

## SERVICES

- Measurement-based extraction of dielectric material properties (relative dielectric constant, loss tangent)
- Modeling, design, layout and measurement of planar resonators for the characterization of metalized substrates
- Characterization of materials over temperature
- Characterization of the effect of moisture absorption on the dielectric material properties
- Characterization of the dielectric material properties under accelerated ageing

## CONTACT

**Fraunhofer Institute for Reliability  
and Microintegration IZM**

Gustav-Meyer-Allee 25  
13355 Berlin, Germany

[www.izm.fraunhofer.de](http://www.izm.fraunhofer.de)  
[info@izm.fraunhofer.de](mailto:info@izm.fraunhofer.de)

**Jens Schneider**

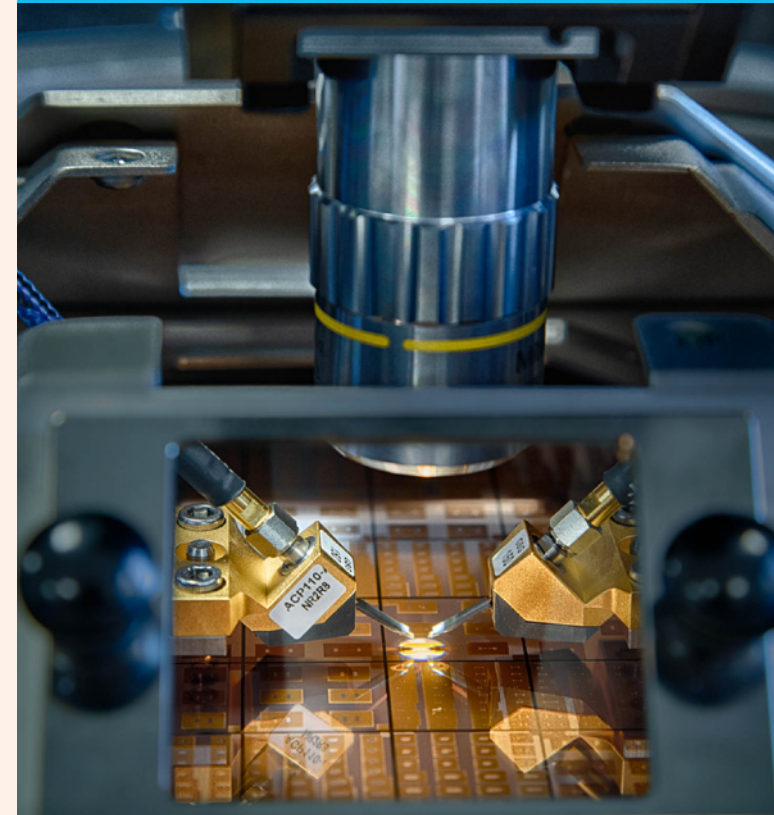
+49 30 46403-614  
[jens.schneider@izm.fraunhofer.de](mailto:jens.schneider@izm.fraunhofer.de)

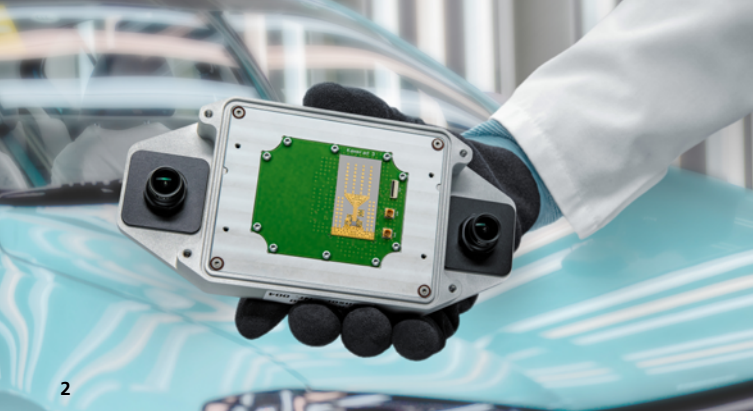


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# DIELECTRIC MATERIAL CHARACTERIZATION 1 MHz TO 500 GHz

