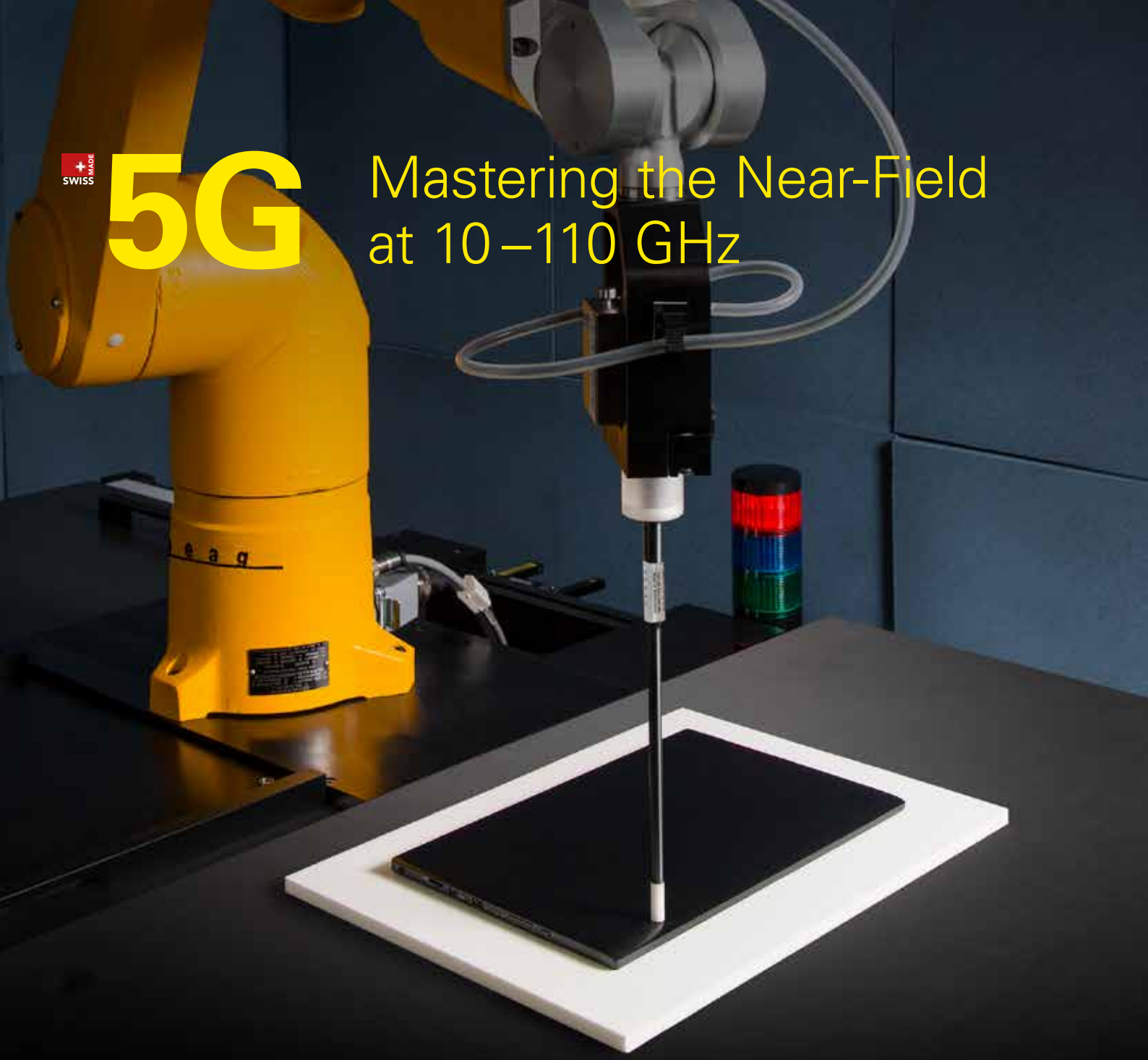

5G Mastering the Near-Field at 10 – 110 GHz

What Are Our 5G Solutions?

SPEAG's comprehensive portfolio of solutions support the wireless industry in design and compliance testing for the performance and regulatory demands of emerging 5G transmitters - including high-resolution and -precision near-field scanning with DASY6 or ICEy, total field analysis, far-field evaluations, and demonstration of compliance with exposure limits as close as 2 mm from transmitters operating in the range of 10 – 110 GHz. The SEMCAD X complementary high-end simulation platform provides all design features, optimization modules, and analysis tools for R&D of 5G transmitters. In addition, the research organization IT'IS Foundation at Zurich43 offers customized research from design to safety validation of 5G devices.

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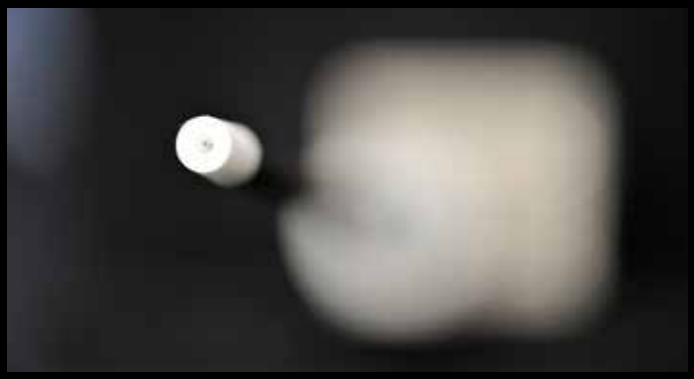
5G Solutions Mastering the Near-Field at 10 – 110 GHz

