Fraunhofer

LASER World of PHOTONICS,
June 24–27, 2019, Munich

CUSTOMIZED SOLUTIONS

CONTENT

CUSTOMIZED SOLUTIONS

Innovative optics enhance the precision, speed and versatility of sensor technology, testing equipment and laser-based production systems. Optics therefore open up new avenues for business and enable more effective and efficient solutions for industry and research. From spectroscopy for increasingly fine analysis, to interception-proof communication based on quantum encryption, to the pioneering use of additive manufacturing to produce customized components – optics are the key to a host of new products and services. Many new developments in industry and society are based on optical processes. This includes environmentally friendly electromobility, high-performance communications, smart medical devices and mass customized manufacturing.

Various Fraunhofer Institutes and Research Institutions will be presenting tailor-made solutions for industry and research at the LASER World of PHOTONICS 2019, in the joint Fraunhofer booths in **Hall A2, Booth 431** and **Hall B3, Booth 335**. These technological innovations are energizing a host of sectors and making an active contribution toward advancing our society. For example, digital photonic production – i.e., the combination of photonics and information technology – is creating new opportunities in the field of Industrie 4.0. Similarly, the use of high-performance ultrafast lasers will soon enable precision machining at a quality and output never before achieved.

The focus of all activities at the Fraunhofer-Gesellschaft is contract research and development. In this instance, these activities include the design and development of new optical systems, laser-beam sources, optical measurement systems, precision optomechanical systems, and laser-based systems for microscale and macroscale material processing. The Fraunhofer Institutes provide processes, system solutions, feasibility studies and expert consultation.

This brochure offers an overview of the solutions that Fraunhofer researchers will be presenting at LASER World of PHOTONICS 2019. We would be delighted to see you there.

If you would like to arrange a personal meeting, please do not hesitate to get in contact.

FRAUNHOFER PRESS TOUR

Tuesday, June 25, 2019
Customized Solutions
Time: 12:30–2:00 p.m.
Includes snacks and open discussion
Location: Fraunhofer booth
Hall A2, Booth 431 (part I of the tour) and
Hall B3, Booth 335 (part II of the tour)

PRESS

Fraunhofer-Gesellschaft e.V.
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With the spirit of scientific inquiry to guide us, we invent the shape of things to come – the world of tomorrow and beyond. For the future is the force that drives the Fraunhofer-Gesellschaft. We ask the questions that need to be asked. We find the answers that need to be found, the solutions that deliver immediate benefits to industry and society. How do we build smart, universally trusted machines? How do we manufacture drugs that provide faster, more affordable relief to patients? How do we make the world a safer place for everyone? And how do we know which idea is the right idea? Researchers, entrepreneurs, visionaries – this is who we are. What we do not only sets the pace for science; it puts science in service of society. Our innovative powers, our partners and workforce, our 70-year history – these are the outward signs of our success. Yesterday's victories and today's possibilities spur our curiosity about the future. They inspire us to explore tomorrow's key issues, forever seeking new answers to the question: **What's next?**

70 YEARS OF
FRAUNHOFER
70 YEARS
OF FUTURE
#WHATSNEXT

PRESENTATIONS

LASERS AND OPTICS

Location: Forum Hall B3

Monday, June 24, 2019
Time: 2:40–5:00 p.m.
CW Diode Pumped Solid State Lasers and Fiber Lasers
Chairmen: Frank Gäbler, Director of Marketing, Coherent | ROFIN
Hans-Dieter Hoffmann, Department Manager Lasers and Optics, Fraunhofer Institute for Laser Technology ILT
Prof. Dr. Andreas Tünnermann, Director, Fraunhofer Institute for Applied Optics and Precision Engineering IOF

Tuesday, June 25, 2019
Time: 1:20–2:40 p.m.
First public workshop *f*o+ [freeform optics plus]
Organized by OptoNet e.V. and Fraunhofer IOF

