#### **Connecting Global Competence**





# **APPLICATION PANELS**

PROGRAM

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JUNE 22-25, 2015, MESSE MÜNCHEN

22nd International Congress on Photonics in Europe–co-located with LASER World of PHOTONICS 2015

# WORLD<sup>or</sup>PHOTONICS CONGRESS

# WELCOME NOTE

## Application panels—Lasers and photonics in actual practice

The application panels are now a permanent part of the World of Photonics Congress. The series of lectures that are held in the Forums of the LASER World of PHOTONICS 2015 exhibition halls bridge the gap between science and practical application.

In the exhibition halls of LASER World of PHOTONICS – Free admission with your ticket

Well-known speakers from industry and research institutes report on the latest industrial and medical application findings in the sector for optical technologies and discuss current challenges with you. Lectures deal with cutting-edge megatrends such as additive manufacturing (3D printing), laser processing of glass and using lasers in automobile headlights.

### For scientific topics, don't miss the Congress

Anyone who wants to gain insights into the latest research projects and upcoming technologies that go beyond actual practice will find the right answers in the eight conferences at the World of Photonics Congress. Be sure not to miss the entire world of photonics research and practice at a single location! Visit the World of Photonics Congress and LASER World of PHOTONICS 2015 in Munich from June 22–25, 2015.

Additional information about the World of Photonics Congress and the LASER World of PHOTONICS exhibition is available at www.photonics-congress.com



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Laser-Advanced New Methods for Diagnostics and Therapeutics

Monday, June 22, 2015, 12:20-14:40

Chairmen: Dr. Carsten Philipp, Elisabeth-Klinik Berlin, DGLM e. V., Dr. Ronald Sroka, Laser-Forschungslabor in LIFE-Centre at Hospital of University Munich, DGLM e.V.



Dr. med. C. Philipp Dr. R. Sroka

To transform a laser into a successful medical device requires intense and careful cooperation between industry and research paired with commitment and the sense for the right moment. Evaluation of medical and social benefits, the power of competing techniques, rules and regulations, financing and reimbursement issues play their role in the development and placement of a medical-approved device or procedure. Furthermore, all medical procedures need continuous reconsideration with respect to competing techniques and with regard to usefulness and outcome. This panel focuses on the ways of cooperation to make biophotonic innovations work, from bench to bedside by views of clinicians, researchers, engineers and industry. Medical, scientific and industrial representatives will provide information about their specific tasks and efforts to launch a specific device or procedure.

### 12:30-12:50

Photoacoustics: Basic Principles, Clinical Potential, and a European Effort to Clinical System **Development** Prof. Dr. Wiendelt Steenbergen Chair of Biomedical Photonic Imaging, University of Twente

### 12:50-13:10

Latest Developments in Pulsed Diode Laser Technology, and its Integration in a Medical Ultrasound Scanner Dr. Andreas Kohl Head of Operations Diode Lasers, Quantel Lasers

### 13:10-13:30

Translation of the Research on Photoacoustic Imaging into a Portable Photoacoustic/US Scanner Dr. Peter Brands Coordinator Advanced Projects, ESAOTE Europe



### 13:30-13:50

A New Approach in Laser Machining of Optical Fibres to Manufacture Diffusors for Medical Therapy Manuela Schwagmeier Laser- und Medizin-Technologie GmbH

### 13:50-14:10

**Optical Fiber Solutions for Laser Ablation of Soft Tissue and imILT** Cristina Pantaleone Clinical Laserthermia Systems AB

### 14:10-14:30

**Clinical Requirements on Optical Fibers for Endovenous Energy Application** CA PD Dr. med. Claus-Georg Schmedt Diakonie-Klinikum Schwäbisch Hall

14:30-14:40 **Speakers Corner** 



















Laser Applications and Optical Diagnostics in Ophthalmology

Monday, June 22, 2015, 14:40-17:00

Chairmen: Prof. Dr. Alfred Vogel, Director Institute of Biomedical Optics, University of Lübeck, Dr. Manfred Dick, Ophthalmic Systems Director Research, Carl Zeiss Meditec AG



Prof. Dr. A. Vogel Dr. M. Dick

This panel presents revolutionary innovations in the fields of refractive and cataract surgery, retinal diagnostics/treatment, and optical coherence tomography. Vortex beams allow for a precise creation of LASIK flaps, femtosecond lasers are employed for flapless refractive surgery and revolutionize cataract surgery. Opto-acoustic measurements enable implementing an online temperature control of retinal photocoagulation, molecular and 2-photon fluorescence real-time imaging improves the diagnostics of degenerative diseases, and laser-based induction of heat shock proteins may enhance the stress resistance of the retinal pigment epithelium. A dramatic increase of data acquisition speed in OCT opened up new possibilities for intra-operative OCT monitoring as well as for ultra-wide-field recording of the ocular fundus, and speckle evaluation allows for OCT-based angiography.

