



Fraunhofer ITWM

FRAUNHOFER INSTITUTE FOR INDUSTRIAL MATHEMATICS ITWM



COMPOSITE MATERIALS

1 + 2 *Composite materials as used in shipbuilding and wind turbines can be tested contact-free and non-destructively using terahertz measurement techniques.*

Non-destructive testing using terahertz measurement techniques

Composite materials such as glass-fiber reinforced or carbon-fiber reinforced polymers (GFRP/CFRP) are being used increasingly as a result of their special properties. The testing of these materials makes high demands on the selected test procedure. Using terahertz measurement techniques, it is possible to test composite materials on the surface and inside. Variations in thickness, defects, cavities, inclusions and pores can be reliably and clearly detected using this measurement technology.

Terahertz measurements are contact-free and do not require any additional coupling medium, thus avoiding the not uncommon problem of residue removal. In contrast to contact-free X-ray techniques, terahertz measurement techniques present no health risks..

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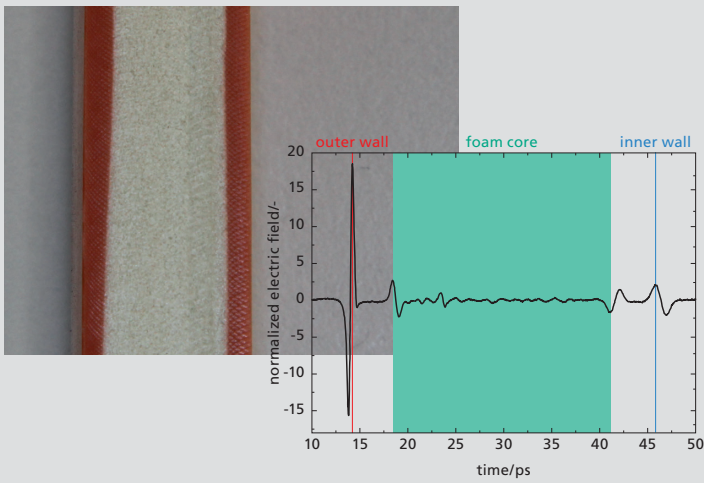
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The benefits

- Contact-free: the specimen does not come into contact with any coupling medium
- Specimens with internal cavities can be analyzed
- Measurement in transmission and reflection configuration
- Simple integration of compact measurement modules into existing production and quality systems

The system

- Robust design with long-term stability
- Can easily be tailored to the measuring task
- User-friendly operator and analysis interface



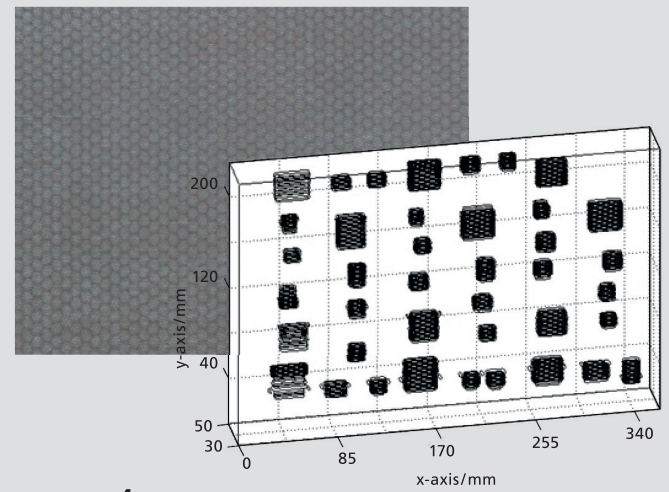
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3 Foamed PVC-pipe: thickness measurement of the massive outer and inner wall and the foam core

4 GFRP C-sandwich specimen with a honeycomb structure* with various internal defects.

Sample size (mm): 340x200; defect size (mm): 6x6 to 25x25.

Right: result of automatic defect detection.



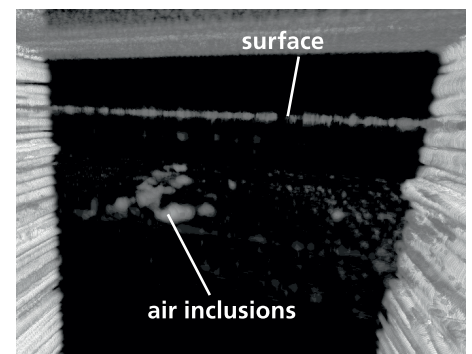
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Inspection of composite materials

- Detection of
 - inhomogeneities
 - cracks
 - inclusions
 - cavities and defects inside the material
 - internal structures
- CFRP cannot be tested in transmission as a result of its electrical conductivity.

Our offer

- Consultation – on technology and application aspects
- Initial tests – in our application lab
- Feasibility studies – technically and economically
- Equipment rent – for limited-period tasks
- Measuring studies – for industry and research
- Development – from single components to individual complete systems
- Measurements on customer's site – with mobile systems on any large objects



Foam with air inclusion: specimen (left) and 3D terahertz image