Tuesday, June 25, 2019
Time: 3:00–5:20 p.m.
Ultrashort Pulse Lasers and Beam Delivery
Chairmen: Dr. Thomas Rettich, Research and Science Coordination, TRUMPF Laser- und Systemtechnik GmbH
Hans-Dieter Hoffmann, Department Manager Lasers and Optics, Fraunhofer Institute for Laser Technology ILT
Prof. Dr. Andreas Tünnermann, Director, Fraunhofer Institute for Applied Optics and Precision Engineering IOF

Wednesday, June 26, 2019
Time: 10:00–12:20 p.m.
High power diode lasers: highly efficient beam sources for pumping and direct applications
Chairmen: Dr. Jörg Neukum, Senior Product Manager – High-Power Diode Laser, Coherent Mainz – DILAS Diodenlaser GmbH
Martin Traub, Group Manager Optics Design and Diode Lasers, Fraunhofer Institute for Laser Technology ILT

Wednesday, June 26, 2019
Time: 1:00–3:00 p.m.
Optical Quantum Technologies 1: Sensing and Computing
Chairmen: Dr. Wilhelm Kaenders, Vorstand Technologie / Member of Executive Board (CTO), TOPTICA Photonics AG
Prof. Dr. Karsten Buse, Director, Fraunhofer Institute for Physical Measurement Techniques IPM

Wednesday, June 26, 2019
Time: 3:00–5:20 p.m.
Optical Quantum Technologies 2: Imaging and Communication
Chairmen: Prof. Dr. Andreas Tünnermann, Director, Fraunhofer Institute for Applied Optics and Precision Engineering IOF
Dr. Jürgen Stuhler, Senior Director Quantum Technologies, TOPTICA Photonics AG

LASER MATERIALS PROCESSING

Location: Forum Hall A3

Monday, June 24, 2019
Time: 10:00–12:20 p.m.
Modelling and Simulation of Laser Material Processes
Chairmen: Dr. Jens Schüttler, Modelling & Simulation, Coherent | ROFIN
Prof. Dr. Wolfgang Schulz, Head of Group Modelling and Simulation, Fraunhofer Institute for Laser Technology ILT / Project Leader Nonlinear dynamics of laser processing NLD, RWTH Aachen University

Monday, June 24, 2019
Time: 2:40–5:00 p.m.
Perspectives and challenges for applications with Ultrashort Pulsed Laser
Chairmen: Dr. Dirk Müller, Director of Strategic Marketing, Coherent
Dr. Arnold Gillner, Department Manager Ablation and Joining, Managing Director Fraunhofer Group Light and Surfaces, Fraunhofer Institute for Laser Technology ILT

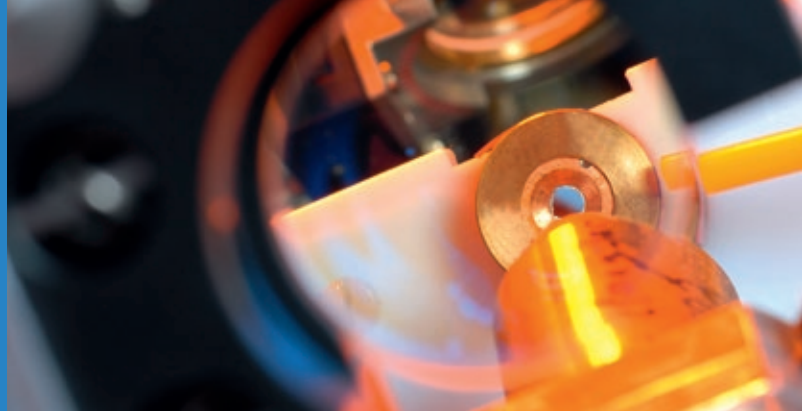
Tuesday, June 25, 2019
Time: 3:00–5:20 p.m.
No E-Mobility without Laser Technology
Chairmen: Dr.-Ing. Hans-Joachim Krauß, Head of Services, Bayerisches Laserzentrum GmbH
Dr.-Ing. Günter Ambrosy, TRUMPF Laser- und Systemtechnik GmbH
Dr. Alexander Olowinsky, Group Manager Microjoining, Fraunhofer Institute for Laser Technology ILT

