FT-IR MICROSCOPY

LUMOS II

Exceptional IR. Brilliant Visuals. Ultrafast Imaging.

Innovation with Integrity

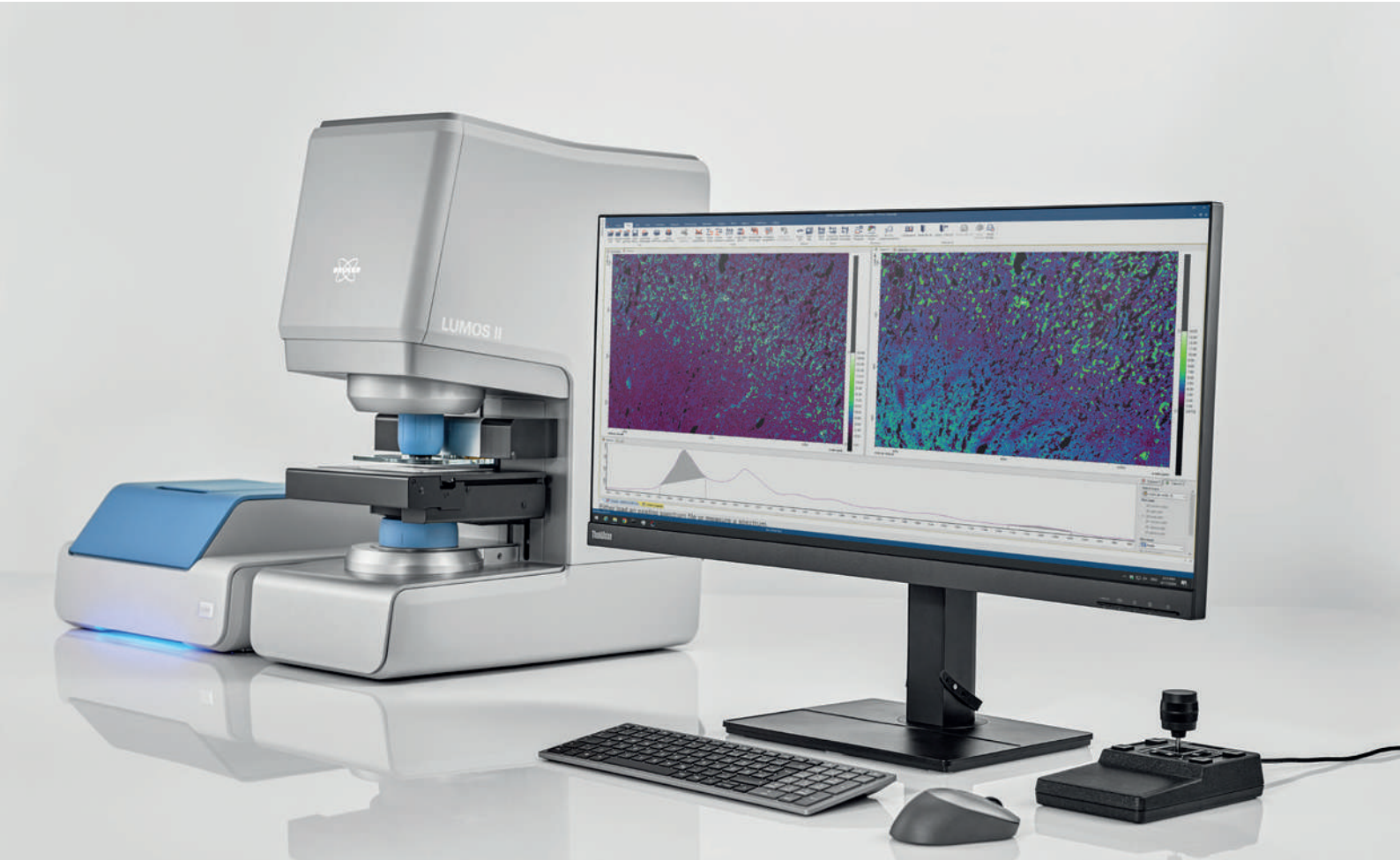
The LUMOS Vision

For more than 15 years, the LUMOS has been the innovation leader in applied IR microscopy, redefining the concept of a modern, routine system and what users expect of it.

