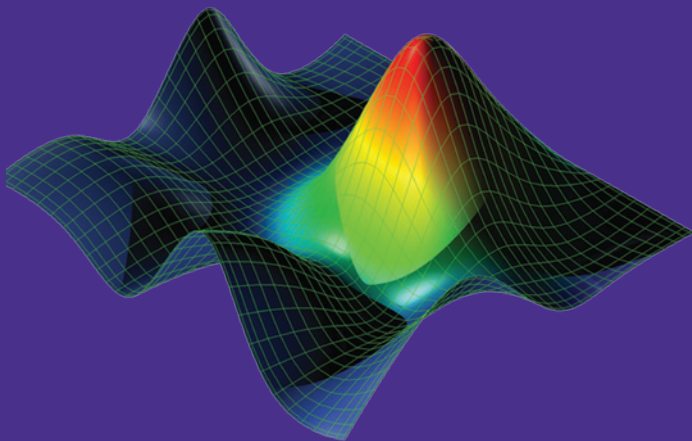


2013 Optical Metrology



- Optical Measurement Systems for Industrial Inspection
- Modeling Aspects in Optical Metrology
- O3A: Optics for Arts, Architecture, and Archaeology
- Videometrics, Range Imaging, and Applications
- Optical Methods for Inspection, Characterization and Imaging of Biomaterials
- Automated Visual Inspection

13–16 May 2013

MUNICH ICM

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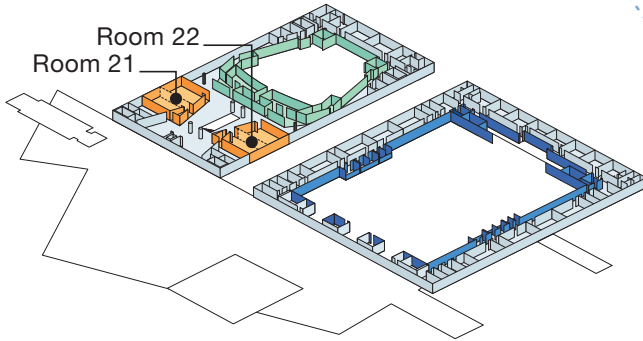
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WORLD OF PHOTONICS CONGRESS

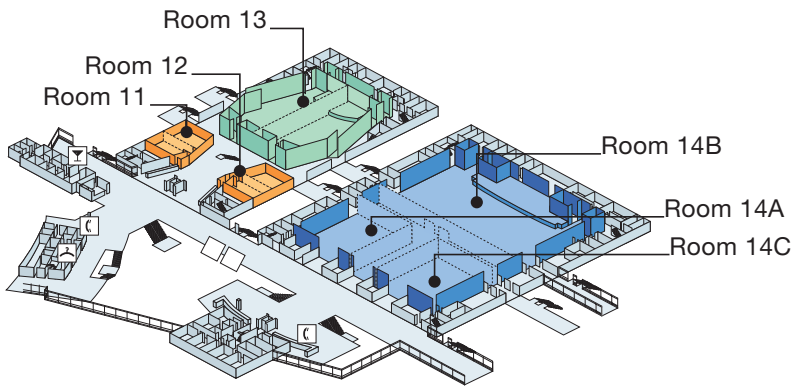


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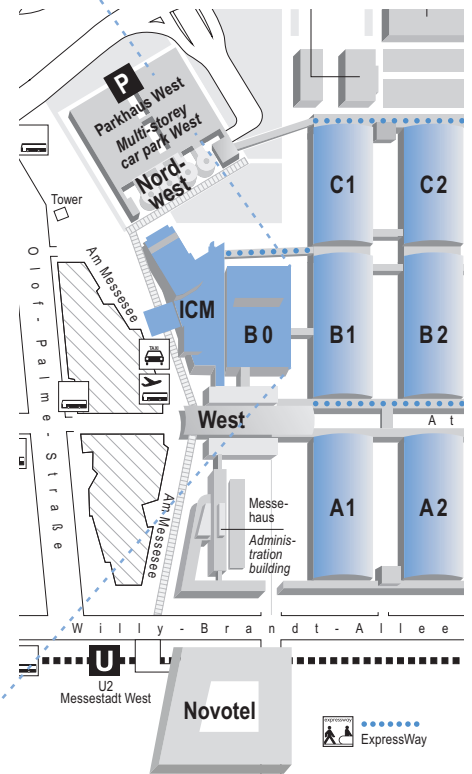
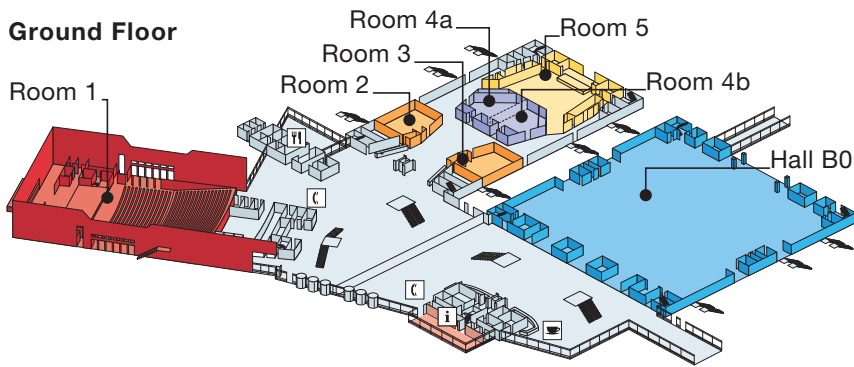
Second Floor



First Floor



Ground Floor





2013 Optical Metrology

13–16 May 2013

MUNICH ICM
International Congress Ctr.
Munich, Germany

2013 Symposium Chairs:



Wolfgang Osten
Univ. Stuttgart (Germany)



Karsten Buse
Fraunhofer-Institut für Physikalische
Messtechnik IPM (Germany)



Andrew J. Moore
Heriot-Watt Univ. (United Kingdom)

Welcome to Munich!

This symposium will highlight new optical principles and systems for metrology, videometrics and machine vision with applications in industrial design, production engineering, process monitoring, maintenance support, biotechnology, vehicle navigation, multimedia technology, architecture, archaeology and arts. Special emphasis is directed to model-based, remote and active approaches, sensor fusion, robot guidance, image sequence processing and scene modelling, biomaterials characterization as well as to the preservation of our shared cultural heritage.

Hear about the latest solutions to practical problems in industrial design and production engineering. Learn about recent advances in using optical technologies to preserve our shared cultural heritage. Find out about new approaches that push optical principles of measurement and testing at the macro, micro- and nanoscales to the forefront of metrology. Exchange new ideas, address your shared concerns, and get access to information not yet published in the mentioned topical areas. Share your research with other engineers, scientists, researchers, and managers. Presentations will be permanently archived in the SPIE Digital Library, and made available to others in the international scientific community who seek to learn, make discoveries, and innovate.

Cooperating Organisations

EOS European Optical Society

WLT German Scientific Laser Society
(Wissenschaftliche Gesellschaft
Lasertechnik e.V.)

ESB The European Society
for Biomaterials



Technical Committee

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Jürgen Beyerer, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation (Germany)
Bernd Bodermann, Physikalisch-Technische Bundesanstalt (Germany)
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Karsten Frenner, Univ. Stuttgart (Germany)
Simonetta Grilli, Istituto Nazionale di Ottica (Italy)
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Ralph P. Tatam, Cranfield Univ. (UK)

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SPIE would like to express its deepest appreciation to the symposium chairs, conference chairs, programme committees, session chairs, and authors who have so generously given their time and advice to make this symposium possible.

The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members. This programme is based on commitments received up to the time of publication and is subject to change without notice.

Daily Event Schedule

MONDAY 13 May	TUESDAY 14 May	WEDNESDAY 15 May	THURSDAY 16 May
Conf. 8788: Optical Measurement Systems for Industrial Inspection (Lehmann), p. 5			
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	Conf. 8792: Optical Methods for Inspection, Characterization and Imaging of Biomaterials (Ferraro, Ritsch-Marte), p. 19		
		8791B: Automated Visual Inspection (Beyerer, Puente-Leon), p. 18	
Special Events			
STUDENTS & SPIE FELLOWS LUNCHEON, 12:30 to 14:00, p. 4	WORKSHOP: Effective Technical Presentations Instructor: Jean-luc Doumont, Principiae bvba (Belgium), 08:30 to 12:30, p. 4	PLENARY SESSION: Challenges in Optical Metrology for Photo-Lithography (Coene), 10:30 to 11:20, p. 3	
	WORKSHOP: Effective Scientific Papers , Instructor: Jean-luc Doumont, Principiae bvba (Belgium), 13:30 to 17:30, p. 4	GETTING HIRED PANEL DISCUSSION, 13:00 to 14:00, p. 4	
		POSTER SESSION, 17:00 to 18:30, p. 4	
		WELCOME RECEPTION, 19:00 to 21:30, p. 4	

SPIE Optical Metrology 2013 features a number of Special Events you will not want to miss: Plenary Presentations, the interactive Poster Session, and a Welcome Reception. These are great opportunities to network and socialize with your colleagues from all over the world.

Plenary Session

Room 1, Wednesday, 10:30 to 11:20

Challenges in Optical Metrology for Photo-Lithography



Wim M.J. Coene,
ASML Research, Netherlands

The technology in photo-lithography is highly driven by the ITRS roadmap, leading to a continuous shrink of the features on ICs as used in the smart devices of today's connected society. Consequently, the lithographic scanner needs to operate as close as possible to its physical limits dictated by its wavelength and numerical aperture (which is known as low-k1 imaging); this implies increasingly tighter process windows, and thus an increased need for advanced lithographic process control and metrology. Optical metrology is well qualified as a valuable metrology technique for the photo-lithographic industry, since it is fast and non-destructive with respect to the patterns written in the photo-resist layer, and since it offers a high precision. Moreover, optical metrology applied on periodic gratings can be used both for the purpose of overlay metrology as well as for critical-dimension (CD) metrology. For the latter, a model-based approach is implemented, in which grating profile parameters are retrieved which relate to the relevant scanner control knobs, like scanner focus. In the presentation, apart from the core technology of optical scatterometry, a range of applications in photo-lithography will be addressed together with a number of new challenges, like reduction of target size for overlay metrology and metrology of scanner aberrations.



Biography: Wim M. J. Coene received the Ph.D. degree in physics from the University of Antwerp, Belgium, in 1986, for his research on modeling of high-energy electron diffraction and image formation in a high-resolution transmission electron microscope. He joined Philips Research Laboratories, Eindhoven, The Netherlands, in 1988, where he worked on phase-retrieval methods in high-resolution TEM devised for digital correction of aberration artifacts, via the use of focal image series. In 1996, he started to work on channel coding and signal processing for optical storage; this research was first focused on Blu-Ray disc technology, and from 2002 was directed toward future generations of optical storage like near-field recording and 2-D optical storage. He joined ASML Netherlands B.V., Veldhoven, The Netherlands, in 2007, where he is currently Director of Research for Sensors, Metrology, and Control for nanolithography. He is also a part-time Professor at the Control Systems Group, in the Department of Electrical Engineering, at the Eindhoven University of Technology, since 2010. His current research interests include metrology for nanolithography, and modeling and control for various subsystems in the lithographic scanner.

Special Events

Student Chapter Leadership Workshop

Sunday 12 May · 09:00 to 17:00

Technische Universität München, Room 2.160/Königssee



The successful SPIE Student Chapter Leadership Workshop is back in Europe for the second time. Join Student Chapter officers from around the world for a full day of professional development training and networking.

Popular lecturer Jean-luc Doumont will facilitate a workshop on leadership in organizations, focusing on motivation and the various leadership styles needed to succeed in a volunteer organization.

All student chapters are welcome to attend, but please RSVP to students@spie.org for confirmation.

WORKSHOP

Effective Technical Presentations

Monday 13 May 2013 · 08:30 to 12:30 · Novotel, Room Wright

WS897: Course Level: Introductory · CEU: 0.35

Instructor: **Jean-luc Doumont**, Principia bvba (Belgium)

Member Price US\$150 · Non-member Price US\$210

Course Details

Oral presentation skills are a key to success for researchers. This course proposes a five-step methodology that will take you from scratch to an effective technical presentation. It also offers tips on how to manage the nervousness associated with speaking in public.

Learning Outcomes

- plan your presentation efficiently
- organize your material into an effective structure
- create slides that get the message across
- deliver your presentation effectively, both verbally and nonverbally
- handle even the most difficult questions

Intended Audience

This material is intended for anyone who must prepare and deliver oral presentations. Both novice and experienced speakers can expect to learn much from it.

Instructor

Jean-luc Doumont runs lectures, workshops, and training programs in oral, written, and graphical communication for engineers, scientists, and managers worldwide. He is an engineer from the University of Louvain and a doctor in applied physics from Stanford University. This course is based on his popular lecture on oral presentations at over 15 top-ranked engineering schools (MIT, Stanford U, UC Berkeley, Caltech, Harvard, etc.).

Note: This course is free to SPIE Student Members, but you must register to attend.

Students and SPIE Fellows Luncheon

Monday 13 May · 12:30 to 14:00

Students: Advance Sign-up Required On-site. Seating Limited.

Students and SPIE Fellows are invited to this engaging networking opportunity. This event gives students an opportunity to network with SPIE Fellows who will share their insights into career paths in optics and photonics. Lunch is complimentary for students, but sign-up is required. The location for the lunch will be available at sign-up.



WORKSHOP

Effective Scientific Papers

Monday 13 May 2013 · 13:30 to 17:30 · Novotel, Room Wright

WS908 · Course Level: Introductory · CEU: 0.35

Instructor: **Jean-luc Doumont**, Principia bvba (Belgium)

Member Price US\$150 · Non-member Price US\$210

Course Details

Strong writing skills are a key to success for researchers. This course proposes a methodology that will take you from scratch to an effective scientific or technical document—a question of structure, not style. The approach is applicable across languages and for a wide range of document types beyond scientific papers, too.

Learning Outcomes

- plan your document efficiently
- create an effective abstract, introduction, and conclusion
- organize your material into an accessible structure
- construct paragraphs that get the message across
- write sentences that are easy to read

Intended Audience

This material is intended for anyone who must write or edit technical documents in general and scientific papers in particular. Both novice and experienced writers can expect to learn much from it.

Instructor

Jean-luc Doumont runs lectures, workshops, and training programs in oral, written, and graphical communication for engineers, scientists, and managers worldwide. He is an engineer from the University of Louvain and a doctor in applied physics from Stanford University. This course is based on his lectures and workshops on scientific and technical writing at universities and research centers around the world (MIT, Shell, Johnson & Johnson, etc.).

Note: This course is free to SPIE Student Members, but you must register to attend.

Poster Session and Reception

Wednesday 15 May · 17:00 to 18:30 · ICM Foyer

All symposium attendees are invited to attend Wednesday poster session provided as an opportunity to enjoy networking and refreshments while reviewing poster papers. The interactive poster sessions are designed to promote opportunities for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors.

Poster presenters may post their poster papers starting at 10.00 on Wednesday in the ICM Foyer and present them during Wednesday Poster Session. Any papers left on the boards following 12.00 hrs the following day will be considered unwanted and will be discarded.

SPIE assumes no responsibility for posters left up after the end of the Poster Session. Poster authors should be at their papers during the poster session to answer questions from attendees. Attendees are requested to wear their conference registration badges to the poster sessions.

Getting Hired Panel Discussion

Wednesday 15 May · 13:00 to 14:00

Photonics Forum - Exhibit Hall B1

Support provided by the **SPIE Career Center** and **optics.org**

Join us for a panel discussion on careers in optics and photonics outside the academic world. Learn about the process for getting hired at tech-based companies and non-academic jobs directly from human resource professionals in the optics and photonics sector. Bring your questions for our panelists.

Among the panelists will be:

Dorothee Mayrhofer, Head of Business Area Photonics, Wirth Partners
Simona Dumitrescu, Trioptics

Welcome Reception

Wednesday 15 May · 19:00 to 21:30

Ratskeller am Marienplatz (Metro Stop: Marienplatz)

This evening event will feature a light meal and beverages. All registered conference attendees are welcome. A guest may accompany a registered attendee for an additional charge (based on space available).

Optical Measurement Systems for Industrial Inspection VIII

Conference Chair: **Peter H. Lehmann**, Univ. Kassel (Germany)

Conference Co-Chairs: **Wolfgang Osten**, Univ. Stuttgart (Germany); **Armando Albertazzi**, Univ. Federal de Santa Catarina (Brazil)

Programme Committee: **Astrid Aksnes**, Norwegian Univ. of Science and Technology (Norway); **Oleg Vyacheslavovich Angelsky**, Yuriy Fedkovych Chernivtsi National Univ. (Ukraine); **Anand Krishna Asundi**, Nanyang Technological Univ. (Singapore); **Klaus-Friedrich Beckstette**, Carl Zeiss AG (Germany); **Ralf B. Bergmann**, Bremer Institut für angewandte Strahltechnik GmbH (Germany); **Harald Bosse**, Physikalisch-Technische Bundesanstalt (Germany); **Karsten Buse**, Rheinische Friedrich-Wilhelms-Univ. Bonn (Germany); **Yuri V. Chugui**, Technological Design Institute of Scientific Instrument Engineering (Russian Federation); **Wim M. J. Coene**, ASML Netherlands B.V. (Netherlands); **Jürgen W. Czarske**, Technische Univ. Dresden (Germany); **Peter J. de Groot**, Zygo Corporation (United States); **Pietro Ferraro**, Istituto Nazionale di Ottica (Italy); **Cosme Furlong**, Worcester Polytechnic Institute (United States); **Marc P. Georges**, Univ. de Liège (Belgium); **Christophe Gorecki**, FEMTO-ST (France); **Andreas Heinrich**, Carl Zeiss AG (Germany); **Richard M. Kowarschik**, Friedrich-Schiller-Univ. Jena (Germany); **Malgorzata Kujawinska**, Warsaw Univ. of Technology (Poland); **Eberhard Manske**, Technische Univ. Ilmenau (Germany); **Fernando Mendoza Santoyo**, Centro de Investigaciones en Óptica, A.C. (Mexico); **Andrew John Moore**, Heriot-Watt Univ. (United Kingdom); **Gunther Notni**, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); **Ryszard J. Pryputniewicz**, Worcester Polytechnic Institute (United States); **Eduard Reithmeier**, Leibniz Univ. Hannover (Germany); **Christian Rembe**, Polytec GmbH (Germany); **Robert Schmitt**, RWTH (Germany); **Jörg Seewig**, Technische Univ. Kaiserslautern (Germany); **Pierre Slangen**, Ecole des Mines d'Alès (France); **Marcus Steinbichler**, Steinbichler Optotechnik GmbH (Germany); **Mitsuo Takeda**, The Univ. of Electro-Communications (Japan); **Cristina Trillo**, Univ. de Vigo (Spain); **Rainer Tutsch**, Technische Univ. Braunschweig (Germany)

Monday 13 May

Opening Remarks Mon 11:00 to 11:10

SESSION 1

Room: ICM Room 14c Mon 11:10 to 12:40

Interferometric Techniques

Session Chairs: **Peter H. Lehmann**, Univ. Kassel (Germany); **Wolfgang Osten**, Institut für Technische Optik (Germany)

11:10: **Low coherence full field interference microscopy or optical coherence tomography: recent advances, limitations and future trends** (*Invited Paper*), Ibrahim Abdulhalim, Ben-Gurion Univ. of the Negev (Israel) [8788-1]

11:40: **Excess fraction measurement of a transparent glass thickness in wavelength tuning interferometry**, Yangjin Kim, The Univ. of Tokyo (Japan); Kenichi Hibino, National Institute of Advanced Industrial Science and Technology (Japan); Kanako Harada, Naohiko Sugita, Mamoru Mitsuishi, The Univ. of Tokyo (Japan) [8788-2]

12:00: **Metrology for adhesive layer of temporary bonding wafers using IR interferometry**, Po-Yi Chang, Yi-Sha Ku, Chia-Hung Cho, Industrial Technology Research Institute (Taiwan) [8788-3]

12:20: **Concept, realization and performance of a two-beam phase-shifting point diffraction interferometer**, Nikolay B. Voznesenskiy, Mariia Voznesenskaia, Natalia Petrova, VTT-NTM OÜ (Estonia); Artur Abels, SmartStuff OU (Estonia) [8788-4]

Lunch Break Mon 12:40 to 13:40

SESSION 2

Room: ICM Room 14c Mon 13:40 to 16:40

Digital Holography and Holographic Microscopy

Session Chair: **Pietro Ferraro**, Istituto Nazionale di Ottica (Italy)

13:40: **Sparsity-based denoising method of wrapped-phase reconstructions in digital holography**, Pasquale Memmolo, Istituto Nazionale di Ottica (Italy); Maria Iannone, Maurizio Ventre, Istituto Italiano di Tecnologia (Italy); Paolo A. Netti, Univ. degli Studi di Napoli Federico II (Italy); Andrea Finizio, Melania Paturzo, Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8788-5]

