

Stability of R&S ZVL3 at Room Temp

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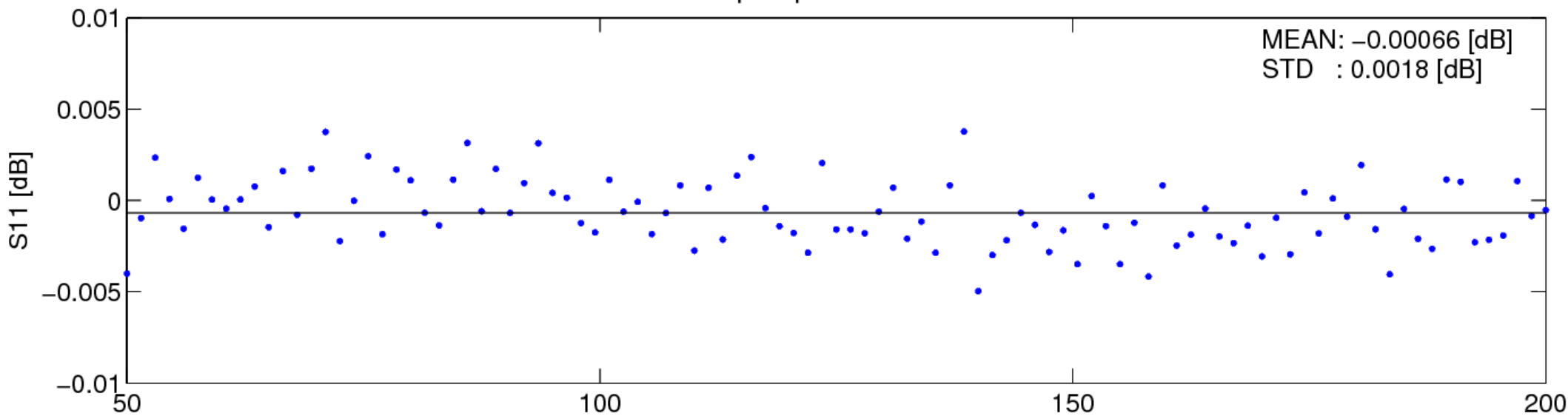
Loads considered:

- open port
- attenuator
- 50 ohm termination

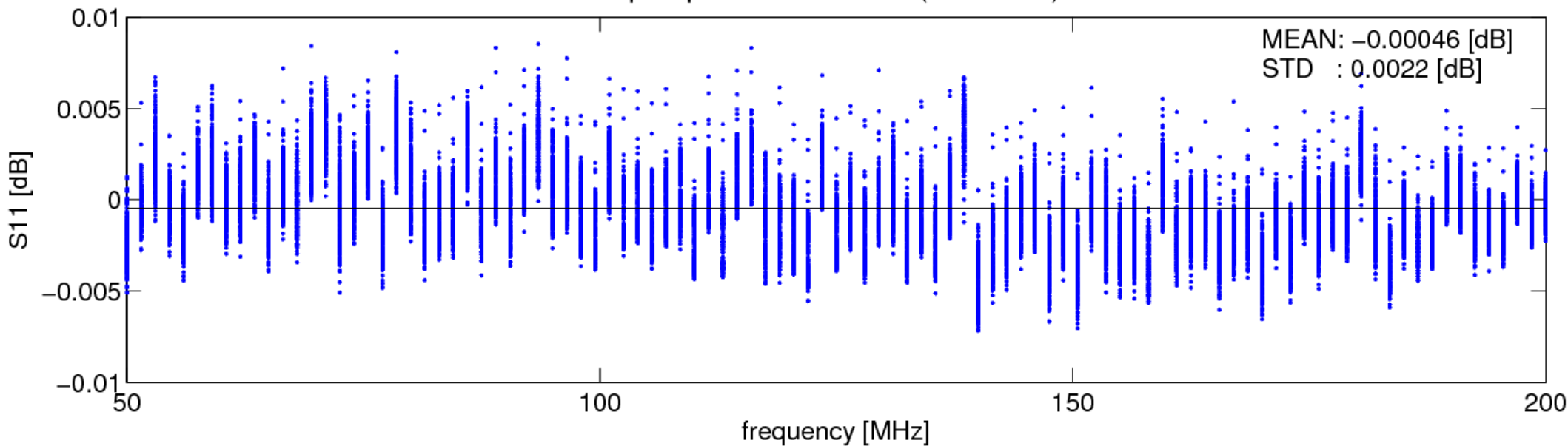
Settings of the VNA:

- SOL calibration using Maury 8050B kit
- Power level: 0 dBm
- Frequency range: 50 - 200 MHz
- Frequency resolution: 1.5 MHz
- Measurement bandwidth: 100 Hz
- Trace averaging: 10 times
- Number of traces: ~150
- Trace recording period: 1 per minute
- Room temperature: 23 C