Wednesday, June 26, 2019
Time: 10:00–12:20 p.m.
Smart Production of Metallic Parts by Additive Manufacturing
Chairmen: Dr. Lucas Jauer, Team Manager Laser Powder Bed Fusion, Fraunhofer Institute for Laser Technology ILT
Dr. Wilhelm Meiners, Expert Additive Manufacturing, TRUMPF Laser & Systemtechnik GmbH

Language: The application panels are held in English.
Location: At the forum in the respective exhibition hall.

You can find more presentations at:
http://s.fhg.de/laser2019

Last update: May 2019



HALL A2
BOOTH 431

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FRAUNHOFER INSTITUTE FOR APPLIED SOLID STATE PHYSICS IAF

In the food and pharmaceutical industries, production processes are constantly monitored to ensure products meet the necessary standards. Using our spectrally tunable quantum cascade lasers (QCLs), we can analyze across a broad wavelength range and identify chemical substances in just one millisecond. This fingerprint measurement enables mobile, real-time, in-line process monitoring. Alongside demonstrators and modules, Fraunhofer IAF also offers QCL chips in the 4–11 µm wavelength range and epitaxy solutions tailored to your specifications. Our applications lab will be delighted to accept your commissions to analyze solids, liquids or gases.

Topics and exhibits

- Quantum cascade laser in action: live spectroscopy with QCL
- Spectrally tunable QCLs operating in the 4–11 µm wavelength range
- 2.X µm tunable semiconductor disk laser with kHz linewidth and 2W output power
- Quantum sensors: diamond lasers for ultrasensitive measurement of magnetic fields at ambient temperature

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FRAUNHOFER RESEARCH INSTITUTION FOR ADDITIVE MANUFACTURING TECHNOLOGIES IAPT

Fraunhofer IAPT is one of the leading research institutes in the field of additive manufacturing (AM). We specialize in the following areas: design, process technology, factory systems and digitalization. Our objective is to scale up additive processes and technologies and facilitate their transfer to industry, thereby enabling the manufacture of completely new und resource-efficient products. We can provide you with customized solutions and help launch you as a competitive player in the field of AM.

Topics and exhibits

- SensePro: sensors with all-round field of vision for enhanced process control of production robots
- Laser welding for microprocessing and macroprocessing applications: laser-only or hybrid processes at outputs up to 30KW
- Laser-based 3D printing: qualification of new alloys, design optimization, quality assurance
- Powder-based laser metal deposition: qualification of new alloys; process and technology development
- GratLAS: automated, laser-based deburring process

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FRAUNHOFER INSTITUTE FOR LASER TECHNOLOGY ILT

The Fraunhofer ILT is one of the leading R&D players in its field. The institute employs over 540 researchers. For more than 30 years, it has been developing and optimizing laserbeam sources and processes for use in manufacturing, medical technology, measurement systems, energy systems and environmental systems.

Topics and exhibits

- Fraunhofer Cluster of Excellence Advanced Photon Sources CAPS: a strategic initiative for the development of high-performance, multi-kW USP lasers and their applications
- Development of beam sources for diode, solid-state, fiber and USP lasers and for tunable lasers used in material processing, test and measurement, and space applications
- Design and development of optical systems and packaging
- Laser-based production technology for macro- and microprocessing (AM, high-speed cutting, lightweight construction, drilling and surface finishing with USP lasers; laser applications in battery technology, laser bonding and thin-film technology)
- Modeling and simulation to optimize production processes and beam sources

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FRAUNHOFER INSTITUTE FOR PRODUCTION TECHNOLOGY IPT

Fraunhofer IPT develops system solutions for connected, adaptive manufacturing. In the field of laser processing, this includes the design of laser-based processes and systems that enable effective and efficient integration of laser technology in a variety of production chains. We also develop systems to monitor and control such laser-based processes, which can be easily retrofitted in existing laser-processing equipment.