14:00: **Holographic Interferometry based on photorefractive crystal to measure 3D thermo-elastic distortion of composite structures and comparison with finite element models**, Cédric Thizy, Univ. de Liège (Belgium); Fabienne Eliot, EADS Astrium (France); Dirk Ballhause, Kingnidé R. Olympio, Rolf Kluge, EADS Astrium GmbH (Germany); Aisling Shannon, Gregory Laduree, European Space Research and Technology Ctr. (Netherlands); Daniel Logut, EADS Astrium (France); Marc P. Georges, Univ. de Liège (Belgium) [8788-6]

14:20: **Lensless single-exposure super-resolved interferometric microscopy**, Luis Granero, Univ. de València (Spain); Carlos Ferreira, Univ. de València (Spain); Javier García, Univ. de València (Spain); Vicente Micó, Univ. de València (Spain) [8788-7]

14:40: **Resolution enhancement and autofocusing in digital holographic microscopy by using structured illumination**, Peng Gao, Giancarlo Pedrini, Institut für Technische Optik (Germany); Wolfgang Osten, Univ. Stuttgart (Germany) [8788-8]

15:00: **Hybrid and transmissive system based on digital holographic microscope and low coherent interferometer for high gradient shape measurement**, Kamil Lizewski, Sławomir Tomczewski, Julianna Kostencka, Tomasz Kozacki, Warsaw Univ. of Technology (Poland) [8788-9]

15:20: **Total compensation of chromatic errors in digital color holography using a single recording**, Mathieu Leclercq, Pascal Picart, Univ. du Maine (France) [8788-10]

Coffee Break Mon 15:40 to 16:00

16:00: **Quantitative phase contrast microscopy by phase retrieval and quasi-monochromatic source**, Arun Anand, Vani Chhaniwal, The Maharaja Sayajirao Univ. of Baroda (India); Ahmad Faradian, Univ. Stuttgart (Germany); Bahram Javidi, Univ. of Connecticut (United States); Giancarlo Pedrini, Wolfgang Osten, Univ. Stuttgart (Germany) [8788-11]

16:20: **Lensless object scanning holography for diffuse objects**, Javier García, Carlos Ferreira, Vicente Micó, Univ. de València (Spain) [8788-12]

SESSION 3

Room: ICM Room 14c Mon 16:40 to 18:00

Measurement of Optical Components and Systems

Session Chair: **Ibrahim Abdulhalim**, Ben-Gurion Univ. of the Negev (Israel)

16:40: **A long trace profiler with large dynamical range**, Antonio Ritucci, Massimiliano Rossi, Media Lario Technologies (Italy) [8788-13]

17:00: **Measuring refractive index variations in injection molded lenses with a Shack-Hartmann wavefront sensor**, Till Spiekermann, Aiko K. Ruprecht, Iris Erichsen, TRIOPTICS GmbH (Germany) [8788-14]

17:20: **Optical characterization method for very small microlenses (sub-50 micron) for industrial mass-production applications**, Myun-Sik Kim, Jonathan Sunarjo, Kenneth J. Weible, Reinhard Voelkel, SUSS MicroOptics SA (Switzerland) [8788-15]

17:40: **Dewar-level integrated MWIR wavefront sensor for optical metrology in low-flux conditions**, Sabrina Velghe, PHASICS S.A. (France); Serge Magli, Sébastien Forge, SOFRADIR (France); Gilles Aubry, HGH Systèmes Infrarouges (France); Nicolas Guérineau, ONERA (France); Benoit F. Wattellier, PHASICS S.A. (France) [8788-16]

Tuesday 14 May

SESSION 4

Room: ICM Room 14cTue 8:20 to 10:00

Digital Holography, Shearography, and Speckle Techniques

Session Chair: **Ralf B. Bergmann**,
Bremer Institut für angewandte Strahltechnik GmbH (Germany)

8:20: **Shape reconstruction using dual wavelength digital holography and speckle movements**, Davood Khodadad, Luleå Univ. of Technology (Sweden); Emil J. Hällstig, Optronik (Sweden); Mikael Sjö Dahl, Luleå Univ. of Technology (Sweden) [8788-17]

8:40: **Digital holographic inspection for the straight pipe inner surface using multiwavelength from laser diodes**, Masayuki Yokota, Teppei Koyama, Tomoaki Kawakami, Shimane Univ. (Japan) [8788-18]

9:00: **Seeing through smoke and flames: a challenge for imaging capabilities, met thanks to digital holography at far infrared**, Massimiliano Locatelli, Eugenio Pugliese, Melania Paturzo, Vittorio Bianco, Andrea Finizio, Anna Pelagotti, Pasquale Poggi, Lisa Miccio, Riccardo Meucci, Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8788-19]

9:20: **A computational tool to highlight anomalies on shearographic images in optical flaw detection**, Analucia V. Fantin, Daniel P. Willemann, Matias R. Viotti, Armando Albertazzi Gonçalves Jr., Univ. Federal de Santa Catarina (Brazil) [8788-20]

9:40: **ESPI based on spatial fringe analysis method using only two sheets of speckle patterns**, Yasuhiko Arai, Kansai Univ. (Japan); S. Yokozeki, Jyouko Applied Optics Lab. (Japan) [8788-21]

Coffee Break Tue 10:00 to 10:30

SESSION 5

Room: ICM Room 14cTue 10:30 to 11:30

Polarization-based Techniques

Session Chair: **Mitsuo Takeda**,
The Univ. of Electro-Communications (Japan)

10:30: **Measurement of low polarization rotations using speckle correlation**, Vani Chhaniwal, Arun Anand, Swapnil Mahajan, Vismay Trivedi, The Maharaja Sayajirao Univ. of Baroda (India); Zeev Zalevsky, Bar-Ilan Univ. (Israel); Bahram Javidi, Univ. of Connecticut (United States) [8788-22]

10:50: **Relation between vectorial source structure and coherence-polarization of light**, Rakesh K. Singh, Indian Institute of Space Science and Technology (India); Dinesh N. Naik, Univ. Stuttgart (Germany); Hitoshi Itou, Maruthi M. Brundavanam, Yoko Miyamoto, The Univ. of Electro-Communications (Japan); Mitsuo Takeda, Utsunomiya Univ. (Japan) .. [8788-23]

11:10: **A polarization-based frequency shifting interferometry for inspecting transparent objects in microelectronics manufacturing**, Seung Hyun Lee, MinYoung Kim, Kyungpook National Univ. (Korea, Republic of) [8788-24]

SESSION 6

Room: ICM Room 14cTue 11:30 to 12:30

High-Speed Techniques

Session Chair: **Jörg Seewig**,
Technische Univ. Kaiserslautern (Germany)

11:30: **Fast and accurate line scanner based on white light interferometry**, Patrick Lambelet, Rudolf Moosburger, Heliotis AG (Switzerland) [8788-25]

11:50: **High speed measurement of specular surfaces based on carrier fringe patterns in a line scan Michelson interferometer setup**, Holger Knell, Peter H. Lehmann, Univ. Kassel (Germany) [8788-26]

12:10: **Speed-up chromatic sensors by optimized optical filters**, Miro Taphanel, Bastiaan Hovestreydt, Karlsruher Institut für Technologie (Germany); Jürgen Beyerer, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany) [8788-27]

Lunch Break Tue 12:30 to 13:40

SESSION 7

Room: ICM Room 14cTue 13:40 to 15:00

Confocal Sensors

Session Chair: **Eberhard Manske**, Technische Univ. Ilmenau (Germany)

13:40: **Robust evaluation of intensity curves measured by confocal microscopies**, Jörg Seewig, Indek Raid, Technische Univ. Kaiserslautern (Germany); Christian Wiehr, Bini Alapurath George, Technical University of Kaiserslautern (Germany) [8788-28]

14:00: **Model-based assistance system for confocal measurements of rough surfaces**, Florian Mauch, Wolfram Lyda, Wolfgang Osten, Univ. Stuttgart (Germany) [8788-29]

14:20: **Parallelized chromatic confocal sensor systems**, Matthias Hillenbrand, Adrian Grewe, Mohamed Bichra, Roman M. Kleindienst, Lucia Lorenz, Raoul Kirner, Robert Weiß, Stefan Sinzinger, Technische Univ. Ilmenau (Germany) [8788-30]

14:40: **Robust signal evaluation for Chromatic Confocal Spectral Interferometry**, Tobias Boettcher, Institut für Technische Optik (Germany); Wolfram Lyda, Marc Gronle, Florian Mauch, Wolfgang Osten, Univ. Stuttgart (Germany) [8788-31]

SESSION 8

Room: ICM Room 14cTue 15:00 to 15:40

Multisensor Approaches

Session Chairs: **Tobias Haist**, Univ. Stuttgart (Germany);
Wolfram Lyda, Univ. Stuttgart (Germany)

15:00: **Measurement, visualization and analysis of extremely large data sets with a nanopositioning and nanomeasuring machine**, Oliver Birlil, Karl-Heinz Franke, Gerhard Linß, Torsten Machleidt, Eberhard Manske, Florian Schale, Hans-Christian Schwannecke, Erik Sparrer, Mathias Weiß, Technische Univ. Ilmenau (Germany) [8788-32]

15:20: **Model-based, active inspection of three-dimensional objects using a multi-sensor measurement system**, Marc Gronle, Wolfram Lyda, Wolfgang Osten, Univ. Stuttgart (Germany) [8788-33]

Coffee Break Tue 15:40 to 16:10

SESSION 9

Room: ICM Room 14cTue 16:10 to 17:30

Fiber-Optics Sensors

Session Chair: **Ivan Kassamakov**, Univ. of Helsinki (Finland)

16:10: **High-frequency optical fiber microphone for condition-based maintenance application**, Daniele Tosi, Univ. of Limerick (Ireland); Massimo Olivero, Guido Perrone, Alberto Vallan, Politecnico di Torino (Italy) . . . [8788-34]

16:30: **A space-borne fiber-optic interrogator module based on narrow-band tunable laser diode for temperature monitoring in telecommunication satellites**, Philipp Putzer, Kayser-Threde GmbH (Germany) and Technische Univ. München (Germany); Nader Kuhenuri, A. W. Koch, Technische Univ. München (Germany); Sebastian Schweyer, Andreas Hurni, Markus P. Plattner, Kayser-Threde GmbH (Germany) [8788-35]

16:50: **Miniature low-cost extrinsic Fabry-Perot interferometer for low-pressure detection**, Sven Poeggel, Daniele Tosi, Gabriel Leen, Elfed Lewis, Univ. of Limerick (Ireland) [8788-36]

17:10: **Applications of tilted fiber Bragg grating in liquid parameters measurement**, Biqiang Jiang, Jianlin Zhao, Abdul Rauf, Chuan Qin, Wei Jiang, Northwestern Polytechnical Univ. (China) [8788-37]

Wednesday 15 May

SESSION 10

Room: ICM Room 14c Wed 8:20 to 10:00

Fringe Projection

Session Chair: **Wolfgang Osten**,
Institut für Technische Optik (Germany)

8:20: **Experimental comparison of phase-shifting fringe projection and statistical pattern projection for active triangulation systems**, Peter Lutzke, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); Martin Schaffer, Friedrich-Schiller-Univ. Jena (Germany); Peter Kühmstedt, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); Richard M. Kowarschik, Friedrich-Schiller-Univ. Jena (Germany); Gunther Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) [8788-38]

8:40: **Scanning fringe projection for fast 3D inspection**, Marc Honegger, Michael Kahl, Sandra Trunz, Interstaatliche Hochschule für Technik Buchs NTB (Switzerland); Stefan Rinner, NTB Interstate University (Switzerland); Andreas Etemeyer, Interstaatliche Hochschule für Technik Buchs NTB (Switzerland); Patrick Lambelet, Heliotis AG (Switzerland) [8788-135]

9:00: **High-speed 3D shape measurement using array projection**, Stefan Heist, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); Marcel Sieler, Fraunhofer IOF (Germany); Andreas Breitbarth, Peter Kühmstedt, Gunther Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) [8788-40]

9:20: **Influence of the structured illumination frequency content on the correspondence assignment precision in**

stereophotogrammetry, Marcus Große, Institut of Applied Optics (Germany); Martin Schaffer, Bastian Harendt, Richard M. Kowarschik, Friedrich-Schiller-Univ. Jena (Germany) [8788-41]

9:40: **High resolution measurements of filigree, inner geometries with endoscopic micro fringe projection**, Christoph Ohrt, Markus Kästner, Eduard Reithmeier, Leibniz Univ. Hannover (Germany) [8788-42]

Coffee Break Wed 10:00 to 10:30

PLENARY SESSION

Room: Saal 1 Wed 10:30 to 11:20

Challenges in Optical Metrology for Photo-Lithography

Wim M.J. Coene, ASML Research, Netherlands

See p. 2 for details.

SESSION 11

Room: ICM Room 14c Wed 11:30 to 12:50

Asphere Measurement

Session Chair: **Gerd Haeusler**,
Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)

11:30: **Measurement of aspheres and free-form surfaces in a non-null test interferometer: reconstruction of high-frequency errors**, Goran B. Baer, Johannes Schindler, Univ. Stuttgart (Germany); Jens Siepmann, Mahr GmbH (Germany); Christof Pruss, Wolfgang Osten, Univ. Stuttgart (Germany); Michael Schulz, Physikalisch-Technische Bundesanstalt (Germany) [8788-43]

11:50: **Non-contact profiling for high precision fast asphere topology measurement**, Juergen Petter, Gernot Berger, Luphos GmbH (Germany) [8788-44]

12:10: **Highly accurate surface maps from profilometer measurements**, Katherine Medicus, Jessica Nelson, Optimax Systems Inc. (United States); Michael Mandina, Optimax Systems, Inc. (United States) [8788-45]

12:30: **Lateral location error compensation algorithm for measuring aspheric surfaces by sub-aperture stitching interferometry**, Zixin Zhao, Hong Zhao, Feifei Gu, Lu Zhang, Xi'an Jiaotong Univ. (China) [8788-46]

Lunch Break Wed 12:50 to 13:50

SESSION 12

Room: ICM Room 14c Wed 13:50 to 15:40

Deflectometry

Session Chair: **Gunther Notni**,

Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany)

13:50: **Deflectometry vs. interferometry (Invited Paper)**, Gerd Haeusler, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); Christian Faber, Univ. of Applied Sciences (Germany); Evelyn Olesch, Svenja Ettl, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) [8788-47]

14:20: **Approach to the measurement of astronomical mirrors with new procedures**, Engelbert Hofbauer, Fachhochschule Deggendorf (Germany); R. Rascher, Hochschule Deggendorf (Germany); Thomas Stubenrauch, Johannes Liebl, Roland Maurer, Fachhochschule Deggendorf (Germany); A. Zimmermann, Univ. Passau (Germany); O. Rösch, Technische Univ. Munchen (Germany); J. Reitberger, Micro Epsilon GmbH (Germany) [8788-48]

14:40: **Precision aspheric optics testing with SCOTS: a deflectometry approach**, Peng Su, Manal Khreishi, Run Huang, Tianquan Su, James H. Burge, College of Optical Sciences, The Univ. of Arizona (United States) [8788-49]

15:00: **Methods to obtain the waveform profile from slope measurements**, Alfonso Moreno, Manuel Espinola, José Martínez, Juan Campos, Univ. Autònoma de Barcelona (Spain) [8788-50]

15:20: **Moiré deflectometry under incoherent illumination: 3D profiler for specular surfaces**, Tomohiro Hirose, Tsunaji Kitayama, Toyota Central R&D Labs., Inc. (Japan) [8788-51]

Coffee Break Wed 15:40 to 16:10

POSTERS-WEDNESDAY

ICM Foyer Wed 17:00 to 18:30

Conference attendees are invited to attend the Optical Metrology Poster Session on Wednesday afternoon. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions. Poster authors, view poster presentation guidelines and set-up instructions on page 28, and at <http://spie.org/x6513.xml>. (Follow the Special Events link)

Optical Imaging and Image Processing

A lateral sensor for the alignment of two formation-flying satellites, Stéphane Roose, Yvan G. Stockman, Univ. de Liège (Belgium); Zoran Sodnik, European Space Research and Technology Ctr. (Netherlands) [8788-71]

Imaging sensor for monitoring of the piston mechanism in cylindrical valves, Ekaterina N. Pantushina, Alexey Gorbachev, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [8788-75]

Precision inspection of micro components flatness by Moiré interferometry, Said Meguellati, Aissa Manallah, Univ. Ferhat Abbas de Sétif (Algeria) [8788-81]

Application of line-scanning microscopy using a linear sensor in semiconductor industry: shape and thickness measurements, Milton P. Macedo, Instituto Superior de Engenharia de Coimbra (Portugal) and Univ. de Coimbra (Portugal); Carlos M. B. A. Correia, Univ. de Coimbra (Portugal) [8788-88]

Design of omnidirectional camera lens system with catadioptric system, Jae Heung Jo, Sangon Lee, Hyeon Jin Seo, Hannam Univ. (Korea, Republic of); Jung Hwan Lee, Joon Mo Kim, JM Tech Co., Ltd. (Korea, Republic of) [8788-98]

Dual view x-ray inspection system for foreign objects detection in canned food, Zhiwen Lu, Ning-song Peng, Shanghai Gaojing Metal Detector Instrument Co., Ltd. (China) [8788-99]

Absolute scale-based imaging position encoder with submicron accuracy, Andrey G. Anisimov, Anton Pantyushin, Oleg Lashmanov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); A. V. Vasilev, National Research Univ. of Information Technologies (Russian Federation); Alexandr N. Timofeev, Valery V. Korotaeov, Sergey V. Gordeev, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [8788-101]

CCD camera-based analysis of thin film growth in industrial PACVD processes, Gerald Zauner, Univ. of Applied Sciences Upper Austria (Austria); Thorsten Schulte, Univ. of Applied Sciences Upper Austria, R&D (Austria); Christian Forsich, Daniel Heim, Univ. of Applied Sciences Upper Austria (Austria) [8788-102]

Towards superresolution imaging with optical vortex scanning microscope, Jan Masajada, Agnieszka Popiolek-Masajada, Ireneusz Augustyniak, Wrocław Univ. of Technology (Poland); Bohdan Sokolenko, Physics Department, Simferopol State University (Ukraine) [8788-103]

Surface normal deblurring caused by conveyor movement for fast surface inspection, Toru Kurihara, Yugo Katsuki, Shigeru Ando, The Univ. of Tokyo (Japan) [8788-132]

Low-Coherence Interferometry

Low-coherence interferometry for thin-film thickness profile measurement, Young-Sik Ghim, Hyug-Gyo Rhee, Ho-Soon Yang, Yun-Woo Lee, Korea Research Institute of Standards and Science (Korea, Republic of); Seung-Woo Kim, KAIST (Korea, Republic of) [8788-72]

Comparison of Michelson and Linnik interference microscopes with respect to measurement capabilities and adjustment efforts, Peter Kuehnhold, Univ. Kassel (Germany); Weichang Xie, University (Germany); Peter H. Lehmann, Univ. Kassel (Germany) [8788-87]

Implementation of a fringe visibility based algorithm in coherence scanning interferometry for surface roughness measurement, Paul C. Montgomery, Fabien Salzenstein, Denis Montaner, Bruno B. Serio, ICube (France); Pierre Pfeiffer, ICube (France) and Laboratoire des Sciences de l'Ingénieur, de l'Informatique et de l'Imagerie (ICube) (France) [8788-124]

Static and (quasi)dynamic calibration of stroboscopic scanning white light interferometer, Jeremias Seppä, MIKES Mittatekniikan keskus (Finland); Ivan Kassamakov, Anton Nolvi, Univ. of Helsinki (Finland); Ville Ville Heikkinen, Centre for Metrology and Accreditation (Finland); Tor Paulin, University of Helsinki (Finland); Antti Lassila, MIKES Mittatekniikan keskus (Finland); Ling Hao, National Physical Lab. (United Kingdom); Edward Hægström, Univ. of Helsinki (Finland) [8788-127]

Interferometric Principles

Temperature sensing by modulating phase of optical fiber, Guanxiao Cheng, Ping Xu, Chunquan Hong, Yang Cao, Feng Zhu, Shuyang Feng, Ruibin Lin, Shenzhen Univ. (China) [8788-77]

Calibration of misalignment aberrations in cylindrical surface interferometric measurement, Junzheng Peng, Dongbao Ge, Yingjie Yu, Mingyi Chen, Shanghai Univ. (China) [8788-80]

The impact of polarization on metrology performance of the lateral shearing interferometer, Peng Z. Yao, Tingwen Xing, Institute of Optics and Electronics (China) [8788-86]

Reaching accuracies of Lambda/100 with the Three-Flat-Test, Steffen Wittek, Karlsruher Institut für Technologie (Germany) [8788-92]

Design and location deviation of the computer generated holograms used for aspheric surface testing, Jie Feng, Chao Deng, Institute of Optics and Electronics (China); Tingwen Xing, Institute of Optics and Electronics (China) and Chinese Academy of Sciences (China) [8788-95]