### 14:40-14:55

Vortex Beams for Corneal and Cataract Surgery Prof. Dr. Alfred Vogel, Director Institute of Biomedical Optics, University of Lübeck

### 14:55-15:10

Laser Presbyopia Treatment Prof. Dr. Holger Lubatschowski Managing Director, Rowiak GmbH

15:10–15:25 Femtosecond Laser Cataract Surgery Dr. Frieder Loesel, Managing Director, 20/10 Perfect Vision AG

### 15:25-15:40

Early AMD Diagnosis, Prophylaxis, and Treatment Prof. Dr. med. Johann Roider, Director University of Kiel, Department of Ophthalmology

### 15:40-15:55

OCT Advances from IOL Master to Intraoperative OCT Dr. Manfred Dick, Ophthalmic Systems Director Research Carl Zeiss Meditec AG

### 15:55-16:10

Clinical Results of Intraoperative OCT PD Dr. med. Philipp Steven, Head Ocular Surface University Eye Clinic, Cologne

### 16:10-16:25

Future Perspectives of Ophthalmic OCT: Ultrafast Ultrawide Field Recording, and OCT-based Angiography Prof. Dr. Robert Huber Institute of Biomedical Optics, University of Lübeck

### 16:25-16:40

Molecular Imaging of the Retina (Autofluorescence, 2-photon FLIM & more) Dr. Kester Nahen Managing Director, Heidelberg Engineering GmbH

























Visions for Future Diagnostics–Infectious Diseases

Tuesday, June 23, 2015, 10:00-12:20

Chairmen: Prof. Dr. Jürgen Popp, Leibniz Institute of Photonic Technolgy, Prof. Dr. Michael Bauer, Center for Sepsis Control & Care, University Hospital, Jena





Prof Dr M Bauer

The multidisciplinary field of infectious disease diagnostics is both a highly innovative research area and a fast-growing market. Its broad range of disciplines and combined know-how involved can be a handicap for straight-forward solutions. Transformation of scientific knowledge into components, systems and innovative products is hindered due to a lack of early communication between the different disciplines and industry. This panel of infection specialists will bring together end-users with technologyowners and developers to match their requirements. Accordingly, a physician will start the session to define unmet medical needs. Speakers from industry and academia will break down medical requirements into defined demands and present technological solutions like lasers and detectors.

### 10:00-10:20

Spectroscopic Point-of-Care Approaches for Medical Diagnosis Prof. Dr. Jürgen Popp Scientific Director, Leibniz Institute of Photonic Technolgy

### 10:20-10:40

The Unmet Medical Need Prof. Dr. Michael Bauer Assistant Director of Anesthesiology and Intensive Care, University Hospital Jena

### 10:40-11:00

Fast Detection of Pathogens with Molecular **Biological Methods** Dr. Marc Lehmann Managing Director, Moldiax GmbH

### 11:00-11:20

**Towards True Point-of-Care of Infectious Diseases** Stephan Hubold Project Manager / R & D, Alere Technologies GmbH

11:20-11:40 **System Solutions for Pathogen Diagnostics** N.N. Analytik Jena AG

### 11:40-12:00

**Comprehensive Mobile In-Vitro Diagnostic System** for the Early Diagnosis of Sepsis

Dr. Bernhard Gerstenecker Senior Scientist, Market Development, **OIAGEN Lake Constance GmbH** 

12:00-12:20 **Speakers Corner** 











Innovation and Trends for Laser Solutions in Life Sciences and Bioinstrumentation

Tuesday, June 23, 2015, 12:20-14:40

### Chairmen: Dr. Matthias Schulze, Coherent Inc., Prof. Dr. Thomas Hellerer, FH München





Dr. M. Schulze

Prof. Dr. T. Hellerer

Lasers represent the single most important sensing tool in life sciences. A tool that enables cutting research through clinical diagnostics; with applications ranging from neuroscience to personalized medicine. Recent laser-powered innovations include superresolution microscopy, optogenetics, higher throughput flow cytometry, as well as faster and lower cost DNA sequencing. These application innovations are in turn being supported by vigorous innovation in laser light sources tailored for life sciences. This workshop will examine the links between specific innovations in life sciences and parallel advances in these light sources. Important innovations include higher power, new wavelengths and improvements in beam delivery systems - both fiber delivery and beam shaping. It will also include a discussion of the relative merits of lasers in comparison to the implementation of LEDs that continue to gain traction in some niche applications.

### 12:20-12:45

Optimizing Lasers for Cost-Sensitive Bio Applications Mr. Wallace Latimer Product Line Manager, Coherent Inc.

### 12:45-13:10

Multi-color Diode Lasers for Biophotonics Dr. Tim Paasch-Colberg Technical Marketing Manager, TOPTICA Photonics AG

### 13:10-13:35

Application of Laser-Based Instrumentation in Life Science Industry: an Instrument Manufacturer's Perspective Dr. Markus Lankers rap.ID Particle Systems GmbH

### 13:35-14:00

The Development of Supercontinuum Fiber Lasers from Scientific to Industrial Biomedical Applications Ross Hodder Head of Sales & Marketing, Fianium Ltd

#### 14:00-14:25

Ultrafast Lasers for Life Science and Bio-Instrumentation Julien Klein, Senior Manager, Product Marketing, Spectra-Physics, a Newport Corp. Company