Topics and exhibits

- Integrated, OCT-based systems for adaptive control of laser processes
- ToolRep: a system solution for laser-based tool repair
- Smart processing module for wire-based laser deposition welding
- Modular integration of laser processes in machine tools

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FRAUNHOFER INSTITUTE FOR MATERIAL AND BEAM TECHNOLOGY IWS

Fraunhofer IWS is a top address for innovations in the fields of laser and surface technology. We offer one-stop solutions covering new process developments, implementation in your production setup and technical support with the finished application. Our key areas of expertise also include systems engineering and process simulation. Fraunhofer IWS focusses its research in the fields of PVD, nanotechnology, chemical surface technology, thermal surface technology, additive manufacturing, joining, laser ablation, laser cutting and microprocessing. Within the scope of our research activities, we also characterize and test material properties.

- Newly developed laser welding head for high-frequency beam oscillation
- New compact drive system for dynamic beam shaping
- System technology for wire-based laser deposition welding
- Laser-generated components from hard-to-weld materials
- Magnetic pulse welding of mixed materials for sheet and tubular joints

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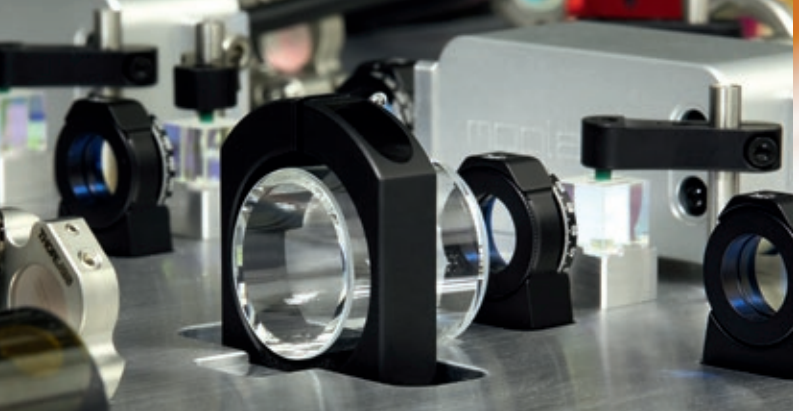

FRAUNHOFER CENTRE FOR APPLIED PHOTONICS CAP, FRAUNHOFER UK

The Fraunhofer Centre for Applied Photonics CAP, Glasgow, UK, develops both optical sources and systems for use across many application fields. Development capability for laser and sources spans a wide range of architectures, wavelength and temporal domains. Particular expertise lies in the development of visible, IR and mid-IR lasers and OPO sources. Applications include quantum enhanced measurements and sensing as well as remote or stand-off detection.

Complete systems incorporating applied photonics include LIDAR for renewable energy wind speed measurement, the stand-off detection of gases and illicit material as well as point of care medical diagnostics.

Topics and exhibits

- Laser source development
- Compact sources for quantum applications
- Remote and stand-off detection
- Complete instrumentation

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FRAUNHOFER LIGHTHOUSE PROJECT FUTUREAM

The Fraunhofer lighthouse project futureAM has been established in order to systematically advance the development of additive manufacturing (AM) for metallic components. Six institutes, all with a wealth of experience in the field of additive manufacturing, have entered into a strategic project partnership: Fraunhofer IAPT, IFAM, IGD, ILT, IWS and IWU.
This strategic project partnership has two fundamental goals:

1. Establishment of a cross-institute cooperation platform to enable coordinated collaboration and utilization of the various localized resources of the Fraunhofer-Gesellschaft in the field of AM
2. Creation of the technological base needed to increase the scalability, productivity and quality of AM processes in line with the requirements for the production of mass customized metal components

Concrete projects include the development of novel software for automated AM component identification and optimization, and a scalable laser powder-bed fusion plant concept with a ten-fold productivity increase.

