

PROCEEDINGS OF SPIE

# ***Optics and Measurement Conference 2014***

**Jana Kovačičinová  
Tomáš Vít**  
*Editors*

**7–10 October 2014  
Liberec, Czech Republic**

*Organized by*  
Institute of Plasma Physics AS CR, v.v.i. (Czech Republic)  
TOPTEC (Czech Republic)

*Cosponsored and Published by*  
SPIE

**Volume 9442**

Proceedings of SPIE 0277-786-786X, V.9442

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Optics and Measurement Conference 2014, edited by Jana Kovačičinová, Tomáš Vít, Proc. of SPIE  
Vol. 9442, 944201 · © 2015 SPIE · CCC code: 0277-786X/15/\$18 · doi: 10.1117/12.2185214

Proc. of SPIE Vol. 9442 944201-1

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Optics and Measurement Conference 2014*, edited by Jana Kovačičinová, Tomáš Víř, Proceedings of SPIE Vol. 9442 (SPIE, Bellingham, WA, 2015) Article CID Number.

ISSN: 0277-786X

ISBN: 9781628415575

Published by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

Copyright © 2015, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at [copyright.com](http://copyright.com). Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/15/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.



[SPIDigitalLibrary.org](http://SPIDigitalLibrary.org)

---

**Paper Numbering:** Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID Number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID Number.

# Contents

vii	<i>Authors</i>
ix	<i>Conference Committee</i>

---

## OPTICS AND MEASUREMENT CONFERENCE 2014

---

9442 02	<b>50 years of holographic interferometry (Invited Paper) [9442-2]</b>
9442 03	<b>Field proven technologies for fabrication of high-precision aspheric and freeform optical surfaces (Invited Paper) [9442-56]</b>
9442 04	<b>Ion beam and plasma jet based methods in ultra-precision optics manufacturing [9442-24]</b>
9442 05	<b>Performance analysis of a DTIRC-LED illumination structure [9442-46]</b>
9442 06	<b>Tool offset optimisation for the machining of free-form optics with a non-zero gradient at the centre [9442-32]</b>
9442 07	<b>Optical properties of Fe<sub>2</sub>O<sub>3</sub> deposited by IBAD and its usage in interference filters [9442-58]</b>
9442 08	<b>Local topography of optoelectronic substrates prepared by dry plasma etching process [9442-55]</b>
9442 09	<b>AFM imaging of natural optical structures [9442-57]</b>
9442 0A	<b>Mechanical properties of carbon fiber composites for applications in space [9442-38]</b>
9442 0B	<b>Numerical analysis of color holograms based on surface-plasmons [9442-11]</b>
9442 0C	<b>Software simulator for design and optimization of the kaleidoscopes for the surface reflectance measurement [9442-19]</b>
9442 0D	<b>Air flow and length noise in displacement interferometry [9442-50]</b>
9442 0E	<b>Influence of the light source on the liquid optical element planarity measurement [9442-8]</b>
9442 0F	<b>Optical frequency references for laser interferometry [9442-6]</b>
9442 0G	<b>In-situ aberration correction of Bessel beams using spatial light modulator [9442-31]</b>
9442 0H	<b>Time resolved PIV measurement of fluid dynamics in agitated vessels [9442-44]</b>
9442 0I	<b>Optical scattering in muscle tissue and its utilisation [9442-25]</b>
9442 0J	<b>Preparation of coatings with low roughness by high-current impulse magnetron discharge [9442-20]</b>

9442 OK	<b>Three-coordinate laser heterodyne interferometer for metrological assurance of scanning probe microscopes</b> [9442-22]
9442 OL	<b>Development of large aperture composite adaptive optics</b> [9442-27]
9442 OM	<b>VISAR interferometer for measuring mass velocity in shock wave experiments</b> [9442-37]
9442 ON	<b>Diagnostic system for cryogenically cooled 10 Hz Yb:YAG laser</b> [9442-13]
9442 OO	<b>High sensitive method for optical birefringence measurement</b> [9442-18]
9442 OP	<b>Advanced interferometry systems for dimensional measurement in nanometrology</b> [9442-12]
9442 OQ	<b>Holographic contouring and its limitations in nearly specularly reflecting surface measurement</b> [9442-43]
9442 OR	<b>Detection and measurement of surface defects by fringe projection technique</b> [9442-9]
9442 OS	<b>Analysis of scorpion venom composition by Raman Spectroscopy</b> [9442-40]
9442 OT	<b>Influence of the circumferential speed of a resin bond grinding wheel on the properties of a ground aspheric surface</b> [9442-26]
9442 OU	<b>Design and realization of an aspherical doublet</b> [9442-34]
9442 OV	<b>Digital holographic interferometry as an experimental instrumentation for measurements of macroscopic properties of polydomain ferroelectrics</b> [9442-61]
9442 OW	<b>Deformable mirror for high power laser applications</b> [9442-14]
9442 OX	<b>Precise curvature measurement of Yb:YAG thin disk</b> [9442-53]
9442 OY	<b>Thin film deposition and LIDT testing at ISI Brno</b> [9442-51]
9442 OZ	<b>The discovery of a new ELL variable star in Centaurus and possibility of detecting new exoplanets using the FRAM telescope</b> [9442-29]
9442 10	<b>Gravity induced deflection of a reference plate and tested plane surfaces and its influence on optical measurement with the Fizeau interferometer</b> [9442-3]
9442 11	<b>Method for interferometric testing of optical surfaces based on evaluation of similarity of nominal and measured interferograms</b> [9442-4]
9442 12	<b>Super-polishing of Zerodur aspheres by means of conventional polishing technology</b> [9442-28]
9442 13	<b>Polishing of S-FPL-53 aspherical lenses</b> [9442-60]
9442 14	<b>Optical security elements based on waveguide effects</b> [9442-36]