At its launch in 2012, we focused on making ATR microscopy better and easier than ever before by building an industry defining integrated, automated ATR objective.

Since 2020, the LUMOS is also shifting the paradigms of IR imaging. First by adding an FPA detector and then, in 2024, by introducing IR QCL technology to the platform.

But most importantly, we never lost sight of the LUMOS vision: creating a micro-analytical workhorse with the highest ease-of-use and outstanding IR spectral performance.



LUMOS II EASY POINT AND SHOOT FT-IR

This is the point-and-shoot quality control and failure analysis instrument you are looking for. With unmatched sample access, reliability and ATR performance you easily access the chemistry of microscopic samples.

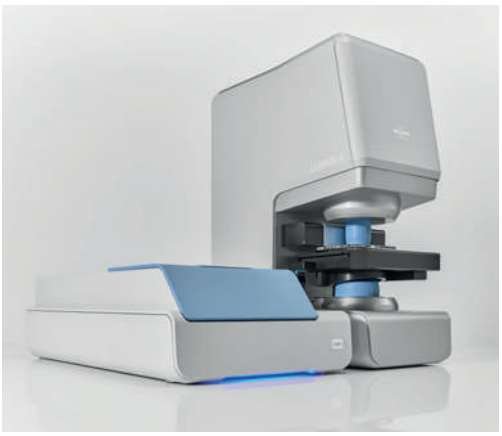
- Automated ATR measurements
- Exceptionally large working distance
- IR throughput optimized for TE MCT
- Autom. detector switching (LN-MCT, DTGS)
- Autom. Knife-edge apertures for ROI selection
- Inert ZnSe optics, no dry-air purge required
- Compact, open access stand-alone design
- Large FOV and high visual clarity
- Upgrade to FPA imaging anytime

LUMOS II IMG FT-IR IMAGING POWERHOUSE

Boasting an FPA detector and the world's best ATR capabilities, it gives access to the smallest chemical details in your samples. Collect 1,024 FT-IR spectra in one go to create stunning chemical images.

- Highspeed FT-IR imaging (1.6 mm^2 per minute)
- 1,024 FT-IR spectra at 5 µm pixel size
- Full MIR spectral range behind every pixel
- LN_2 cooled 32 x 32 focal-plane array (FPA) detector
- Chemical imaging in TRANS, REFL, and ATR
- Autom. ATR imaging at 1.25 µm pixel resolution
- Autom. switching between all detectors (up to 3)

LUMOS II ILIM ULTRAFAST IR LASER IMAGING

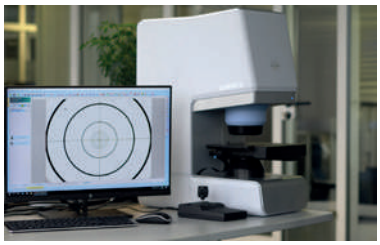


Dedicated to IR imaging, this system builds on a quantum cascade laser and widefield camera detector to shift the borders of speed and quality in IR imaging.

- Unrivalled IR imaging speeds:
  > Single wavenumbers at 4.5 mm^2 per second
  > MIR (1,800 - 950 cm^{-1}) at 1.1 mm^2 per second
- 249,600 IR spectra at 5 µm pixel size
- Patented technology prevents interference artefacts
- Dedicated IR laser optics for superb image quality
- Application focused end-to-end workflows.
- Measurements in TRANS and REFL
- Open design laser class 1 instrument

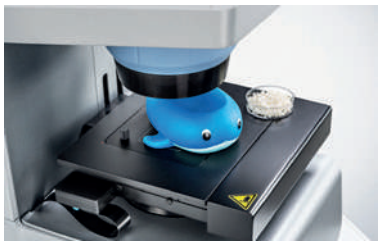
The Technology behind LUMOS II

Complete Automation



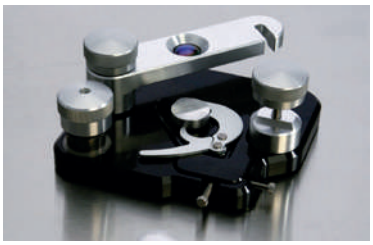
Maximum precision, full motorization and easy software control are a given with LUMOS II. Switch between apertures, detectors and measurement modes with a click.