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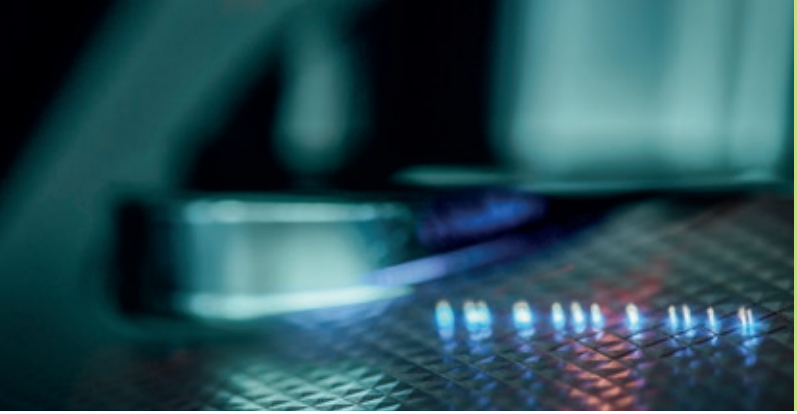

COLLABORATIVE PROJECT EVEREST

The Collaborative project eVerest involves a consortium of three research establishments (FH Münster University of Applied Sciences, RWTH Aachen University and Fraunhofer ILT) and five partners from industry (Volkswagen, DMG MORI, Scanlab, Precitec and Amphos). Its purpose is to develop an efficient machining system capable of producing large-format 3D forming tools for surface texturing.

Project priorities include the development of the following system components:

- A high-performance USP laser
- A sequential photonic process chain consisting of ablation and polishing, each with a USP laser
- A system to increase the rate of ablation including a fast z-shifter and scanner control technology to enable eight-axis simultaneous processing

This highly integrated system features innovative control technology to process the data flow. It more than halves the time required to produce a textured surface in the micron range.

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HALL B3
BOOTH 335

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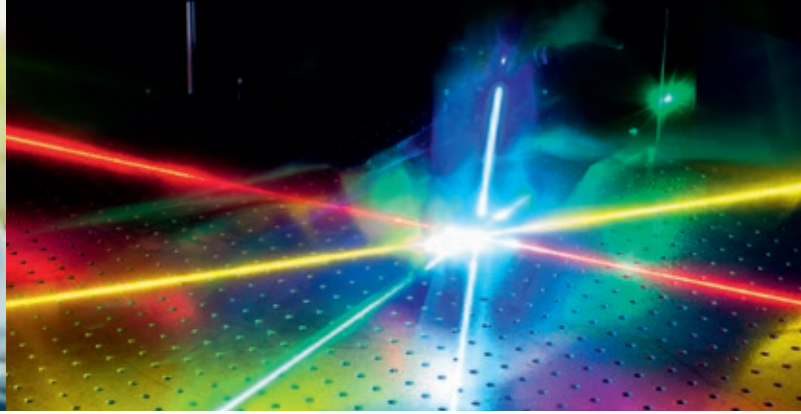

FRAUNHOFER INSTITUTE FOR APPLIED OPTICS AND PRECISION ENGINEERING IOF

The Fraunhofer IOF develops innovative optical systems and applications to generate and manipulate light. Our services extend along the entire photonics process chain, from the design of opto-mechanical and optoelectronic systems to the manufacturing of customized solutions. Fraunhofer IOF comprises the following business units: Optical Components and Systems, Precision Engineering Components and Systems, Functional Optical Surfaces and Coatings, Photonic Sensors and Measuring Systems, and Lasers.

Topics and exhibits

- Quantum technology for communications and imaging applications
- Optical freeform technologies
- Additive manufacture of optics
- Optical coatings
- Nano- and micro-optics
- Illumination optics
- Adaptive optics
- Fiber lasers

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FRAUNHOFER INSTITUTE FOR PHYSICAL MEASUREMENT TECHNIQUES IPM

The Fraunhofer Institute IPM develops tailor-made measuring techniques and systems for industry. Many years of experience with optical technologies form the basis for high-tech solutions in the fields of production control, object and shape detection, gas and process technology as well as thermal energy converters. The institute has around 220 employees. The director of Fraunhofer IPM is Prof. Karsten Buse, who also holds the Professorship for Optical Systems in the Department of Microsystems Engineering (IMTEK) at the University of Freiburg.