- 9442 15     **Design and fabrication of diffraction grating for application in hyperspectral imaging for the long-wavelength infrared spectral region** [9442-35]
- 9442 16     **CNC subaperture polishing process arrangement for microroughness minimisation** [9442-23]
- 9442 17     **Optical properties of metal nanoparticles used in biosensors** [9442-63]
- 9442 18     **3D form inspection of grinded optical surfaces by digital holography** [9442-42]
- 9442 19     **Quantification of synthetic lens surface characteristics by an optical measurement system as stylus instrument** [9442-52]
- 9442 1A     **Jamin interferometer for precise measurement of refractive index of gases** [9442-33]
- 9442 1B     **Development of methodology for evaluation of subsurface damage** [9442-45]
- 9442 1C     **Quantitative microstructural characterization of transparent YAG ceramics via microscopic image analysis using stereological relations** [9442-75]
- 9442 1D     **High-throughput optical system for HDES hyperspectral imager** [9442-39]
- 9442 1E     **Progress in design of advanced LIDT station in HiLASE project** [9442-59]
- 9442 1F     **Numerical simulation of deformation and figure quality of precise mirror** [9442-54]
- 9442 1G     **Cooling options for high-average-power laser mirrors** [9442-10]
- 9442 1H     **Impact of overmodulation on spectral response in high efficient transmission gratings** [9442-16]
- 9442 1I     **Real-time direct measurement of diffraction efficiency of reflection gratings in photopolymer recording materials** [9442-17]
- 9442 1J     **All-dielectric diffraction grating for multi-petawatt laser systems** [9442-15]
- 9442 1K     **Multi-layer surface profiling using gated wavefront sensing** [9442-47]



# Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Acef, Ouali, 0F	Kmetik, Viliam, 0L
Arnold, Th., 04	Kopecky, V., 0H
Arzola, Alejandro V., 0G	Kopecký, Václav, 18
Babadi, S., 05	Koshkin, D. S., 0M
Bittner, Jiří, 0C	Kotek, M., 0H
Boehm, G., 04	Koubíková, Lucia, 0N
Bouafia, Mohamed, 0R	Kramer, Daniel, 0N, 1J
Bourgenot, C., 06	Kunc, Š., 0O
Boutaleb, T., 05	Kuznetsov, Andrey P., 0K, 0M
Budasz, Jiří, 07	Květoň, Milan, 1H, 1I
Čáp, Jiří, 0C	Lazar, Josef, 0D, 0F, 0P, 0Y
Chew, Kuw Wai, 1K	Lédl, Vít, 0Q, 0V, 18
Chiodo, Nicola, 0F	Lerer, Alexander, 1J
Chyla, Michal, 0X	Lormeau, Jean Pierre, 03
Číp, Ondřej, 0D, 0F, 0P	Lucianetti, A., 1G
Dallaeva, Dinara, 08, 09	Macúchová, Karolina, 0C
Daniel, V., 0A	Mallick, T., 05
Doleček, Roman, 0Q, 0V, 15, 18	Manallah, Aïssa, 0R
du Burck, Frédéric, 0F	Mann, Klaus, 0X
Dumas, Paul, 03	Martínez-Zérega, Brenda E., 0S
Endo, Akira, 0X	Mašek, Martin, 0Z
Esposito, Laura, 1C	Matela, Milan, 0U
Fibrich, Martin, 0N	Matoušek, Ondřej, 0T, 0U, 12, 16, 1B
González-Solís, José L., 0S	Melich, Radek, 0U, 1D, 1F
Grmela, Lubomír, 08, 09, 0I, 17	Menoni, Carmen, 1K
Gubskiy, Konstantin L., 0K, 0M	Mikhailuk, A. V., 0M
Hana, P., 0A	Mikš, Antonín, 10, 11
Hartman, Pavel, 0B	Mikulickova, Lenka, 0L
Havran, Vlastimil, 0C	Miura, Taisuke, 0X
Holá, Miroslava, 0D, 0P, 0W	Mocek, Tomas, 0X, 1G
Hošek, Jan, 0C, 0E	Mokrý, Pavel, 0Q, 0V
Hostaša, Jan, 1C	Mrňa, Libor, 0W
Hrabina, Jan, 0F, 0P	Muzik, Jiří, 0X
Hufka, Jan, 07	Nagisetty, Siva S., 0X
Hykl, Jiří, 0E	Naylon, Jack A., 0N
Indra, Lukáš, 0N	Němcová, Šárka, 0C, 0L
Inneman, Adolf, 0A, 0L	Nitzsche, Tobias, 03
Jákl, Petr, 0G	Nordin, Nur Dalilla, 1K
Jasikova, D., 0H	Novak, Jiří, 11
Jenkins, Rich, 03	Novák, Pavel, 10, 11
Jíran, Lukas, 0L	Oulehla, Jindřich, 0P, 0Y
Kalinchenko, Galina, 1J	Pabst, Willi, 1C
Kaspar, Pavel, 09, 0I, 17	Paetzelt, H., 04
Kaziev, Andrey V., 0J	Pavlica, Richard, 0L
Kazieva, Tatiana V., 0K	Petru, M., 0A
Khodachenko, Georgy V., 0J	Pietag, F., 04
Klepetková, Eva, 12, 13	Pintr, Pavel, 0Z, 15, 1D

