

VNA Tools Training

Subject	VNA Tools II workshop
Document version	v.01
Instructors	Michael Wollensack, Juerg Ruefenacht, Marko Zeier
Organisation	METAS
Date	08. – 10. November 2016 (09:00 – 17:00)
Location	METAS, meeting room HB30

Agenda

VNA Tools – theory parts

- Introduction (Project, Motivation, License)
- VNA Tools overview
- VNA Tools uncertainty calculation overview (the core library: Metas.Unclib)
- VNA Tools measurement model and uncertainty calculation
- VNA Tools demonstration
- VNA Tools data formats
- VNA Tools optimization calibration

VNA Tools - practical parts

- Installation, data taking, Measurement Journal
- Calibration (available methods and error term calculation)
- Error Correction
- Visualisation, Data analysis, Data export
- Working with the Tool functionalities
- Good measurement practices (custom cables, statistical experiments, measurement set-up, ...)
- Data base (definitions and management)
- Evaluation of the VNA box data (Noise, Drift, Linearity, Raw performance, measurement wizard)
- New cal standard definitions (systematic connector effects) and near field coupling issue
- Future developments, Question & Answer, Feedback

Additional VNA metrology topics (if time and interest)

- S-parameter traceability chain used at METAS
- Best measurement practice hints used during the S-parameter traceability process

Note: Please do not forget to bring your own laptops with you.

Minimal system requirements: Windows XP or Windows 7, at least 512 MB (better 1024 MB) of RAM

© VNA Tools II

1 day: (Introduction, theory, installation, demo)

- Introduction
- VNA Tools overview
- Uncertainty calculation according GUM
- Metas.UncLib (concept and demo)
- Implemented VNA Measurement Model
- Software Installation
- One Port error model
- VNA Tools demo (general overview)
- Measurement Journal
- Hands-on example with a real VNA (to demonstrate the VNA Tools measurement process)

2 day: (using the software, S-parameter traceability)

- Two port error model (switched versus general model)
- Supported calibration concepts
- 2.4 mm example with measurement data collected at METAS:
 - SOLT_01 example (generic cal standard definitions from the cal kit manufacturer)
 - UThru_01 example (generic cal standard definitions from the cal kit manufacturer)
 - QSOLT_01 example (generic cal standard definitions from the cal kit manufacturer)
- Presentation about the systematic connector effects (based on the new research collaboration outcomes with Keysight, Huber+Suhner and METAS)
 - SOLT_02 example (data base standard definitions; including the systematic connector effects)
 - UThru_02 example (data base standard definitions; including the systematic connector effects)
 - QSOLT_02 example (data base standard definitions; including the systematic connector effects)
- Discussions on how to improve the measurement set-up (goal: to reduce uncertainties)
 - SOLT_03 example (data base standard definitions and better set-up)
 - UThru_03 example (data base standard definitions and better set-up)
 - QSOLT_03 example (data base standard definitions and better set-up)
- Optimization calibration (theory and example)

3 day: (additional topics, just a few typical examples:)

- Data formats supported by VNA Tools
- VNA Tools data base (connector, cable, cal standards, VNA box)
- How to evaluate the entries needed by the data base (new measurement wizard to determine noise effects)
- Post processing of the data including the uncertainties
- Add measurement series (DUT, Sliding Load, ECAL, step attenuators, VNA drift)
- Frequency lists
- Edit a measurement journal entry
- Define a statistical experiment (instable DUT)
- Custom cable or custom connector definitions
- Unc analysis (how to improve your system; where are the weakest links?)
- Driver development (VNA, step attenuator)
- Splitter characterizations (Juroshek method, 2-port method, 3-port method)
- Good measurement practice (hints and tips)

If time and interest:

- How VNA Tools can be used in the modeling process of airlines, offset shorts and flush shorts. The 'PrimaryOffsetShortStandard' and 'PrimaryLineStandard'.
- VNA Tools – software validation and verification.
- ...

Note: We do offer lab visits and time for individual discussions after each training day.