Development of a zero-method interferometer by means of dynamic generation of reference wave front, Ryohei Hanayama, Katsuhiko Ishii, The Graduate School for the Creation of New Photonics Industries (Japan) [8788-100]

Automatic unit for measuring refractive index of air based on Ciddor equation and its verification using direct interferometric measurement method, Václav Hucl, Martin Čížek, Jan Hrabina, Bretislav Mikel, Šimon Rerucha, Zdenek Buchta, Petr Jedlicka, Adam Lešundák, Jindrich Oulehla, Libor Mrna, Martin Šarbort, Radek Šmid, Josef Lazar, Ondrej Číp, Institute of Scientific Instruments of the ASCR, v.v.i. (Czech Republic) [8788-115]

Wavelength modulation-based method for interference phase detection with reduced optical complexity, Šimon Rerucha, Martin Šarbort, Zdenek Buchta, Bretislav Mikel, Radek Šmid, Martin Čížek, Petr Jedlicka, Jan Rerucha, Josef Lazar, Ondrej Číp, Institute of Scientific Instruments of the ASCR, v.v.i. (Czech Republic) [8788-120]

Precision positioning with suppression of the influence of refractive index of air, Miroslava Hola, Jan Hrabina, Jindrich Oulehla, Martin Čížek, Bretislav Mikel, Šimon Rerucha, Zdenek Buchta, Ondrej Číp, Josef Lazar, Institute of Scientific Instruments of the ASCR, v.v.i. (Czech Republic) [8788-126]

Digital Holography

Real-time visualization and analysis of airflow field by use of digital holography, Jianglei Di, Bingjing Wu, Xin Bing Chen, Junjiang Liu, Jun Wang, Jianlin Zhao, Northwestern Polytechnical Univ. (China) [8788-78]

Visual and dynamic measurement of temperature fields by use of digital holographic interferometry, Jianlin Zhao, Jianglei Di, Northwestern Polytechnical Univ. (China); Bingjing Wu, Northwestern Polytechnical University (China); Jun Wang, Northwestern Polytechnical Univ. (China); Qian Wang, Northwestern Polytechnical University (China); Hongzhen Jiang, Northwestern Polytechnical Univ. (China) [8788-79]

Image quality improvement using speckle method in digital holography by means of multi-mode fiber, Hideki Funamizu, Shohei Shimoma, Yoshihisa Aizu, Muroran Institute of Technology (Japan) [8788-104]

Tilted objects EFI in digital holography by two different numerical approaches, Marcella Matrecano, Melania Paturzo, Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8788-107]

Non-Bayesian noise reduction in digital holography by random resampling masks, Vittorio Bianco, Melania Paturzo, Istituto Nazionale di Ottica (Italy); Pasquale Memmolo, Istituto Nazionale di Ottica (Italy) and Istituto Italiano di Tecnologia (Italy); Andrea Finizio, Istituto Nazionale di Ottica (Italy); Bahram Javidi, ECE Department, University of Connecticut, USA. (United States); Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8788-109]

Digital holographic microscopy for the study of nano-fibers, Hamdy H. Wahba, Mansoura Univ. (Egypt) and Luleå Univ. of Technology (Sweden); Mikael Sjö Dahl, Per Gren, Erik Olsson, Luleå Univ. of Technology (Sweden) [8788-123]

Computed tomography of cylindrically symmetric object by use of digital holography, Zhelang Pan, Shiping Li, Jingang Zhong, Jinan Univ. (China) [8788-128]

Stimulated LIF studied using pulsed digital holography and modelling, Eynas Amer, Jonas Stenvall, Per Gren, Mikael Sjö Dahl, Luleå Univ. of Technology (Sweden) [8788-130]

Measurement of Optical Components and Systems

Analysis of method of 3D shape reconstruction using scanning deflectometry, Jiri Novak, Pavel Novak, Antonin Mijs, Czech Technical Univ. in Prague (Czech Republic) [8788-73]

Optical resolution measurement system for small lens by using slanted-slit method, Kuang-Yuh Huang, Chou-Min Chia, National Taiwan Univ. (Taiwan); Elmer Chang, Genius Electronic Optical Co. (Taiwan) [8788-90]

A compensation method of large aperture optical lens for gravity deformation, Juan L. Yang, Tingwen Xing, Institute of Optics and Electronics (China); Jie Feng, Institute of Optics and Electronics (China) and Univ. of the Chinese Academy of Sciences (China) [8788-91]

Design and experiment of testing an off-axis aspheric surface by computer generated hologram, Shijie Li, Fan Wu, Qiang Chen, Bin Fan, Lianghong Li, Institute of Optics and Electronics (China) [8788-111]

Efficient testing methodologies for microcameras in a gigapixel imaging system, Seo Ho Youn, Daniel L. Marks, Duke Univ. (United States); Paul O. McLaughlin, RPC Photonics, Inc. (United States); David J Brady, Jungsang Kim, Duke University (United States) [8788-119]

Spectral Methods, Spectroscopy

CO₂ laser photoacoustic spectrometry: sensitivity and drift analysis, Jan Skrinisky, VŠB-TU Ostrava (Czech Republic) and J. Heyrovský Institute of Physical Chemistry of the ASCR, v.v.i. (Czech Republic); Zdenek Zelingner, J. Heyrovský Institute of Physical Chemistry (Czech Republic); Václav Nevrlý, VŠB-TU Ostrava (Czech Republic); Tomáš Hejzlar, Pavel Palát (Czech Republic); Barbora Baudišová, Petr Bitala, VŠB-TU Ostrava (Czech Republic) . . . [8788-74]

Development of program package for investigation and modeling of carbon nanostructures in diamond like carbon films with the help of Raman scattering and infrared absorption spectra line resolving, David B. Hayrapetyan, Russian-Armenian State Univ. (Armenia) and State Engineering Univ. of Armenia (Armenia); Levon Hovhannisyanyan, State Engineering Univ. of Armenia (Armenia); Paytsar A Mantashyan, Institute for Physical Research of NAS RA (Armenia) [8788-76]

Laser welding control by monitoring of plasma, Hana Chmelickova, Hana Sebestova, Martina Havelkova, Lenka Rihakova, Libor Nozka, Palacký Univ. Olomouc (Czech Republic) [8788-96]

Spectral monitoring of toluene and ethanol in gasoline blends using Fourier-Transform Raman spectroscopy, Valentin Ortega Clavero, Andreas Weber, Werner W. Schröder, Dan Curticapean, Hochschule Offenburg (Germany); Patrick P. Meyrueis, Nicolas Javahiraly, Univ. de Strasbourg (France) [8788-112]

Reflection, transmission and color measurement system for the online quality control of float glass coating process, Izmir Mamedbeili, TÜBİTAK National Research Institute of Electronics and Cryptology (Turkey); Fahrettin Cakiroglu, TÜBİTAK-BILGEM (Turkey); Gokhan Bektas, Dadash Riza, TÜBİTAK National Research Institute of Electronics and Cryptology (Turkey); Fikret Hacizade, TÜBİTAK-BILGEM (Turkey) [8788-113]

Gas sensing using TDLAS, Sungwoon Yoon, Sewon Kim, KITECH (Korea, Republic of) [8788-131]

Automated hardware and software complex for extended light sources verification, Elena V. Gorbunova, Vladimir Peretiagin, Aleksandr N. Chertov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [8788-134]

Large Scale Objects

Three-axis optic-electronic autocollimation system for the inspection of large-scale objects, Igor A. Konyakhin, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); Alexandr N. Timofeev, Saint-Petersburg National Research Univ. of Information Technologies (Russian Federation); Aleksey I. Konyakhin, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [8788-83]

Optical device for the improvement of positioning accuracy in large machine tools, Lorenzo Coccola, Istituto di Fotonica e Nanotecnologie (Italy); Massimo Fedel, Consiglio Nazionale delle Ricerche (Italy); Marcomattia Mocellin, Istituto di Fotonica e Nanotecnologie (Italy); R. Casarin, FPT Industrie S.P.A. (Italy); Luca Poletto, Istituto di Fotonica e Nanotecnologie (Italy) [8788-84]

Thursday 16 May

SESSION 13

Room: ICM Room 14cThu 8:20 to 10:00

Measurements of Large-Scale Objects

Session Chair: **Christian Rembe**, Polytec GmbH (Germany)

8:20: **Optical profilometer using laser based conical triangulation for inspection of inner geometry of corroded pipes in cylindrical coordinates**, Pedro D. V. Buschinelli, João R. de Castro Melo, Armando Albertazzi Gonçalves Jr., Univ. Federal de Santa Catarina (Brazil); João M. C. dos Santos, Cláudio S. Camerini, Petroleo Brasileiro SA (Brazil) [8788-52]

8:40: **Active retroreflector with in situ beam analysis to measure the rotational orientation in conjunction with a laser tracker**, Oliver Hofherr, Albert-Ludwigs-Univ. Freiburg (Germany); Christian Wachten, PI miCos GmbH (Germany); Claas Müller, Holger Reinecke, Albert-Ludwigs-Univ. Freiburg (Germany) [8788-53]

9:00: **Automated control of robotic camera tacheometers for measurements of industrial large scale objects**, Teuvo A. Heimonen, Jukka Leinonen, Jani Sipola, Kemi-Tornio Univ. of Applied Sciences (Finland) [8788-54]

9:20: **Development of alignment-guidance device for grooved roll mill using parallel projection imaging technique**, Toshifumi Kodama, Teruhisa Iwata, Daisaku Yamagami, Keiji Takagi, JFE Steel Corp. (Japan) [8788-55]

9:40: **Photogrammetry based system for the measurement of cylindrical forgings axis straightness**, Aneta Zatočilova, Radek Poliščuk, David Paloušek, Jan Brandejs, Brno Univ. of Technology (Czech Republic) [8788-56]

Coffee Break Thu 10:00 to 10:30

SESSION 14

Room: ICM Room 14cThu 10:30 to 13:00

Light Scattering Techniques and Linewidth Measurement

Session Chair: **Peter H. Lehmann**, Univ. Kassel (Germany)

10:30: **Light scattering techniques for efficient surface quality control (Invited Paper)**, Angela Duparré, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) [8788-57]

11:00: **Sub-nanometer in-die overlay metrology: measurement and simulation at the edge of finiteness**, Henk-Jan H. Smilde, Martin Jak, Arie J. den Boef, Mark Van Schijndel, Murat Bozkurt, Andreas Fuchs, Maurits Van Der Schaar, Steffen Meyer, Stephen Morgan, Kaustuve Bhattacharyya, ASML Netherlands B.V. (Netherlands); Guo-Tsai Huang, Chih-Ming Ke, Kai-Hsiung Chen, Taiwan Semiconductor Manufacturing Co. Ltd. (Taiwan) [8788-58]

11:20: **Nanometrology of periodic nanopillar arrays by means of light scattering**, Oliver Paul, Carl Zeiss AG (Germany); Frank Widulle, Carl Zeiss AG (Germany) and Carl Zeiss AG (Germany); Bernd H. Kleemann, Andreas Heinrich, Carl Zeiss AG (Germany) [8788-59]

11:40: **Phase information in coherent Fourier scatterometry**, Nitish Kumar, Technische Univ. Delft (Netherlands); Omar El Gawhary, Delft University of Technology (Netherlands) and VSL Dutch Metrology Institute (Netherlands); Sarathi Roy, Sylvania F. Pereira, Hendrik Paul Urbach, Technische Univ. Delft (Netherlands) [8788-60]

12:00: **Revisiting parallel catadioptric goniophotometers**, Boris C. Karamata, Marilyne Andersen, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [8788-61]

12:20: **Metrology solutions using optical scatterometry for advanced CMOS: III-V and Germanium multi-gate field-effect transistors**, Hock-Chun Chin, Nanometrics Inc. (United States); Bin Liu, Xingui Zhang, National Univ. of Singapore (Singapore); Moh-Lung Ling, Chan-Hoe Yip, Yongdong Liu, Jiangtao Hu, Nanometrics Inc. (United States); Yee-Chia Yeo, National Univ. of Singapore (Singapore) [8788-62]

12:40: **The road towards accurate optical width measurements at the industrial level**, Bernd Bodermann, Rainer G. J. Köning, Detlef Bergmann, Egbert Buhr, Wolfgang Hässler-Grohne, Jens Flügge, Harald Bosse, Physikalisch-Technische Bundesanstalt (Germany) [8788-63]

Lunch Break Thu 13:00 to 14:10

Optical measurement system applied to continuous displacement monitoring of long-span suspension bridges, Luis F. Lages Martins, Nacional de Engenharia Civil (Portugal); José Manuel N. V. Rebordão, Univ. de Lisboa (Portugal); Álvaro S. Ribeiro, Nacional de Engenharia Civil (Portugal) . . [8788-93]

Iterative alignment of reflector segments using a laser tracker, Lizeth Cabrera Cuevas, Maribel Lucero Alvarez, Andrea Leon Huerta, Emilio Hernandez Rios, Josefina Lazaro Hernandez, Carlos A. Tzile Torres, David Castro Santos, David M. Gale, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Grant Wilson, Gopal Narayanan, Department of Astronomy, University of Massachusetts (United States); David R Smith, Mechanical Engineering Research Laboratory (United States) [8788-106]

Research of autocollimating angular deformation measurement system for large-size objects control, Tatiana V. Turgaljeva, Igor A. Konyakhin, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [8788-110]

Alignment of a large outdoor antenna surface using a laser tracker, Andrea Leon Huerta, Maribel Lucero Alvarez, Emilio Hernandez Rios, Carlos A. Tzile Torres, Lizeth Cabrera Cuevas, David Castro Santos, Josefina Lazaro Hernandez, David M. Gale, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Grant Wilson, Gopal Narayanan, Department of Astronomy, University of Massachusetts (United States) [8788-117]

Iterative improvements to the surface error of a 1.7 metre aluminium reflector, David Castro Santos, Lizeth Cabrera Cuevas, Emilio Hernandez, David M. Gale, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); David R. Smith, MERLAB, P.C. (United States) [8788-118]

Camera-based curvature measurement of a large incandescent object, Arttu Ollikkala, Univ. of Oulu (Finland); Timo Kananen, Oulu Southern Institute (Finland); Anssi J. Mäkynen, Univ. of Oulu (Finland); Markus Holappa, Rautaruukki Oy (Finland) [8788-121]

Displacement Measurement and Nondestructive Testing

Measurement uncertainty in the profile detection on solar troughs, Paola Sansoni, Daniela Fontani, Franco Francini, Istituto Nazionale di Ottica (Italy); Stefano Toccafondi, Matteo Messeri, Univ. degli Studi di Firenze (Italy); Stefano Coraggia, Luca Mercatelli, David Jafrancesco, Elisa Sani, Istituto Nazionale di Ottica (Italy) [8788-85]

Small angle light scattering for a glass fibre diameter characterization, Grzegorz Swirniak, Grzegorz Glomb, Wrocław Univ. of Technology (Poland) [8788-94]

Measurement of residual stress fields in FHPP welding: a comparison between DSPI combined with hole-drilling and neutron diffraction, Matias R. Viotti, Armando Albertazzi Gonçalves Jr., Univ. Federal de Santa Catarina (Brazil); Peter Staron, Helmholtz-Zentrum Geesthacht (Germany); Marcelo T. Pisa, Petrobras Transporte S.A. (Brazil) [8788-105]

Deformation measurement of centimeter-sized objects by sequentially recorded intensity patterns, János Kornis, Balázs Gombkőto, Budapest Univ. of Technology and Economics (Hungary) [8788-108]

Energetic sensitivity of optical-electronic systems based on polychromatic optical equisignal zone, Anton A. Maraev, Alexandr N. Timofeev, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [8788-114]

Design and analysis of a low-cost compensated POF displacement sensor for industrial applications, Daniele Tosi, Univ. of Limerick (Ireland); Massimo Olivero, Guido Perrone, Alberto Vallan, Politecnico di Torino (Italy) . . [8788-122]

Tape measuring system using linear encoder and digital camera, Tae Bong Eom, Korea Research Institute of Standards and Science (Korea, Republic of); Don Young Jeong, Myung Soon Kim, Korea Research Institute of Standards and Science (Korea, Republic of) and KRISS (Korea, Republic of); Jae Wan Kim, Jong-Ahn Kim, Korea Research Institute of Standards and Science (Korea, Republic of) [8788-133]

Turbine-blade tip clearance and tip timing measurements using an optical fiber bundle sensor, Iker Garcia, Univ. del País Vasco (Spain); Josu Beloki, Aeronautical Technologies Ctr. (Spain); Joseba Zubia-Zaballa, Gaizka Durana, Gotzon Aldabaldetrekue, Univ. del País Vasco (Spain) [8788-125]

SESSION 15

Room: ICM Room 14cThu 14:10 to 15:30

Laser-Doppler Techniques

Session Chair: **Angela Duparré**,

Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany)

14:10: **3D shape measurements of fast moving rough surfaces by two tilted interference fringe systems**, Robert Kuschmierz, Philipp Günther, Jürgen W. Czarske, Technische Univ. Dresden (Germany) [8788-64]

14:30: **Optical vibration analysis of MEMS devices with pm-resolution in x, y, and z directions**, Moritz Giesen, Robert Kowarsch, Wanja Ochs, Marcus Winter, Christian Rembe, Polytec GmbH (Germany) [8788-65]

14:50: **Characterization and demonstration of a 12-channel Laser-Doppler vibrometer**, Tobias Haist, Christian Lingel, Wolfgang Osten, Univ. Stuttgart (Germany); Karl Bendel, Robert Bosch GmbH (Germany); Moritz Giesen, Michael Gartner, Christian Rembe, Polytec GmbH (Germany)..... [8788-66]

15:10: **Quantitative video-rate holographic imaging of nanoscale surface waves**, Michael Atlan, Francois Bruno, Ecole Supérieure de Physique et de Chimie Industrielles (France).....

Coffee Break Thu 15:30 to 16:00

SESSION 16

Room: ICM Room 14cThu 16:00 to 17:00

Stress, Strain, & Displacement Measurement

Session Chair: **Armando Albertazzi Gonçalves Jr.**,
Univ. Federal de Santa Catarina (Brazil)

16:00: **Diagnostic of structures in heat and power generating industries with utilization of 3D digital image correlation**, Marcin R. Malesa, Malgorzata Kujawska, Krzysztof Malowany, Warsaw Univ. of Technology (Poland); Bartlomiej Siwek, KSM Vision Ltd. (Poland) [8788-68]

16:20: **Integrated digital image correlation for residual stress measurement**, Antonio Baldi, Filippo Bertolino, Univ. degli Studi di Cagliari (Italy) [8788-69]

16:40: **Infrared differential interference contrast microscopy for overlay metrology on 3D-interconnect bonded wafers**, Yi-sha Ku, Deh-Ming Shyu, Yeou-Sung Lin, Chia-Hung Cho, Industrial Technology Research Institute (Taiwan)..... [8788-70]

CLOSING REMARKS

Room: ICM Room 14c 17:00 to 17:10



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Modeling Aspects in Optical Metrology IV

Conference Chair: **Bernd Bodermann**, Physikalisch-Technische Bundesanstalt (Germany)

Conference Co-Chairs: **Karsten Frenner**, Univ. Stuttgart (Germany); **Richard M. Silver**, National Institute of Standards and Technology (United States)

Programme Committee: **Markus Bär**, Physikalisch-Technische Bundesanstalt (Germany); **Jörg Bischoff**, Osires Optical Engineering (Germany); **Harald Bosse**, Physikalisch-Technische Bundesanstalt (Germany); **Sven Burger**, Konrad-Zuse-Zentrum für Informationstechnik Berlin (Germany); **Andreas Erdmann**, Fraunhofer-Institut für Integrierte System und Bauelementetechnologie (Germany); **Christian Hafner**, ETH Zurich (Switzerland); **Wolfgang Holzapfel**, DR. JOHANNES HEIDENHAIN GmbH (Germany); **Bernd H. Kleemann**, Carl Zeiss AG (Germany); **Wolfgang Osten**, Univ. Stuttgart (Germany); **Andreas Rathsfeld**, Weierstrass-Institut für Angewandte Analysis und Stochastik (Germany); **Thomas Scherübl**, Carl Zeiss SMS GmbH (Germany); **Patrick Schiavone**, Asepta Nanographics (France); **Irwan Setija**, ASML Netherlands B.V. (Netherlands); **Michael Totzeck**, Carl Zeiss SMT GmbH (Germany); **Jari Turunen**, Univ. of Eastern Finland (Finland); **Frank Wyrowski**, Friedrich-Schiller-Univ. Jena (Germany)

Monday 13 May

Opening Remark Mon 11:10 to 11:15

SESSION 1

Room: ICM Room 12 Mon 11:15 to 12:45

Scatterometry I

Session Chair: **Irwan D. Setija**, ASML Netherlands B.V. (Netherlands)

11:15: **Assessment of the scatterometry capability to detect an etch process deviation** (*Invited Paper*), Nicolas Troscompt, Maxime Besacier, LTM CNRS (France); Mohamed Saïb, Asepta Nanographics (France) [8789-1]