14:25–14.40 Speakers Corner

















Advanced Applications of Ultrashort Pulsed Laser Systems

Monday, June 22, 2015, 14:40-17:00

Chairmen: Dirk Müller, Coherent LaserSystems GmbH, Dr. Arnold Gillner, Fraunhofer Institute for Lasertechnology ILT





D. Müller

Dr. A. Gillner

Ultrashort pulsed lasers provide outstanding capabilities with respect to accuracy, independence of material and highest flexibility. It is extremely precise, uses enormously strong bundled energy, and it is ideally suited for the extremely delicate tasks that it performs. With this characteristic, ultrashort pulsed lasers have been successfully proven for numerous industrial applications, especially in display manufacturing for medical technology and electronics. However, due to the increase of average power, also applications on large components will be possible and show the way for future emerging markets. New scanning systems and multiple-beam approaches are necessary to provide high productivity and high quality at the same time. With these new optical systems, outstanding applications have been realized for glass and sapphire cutting, micro drilling, 3D-ablation as well as thin-film structuring without any thermal issues.

### 14:40-15:00

### **Laser-Processing of Battery Materials**

Dr. Wilhelm Pfleging, Head of Group Laser Materials Processing, Karlsruhe Institute of Technology

### 15:00-15:20

High-Rate Laser Micro-Machining Systems Using Ultrashort Pulsed Lasers Uwe Wagner Chief Sales Officer, 3D-Micromac AG

### 15:20-15:40

Surface Structuring with Ultrashort Laser Pulses– Ways to Optimize Efficiency, Precision and Quality Dr. Beat Neuenschwander, Bern University of Applied Sciences, Institute for Applied Laser, Photonics Surface Technologies

### 15:40-16:00

Ultrashort-Pulsed Laser for Mictrostructuring of Large Surfaces Dr. Stephan Brüning F & E-Project Manager, Schepers GmbH & Co KG

### 16:00-16:20

Ultrashort Pulse Laser Processing of Transparent Materials Prof. Dr. Stefan Nolte, Professor of Experimental Physics/Laser Physics, Friedrich-Schiller-University Jena

16:20–16:40 Speakers Corner













3D-Printing: Laser-Based Additive Manufacturing for the Production of Metal Parts

Tuesday, June 23, 2015, 10:00-12:20

### Chairmen: Dr. Dieter Schwarze, SLM Solutions GmbH, Dr. Wilhelm Meiners, Fraunhofer Institute for Lasertechnology ILT





Dr. W. Meiners

The additive manufacturing processes most commonly used for metallic components are Selective Laser Melting (SLM) for producing new parts, and Laser Metal Deposition (LMD) for repairing and modifying existing components. Since they manufacture without tools and offer a great freedom of geometry, these additive processes enable functionally optimized components to be produced, e.g. in automobile, tools as well in aviation and turbine construction. In addition, the industry expects, above all, a significant increase in resource and energy efficiency during the entire life cycle of a product thanks to the use of functionally optimized components as well as to flexible repair strategies. For this reason, these processes are increasingly making their way into industrial manufacturing chains. In this panel, practical examples from industrial applications will be presented in addition to a process overview.

#### 10:00-10:20

Laser-based Additive Manufacturing: Basic Principle and Examples of Applications Dr. Wilhelm Meiners Group Leader, Fraunhofer Institute for Lasertechnology ILT

### 10:20-10:40

Material Properties of Nickel-based Superalloys with quasi Single-Crystalline Structures Produced by Selective Laser Melting Dr. Dieter Schwarze Scientific Coordinator, SLM Solutions GmbH

### 10:40-11:00

ADM—Additive Design & Manufacturing Alexander Bonke FIT AG

### 11:00-11:20

Special Requirements for Making Metal Cooling Microstructures by using SLM Dr. Thomas Ebert Managing Director, IQ evolution GmbH

### 11:20-11:40

Oliver Müllerschön

TRUMPF: Product and Application Solutions for Additive Manufacturing

Senior Manager, Industry Management Laser System and Surface Treatment Solutions, TRUMPF Laser- und Systemtechnik GmbH

### 11:40-12:00

High-Speed Laser Cladding as Substitute / Alternative for (Nickel) Hard Chromium Surface Treatment on XXL Components Ernst Dijkstra, Plating Solutions

12:00–12:20 Speakers Corner





















# Ultrafast Laser Beam Deflection and Transportation

Tuesday, June 23, 2015, 14:40-17:00

Chairmen: Dr. Marwan Abdou-Ahmed, Institut für Strahlwerkzeuge (IFSW), Dr. Lutz Aschke, CEO, IVAM





Dr. M. Abdou-Ahmed

Dr. L. Aschke

Ultrafast laser sources at picosecond and femtosecond regimes have experienced great progresses in the last decade leading to the availability of laser systems with several hundred watts of average power on the market and higher than 1kW in the laboratory. Consequently, significant efforts are needed for beam-shaping, beam-guiding and beam-deflection optical systems in order to address the required beam characteristics and fast processing times on the work piece. The present panel will be dedicated to the different beam-shaping and beamscanning technologies for efficient and high-throughput material processing. The panel will combine this with expertise in the field of laser-based manufacturing technologies to discuss highly innovative beam-shaping and beam-steering devices and applications.