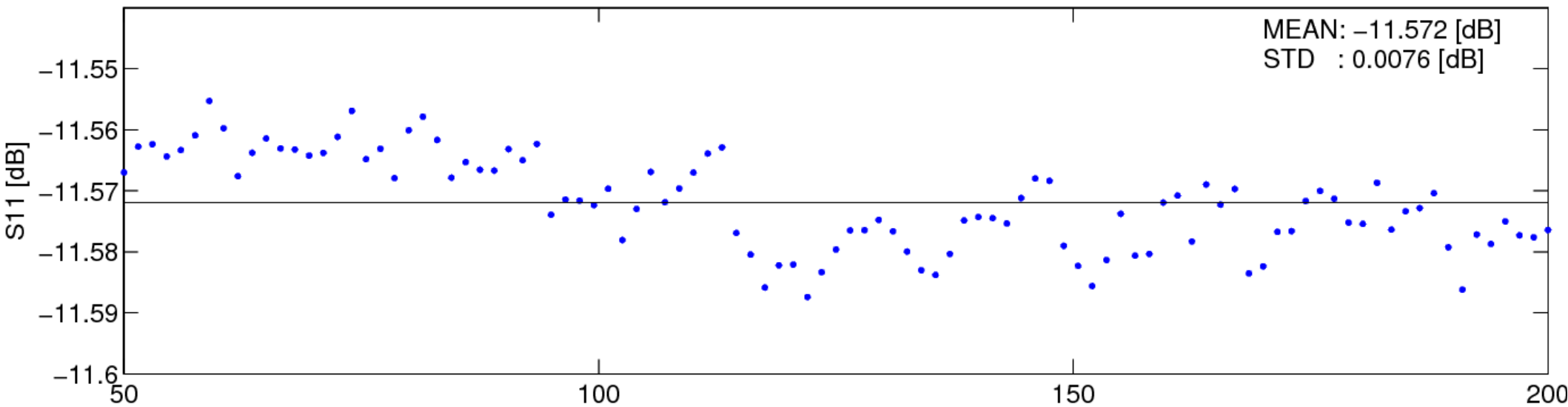
open port: 1 trace



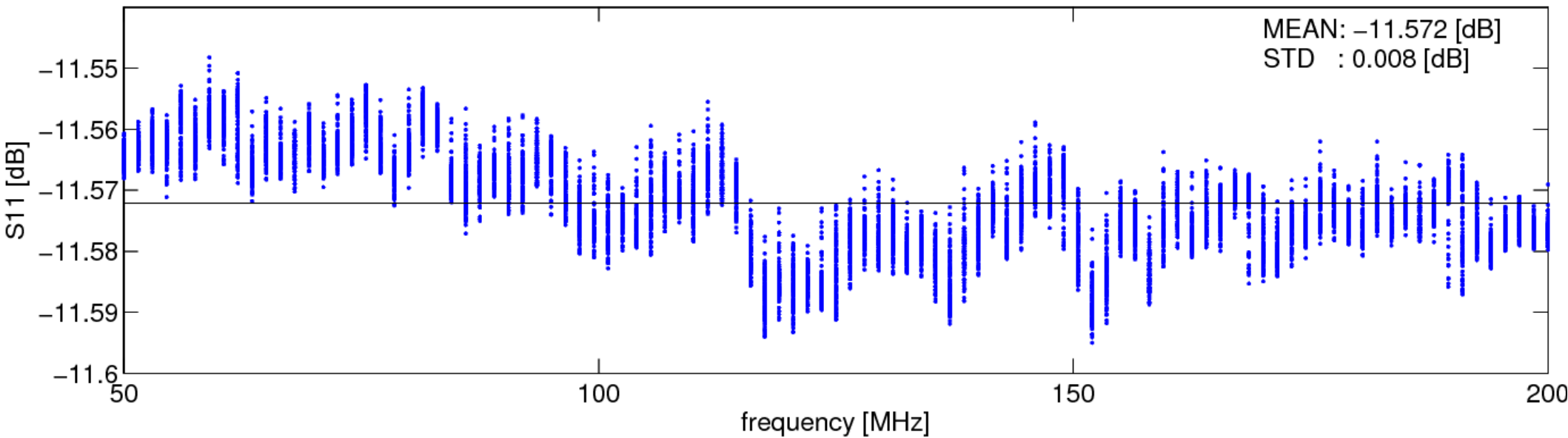
open port: ~150 traces (2.5 hours)