11:45: **Mueller matrix characterization using spectral reflectometry**, Dror Shafir, Gilad Barak, Michal H Yachini, Nova Measuring Instruments Ltd. (Israel); Matthew J Sendelbach, Cornel Bozdog, Nova Measuring Instruments Inc. (United States); Shay Wolfing, Nova Measuring Instruments Ltd. (Israel) [8789-2]

12:05: **Numerical investigations of the influence of different commonly applied approximations in scatterometry**, Johannes Endres, Physikalisch-Technische Bundesanstalt (Germany); Sven Burger, JCMwave GmbH (Germany); Matthias Wurm, Bernd Bodermann, Physikalisch-Technische Bundesanstalt (Germany) [8789-3]

12:25: **Scatterometry sensitivity analysis for conical diffraction versus in-plane diffraction geometry with respect to the side wall angle**, Victor Soltwisch, Physikalisch-Technische Bundesanstalt (Germany); Sven Burger, JCMwave GmbH (Germany); Frank Scholze, Physikalisch-Technische Bundesanstalt (Germany) [8789-4]

Lunch Break Mon 12:45 to 14:00

SESSION 2

Room: ICM Room 12 Mon 14:00 to 15:30

Interferometry I

Session Chair: **Bernd Bodermann**, Physikalisch-Technische Bundesanstalt (Germany)

14:00: **Phase unwrapping using geometric constraints for high-speed fringe projection based 3D measurements** (*Invited Paper*), Christian Bräuer-Burchardt, Peter Kühmstedt, Gunther Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) [8789-5]

14:30: **Sensitivity analysis of tilted-wave interferometer asphere measurements using virtual experiments**, Ines Fortmeier, Manuel Stavridis, Axel Wiegmann, Michael Schulz, Physikalisch-Technische Bundesanstalt (Germany); Goran B. Baer, Christof Pruss, Wolfgang Osten, Univ. Stuttgart (Germany); Clemens Elster, Physikalisch-Technische Bundesanstalt (Germany) [8789-6]

14:50: **A method to measure sub nanometric amplitude displacements based on optical feedback interferometry**, Francisco J. Azcona Guerrero, Reza Atashkhouei, Santiago R. Royo, Univ. Politècnica de Catalunya (Spain); Jorge Méndez Astudillo, Ajit Jha, Centre de Desenvolupament de Sensors, Instrumentació i Sistemes, UPC-CD6 (Spain) [8789-7]

15:10: **Influence of surface structure on shape and roughness measurement using two-wavelength speckle interferometry**, Thomas Bodendorfer, Philipp Mayinger, Alexander W. Koch, Technische Univ. München (Germany) [8789-8]

Coffee Break Mon 15:30 to 16:00

SESSION 3

Room: ICM Room 12 Mon 16:00 to 18:00

Optical Systems I

Session Chair: **Harald Bosse**, Physikalisch-Technische Bundesanstalt (Germany)

16:00: **A simulation environment for assisting system design of coherent laser doppler wind sensor for active wind turbine pitch control**, Leilei Shinohara, Karlsruher Institut für Technologie (Germany); Tran Tuan Anh Pham, Karlsruhe Institute of Technology (Germany); Thorsten Beuth, Harsha Umesh Babu, Karlsruher Institut für Technologie (Germany); Nico Heussner, FZI Forschungszentrum Informatik (Germany); Siegwart Bogatscher, Svetlana Danilova, Wilhelm Stork, Karlsruher Institut für Technologie (Germany). [8789-32]

16:20: **Design rules for a compact and low-cost optical position sensing of MOEMS tilt mirrors based on a Gaussian-shaped light source**, Marcus Baumgart, Andreas Tortschanoff, Carinthian Tech Research AG (Austria) [8789-9]

16:40: **Extremum seeking control to avoid speckle-dropouts in a vibrometer**, Robert Dehnert, Sascha Mayer, Bernd Tibken, Bergische Univ. Wuppertal (Germany) [8789-10]

17:00: **Characterisation and comparison of ophthalmic instrument quality using a model eye with reverse ray-tracing**, Conor Sheil, Alexander V. Goncharov, National Univ. of Ireland, Galway (Ireland) [8789-11]

17:20: **Modelling PTB's spatial angle autocollimator calibrator**, Oliver Kranz, Ralf D. Geckeler, Andreas Just, Michael Krause, Physikalisch-Technische Bundesanstalt (Germany) [8789-13]

17:40: **Transmission functions of optical choppers for Gaussian beam distributions: modeling and simulations**, Octavian Cira, Virgil-Florin Duma, Aurel Vlaicu Univ. of Arad (Romania) [8789-14]

Tuesday 14 May

SESSION 4

Room: ICM Room 12 Tue 8:10 to 10:00

Microscopy and Imaging Systems

Session Chair: **Sven Burger**, JCMwave GmbH (Germany)

8:10: **Deconvolution microscopy of living cells for phase-contrast imaging** (*Invited Paper*), Guanxiao Cheng, Ping Xu, Zhilong Sun, ChunQuan Hong, Zelin Li, Shenzhen Univ. (China) [8789-15]

8:40: **Measurement based simulation of microscope deviations for evaluation of stitching algorithms for the extension of Fourier-based alignment**, Florian Engelke, Markus Kästner, Eduard Reithmeier, Leibniz Univ. Hannover (Germany) [8789-16]

9:00: **3D optical metrology using Fourier normalization to obtain Sub-nanometer parametric uncertainties**, Richard M. Silver, Bryan M. Barnes, Jing Qin, Hui Zhou, Martin Sohn, National Institute of Standards and Technology (United States) [8789-17]

9:20: **Reconstruction of SNOM near-field images from rigorous optical simulations by including topography artifacts**, Markus Ermes, Stephan Lehnen, Karsten Bittkau, Reinhard Carius, Forschungszentrum Jülich GmbH (Germany) [8789-18]

9:40: **Defect parameters retrieval based on optical projection images**, Dongbo Xu, Sikun Li, Shanghai Institute of Optics and Fine Mechanics (China); Xiangzhao Wang, Shanghai Institute of Optics and Fine Mechanics (China) and Graduate School of the Chinese Academy of Science (China); Tim Fühner, Andreas Erdmann, Fraunhofer-Institut für Integrierte Systeme und Bauelementetechnologie IISB (Germany) [8789-19]

Coffee Break Tue 10:00 to 10:30

Conference 8789 · Room: ICM Room 12

SESSION 5

Room: ICM Room 12 Tue 10:30 to 12:40

Maxwell Solver and Wave Propagation

Session Chair: Karsten Frenner,
Institut für Technische Optik (Germany)

10:30: **Alternative discretization in the aperiodic Fourier modal method leading to reduction in computational costs** (*Invited Paper*), Maxim Pisarenco, Irwan D. Setija, ASML Netherlands B.V. (Netherlands) [8789-20]

11:00: **Modeling and optimization of high index contrast gratings with aperiodic topologies**, Milan Maksimovic, Focal 2.0 BV (Netherlands) . [8789-21]

11:20: **Finite element method for computational metrology**, Sven Burger, JCMwave GmbH (Germany) and Konrad-Zuse-Zentrum für Informationstechnik Berlin (Germany); Jan Pomplun, Lin Zschiedrich, JCMwave GmbH (Germany); Frank Schmidt, JCMwave GmbH (Germany) and Konrad-Zuse-Zentrum für Informationstechnik Berlin (Germany); Bernd Bodermann, Physikalisch-Technische Bundesanstalt (Germany) [8789-22]

11:40: **Effect of imposed boundary conditions on the accuracy of transport of intensity equation based solvers**, Juan Martinez-Carranza, Kostantinos Falaggis, Tomasz Kozacki, Malgorzata Kujawinska, Warsaw Univ. of Technology (Poland) [8789-23]

12:00: **Rigorous Dyson equation and quasi-separable T-scattering operator technique for study of magnetic response from ordered and disordered non-magnetic particles' ensembles at electromagnetic wave multiple scattering**, Yurii N. Barabanenkov, Institute of Radio Engineering and Electronics (Russian Federation); Mikhail Y. Barabanenkov, Institute of Microelectronics Technology and High Purity Materials (Russian Federation) [8789-24]

12:20: **The influence of nonlinear modal propagation analysis on MMI power splitters for miniaturization**, Mehdi Tajaldini, Mohd Zubir MatJafri, Univ. Sains Malaysia (Malaysia) [8789-25]

Lunch Break Tue 12:40 to 13:50

SESSION 6

Room: ICM Room 12 Tue 13:50 to 15:30

New Materials and Scatterometry II

Session Chair: Richard Silver,
National Institute of Standards and Technology (United States)

13:50: **Multi resonant platform based on modified metallic nanoparticles for biological tissue characterization**, Renato Iovine, Luigi La Spada, Univ. degli Studi di Roma Tre (Italy); Richard Tarparelli, Lucio Vegni, Univ degli Studi di Roma Tre (Italy) [8789-26]

14:10: **Investigation of microstructured fiber geometries by scatterometry**, Poul-Erik Hansen, Danish Fundamental Metrology Ltd. (Denmark); Sven Burger, JCMwave GmbH (Germany) [8789-27]

14:30: **Simulation based optimization of scatterometric signatures by designed near field structures**, Valeriano Ferreras Paz, Karsten Frenner, Univ. Stuttgart (Germany); Wolfgang Osten, Univ. Stuttgart (Germany) and Stuttgart Research Ctr. of Photonic Engineering (Germany) [8789-28]

14:50: **Alternative methods for uncertainty evaluation in EUV scatterometry**, Sebastian Heidenreich, Mark-Alexander Henn, Hermann A. Gross, Bernd Bodermann, Markus Bär, Physikalisch-Technische Bundesanstalt (Germany) [8789-29]

15:10: **The effect of line roughness on DUV scatterometry**, Mark-Alexander Henn, Sebastian Heidenreich, Hermann A. Gross, Bernd Bodermann, Markus Bär, Physikalisch-Technische Bundesanstalt (Germany) [8789-30]

Coffee Break Tue 15:30 to 16:00

SESSION 8

Room: ICM Room 12 Tue 16:00 to 17:20

Interferometry and Phase II

Session Chair: Wolfgang Osten,
Institut für Technische Optik (Germany)

16:00: **Modelling laser interferometers for the measurement of the Avogadro constant**, Birk Andreas, Physikalisch-Technische Bundesanstalt (Germany); Giovanni Mana, Enrico Massa, Istituto Nazionale di Ricerca Metrologica (Italy); Carlo Palmisano, Univ. di Torino (Italy) [8789-33]

16:20: **Fundamental performance determining factors of the ultrahigh-precision space-borne optical metrology system for the LISA Pathfinder mission**, Gerald Hechenblaikner, Reinhold Flatscher, EADS Astrium GmbH (Germany) [8789-34]

16:40: **EFPI signal processing method providing picometer-level resolution in cavity length measurement**, Nikolai A. Ushakov, Leonid B. Liokumovich, Andrey V. Medvedev, St. Petersburg State Polytechnical Univ. (Russian Federation) [8789-35]

17:00: **Comparative analysis of absolute methods to test rotationally asymmetric surface deviation**, Weihong Song, Xi Hou, Fan Wu, Wenchuan Zhao, Institute of Optics and Electronics (China) [8789-37]

CLOSING REMARKS

Room: ICM Room 12 18:00 to 18:05

Wednesday 15 May

POSTERS-WEDNESDAY

ICM Foyer Wed 17:00 to 18:30

Conference attendees are invited to attend the Optical Metrology Poster Session on Wednesday afternoon. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions. Poster authors, view poster presentation guidelines and set-up instructions on page 28, and at <http://spie.org/x6513.xml>. (Follow the Special Events link)

A new method for adjusting the lateral transfer hollow retroreflector, Alexandr G. Ershov, S.I. Vavilov State Optical Institute (Russian Federation) [8789-38]

Absolute testing of flats with all terms by using even and odd functions, Xin Jia, Fuchao Xu, Tingwen Xing, Institute of Optics and Electronics (China); Zhixiang Liu, Institute of Optics and Electronics, Chinese Academy of Sciences (China) [8789-39]

Modeling of Risley prisms devices for exact scan patterns, Alexandru Schitea, Marius Tuf, Virgil-Florin Duma, Aurel M. Vlaicu, Aurel Vlaicu Univ. of Arad (Romania) [8789-40]

Efficient and stable numerical method for evaluation of Zernike polynomials and their Cartesian derivatives, Pavel Novak, Jiri Novak, Czech Technical Univ. in Prague (Czech Republic) [8789-41]

Numerical analysis of a solid state laser system designated for paint layers removal from various substrates, Ion I. Lancranjan, Dan M. Savastru, Roxana S. Savastru, Sorin I. Miclos, National Institute of R&D for OptoElectronics (Romania) [8789-42]

Mathematical model of a galvanometer-based scanner: simulations and experiments, Corina Mnerie, Aurel Vlaicu Univ. of Arad (Romania); Stefan Preitl, Politehnica Univ. of Timisoara (Romania); Virgil-Florin Duma, Aurel Vlaicu Univ. of Arad (Romania) [8789-43]

Design of soft x-ray gratings for free electron lasers: from specification to characterization, Maurizio Vannoni, Daniele La Civita, European XFEL GmbH (Germany); Rolf Follath, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (Germany); Liubov Samoylova, European XFEL GmbH (Germany); Frank Siewert, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (Germany); Harald Sinn, European XFEL GmbH (Germany) [8789-44]

Super-resolution imaging based on liquid crystal on silicon displays technology, Anwar Hussain, Mohammad Sohail, Pakistan Institute of Engineering and Applied Sciences (Pakistan); Jose Luis Martinez, Angel Lizana, Univ. Autònoma de Barcelona (Spain); Andrés Márquez, Universidad de Alicante (Spain); Juan Campos, Univ. Autònoma de Barcelona (Spain) [8789-47]

S-Genius, a universal software platform with versatile inverse problem resolution for scatterometry, David Fuard, Nicolas Troscompt, LTM CNRS (France) and CEA-LETI-Minatec (France); Ismael El Kalyoubi, LTM-CNRS, UJF, INPG (France) and CEA-LETI-Minatec (France); Sébastien Soulan, Maxime Besacier, CEA-LETI-Minatec (France) [8789-48]

Testing an aspheric lens combining the Ronchi test and interferometric test by transmission, Fermin-Salomon Granados-Agustín, María-Elizabeth Percino-Zacarías, Esperanza Carrasco Licea, Daniel Aguirre-Aguirre, Rafael Izazaga-Pérez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [8789-49]

Phase recovery from interferograms under severe vibrations, Jesús Muñoz-Maciel, Francisco J. Casillas-Rodríguez, Miguel J. Mora-Gonzalez, Francisco G. Peña-Lecona, Victor M. Durán Ramírez, Univ. de Guadalajara (Mexico) [8789-50]

Optical testing of soft contact lenses with a rigid cornea, Romain Bouchand, Alexander V. Goncharov, National Univ. of Ireland, Galway (Ireland) . . . [8789-51]

The dispersion of the refractive index visualization in the broadband source interferometry, Ilya V. Smirnov, Vladislav V. Lychagov, Alexander L. Kalyanov, N.G. Chernyshevsky Saratov State Univ. (Russian Federation); Vladimir P. Ryabukho, N.G. Chernyshevsky Saratov State Univ. (Russian Federation) and Institute of Precision Mechanics and Control (Russian Federation) [8789-52]

Optics for Arts, Architecture, and Archaeology IV

Conference Chairs: **Luca Pezzati**, Istituto Nazionale di Ottica (Italy); **Piotr Targowski**, Nicolaus Copernicus Univ. (Poland)

Programme Committee: **Dario Ambrosini**, Univ. degli Studi dell'Aquila (Italy); **John F. Asmus**, Univ. of California, San Diego (United States); **Brunetto Giovanni Brunetti**, Univ. degli Studi di Perugia (Italy); **Andreas Burmester**; **Marta Castillejo**, Consejo Superior de Investigaciones Científicas (Spain); **Alberto de Tagle**, Netherlands Institute for Cultural Heritage (Netherlands); **John K. Delaney**, National Gallery of Art (United States); **Raffaella E. M. Fontana**, Istituto Nazionale di Ottica (Italy); **Roger M. Groves**, Technische Univ. Delft (Netherlands); **Igor P. Gurov**, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); **Alexander J. Kossolapov**, The Hermitage Museum (Russian Federation); **Haida Liang**, Nottingham Trent Univ. (United Kingdom); **Nicola Masini**, Consiglio Nazionale delle Ricerche (Italy); **David R. Saunders**, The British Museum (United Kingdom); **Heike Stege**, Doerner Institut (Germany); **Vivi Tornari**, Foundation for Research and Technology-Hellas (Greece)

Wednesday 15 May

Welcome and Introduction Wed 8:15 to 8:20

SESSION 1

Room: ICM Room 12 Wed 8:20 to 10:00

New Methods and Applications for Restoration

Session Chair: **Marta Castillejo**,
Consejo Superior de Investigaciones Científicas (Spain)

8:20: **Spin-offs from laser ablation in art conservation** (*Invited Paper*), John F. Asmus, Jessica P. Elford, Univ. of California, San Diego (United States); Vadim A. Parfenov, St. Petersburg State Univ. (Russian Federation) [8790-1]

8:50: **Potential of Chlorophyll Fluorescence imaging for assessing bio- viability changes of biodeteriogen growths on stone monuments** (*Invited Paper*), Iacopo Osticioli, Marta Mascali, Istituto di Fisica Applicata Nello Carrara (Italy); Daniela Pinna, Univ. degli Studi di Bologna (Italy); Salvatore Siano, Istituto di Fisica Applicata Nello Carrara (Italy) [8790-2]

9:20: **Detection of transport and age induced damages on artwork: an advanced concept**, Michael Morawitz, Univ. Stuttgart (Germany); Niclas Hein, Staatliche Akademie der Bildenden Künste Stuttgart (Germany); Igor V Alexeenko, Immanuel Kant Baltic Federal Univ. (Russian Federation); Marc Wilke, Giancarlo Pedrini, Univ. Stuttgart (Germany); Christoph Kreckel, Staatliche Akademie der Bildenden Künste Stuttgart (Germany); Wolfgang Osten, Univ. Stuttgart (Germany) [8790-3]

9:40: **Use of the LIBS method in oil paintings examination, based on examples of analyses conducted at the Wilanow Palace Museum**, Elzbieta Modzelewska, Agnieszka Pawlak, Wilanow Palace Museum (Poland); Wojciech Skrzeczanski, Jan A. Marczak, Military Univ. of Technology (Poland); Anna Selerowicz, Academy of Fine Arts, Warsaw (Poland) [8790-4]

Coffee Break Wed 10:00 to 10:30

PLENARY SESSION

Room: Saal 1 Wed 10:30 to 11:20

Challenges in Optical Metrology for Photo-Lithography

Wim M.J. Coene, ASML Research, Netherlands

See p. 2 for details.