### 14:40-15:05

Multi-Axis Scan Head for High-Precision Micro-Drilling with Ultrashort Pulse Lasers Daniel Schwab QMR / Project Engineer, ARGES GmbH

### 15:05-15:30

Increasing Efficiency of Ultrashort-Pulsed Laser Processes by Using Multi-Beam Scanners Dr. Jens Holtkamp Managing Director, Pulsar Photonics GmbH

### 15:30-15:55

Scanner-based Processing of CFRP with Ultrashort Pulses and 1 kW Average Laser Power Christian Freitag, Scientific Associate, Institut für Strahlwerkzeuge (IFSW)

### 15:55-16:20

High-Throughput Surface Structuring with Scanners Dr. Markus Zecherle Manager Research Projects, R & D, SCANLAB AG

### 16:20-16:45

Polygon Scanners—Capabilities, Applications and System Integration Considerations Ronny De Loor CTO, Next Scan Technology













## Lasers in Microelectronics: The Smart World Approaching

Wednesday, June 24, 2015, 10:00-12:20

### Chairmen: Rainer Pätzel, Coherent LaserSystems GmbH, Dr. Dietmar Kracht, Laser Zentrum Hannover





R. Pätzel

Dr. D. Kracht

Today, we can no longer imagine the modern world without the myriad miniature electronic systems and devices that put the "smart" into our homes such as televisions, smartphones, tablets, touch-interfaces and many other multi-functional gadgets and devices. The cost-effective manufacturing of these devices is an ongoing challenge for the industry, and laser processing is at the heart of innovation, be it in display manufacturing, in advanced packaging or in solid-state lighting. Lasers serve many tasks, from high-precision structuring, drilling, cutting, marking and metallization of a multitude of materials, to large-area processing of thin films. This workshop will provide insight into latest laser applications that are related to microelectronic devices and have shown to be the driver for rapid innovation in manufacturing technologies.

### 10:00-10:20

Tailoring DPSSLs Towards Ultrastable, High-Repetition Rate Industrial Laser Tools for Microelectronics Processing

Dr. Martin Paster Sales Manager, InnoLas Photonics

### 10:20-10:40

Lasers for Electronics Dr. Ing. Roman Ostholt VP Technology Management, LPKF

### 10:40-11:00

Dynamic Focus Control in Laser Micro-Machining: Methods, Guidelines and Limitations Dr. Adam Weiss President, Wise Device Incorporated

### 11:00-11:20

Excimer Laser Ablation—A Novel Patterning Technology in Semiconductor Packaging Applications Dr. Ralph Zoberbier General Manager Exposure and Laser Processing SUSS MicroTec Lithography GmbH

### 11:20-11:40

Laser Applications in the Display Industry Dr. Bukuk Oh Chief Research Engineer, LG Electronics PRI

### 11:40-12:00

Advanced Packaging Challenges and their Impact on Laser Specifications Dr. Dirk Mueller Director of Marketing, Coherent Inc.

12:00–12:20 Speakers Corner





















Increased Automotive Efficiency Enabled by Laser Technology

Wednesday, June 24, 2015, 14:40-17:00

Chairmen: Dr. Rüdiger Brockmann, Director Industry- and Product-Management, TRUMPF Laser- und Systemtechnik GmbH, Dr. Hans-Joachim Krauß, Head of Services, Bayerisches Laserzentrum GmbH



Dr. R. Brockmann Dr. H.-J. Krauß

During the past decade, the laser was established as a standard tool for welding, cutting, brazing and many other applications in the automotive industry. However, new concepts for both e-driven mobiles as well as conventional vehicles, which are driven by combustion engines, require new solutions for higher efficiency. In the body area, increased efficiency can be reached by a light-weight approach. Therefore, new materials as well as new design concepts are introduced. The laser technology enables innovative production processes for this approach. It can be used for joining of dissimilar materials (e.g. copper and aluminum or plastic and metal). Furthermore, processes for cutting, joining and structuring of fiber-reinforced plastics are developed. In the power-train area, the laser is used to increase or reduce friction, or to allow new designs which save weight. This application panel shows an overview about the latest applications and developments of laser-based production technologies and laser technology itself.

### 14:40-15:00

Application Examples how Laser Technology Enables Automotive Efficiency

Dipl.-Ing. Ralf Kimmel, Head of Industry Management Automotive, TRUMPF Laser- und Systemtechnik GmbH

### 15:00-15:20

Testing of New Materials and Computer-Aided Optimization of Process Parameters and Clamping Devices during Predevelopment of Laser Welding Processes Prof. Dr. Peter Weidinger



Director Materials Laboratory, Brose Fahrzeugteile GmbH & Co. KG

### 15:20-15:40

Laser Beam Remote Welding of Aluminum Hang-on Parts Dr. Jan-Philipp Weberpals Technical Developer, Audi AG

### 15:40-16:00

Seam-tracked Laser Beam Remote Welding of Fillet Welds with Automated Gap Bridging Dr. Florian Albert Director of Application Department, Scansonic MI GmbH

### 16:00-16:20

Tailor-Welded Coils—A Unique Laser Welding Process Dr. Christian Both Head of R + D, WISCO Tailored Blanks GmbH