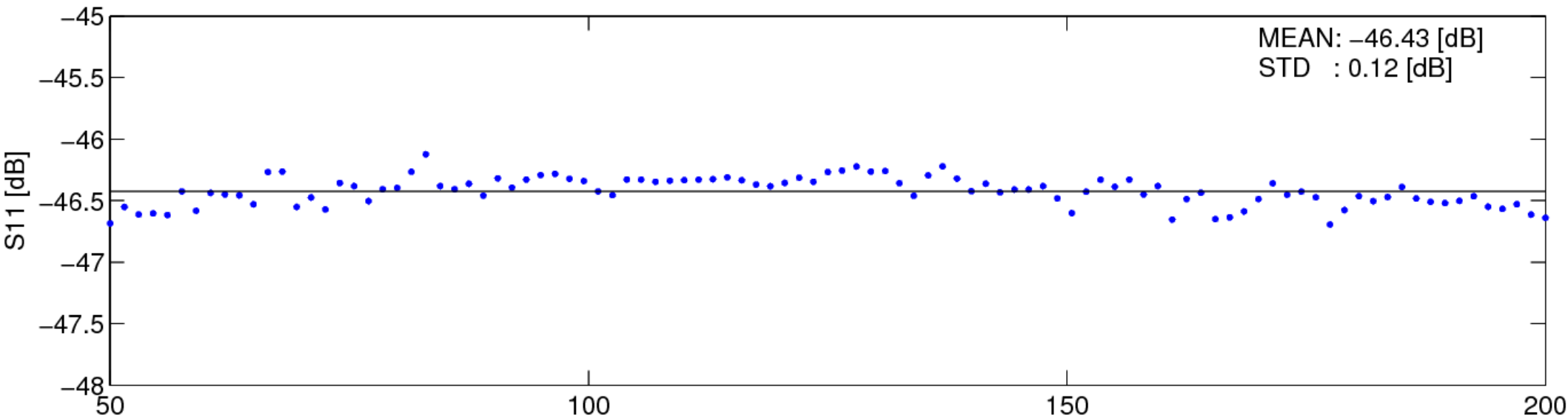
attenuator: 1 trace



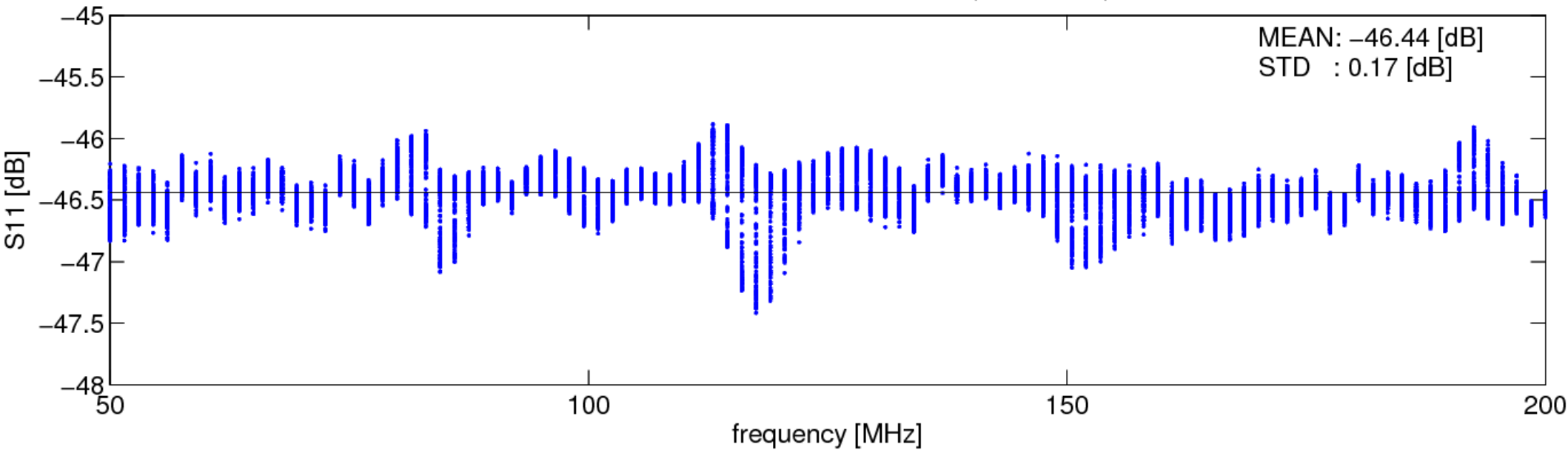
attenuator: ~150 traces (2.5 hours)



50 ohm terminator: 1 trace



50 ohm terminator: ~150 traces (2.5 hours)



Conclusions

1) After 2.5 hours of measurements, if the expected response of S11 is flat in the frequency domain, the overall STD increases with respect to the result from one measurement as following:

	<u>Mean [dB]</u>	<u>1 Trace [dB]</u>	<u>150 Traces [dB]</u>	<u>Increase [%]</u>
Open port	0	0.0018	0.0022	22
Attenuator	-11.57	0.0076	0.0080	5
Termination	-46.44	0.12	0.17	42

2) The increase is less than 50%. Therefore, in all cases the primary contribution comes from the noise in the frequency domain, and not from the scatter in time.

3) This suggests that if an S11 measurement is done less than two hours after the VNA calibration (keeping the temperature constant), the relative uncertainty can be obtained directly from the scatter of the trace when compared to a flat line (for a resistive load).

4) For an antenna with S11 around -15 [dB], one or more attenuators could be used to establish the relative uncertainty at that level (again, if the temperature has been kept constant). From the table above, at a level of S11= -15 [dB] the expected relative uncertainty is about 0.01 [dB].