

IMAGING TERAHERTZ FMCW RADAR SYSTEM

1 *360° reflection measurement of a high voltage insulator made of glass-fiber reinforced polymer with artificial defects*

2 *Reflection measurements on a rotationally symmetrical object*

Imaging terahertz FMCW radar systems allow a contact-free inspection of surfaces and concealed structures. Fraunhofer ITWM uses in its terahertz FMCW radar system measurement modules with 100 GHz, 150 GHz, 300 GHz or 500 GHz. By the combination of different frequencies in one testing system the optimum frequency can be selected for certain material properties.

The design of the measurement systems is suited for reflection and transmission measurements on plane objects as well as for reflection measurements on rotationally symmetrical objects. The application of several measurement modules allows very short measuring times with comparatively high image resolution.

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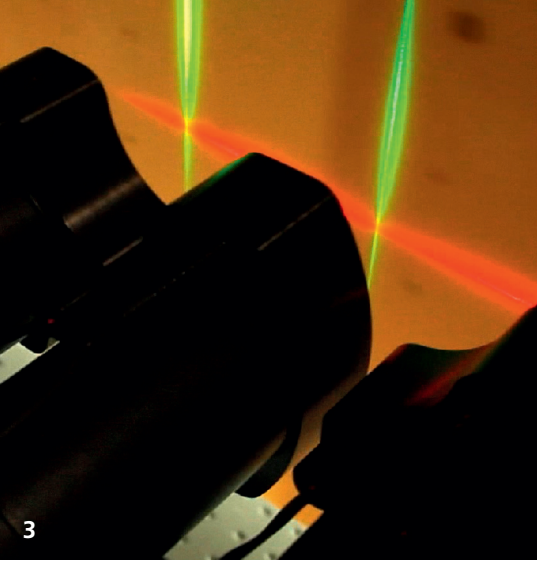
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Advantages

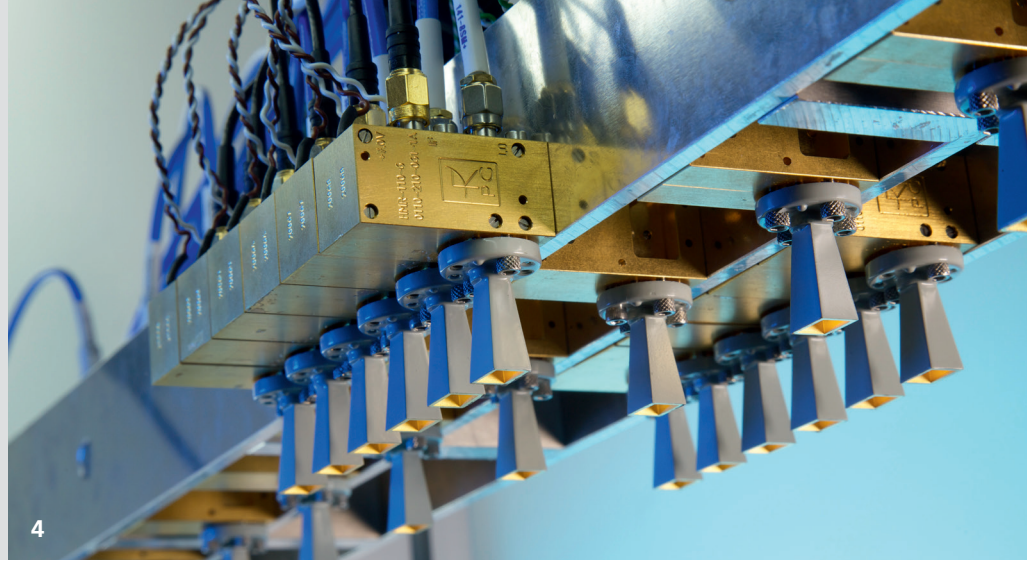
- Robust and long-term stable construction
- Quick and simple switching between transmission and reflection configuration
- No special radiation protection measures necessary
- Simple integration of the measurement modules into existing production and quality control systems
- Operator-friendly user interface and analysis surface of the control software

Our offer

- Comprehensive consultation
- Test measurements on existing systems
- Feasibility studies
- Measurements services
- Equipment rental
- Individual design of measurement modules and peripherals according to customer preferences



3 Reflection and transmission measurements on plane objects



4 Line scanner based on MIMO technique

Material selection

Transparent materials, which permit looking inside or through the material, include ceramics, polymer, composite materials such as glass-fiber reinforced polymer (GFRP) and natural-fiber reinforced polymer (NFRP), chemicals, paints and varnishes, adhesives, semiconductors, textiles, and paper.

Reflective materials, which allow surface or applied-coatings inspection, are metals and electrically conductive materials such as carbon-fiber-reinforced polymer (CFRP).

Applications

Non-contact inspection:

- Impurity detection of bubbles and blisters
- Inspection of hidden structures
- Delamination
- Adhesive joints
- Detection of inhomogeneities as undulation in GFRP and NFRP
- Thickness measurement

Quality control:

- Inspection of packed and unpacked items
- Detection of hidden defects in production lines

System specifications

Operation mode	FMCW
Measurement time per profil	100 μs to 1 sec (depending on the request)

For the measurement modules: M1 / M2 / M3 / M4

Frequency range	100 GHz / 150 GHz / 300 GHz / 500 GHz
Dynamic range	40–50 dB / 40–50 dB / 35–40 dB / 30–40 dB
Output power	2 mW / 100 μW / 60 μW / 2 μW
Spatial resolution*	3 mm / 2 mm / 1 mm / 0,6 mm
Depth resolution in typ. materials*	6 mm / 4 mm / 2 mm / 2 mm
Depth penetration*	several centimeters

*according to measurement assembly and sample properties