Topics and exhibits

- Generation and system integration of frequency combs
- Quantum cascade lasers to analyze exhaust gases
- Design and build of customized analytic systems
- Nonlinear frequency conversion for generating laser light in new wavelength ranges and extending the wavelength range of radiation detectors
- Optical components and systems: multi-reflection gas-measurement cells for the analysis of trace gases

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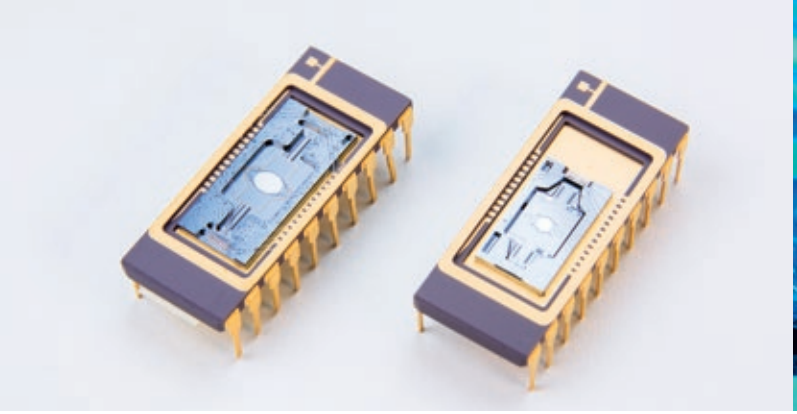

FRAUNHOFER INSTITUTE FOR PHOTONIC MICROSYSTEMS IPMS

The Fraunhofer IPMS develops and produces micro-electromechanical systems (MEMS) and micro-opto-electromechanical systems (MOEMS). It also integrates these in systems based on light deflection and modulation. Fraunhofer IPMS is certified according to DIN EN ISO 9001 and boasts state-of-the-art equipment and clean-room facilities. It offers top-quality products and processes based on rich scientific expertise and applications experience. Services range from design through to product development and pilot production – from component up to system solution.

Topics and exhibits

- MEMS scanner in a tunable quantum cascade laser (QCL) module for spectroscopy in the mid-infrared range
- Programmable MEMS grating for optical spectroscopy
- Fluidic micro-lens with variable focus

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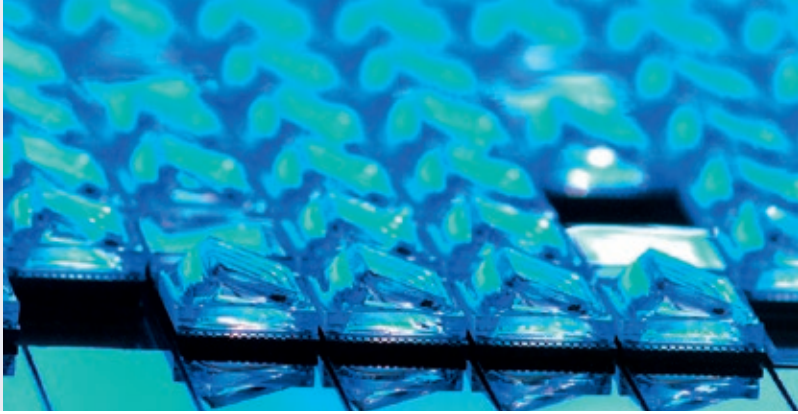

FRAUNHOFER INSTITUTE FOR SILICON TECHNOLOGY ISIT

The Fraunhofer ISIT is presenting resonant micro-scanning mirrors with analog adjustability for applications such as laser-processing of materials at powers up to 2kW, automotive laser headlights, compact full-color laser projection displays, gesture-recognition systems and sensors for imaging applications. Thanks to vacuum encapsulation at the wafer level, these 2D actuators operate very reliably over a wide temperature and humidity range. These components are used in, for example, camera scanning, LIDAR, structured illumination and medical technology applications.

