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:


ISSN: 0277-786X
ISBN: 9780819496041

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 © 2013, 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. 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/13/$18.00.

Printed in the United States of America.

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

SPIEDigitalLibrary.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.
### SESSION 1 INTERFEROMETRIC TECHNIQUES

8788 02 **Low coherence full field interference microscopy or optical coherence tomography: recent advances, limitations and future trends (Invited Paper) [8788-1]**  
I. Abdulhalim, Ilse Katz Ctr. for Nano Scale Science and Technology (Israel)

8788 03 **Excess fraction measurement of a transparent glass thickness in wavelength tuning interferometry [8788-2]**  
Y. Kim, The Univ. of Tokyo (Japan); K. Hibino, National Institute of Advanced Industrial Science and Technology (Japan); K. Harada, N. Sugita, M. Mitsuishi, The Univ. of Tokyo (Japan)

8788 04 **Metrology for adhesive layer of temporary bonding wafers using IR interferometry [8788-3]**  
P.-Y. Chang, Y.-S. Ku, C.-H. Cho, Industrial Technology Research Institute (Taiwan)

8788 05 **Concept, realization and performance of a two-beam phase-shifting point diffraction interferometer [8788-4]**  
N. Voznesenskiy, M. Voznesenskaia, N. Petrova, VTT-NTM OÜ (Estonia); A. Abels, SmartStuff OÜ (Estonia)

### SESSION 1 DIGITAL HOLOGRAPHY AND HOLOGRAPHIC MICROSCOPY

8788 06 **Sparsity-based denoising method of wrapped-phase reconstructions in digital holography [8788-5]**  
P. Memmolo, Istituto Italiano di Tecnologia (Italy) and CNR-Istituto Nazionale di Ottica (Italy); M. Iannone, Istituto Italiano di Tecnologia (Italy); M. Ventre, Univ. of Naples Federico II (Italy); P. A. Netti, Istituto Italiano di Tecnologia (Italy); A. Finizio, M. Paturzo, P. Ferraro, CNR-Istituto Nazionale di Ottica (Italy)

8788 07 **Holographic Interferometry based on photorefractive crystal to measure 3D thermo-elastic distortion of composite structures and comparison with finite element models [8788-6]**  
C. Trizy, Univ. de Liège (Belgium); F. Eliot, EADS-Astrium (France); D. Balhause, K. R. Olympio, R. Kluge, EADS-Astrium (Germany); A. Shannon, G. Laduree, European Space Agency ESTEC (Netherlands); D. Logut, EADS-Astrium (France); M. P. Georges, Univ. de Liège (Belgium)

8788 08 **Lensless single-exposure super-resolved interferometric microscopy [8788-7]**  
L. Granero, C. Ferreira, J. García, V. Micó, Univ. de València (Spain)
Resolution enhancement and autofocusing in digital holographic microscopy by using structured illumination [8788-8]
P. Gao, G. Pedrini, W. Osten, Univ. Stuttgart (Germany)

Hybrid and transflective system based on digital holographic microscope and low coherent interferometer for high gradient shape measurement [8788-9]
K. Łżewski, S. Tomczewski, J. Kostencka, T. Kozacki, Warsaw Univ. of Technology (Poland)

Total compensation of chromatic errors in digital color holography using a single recording [8788-10]
M. Leclercq, LUNAM Univ., Univ. du Maine, CNRS (France); P. Picart, LUNAM Univ., Univ. du Maine, CNRS (France) and École Nationale Supérieure d’Ingénieurs du Mans (France)

Lensless object scanning holography for diffuse objects [8788-12]
J. García, C. Ferreira, V. Micó, Univ. de València (Spain)

SESSION 3 MEASUREMENT OF OPTICAL COMPONENTS AND SYSTEMS

A long trace profiler with large dynamical range [8788-13]
A. Ritucci, M. Rossi, Media Lario Technologies (Italy)

Optical characterization method for very small microlenses (sub-50 micron) for industrial mass-production applications [8788-15]
M.-S. Kim, J. Sunarjo, K. J. Weible, R. Voelkel, SUSS MicroOptics SA (Switzerland)

SESSION 4 DIGITAL HOLOGRAPHY, SHEAROGRAPHY, AND SPECKLE TECHNIQUES

Shape reconstruction using dual wavelength digital holography and speckle movements [8788-17]
D. Khodadad, Luleå Univ. of Technology (Sweden); E. Hällstig, Optronic Partner dp AB (Sweden); M. Sjödahl, Luleå Univ. of Technology (Sweden)

Digital holographic inspection for the straight pipe inner surface using multiwavelength from laser diodes [8788-18]
M. Yokota, T. Koyama, T. Kawakami, Shimane Univ. (Japan)

