

Field Testing and Coverage Verification

Why Field Test?

Even the best RF prediction tools are only as good as their terrain models. Buildings, vegetation, and local obstructions can significantly degrade predicted coverage. Field testing confirms what the models predict - and reveals the surprises they miss.

Basic Field Test Procedure

1. Deploy the repeater at the proposed site, even temporarily on a tripod.
2. Walk or drive the coverage area with a second device (phone running the [Meshtastic app](#), or a handheld node).
3. Record signal metrics at known locations: SNR (signal-to-noise ratio) and RSSI (received signal strength indicator).
4. Note locations where packets stop getting through - this defines your coverage boundary.
5. Compare results to your predicted coverage map and identify gaps or surprises.

Understanding SNR and RSSI for LoRa

RSSI is received signal power in dBm. For mid-range spreading factors, useful values run roughly -90 to -120 dBm and reliability degrades below about -120 dBm. But -120 dBm is *not* a hard floor: at high spreading factors (SF11/SF12, the Long Fast and Long Slow presets) the SX1262 decodes reliably down to roughly -131 to -137 dBm (BW 125 - 250 kHz). The usable RSSI floor depends on the active modem preset, so don't reject an otherwise-usable high-SF link just because RSSI dipped past -120 dBm.

SNR is signal-to-noise ratio in dB. LoRa's key advantage over conventional radios is its ability to decode packets at *negative* SNR values, and how far negative depends on the spreading factor. The theoretical demodulator SNR floor is about -7.5 dB at SF7, about -17.5 dB at SF11, and about -20 dB at SF12. So the SNR at which a link fails is preset-dependent: a Long Slow (SF12) link decodes well below where a fast, low-SF (SF7) link would already be failing.

Rule of thumb (these bands are preset-dependent - treat them as a rough guide and interpret SNR against your active modem preset, not as universal thresholds):

- SNR > 0 dB - strong signal on any preset.
- -5 to -10 dB - marginal on fast/low-SF presets (e.g. ShortFast), but still solidly decodable on Long Fast (SF11) or Long Slow (SF12).
- Below -15 dB - near the noise floor and likely to lose packets on low-SF presets, but long-range high-SF presets routinely decode down toward -20 dB SNR, so -15 dB is still usable on Long Fast / Long Slow.

For planning purposes it can help to adopt a single conservative marginal-SNR floor (around -15 dB) across the book, while remembering the true decode floor is lower at high SF (SF11 ≈ -17.5 dB, SF12 ≈ -20 dB).

Reading Signal Data in Meshtastic

The Meshtastic app shows RSSI and SNR for each received packet in the message details view. This is real link-quality data from your actual deployment - use it as your primary signal source during field testing. For multi-hop paths, the Meshtastic **traceroute** feature reports the **SNR per hop** (not RSSI), which is useful for finding the weakest link in a chain of repeaters.

Recording a Coverage Map

Simple approach: note GPS coordinates alongside SNR and RSSI values in a spreadsheet while driving, then export the data to Google My Maps or another mapping tool.

Automated approach: enable the Meshtastic [Range Test module](#) (Config → Module → Range Test). It automatically logs positions with signal data to a CSV file as you walk or drive the area. In a range test the fixed node acts as the Sender and the mobile node acts as the Receiver - the Receiver is the one that logs the CSV with GPS.

Visualisation: import the CSV into Google My Maps or QGIS to produce a signal-strength overlay map that you can compare directly against your predicted coverage.

What to Look For

- **Expected coverage but no packets:** interference, antenna issue, wrong modem preset, or an obstruction absent from the terrain model.
- **Better-than-expected coverage:** diffraction over a ridge, reflections from buildings or open water.
- **Unexpected dead zones:** metal structures, buildings with metal roofing, or terrain features not captured in SRTM data (SRTM is coarse ~30 m surface-model data, so small obstructions are easily missed).

Iterating on the Design

If field testing reveals coverage gaps, consider: adding a second repeater as a relay node, increasing antenna height, or repositioning the existing repeater. A 10-metre increase in antenna height can eliminate a surprisingly large dead zone - elevation is often more valuable than additional TX power.

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