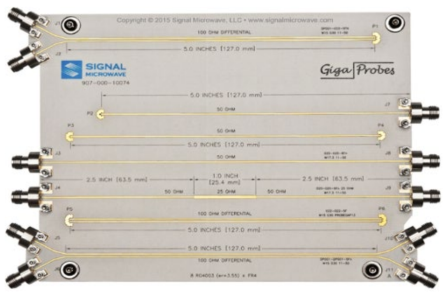
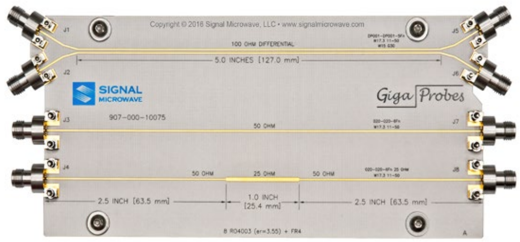
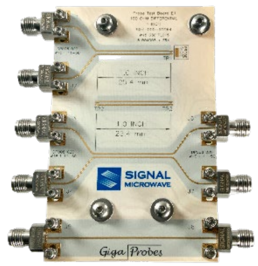
DBNN & ISBNN Test Verification Boards



DBNN-002



DBNN-003



ISBNN

Vector Network Analyzer (VNA) Measurement calibration is an accuracy enhancement procedure that removes repeatable systemic measurement errors that cause uncertainty in measuring a Device Under Test (DUT).

A VNA calibrates measurement by measuring actual, well-defined short, open, and load (SOLT) standards and mathematically comparing results with ideal "models" of these standards. During calibration, all cables and connections without a DUT are measured, however it does not include a full sweep frequency measurement against a known loss standard.

After completing calibration, a secondary verification is required, as the calibration standards are lossless, so they cannot be used as a known frequency loss response over frequency to verify all cables are in good condition. This step is critical because a common failure in cables is frequency dropouts or noise caused by small breaks in the ground shield from repetitive movements. These frequency dropout errors become part of the VNA measurement of the DUT. A prototype design can be compromised by this error and lead to rejection. Note that SOLT calibration doesn't reset VNA controls to a neutral state of operation. Instead, it retains the previous user's control settings. The setup may include offsets, embedded models, and other setups incompatible with testing requirements which can result in inaccurate measurements and wasted time trying to determine why measurements are incorrect.

GigaProbes' DBNN-002, DBNN-003 and ISBNN test verification boards have various critical uses and benefits in the process of VNA calibration and measurement, and are available in configurations for 40, 50, 70 and 110 GHz as shown below. The ISBNN boards are used specifically to create measurements from the probe to connector trace that is used to develop the Ataitec ISD probe model which the VNA uses to de-embed the probe loss from the trace measurement.

Applications

Use to locate bad cables not detected by the system SOLT calibration.

Detect front panel setups unsuitable for measuring differential traces.

Identify measurement inaccuracies in VNA systems before testing to save time and money.

Use the in-situ trace to create an Ataitec ISD differential probe model and verify its accuracy to remove probe loss from the PCB measurement.

Specifications

Bandwidths: Determined by the RF connectors

1 ea. differential “connector-to-connector” golden reference trace

1 ea. differential “probe-to-RF connector” in-situ measure trace

Benefits

Make accurate bandwidth S-parameter measurements on passive linear interconnects and systems.

Avoid using bad RF cables before measurements are performed.

Series & Part #s	Bandwidth	The following traces are included on each board in a series
DB40-002 DB50-002 DB70-002	40 GHz 50 GHz 70 GHz	100-ohm, 50-ohm, and Beaty line connector-to-connector traces, connector-to-probe pad traces and probe-pad-to-probe-pad traces.
DB40-003 DB50-003 DB70-003	40 GHz 50 GHz 70 GHz	100-ohm, 50-ohm, and Beaty line connector-to-connector traces
ISB40 ISB50 ISB70 ISB110	40 GHz 50 GHz 70 GHz 110 GHz	100-ohm and 50-ohm connector-to-connector traces and 100-ohm connector-to-probe pad traces.

How to verify VNA measurement system accuracy

To verify that all VNA cables are good and front panel settings are correct, measure S-parameter bandwidth on a differential or single-ended trace located on a DBNN/ISBNN Test Verification Board. After the measurement, the VNA will display a linear frequency power roll-off graph as shown in *Figure1*.

If unsure whether the measurement is correct, compare it with a "golden trace" measurement taken from similar traces by a factory calibrated VNA with new cables. See the DBNN & ISBNN Test Boards User Guide which includes these measurement plots. The tests verify that all cables are in good condition and that the front panel settings are correct for passive linear interconnect testing and that it is ready for critical testing.

