

Pre-Measurement & Cable Check with ISB40NN “Golden Reference Trace”

Verifying VNA System Accuracy and Cable Functionality

Perform a SOLT (Short-Open-Load-Thru) calibration. If you’re conducting a differential calibration, measure the connectorized golden reference differential trace on the ISBNN VNA Test Verification Board shown in Figure 1. Ensure your insertion loss measurement covers the full stop-frequency bandwidth supported by both the VNA and the ISBNN board.

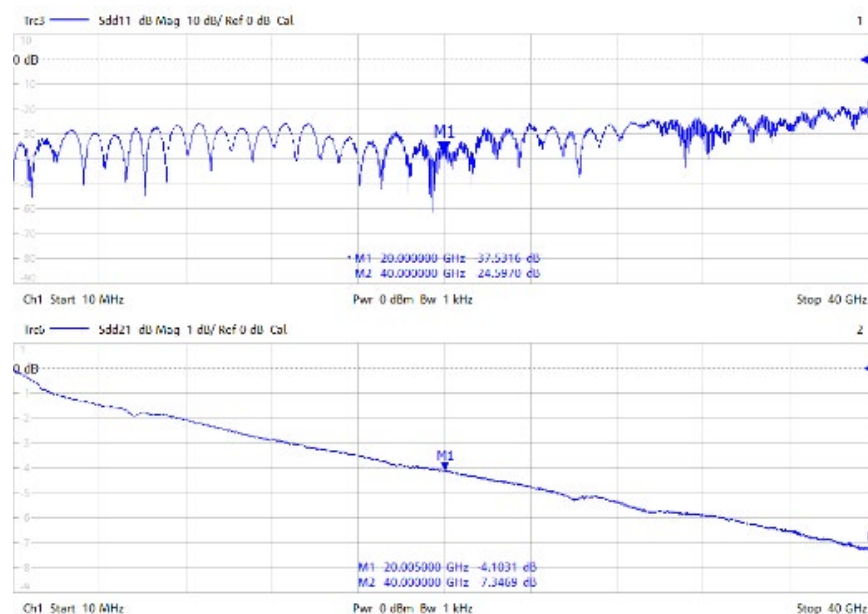


Figure 1. 40 GHz insertion loss measurement from an ISB40 40 GHz differential trace.

As shown in Figure 1, the measurement should exhibit a smooth, linear frequency roll-off with minimal noise and no narrow frequency dropouts. If you’re unsure of the expected profile, consult the gold reference trace examples in the [ISBNN & DBNN User Guide](#).

If the measurement follows this signature, the VNA is fully calibrated, all cables are functioning properly, port assignments are correct, and no front-panel settings are compromising the measurement accuracy. Your VNA is now ready for critical measurements.

Troubleshooting

- If there is noise or a narrow frequency suckout in the golden reference measurement, you are likely to have a bad cable. Use a spare unused cable and swap out one cable at a time until the real-time measurement matches the stored reference measurement.
- If there are no anomalies in the insertion loss measurements, but they do not correlate with the golden reference trace measurement, a front panel setting might be causing the issue.
- If the measurement does not have noise or frequency suckout, but the insertion loss does not match the golden reference measurements:
 - There may be a de-embedding file left in the VNA setup that is not related to your measurements.
 - Check for offset value settings or other settings not relevant for your measurement.
 - Check for proper VNA port assignments.

The goal is to get the Gold Reference insertion loss measurement to have a linear loss signature with no noise or random frequency suckouts, offsets and the insertion loss should start at 0 dB, etc. If all these issues are negative it is possible that the VNA needs to be sent for calibration or repair.

Verifying Differential De-Embedding Probe Models with the ISB40 40 GHz VNA Test Verification Board

To verify the GigaProbes differential probe model's accuracy, make an insertion loss measurement from the "probe to connector trace" on the ISB40 Test Verification Board (see Figure 2). The following procedure demonstrates how to use this insertion loss measurement from the ISB40 40 GHz board to validate the accuracy of the DVT40 probe de-embedding file developed with AtaiTec ISD software (see [In-Situ De-embedding \(ISD\) - AtaiTec](#)).

