



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

## COMPOSITE MATERIALS NON-DESTRUCTIVE TESTING USING TERAHERTZ MEASUREMENT TECHNIQUES

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[www.ipm.fraunhofer.de/en/terahertz](http://www.ipm.fraunhofer.de/en/terahertz)



[www.TeraTec.org/en](http://www.TeraTec.org/en)

Composite materials such as glass-fiber reinforced or carbon-fiber reinforced plastics (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.

#### The system

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

#### The benefits

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

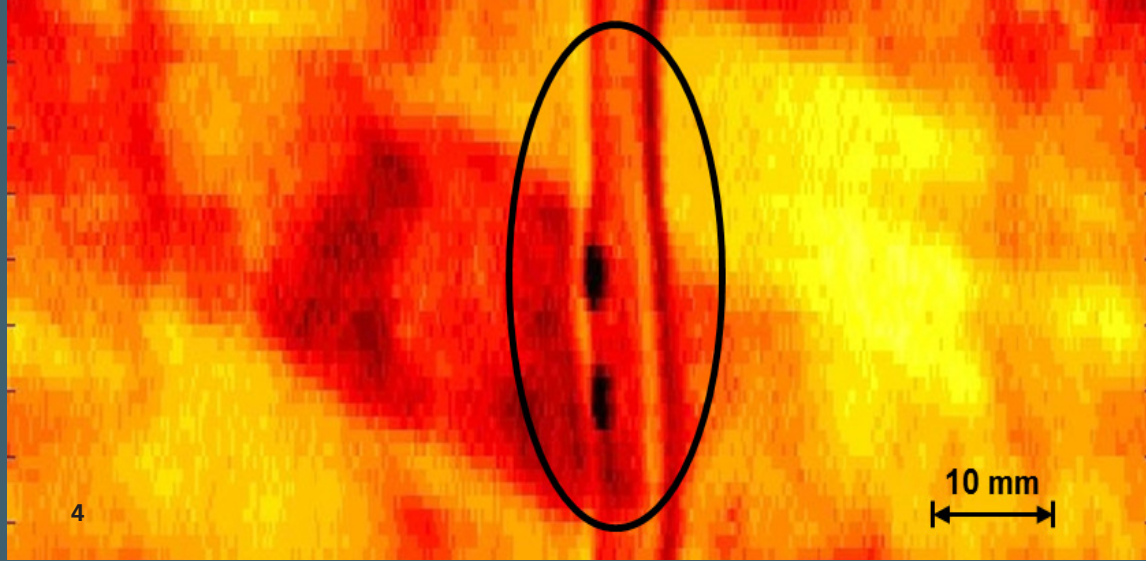
#### Radiation protection

- Radiation harmless to health



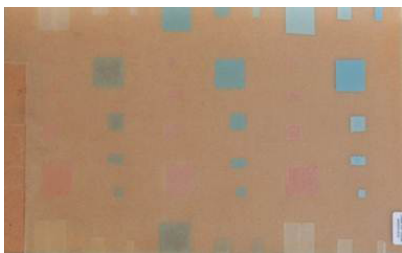
Ø = 50 mm

3



4

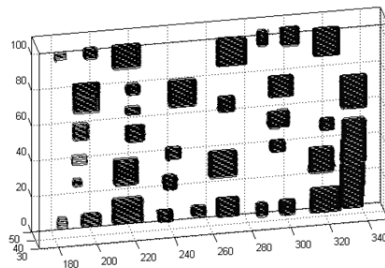
10 mm



GFRP A-sandwich specimen with a foam structure\* with various internal defects.

Sample size (mm): 340 x 200; defect size (mm): 6 x 6 to 25 x 25.

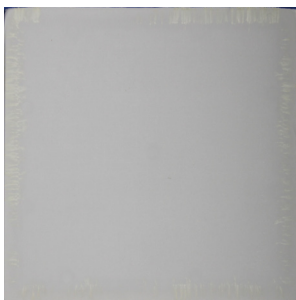
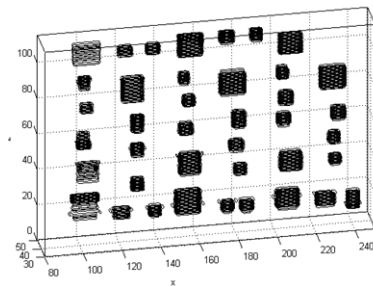
Right: result of automatic defect detection.



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

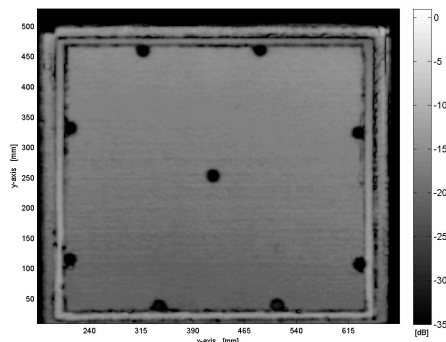
Sample size (mm): 340 x 200; defect size (mm): 6 x 6 to 25 x 25.

Right: result of automatic defect detection.



GFRP sample with a honeycomb structure: internal structure can be verified in the base plate.

Sample size (mm): 510 x 510 x 10.



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

3/4 Inclusions in the GFRP pipe can be detected by testing with terahertz measurement techniques.

\* EU-Projekt DOTNAC (FP7-AAT-2010-RTD-1)