Seeing through smoke and flames: a challenge for imaging capabilities, met thanks to digital holography at far infrared [8788-19]

A computational tool to highlight anomalies on shearographic images in optical flaw detection [8788-20]
A. V. Fantin, D. P. Willemann, M. Viotti, A. Albertazzi, Federal Univ. of Santa Catarina (Brazil)

ESPI based on spatial fringe analysis method using only two sheets of speckle patterns [8788-21]
Y. Arai, Kansai Univ. (Japan); S. Yokozeki, Jyouko Applied Optics Lab. (Japan)
SESSION 5  POLARIZATION-BASED TECHNIQUES

8788 0O  Relation between vectorial source structure and coherence-polarization of light [8788-23]
          R. K. Singh, Indian Institute of Space Science and Technology (India); D. N. Naik, Univ.
          Stuttgart (Germany); H. Itou, M. M. Brundavanam, Y. Miyamoto, The Univ. of Electro-
          Communications (Japan); M. Takeda, Utsunomiya Univ. (Japan)

8788 0P  A polarization-based frequency shifting interferometry for inspecting transparent objects in
          microelectronics manufacturing [8788-24]
          S. H. Lee, M. Y. Kim, Kyungpook National Univ. (Korea, Republic of)

SESSION 6  HIGH-SPEED TECHNIQUES

8788 0Q  Fast and accurate line scanner based on white light interferometry [8788-25]
          P. Lambelet, R. Moosburger, Heliotis AG (Switzerland)

8788 0R  High speed measurement of specular surfaces based on carrier fringe patterns in a line
          scan Michelson interferometer setup [8788-26]
          H. Knell, P. Lehmann, Univ. Kassel (Germany)

8788 0S  Speed-up chromatic sensors by optimized optical filters [8788-27]
          M. Taphanel, B. Hovestreydt, Karlsruher Institut für Technologie (Germany); J. Beyerer,
          Fraunhofer IOF (Germany)

SESSION 7  CONFOCAL SENSORS

8788 0T  Robust evaluation of intensity curves measured by confocal microscopies [8788-28]
          J. Seewig, I. Raid, C. Wiehr, B. A. George, Technische Univ. Kaiserslautern (Germany)

8788 0U  Model-based assistance system for confocal measurements of rough surfaces [8788-29]
          F. Mauch, W. Lyda, W. Osten, Institute for Technical Optics, Univ. Stuttgart (Germany)

8788 0V  Parallelized chromatic confocal sensor systems [8788-30]
          M. Hillenbrand, A. Grewe, M. Bichra, R. Kleindienst, L. Lorenz, R. Kirner, R. Weiß, S.
          Sinzinger, Technische Univ. Ilmenau (Germany)

8788 0W  Robust signal evaluation for Chromatic Confocal Spectral Interferometry [8788-31]
          T. Boettcher, W. Lyda, M. Gronle, F. Mauch, W. Osten, Univ. Stuttgart (Germany)

SESSION 8  MULTISENSOR APPROACHES

8788 0X  Measurement, visualization and analysis of extremely large data sets with a
          nanopositioning and nanomeasuring machine [8788-32]
          O. Birli, K.-H. Franke, G. Linß, T. Machleidt, E. Manske, F. Schale, H.-C. Schwannecke,
          E. Sparrer, M. Weiß, Technische Univ. Ilmenau (Germany)
Model-based, active inspection of three-dimensional objects using a multi-sensor measurement system [8788-33]
M. Gronle, W. Lyda, W. Osten, Univ. Stuttgart (Germany)

SESSION 9 FIBER-OPTICS SENSORS

High-frequency optical fiber microphone for condition-based maintenance application [8788-34]
D. Tosi, Univ. of Limerick (Ireland); M. Olivero, G. Perrone, A. Vallan, Politecnico di Torino (Italy)

A space-borne fiber-optic interrogator module based on narrow-band tunable laser diode for temperature monitoring in telecommunication satellites [8788-35]
P. Putzer, N. Kuhnenri, A. W. Koch, Technische Univ. München (Germany); S. Schweyer, A. Hurni, M. Plattner, Kayser-Threde GmbH (Germany)

Miniature low-cost extrinsic Fabry-Perot interferometer for low-pressure detection [8788-36]
S. Poeggel, D. Tosi, G. Leen, E. Lewis, Univ. of Limerick (Ireland)

Applications of tilted fiber Bragg grating in liquid parameters measurement [8788-37]
B. Jiang, J. Zhao, A. Rauf, C. Qin, W. Jiang, Northwestern Polytechnical Univ. (China)