SESSION 2

Room: ICM Room 12 Wed 11:30 to 12:40

Structure and Material Analyses

Session Chair: **Haida Liang**, Nottingham Trent Univ. (United Kingdom)

11:30: **Unwrapping layers in historic artwork: virtual cross-sections with pump-probe microscopy** (*Invited Paper*), Tana E. Villafana, Duke Univ. (United States); William P. Brown, North Carolina Museum of Art (United States); John K. Delaney, National Gallery of Art (United States); Jennifer Mass, Henry Francis DuPont Winterthur Museum (United States); Barbara Buckley, The Barnes Foundation (United States); Warren S. Warren, Martin C. Fischer, Duke Univ. (United States) [8790-5]

12:00: **Development and application of portable hyperspectral imaging cameras for the identification and mapping of organic artist's materials such as paint binders and textile fibers**, John K. Delaney, National Gallery of Art (United States); Paola Ricciardi, The Fitzwilliam Museum (United Kingdom); Kathryn Dooley, Suzanne Lomax, National Gallery of Art (United States); Murray H. Loew, The George Washington Univ. (United States) [8790-6]

12:20: **Deterioration estimation of paintings by means of combined 3D and hyperspectral data analysis**, Luis Granero Montagud, AIDO Instituto Tecnológico de Óptica, Color e Imagen (Spain); Cristina Portalés-Ricart, IRTIC Instituto de Robótica y Tecnologías de la Información y las Comunicaciones (Spain); Begoña Pastor-Carbonell, Emilio Ribes-Gómez, Antonio Gutiérrez-Lucas, AIDO Instituto Tecnológico de Óptica, Color e Imagen (Spain); Vivi Tornari, Vassilis M. Papadakis, Foundation for Research and Technology-Hellas (Greece); Roger M. Groves, Beril Sirmacek, Technische Univ. Delft (Netherlands); Alessandra Bonazza, Izabela Ozga, Istituto di Scienze dell'Atmosfera e del Clima (Italy); Jan P. Vermeiren, Koen Van Der Zanden, Xenics NV (Belgium); Matthias Förster, Petra Aswendt, ViALUX GmbH (Germany); Albert Borreman, Avantes B.V. (Netherlands); Jon D. Ward, Gooch & Housego Plc (United Kingdom); António Cardoso, Luís Aguiar, Filipa Alves, Signinum - Gestão de Património Cultural (Portugal); Polonca Ropret, Institute for the Protection of Cultural Heritage of Slovenia (Slovenia); José María Luzón-Nogué, Real Academia de Bellas Artes de San Fernando (Spain) [8790-7]

Lunch Break Wed 12:40 to 14:00

SESSION 3

Room: ICM Room 12 Wed 14:00 to 15:30

Image and Processing and Other Digital Data Processing Methods for Optics

Session Chair: **Vadim A. Parfenov**,
St. Petersburg State Univ. (Russian Federation)

14:00: **Extending hyperspectral imaging from Vis to NIR spectral regions: a novel scanner for the in-depth analysis of polychrome surfaces** (*Invited Paper*), Costanza Cucci, Marcello Picollo, Andrea Casini, Lorenzo Stefani, Istituto di Fisica Applicata Nello Carrara (Italy) [8790-8]

14:30: **Automatic registration and mosaicing of conservation images**, Damon M. Conover, The George Washington Univ. (United States); John K. Delaney, National Gallery of Art (United States) and George Washington Univ. (United States); Murray H. Loew, The George Washington Univ. (United States) [8790-9]

14:50: **Micromorphology of gold jewels: a novel algorithm for 3D reconstruction and its quality assessment**, Ilaria Cacciari, Andrea A. Mencaglia, Salvatore Siano, Istituto di Fisica Applicata Nello Carrara (Italy) [8790-10]

15:10: **Surface monitoring measurements of materials on environmental change conditions**, Vivi Tornari, Irini Bernikola, Foundation for Research and Technology-Hellas (Greece); Paul Bellendorf, Fraunhofer Gesellschaft zur Förderung der angewandten Forschung e.V. (Germany); Chiara Bertolin, Consiglio Nazionale Delle Ricerche - Istituto di Scienze dell'atmosfera e del Clima (Italy); Dario Camuffo, Consiglio Nazionale delle Ricerche (Italy); Lola Kotova, Daniela Jacobs, Max Planck Institute for Meteorology, Hamburg (Germany); Roko Zarnic, University of Ljubljana, Slovenia (Slovenia); Vlatka Rajcic, Faculty of civil engineering, University of Zagreb, Croatia (Croatia); Johanna Leissner, Fraunhofer Gesellschaft zur Förderung der angewandten Forschung e.V. (Germany) [8790-11]

Coffee Break Wed 15:30 to 16:00

Conference 8790 · Room: ICM Room 12

SESSION 4

Room: ICM Room 12 Wed 16:00 to 17:20

Integrated Techniques and Case Studies

Session Chair: **John K. Delaney**, National Gallery of Art (United States)

16:00: **Systematic noninvasive optical investigation of wall paintings at a UNESCO world heritage site**, Haida Liang, Andrei Lucian, Chi Shing Cheung, Nottingham Trent Univ. (United Kingdom); Bomín Su, Dunhuang Academy (China) [8790-12]

16:20: **Close range photogrammetry applied to the documentation of an archaeological site in the Gaza Strip, Palestine**, Emmanuel Alby, Institut National des Sciences Appliquées de Strasbourg (France) [8790-13]

16:40: **Evaluation of historical museum interior lighting system using fully immersive virtual luminous environment**, Mojtaba Navvab, Univ. of Michigan (United States); Fabio Bisegna, Franco Gugliemetti, Univ. degli Studi di Roma La Sapienza (Italy) [8790-14]

17:00: **Defects detection and non-destructive testing (NDT) techniques in paintings: a unified approach through measurements of deformation**, Stefano Sfarra, Univ. degli Studi dell'Aquila (Italy); Clemente Ibarra-Castanedo, Univ. Laval (Canada); Dario Ambrosini, Domenica Paoletti, Univ. degli Studi dell'Aquila (Italy); Abdelhakim Bendada, Xavier P. V. Maldague, Univ. Laval (Canada) [8790-15]

POSTERS-WEDNESDAY

ICM Foyer Wed 17:00 to 18:30

Conference attendees are invited to attend the Optical Metrology Poster Session on Wednesday afternoon. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions. Poster authors, view poster presentation guidelines and set-up instructions on page 28, and at <http://spie.org/x6513.xml>. (Follow the Special Events link)

Noninvasive topographic inspection of wood artworks, Manuel F. Costa, Univ. do Minho (Portugal) [8790-37]

SYDDARTA; new methodology for digitisation of deterioration estimation in paintings, Luis Granero Montagud, AIDO Instituto Tecnológico de Óptica, Color e Imagen (Spain); Cristina Portalés-Ricart, IRTIC Instituto de Robótica y Tecnologías de la Información y las Comunicaciones (Spain); Begoña Pastor-Carbonell, Emilio Ribes-Gómez, Antonio Gutiérrez-Lucas, AIDO Instituto Tecnológico de Óptica, Color e Imagen (Spain); Vivi Tornari, Vassilis M. Papadakis, Foundation for Research and Technology-Hellas (Greece); Roger M. Groves, Beril Sirmacek, Technische Univ. Delft (Netherlands); Alessandra Bonazza, Izabela Ozga, Istituto di Scienze dell'Atmosfera e del Clima (Italy); Jan P. Vermeiren, Koen van der Zanden, Xenics NV (Belgium); Matthias Förster, Petra Aswendt, ViALUX GmbH (Germany); Albert Borreman, Avantes B.V. (Netherlands); Jon D. Ward, Gooch & Housego Plc (United Kingdom); Polonca Ropret, Institute for the Protection of Cultural Heritage of Slovenia (Slovenia); António Cardoso, Luís Aguiar, Filipa Alves, Signinum - Gestão de Património Cultural (Portugal); José María Luzón-Nogué, Christian Dietz, Real Academia de Bellas Artes de San Fernando (Spain) [8790-38]

Optical characterization of amber specimens from the unique collection of the Museum of the Earth of the Polish Academy of Sciences in Warsaw, Anna Zatorska, Academy of Fine Arts, Warsaw (Poland); Barbara Kosmowska-Ceranowicz, Museum of the Earth (Poland) and Polish Academy of Sciences (Poland); Andrzej Koss, Academy of Fine Arts, Warsaw (Poland) and Interacademy Institute for Conservation and Restoration of Works of Art (Poland); Jan A. Marczak, Marek Strzelec, Antoni Sarzynski, Military Univ. of Technology (Poland); Wojciech Skrzeczanowski, Military University of Technology, Institute of Optoelectronics (Poland) [8790-39]

Studies on watercolour deacidification by means of the Bookkeeper preparation, Elzbieta Jezewska, Joanna Kurkowska, Kamila Zaleska, Anna Zatorska, Academy of Fine Arts, Warsaw (Poland) [8790-40]

Application of spectroscopic techniques for the study of the surface changes in poplar wood and possible implications in conservation of wooden artefacts, Claudia Pelosi, Giorgia Agresti, Luca Calienno, Angela Lo Monaco, Rodolfo Picchio, Ulderico Santamaria, Vittorio Vinciguerra, Univ. degli Studi della Tuscia (Italy) [8790-41]

μ -XRPD studies of blue pigments in Gdansk paintings of the 17th century, Justyna Olszewska-Swietlik, Bożena Szmelter-Fausek, Nicolaus Copernicus Univ. (Poland); Alicja Rafalska-Lasocha, Jagiellonian Univ. in Krakow (Poland); Marta Grzesiak-Nowak, Jerzy Haber Institute of Catalysis and Surface Chemistry (Poland) [8790-43]

Multispectral metering and exosimetric system for diagnosis and conservation, Matteo Miccoli, Marcello Melis, Profilocolore Srl (Italy) [8790-44]

Modular wide spectrum lighting system for diagnosis, conservation and restoration, Marcello Melis, Matteo Miccoli, Profilocolore Srl (Italy) [8790-45]

A systematic study of historic writing and drawing inks using THz-TD spectroscopy and imaging, Tiphaine Bardou, Univ. College London (United Kingdom); Rob May, TeraView Ltd. (United Kingdom); Bianca Jackson, Univ. of Rochester (United States); Philip F. Taday, TeraView Ltd. (United Kingdom); Matija Strlic, Univ. College London (United Kingdom) [8790-46]

Multiscale modelling of surfaces by profilometry based on conoscopic holography, Claudia Daffara, Francesca Monti, Paolo Fiorini, Marco Carletti, Univ. degli Studi di Verona (Italy); Raffaella E. M. Fontana, Istituto Nazionale di Ottica (Italy) [8790-47]

NavOScan: hassle-free handheld 3D scanning with automatic multi-view registration based on combined optical and inertial pose estimation, Christoph Munkelt, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); Bernhard Kleiner, Fraunhofer-Institut für Produktionstechnik und Automatisierung (Germany); Torfi Þórhallsson, Innovation Ctr. Iceland (Iceland); Carlos Mendoza, Innovation Center Iceland (Iceland); Christian Bräuer-Burchardt, Fraunhofer IOF (Germany); Peter Kühmstedt, Gunther Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) [8790-48]

Multispectral noninvasive techniques for investigations of Gothic mural paintings: case study of chapel in Chwarszczany (Poland, West Pomerania), Jaroslaw Rogoz, Pawel Szroeder, Nicolaus Copernicus Univ. (Poland); Wojciech Bartz, Univ. of Wroclaw (Poland); Teresa Kurkiewicz, Adam Cupa, Joanna Karbowska-Berendt, Katarzyna Krynicka-Szroeder, Joanna Jarmilko, Robert Rogal, Nicolaus Copernicus Univ. (Poland) [8790-49]

Original or fake? Investigation of authenticity of three artworks attributed to Lyonel Feininger, George Grosz and Paul Klee, Elzbieta Basiul, Jaroslaw Rogoz, Jolanta Czuczko, Pawel Szroeder, Adam Cupa, Malgorzata Geron, Nicolaus Copernicus Univ. (Poland) [8790-50]

The use of multispectral nondestructive techniques in conservation diagnostics, Elzbieta Basiul, Jaroslaw Rogoz, Adam Cupa, Marta Pilarska, Pawel Szroeder, Nicolaus Copernicus Univ. (Poland) [8790-51]

μ -Raman, FESEM-EDS and LA-ICP-MS study of Roman glass mosaic tesserae, Elena Basso, Marco Malagodi, Claudia Invernizzi, Univ. degli Studi di Pavia (Italy); Mauro F. La Russa, Univ. della Calabria (Italy); Danilo Bersani, Pier Paolo Lottici, Univ. degli Studi di Parma (Italy) [8790-52]

The preliminary results on the investigation of historic stained glass panels from Grodziec collection, Poland., Malgorzata Walczak, M. Kaminska, Pawel Karaszkiweicz, Academy of Fine Arts, Cracow (Poland); Jacek Szczerbinski, Marek Szymonski, Jagiellonian Univ. in Krakow (Poland) [8790-53]

Material investigation on three special paper molds from Magnani's museum collections, Iacopo Osticioli, Istituto di Fisica Applicata Nello Carrara (Italy); Massimiliano Bini, Museo della Carta (Italy); Juri Agresti, Ilaria Cacciari, Istituto di Fisica Applicata Nello Carrara (Italy); Silvia Calusi, Istituto Nazionale di Fisica Nucleare (Italy); Pier A. Mandò, Univ. degli Studi di Firenze (Italy) and Istituto Nazionale di Fisica Nucleare (Italy); Salvatore Siano, Istituto di Fisica Applicata Nello Carrara (Italy) [8790-54]

Remote photonic technologies for artwork inspection, Vivi Tornari, Foundation for Research and Technology-Hellas (Greece); Giancarlo Pedrini, Wolfgang Osten, Institut für Technische Optik (Germany) [8790-55]

Improvement of photometry stereo reconstruction of surface's 3D topography by direct reflectivity measurement, Jaroslav Valach, David Vrba, Vladimír Kocour, Miloš Cerný, Institute of Theoretical and Applied Mechanics (Czech Republic) [8790-56]

Laser investigation to remove microorganisms on Machu Picchu quarry stone, Mariela Speranza, Mikel Sanz, Mohamed Oujja, Carmen Ascaso, Marta Castillejo, Sergio Pérez-Ortega, Consejo Superior de Investigaciones Científicas (Spain); Gladys Huallparimachi, Dirección Regional de Cultura de Cusco (Peru); Mónica Álvarez de Buergo, Rafael Fort, Instituto de Geociencias (Spain); Asunción de los Ríos, Consejo Superior de Investigaciones Científicas (Spain) [8790-57]

Laser ablation cleaning of an underwater archaeological bronze spectacle plate from the H.M.S. DeBraak shipwreck, Bartosz A. Dajnowski, Univ. of Delaware (United States) and The Conservation of Sculpture & Objects Studio, Inc. (United States) [8790-58]

Modern technology in originality and authentication dispute on movable and detached artworks, Vivi Tornari, Foundation for Research and Technology-Hellas (Greece); Eleni Kouloumpi, National Art Gallery and Alexandros Soutzos Museum (Greece); Fotini Koussiaki, Alexandros Soutzos Museum (Greece) [8790-59]

Surface Skeleton Generation Based on 360-degree Profile Scan, Lujie Chen, Singapore Univ. of Technology & Design (Singapore); Lawrence Sass, Woong Ki Sung, Vernelle Noel, Massachusetts Institute of Technology (United States) [8790-60]

μ -MFT : a simplified microfading instrument intended for widespread application, Andrew J. Lerwill, Christel Pesme, Vincent Beltran, James Druzik, The Getty Conservation Institute (United States) [8790-29]

Thursday 16 May

SESSION 5

Room: ICM Room 12Thu 8:30 to 10:00

Stratigraphic and Depth-Resolved Methods

Session Chair: Raffaella E. M. Fontana,
Istituto Nazionale di Ottica (Italy)

8:30: **Terahertz analysis of stratified wall plaster at buildings of cultural importance across Europe** (*Invited Paper*), Gillian C. Walker, The Univ. of Reading (United Kingdom); Bianca Jackson, Univ. of Rochester (United States); David Giovannacci, Lab. de Recherche des Monuments Historiques (France); John W. Bowen, The Univ. of Reading (United Kingdom); Bruno Delandes, United Nations Educational, Scientific and Cultural Organization (Latvia); Julien Labaune, Gérard A. Mourou, Ecole Polytechnique (France); Michel Menu, Ctr. de Recherche et de Restauration des Musées de France (France); Vincent Detalle, Lab. de Recherche des Monuments Historiques (France) [8790-16]

9:00: **Laser-induced plasma spectroscopy depth profile analysis: a contribution to authentication**, Juri Agresti, Iacopo Osticioli, Andrea A. Mencaglia, Salvatore Siano, Istituto di Fisica Applicata Nello Carrara (Italy) [8790-17]

9:20: **A swept source Optical Coherence Tomography system at 2000nm for imaging of painted objects**, Chi Shing Cheung, Nottingham Trent Univ. (United Kingdom); Masaki Tokurakawa, Jae M. Daniel, W. Andrew Clarkson, Univ. of Southampton (United Kingdom); Haida Liang, Nottingham Trent Univ. (United Kingdom) [8790-18]

9:40: **Application of optical coherence microscopy for studying decorative art objects**, Ekaterina V. Zhukova, Igor P. Gurov, Nikita Margaryants, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [8790-19]

Coffee Break Thu 10:00 to 10:30

SESSION 6

Room: ICM Room 12Thu 10:30 to 12:20

Topography and Tomography

Session Chair: Brunetto Giovanni Brunetti,
Univ. degli Studi di Perugia (Italy)

10:30: **Multiphoton microscopy, an efficient tool for in situ study of cultural heritage artifacts** (*Invited Paper*), Gaël Latour, Ecole Polytechnique (France); Jean-Philippe Echard, Marie Didier, Cite de la Musique (France); Marie-Claire Schanne-Klein, Ecole Polytechnique (France) [8790-20]

11:00: **Ultra-high resolution Fourier domain optical coherence tomography for resolving thin layers in painted works of art**, Chi Shing Cheung, Haida Liang, Nottingham Trent Univ. (United Kingdom) [8790-21]

11:20: **OCT structural examination of 'Madonna dei Fusi' by Leonardo da Vinci**, Piotr Targowski, Magdalena A. Iwanicka, Marcin Sylwestrzak, Ewa A. Kaszewska, Nicolaus Copernicus Univ. (Poland); Cecilia Frosinini, Opificio delle Pietre Dure (Italy) [8790-22]

11:40: **Study of surface optical properties for characterizing the cleaning process of paintings**, Raffaella E. M. Fontana, Marco Barucci, Enrico M. Pampaloni, Luca Pezzati, Istituto Nazionale di Ottica (Italy); Claudia Daffara, Univ. degli Studi di Verona (Italy) [8790-23]

12:00: **Artwork analysis by optical surface profilometry**, Giuseppe Martini, Univ. degli Studi di Pavia (Italy); Rosaria Avagliano, Viviana Guidetti, Arkedos S.r.l. (Italy); Enrico M. Randone, Maria Pia Riccardi, Univ. degli Studi di Pavia (Italy) [8790-24]

Lunch Break Thu 12:20 to 14:00

SESSION 7

Room: ICM Room 12Thu 14:00 to 15:30

New Portable Instruments for In-Situ Applications

Session Chair: Vivi Tornari,
Foundation for Research and Technology-Hellas (Greece)

14:00: **Mid-infrared hyperspectral imaging of painting materials** (*Invited Paper*), Francesca Rosi, Costanza Miliani, Consiglio Nazionale delle Ricerche (Italy); Roland Harig, René Braun, Bruker Optik GmbH (Germany); Diego Sali, Bruker Italia S.r.l. unipersonale (Italy); Alessia Daveri, Associazione laboratorio di Diagnostica per i Beni Culturali (Italy); Brunetto G. Brunetti, Antonio Sgamellotti, Univ. degli Studi di Perugia (Italy) [8790-25]

14:30: **High spatial acuity multi- and hyperspectral infrared reflectography from 960 to 2500 nm: applications to paintings and drawings**, John K. Delaney, Paola Ricciardi, Marie Didier, National Gallery of Art (United States); Damon M. Conover, The George Washington Univ. (United States); Kim Schenck, Mervin Richard, National Gallery of Art (United States) [8790-26]

14:50: **Thermal quasi reflectography (TQR): current research and potential applications**, Claudia Daffara, Univ. degli Studi di Verona (Italy); Dario Ambrosini, Univ. degli Studi dell'Aquila (Italy); Luca Pezzati, Istituto Nazionale di Ottica (Italy); Giacomo Marchioro, Univ. degli Studi di Verona (Italy) ... [8790-27]

15:10: **Recent developments in microreflectance spectroscopy for photodegradation studies**, Tomasz Lojewski, Jacob L. Thomas, Joanna Lojewska, Jagiellonian Univ. in Krakow (Poland) [8790-28]

Coffee Break Thu 15:30 to 16:00

SESSION 8

Room: ICM Room 12Thu 16:00 to 18:10

Surface Examination and Analysis

Session Chair: Tomasz Lojewski, Univ. in Krakow (Poland)

16:00: **A multi-analytical investigation of semi-conductor pigments with time-resolved spectroscopy and imaging** (*Invited Paper*), Austin Nevin, Consiglio Nazionale delle Ricerche (Italy); Anna Cesaratto, Cosimo D'Andrea, Gianluca Valentini, Daniela Comelli, Politecnico di Milano (Italy) [8790-30]

16:30: **Underwater inverse LIBS for marine archaeology**, John F. Asmus, Jessica P. Elford, Michael D. Magde, Douglas Magde, Univ. of California, San Diego (United States); Vadim A. Parfenov, Saint-Petersburg State Univ. (Russian Federation) [8790-32]

16:50: **Multispectral hypercolorimetry and automatic guided pigment identification: some masterpieces case studies**, Matteo Miccoli, Marcello Melis, Donato Quarta, Profilocolore Srl (Italy) [8790-33]

17:10: **Automated full-3D digitization system for documentation of paintings**, Maciej Karaszewski, Marcin Adamczyk, Robert Sitnik, Jakub Michonski, Wojciech Zaluski, Warsaw Univ. of Technology (Poland); Eryk Bunsch, Wilanow Palace Museum (Poland); Pawel Bolewicki, Warsaw Univ. of Technology (Poland) [8790-34]

17:30: **Automated analysis of art object surfaces using time-averaged digital speckle pattern interferometry**, Michal Lukomski, Leszek Krzemien, Jerzy Haber Institute of Catalysis and Surface Chemistry (Poland) ... [8790-35]

17:50: **A simple optical method for evaluation of visual properties of surfaces**, Jaroslav Valach, Cristiana Lara Nunes, Krzysztof Niedoba, Institute of Theoretical and Applied Mechanics (Czech Republic) [8790-36]

Videometrics, Range Imaging, and Applications XII

Conference Chairs: **Fabio Remondino**, Fondazione Bruno Kessler (Italy); **Mark R. Shortis**, RMIT Univ. (Australia)