The Open Design



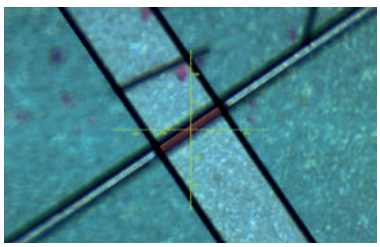
LUMOS II is designed for easy 270° access to your samples. Analyze samples of up to 4 cm in height and utilize 3 cm of extra working distance for structured samples.

The Accessories



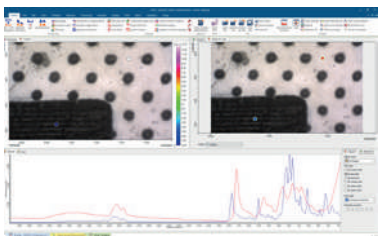
The LUMOS II offers many accessories to enable analysis of a variety of samples. Special sample holders are available for particle filters, tablets, tissue slides and much more.

The Knife Edge Aperture



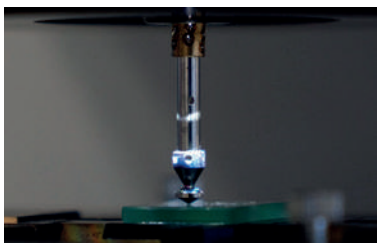
Illuminated, knife-edge apertures allow precise adjustment to the sample shape for optimal spectral quality. Full software integration enables automated workflows.

The Software: OPUS



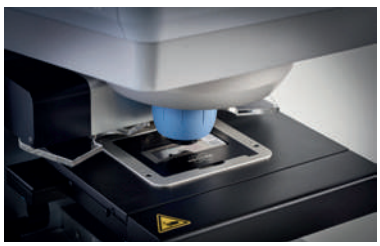
The command center of any LUMOS II. Clear intervace designed for ease of you with powerful spectroscopic tools and AI-powered evaluation routines.

Our ATR Design



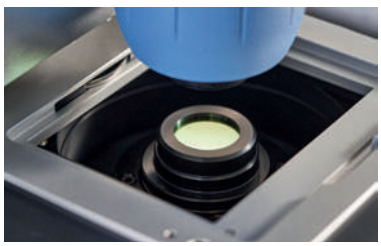
The ATR objective is integrated and motorized for automation and outstanding precision. It offers different pressure modes and drive speeds to finely tune the ATR experiment.

The WinGuard™



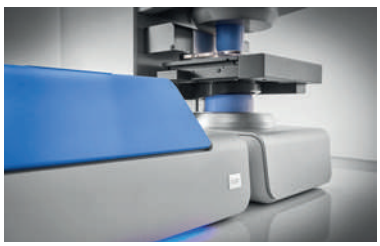
Always enjoy the LUMOS II's open design. Our laser protection system ensures laser safety class 1 and one-click operation, making the ILIM user-friendly even for beginners.

The IR Laser Imaging Speed



Engineering at its finest. We have optimized the optical design to yield an incredible IR field of view, allowing highest imaging speeds at maximum spatial resolution.

The ILIM module



Our patented technology suppresses spatial coherence artefacts in any IR laser imaging measurement producing images of the highest spectral quality and clarity.

The Potential of IR Imaging

A single spec of dust on a PCB board, a small inclusion on a treated surface, or some oily residue on a plastic part – not all samples require IR imaging - but they still benefit from it. Just think about it. IR Imaging could detect, if the small dust particle is in fact a complex agglomerate, or, if the small surface residue is actually altering the sample's chemistry. In general, IR imaging delivers a comprehensive picture of your samples and accelerates failure analysis, troubleshooting and material research.

