VNA Accuracy Test 2

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Description

- This test 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.
Figure: Attenuators at different power levels. The curvature of the magnitude remains similar as power decreases.
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.