1. Setup

- Use a DVT40 or DVT-FPP40 40 GHz differential probe and a 40 GHz VNA with differential calibration.
- Connect the differential probe to the VNA's differential probe positioner arm using an adapter.
- Place the probe tips on the differential "probe pads to connector trace" on the ISB40 board.
- Attach two cables to the end of the trace and to the VNA's second differential port and make a 40 GHz Raw Reference insertion loss measurement.

2. Raw Reference Measurement

- This raw measurement contains the accumulated loss of the probe and trace that corresponds to the green insertion-loss plot in Figure 3.
- The raw DVT40 40 GHz insertion loss measurement may exhibit resonances due to removing the dielectric between variable pitch (0.35-1.6mm) probe tips, which increases the input impedance and causes mismatch reflections at the test pads. These resonances are largely mitigated by de-embedding. In contrast, the fixed-pitch DVT-FPP40 40 GHz probe uses an internal high-bandwidth PCB to achieve a linear frequency response with an input impedance of about 95 ohms, closely matching the 100-ohm differential trace which minimizes impedance mismatch reflections.

3. Verification

- Save this real-time measurement from the probe pads to the connector trace to the VNA memory.
- Load this measurement on the VNA screen as a reference.
- Ensure the probe remains on the traces, and the measurements should overlap. If they do not, the probe might have moved off the trace.

4. De-embedding

- Load the DVT40 or DVT-FPP40 probe de-embedding file into the VNA.
 - The file may be stored on a memory stick that came with the probe system.
- Apply this de-embedding file to the real-time green raw measurement in the VNA.
- This should remove the DVT40 probe loss, shown as the blue insertion loss trace in Figure 3.
- The blue measurement should show ~4 dB less loss than the raw green trace, indicating the probe loss has been removed, leaving only the PCB trace loss.

5. Conclusion: The difference in loss represents the probe's frequency loss, leaving only the PCB trace loss.

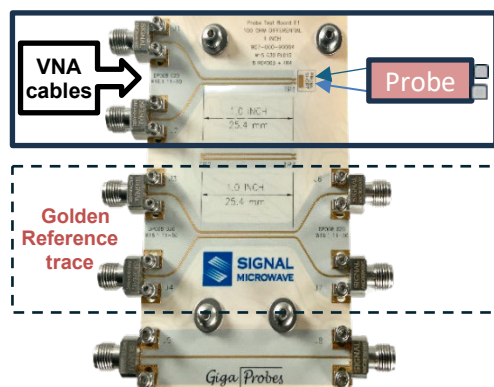


Figure 2. ISB40 VNA Test Verification Board (40 GHz, 50 GHz 70 GHz and 110 GHz)

Figure 3. Verifying de-embedding accuracy involves comparing the insertion loss measurements from the probe pads to the connector trace on the ISB40 board.

The green trace shows the raw measurement, including both probe and trace loss.

The blue trace represents the same measurement with probe de-embedding applied, isolating only the trace loss from the green raw data.

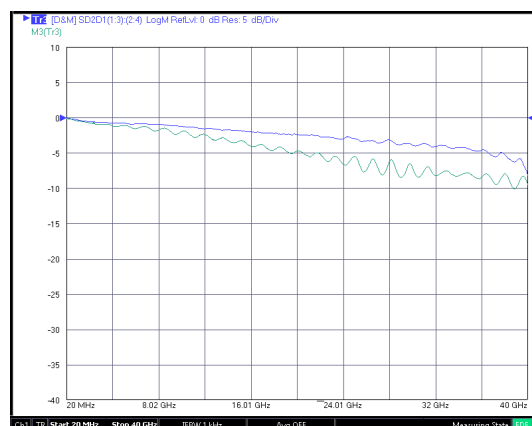


Figure 3. The difference between the two traces equals the de-embedded probe loss.