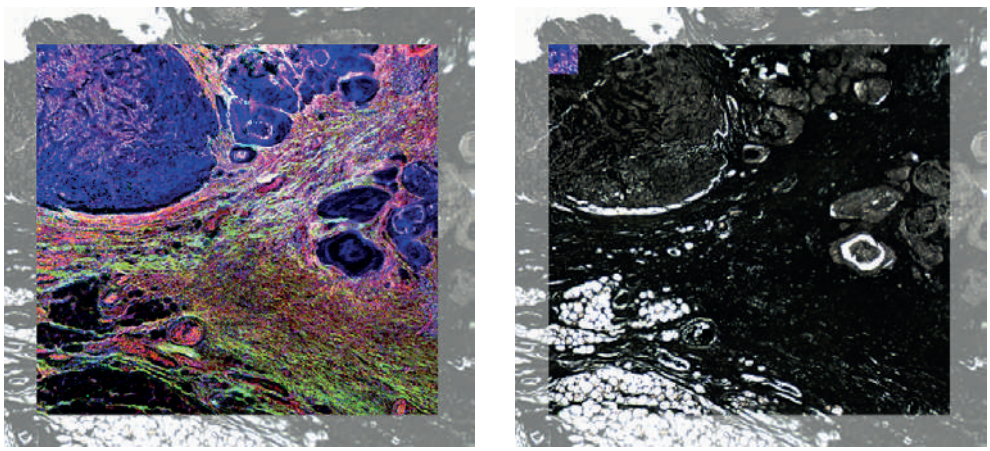
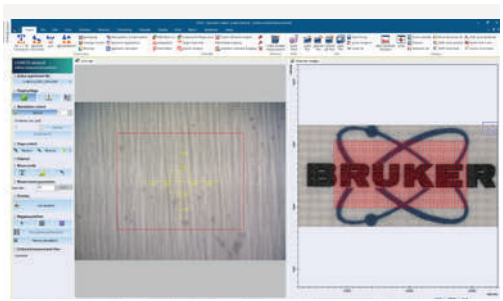
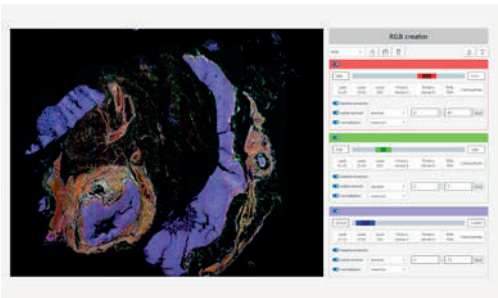


Fig. 1
IR images created by LUMOS II superimposed on the respective visual image. The FOV of ILIM (2.21 mm x 2.04 mm, left) covers sample areas much faster than the FOV of FT-IR FPA imagng (0.16 mm x 0.16 mm; right)

Above, you see the comparison between a the field of view of IR laser and FT-IR imaging using focal plane array detectors. The much larger field of view of ILIM offers a tremendous and obvious speed advantage. FT-IR, on the other hand, provides a broader spectral range for richer chemical information. What ever your application requires, LUMOS II has you covered.



The OPUS measurement guide supports you from single-point to focal-plane array measurements. Use simple drag and drop commands to setup your analysis - ease of use is guaranteed.



IR chemical imaging offers unmatched level of detail providing a wealth of data. With our OPUS software and AI-based evaluation tools we provide everything needed.

Applications

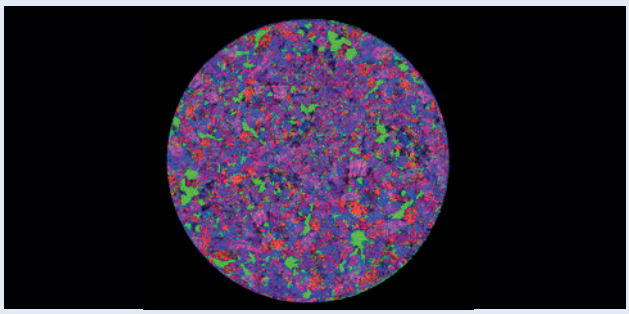
Electronics Failure Analysis

All types of (in)organic materials are used in the production of electronic products. IR spectroscopy is a universal technique that yields valuable chemical information for most samples. Therefore, IR microscopy is of great help in failure and root cause analysis.

A CMOS chip of a digital camera was investigated by single point measurements to determine the cause of failure.

Pharmaceuticals Quality Control

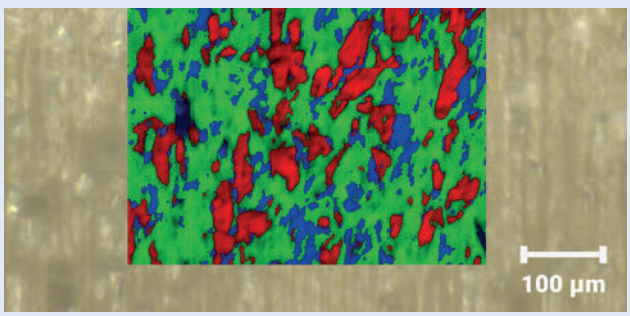
The LUMOS II is fully compliant with cGMP, GLP and all pharmaceutical regulations such as 21 CFR part 11. Automated test routines (OQ/PQ) give you time to focus on the analysis of tablets, granules and powders, improving your search for particles, contaminations or the evaluation of API and excipient distributions.