### 16:20-16:40

### Laser Surface Treatment of Composite Structures for Improved Adhesion

Dr. Tobias Mertens, Engineer Metallic Technologies & Surface Department, Airbus Group













Laser Processing of Glass

Thursday, June 25, 2015, 10:00-12:20

Chairmen: Christof Siebert, TRUMPF Laser- und Systemtechnik GmbH, Dr. Edgar Willenborg, Fraunhofer Institute for Lasertechnology ILT





C. Siebert

Dr. E. Willenborg

Laser radiation can be used for glass processing in many different ways to significantly improve established processes or to create completely new ones. Especially laser cutting of chemically strengthened glass is a process with huge impact in the mobile phone industry. Here, glass is a key component and determines how users interact with the devices. But also other laser-based processes for glass are under development or already in industrial usage. Examples are laser polishing and laser-based optics manufacturing or laser-based structuring of surfaces, or even in-volume structuring. A wide range of laser sources, from ultrashort pulse lasers to CW CO2 lasers, are used for the different processes. In this application panel, an overview on the state of the art of laser processing of glass will be given.

### 10:00-10:20

Ultrashort Pulse Laser Processing of Glass-**Fundamentals and Challenges** Jan Wieduwilt TRUMPF Laser- und Systemtechnik GmbH

### 10:20-10:40

Industrial Femtosecond Lasers for Highest Quality, Fast Processing of Transparent, Brittle Materials Dr. Victor Matylitsky Business Development Manager, Newport Spectra-Physics GmbH

### 10:40-11:00

Innovative Laser Technologies for Cutting, **Drilling and Structuring of Glass and Other Transparent, Brittle Materials** Dr. Roland Maverhofer

Rofin-Baasel Lasertech GmbH & Co. KG

### 11:00-11:20

Laser Polishing of Optics and Edge Rounding Christian Weingarten, Scientist/Project Manager, Fraunhofer Institute for Lasertechnology ILT

### 11:20-11:40

SLE: A New Way for 3D Micro Machining of Glass Martin Hermanss, CEO LightFab UG

### 11:40-12:00

Industrial Processing of Brittle Materials Using **Ultrashort Pulsed Laser Sources** Dr. Dmitrij Walter Head of R & D Laser & Optical Devices, Manz AG

12:00-12:20 **Speakers Corner** 



















# **Pico- and Femtosecond Lasers-Status and Prospects**

### Tuesday, June 23, 2015, 14:40-17:00

Chairmen: Dr. Thomas Rettich, TRUMPF Laser- und Systemtechnik GmbH, Dieter Hoffmann, Fraunhofer Institute for Lasertechnology ILT Prof. Dr. Andreas Tünnermann, Fraunhofer Institute for Applied **Optics and Precision Engineering IOF** 

D. Hoffmann





Dr. T. Rettich

Prof. Dr. A. Tünnermann

Sources of ultrashort and high-peak power optical pulses have become extremely important for numerous applications in science and industry. Considerable progress has been made over the last decade to realize reliable and highly efficient femtosecond and picosecond sources based on diode-pumped solid state and fiber technology. Using novel laser geometries, output powers exceeding the kW level have been demonstrated for these systems even in femtosecond pulse operation. This panel provides an overview about the recent progress in performance scaling. The panel enables you to compare state-of-theart laser concepts for operation in industrial environments. The presentations will be given by selected speakers of international market leaders in the field of ultrafast lasers.

### 14:40-14:50

Welcome and Introduction by the Chairs of the Application Panel

### 14:50-15:05

Novel Technologies and Applications Related to Ultrashort Pulsed Lasers

Dr. Max Kahmann, Product Manager, TRUMPF Laser- und Systemtechnik GmbH

### 15:05-15:20

**Reliable ps and fs Lasers for Industrial Ultrafast** Laser Applications Dr. Ralf Knappe, Director of Engineering, Coherent Kaiserslautern GmbH

### 15:20-15:35

Industrial Femtosecond Lasers Based on Hybrid Fiber and Solid-State Architectures

Dr. Clemens Hönninger Vice President Research & Development, Amplitude Systèmes

### 15:35-15:50

**Reliable, Compact, Flexible and Cost-effective** High-Power/Energy ps and fs Lasers and Application **Examples** Dr. Keming Du, CEO, EdgeWave GmbH

### 15:50-16:05

**Power-Scaling of Ultrashort Pulse Lasers Using** InnoSlab Technology Dr. Claus Schnitzler, Managing Partner, AMPHOS GmbH

### 16:05-16:20

ps and fs Lasers for Materials Processing Jürgen Serbin Business Unit Manager, Rofin-Baasel Lasertech

### 16:20-16:35

Fiber-based High-Performance Ultrafast Laser Systems Dr. Jens Limpert, R & D, Active Fiber Systems GmbH

16:35-16:50 **Speakers Corner** 



























Wednesday, June 24, 2015, 10:00-12:20

Chairmen: Frank Gäbler, Coherent Inc.,

Dieter Hoffmann, Fraunhofer Institute for Lasertechnology ILT Prof. Dr. Andreas Tünnermann, Fraunhofer Institute for Applied **Optics and Precision Engineering IOF** 





F. Gäbler

Prof. Dr. A. Tünnermann

Diode-pumped solid state lasers and fiber lasers have established themselves as attractive laser concepts for various applications in science and industry. This panel presents recent developments and current trends in the field of high-power lasers for industrial applications. Central topics are significant improvements in efficiency as well as robustness and reliability. The presentations cover CW lasers, pulsed lasers in the microsecond and nanosecond range, and the generation of green and ultraviolet light at high average power. The panel enables you to get an overview and to compare state-of-the-art laser concepts for operation in industrial environments. The presentations will be given by selected speakers of international market leaders in the field of high power lasers.