Programme Committee: **Jean-Angelo Beraldin**, National Research Council Canada (Canada); **Jan Boehm**, Univ. College London (United Kingdom); **Werner Boesemann**, AICON 3D Systems GmbH (Germany); **Hirofumi Chikatsu**, Tokyo Denki Univ. (Japan); **Nicola D'Apuzzo**, Homometrica Consulting (Switzerland); **Sabry F. El-Hakim**, Carleton Univ. (Canada); **Gabriele Guidi**, Politecnico di Milano (Italy); **Derek D. Lichti**, Univ. of Calgary (Canada); **Thomas Luhmann**, Jade Univ. (Germany); **Hans-Gerd Maas**, Technische Univ. Dresden (Germany); **Jon P. Mills**, Newcastle Univ. (United Kingdom); **Norbert Pfeifer**, Vienna Univ. of Technology (Austria); **Stuart Robson**, Univ. College London (United Kingdom); **David Stoppa**, Fondazione Bruno Kessler (Italy)

Tuesday 14 May

Opening Remarks Tue 8:00 to 8:10

SESSION 1

Room: Novotel: Room Zeppelin Tue 8:10 to 10:00

Industrial Applications and Automation

Session Chair: **Fabio Remondino**, Fondazione Bruno Kessler (Italy)

8:10: **Fast-robust-accurate: optical measurement systems for industrial applications** (*Invited Paper*), Robert Godding, AICON 3D Systems GmbH (Germany) [8791-1]

8:40: **A webcam photogrammetric method for robot calibration**, Ben Sargeant, Ali Hosseiniveh Ahmadabadian, Tohid Erfani, Stuart Robson, Jan Boehm, Univ. College London (United Kingdom) [8791-2]

9:00: **Investigation of a consumer-grade digital stereo camera**, Fabio Menna, Erica Nocerino, Fabio Remondino, Fondazione Bruno Kessler (Italy); Mark R. Shortis, RMIT Univ. (Australia) [8791-3]

9:20: **Development of virtual pipe fitting system**, Hiroshi Yokoyama, Kazuyuki Takeuchi, Hitachi Plant Technologies, Ltd. (Japan) [8791-38]

9:40: **Monitoring structure movement with laser tracking technology**, Luigi Barazzetti, Alberto Giussani, Fabio Roncoroni, Mattia Previtali, Politecnico di Milano (Italy) [8791-5]

Coffee Break Tue 10:00 to 10:30

SESSION 2

Room: Novotel: Room Zeppelin Tue 10:30 to 11:30

Automation and Image Registration

Session Chair: **Mark R. Shortis**, RMIT Univ. (Australia)

10:30: **Image selection in photogrammetric multi-view stereo methods for metric and complete 3D reconstruction**, Ali Hosseiniveh Ahmadabadian, Stuart Robson, Jan Boehm, Univ. College London (United Kingdom); Mark R. Shortis, RMIT Univ. (Australia) [8791-7]

10:50: **Mosaicking thermal images of buildings**, Luigi Barazzetti, Silvia Erba, Mattia Previtali, Elisabetta Rosina, Politecnico di Milano (Italy); Marco Scaioni, Tongji Univ. (China) [8791-8]

11:10: **Evaluation of outlier detection based on support vector machine regression for close-range photogrammetry**, Yin-Yu Lu, Christos Stamatopoulos, Clive S. Fraser, The Univ. of Melbourne (Australia) [8791-9]

Lunch Break Tue 11:30 to 13:40

SESSION 3

Room: Novotel: Room Zeppelin Tue 13:40 to 15:20

Point Cloud Processing and Analysis

Session Chair: **Gabriele Guidi**, Politecnico di Milano (Italy)

13:40: **Automatic object detection in point clouds based on knowledge guided algorithms**, Hung Truong, i3mainz (Germany) and Univ. de Bourgogne (France); Ashish Karmacharya, Waldemar Mordwinzew, Frank Boochs, Celeste Chudyk, i3mainz (Germany); Adlane Habel, Yvon Voisin, Univ. de Bourgogne (France) [8791-11]

14:00: **3D scanner point cloud denoising by near points surface fitting**, Vaclav Smitka, Martin Stroner, Czech Technical Univ. in Prague (Czech Republic) [8791-12]

14:20: **View integration technique using multi-resolution point clouds in 3D modeling**, Elwira Holowko, Robert Sitnik, Warsaw Univ. of Technology (Poland) [8791-13]

14:40: **Primitive-based registration of indoor TLS data using a priori approximation of the poses**, Jean-François Hullo, Institut National des Sciences Appliquées de Strasbourg (France); Guillaume Thibault, EDF - DTG Grenoble (France); Pierre Grussenmeyer, Tania Landes, Institut National des Sciences Appliquées de Strasbourg (France) [8791-14]

15:00: **Alignment of range image data based on MEMS IMU and coarse 3D models derived from evacuation plans**, Ali Mohammad Khosravani, Michael Peter, Dieter Fritsch, Univ. Stuttgart (Germany) [8791-15]

Coffee Break Tue 15:20 to 15:50

SESSION 4

Room: Novotel: Room Zeppelin Tue 15:50 to 17:50

Image-based Reconstruction, Tracking and Monitoring

Session Chair: **Robert Godding**, AICON 3D Systems GmbH (Germany)

15:50: **A review of techniques for the identification and measurement of fish in underwater stereo-video image sequences**, Mark R. Shortis, Mehdi Ravanbaksakh, RMIT Univ. (Australia); Faisal Shaifat, Euan S. Harvey, Ajmal S. Mian, The Univ. of Western Australia (Australia); James W. Seager, SeaGIS Pty. Ltd. (Australia); Philip F. Culverhouse, University of Plymouth (United Kingdom); Danelle E Cline, Duane R Edgington, Monterey Bay Aquarium Research Institute (United States) [8791-16]

16:10: **A photogrammetric approach to survey floating and semi-submerged objects**, Fabio Menna, Erica Nocerino, Fondazione Bruno Kessler (Italy); Salvatore Troisi, Univ. degli Studi di Napoli Parthenope (Italy); Fabio Remondino, Fondazione Bruno Kessler (Italy) [8791-17]

16:30: **Experiences in determination of non-rigid body motion in industrial environment using low-cost photogrammetry**, Ewelina Rupnik, Josef Jansa, Technische Univ. Wien (Austria) [8791-18]

16:50: **High accuracy low-cost videogrammetric system: an application to 6DOF estimation of ship models**, Erica Nocerino, Fondazione Bruno Kessler (Italy) and Univ. degli Studi di Napoli Parthenope (Italy); Fabio Menna, Fondazione Bruno Kessler (Italy); Salvatore Troisi, Univ. degli Studi di Napoli Parthenope (Italy) [8791-19]

17:10: **Generation of synthetic image sequences for the verification of matching and tracking algorithms for deformation analysis**, Folkmar Bethmann, Christian Jepping, Thomas Luhmann, Jade Univ. of Applied Sciences (Germany) [8791-20]

17:30: **Stochastic process modeling for multiple human tracking using stereo video camera**, Takashi Fuse, Wataru Nakanishi, The Univ. of Tokyo (Japan) [8791-21]

Wednesday 15 May

SESSION 5

Room: Novotel: Room Zeppelin Wed 8:00 to 9:50

Active Sensors Characterisation and Applications

Session Chair: **Fabio Remondino**, Fondazione Bruno Kessler (Italy)

8:00: **Metrological characterization of 3D imaging devices** (*Invited Paper*), Gabriele Guidi, Politecnico di Milano (Italy) [8791-22]

8:30: **An improved calibration method for structured light projection measurement system**, Baopeng Li, Bing Li, Bingcai Liu, Xi'an Jiaotong Univ. (China); Tao Jiang, Xi'an Jiaotong Univ. (China) [8791-44]

8:50: **Calibration of profile laser scanner with conical shape modification for autonomous mapping system**, Bronislav Koska, Czech Technical Univ. in Prague (Czech Republic) [8791-41]

9:10: **Lighting estimation in fringe images during motion compensation for 3D measurements**, Andreas Breitbarth, Peter Kühmstedt, Gunther Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); Joachim Denzler, Friedrich-Schiller-Univ. Jena (Germany) [8791-25]

9:30: **A robotized six degree of freedom stage for optical microscopy**, Misho Z. Avramov, Sofia Univ. "St. Kliment Ohridski" (Bulgaria) and BSS Ltd. (Bulgaria); Ivan Ivanov, Viktor Pavlov, Krista Zaharieva, Sofia Univ. (Bulgaria) [8791-26]

Coffee Break Wed 9:50 to 10:30

PLENARY SESSION

Room: Saal 1 Wed 10:30 to 11:20

Challenges in Optical Metrology for Photo-Lithography

Wim M.J. Coene, ASML Research, Netherlands

See p. 2 for details.

SESSION 6

Room: Novotel: Room Zeppelin Wed 11:40 to 12:00

General Session

Session Chair: **David Stoppa**, Fondazione Bruno Kessler (Italy)

11:40: **A background light resistant TOF range finder with integrated PIN photodiode in 0.35µm CMOS**, Milos Davidovic, Avago Technologies Fiber Austria GmbH (Austria); Johannes Seiter, Michael Hofbauer, Wolfgang Gaberl, Horst Zimmermann, Technische Univ. Wien (Austria) [8791-28]

POSTER REVIEW

Room Novotel: Room Zeppelin Wed 12:00 to 12:30

Brief oral overview of poster presentations scheduled for Videometrics, Range Imaging and Application Conference.

Presentations by posters 8791-39, 40, 42.

Lunch Break Wed 12:30 to 14:00

SESSION 7

Room: Novotel: Room Wright Wed 14:00 to 15:20

NOTE ROOM CHANGE

3D Shape Measurement and Reconstruction

Session Chair: **Mark R. Shortis**, RMIT Univ. (Australia)

14:00: **Optical sensor feedback assistive technology to enable patients to play an active role in the management of their body dynamics during radiotherapy treatment**, James M. Parkhurst, The Christie NHS Foundation Trust (United Kingdom); Gareth J. Price, The Christie NHS Foundation Trust (United Kingdom) and The Univ. of Manchester (United Kingdom); Phil J. Sharrock, Julie Stratford, The Christie NHS Foundation Trust (United Kingdom); Christopher J. Moore, The Christie NHS Foundation Trust (United Kingdom) and The Univ. of Manchester (United Kingdom) [8791-30]

14:20: **Technique for real-time frontal face image acquisition using stereo system**, Vladimir A. Knyaz, Yury V. Vizilter, Yury I. Kudryashov, GosNIIAS (Russian Federation) [8791-31]

14:40: **Improved EEG source localization employing 3D sensing by "Flying Triangulation"**, Svenja Ettl, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); Stefan Rampp, Sarah Fouladi, Universitätsklinikum Erlangen (Germany); Sarang S. Dalal, Univ. Konstanz (Germany); Florian Willomitzer, Oliver Arold, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); Hermann Stefan, Universitätsklinikum Erlangen (Germany); Gerd Häusler, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) [8791-32]

15:00: **3D building modelling from multiple view oblique images**, Jing Xiao, Wanshou Jiang, Wuhan Univ. (China) [8791-33]

Coffee Break Wed 15:20 to 16:00

SESSION 8

Room: Novotel: Room Wright Wed 16:00 to 17:00

Time of Flight Calibration and Modelling

Session Chair: **David Stoppa**, Fondazione Bruno Kessler (Italy)

16:00: **A study of systematic errors in the PMD CamBoard nano**, Jacky C. K. Chow, Derek D. Lichti, Univ. of Calgary (Canada) [8791-34]

16:20: **Correction of a phase dependent error in a time-of-flight range sensor**, Johannes Seiter, Michael Hofbauer, Milos Davidovic, Horst Zimmermann, Technische Univ. Wien (Austria) [8791-35]

16:40: **Correction of the temperature dependent error in a correlation based time-of-flight system by measuring the distortion of the correlation signal**, Michael Hofbauer, Johannes Seiter, Technische Univ. Wien (Austria); Milos Davidovic, Technische Univ. Wien (Austria) and Avago Technologies Fiber Austria GmbH (Austria); Horst Zimmermann, Technische Univ. Wien (Austria) [8791-36]

POSTERS-WEDNESDAY

ICM Foyer Wed 17:00 to 18:30

Conference attendees are invited to attend the Optical Metrology Poster Session on Wednesday afternoon. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions. Poster authors, view poster presentation guidelines and set-up instructions on page 28, and at <http://spie.org/x6513.xml>. (Follow the Special Events link)

Easy to use hand-gesture-based optical remote control: basic principle and recognition results, Michael Krocka, Heinrich Ruser, Christian M. Kargel, Univ. der Bundeswehr München (Germany) [8791-39]

2D and 3D documentation of St. Nicolas baroque church for the general reconstruction using laser scanning and photogrammetry technologies combination, Tomáš Køemen, Bronislav Koska, Czech Technical Univ. in Prague (Czech Republic) [8791-40]

Relative orientation of videos from range imaging cameras, Sajid Ghuffar, Technische Univ. Wien (Austria); Camillo Reszl, Vienna University of Technology (Austria); Norbert Pfeifer, Technische Univ. Wien (Austria) [8791-42]

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Conference Chairs: **Jürgen Beyerer**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung and Karlsruhe Inst. of Technology (Germany); **Fernando Puente León**, Karlsruher Institut für Technologie (Germany)

Programme Committee: **Jürgen Berthold**, Verein Deutscher Ingenieure e.V. (Germany); **Klaus Donner**, Univ. of Passau (Germany); **Christian Frese**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Andreas M. Heinrich**, Carl Zeiss AG (Germany); **Michael Heizmann**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Bernd Jähne**, Ruprecht-Karls-Universität Heidelberg (Germany); **Thomas Längle**, Fraunhofer IOSB (Germany); **Markus Maurer**, VITRONIC Dr.-Ing. Stein Bildverarbeitungssysteme GmbH (Germany); **Wolfgang Osten**, Univ. Stuttgart (Germany); **Felix Salazar**, Univ. Politécnica de Madrid (Spain); **Robert Schmitt**, Fraunhofer-Institut für Produktionstechnologie (Germany); **Hugo Thienpont**, Vrije Univ. Brussel (Belgium); **Stefan Werling**, Fraunhofer IOSB (Germany); **Ernst Wiedenmann**, AiMESS Services GmbH (Germany); **Volker Willert**, Technische Univ. Darmstadt (Germany)

Wednesday 15 May

PLENARY SESSION

Room: Saal 1 Wed 10:30 to 11:20

Challenges in Optical Metrology for Photo-Lithography

Wim M.J. Coene, ASML Research, Netherlands

See p. 2 for details.

POSTERS-WEDNESDAY

ICM Foyer Wed 17:00 to 18:30

Conference attendees are invited to attend the Optical Metrology Poster Session on Wednesday afternoon. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions. Poster authors, view poster presentation guidelines and set-up instructions on page 28, and at <http://spie.org/x6513.xml>. (Follow the Special Events link)

Fast car/human classification methods in the computer vision tasks, Boris V. Vishnyakov, Ivan K. Malin, GosNIIAS (Russian Federation); Yuri V Vizilter, FGUP GOSNIIAS (Russian Federation); Shih-Chia Huang, National Taipei Univ. of Technology (Taiwan); Sy-Yen Kuo, National Taiwan Univ. (Taiwan) . . . [8791-64]

Identification of bacteria species by using morphological and textural properties of bacterial colonies diffraction patterns, Agnieszka P. Suchwalko, Igor B. Buzalewicz, Halina Podbielska, Wrocław Univ. of Technology (Poland) . . . [8791-65]

Optical-electronic system for express analysis of mineral raw materials dressability by color sorting method, Artem A. Alehin, Elena V. Gorbunova, Aleksandr N. Chertov, Darya B. Petuhova, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [8791-66]

Pattern coding strategies for deflectometric measurement systems, Sebastian Höfer, Masoud Roschani, Karlsruher Institut für Technologie (Germany); Stefan Werling, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany) . . . [8791-67]

Technique for positioning moving binocular vision measurement system and data registration with ball target, Feifei Gu, Hong Zhao, Zinxi Zhao, Xi'an Jiaotong Univ. (China); Lu Zhang, Xi'an Jiaotong Univ. (China) . . . [8791-69]

On the reduction of the lateral localization uncertainty of targets inside a LIDAR beam, Konrad Wenzl, Heinrich Ruser, Christian M. Kargel, Univ. der Bundeswehr München (Germany) . . . [8791-70]

Thursday 16 May

Welcome and Introduction Thu 11:00 to 11:10

SESSION 10

Room: ICM/Hall B: Rom B21 Thu 11:10 to 12:10

Image Acquisition

Session Chairs: **Jürgen Beyerer**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany);

Fernando Puente León, Karlsruher Institut für Technologie (Germany)

11:10: **Miniature photometric stereo system for textile surface structure reconstruction**, Dimitris S. Gorpas, Ctr. for Research and Technology Hellas (Greece) and Univ. of California, Davis (United States); Christos Kampouris, Ctr. for Research and Technology Hellas (Greece); Sotiris Malassiotis, Ctr for Research and Technology Hellas (Greece) . . . [8791-50]

11:30: **Multi-view line-scan inspection system using planar mirrors**, Bransilav Holländer, Svorad Stolc, Reinhold Huber-Mörk, AIT Austrian Institute of Technology GmbH (Austria) . . . [8791-51]

11:50: **Reconstruction of specular surfaces via probabilistic voxel carving**, Alexey V. Pak, Karlsruher Institut für Technologie (Germany) and Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany) . . . [8791-54]

Lunch Break Thu 12:10 to 13:30

SESSION 11

Room: ICM/Hall B: Rom B21 Thu 13:50 to 15:30

Image Fusion and Processing

Session Chairs: **Jürgen Beyerer**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany);

Fernando Puente León, Karlsruher Institut für Technologie (Germany)

13:50: **Pattern and form recognition of statistically distributed defects on functional optical surfaces**, Puja Kadkhoda, Puyan Chubak, Laser Zentrum Hannover e.V. (Germany); Martin Lassahn, Medizinische Hochschule Hannover (Germany); Detlev Ristau, Laser Zentrum Hannover e.V. (Germany) . . . [8791-55]

14:10: **Inspecting rapidly moving surfaces for small defects using CNN cameras**, Andreas Blug, Daniel Carl, Heinrich A. Höfler, Fraunhofer-Institut für Physikalische Messtechnik (Germany) . . . [8791-56]

14:30: **Combined spatial and spectral unmixing of image signals for material recognition in automated inspection systems**, Matthias Michelsburg, Fernando Puente León, Karlsruher Institut für Technologie (Germany) . . . [8791-57]

14:50: **Model based image restoration for underwater images**, Thomas Stephan, Karlsruher Institut für Technologie (Germany); Peter Frühberger, Stefan Werling, Michael Heizmann, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany) . . . [8791-58]

15:10: **Automated real-time search and analysis algorithms for a non-contact 3D profiling system**, Mark D. Haynes, Chih-Hang Wu, Terry B. Beck, Robert J. Peterman, Kansas State Univ. (United States) . . . [8791-59]

Coffee Break Thu 15:30 to 16:00

SESSION 12

Room: ICM/Hall B: Rom B21 Thu 16:00 to 17:20

Automated Inspection

Session Chairs: **Jürgen Beyerer**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany);

Fernando Puente León, Karlsruher Institut für Technologie (Germany)

16:00: **A semi-automatic measurement system based on digital image analysis for the application to the single fiber fragmentation test**, Swen Blobel, Karin Thielsch, Volker Ulbricht, Technische Univ. Dresden (Germany) . . . [8791-60]

16:20: **Automatic area based registration method and its application to the surface inspection of steel industry products**, Ricardo García Llenderros, Ignacio Álvarez García, José M. Enguita González, Silvia Rodríguez Jiménez, Univ. de Oviedo (Spain) . . . [8791-61]

16:40: **Investigation of fluorescence spectra disturbances influencing the classification performance of fluorescently labeled plastic flakes**, Petr Fomin, Siegfried Brunner, Christian M. Kargel, Univ. der Bundeswehr München (Germany) . . . [8791-62]

17:00: **Development of automated endoscopes for dimensional micro-measurements**, Frank Hrebabetzky, Photonita Ltda. (Brazil) . . . [8791-63]

CONCLUDING REMARKS

Room: ICM/Hall B: Rom B21 17:20 to 17:25

Optical Methods for Inspection, Characterization, and Imaging of Biomaterials

Conference Chairs: **Pietro Ferraro**, Istituto Nazionale di Ottica (Italy); **Monika Ritsch-Marte**, Innsbruck Medical Univ. (Austria); **Simonetta Grilli**, Istituto Nazionale di Ottica (Italy); **David Stifter**, Johannes Kepler Univ. Linz (Austria)

Programme Committee: **Luigi Ambrosio**, CNR (Italy); **Boris N. Chichkov**, Laser Zentrum Hannover e.V. (Germany); **Jonathan M. Cooper**, Univ. of Glasgow (United Kingdom); **Cornelia Denz**, Westfälische Wilhelms-Universität Münster (Germany); **Frank Dubois**, Univ. Libre de Bruxelles (Belgium); **Wolfgang A. Ertmer**, Leibniz Univ. Hannover (Germany); **Jochen R. Guck**, Technische Univ. Dresden (Germany); **Theo Lasser**, Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Fernando Mendoza Santoyo**, Ctr. de Investigaciones en Óptica, A.C. (Mexico); **Samarendra K. Mohanty**, The Univ. of Texas at Arlington (United States); **Serge Monneret**, Institut Fresnel (France); **Fiorenzo Gabriele Omenetto**, Tufts Univ. (United States); **Pablo D Ruiz**, Loughborough Univ. (United Kingdom); **David D. Sampson**, The Univ. of Western Australia (Australia); **Natan T. Shaked**, Tel Aviv Univ. (Israel); **Ruikang K. Wang**, Univ. of Washington (United States); **Zeev Zalevsky**, Bar-Ilan Univ. (Israel); **Paul Zaslansky**, Univ. Berlin (Germany)

Wednesday 15 May

PLENARY SESSION

Room: Saal 1 Wed 10:30 to 11:20

Challenges in Optical Metrology for Photo-Lithography

Wim M.J. Coene, ASML Research, Netherlands

See p. 2 for details.