The distribution of APIs, excipients, and fillers was evaluated with IR Laser Imaging (ILIM) to tune production parameters.

Plastics Product Development

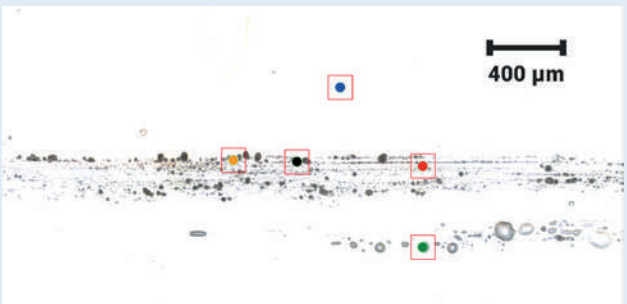
IR is one of the most important analytical techniques in plastics manufacturing and polymer science. It is used to track the causes of product defects, such as inclusions impurities and inhomogeneities, to study ageing processes, or to characterize new materials. Start uncovering the chemical composition of multilayer structures, laminates, composites and coatings.



This composite material was tested for the distribution of teflon (red) and aramide fibers (blue) in a matrix of polyoxymethylen (green).

Coatings Surface Analysis

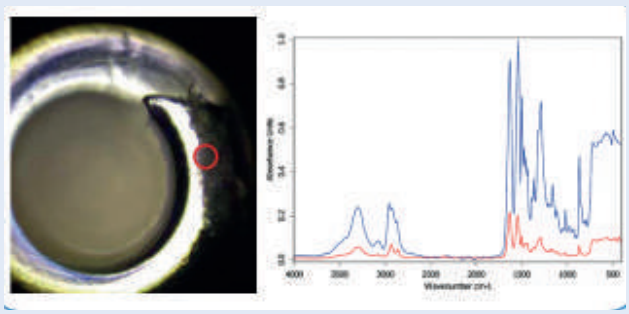
Certain surface treatments adapt products to their specific requirements. These may include coatings such as polymers and or DLC plating. IR imaging is ideal for checking the homogeneity and quality of such coatings.



This coated glass surface shows an oil-like residue and smearing. FT-IR revealed the identity of the contaminations.

Technical Cleanliness Root Cause Analysis

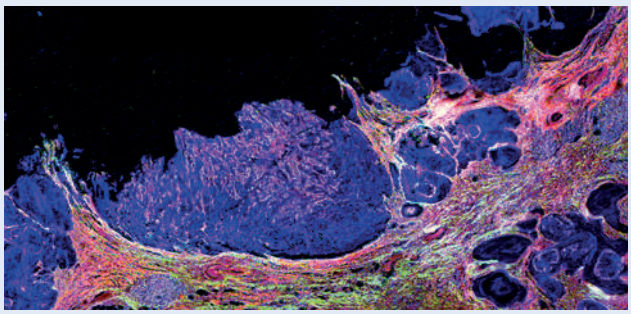
IR spectroscopy and microscopy are great tools to uncover the origin of contaminations like particles or organci residues. One of its greatest advantages is the fast error detection and quick determination of the root cause.



A spring in an electric motor housing showed signs of unusual wear. FT-IR microscopy revealed presence and identity of a contaminant.

Life-Science Tissue Analysis

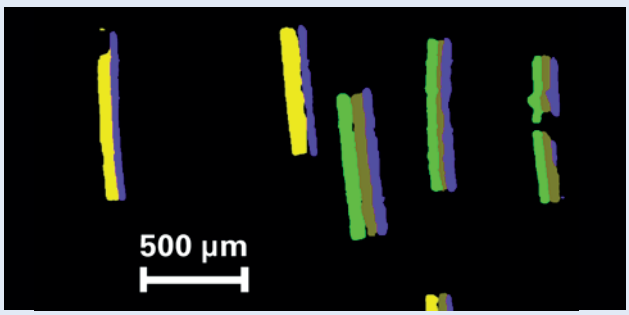
Analysis by IR microscopy also provides important insights into biology. It enables the discovery of specific disease patterns, dysfunctional tissue or even new disease-related biomarkers. With its fast imaging performance and large field of view, the LUMOS II simplifies the tedious work of tissue analysis.



