VNA Accuracy Test 2

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Description

- ▶ This tests focuses only on the Agilent E5072A VNA. The main purpose is to compare the shape of the trace for three different 10-dB attenuators at three power levels, -10 dBm, -5 dBm, 0 dB. The other settings are:
  - ▶ frequency range: 1 to 300 MHz
  - ▶ frequency resolution: 1 MHz
  - ▶ bandwidth: 100 Hz
  - ▶ averaging: 20 traces
- ▶ The steps in the testing at each power level are:
  1. calibrate the VNA at its SMA port with the *open*, *short*, & *match* standards of the Agilent Calkit 85033E.
  2. measure the same *open*, *short*, & *match*, AGAIN after calibration.
  3. measure the three attenuators.
- ▶ There is one test where the frequency range is extended from 1 MHz to 1 GHz, while keeping the other settings. The calibration was performed after extending the range.
- ▶ The attenuators are labeled *attn1*, *attn2*, and *attn3*. *Attn1* is the same as *attn1* in the previous test. Attenuators *attn2* and *attn3* are new, of different brand, to see if a flatter magnitude was achieved with these devices.
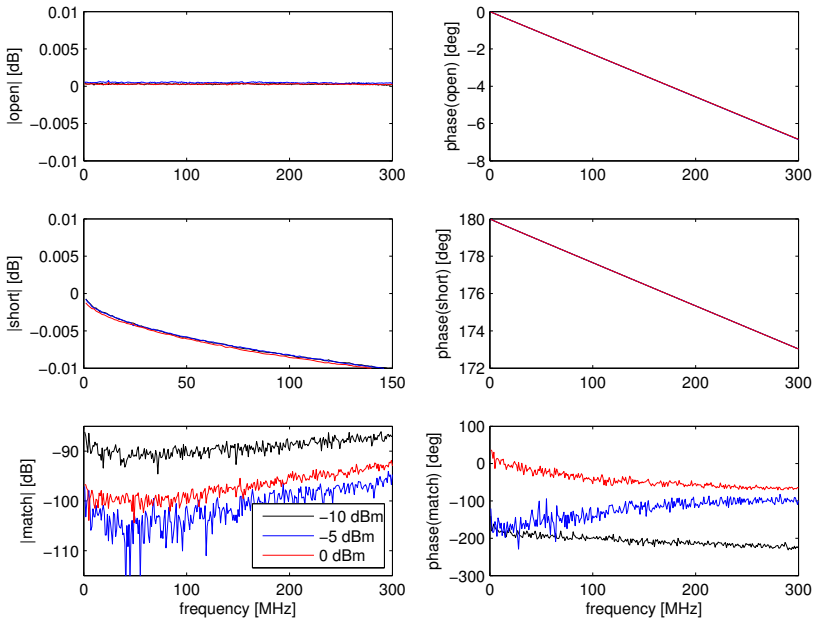
Figure: Standards of the Agilent 85033E calibration kit, after calibration, at different power levels. The magnitude of the traces for the *match* are low but not flat. The curvature has a minimum between 50 and 100 MHz.
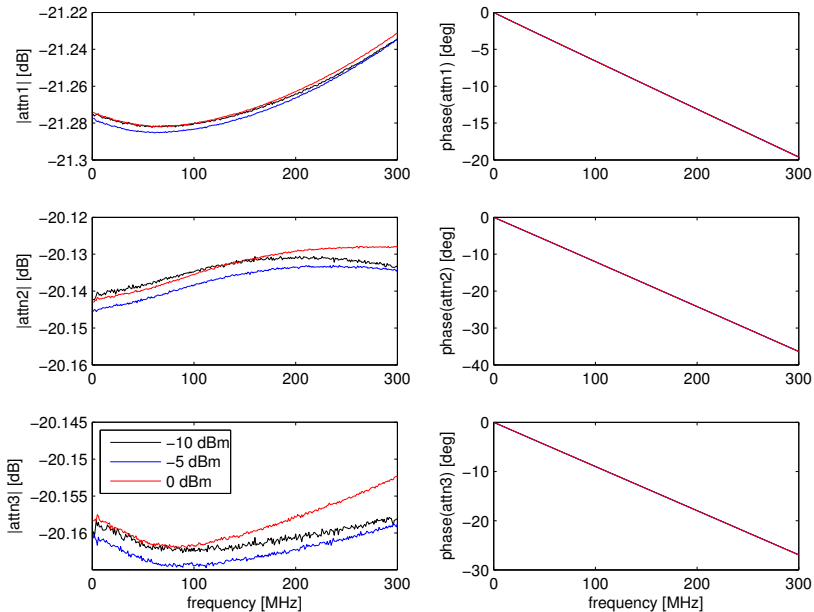
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Figure: Attenuators at different power levels. The curvature of the magnitude remains similar as power decreases.
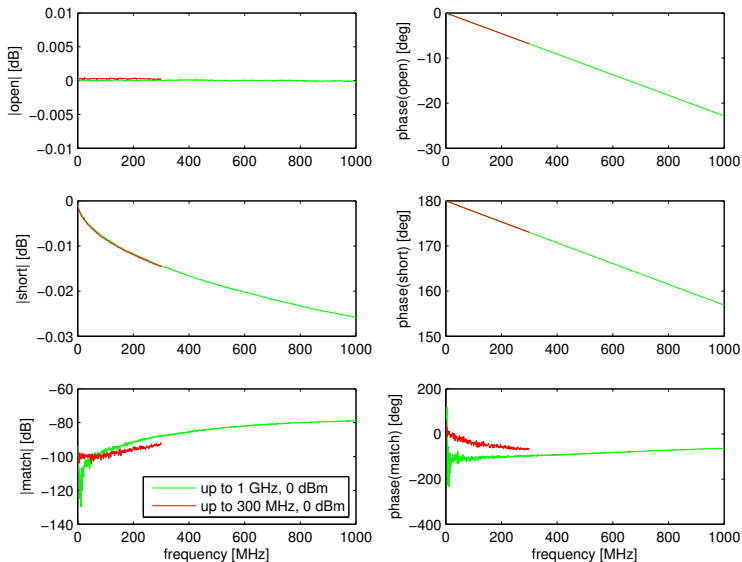
4

