

Field Antenna Testing

Without Lab Equipment

Professional antenna testing requires a vector network analyzer and anechoic chamber. Field testing with simple tools can still tell you whether an antenna is working as expected for your deployment.

The Two-Node RSSI Test

The most practical field test for comparing antennas:

1. Set up a reference node at a fixed location (indoors at a window, or on a tripod outdoors). Keep the reference node's own antenna unchanged for the whole test.
2. Connect your test antenna to the mobile node
3. Walk to a consistent test point 50-200m away
4. Record RSSI (in dBm) **at the fixed reference node** - it is the end that "hears" the antenna under test. Take several readings (e.g. 10-20 over a minute or two) and average them, since LoRa RSSI swings several dB from multipath and orientation moment to moment. View RSSI in the [Meshtastic app](#).
5. Replace the antenna on the mobile node with a known reference (stock rubber duck or a calibrated dipole)
6. Return to the same test point and record the averaged RSSI at the reference node again

The change in averaged RSSI at the reference node when you swap the test antenna approximates the test antenna's gain change: a +3 dB improvement means the new antenna has roughly 3 dB more gain than the reference, in that direction. This only holds if transmit power, position, and the reference node's antenna are all held constant, and only on the receiving end - so always read RSSI at the fixed reference node, not "either node." A single test point cannot capture pattern differences (for example, a high-gain collinear may show *less* RSSI to a nearby high-angle node despite more boresight gain), so treat the result as a rough comparison, not a precise gain measurement.

Important: Test at multiple azimuths (compass directions) for [directional antennas](#).

Omnidirectional antennas should show similar RSSI regardless of direction.

Checking for Antenna Resonance with an SDR

An RTL-SDR dongle (~\$25-40 depending on model and vendor, as of 2026) can help confirm an antenna is "alive," but note that bare noise-floor observation is **not** a reliable resonance test:

1. Connect the test antenna to the SDR via an appropriate adapter
2. Open SDR# or GQRX
3. Look at the noise floor across 900-930 MHz while the antenna is connected vs. with a dummy load or no antenna
4. A working antenna will generally raise the received noise floor versus no antenna, confirming it is receiving - but a rise (or lack of one) does not cleanly prove resonance at 915 MHz, since ambient noise depends on what is transmitting nearby, not solely on antenna resonance.

This noise-floor check only tells you whether the antenna is receiving at all; it is not a resonance or SWR measurement. For a real resonance check, use a NanoVNA to measure return loss, or transmit a known low-power carrier from a second node and compare the received level across frequencies. An RTL-SDR with a noise source and a directional coupler can also reveal resonance notches, but a bare dongle cannot.

Common Field Issues and Quick Diagnosis

Symptom	Likely Cause	Quick Test
RSSI much worse than expected	Wrong frequency antenna, damaged element, or loose connector	Swap with known-good antenna; check connector seating
Range varies wildly with orientation	Antenna is directional (yagi, patch), or near-field coupling to enclosure	Mount antenna away from metal surfaces
Range degrades after outdoor installation	Water ingress into connector or pigtail	Inspect connector for corrosion; re-weatherproof
Node transmits but no one hears it	Open circuit in antenna path (broken cable, wrong adapter)	Verify continuity/SWR with a NanoVNA (receive-only) <i>before</i> transmitting, then swap the cable

Caution: Do not key or transmit with a suspected open or disconnected antenna line. Transmitting into an open or badly mismatched port can damage the radio's power amplifier. Check continuity

and SWR with a NanoVNA (which is receive-only) first, or transmit only briefly with a dummy load attached - never transmit without an antenna or dummy load connected.

Documentation for Installations

For permanent outdoor installations, document your baseline measurements:

- Date of installation
- Antenna model and supplier
- SWR at 915 MHz (from NanoVNA if available)
- RSSI to 2-3 reference nodes at known distances
- Photos of antenna mounting and connector weatherproofing

This documentation makes troubleshooting future performance issues much faster - you have a baseline to compare against.

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