Welcome and Introduction Wed 13:20 to 13:30

SESSION 1

Room: Novotel: Room Zeppelin Wed 13:30 to 15:20

Tomography

Session Chair: **David Stifter**, Johannes Kepler Univ. Linz (Austria)

13:30: **Optomechanical Nanoindentation: combining atomic force microscope indentation with optical coherence tomography** (*Invited Paper*), Dhawal C. Chavan, Jianhua Mo, Mattijs de Groot, Anna Meijering, Johannes de Boer, Davide Iannuzzi, Vrije Univ. Amsterdam (Netherlands) [8792-1]

14:00: **Optical coherence tomography for non-destructive analysis of coatings in pharmaceutical tablets**, Daniel Markl, Research Ctr. Pharmaceutical Engineering GmbH (Austria); Günther Hanneschläger, RECENTD GmbH (Austria); Stephan Sacher, Research Ctr. Pharmaceutical Engineering GmbH (Austria); Johannes Khinast, Research Ctr. Pharmaceutical Engineering GmbH (Austria) and Graz Univ. of Technology (Austria); Michael Leitner, RECENTD GmbH (Austria) [8792-2]

14:20: **Recurrence signal processing in Fourier-domain optical coherence tomography based on linear Kalman filtering**, Igor P. Gurov, Maxim A. Volynsky, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [8792-3]

14:40: **Holographic method for capillary induced aberration compensation for 3D tomographic measurements of living cells**, Julianna Kostencka, Tomasz Kozacki, Arkadiusz Kus, Michal Dudek, Malgorzata Kujawinska, Warsaw Univ. of Technology (Poland); Björn Kemper, Ctr. for Biomedical Optics and Photonics (Germany) [8792-4]

15:00: **Spatial light interference microscopy and tomography (SLIM & SLIT)** (*Invited Paper*), Gabriel Popescu, Univ. of Illinois at Urbana-Champaign (United States) [8792-5]

Coffee Break Wed 15:20 to 15:50

Please note that Sessions 2 and 3 run concurrently

SESSION 2

Room: Novotel: Room Zeppelin Wed 15:50 to 17:20

Interferometry and Speckle

Session Chair: **Monika Ritsch-Marte**, Innsbruck Medical Univ. (Austria)

15:50: **Probing buried liquid water interfaces in soft nanoscopic systems** (*Invited Paper*), Sylvie Roke, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [8792-6]

16:20: **Structured white-light illumination for diagnostic investigations**, Philipp Schau, Univ. Stuttgart (Germany); A. Brandes, Univ. Ulm (Germany); Karsten Frenner, Univ. Stuttgart (Germany); A. Kienle, Univ. Ulm (Germany); Wolfgang Osten, Univ. Stuttgart (Germany) [8792-7]

16:40: **Quadriwave lateral shearing interferometry as a quantification tool for microscopy. Application to dry mass determination of living cells, temperature mapping, and vibrational phase imaging**, Serge Monneret, Pierre Bon, Guillaume Baffou, Pascal Berto, Julien Savatier, Sherazade Aknoun, Hervé Rigneault, Institut Fresnel (France) [8792-8]

17:00: **Corneal surface reconstruction by using heterodyne Moiré method**, Wei-Yao Chang, National Chiao Tung Univ. (Taiwan); Kun-Huang Chen, Der-Chin Chen, Feng Chia Univ. (Taiwan); Jung-Kai Tseng, Shyan-Tarnng Chen, Hun-Ying Sun, Chung Shan Medical Univ. (Taiwan); Jing-Heng Chen, Feng Chia Univ. (Taiwan); Ken-Yuh Hsu, National Chiao Tung Univ. (Taiwan) [8792-10]

SESSION 3

Room: ICM Room 14c Wed 16:30 to 18:10

NOTE ROOM CHANGE

Spectroscopy and Scattering

Session Chair: **Gabriel Popescu**, Univ. of Illinois at Urbana-Champaign (USA)

16:30: **Noninvasive inspection of skin lesions via multispectral imaging**, Anna Pelagotti, Pasquale P. Ferrara, Leonardo Pescitelli, Istituto Nazionale di Ottica (Italy); Gianni Gerlini, ASL 10 (Italy); Alessandro Piva, Univ. degli Studi di Firenze (Italy); Lorenzo Borgognoni, ASL 10 (Italy) [8792-11]

16:50: **Raman spectroscopy assessment of bone graft treated with antibiotics**, Alexander Wurm, Ruth Steiger, Monika Ritsch-Marte, Debora Coraca-Huber, Innsbruck Medical Univ. (Austria) [8792-12]

17:10: **Label-free biochemical characterization of bovine sperm cells using Raman microscopy**, Anna Chiara De Luca, Stefano Manago, Consiglio Nazionale delle Ricerche (Italy); Maria A. Ferrara, Luigi Sirleto, Istituto per la Microelettronica e Microsistemi (Italy); Roberto Puglisi, Donatella Balduzzi, Andrea Galli, Istituto Sperimentale Italiano Lazzaro Spallanzani (Italy); Ivo Rendina, National Research Council, Institute for Microelectronics and Microsystems (Italy); Pietro Ferraro, Istituto Nazionale di Ottica (Italy); Giuseppe Coppola, Istituto per la Microelettronica e Microsistemi (Italy) [8792-13]

17:30: **Highly sensitive and reproducible near-infrared SERS sensors based on core-satellite nanostructures**, Yuanhui Zheng, Melbourne Ctr. for Nanofabrication (Australia); Udo Bach, Monash Univ. (Australia) and Commonwealth Scientific and Industrial Research Organisation (Australia) and Melbourne Ctr. for Nanofabrication (Australia) [8792-14]

17:50: **Optical approach in characterizing dental biomaterials**, Nazif Demoli, Zlatko Vucic, Institut Za Fiziku (Croatia); Ognjen Milat, Institute of Physics (Croatia); Jadranko Gladic, Davorin Lovric, Institut Za Fiziku (Croatia); Vlatko Panduric, Danijela Matošević, Univ. of Zagreb (Croatia); Andrea Moguš-Milankovic, Institut Ruder Boškovic (Croatia); Mira Ristic, Ruder Boškovic Institute (Croatia); Marina Calogovic, Institut Ruder Boškovic (Croatia); Zrinka Tarle, Univ. of Zagreb (Croatia) [8792-15]

POSTERS-WEDNESDAY

ICM Foyer Wed 17:00 to 18:30

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Visualization of deformation by secondary speckle sensing, Javier Garcia, Vicente Micó, Martín Sanz-Sabater, Univ. de València (Spain); Yevgeny Beiderman, Zeev Zalevsky, Bar-Ilan Univ. (Israel) [8792-9]

Characterization of photopolymers as optical recording materials by means of digital holography microscopy, Maria A. Ferrara, Istituto per la Microelettronica e Microsistemi (Italy); Fabio Borbone, Univ. degli Studi di Napoli Federico II (Italy); Valerio Striano, Antares S.carl (Italy); Giuseppe Coppola, Istituto per la Microelettronica e Microsistemi (Italy) [8792-34]

Interaction of neuronal cells with nanotopographies, Ilaria Tonazzini, Sandro Meucci, Fabio Beltram, Marco Cecchini, Lab. NEST (Italy) and Consiglio Nazionale delle Ricerche (Italy) and Scuola Normale Superiore di Pisa (Italy) [8792-57]

Reducing measurement uncertainty of instruments based on the phenomenon of surface plasmon resonance, Gleb Dorozinsky, Vladimir P. Maslov, Anton V. Samoylov, Yuri Ushenin, V. Lashkaryov Institute of Semiconductor Physics (Ukraine) [8792-58]

Visualization of permanent marks in progressive addition lenses by digital in-line holography, Beatriz Perucho, Vicente Micó, Univ. de València (Spain) [8792-59]

Visualizing affect of mono and divalent ions on formation of native collagen fibrils via SEM and AFM, Ashish K. Dwivedi, Padma S. Vankar, Indian Institute of Technology Kanpur (India) [8792-60]

Apoized photon sieves for phase-contrast nano-imaging of living cells, Guanxiao Cheng, Ping Xu, ChunQuan Hong, Zhilong Sun, Shenzhen Univ. (China) [8792-61]

Phase-contrast microscopy with diffractive optical elements, Guanxiao Cheng, Ping Xu, Shenzhen Univ. (China) [8792-62]

Numerical solution of diffusion approximation in fluorescence molecular tomography imaging system, Sima Saleh, Tehran Univ. of Medical Sciences (Iran, Islamic Republic of) and Research Ctr. for Molecular and Cellular Imaging (Iran, Islamic Republic of); Mansooreh Karimi, Shahid Beheshti Univ. (Iran, Islamic Republic of) [8792-63]

Thursday 16 May

Please note: Session 4 runs concurrently with Session 5

SESSION 4

Room: Novotel: Room Zeppelin Thu 8:00 to 11:20

Scaffolds and Materials

Session Chair: **Daive Iannuzzi**, Vrije Univ. Amsterdam (Netherlands)

8:00: **Characterization of a bioinspired elastin-polypropylene fumarate material for vascular prostheses applications**, Silvia Scaglione, Rossella Barengi, Consiglio Nazionale delle Ricerche (Italy); Szabolcs Beke, Istituto Italiano di Tecnologia (Italy); Luca Ceseracciu, Ilaria Romano, Italian Institute of Technology (Italy); Francesca Sbrana, Paola Stagnaro, Consiglio Nazionale delle Ricerche (Italy); Fernando Brandi, Istituto Italiano di Tecnologia (Italy); Massimo Vassalli, Consiglio Nazionale delle Ricerche (Italy) [8792-16]

8:20: **In situ 3D monitoring of collagen fibrillogenesis using SHG microscopy**, Stéphane Bancelin, Ecole Polytechnique (France) and Ctr. National de la Recherche Scientifique (France) and INSERM (France); Vaia Machairas, Etienne Decencièrre, Mines ParisTech (France); Claire Albert, Gervaise Mosser, Thibaud Coradin, Carole Aimé, Univ. Pierre et Marie Curie (France) and Collège de France (France) and Ctr. National de la Recherche Scientifique (France); Marie-Claire Schanne-Klein, Ecole Polytechnique (France) and Ctr. National de la Recherche Scientifique (France) and INSERM (France) [8792-17]

8:40: **Direct laser writing of three-dimensional niches functionalized for mesenchymal stem cells**, Shane M. Eaton, Renato Bertozzi, Istituto di Fotonica e Nanotecnologie (Italy); Michele M. Nava, Politecnico di Milano (Italy); Giulio Cerullo, Istituto di Fotonica e Nanotecnologie (Italy); Manuela T. Raimondi, Politecnico di Milano (Italy); Roberto Osellame, Istituto di Fotonica e Nanotecnologie (Italy) [8792-18]

9:00: **Deciphering the dialogues at the cell material interface** (*Invited Paper*), Paolo A. Netti, Istituto Italiano di Tecnologia (Italy) and Univ. degli Studi di Napoli Federico II (Italy) [8792-19]

9:30: **Dynamic Imaging of Intracellular Motion Characterizes Three-Dimensional Living Tissue** (*Invited Paper*), David D. Nolte, Purdue Univ. (United States) [8792-20]

Coffee Break Thu 10:00 to 10:30

10:30: **Development and characterization of nanocomposite biomaterials for laser-activated tissue bonding and drug release** (*Invited Paper*), Roberto Pini, Paolo Matteini, Fulvio Ratto, Francesca Rossi, Istituto di Fisica Applicata Nello Carrara (Italy); Sonia Centi, Univ. degli Studi di Firenze (Italy); Francesca Tatini, Istituto di Fisica Applicata Nello Carrara (Italy) [8792-21]

11:00: **Fabrication of 3D tissue equivalent: an in vitro platform for understanding collagen evolution in healthy and diseased models**, Francesco Urciuolo, Giorgia Imparato, Costantino Casale, Sara Scamardella, Paolo A. Netti, Istituto Italiano di Tecnologia (Italy) [8792-22]

SESSION 5

Room: Novotel: Room Wright Thu 8:30 to 10:00

NOTE ROOM CHANGE

Microscopy I

Session Chair: **Sylvie Roke**, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

8:30: **Topographic mapping of microscopic objects using quantitative phase microscopy coupled with optical manipulation**, Samarendra K. Mohanty, Nelson Cardenas, The Univ. of Texas at Arlington (United States) [8792-24]

8:50: **A novel simultaneous method for polarization retrieval in multi-heterodyne scanning near-field optical microscopy**, Libo Yu, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Sfez Tristan, Manufacture des Montres Rolex S.A. (Switzerland); Vincent Paeder, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Petri A. Stenberg, Univ. of Eastern Finland (Finland); Wataru Nakagawa, Montana State Univ. (United States); Markku Kuittinen, Univ. of Eastern Finland (Finland); Hans Peter Herzig, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [8792-25]

9:10: **In situ imaging of the mouse cochlea using two-photon microscopy** (*Invited Paper*), Xin Yang, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Ye Pu, California Institute of Technology (Switzerland); Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Konstantina M. Stankovic, Massachusetts Eye and Ear Infirmary (United States) ... [8792-28]

9:40: **Second-harmonic interferometry with high spatial resolution: a robust method towards quantitative phase imaging of transparent dispersive materials**, Fernando Brandi, Istituto Italiano di Tecnologia (Italy); Facio Conti, Marco Tiberi, Univ. di Pisa (Italy) and Plasma Diagnostics & Technologies Ltd. (Italy); Francesco Giammanco, Univ. di Pisa (Italy) and Plasma Diagnostics & Technologies Ltd (Italy); Alberto Diaspro, Istituto Italiano di Tecnologia (Italy) [8792-55]

Coffee Break Thu 10:00 to 10:30

Please note: Sessions 4 & 6 run concurrently with Sessions 5 & 7

SESSION 6

Room: Novotel: Room ZeppelinThu 11:20 to 12:50

Fluids I

Session Chair: **Pietro Ferraro**, Istituto Nazionale di Ottica (Italy)

- 11:20: **On the fabrication of living tissues by laser-assisted bioprinting** (*Invited Paper*), Fabien Guillemot, Univ. of Bordeaux/INSERM (France). [8792-29]
- 11:50: **Pyroelectric manipulation of liquid crystal droplets**, Francesco Merola, Simonetta Grilli, Sara Coppola, Veronica Vespini, Sergio M. De Nicola, Istituto Nazionale di Ottica (Italy); Pasqualino Maddalena, Univ. degli Studi di Napoli Federico II (Italy); Cosimo Carfagna, Instituto de Ciencia y Tecnologia de Polimeros (Italy); Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8792-30]
- 12:10: **Holographic image acquisition for laser Doppler imaging**, Michael Atlan, Francois Bruno, Ecole Supérieure de Physique et de Chimie Industrielles (France) [8792-31]
- 12:30: **Charge-driven dispensing of biomolecules**, Simonetta Grilli, Lisa Miccio, Sara Coppola, Veronica Vespini, Istituto Nazionale di Ottica (Italy); Pat Orlando, Kent State Univ. (United States); Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8792-32]
- Lunch Break Thu 12:50 to 14:00

SESSION 7

Room: Novotel: Room WrightThu 10:30 to 11:40

Holography

Session Chair: **David Stifter**, Johannes Kepler Univ. Linz (Austria)

- 10:30: **Multi-wavelength digital lensless holographic microscopy: a simple approach to color digital holographic microscopy** (*Invited Paper*), Jorge I. Garcia-Sucerquia, Univ. Nacional de Colombia (Colombia); Daniel Velasquez Prieto, Univ. EAFIT (Colombia) [8792-33]
- 11:00: **New method of 3D tracking of in vitro cells by digital holographic microscopy**, Pasquale Memmolo, Istituto Nazionale di Ottica (Italy) and Istituto Italiano di Tecnologia (Italy); Maria Iannone, Maurizio Ventre, Paolo A. Netti, Istituto Italiano di Tecnologia (Italy); Andrea Finizio, Melania Paturzo, Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8792-35]
- 11:20: **Visualization of 3D surface acoustic waves in granular media using digital color holography**, Mathieu Leclercq, Pascal Picart, Vincent Tournat, Univ. du Maine (France); Guillaume Penelet, Univ. du Maine, CNRS (France) [8792-36]
- Lunch Break Thu 11:40 to 13:00

JOINT SESSION 1

Room: ICM Room 11Thu 11:00 to 11:45

Joint Session with the European Conference on Biomedical Optics, JTh2B

NOTE ROOM CHANGE

Optical Metrology I

Session Chair: **Gabriel Popescu**, Univ. of Illinois at Urbana-Champaign (United States)

- 11:00: **Low-cost miniature fiber-optic extrinsic Fabry-Perot interferometric pressure sensor for biomedical applications**, Sven Poeggel, Daniele Tosi, Gabriel Leen, Eifed Lewis, Univ. of Limerick (Ireland) [8792-70]/ [JTh2B.1]
- 11:15: **Force-clamp laser trapping of rapidly interacting molecules**, Marco Capitanio, Carina Monico, Francesco Vanzi, Univ. degli Studi di Firenze (Italy); Francesco Saverio Pavone, European Lab. for Non-linear Spectroscopy (Italy) [8792-71]/ [JTh2B.2]
- 11:30: **Optics with diatoms: towards efficient, bioinspired photonic devices at the micro-scale**, Edoardo De Tommasi, Ilaria Rea, Luca De Stefano, Principia Dardano, Istituto per la Microelettronica e Microsistemi (Italy); Giuseppe Di Caprio, The Rowland Institute at Harvard (United States); Maria A. Ferrara, Giuseppe Coppola, Istituto per la Microelettronica e Microsistemi (Italy) [8792-23]/ [JTh2B.3]

Please note that Joint Session 2 runs concurrently with Sessions 8 and 9

JOINT SESSION 2

Room: ICM Room 11Thu 14:00 to 14:45

Joint Session with the European Conference on Biomedical Optics, JTh3B

NOTE ROOM CHANGE

Optical Metrology II

Session Chair: **Pietro Ferraro**, Istituto Nazionale di Ottica (Italy)

- 14:00: **Nano gold markers tracked and localized in cell**, Michel Gross, Univ. Montpellier 2 (France); Frederic Verpillat, Lab. Kastler Brossel (France); Pierre Desbiolles, Ecole Normale Supérieure (France) [8792-72]/ [JTh3B.1]
- 14:15: **Investigation on 3D morphological changes of in vitro cells through digital holographic microscopy**, Pasquale Memmolo, Istituto Nazionale di Ottica (Italy) and Istituto Italiano di Tecnologia (Italy); Lisa Miccio, Francesco Merola, Istituto Nazionale di Ottica (Italy); Paolo A. Netti, Istituto Italiano di Tecnologia (Italy); Giuseppe Coppola, Istituto per la Microelettronica e Microsistemi (Italy); Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8792-26]/ [JTh3B.2]
- 14:30: **A new 3D tracking method exploiting the capabilities of digital holography in microscopy**, Lisa Miccio, Istituto Nazionale di Ottica (Italy); Pasquale Memmolo, Istituto Italiano di Tecnologia (Italy); Francesco Merola, Istituto Nazionale di Ottica (Italy); Sabato Fusco, Valerio Embrione, Paolo A. Netti, Istituto Italiano di Tecnologia (Italy); Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8792-27]/ [JTh3B.3]

Please note that Session 8 and 9 run concurrently

SESSION 8

Room: Novotel: Room ZeppelinThu 14:00 to 16:50

Fluids II

Session Chair: David Nolte, Purdue Univ. (United States)

14:00: **Rheology at the micro-scale: new tools for bio-analysis** (*Invited Paper*), Rebecca L. Warren, Manlio Tassieri, Xiang Li, Andrew Glidle, David J. Paterson, Allan Carlsson, Jonathan M. Cooper, Univ. of Glasgow (United Kingdom) [8792-37]

