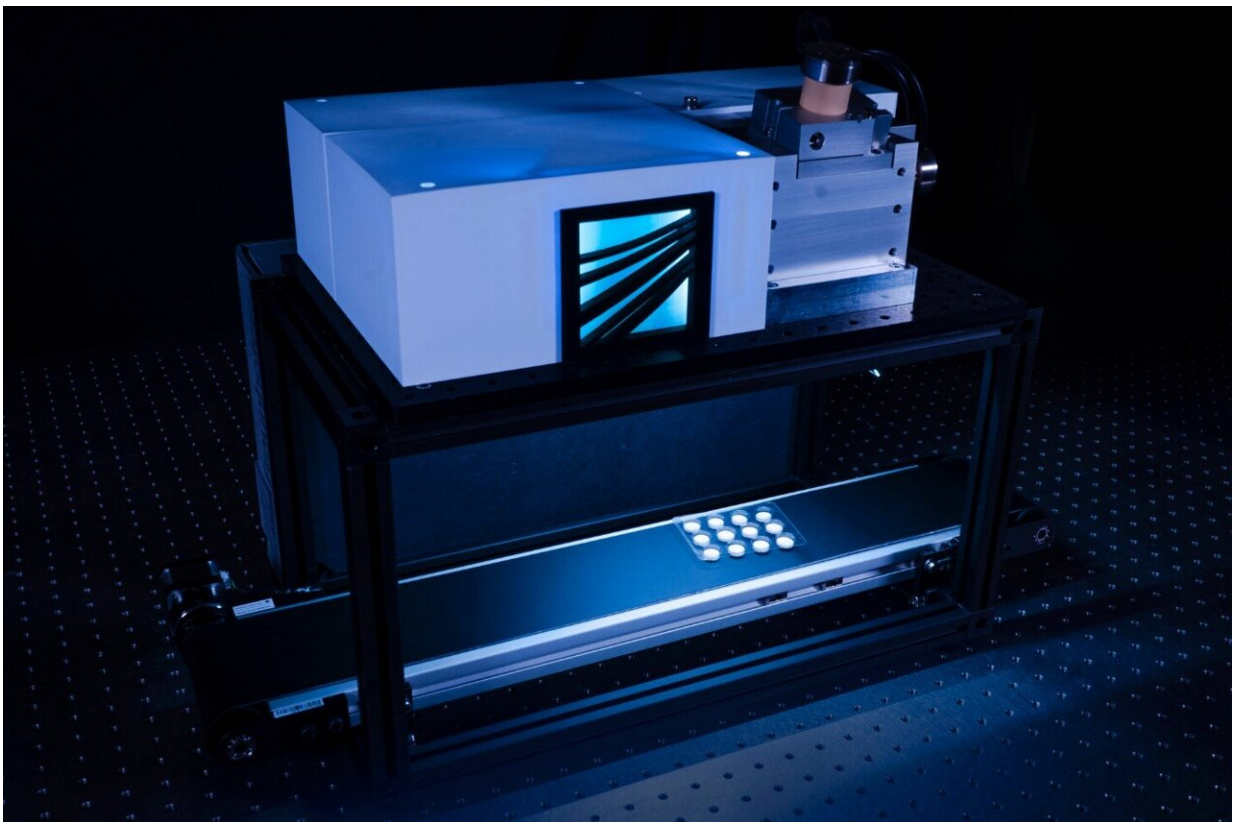


Inline-capable spectroscopic measurement system for industrial quality assurance and process control

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Fraunhofer IAF has developed an integrable measurement system in collaboration with Fraunhofer CAP for testing applications in the pharmaceutical, chemical and food industries. Credit: Fraunhofer Institute for Applied Solid State Physics IAF

Ensuring quality without losing time: Companies from the pharmaceutical, chemical and food industry in particular depend on meeting the highest quality requirements while at the same time optimizing production processes. For such applications, Fraunhofer IAF has developed an integrable measurement system in collaboration with the Fraunhofer Centre for Applied Photonics. It uses machine vision to specifically detect samples and verify them contact-free within a few milliseconds using laser-based infrared spectroscopy.

With an inline-capable, laser-based infrared spectroscopy measurement system, researchers at the Fraunhofer Institute for Applied Solid State Physics IAF want to support [industrial companies](#) from the pharmaceutical, chemical and [food industry](#) in making quality assurance measures and process controls more reliable and at the same time more efficient. The system is characterized by a flexible design and a high spectral scanning speed that allows it to be integrated into existing visual inspection systems, enabling full spectroscopic inspection.

"The measurement system vividly demonstrates the great benefit of laser-based infrared spectroscopy for industrial sectors in which products have to be verified or differentiated reliably and quickly," emphasizes Dr. Marko Härtelt, responsible project manager at Fraunhofer IAF.

Mid-infrared backscattering spectroscopy by QCL and MOEMS grating scanner

The specific advantages of the system result from the backscattering spectroscopy method in the mid-infrared with wavelengths in the range of 4 to 12 μm . Since molecular compounds have very characteristic absorption and emission lines in this spectral range, they can be clearly identified.



The broad-emitting and spectrally fast-scanning laser module combines QCL from Fraunhofer IAF and MOEMS grating scanner from Fraunhofer IPMS. Credit: Fraunhofer Institute for Applied Solid State Physics IAF

One of the core components of the measurement system is a broad-emitting and spectrally fast-scanning laser module. It combines quantum cascade lasers (QCLs) from Fraunhofer IAF and micro-opto-electro-mechanical grating scanners (MOEMS) from the Fraunhofer Institute for Photonic Microsystems IPMS. The high brilliance of the light source and the unique properties of the MOEMS scanner enable [infrared spectroscopy](#) at a rate of one kilohertz.

In the analysis of the measurement results, a [neural network](#) supports the

system to drastically minimize the error rate and at the same time the required measurement time.

Demonstration of industrial use at LASER World of PHOTONICS 2022

To illustrate the measurement system's ability to be integrated into [industrial processes](#), the Fraunhofer IAF team has developed a practical demonstrator: A conveyor belt moves twelve identical-looking tablets in a common tablet blister. The device recognizes the blister contents contactlessly in just 300 milliseconds. The results of the detection for each individual tablet are immediately displayed on the connected screen so that contaminated or defectively loaded specimens can be sorted out.

Fraunhofer IAF will present the demonstrator of its QCL-based [measurement system](#) at this year's LASER World of PHOTONICS trade fair in Munich from April 26 to 29, 2022 (Hall A6, Booth 441).

Provided by Fraunhofer Institute for Applied Solid State Physics IAF

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