EXPERTISE / EQUIPMENT / SERVICES



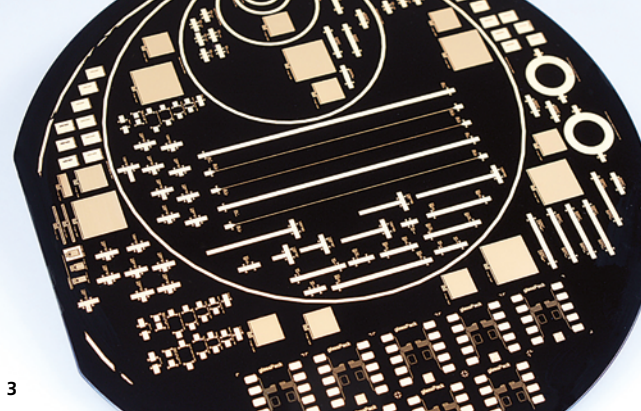


## WHAT WE DO

Fraunhofer IZM has the expertise and the equipment to measure and extract the electrical properties of materials in dependency on frequency, temperature and humidity.

Measurements and extraction are carried out in the frequency range between 1 MHz and 500 GHz, over a temperature range between -20° and 250° Celsius and assessing the impact of humidity.

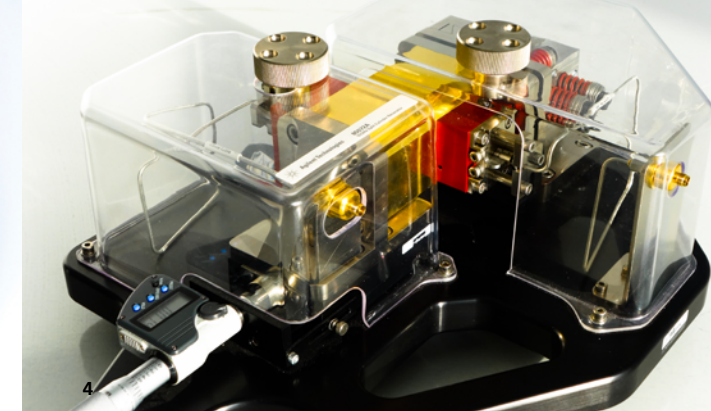
We measure both metalized and non-metalized substrate materials, including adhesives, coatings, underfill, mold, wafers and PCB laminates.



## EXPERTISE

The know-how that we developed over the last 20+ years allows us to characterize:

- non-metalized substrates, with the broad range of measurement fixtures available at Fraunhofer IZM;
- metalized substrates. For this purpose, we:
  - model, simulate and design planar resonators which are fabricated on the substrate;
  - perform RF measurements of the fabricated structures;
  - procure cross-sections of the resonators to measure the exact profile of the structures;
  - measure the geometry and the roughness profile of the metallic layers;
  - compare simulation with RF measurement to extract the properties of the substrate material.



## MEASUREMENT EQUIPMENT

The following measurement equipment is available at Fraunhofer IZM:

- Agilent 16453A dielectric material test fixture (1 MHz–1 GHz)
- QWED split-post cavity resonator (2.45 GHz)
- Agilent 85072A split-cylinder resonator (10 GHz–26 GHz)
- Agilent 85070E dielectric probe (200 MHz–20 GHz)
- Quasi-optical free-space fixture (40 GHz–170 GHz)
- Keysight DPS03 Open Resonator Method (18 GHz–140 GHz)
- Agilent 16454 magnetic materials test fixture (10 MHz–1 GHz)
- Agilent N5247B Vector Network Analyzer (10 MHz–67 GHz, with extensions up to 500 GHz)
- Menlo TeraSmart Terahertz Spectrometer (100 GHz–5.5 THz)
- Hommel profilometer