

Combining the Strength of EM Simulation and Measurement during Design and Operation of a High Precision Near-Field Scanner

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Simulation and measurement are typically considered to be competing approaches in the modern design process. However, in many aspects the two can complement each other very efficiently and in principle unfold their individual strengths only in the combination of both. This presentation will highlight this for three scenarios during the development and operation of a high precision complex near-field scanner.

- Modern sophisticated field scanners can measure near-fields with an impressive precision of less than $50\mu\text{m}$. At the same time this high level of precision makes the scanner very sensitive to external influences and disturbances which may diminish the overall performance of the measurement device. Full 3D EM simulation is a very useful tool to track the potential reasons for scattering and can help to improve the design much faster and more cost efficiently than the classical approach of building physical prototypes. In the device considered here, simulation showed that acrylic glass should be taken for the positioning construction rather than metal in order to reduce parasitic scattering.
- The accuracy of a measurement is typically limited by the size, measurement distance over DUT surface and the integrative character of the measurement probe. If the near-field distribution of the probe in use is known exactly, those effects can be eliminated in the post-processing by a de-convolution step (see Figure 1). Again for very small probes this information is only available through 3D EM simulation, because its characterization by measurements would demand other measurement probes of at least one order of magnitude smaller than the near field probe itself.
- Finally, once the near-field has been accurately measured for a highly complex structure such as an integrated circuit, it may be very interesting to use this result as a driving source for a 3D EM simulation in a next step, e.g. for designing shielding cans or to perform general EMC analyses. The results of the Fraunhofer ENAS developed 3D high precision near field scanner can be imported directly into CST MICROWAVE STUDIO® as so called complex sources (equivalent complex and frequency dependent description on a surface of a brick). This feature is very efficient for all kinds of multi-scale simulation tasks as well as for the coupling of simulation and near-field measurement.

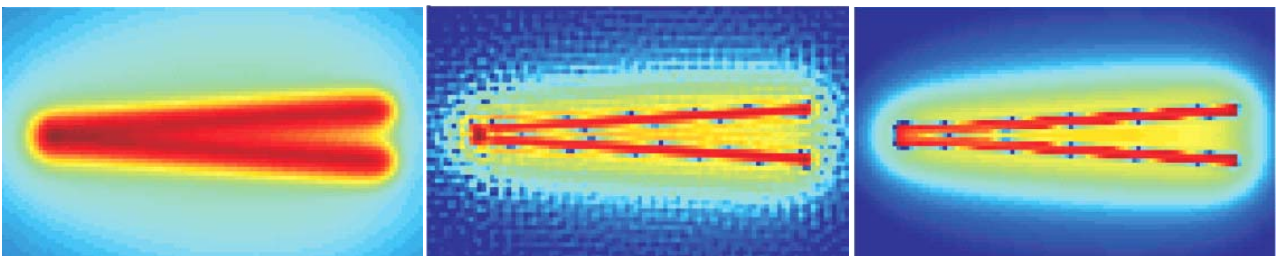


Figure 1: Raw picture of the measured microstrip line structure (left), the same result after de-convolution of the probe effects (middle) and the simulated reference solution (right).