



Meeting of the CCEM – GT-RF, BIPM, 12-13 March, 2007

Activities in RF & Microwave and in EMC & Antenna METAS, Switzerland

1. RF & Microwave

1.1 Impedance and Network Analysis

The laboratory is currently in the process of extending its frequency upper limit from 50 GHz to 67 GHz. Mechanical deviations from the nominal geometry become increasingly important at higher frequencies. The impact of these deviations on the electrical properties are particularly hard to specify for the connector interface. For this purpose the R&D project *CoMo70* (Connector Modelling up to 70 GHz) has been initiated. The project investigates connector effects at high frequencies using electromagnetic field simulation tools. Part of the outcome will be refined VNA calibration methods which will help METAS to establish traceability up to 67 GHz. Participants of this project are: Swiss Federal Office of Technology ETHZ, METAS, Agilent and Huber+Suhner.

Web site: <http://www.aramis.admin.ch/Default.aspx?page=Grunddaten&projectid=21856>

1.2 Power, Attenuation and Noise

Calibration services for RF power with the 2.92 mm connector (K connector) have been improved, resulting in significantly smaller measurement uncertainties.

An extensive overhaul of the primary attenuation standard WBCO (Wave Guide Below Cut-off) took place. The whole system was mechanically revised and a new measurement software with improved measuring algorithm was written and implemented.

Measurement of Excess Noise Ratio (ENR) of noise sources and Noise Figure of amplifiers is provided as a new calibration service.

1.3 Pulse Parameter

The measurement of the spectral amplitude density of CISPR pulse generators is provided as a new calibration service. The method has been validated through the comparison of time domain and frequency domain measurements.

1.4 Complex-valued measurement uncertainties

Measurement quantities in RF & MW metrology are often complex-valued. The calculation of measurement uncertainties for complex-valued measurands, and multivariate measurands in general, is not that well established yet and software support is needed. In a collaboration with Blair Hall from MSL/IRL, New Zealand, an upgrade of the metrology software "VNA Tools" is underway to implement proper uncertainty calculation for S-parameter measurements. The laboratory is also collaborating with the Measurement Uncertainty Research Group (<http://www.mu.ethz.ch/>) at ETHZ, which develops the Monte Carlo based measurement uncertainty calculator "MUSE" that supports complex-valued measurands too.

Measurement uncertainty evaluation for multivariate quantities and the analysis of measurement comparisons with multivariate measurands have been discussed in conference contributions.

2. EMC and Antenna

The emc METAS laboratory can now calibrate antennas in the frequency range from 30 MHz up to 18 GHz (newly from 3 GHz to 18 GHz). Great efforts have been made in order improve the quality of the anechoic chamber above 1 GHz. For this purpose, our laboratory developed new absorber measurement methods from 80 MHz up to 18 GHz. With theses methods, we could compare 9 different commercial absorber samples. The idea is to replace parts of the existing absorbers of the anechoic chamber with new types of absorbers with the goal to increase the quality of the room above 1 GHz without loosing too much below 1 GHz. This work is in progress.

Significant contributions have been made to CISPR/A/WG1 for the specification of common mode absorbing devices (CMAD). The background document (CISPR/A/621) as well as the verification of CMAD document (CISPR/A/634/CD) have now been voted. A new document providing the specification of the CMAD (CISPR/A/677) has been prepared.

The capabilities of EMC immunity testing have been extended and include now automotive tests.

2.1 Non-ionising radiation

A draft recommendation for measurements of the non-ionising radiation of broadcast transmitters and UMTS base stations was issued in 2005 (in co-operation: Swiss Environmental Agency BUWAL and METAS). A successful comparison has been organised in order to assess the validity of the present recommendation as well as the measuring capabilities of accredited laboratories in Switzerland.