SESSION 10 FRINGE PROJECTION

Experimental comparison of phase-shifting fringe projection and statistical pattern projection for active triangulation systems [8788-38]
P. Lutzke, Fraunhofer IOF (Germany); M. Schaffer, Friedrich Schiller Univ. (Germany); P. Kühnstedt, Fraunhofer IOF (Germany); R. Kowarschik, Friedrich Schiller Univ. (Germany); G. Notni, Fraunhofer IOF (Germany)

Scanning fringe projection for fast 3D inspection [8788-135]
M. Honegger, M. Kohl, S. Trunz, S. Rinner, A. Etemeyer, NTB Univ. of Applied Sciences (Switzerland); P. Lambelet, Heliotis AG (Switzerland)

High-speed 3D shape measurement using array projection [8788-40]
S. Heist, M. Sieler, A. Breitbarth, P. Kühnstedt, G. Notni, Fraunhofer IOF (Germany)

Influence of the structured illumination frequency content on the correspondence assignment precision in stereophotogrammetry [8788-41]
M. Große, M. Schaffer, B. Harendt, R. Kowarschik, Institute of Applied Optics (Germany)

High resolution measurements of filigree, inner geometries with endoscopic micro fringe projection [8788-42]
C. Ohrt, M. Kästner, E. Reithmeier, Leibniz Univ. Hannover (Germany)
SESSION 11  ASPHERE MEASUREMENT

8788 18  Measurement of aspheres and free-form surfaces in a non-null test interferometer: reconstruction of high-frequency errors [8788-43]
G. Baer, J. Schindler, Univ. Stuttgart (Germany); J. Siepmann, Mahr GmbH (Germany); C. Pruß, W. Osten, Univ. Stuttgart (Germany); M. Schulz, Physikalisch-Technische Bundesanstalt (Germany)

8788 19  Non-contact profiling for high precision fast asphere topology measurement [8788-44]
J. Petter, G. Berger, Luphos GmbH (Germany)

8788 1A  Highly accurate surface maps from profilometer measurements [8788-45]
K. M. Medicus, J. D. Nelson, M. P. Mandina, Optimax Systems, Inc. (United States)

8788 1B  Lateral location error compensation algorithm for measuring aspheric surfaces by sub-aperture stitching interferometry [8788-46]
Z. Zhao, H. Zhao, F. Gu, L. Zhang, Xi’an Jiaotong Univ. (China)

SESSION 12  DEFLECTOMETRY

8788 1C  Deflectometry vs. interferometry (Invited Paper) [8788-47]
G. Häusler, C. Faber, E. Olesch, S. Ettl, Univ. of Erlangen-Nuremberg (Germany)

8788 1D  Approach to the measurement of astronomical mirrors with new procedures [8788-48]
E. Hofbauer, R. Rascher, Th. Stubenrauch, J. Liebl, R. Maurer, Hochschule Deggendorf (Germany); A. Zimmermann, Univ. Passau (Germany); O. Rösch, Technische Univ. München (Germany); J. Reitberger, Micro Epsilon GmbH (Germany)

8788 1E  Precision aspheric optics testing with SCOTS: a deflectometry approach [8788-49]
P. Su, M. Khreishi, R. Huang, T. Su, J. H. Burge, College of Optical Sciences, The Univ. of Arizona (United States)

8788 1F  Methods to obtain the waveform profile from slope measurements [8788-50]
A. Moreno, Univ. Autònoma de Barcelona (Spain); M. Espinola, INDO Lens Group S.L.U. (Spain); J. Martínez, J. Campos, Univ. Autònoma de Barcelona (Spain)

8788 1G  Moiré deflectometry under incoherent illumination: 3D profiler for specular surfaces [8788-51]
T. Hirose, T. Kitayama, Toyota Central R&D Labs., Inc. (Japan)

SESSION 13  MEASUREMENTS OF LARGE-SCALE OBJECTS

8788 1H  Optical profilometer using laser based conical triangulation for inspection of inner geometry of corroded pipes in cylindrical coordinates [8788-52]
P. D. V. Buschinelli, J. C. Melo, A. Albertazzi Jr., Univ. Federal de Santa Catarina (Brazil); J. M. C. Santos, C. S. Camerini, Cidade Univ. (Brazil)
Active retroreflector with in situ beam analysis to measure the rotational orientation in conjunction with a laser tracker [8788-53]
O. Hofherr, Univ. of Freiburg (Germany); C. Wachten, PI miCos GmbH (Germany);
C. Müller, H. Reinecke, Univ. of Freiburg (Germany)

Automated control of robotic camera tacheometers for measurements of industrial large scale objects [8788-54]
T. Heimonen, J. Leinonen, J. Sipola, Kemi-Tornio Univ. of Applied Sciences (Finland)