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D. Hoffmann

### 10:00-10:10

Welcome and Introduction by the Chairs of the Application Panel

### 10:10-10:25

Advances in Thin Disk Laser Technology Dr. Alexander Killi, Head of Department Research, TRUMPF Laser- und Systemtechnik GmbH

### 10:25-10:40

Multi-kW Fiber Laser Modules and Engines Enabled by High-Brightness Laser Diode Pumps Erik Zucker, Sr. Director Lasers Strategy, JDSU

### 10:40-10:55

Modular Multi-kW Fiber Laser System Dr. Bruno Acklin, Director of Engineering, Diodes, Fiber and Systems, Coherent, Inc.

10:55-11:10 **High-Power Fiber Lasers for Industrial Macro Applications** Frank Becker, Project Manager R & D, Rofin-Sinar Laser GmbH

11:10-11:25 Fiber Lasers in China–From Laboratory to Industry Dr. Cheng Li Raycus Fiber Laser Technologies Ltd.

11:25-11:40 High-Power Fiber Lasers Reaching 50% Wall-Plug Efficiencv Andreas Siewert, IPG Laser GmbH

11:40-11:55 **Ultrafast Thin Disk Lasers for Industrial Applications** Sven Poggel Team Manager R & D, Jenoptik Laser GmbH

11:55-12:10 **Speakers Corner** 























# LASERS AND OPTICS

High-Power Diode Lasers: Edge Emitters and Vertical Emitters—Status and Prospects

Wednesday, June 24, 2015, 14:40-17:00

### Chairmen: Dr. Jens Biesenbach, DILAS Diodenlaser Martin Traub, Fraunhofer Institute for Lasertechnology ILT



Dr. J. Biesenbach N

h M. Traub

High-power diode lasers have become well established as pump sources for solid state and fiber lasers, for material processing and medical applications. Significant progress in output power, brightness and production technology is still extending their range of applications. Their major advantages, compared to solid state and gas lasers, are high wall-plug efficiency, compact size, low cost, high reliability and low maintenance. Innovative diode laser designs, i.e. those based on dense spectral beam combining (SBC) as well as the diode manufacturing technology, show this technology's potential to reach applications which were so far dominated by SSL. In addition, edge emitters, vertical emitters (VCSEL) and their applications will be discussed. The presentations will be given by selected speakers of international market leaders in the field of high-power diode lasers and cover beam sources for a wide range of applications from automotive lighting to materials processing.

### 14:40-15:00

Surface Cladding with Multi-kW Diode Lasers Dr. Jens Biesenbach Technical Director, DILAS Diodenlaser

### 15:00-15:20

Fiber-Coupled Diode Lasers—Power and Brigthness— Status and Outlook Markus Rütering Sales Manager Asia, Laserline

### 15:20-15:40

Modular High Brightness Direct Diode Lasers for Material Processing and other Applications Haro Fritsche, Project Manager Advanced Development, Direct Photonics Industries GmbH

### 15:40-16:00

High-Power Wavelength Beam-Combined Direct Diode Lasers

Dr. Hagen Zimer, Group Leader "High Power Diode Lasers", TRUMPF Laser- und Systemtechnik GmbH

### 16:00-16:20

New Developments in High-Power VCSEL Systems Dr. Holger Moench, Manager Technology & Strategy, Philips GmbH Photonics, Aachen

### 16:20-16:40

Multi-kW-Class Direct Diode Lasers for Industrial Metal Cutting and Welding

Ph. D. Robin Huang Vice President, Teradiode Inc.

















# OPTICAL METROLOGY AND IMAGING

Contact-Free 3D Measurement Methods Ranging from Laser-Scanning to Imaging

Monday, June 22, 2015, 14:40-17:00

### Chairmen: Dr.-Ing. Gerhard Holst, Head of Science & Research, PCO AG, Prof. Dr.-Ing. Gerd Hirzinger, Former Head of Institute, DLR Institute of Robotics and Mechatronics





Dr. G. Holst

Prof. Dr. G. Hirzinger

The panel shows state-of-the-art contact-free 3D measuring technologies in the range of imaging and laser scanning. It will give an overview of the different technologies with their inherent characteristics, to measure precise three-dimensional data from industrially relevant objects up to airborne measurements of historical buildings. Furthermore, it will show how the different methods can compete or complement each other, with applications from a variety of fields.