A microtome tissue section that was analyzed by ILIM to detect regions afflicted by cancer.

Forensics Thin layer analysis

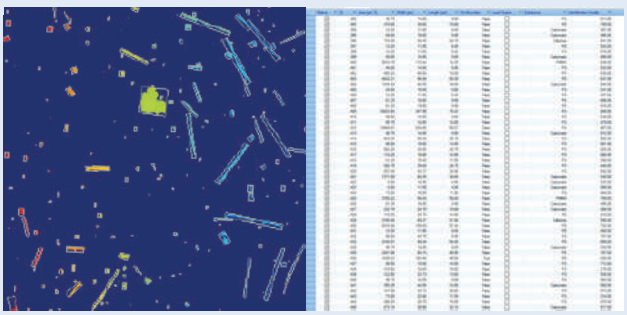
Forensical science deals with microscopic evidence ranging from gun shot residue to fibers or particles collected at a crime scene. FT-IR microscopy and imaging is an easy way to quickly and reliably collect chemical information on trace evidence to support criminal investigations.



IR laser image of a microtome cut of paint chip particles that were found at a crime scene and embedded in resin.

Particle Analysis Microplastics

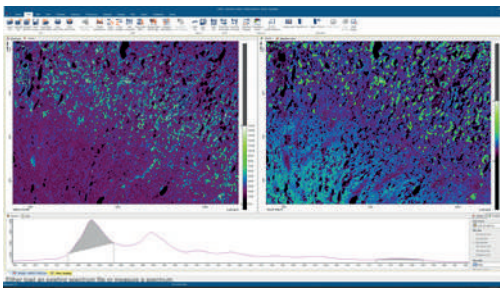
Whether it be microplastics or contaminations or relevant production parameters, the chemical investigation of particles can be crucial. With special software features to identify particles and measure them automatically, the LUMOS II is ideal for the analysis of any particle on any surface.



Particles and fibres with different chemical compositions were highlighted in the IR image, identified, and listed on the right.

Pioneers Need the Best Support

We help users unlock the full potential of our solutions by outstanding service and application support. Keep in touch with our engineers and scientists to make the most of your application.



Our hardware? Simply mighty.

We follow a simple philosophy in our hardware design. We believe that high-quality automation is the best way to achieve maximum robustness, reliability, and ease-of-use.

Our instruments feature extensive system intelligence and self-tests to assure highest performance and ease of operation. Together with customer-centric service solutions, your system never lets you down.

Our software? Mighty simple.

Today's software must fulfill many requirements, Starting at being easy-to-use and ending at cGMPcompliance. That's why we chose a simple all-in-one approach.

OPUS can be perfectly tailored to your needs and f eatures classical as well as AI-based evaluation tools to speed up analysis of any sample you might encounter.

"With the LUMOS II ILIM we perform biomedical imaging of whole tissue sections with high throughput and excellent spectral quality. These detailed IR fingerprints allow us to analyze neurogenerative disease and cancer pathology with a level of depth that goes beyond conventional histology and immunohistochemistry."
Klaus Gerwert, Ph.D., Founding Director, Center for Protein Diagnostics, Chair and Professor of the Department for Biophysics, Ruhr University Bochum

"Amongst other aspects of microplastics our research focuses on the analysis and impact of microplastic particles in the environment. We use FT-IR imaging on a daily basis to reliably find and identify these particles even in complex matrices by chemical imaging of complete particle filters. The LUMOS II IMG has become a workhorse in our microplastic laboratory that provides the performance and measurement speed we need to advance our research."
Christian Laforsch, Ph.D, Professor for Animal Ecology, Martin Löder, Ph.D., Assistant Professor for Animal Ecology, Director, Collaborative Research Centre Microplastics, University of Bayreuth

Laser class 1 product.

Bruker Optics is continually improving its products and reserves the right to change specifications without notice.
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