Development of alignment-guidance device for grooved roll mill using parallel projection imaging technique [8788-55]
T. Kodama, T. Iwata, D. Yamagami, K. Takagi, JFE Steel Corp. (Japan)

Photogrammetry based system for the measurement of cylindrical forgings axis straightness [8788-56]
A. Zatočilová, R. Poliščuk, D. Paloušek, J. Brandejs, Brno Univ. of Technology (Czech Republic)

Sub-nanometer in-die overlay metrology: measurement and simulation at the edge of finiteness [8788-58]
H.-J. H. Smilde, M. Jak, A. den Boef, M. van Schijndel, M. Bozkurt, A. Fuchs, M. van der Schaar, S. Meyer, S. Morgan, K. Bhattacharyya, ASML Netherlands B.V. (Netherlands); G.-T. Huang, C.-M. Ke, K.-H. Chen, TSMC Ltd. (Taiwan)

Nanometrology of periodic nanopillar arrays by means of light scattering [8788-59]
O. Paul, F. Widulle, B. H. Kleemann, A. Heinrich, Carl Zeiss AG (Germany)

Phase information in coherent Fourier scatterometry [8788-60]
N. Kumar, Technische Univ. Delft (Netherlands); O. El Gawhary, Technische Univ. Delft (Netherlands) and VSL Dutch Metrology Institute (Netherlands); S. Roy, S. F. Pereira, H. P. Urbach, Technische Univ. Delft (Netherlands)

Revisiting parallel catadioptric goniophotometers [8788-61]
B. Karamata, M. Andersen, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

Metrology solutions using optical scatterometry for advanced CMOS: III-V and Germanium multi-gate field-effect transistors [8788-62]
H.-C. Chin, Nanometrics Inc. (United States); B. Liu, X. Zhang, National Univ. of Singapore (Singapore); M.-L. Ling, C.-H. Yip, Y. Liu, J. Hu, Nanometrics Inc. (United States); Y.-C. Yeo, National Univ. of Singapore (Singapore)

The road towards accurate optical width measurements at the industrial level [8788-63]
B. Bodermann, R. König, D. Bergmann, E. Buhr, W. Häßler-Grohne, J. Flügge, H. Bosse, Physikalisch-Technische Bundesanstalt (Germany)
Part Two

SESSION 15  LASER-DOPPLER TECHNIQUES

8788 1T  3D shape measurements of fast moving rough surfaces by two tilted interference fringe systems [8788-64]
R. Kuschmierz, P. Günther, J. W. Czarske, Technische Univ. Dresden (Germany)

8788 1U  Optical vibration analysis of MEMS devices with pm-resolution in x, y, and z directions [8788-65]
M. Giesen, R. Kowarsch, W. Ochs, M. Winter, C. Rembe, Polytec GmbH (Germany)

8788 1V  Characterization and demonstration of a 12-channel Laser-Doppler vibrometer [8788-66]
T. Haist, C. Lingel, W. Osten, Univ. Stuttgart (Germany); K. Bendel, Robert Bosch GmbH (Germany); M. Giesen, M. Gartner, C. Rembe, Polytec GmbH (Germany)

SESSION 16  STRESS, STRAIN, & DISPLACEMENT MEASUREMENT

8788 1X  Diagnostic of structures in heat and power generating industries with utilization of 3D digital image correlation [8788-68]
M. Malesa, M. Kujawinska, K. Malowany, Warsaw Univ. of Technology (Poland); B. Siwek, KSM Vision Ltd. (Poland)

8788 1Y  Integrated digital image correlation for residual stress measurement [8788-69]
A. Baldi, F. Bertolino, Univ. degli Studi di Padova (Italy)

8788 1Z  Infrared differential interference contrast microscopy for overlay metrology on 3D-interconnect bonded wafers [8788-70]
Y. Ku, D.-M. Shyu, Y.-S. Lin, C.-H. Cho, Industrial Technology Research Institute (Taiwan)

POSTER SESSION

8788 20  A lateral sensor for the alignment of two formation-flying satellites [8788-71]
S. Roose, Y. Stockman, Ctr. Spatial de Liège (Belgium); Z. Sodnik, European Space Agency ESTEC (Netherlands)

8788 22  Analysis of method of 3D shape reconstruction using scanning deflectometry [8788-73]
J. Novák, P. Novák, A. Mikší, Czech Technical Univ. in Prague (Czech Republic)