### 14:40-15:00

**3D Laser Scanning: Development from the Beginning until Today** Dr. Christoph Fröhlich CEO. Zoller & Fröhlich GmbH

### 15:00-15:20

Photogrammetry—Precise and Fast Optical 3D Coordinate Measurement with High-Resolution Digital Cameras Dr.-Ing. Andreas Rietdorf R & D, AICON 3D Systems GmbH

### 15:20-15:40

### New Developments in Photogrammetric Matching Approaches for 3D Surface Reconstruction

Prof. Dr.-Ing. habil. Thomas Luhmann Head of Institute, Institute for Applied Photogrammetry and Geoinformatics, Jade University of Applied Sciences

### 15:40-16:00

Multi-Scale, Multi-Sensor 3D Documentation of Courtly Ceremonial Rooms Bernhard Strackenbrock R & D. DLR / Illustrated Architecture

### 16:00-16:20

**3D Measurements Based on Light Field Acquisition** Prof. Dr. Bernd Jähne Director, HCI Heidelberg Collaboratory for Image Processing

### 16:20-16:40

Light Field Cameras for Metric 3D-Measurements Dr. habil. Christian Perwaß CEO, Raytrix GmbH



















# OPTICAL METROLOGY AND IMAGING

High-Coherence Metrology from Long-Distance to Nanoscale Dimensions

Tuesday, June 23, 2015, 10:00-12:20

### Chairmen: Dr. Patrick Leisching, TOPTICA Photonics AG, Dr. Christian V. Poulsen, NKT Photonics A/S





Dr. P. Leisching

Dr. C. V. Poulsen

This panel presents the state of the art of non-contact metrology techniques employing high-coherence laser systems. The presentations introduce selected applications along with the enabling laser technology. The session also explores the strategies for next-generation applications and elucidates the corresponding requirements for future laser systems. Highlighted use-cases range from long-distance metrology employed in space-borne or geoscience applications, to large-volume metrology for intermediate-sized objects such as aircrafts, on to small-volume metrology, e.g., for high-precision metal working, thin film metrology on scales of 1 to 100 mm, and finally to nanometrology that accurately measures critical dimensions of semiconductor devices. 10:00–10:05 Introduction to High-Coherence Laser Technologies by the Chairs of the Application Panel

### 10:05-10:25

Low-Noise DFB Fiber Lasers for Interferometric Sensing Dr. Jens Engholm Pedersen, Sr. Scientist, NKT Photonics

#### 10:25-10:45

Gas-Filled Hollow-Core Fibres and Bulk Gas Cells as Optical Frequency References Dr. Jan Hald, Team Leader, DFM

### 10:45-11:05

Distributed Acoustic Sensing in the Oil and Gas Industry

Lew Stolpner, VP Technology & Product Management, Andrew Luis (no photo), GM, OptaSense Inc., Redfern Integrated Optics

### 11:05-11:25

Iodine-Stabilized Optical Frequency Standards at PTB: Performance and Applications Dr. Thomas Legero Physikalisch-Technische Bundesanstalt PTB

### 11:25-11:45

Metrology Applications for Next-Generation Single-Frequency and Single-Mode Diode Lasers Dr. Christian Nölleke, Project Leader R & D, TOPTICA Photonics AG

### 11:45-12:05

Femtosecond Lasers and Optical Frequency Combs for High-Precision Distance Measurements from 1 Meter to Kilometers and Beyond Dr. Ronald Holzwarth, CTO, Menlo Systems GmbH

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12:05–12:20 Speakers Corner















# OPTICAL METROLOGY AND IMAGING

Terahertz Spectroscopy and Inspection in Industrial Applications

Tuesday, June 23, 2015, 14:40-17:00

### Chairmen: Dr. Thomas Renner, TOPTICA Photonics AG, Prof. Dr. Martin Schell, HHI Fraunhofer Institute for Telecommunications





Dr. T. Renner

Prof. Dr. M. Schell

Terahertz radiation is very attractive for non-destructive testing because many industrially relevant materials like synthetics, polymers, textiles, paper and cardboard are transparent here. In addition, many gases and organic solids—including toxic or explosive substances—show characteristic absorption lines. New laser-based technologies now enable the generation and detection of Terahertz radiation without cryogenic temperatures or complex RF electronic devices. This enables Terahertz to migrate from lab settings to industrial environments as a tool for measurement of layer thickness, humidity, chemical composition or hidden defect structures. Experts from laser and component manufacturers, as well as solution providers for plastic inspection, paper industry, medical industries and homeland security will report about the latest developments on Terahertz technology.

### 14:40–15:00 Lasers for Terahertz Generation Dr. Anselm Deninger Product Manager Terahertz, TOPTICA Photonics AG

### 15:00–15:20 Terahertz Emitter and Detector Antennas

Dr. Thorsten Goebel, Head of Terahertz Sensors and Systems Group, HHI Fraunhofer Institute for Telecommunications

### 15:20-15:40

### Terahertz Systems for Industrial Applications

Dr. Joachim Jonuscheit, Deputy Head of Department Fraunhofer Institute for Physical Measurement Techniques IPM

### 15:40-16:00

Terahertz Systems for Plastic Pipes Arno Neumeister Product Manager, iNOEX GmbH

16:00–16:20 Terahertz Imaging and Spectroscopy for Security Applications Dr. Niklas Waasem, Sales Engineer, Hübner