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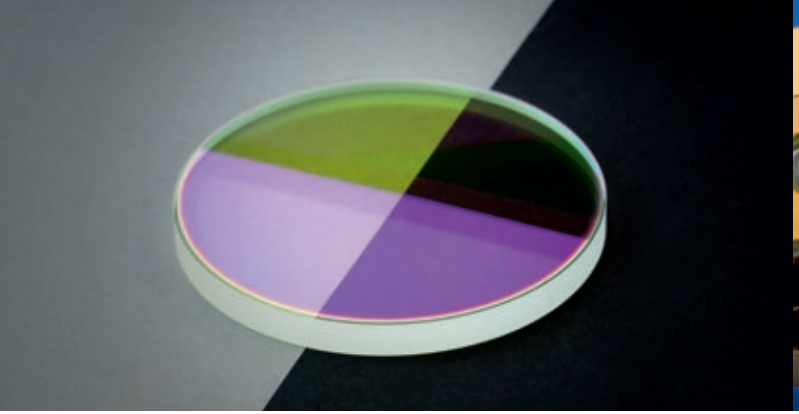

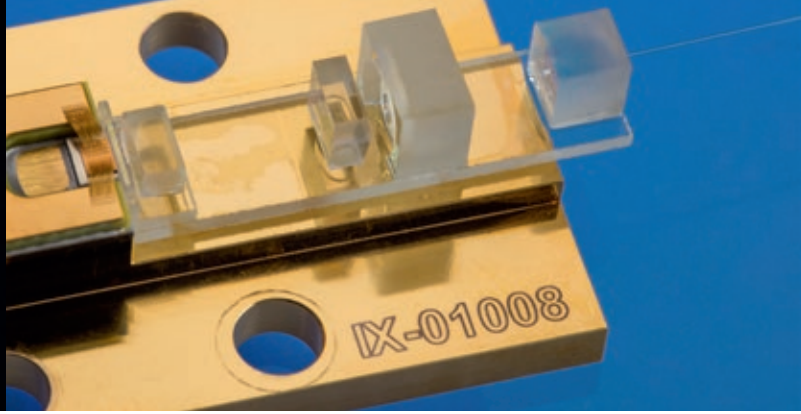

FRAUNHOFER INSTITUTE FOR SURFACE ENGINEERING AND THIN FILMS IST

At this year's LASER World of PHOTONICS, the Fraunhofer IST is presenting ultraprecise optical interference and bandpass filters that have been produced with the Enhanced Optical Sputtering System EOSS®. Using this system, it is possible to batch-process up to ten substrates simultaneously. EOSS® is an extremely precise and reliable process, guaranteeing uniform coatings, even with highly complicated designs. Fraunhofer IST is also showing a demonstration version of MOCCA+® (Modular Coating Control Application), a system that monitors coating thickness and automates the entire coating process. It is designed for use in the manufacture of precision optics.

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FRAUNHOFER INSTITUTE FOR RELIABILITY AND MICROINTEGRATION IZM

The Fraunhofer IZM conducts applied research for industry. It specializes in the development of high-scale-integrated and reliable packaging solutions for electronic and photonic components at the wafer and panel level.

Topics and exhibits

- Photonic assembly: optical coupling and integration of diode lasers and integrated optical chips in an industrially automated active alignment process for optimal optical coupling and beam shaping
- Electrical optical circuit boards (EOCB): diffusion of optical waveguides into thin glass panels for optical data transmission at high bit rates; can be laminated as an intermediate optical layer in multilayer stacks
- Fiber-optic interconnects and sensors: shaping and joining fiber and micro-optical components with, for example, CO_2 lasers to couple high laser power with glue-free interfaces; construction of compact fiber-optic sensors, development of novel narrow-band microresonators

