



Schweizerische Eidgenossenschaft
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Federal Institute of Metrology METAS

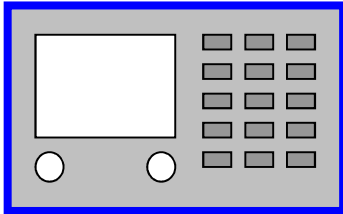


VNA accuracy and traceability

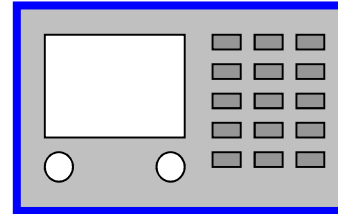
Juerg Ruefenacht

Motivation

VNA 1 (**ideal** load definitions)



VNA 2 (**database** load definitions)



Cal Kit 1 (generic and/or polynomial data)

Open: polynomial data (C-terms)
 Short: polynomial data (L-terms)
 Load: assumed to be perfect $50+j0$ ohm

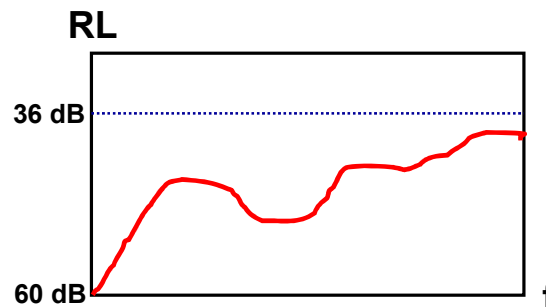
Specs: O / S: phase deviation from nominal
 Load: RL better than 36 dB

Cal Kit 2 (data base data with unc.)

Open:
 Short:
 Load:

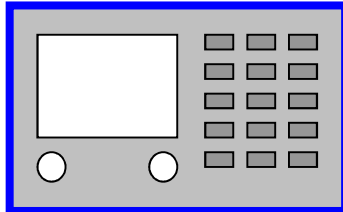
VRC		VRC f(frequency)		
freq	freq	freq	real	imag
1	1	1	1.23	3.47
2	2	2	1.23	3.47
3	3	3	1.23	3.47
4	4	4	1.23	3.47
5	5	5	1.23	3.47

As an example: assumption that we have two identical loads in both calibration kits.

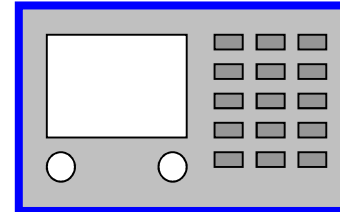


Motivation

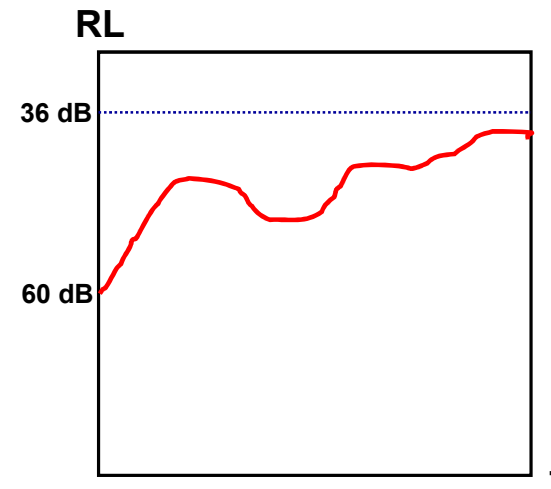
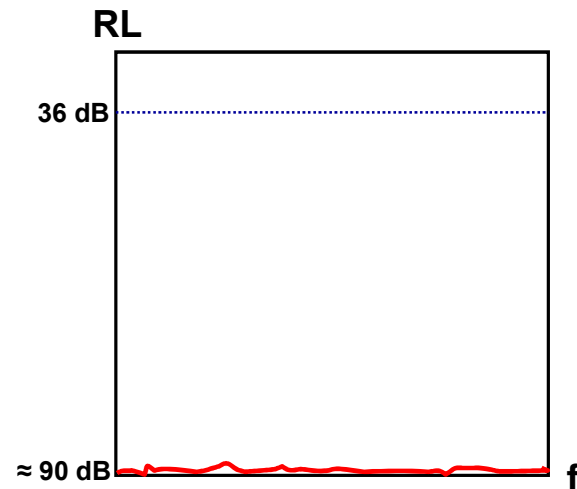
VNA 1 (**ideal** load definitions)



