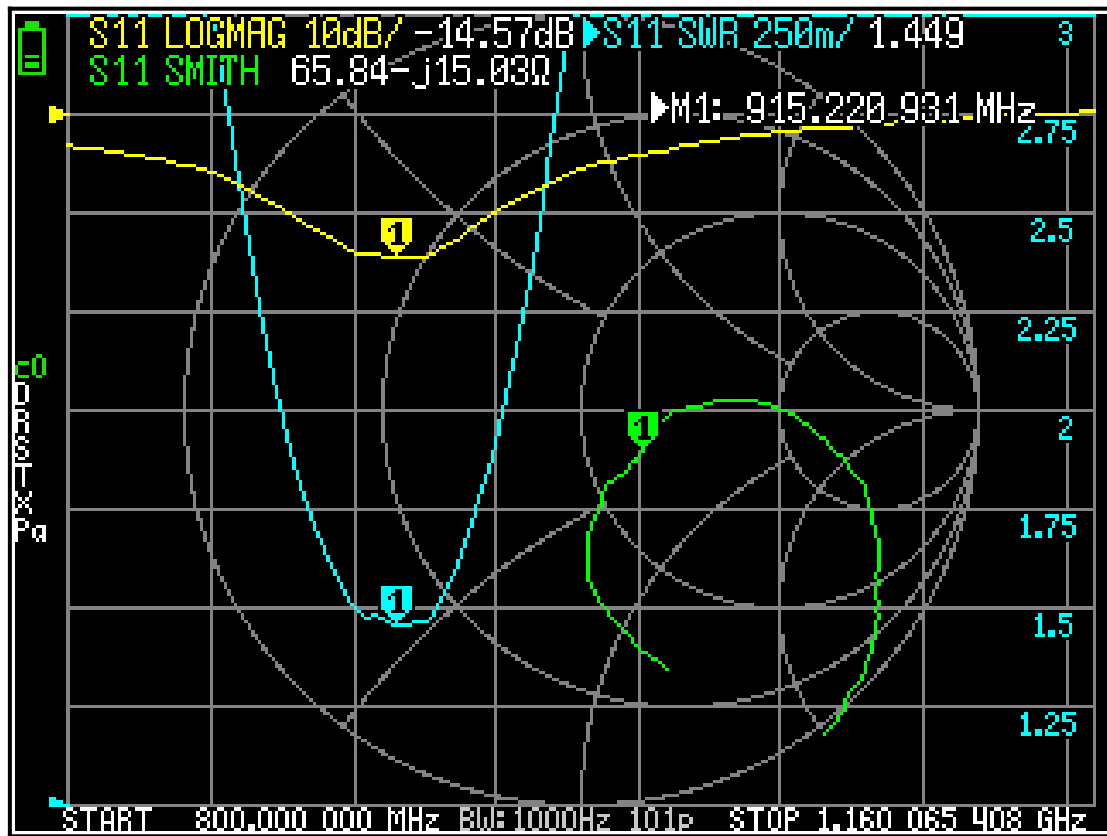
If you spot any **typos, mistakes,** or **issues** with the files, feel free to DM me on Discord **@quavara**

Need help or having trouble? DM me on Discord **@quavara**