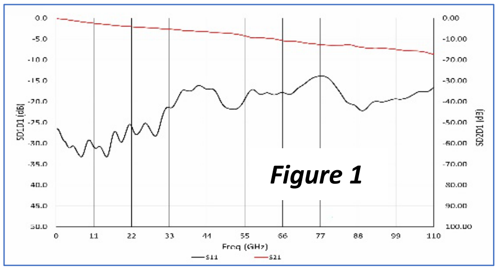


Figure 1

If the measurement indicates that the front panel is set correctly, but the measurements still contain noise or frequency dropouts, remove all cables and attach one cable at a time. Then run the same comparative verification test on each cable until the defective cable is located. If the measurement is still noisy, the VNA will likely need to be sent to a calibration and repair lab for diagnostics.

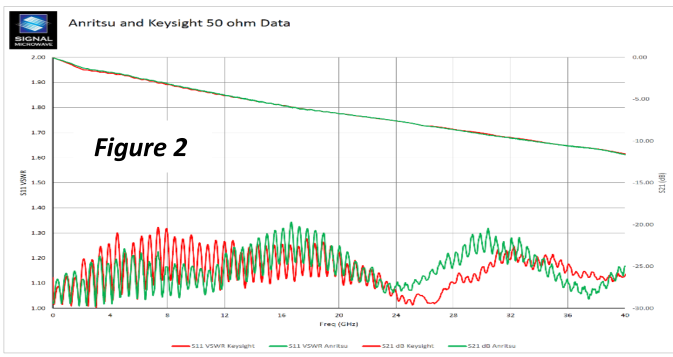


Figure 2

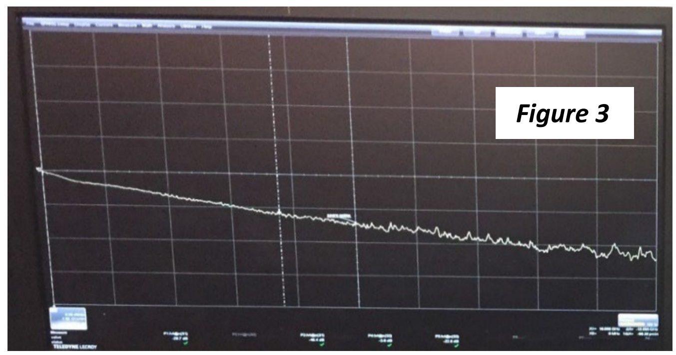


Figure 3

Ideally, you should compare the measurements with your own "Golden Standard" measurements taken with the VNA that you will use to make the test measurements). The S-parameter bandwidth measurements are obtained from the traces on the Test Verification Board once the VNA has been calibrated and the cables are known to be good. Store these measurements as your "Golden Standard" along with the front panel settings on a separate memory stick to prevent overwriting in the VNA.

To verify that the VNA is measuring accurately, recall the VNA settings, then acquire the stored "Golden Standard" measurement from the memory stick. Store the measurement on the screen as a reference waveform. Then, using the Test Verification Board, measure the same trace live and overlap the two waveforms. If the two measurements correlate (*Figure 2)*, the VNA will make accurate measurements.

If the two traces do not match (*Figure 3*), there may be a problem with the front panel setup of the VNA, or you may have discovered a defective cable before making critical measurements, and further investigation is required. You may use the same "Gold Standard" measurement and perform the same comparative measurement process to locate the defective cable, switching out a known good cable one at a time until you locate the defective cable.

Verify probe system bandwidth

The green trace (*Figure 4)* shows a differential in-situ insertion-loss measurement utilizing a differential probe from the probe-to-connector trace on an ISBNN or DBNN-002 board, which includes both probe and trace frequency loss.

In conjunction with a short/open S2p measurement, the Ataitec ISD software can be used to create a differential probe model which the VNA uses to de-embed the probe loss from the measurement, resulting in the blue trace.

The dB loss measurement between the two insertion-loss measurements represents the probe loss value which verifies the probe model's de-embedding accuracy.

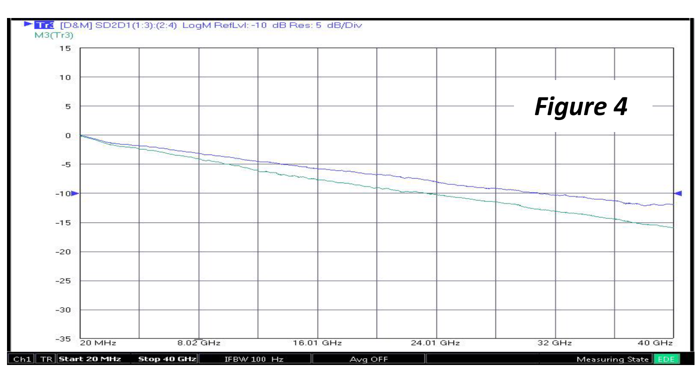


Figure 4