Figure: Standards at 0 dBm, up to 300 MHz and up to 1 GHz. The *match* is different in the two cases, including the curvature.
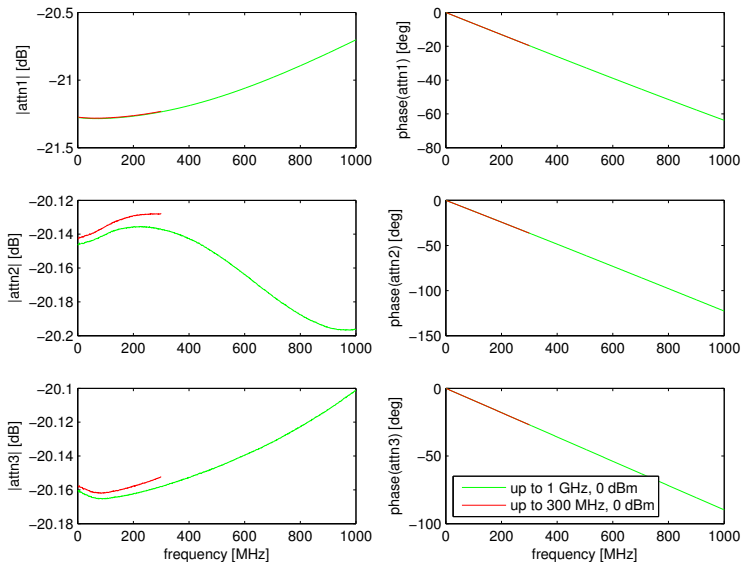
Figure: Attenuators at 0 dBm, up to 300 MHz and up to 1 GHz. The curvatures remain close in the two cases.

Discussion

- At lower power levels the curvature of the attenuators persist.
- The *match* is modeled as a 50-ohm load and therefore its magnitude is expected to be flat. The measured traces are low, but not perfectly flat.
- The curvature of the *match* is different between the measurement up to 300 MHz and up to 1 GHz, but the curvature of the attenuators remain similar in both frequency ranges. This suggests that the 'error' on the measurement of the *match* is not necessarily the cause of the curvature of the attenuators.
- A good test of sensitivity to the measurement of the *match* consists of using a different calibration kit. We have available the Maury 8050S, but its definition files are in CKT format. I have asked Maury to send me the files in CKX format so they can be loaded on the ENA-series Agilent VNA.