

PRESS RELEASE

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Fraunhofer ITWM With Three Exhibits at the Trade Fair Control **Digital Twins and Terahertz Waves Ensure Quality**

The Fraunhofer Institute for Industrial Mathematics ITWM will again be present at the international trade fair for quality assurance »Control« in Stuttgart. From May 3 to 6, the researchers will show their testing systems for assuring product quality in industrial environments in hall 6, booth 6301. Two of the exhibits are dedicated to the material characterization of test materials, a third to the virtual development of inspection systems.

V-POI: Virtual Inspection Planning for Adaptive Surfaces

Visual inspection systems are a key element of quality inspection in the manufacturing industry: 100 percent inspection of components is usually essential, as products with surface defects are not allowed to leave the factory. However, the development of visual inspection systems requires a lot of practical experience and is often time-consuming and expensive.

With V-POI, the »Image Processing« department of Fraunhofer ITWM in Kaiserslautern offers a web-based solution: With the help of a digital twin, the visual inspection system is developed virtually and takes surface and physical parameters into account. V-POI provides users with an inspection plan that includes camera and illumination positions as well as information about the coverage of different camera positions. Photorealistic product simulation and a defect simulation are also part of the system. The image set is then used for machine learning training.

The inspection system can therefore be fully planned even before the actual – usually highly adaptive – process begins in the image processing lab.

Mobile Handheld Scanner for Non-destructive Terahertz Testing

The department »Material Characterization« of Fraunhofer ITWM presents its mobile handheld terahertz scanner. Its great advantage: flexibility.

Up to now, terahertz sensors mostly work in scanners and are installed in stationary testing systems. This is why the technology cannot be used for large components or complicated component geometries. The mobile hand-held scanner provides a remedy here: it works regardless of location and has no problems with irregular geometries. This makes it a reliable alternative in production as well as in repair and service. It is

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used, for example, to inspect plastic or metal pipes, even if they are coated or insulated. Components containing fiber composites or tensile attachments such as cladding or windows can also be inspected without any problems.

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Short-Pulse Terahertz System for Layer Thickness Measurement

When measuring layer thickness in industrial environments, there are often sources of interference that cause vibrations and oscillations and thus falsify the measurement results. These interference signals are generated in the production environment, for example, by presses, punches, moving forklifts and trucks. In addition, during time-of-flight measurements, the robot arm vibrates slightly when it stops, which is also problematic. The Fraunhofer ITWM has developed a solution which, despite these sources of interference, enables non-contact and non-destructive reliable measurements: the short-pulse terahertz system.

In analogy to ultrasonic measurements, short terahertz light pulses are sent to the sample, with the difference that no coupling medium such as gel or water is required for terahertz measurements. Light pulses are reflected at each interface – the transitions between different layers such as paint and metal. These echo signals, arriving one after the other, provide information about the sequence and spacing of the layers. The measurements are then evaluated by comparison with a simulated measurement signal. The system has proven its worth in the final inspection of car coatings.

Visuals



A short pulse terahertz sensor © Fraunhofer ITWM

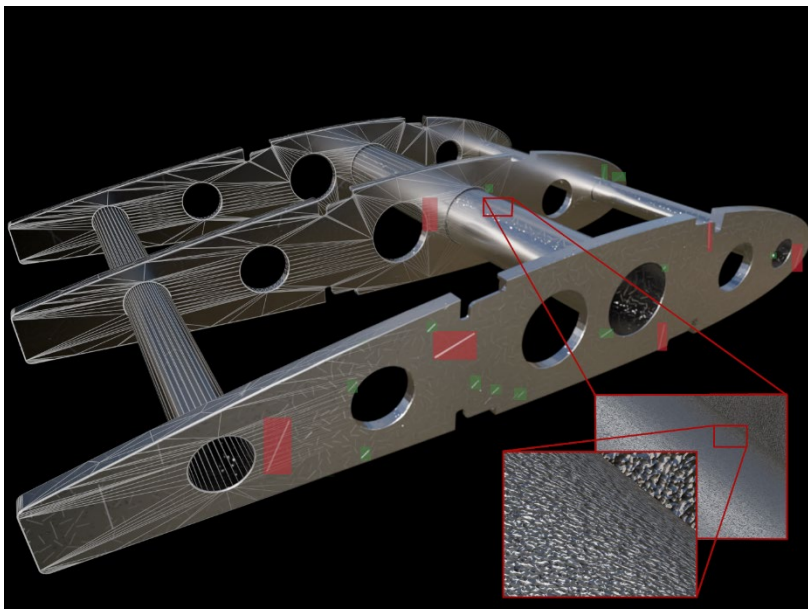
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Terahertz hand-held scanner ©Fraunhofer ITWM



The V-POI software uses 3D models to simulate defects; here the model of an aircraft wing.
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About the Fraunhofer Institute for Industrial Mathematics ITWM

The Fraunhofer Institute for Industrial Mathematics ITWM in Kaiserslautern is one of the largest research institutes for industrial mathematics worldwide. We see our task in further developing mathematics as a key technology and providing innovative impetus. Our focus is on the implementation of mathematical methods and technology in application projects and their further development in research projects. The close cooperation with partners from industry guarantees the high practical relevance of our work.

Their integral components are consulting, implementation and support in the application of high-performance computer technology and the provision of tailor-made software solutions. Our various competencies address a wide range of customers: automotive industry, mechanical engineering, textile industry, energy and finance. This also benefits from our good networking, for example in the High performance center "Simulation- and software-based innovation".