8788 23  CO₂ laser photoacoustic spectrometry: sensitivity and drift analysis [8788-74]
J. Škřínský, VŠB - Technical Univ. of Ostrava (Czech Republic) and J. Heyrovsky Institute of Physical Chemistry of the ASCR, v.v.i. (Czech Republic); Z. Zelinger, J. Heyrovsky Institute of Physical Chemistry of the ASCR, v.v.i. (Czech Republic); T. Hejzlar, Pavel Palát, Bezpečnost práce a požární ochrana (Czech Republic); V. Nevrť, B. Baudišová, P. Bitala, VŠB - Technical Univ. of Ostrava (Czech Republic)
Imaging sensor for monitoring of the piston mechanism in cylindrical valves
E. N. Pantiushina, A. A. Gorbachev, Saint-Petersburg National Research Univ. of Information Technologies (Russian Federation)

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
D. B. Hayrapetyan, Russian-Armenian State Univ. (Armenia) and State Engineering Univ. of Armenia (Armenia); L. T. Hovhannisyan, State Engineering Univ. of Armenia (Armenia); P. A. Mantashyan, Institute for Physical Research of NAS RA (Armenia)

Temperature sensing by modulating phase of optical fiber
G. Cheng, P. Xu, C. Hong, Y. Cao, F. Zhu, S. Feng, R. Lin, Shenzhen Univ. (China)

Real-time visualization and analysis of airflow field by use of digital holography
J. Di, B. Wu, X. Chen, J. Liu, J. Wang, J. Zhao, Northwestern Polytechnical Univ. (China)

Visual and dynamic measurement of temperature fields by use of digital holographic interferometry
J. Zhao, J. Di, B. Wu, J. Wang, Q. Wang, H. Jiang, Northwestern Polytechnical Univ. (China)

Calibration of misalignment aberrations in cylindrical surface interferometric measurement
J. Peng, D. Ge, Y. Yu, M. Chen, Shanghai Univ. (China)

Three-axis optic-electronic autocollimation system for the inspection of large-scale objects
I. A. Konyakhin, A. N. Timofeev, A. I. Konyakhin, Saint-Petersburg National Research Univ. of Information Technologies (Russian Federation)

Optical device for the improvement of positioning accuracy in large machine tools
L. Cocola, M. Fedel, M. Mocellin, CNR-Institute of Photonics and Nanotechnologies (Italy); R. Casarin, FPT Industrie S.P.A. (Italy); L. Poletto, CNR-Institute of Photonics and Nanotechnologies (Italy)

Measurement uncertainty in the profile detection on solar troughs
P. Sansoni, D. Fontani, F. Francini, CNR-Istituto Nazionale di Ottica (Italy); S. Toccafondi, M. Messeri, Univ. of Florence (Italy); S. Coraggia, L. Mercatelli, D. Jafrancesco, E. Sani, CNR-Istituto Nazionale di Ottica (Italy)

The impact of polarization on metrology performance of the lateral shearing interferometer
Z. Yao, Institute of Optics and Electronics (China) and Univ. of Chinese Academy of Sciences (China); T. Xing, Institute of Optics and Electronics (China)

Comparison of Michelson and Linnik interference microscopes with respect to measurement capabilities and adjustment efforts
P. Kühnhold, W. Xie, P. Lehmann, Univ. Kassel (Germany)
Application of line-scanning microscopy using a linear sensor in semiconductor industry: shape and thickness measurements [8788-88]
M. P. Macedo, Univ. of Coimbra (Portugal) and Instituto Superior de Engenharia de Coimbra (Portugal); C. M. B. A. Correia, Univ. of Coimbra (Portugal)

Optical resolution measurement system for small lens by using slanted-slit method [8788-90]
K.-Y. Huang, C.-M. Chia, National Taiwan Univ. (Taiwan); E. Chang, Genius Electronic Optical Co. (Taiwan)

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

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

Optical measurement system applied to continuous displacement monitoring of long-span suspension bridges [8788-93]
L. Lages Martins, National Lab. for Civil Engineering (Portugal); J. M. Rebordão, Univ. of Lisbon (Portugal); A. S. Ribeiro, National Lab. for Civil Engineering (Portugal)

Small angle light scattering for a glass fibre diameter characterization [8788-94]
G. Świńiak, G. Głomb, Wroclaw Univ. of Technology (Poland)

Design and location deviation of the computer generated holograms used for aspheric surface testing [8788-95]
J. Feng, Institute of Optics and Electronics [China] and Univ. of Chinese Academy of Sciences [China]; C. Deng, T. Xing, Institute of Optics and Electronics [China]

Laser welding control by monitoring of plasma [8788-96]
H. Chmelickova, H. Sebestova, M. Havelkova, L. Rihakova, L. Nozka, Joint Lab. of Optics of Palacky Univ. and Institute of Physics of the Academy of Sciences (Czech Republic)