Pleštil, Jan, 1D  
 Pokorný, Petr, 10, 11  
 Polák, J., 1B  
 Polak, Jaroslav, 0T, 12, 16  
 Poláková, Ivana, 12, 13, 16  
 Pošmourný, Josef, 12  
 Possolt, Martin, 14, 15  
 Procháska, František, 0T, 0U, 12, 13, 16, 1B  
 Prokopyeva, Elena, 08, 09, 0I, 17  
 Provazník, Milan, 0P  
 Psota, Pavel, 0Q, 0U, 0V, 18  
 Ramazanov, Shikhgasan, 08  
 Ramírez-Iniguez, R., 05  
 Rascher, Rolf, 19  
 Reshetov, Vladimír N., 0K  
 Robertson, D. J., 06  
 Rus, Bedřich, 0N, 1J  
 Sandri, Paolo, 1F  
 Šarbot, Martin, 0D, 0F, 0W  
 Schäfer, Patrick, 19  
 Sedlár, Petra, 0P  
 Shchelkanov, Ivan A., 0J  
 Sieger, L., 0A  
 Škarvada, Pavel, 09  
 Škereň, Marek, 0B, 14  
 Slezak, O., 1G  
 Steiger, Kateřina, 0V, 15  
 Stetson, Karl A., 02  
 Šubert, Eduard, 12  
 Šulc, M., 0O  
 Šulc, Miroslav, 12, 1A  
 Supranowitz, Chris, 03  
 Svoboda, Jakub, 14  
 Tan, ChingSeong, 1K  
 Thoma, Jiří, 0N  
 Tik, Eddy Chow Mun, 1K  
 Tománek, Pavel, 08, 09, 0I, 17  
 Tomka, David, 0T, 0U, 12, 16, 1B  
 Uhlířová, Tereza, 1C  
 Václavík, Jan, 07, 15, 1D  
 Vanda, Jan, 1E  
 Vápenka, David, 0Z  
 Vinš, Václav, 0E  
 Viť, Tomáš, 1F  
 Vitovec, Bohumil, 0L  
 Vojna, D., 1G  
 Vojtíšek, Petr, 0Q, 0V, 15, 18, 1H, 1I  
 Vychodil, Miloslav, 0P  
 Vyhlička, Štěpán, 1J  
 Wang, Xin, 1K  
 Wünsche, Christine, 19  
 Zemánek, Pavel, 0G  
 Zicha, Josef, 0L



# Conference Committee

## *Conference Chairs*

**Jana Kovačičinová**, Institute of Plasma Physics AS CR, v.v.i.  
(Czech Republic)

**Tomáš Vít**, Institute of Plasma Physics AS CR, v.v.i.  
(Czech Republic)

## *Scientific Committee*

**Pavel Tománek**, Brno University of Technology (Czech Republic)

**Pavel Zemánek**, Institute of Scientific Instruments AS CR, v.v.i.  
(Czech Republic)

**Josef Lazar**, Institute of Scientific Instruments AS CR, v.v.i.  
(Czech Republic)

**Rolf Rascher**, University of Applied Sciences Deggendorf (Germany)

**Christine Wünsche**, University of Applied Sciences Deggendorf  
(Germany)

**Gerd Leuchs**, University of Ottawa (Canada)

**Matthias Pfaff**, OptoTech Optikmaschinen GmbH (Germany)

**David Walker**, Zeeko Ltd. (United Kingdom)

**David J Robertson**, Durham University (United Kingdom)

**Václav Kopecký**, Technical University in Liberec (Czech Republic)

**Miroslav Šulc**, Institute of Plasma Physics AS CR, v.v.i.  
(Czech Republic)

**Marek Škřeň**, Czech Technical University in Prague (Czech Republic)

**Pavel Fiala**, Czech Technical University in Prague (Czech Republic)

