TERAHERTZ SPECTROSCOPY FOR NON-DESTRUCTIVE TESTING

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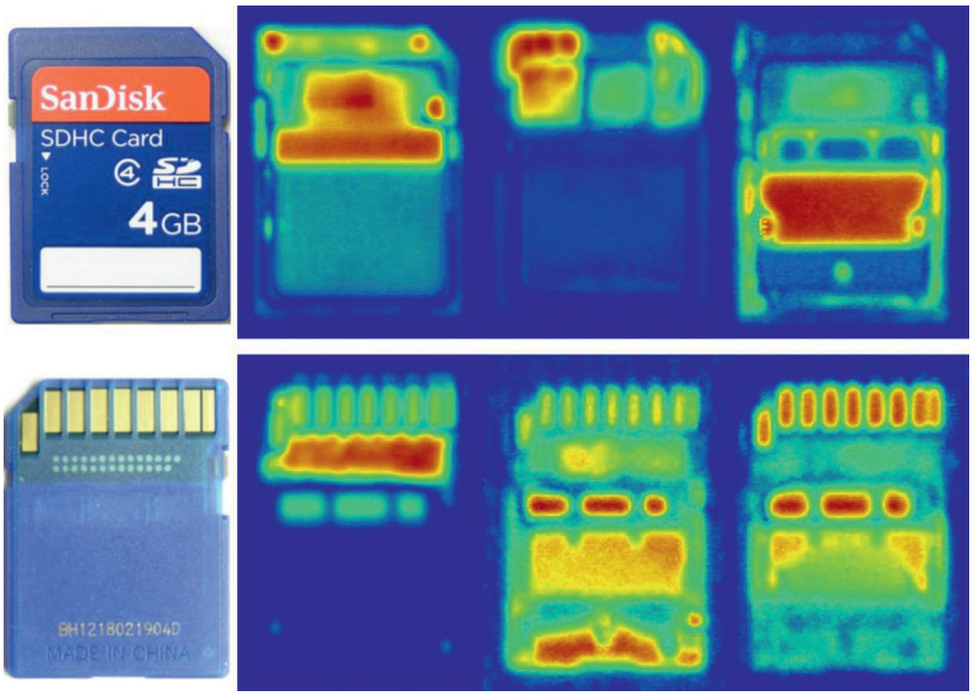

AT A GLANCE

Non-hazardous THz pulses are employed in contact-free time-of-flight measurements for non-destructive testing of opaque materials.

Application example: THz image of an SD memory card. Cross-section images reveal the inner structure of the card layer-by-layer.

Features

- Contact-free
- Non-hazardous radiation, no additional safety measures required
- Temperature independent
- Fully fiber-coupled
- Measurements in transmission or reflection geometry
- Up to 100 measurements per second

Applications

- Layer thickness determination
- In-line process monitoring
- Inspection of multi-layer samples
- Thickness determination
- THz imaging
- Defect identification and mapping

Technical background

Ceramics, polymers, paper, textiles, and industrial glues are transparent for THz radiation. Optically opaque materials can be penetrated and inspected with ultrashort, non-hazardous THz pulses in a time-of-flight measurement. The depth resolution is determined by the bandwidth of the THz pulse and can be as low as a few µm, depending on the specific material under test. The lateral resolution is approx. 0.3 mm. The fully fiber-coupled THz system allows for flexible adjustments. The measurement is contact-free and temperature independent.

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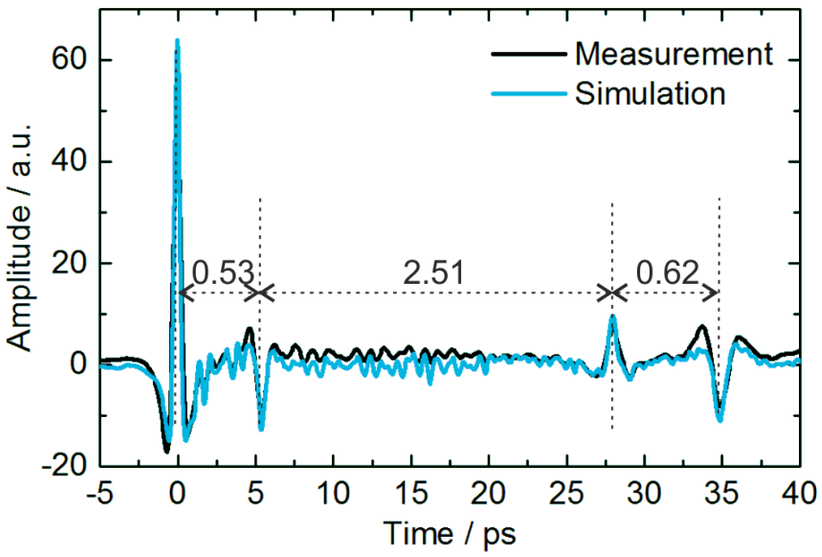
Application Example: Multilayer Thickness Measurement



THz signal and retrieved layer thicknesses in mm from a multilayer plastic pipe measured in reflection geometry.

Specifications

• Frequency range	0.1 THz - 6.5 THz
• Dynamic range	> 90 dB
• Lateral resolution*	0.3 mm
• In-plane resolution*	< 10 µm
• Accuracy of layer thickness determination*	< 1 µm

* Depending on sample characteristics

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Liebermeister, L., et al. "Terahertz Multilayer Thickness Measurements: Comparison of Optoelectronic Time and Frequency Domain Systems". J Infrared Milli Terahz Waves (2021)

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