Design of omnidirectional camera lens system with catadioptic system [8788-98]
J. H. Jo, S. Lee, H. J. Seo, Hannam Univ. (Korea, Republic of); J. H. Lee, J. M. Kim, JM-Tec. Co. Ltd. (Korea, Republic of)

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

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

Absolute scale-based imaging position encoder with submicron accuracy [8788-101]
A. G. Anisimov, A. V. Pantyushin, O. U. Lashmanov, A. S. Vasilev, A. N. Timofeev, V. V. Korotaev, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation); S. V. Gordeev, SKBIS OAO (Russian Federation)
8788 2U  
CCD camera-based analysis of thin film growth in industrial PACVD processes [8788-102]  
G. Zauner, T. Schulte, C. Forsich, D. Heim, Upper Austria Univ. of Applied Sciences (Austria)

8788 2V  
Towards superresolution imaging with optical vortex scanning microscope [8788-103]  
J. Masajada, A. Popiok-Masajada, I. Augustyniak, Wroclaw Univ. of Technology (Poland);  
B. Sokolenko, Simferopol State Univ. (Ukraine)

8788 2W  
Image quality improvement using speckle method in digital holography by means of mult-mode fiber [8788-104]  
H. Funamizu, S. Shimoma, Y. Aizu, Muroran Institute of Technology (Japan)

8788 2X  
Measurement of residual stress fields in FHPP welding: a comparison between DSPI combined with hole-drilling and neutron diffraction [8788-105]  
M. R. Viotti, A. Albertazzi Jr., Univ. Federal de Santa Catarina (Brazil); P. Staron, Institut für Werkstoffforschung (Germany); M. Pisa, Ctr. de Pesquisas e Desenvolvimento (Brazil)

8788 2Y  
Iterative alignment of reflector segments using a laser tracker [8788-106]  
L. Cabrera Cuevas, M. Lucero Alvarez, A. Leon-Huerta, E. Hernandez Rios, J. Hernandez Lázaro, C. Tzile Torres, D. Castro Santos, D. M. Gale, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); G. Wilson, G. Narayanan, Univ. of Massachusetts (United States);  
D. R. Smith, Mechanical Engineering Research Lab. (United States)

8788 2Z  
Tilted objects EFI in digital holography by two different numerical approaches [8788-107]  
M. Matreccano, M. Paturzo, P. Ferraro, CNR-Istituto Nazionale di Ottica (Italy)

8788 31  
Non-Bayesian noise reduction in digital holography by random resampling masks [8788-109]  
V. Bianco, M. Paturzo, CNR-Istituto Nazionale di Ottica (Italy); P. Memmolo, CNR-Istituto Nazionale di Ottica (Italy) and Istituto Italiano di Tecnologia (Italy); A. Finizio, CNR-Istituto Nazionale di Ottica (Italy); B. Javidi, Univ. of Connecticut (United States); P. Ferraro, CNR-Istituto Nazionale di Ottica (Italy)

8788 32  
Research of autocollimating angular deformation measurement system for large-size objects control [8788-110]  
T. V. Turgalieva, I. A. Konyakhin, Saint-Petersburg National Research Univ. of Information Technologies (Russian Federation)

8788 33  
Design and experiment of testing an off-axis aspheric surface by computer generated hologram [8788-111]  
S. Li, Institute of Optics and Electronics (China) and Univ. of Chinese Academy of Sciences (China); F. Wu, Q. Chen, B. Fan, L. Li, Institute of Optics and Electronics (China)

8788 34  
Spectral monitoring of toluene and ethanol in gasoline blends using Fourier-Transform Raman spectroscopy [8788-112]  
V. Ortega Clavero, Univ. of Applied Sciences Offenburg (Germany) and Univ. of Strasbourg (France); A. Weber, W. Schròder, D. Curticeapean, Univ. of Applied Sciences Offenburg (Germany); P. Meyrueis, N. Javahiraly, Univ. of Strasbourg (France)

8788 35  
Reflection, transmission and color measurement system for the online quality control of float glass coating process [8788-113]  
I. Mamedbeili, F. Cakiroglu, G. Bektas, D. Riza, F. Hacizade, TUBITAK-BILGEM (Turkey)
Energetic sensitivity of optical-electronic systems based on polychromatic optical equisignal zone [8788-114]
A. A. Maraev, A. N. Timofeev, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)

Automatic unit for measuring refractive index of air based on Ciddor equation and its verification using direct interferometric measurement method [8788-115]

