The New EURAMET cg-12 Guide

Guidelines on the Evaluation of Vector Network Analysers (VNA)

CCEM GT-RF meeting, BIPM, 2015-03-10

Background

- EURAMET cg-12 (previously EA-10/12) is in use by accredited labs and many NMIs

- … is considered to be outdated and not applicable at higher frequencies

- Guide promotes Residual Error Model:
  - Formalism not GUM compliant
  - Scalar treatment, phase neglected
  - Assumptions questionable (ideal airlines, connector reflections ignored) and limits of applicability not defined
  - Promotes sometimes just «typical values»
  - Origin of equations not referenced (see ANAMET report 51)

- Revision of guide within EMRP project «HF Circuits»

HF-Circuits

EMRP Project (07-2013 to 06-2016)

Task 5.4: METAS, LNE, NPL, PTB, SP, VSL

5.4.1	Layout of new EURAMET Guide defined. Timeline for rewrite defined and writing tasks assigned.	METAS	LNE, NPL, PTB, SP, VSL	Document	Dec 2014
5.4.2	First draft of new EURAMET Guide ready for review	METAS	LNE, NPL, PTB, SP, VSL	Draft Guide	June 2015
5.4.3	Second draft of new EURAMET Guide ready for review	METAS	LNE, NPL, PTB, SP, VSL	Draft Guide	Dec 2015
5.4.4	Revised EURAMET Guide submitted to EURAMET for publication.	METAS	LNE, NPL, PTB, SP, VSL	Guide	May 2016

Target Audience

- Industrial labs: not so much

- Calibration Laboratories: strongly

- NMIs: partly

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Content of current Guide

- Reference Standards: «Traceability Kit» (enhanced verification kit)
- Mathematical Models: very brief
- Uncertainty evaluation
  - Rationale for Residual Error Model
  - One Port and Two Port Magnitude
    Residual Errors with ripple method
    device, cable and connector uncertainties (typical values)
    equations for mismatch and isolation

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Content of revised Guide 1/3

- Introduction
    - How to read this guide
    - Why an updated guide
    - Scope and Applicability (primarily coaxial measurements)

- Traceability scheme, Reference standards
    - Traceability chain
    - Measurement standards

- VNA Calibration schemes
    - SOLT
    - Unknown Thru
    - ECUs

Content of new guide 2/3

- Verification
    - Purpose
    - Verification Standards
    - Plausibility checks
    - Verification criteria

- Uncertainty contributions in a VNA measurement
    - Identification of contributions
    - Characterization of contributions

- VNA measurement model

Content of new guide 3/3

- Uncertainty evaluation
  - Verification based uncertainty estimation
  - Revised ripple method
  - Rigorous uncertainty propagation through measurement model

- Practical advice, best measurement practice

- Appendix
  - Examples
  - Technical details
  - Waveguide section