16:20–16:40 The Use of Terahertz Sensors: Out of the Lab and Into the Factory Phil Taday, Head of Applications, Teraview





















### Imaging

A2

A2

B1

**B**3

**B**3

### Sensors, Test and Measurement / Optical Measurement Systems A2/A3 Lasers and Laser Systems for Production Engineering **Optics / Manufacturing Technology for Optics Optical Information and Communication B2/B3** Lasers and Optoelectronics **Biophotonics and Medical Engineering** ICM/BO WORLD<sup>or</sup>PHOTONICS CONGRESS Special Exhibit "Photons in Production" A2 Photonics Forum Hall A2 "Optical Metrology and Imaging" A3 Photonics Forum Hall A3 "Industrial Laser Applications" **A**3 Special Exhibit "Photonics Applications in the Automotive Sector" A3 Special Exhibit "3D Printing" / "Additive Manufacturing" BI Career Center Photonics Forum Hall B3 "Biophotonics and Medical Applications / **B**3 Lasers and Optics" **B**3 Startup World



# EVENT VENUE:

The "Application Panels-Lasers and Photonics in Actual Practice" are being held at the forums in exhibition halls A2, A3 and B3, depending on the topic.



# ADMISSION:

You must purchase an admission ticket to LASER World of PHOTONICS 2015 to gain admission to the halls. The trade show is the perfect opportunity to combine expanding your knowledge with making new business contacts. A separate ticket is needed to attend the conferences at the World of Photonics Congress. For additional information, refer to: www.photonics-congress.com

## LANGUAGE:

All application panels will be held in English.

# **NETWORKING:**

Take advantage of the Application Panels for networking and to expand your expertise. After the series of Application Panels is over, the speakers will be available in the Speakers' Corner of the forum to answer questions.









# CLEO®/Europe – EQEC 2015

### Sunday, June 21 to Thursday, June 25, 2015

# CLEO<sup>®</sup>/Europe 2015 Topics

- Solid State Lasers
- Semiconductor Lasers
- Terahertz Sources and Applications
- Applications of Nonlinear Optics
- Optical Materials, Fabrication and Characterization
- Ultrafast Optical Technologies
- High-Field Laser Physics and Attosecond Technologies
- Optical Sensing and Metrology
- Optical Technologies for Communi-
- cations and Data Storage - Fiber and Guided Wave Lasers and Amplifiers
- Micro- and Nano-Photonics
- Biophotonics and Applications
- Materials Processing with Lasers
- Photonics in Defense and Security

# **EQEC 2015 Topics**

- Quantum Optics
- Ouantum Information, Communi-
- cation, and Simulation
- Atom Optics and Quantum Matter
- Precision Metrology and Frequency Combs
- Ultrafast Optical Science
- Nonlinear Phenomena, Solitons and Self-Organization
- Light-Matter Interactions at the Nanoscale
- Plasmonics and Metamaterials
- Theoretical and Computational Photonics

# **Joint Symposia**

- Light Management in Photovoltaics
- Photonics Lab-on-a-Chip Biosensors
- Laser-Driven Acceleration
- Optics in Graphene and Other **Two-Dimensional Materials**
- Integrated Quantum Optics

# **European Conferences on Biomedical Optics**

### Sunday, June 21 to Thursday, June 25, 2015

- Advanced Microscopy Techniques
- Clinical and Biomedical Spectroscopy and Imaging
- Diffuse Optical Imaging
- Opto-Acoustic Methods and Applications in Biophotonics
- Novel Biophotonics Techniques

and Applications

- Optical Coherence Imaging Techniques and Imaging in Scattering Media
- Medical Laser Applications and Laser-Tissue Interactions
- Neurophotonics

# LiM 2015

### Monday, June 22 to Thursday, June 25, 2015

### Macro Materials Processing

- Joining (Welding and Brazing)
- Cutting
- Surface Treatment and Cladding
- Additive Manufacturing
- Fundamentals and Process Simulation
- System Technology
- Process Monitoring and Control
- CFRP

#### **Micro Materials Processing** \_\_\_\_\_

- Micro-Joining (Welding and Brazing)
- Ablation, Drilling and Micro-Cutting
- Surface Functionalization
- Processing of Transparent Materials
- Fundamentals and Process Simulation
- System Technology
- Process Monitoring and Control

# EOSMTOC/EOSLE/EOSOF/EOSOME

Monday, June 22 to Wednesday, June 24, 2015

- June 22-24, 2015
- EOS Conference on Manufacturing and Testing of Optical Components (EOSMTOC)
- June 24, 2015 EOS Conference on Light Engineering (EOSLE)

### - June 23-24, 2015

EOS Conference on Optofluidics (EOSOF)

- June 24-25, 2015 EOS Conference on **Optomechanical Engineering** (EOSOME)

# **SPIE Optical Metrology**

### Monday, June 22 to Thursday, June 25, 2015

- Optical Measurement Systems for Industrial Inspection
- Modeling Aspects in Optical Metrology
- Optics for Arts, Architecture, and Archaeology
- Videometrics, Range Imaging, and Applications
- Optical Methods for Inspection, Characterization, and Imaging of **Biomaterials**
- Automated Visual Inspection and Machine Vision





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