Alignment of a large outdoor antenna surface using a laser tracker [8788-117]
A. Leon-Huerta, M. Lucero Alvarez, E. Hernandez Rios, C. Tzile Torres, L. Cabrera Cuevas, D. Castro Santos, J. Hernandez Lázaro, D. M. Gale, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); G. Wilson, G. Narayanan, Univ. of Massachusetts (United States)

Iterative improvements to the surface error of a 1.7 metre aluminium reflector [8788-118]
D. Castro Santos, L. Cabrera Cuevas, E. Hernandez Rios, D. M. Gale, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); D. R. Smith, Mechanical Engineering Research Lab. (United States)

Efficient testing methodologies for microcameras in a gigapixel imaging system [8788-119]
S. H. Youn, D. L. Marks, Duke Univ. (United States); P. O. McLaughlin, RPC Photonics (United States); D. J. Brady, J. Kim, Duke Univ. (United States)

Wavelength modulation-based method for interference phase detection with reduced optical complexity [8788-120]

Camera-based curvature measurement of a large incandescent object [8788-121]
A. V. H. Ollikkala, T. P. Kananen, A. J. Mäkynen, Univ. of Oulu (Finland); M. Holappa, Rautaruukki Oyj (Finland)

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

Digital holographic microscopy for the study of nano-fibers [8788-123]
H. H. Wahba, Damietta Univ. (Egypt) and Luleå Univ. of Technology (Sweden); M. Sjödahl, P. Gren, E. Olsson, Luleå Univ. of Technology (Sweden)

Implementation of a fringe visibility based algorithm in coherence scanning interferometry for surface roughness measurement [8788-124]
P. C. Montgomery, F. Salzenstein, D. Montaner, B. Serio, P. Pfeiffer, Lab. des Sciences de l’Ingénieur, de l’Informatique et de l’Imagerie (France)

Turbine-blade tip clearance and tip timing measurements using an optical fiber bundle sensor [8788-125]
I. Garcia, Univ. of the Basque Country (Spain); J. Beloki, Aeronautical Technologies Ctr. (Spain); J. Zubia, G. Durana, G. Aldabaldetreku, Univ. of the Basque Country (Spain)
**8788 3I**  
**Precision positioning with suppression of the influence of refractive index of air** [8788-126]  
M. Holá, J. Hrabina, J. Oulehla, M. Čížek, B. Mikel, Š. Řeřucha, Z. Buchta, O. Čip, J. Lazar,  
Institute of Scientific Instruments of the ASCR, v.v.i. (Czech Republic)

**8788 3J**  
**Static and (quasi)dynamic calibration of stroboscopic scanning white light interferometer** [8788-127]  
J. Seppä, Ctr. for Metrology and Accreditation (Finland); I. Kassamakov, A. Nolvi, Univ. of Helsinki (Finland); V. Heikkinen, Ctr. for Metrology and Accreditation (Finland); T. Paulin, Univ. of Helsinki (Finland); A. Lassila, Ctr. for Metrology and Accreditation (Finland); L. Hao, National Physical Laboratory (United Kingdom); E. Hæggsröm, Univ. of Helsinki (Finland)

**8788 3K**  
**Computed tomography of cylindrically symmetric object by use of digital holography** [8788-128]  
Z. Pan, Jinan Univ. (China) and South China Agricultural Univ. (China); S. Li, J. Zhong, Jinan Univ. (China)

**8788 3M**  
**Stimulated LF studied using pulsed digital holography and modelling** [8788-130]  
E. Amer, Luleå Univ. of Technology (Sweden) and Zagazig Univ. (Egypt); J. Stenvall, P. Gren, M. Sjödahl, Luleå Univ. of Technology (Sweden)

**8788 3O**  
**Surface normal deblurring caused by conveyor movement for fast surface inspection** [8788-132]  
T. Kurihara, Y. Katsuki, S. Ando, Univ. of Tokyo (Japan)

**8788 3P**  
**Tape measuring system using linear encoder and digital camera** [8788-133]  
T. B. Eom, D. Y. Jeong, M. S. Kim, J. W. Kim, J. A. Kim, Korea Research Institute of Standards and Science (Korea, Republic of)

**8788 3Q**  
**Automated hardware and software complex for extended light sources verification** [8788-134]  
E. V. Gorbunova, V. S. Peretyagin, A. N. Chertov, National Research Univ. of Information Technologies, Mechanics and Optics (Russian Federation)

*Author Index*
Conference Committee

Symposium Chairs

Wolfgang Osten, Universität Stuttgart (Germany)
Karsten Buse, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany)
Andrew J. Moore, Heriot-Watt University (United Kingdom)

Conference Chair

Peter H. Lehmann, Universität Kassel (Germany)