VNA 2 (**database** load definitions)

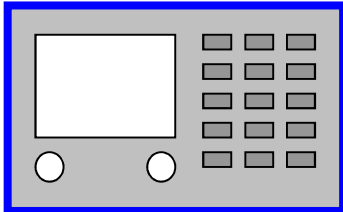


1st step: Perform a OnePort cal and directly measure the used cal load (without a new connection)

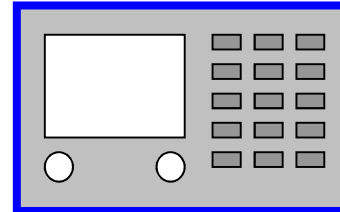


Motivation

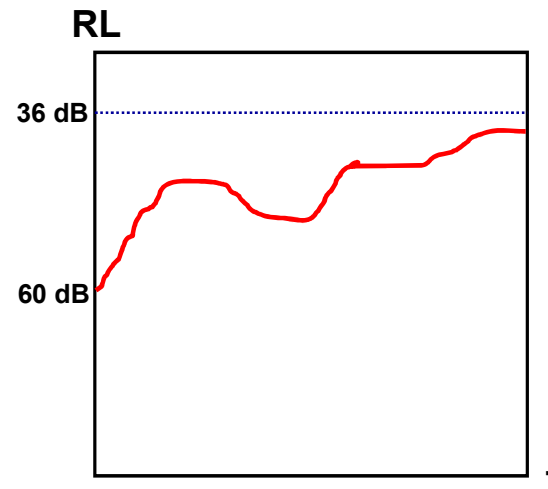
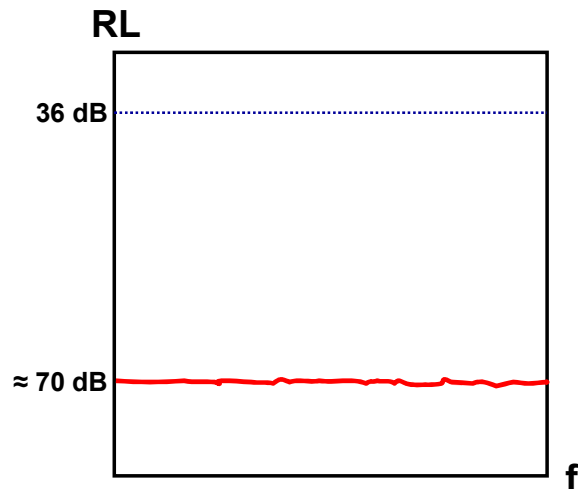
VNA 1 (**ideal** load definitions)



VNA 2 (**database** load definitions)

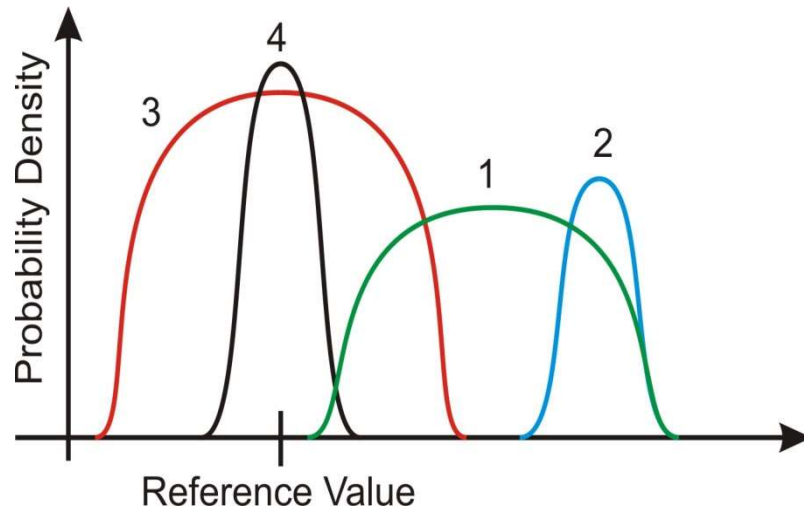


2nd step: Re-measure the used cal load (new connection – now including the connector repeatability)



Customer question: which VNA is more accurate → traceability?

Motivation: VNA accuracy



1. **inaccurate and imprecise**
2. **inaccurate but precise**
3. **accurate but imprecise**
4. **accurate and precise (goal)**

inaccurate: e.g.: using a non-traceable calibration kit, compression

imprecise : unstable VNA hardware or measurement set-up