Novel EUmmWV2 Probe

The new EUmmWV2 probe is designed for precise interference-free measurement of mm-wave range near-fields. Made of two advanced high precision diode-loaded sensors printed on glass substrate (0.9 × 0.18 × 20 mm) protected by high density foam, the specifications are:

- Frequency range: 750 MHz – 110 GHz
- Dynamic range: < 20 – 3,000 V/m (with PRE-10 to 10,000 V/m)
- Deviation from hemispherical isotropy: < 0.5 dB at 60 GHz
- Linearity: < 0.2 dB
- Compatibility: DASY6 V6.4+ and ICEy V2.0+
- ISO17025 accredited calibration

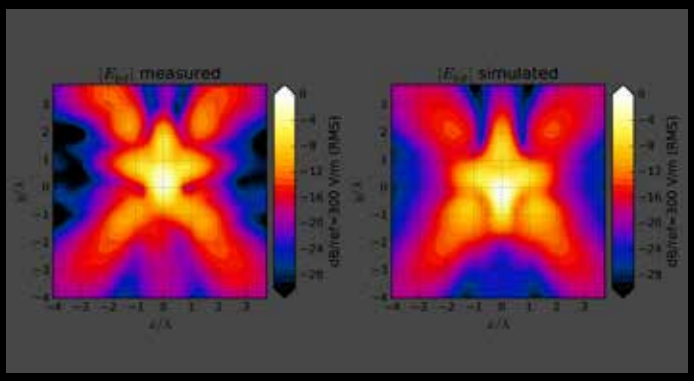


Close-up of the novel EUmmWV2 probe tip, revealing the sensors atop a glass substrate and surrounded by high-density foam.

5G Modules for DASY6 and ICEy

The specialized modules for near-field evaluations > 10 GHz offer the following features:

- User-friendly graphical user interface (GUI)
- Optimized number and location of measurement points as a function of frequency, the dimensions of and the distance of the evaluation plane from the device-under-test (DUT)
- Automatic DUT 3D surface reconstruction from laser triangulation scans in ICEy
- Novel algorithms for reconstruction of amplitude and phase (E, H, and S) from measurements of the E-field polarization ellipses on two planes
- User-defined power density averaging areas
- Reconstruction uncertainty at 2 mm distance < 15% for frequencies > 28 GHz; at 5 mm for > 10 GHz.
- Support for a large variety of scans
- Advanced visualization of magnitude, vector field, and spatially averaged values
- Field overlay on 3D model of the DUT in ICEy

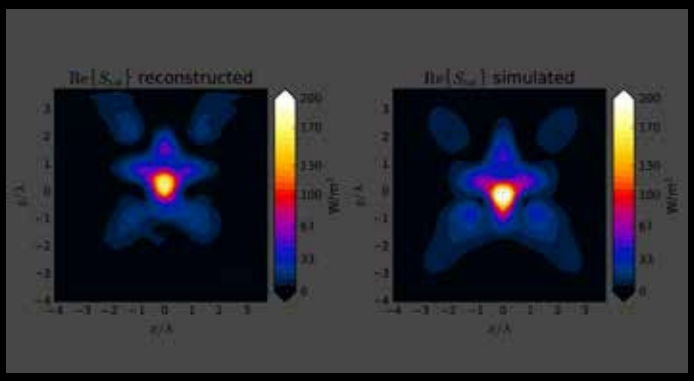


Measured E-field (left) compared to the simulations (right) at 30 GHz.

SEMCAD X 5G

The 5G extension of SEMCAD X/Sim4Life for optimization, performance assessment, and demonstration of compliance of 5G devices has these main features:

- Dedicated intuitive modelling tools to create CAD-models of phased arrays and to setup FDTD simulations
- Efficient array-factor far-field evaluators for fast prototyping
- Predefined phase/amplitude excitation patterns to simulate arrays operating under various conditions
- Latest surface-averaged power density evaluators
- Direct comparison with the DASY6 results of the 5G Module
- Compatible with circuit design software tools for analysis and further optimization of feeding network effects
- Parameter sweeps and optimizer to automate design workflows
- Generalized Huygens approach (multi-scale, micro-macro)
- MIMO module to analyze diversity performance
- Fastest, most robust FDTD, FEM, and MM solvers; CPU-GPU, AXE/CUDA, latest NVIDIA PASCAL architecture

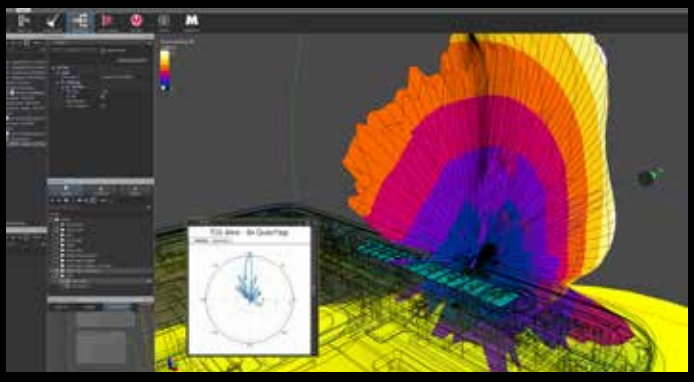


Reconstructed power density (left) from measurements compared to simulation (right).

5G Customized Research

The IT'IS Foundation works to establish the scientific bases behind the IEC TC106 product standards as well as SPEAG's and Zurich MedTech AG's (ZMT) products and closely collaborates with major mobile manufactures to design and optimize novel wireless 5G products and smooth the path through regulatory approval.

For further information, contact us at customized@itis.swiss



Powerful 5G simulation toolbox in Sim4Life: Design, optimization, and analysis of an embedded quasi-Yagi phased array (mobile phone, head).

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