Conference Co-chairs

Wolfgang Osten, Universität Stuttgart (Germany)
Armando Albertazzi, Universidade Federal de Santa Catarina (Brazil)

Conference Programme Committee

Astrid Aksnes, Norwegian University of Science and Technology (Norway)
Oleg Vyacheslavovich Angelsky, Yuriy Fedkovych Chernivtsi National University (Ukraine)
Anand Krishna Asundi, Nanyang Technological University (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- Universität 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 Universität 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, Université de Liège (Belgium)
Christophe Gorecki, FEMTO-ST (France)
Andreas Heinrich, Carl Zeiss AG (Germany)
Richard M. Kowarschik, Friedrich-Schiller- Universität Jena (Germany)
Malgorzata Kujawinska, Warsaw University of Technology (Poland)
Eberhard Manske, Technische Universität Ilmenau (Germany)
Fernando Mendoza Santoyo, Centro de Investigaciones en Óptica, A.C. (Mexico)
Andrew John Moore, Heriot-Watt University (United Kingdom)
Gunther Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany)
Ryszard J. Pryputniewicz, Worcester Polytechnic Institute (United States)
Eduard Reithmeier, Leibniz Universität Hannover (Germany)
Christian Rembe, Polytec GmbH (Germany)
Robert Schmitt, RWTH (Germany)
Jörg Seewig, Technische Universität Kaiserslautern (Germany)
Pierre Slangen, Ecole des Mines d’Alès (France)
Marcus Steinbichler, Steinbichler Optotechnik GmbH (Germany)
Mitsuo Takeda, The University of Electro-Communications (Japan)
Cristina Trillo, Universidad de Vigo (Spain)
Rainer Tutsch, Technische Universität Braunschweig (Germany)
Introduction

In 2013, optical metrology systems are well-established and do their job reliably in many fields of industrial inspection. Most measurement systems are based on similar sets of optical standard components. The basics of optical measurement techniques are widely understood and the limitations of optical principles are generally well-known.

So, why is a conference on “Optical Measurement Systems for Industrial Inspection” really needed? The answer is that there are still enough measurement problems to be solved and often optical metrology provides the only promising solutions. Industrial production processes are gaining complexity, precision and speed. Industrial products are becoming continuously more demanding. They require higher and higher accuracy in all three dimensions. At the same time, measuring speed should be increased and measurement systems come closer to production. These demands steadily stimulate the search for new or improved measurement methods, strategies and configurations. Novel components help researchers to meet these industrial requirements. In addition, powerful software tools, e.g. optics design and simulation software, enable to understand, layout, and optimize complex optical systems.

Therefore, the Munich conference still represents an important international forum of scientific exchange and discussion. More than 150 submissions show that the Munich conference series, which was established more than 12 years ago, is a considerable event for researchers working in the field of optical metrology all over the world. With more than 70 oral presentations and more than 60 posters, the 2013 conference could hold the high number and outstanding level of contributions, which made it as successful as it is.

Traditionally, a large number of contributions address optical measurement of three-dimensional geometrical features. The methods focus on both, coherent techniques such as holography and interferometry, as well as incoherent methods like structured light, confocal techniques, or deflectometry.

Since the measuring objects reach from the micrometer or even sub-micrometer range to dimensions of several meters, in this year's conference, there are sessions on large scale objects on the one hand, on light scattering techniques and line-width measurements dealing with smallest structures on the other. A field of application, which still remains in the focus of the conference, is the measurement of optical components, e.g. aspheres, free-form surfaces, and optical systems. And not only here, but in general, it is a basic concern of the conference since its beginnings to address those techniques that go beyond the limits of current optical instruments.
Since it is the people who move things forward, we would like to thank those who supported this conference.

First, we would like to express our sincere gratitude to the program committee for their support in the run-up of the conference. We also thank all authors, especially the distinguished invited speakers: Ibrahim Abdulhalim (Ben-Gurion Univ. of the Negev, Israel), Gerd Häusler (Friedrich-Alexander-Univ. Erlangen-Nürnberg, Germany) and Angela Duparré (Fraunhofer-Institut für Angewandte Optik und Feinmechanik, Jena, Germany) for their stimulating lectures on “Low coherence full field interference microscopy or optical coherence tomography: recent advances, limitations and future trends” (I. Abdulhalim), “Deflectometry vs. interferometry” (G. Häusler) and “Light scattering techniques for efficient surface quality control” (A. Duparré).

Finally, many thanks are due to the SPIE staff for their excellent and cooperative work during the conference organization and the preparation of these proceedings. Thanks are also due to all authors, who not only fill the conference with life, but also give added value to this proceedings volume.

Peter H. Lehmann
Wolfgang Osten
Armando Albertazzi