14:30: **Small angle light scattering characterization of single micrometric particles in microfluidic flows**, David Dannhauser, Giovanni Romeo, Filippo Causa, Paolo A. Netti, Istituto Italiano di Tecnologia (Italy) [8792-38]

14:50: **Photo-pyro-electrohydrodynamic dispensing by using gold nanorods**, Marella de Angelis, Paolo Matteini, Fulvio Ratto, Roberto Pini, Istituto di Fisica Applicata Nello Carrara (Italy); Sara Coppola, Istituto Nazionale di Ottica sez di Napoli (Italy); Simonetta Grilli, Veronica Vespini, Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8792-39]

15:10: **Non-invasive continuous imaging of drug release from soy-based skin equivalent using wide-field interferometry**, Haniel Gabai, Tel Aviv Univ. (Israel); Maya Baranes-Zeevi, Tel-Aviv University (Israel) and Tel Aviv University (Israel); Meital Zilberman, Tel Aviv University (Israel); Natan T. Shaked, Tel Aviv Univ. (Israel) [8792-40]

Coffee Break Thu 15:30 to 16:00

16:00: **Laser microfabrication of biomedical devices: time-resolved microscopy of the printing process** (*Invited Paper*), Pere Serra Coromina, Adrian Patrascioiu, Juan Marcos Fernández-Pradas, José Luis Morenza, Univ. de Barcelona (Spain) [8792-41]

16:30: **Optical assembly of bio-hybrid machines**, Alvaro Barroso Peña, Shirin Landwerth, Mike Wördemann, Maik Becker, Armido Studer, Cornelia Denz, Westfälische Wilhelms-Universität Münster (Germany) [8792-42]

SESSION 9

Room: Novotel: Room WrightThu 13:00 to 15:30

Microscopy II

Session Chair: Paolo A. Netti, Istituto Italiano di Tecnologia (Italy) and Univ. degli Studi di Napoli Federico II (Italy)

13:00: **Optical elastography: progress in medical micro-imaging of tissue mechanics** (*Invited Paper*), David D. Sampson, Robert A. McLaughlin, Kelsey M. Kennedy, Brendan F. Kennedy, The Univ. of Western Australia (Australia) . . . [8792-43]

13:30: **Microscopy with multimode fibers** (*Invited Paper*), Christophe Moser, Salma Farahi, Ioannis N. Papadopoulos, Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [8792-44]

14:00: **Full-field optical coherence microscopy for material testing: contrast enhancement and dynamic process monitoring**, Bettina Heise, Johannes Kepler Univ. Linz (Austria); Alexander Jesacher, Innsbruck Medical Univ. (Austria); Stefan Bernet, Johannes Kepler Univ. Linz (Austria); Swanhild Bernstein, Technische Univ. Bergakademie Freiberg (Germany); Monika Ritsch-Marte, Innsbruck Medical Univ. (Austria); David Stifter, Johannes Kepler Univ. Linz (Austria) [8792-45]

14:20: **Variable-focus diffractive Moiré-lenses**, Walter H. Harm, Stefan Bernet, Monika Ritsch-Marte, Innsbruck Medical Univ. (Austria) [8792-46]

14:40: **Scanning ion conductance microscopy (SICM): from measuring cell membrane mechanical properties to guiding neuron growth**, Mario Pellegrino, Univ. di Pisa (Italy); Paolo Orsini, Univ. di Pisa (Italy) and Istituto Nazionale di Ottica (Italy); Monica Pellegrini, Scuola Normale di Pisa (Italy); Elisabetta Tognoni, Cesare Ascoli, Paolo Baschieri, Franco Dinelli, Istituto Nazionale di Ottica (Italy) [8792-47]

15:00: **Lensfree Computational Imaging** (*Invited Paper*), Aydogan Ozcan, Univ. of California, Los Angeles (United States) [8792-48]

Coffee Break Thu 15:30 to 16:00

Please note that Sessions 10 and 11 run concurrently

SESSION 10

Room: Novotel: Room Zeppelin Thu 16:50 to 18:30

Cell Mechanics and Biomimetics

Session Chair: Fabien Guillemot, Univ. of Bordeaux/INSERM (France)

16:50: **Speckle based configuration for simultaneous *in vitro* inspection of mechanical contractions of cardiac myocyte cells** (*Invited Paper*), Mark Golberg, Dror Fixler, Asher Shainberg, Bar-Ilan Univ. (Israel); Sharon Zlochiver, Tel-Aviv Univ. (Israel); Vicente Mico, Javier Garcia, Univ. de València (Spain); Yevgeny Beiderman, Zeev Zalevsky, Bar-Ilan Univ. (Israel) [8792-49]

17:20: **Cell mechanics investigation by digital holographic microscopy**, Lisa Miccio, Istituto Nazionale di Ottica (Italy); Pasquale Memmolo, Istituto Italiano di Tecnologia (Italy); Francesco Merola, Istituto Nazionale di Ottica (Italy); Sabato Fusco, Valerio Embrione, Paolo A. Netti, Istituto Italiano di Tecnologia (Italy); Pietro Ferraro, Istituto Nazionale di Ottica (Italy) [8792-50]

17:40: **Optical-mechanical properties of diseased cells measured by interferometry**, Natan T. Shaked, Yael Bishitz, Haniel Gabai, Pinhas Girshovitz, Tel Aviv Univ. (Israel) [8792-51]

18:00: **Optomechanical phenotyping of biological cells** (*Invited Paper*), Jochen R. Guck, Univ. of Cambridge (United Kingdom) [8792-52]

SESSION 11

Room: Novotel: Room WrightThu 16:00 to 17:00

Microscopy III

Session Chair: Monika Ritsch-Marte, Innsbruck Medical Univ. (Austria)

16:00: **Biomechanical imaging with Brillouin microscopy** (*Invited Paper*), Giuliano Scarcelli, Harvard Medical School (United States) [8792-53]

16:30: **Optical imaging through strongly scattering layers** (*Invited Paper*), Allard P. Mosk, Univ. Twente (Netherlands) [8792-54]

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General Information

Registration _____

Onsite Registration and Badge Pick-Up Hours

ICM West Foyer

Saturday 11 May	16.00 to 18.00 hrs
Sunday 12 May	8.00 to 17.00 hrs
Monday 13 May	7.30 to 17.00 hrs
Tuesday 14 May	8.00 to 17.00 hrs
Wednesday 15 May	8.00 to 17.00 hrs
Thursday 16 May	8.00 to 16.00 hrs

Conference Registration

Includes admission to all conference sessions, plenaries, panels, and poster sessions, admission to the Exhibition, Optical Metrology Welcome Reception, coffee breaks, and a choice of proceedings. Student pricing does not include proceedings.

Exhibition Registration

Exhibition-Only visitor registration is complimentary.

Press Registration

For credentialed press and media representatives only. Please email contact information, title, and organization to media@spie.org.

SPIE Cashier

Registration Area

Open during registration hours

Registration Payments

If you are paying by cash or cheque as part of your onsite registration, wish to add a course, workshop, or special event requiring payment, or have questions regarding your registration, visit the SPIE Cashier.

Receipts and Certificate of Attendance

Preregistered attendees who did not receive a receipt or attendees who need a Certificate of Attendance may obtain those from the SPIE Cashier.

Badge Corrections

Badge corrections can be made by the SPIE Cashier. Please have your badge removed from the badge holder and marked with your changes before approaching the counter.

Food + Beverage Services _____

Coffee Breaks

ICM Foyers / Novotel Foyer

Complimentary coffee will be served twice daily, in the Conference Foyer Areas at the times indicated in the programme. Please refer to the individual conference programmes for timings for coffee and lunch breaks.

Food & Refreshments for Purchase

The ICM has three permanent food-service operations in the foyer area – the ICM Bistro, ICM Bar and ICM Café where guests can purchase food. There is also the “Am See” restaurant, located on the 1st floor above the registration area of the ICM. Lunch at the Novotel is also available to those who are not staying at the hotel.

There are also a number of bars and restaurants located in the Riem Arkaden complex on the other side of the underground station for the ICM, “Messestadt West”.

Author / Presenter Information _____

Speaker Check-In and Preview Station

ICM Foyer

Monday through Thursday Open during registration hours

As in previous years, authors will be contacted by the company m-Events with exact instructions on how to upload their presentations and e-posters. The meeting rooms will contain the relevant equipment to carry out a centralised screening process. Any questions regarding compatibility and available equipment would need to be directed to m-Events.

Poster Setup Instructions

ICM Foyer

Wednesday 15 May 17.00 to 18.30

All symposium attendees are invited to attend Wednesday poster session provided as an opportunity to enjoy networking and refreshments while reviewing poster papers.

Poster presenters may post their poster papers starting at 10.00 on Wednesday in the Conference Area Hallway and present them during Wednesday Poster Session. Any papers left on the boards following 12.00 hrs the following day will be considered unwanted and will be discarded.

SPIE assumes no responsibility for posters left up after the end of the Poster Session. Poster authors should be at their papers during the poster session to answer questions from attendees. Attendees are requested to wear their conference registration badges to the poster sessions.

Onsite Services _____

Internet Access

ICM Foyers

Complimentary Wi-fi access for laptop users and a number of complimentary computer stations with timed access can be found in the ICM foyer areas. Connection speeds will depend on the number of users. Please read the SPIE Wireless Internet Service Policy.

SPIE Conference App

Download the free SPIE Conference App, available for iPhone and Android smart phones. Search and browse the programme, special events, participants, exhibitors, and more.

SPIE Publications

SPIE Booth 1.649, Hall 1

Browse the latest SPIE Press Books and Proceedings.

SPIE Luggage + Coat Check

Below the registration area in ICM West Entrance

Open during registration hours

Luggage, package, and coat storage are available against charge. Please note this service is only available during registration hours.

Urgent Message Line

An urgent message line is available during registration hours:

+49 89 949-11468, Fax: +49 89 949-11469.

Attendees should check the message board in the registration area for any messages held for them.

The Business Centre

ICM Foyer

Open during registration hours

Use this service to print your boarding pass at a charge.

Travel

Welcome to Munich

Munich, "the city with a heart," is the capital of Bavaria, and has established itself as Germany's high-tech hub (Silicon Bavaria) and is one of the most important industrial and economic centers in the European community. It boasts of such hi-tech corporations as BMW and Daimler-Chrysler Aerospace. In addition to being the country's leading university centre and hub for insurance, banking, electronic, and mechanical engineering, Munich offers its visitors shopping, music, art, gourmet restaurants, beer gardens, outdoor cafes, ethnic restaurants, popular night-spots, grand cathedrals and opulent palaces. For more information on Munich and the surrounding area, please refer to the following websites:

- <http://www.tyzo.com/europe/germany/munich/>
- http://www.muenchen.de/rathaus/home_en/
- <http://www.munichfound.com/>

Airport Information

At Munich Airport, you'll enjoy excellent national, inter-European and international flights. With approximately 38 Million passengers a year, the airport is ranked number two in Germany. Its 106 airlines, 73 direct flights and 244 destinations make Munich an attractive destination.

Car Rental

Call the Hertz International Reservation Center at 1-800-654-3001 in the USA or your local Hertz Reservations Center to receive a special discount for SPIE. Reservations may also be placed on-line at www.hertz.com. You will receive 15% off qualifying Affordable rates at participating locations in Munich.

Be sure to identify yourself as a SPIE attendee. The PC# below must be on your advance reservation to receive this special offer. You must present this coupon at the time of rental in order to receive this discount. This special offer is available for rentals from May 1-31, 2013.

Transportation from the Airport

The Franz Josef Strauss Airport (MUC) is located 17 miles (27 km) northeast of the center of Munich. Please refer to the Munich International Airport website for more detailed information:

<http://www.munich-airport.de/en/consumer/index.jsp>

or to the Laser 2013 site:

http://www.messe-muenchen.de/en/meta/anreise/anreise_mit_dem_flugzeug/anreise_mit_dem_flugzeug.php

Shuttles and Public Transportation

At Munich Central Station take the underground U2. The journey to the trade fair grounds takes about 17 minutes. Please refer to the Laser 2013 website for more detailed information on public transport:

http://www.messe-muenchen.de/en/meta/anreise/anreise_mit_oeffentlichen_verkehrsmitteln/anreise_mit_oeffentlichen_verkehrsmitteln.php

Driving Directions and Parking

For driving directions and parking, please refer to the Laser 2013 website for more detailed information:

http://www.messe-muenchen.de/en/meta/anreise/anreise_mit_dem_auto/anreise_mit_dem_auto_contentmaster.php

SPIE Optical Metrology

May 12-16, 2013
Munich, Germany

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2. Be sure to identify yourself as a SPIE attendee. The PC# below must be on your advance reservation to receive this special offer. You must present this coupon at the time of rental in order to receive this discount.
3. This special offer is available for rentals from May 1-31, 2013.

ENJOY YOUR TRIP!

SPIE

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Important Rental Information

1. The SPIE discount is available at participating locations in Munich.
2. The 15% Discount applies to rentals on Affordable Rates from May 1-31, 2013.
3. Reservations must be made at least 24 hours prior to vehicle pickup, using the PC# on the coupon.
4. Minimum rental period is 3 days.
5. Offer includes Compact and above both manuals and automatic (includes basic/standard cars – not vans, premium, luxury, collections, etc.).
6. Discount does not apply to taxes, intercity drop charges, insurance or optional services.
7. Certificate has no cash value and may not be combined with any other offer, discount or promotion. Certificate must be presented and surrendered at time of rental.
8. Vehicles must be returned to renting location and rate restrictions apply.
9. Minimum rental age is 25 (exceptions apply). Hertz standard driver and credit qualifications for the rental location apply. Blackout periods may apply.

Granting Attendee Registration and Admission

SPIE, or their officially designated event management, in their sole discretion, reserves the right to accept or decline an individual's registration for an event. Further, SPIE, or event management, reserves the right to prohibit entry or remove any individual whether registered or not, be they attendees, exhibitors, representatives, or vendors, who in their sole opinion are not, or whose conduct is not, in keeping with the character and purpose of the event. Without limiting the foregoing, SPIE and event management reserve the right to remove or refuse entry to any attendee, exhibitor, representative, or vendor who has registered or gained access under false pretenses, provided false information, or for any other reason whatsoever that they deem is cause under the circumstances.

Misconduct Policy

SPIE is a professional, not-for-profit society committed to providing valuable conference and exhibition experiences. SPIE is dedicated to equal opportunity and treatment for all its members and meeting attendees. Attendees are expected to be respectful to other attendees, SPIE staff, and contractors. Harassment and other misconduct will not be tolerated; violators will be asked to leave the event.

Identification

To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued Photo ID at registration to collect registration materials.

Individuals are not allowed to pick up badges for attendees other than themselves. Further, attendees may not have some other person participate in their place at any conference-related activity. Such other individuals will be required to register on their own behalf to participate.

Capture and Use of a Person's Image

By registering for an SPIE event, I grant full permission to SPIE to capture, store, use, and/or reproduce my image or likeness by any audio and/or visual recording technique (including electronic/digital photographs or videos), and create derivative works of these images and recordings in any SPIE media now known or later developed, for any legitimate SPIE marketing or promotional purpose.

By registering for an SPIE event, I waive any right to inspect or approve the use of the images or recordings or of any written copy. I also waive any right to royalties or other compensation arising from or related to the use of the images, recordings, or materials. By registering, I release, defend, indemnify and hold harmless SPIE from and against any claims, damages or liability arising from or related to the use of the images, recordings or materials, including but not limited to claims of defamation, invasion of privacy, or rights of publicity or copyright infringement, or any misuse, distortion, blurring, alteration, optical illusion or use in composite form that may occur or be produced in taking, processing, reduction or production of the finished product, its publication or distribution.

Payment Method

Registrants for paid elements of the event, who do not provide a method of payment, will not be able to complete their registration. Individuals with incomplete registrations will not be able to attend the conference until payment has been made. SPIE accepts VISA, MasterCard, American Express, Discover, Diner's Club, checks and wire transfers. Onsite registrations can also pay with Cash.

Authors/Coauthors

By submitting an abstract, you agree to the following conditions:

- An author or coauthor (including keynote, invited, and solicited speakers) will register at the author registration rate, attend the meeting, and make the presentation as scheduled.
- A full-length manuscript (8-12 pages) for any accepted oral or poster presentation will be submitted for publication in the SPIE Digital Library, printed conference Proceedings, and CD. (Some SPIE events have other requirements that the author is made aware of at the time of submission.)
- Only papers presented at the conference and received according to publication guidelines and timelines will be published in the conference Proceedings and SPIE Digital Library (or via the requirements of that event).

Audio, Video, Digital Recording Policy

Conferences, courses, and poster sessions: For copyright reasons, recordings of any kind are prohibited without prior written consent of the presenter. Attendees may not capture nor use the materials presented in any meeting room without written permission. Consent forms are available at Speaker Check-In. Individuals not complying with this policy will be asked to leave a given session and asked to surrender their recording media.

Exhibition Hall: For security and courtesy reasons, recordings of any kind are prohibited unless one has explicit permission from on-site company representatives. Individuals not complying with this policy will be asked to surrender their recording media and to leave the exhibition hall.

Your registration signifies your agreement to be photographed or videotaped by SPIE in the course of normal business. Such photos and video may be used in SPIE marketing materials or other SPIE promotional items.

Laser Pointer Safety Information/Policy

SPIE supplies tested and safety-approved laser pointers for all conference meeting rooms. For safety reasons, SPIE requests that presenters use provided laser pointers.

Use of a personal laser pointer represents user's acceptance of liability for use of a non-SPIE-supplied laser pointer. If you choose to use your own laser pointer, it must be tested to ensure <5 mW power output. Laser pointers in Class II and IIIa (<5 mW) are eye safe if power output is correct, but output must be verified because manufacturer labeling may not match actual output. Come to Speaker Check-In and test your laser pointer on our power meter. You are required to sign a waiver releasing SPIE of any liability for use of potentially non-safe, personal laser pointers. Misuse of any laser pointer can lead to eye damage.

Underage Persons on Exhibition Floor Policy

For safety and insurance reasons, no one under the age of 16 will be allowed in the exhibition area during move-in and move-out. During open exhibition hours, only children over the age of 12 accompanied by an adult will be allowed in the exhibition area.

Unauthorized Solicitation Policy

Unauthorized solicitation in the Exhibition Hall is prohibited. Any nonexhibiting manufacturer or supplier observed to be distributing information or soliciting business in the aisles, or in another company's booth, will be asked to leave immediately.

Unsecured Items Policy

Personal belongings should not be left unattended in meeting rooms or public areas. Unattended items are subject to removal by security. SPIE is not responsible for items left unattended.

Wireless Internet Service Policy

At SPIE events where wireless is included with your registration, SPIE provides wireless access for attendees during the conference and exhibition but cannot guarantee full coverage in all locations, all of the time. Please be respectful of your time and usage so that all attendees are able to access the internet.

Excessive usage (e.g., streaming video, gaming, multiple devices) reduces bandwidth and increases cost for all attendees. No routers may be attached to the network. Properly secure your computer before accessing the public wireless network. Failure to do so may allow unauthorized access to your laptop as well as potentially introduce viruses to your computer and/or presentation. SPIE is not responsible for computer viruses or other computer damage.

Mobile Phones and Related Devices Policy

Mobile phones, tablets, laptops, pagers, and any similar electronic devices should be silenced during conference sessions. Please exit the conference room before answering or beginning a phone conversation.

Smoking

For the health and consideration of all attendees, smoking is not permitted at any event elements, such as but not limited to: plenaries, conferences, workshops, courses, poster sessions, hosted meal functions, receptions, and in the exhibit hall. Most facilities also prohibit smoking in all or specific areas. Attendees should obey any signs preventing or authorizing smoking in specified locations.

Hold Harmless

Attendee agrees to release and hold harmless SPIE from any and all claims, demands, and causes of action arising out of or relating to your participation in the event you are registering to participate in and use of any associated facilities or hotels.

Event Cancellation

If for some unforeseen reason SPIE should have to cancel the event, registration fees processed will be refunded to registrants. Registrants will be responsible for cancellation of travel arrangements or housing reservations and the applicable fees.

2013

Remote Sensing

Conference: 23–26 September 2013
www.spie.org/rs2013

Security+ Defence


Conference: 23–26 September 2013
 Exhibition: 24–25 September 2013
www.spie.org/sd2013

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Conferences & Courses
 23–26 September 2013

Exhibition
 24–25 September 2013

Location
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 Dresden, Germany





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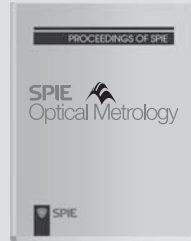
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*Indicates volumes that will be available at the meeting. Other Proceedings will be available 6 weeks after the conference.

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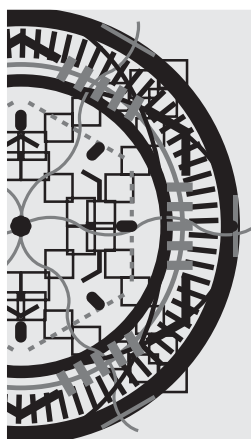
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