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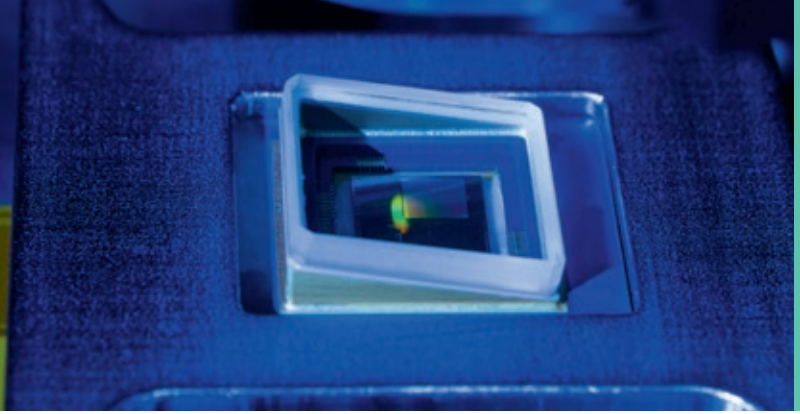

FRAUNHOFER PROJECT HUB «MICROELECTRONIC AND OPTICAL SYSTEMS FOR BIOMEDICINE» MEOS

At this year's LASER World of PHOTONICS, the Fraunhofer Project Hub for «Microelectronic and Optical Systems for Biomedicine» MEOS is presenting exemplary results of two of its technology platforms: Structured Illumination and Advanced Imaging. Using micromirror arrays from Fraunhofer IPMS, researchers are developing optical modules for high-resolution microscopy with substantially reduced phototoxicity. This is used for the precise illumination of individual cells in the field of biophotonics. In the field of imaging, researchers are working for example on a high-resolution confocal laser-scanning fluorescence microscope to enable the automatic real-time identification of cancer cells during surgery. Both of these systems are based on a combination of optical MEMS components and special optics.

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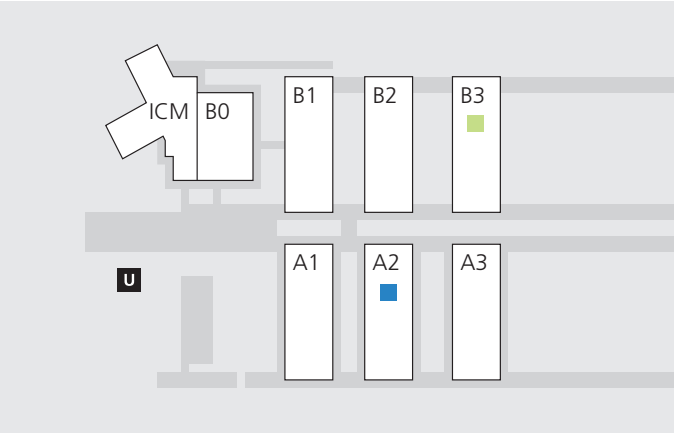
EXHIBITING FRAUNHOFER UNITS



HALL A2, BOOTH 431

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HALL A2, BOOTH 431

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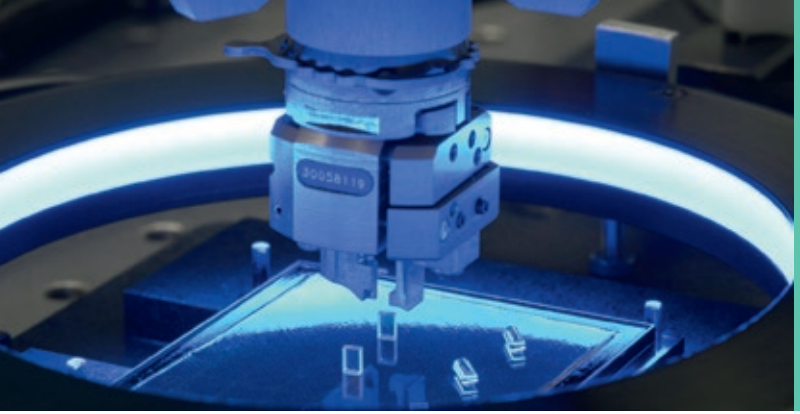

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