

PROCEEDINGS OF SPIE

Interferometry XVI: Techniques and Analysis

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Editors

**13–15 August 2012
San Diego, California, United States**

Sponsored and Published by
SPIE

Volume 8493

Proceedings of SPIE 0277-786-786X, V.8493

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

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 *Interferometry XVI: Techniques and Analysis*, edited by Joanna Schmit, Katherine Creath, Catherine E. Towers, Jan Burke, Proceedings of SPIE Vol. 8493 (SPIE, Bellingham, WA, 2012) Article CID Number.

ISSN: 0277-786X

ISBN: 9780819492104

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

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Contents

- ix *Conference Committee*
- xi *Introduction*

SESSION 1 ON THE FRINGE

- 8493 02 **Measurement and modeling of the thermal behavior of a laboratory DASH interferometer (Invited Paper)** [8493-1]
K. D. Marr, C. R. Englert, U.S. Naval Research Lab. (United States); J. M. Harlander, St. Cloud State Univ. (United States)
- 8493 03 **Digital holography reconstruction algorithms to estimate the morphology and depth of nonspherical absorbing particles** [8493-2]
D. R. Guildenbecher, Sandia National Labs. (United States); J. Gao, Purdue Univ. (United States); P. L. Reu, Sandia National Labs. (United States); J. Chen, Purdue Univ. (United States)
- 8493 04 **Spectrally resolved complex transmittance measurements of infrared nanostructured devices** [8493-3]
J. Jaeck, A. Fallou, G. Vincent, J. Primot, ONERA (France); J.-L. Pelouard, LPN, Ctr. National de la Recherche Scientifique (France); R. Haïdar, ONERA (France)
- 8493 05 **A digital gradient sensing method for evaluating orthogonal stress gradients in transparent solids subjected to mechanical loads** [8493-4]
H. Tippur, C. Periasamy, Auburn Univ. (United States)
- 8493 06 **An interferometric observation of topological effect by novel axially symmetrical wave plate** [8493-5]
T. Wakayama, Saitama Medical Univ. (Japan); Y. Otani, Utsunomiya Univ. (Japan); T. Yoshizawa, NPO 3D Associates (Japan)

SESSION 2 OPTICAL COHERENCE TOMOGRAPHY

- 8493 07 **Nondestructive metrology of layered polymeric optical materials using optical coherence tomography** [8493-6]
J. Yao, The Institute of Optics, Univ. of Rochester (United States); P. Meemon, The Institute of Optics, Univ. of Rochester (United States) and Suranaree Univ. of Technology (Thailand); K.-S. Lee, K. Xu, J. P. Rolland, The Institute of Optics, Univ. of Rochester (United States)
- 8493 08 **Characterization of ink-jet printed RGB color filters with spectral domain optical coherence tomography** [8493-7]
J. Czajkowski, P. Vilmi, J. Lauri, R. Sliz, T. Fabritius, R. Myllylä, Univ. of Oulu (Finland)
- 8493 09 **Wavelength-scanning polarimetric interferometry using channeled spectroscopic polarization state generator** [8493-8]
K. Oka, T. Kinoshita, Hokkaido Univ. (Japan)

- 8493 0A **Composite low-coherence interferometer for imaging of immersed tissue with high accuracy** [8493-9]
C.-W. Chang, I.-J Hsu, Chung Yuan Christian Univ. (Taiwan)

SESSION 3 SPATIAL STRUCTURES AND ABERRATIONS

- 8493 0B **Sub-angstrom surface metrology with a virtual reference interferometer (Invited Paper)** [8493-10]
K. Freischlad, Zometrics, Inc. (United States)
- 8493 0C **Comparison of the area structure function to alternate approaches for optical surface characterization** [8493-11]
L. He, A. Davies, C. J. Evans, The Univ. of North Carolina at Charlotte (United States)
- 8493 0D **Diffraction effects for interferometric measurements due to imaging aberrations** [8493-12]
P. Zhou, C. Zhao, J. Burge, College of Optical Sciences, The Univ. of Arizona (United States)
- 8493 0E **Fitting high-order Zernike polynomials to finite data** [8493-13]
B. Lewis, J. H. Burge, College of Optical Sciences, The Univ. of Arizona (United States)

SESSION 4 CALIBRATION TECHNIQUES

- 8493 0F **Calibrating the sag due to gravity of horizontal interferometer reference flats (Invited Paper)** [8493-14]
J. Burke, CSIRO (Australia) and Bremer Institut für angewandte Strahltechnik GmbH (Germany); U. Griesmann, National Institute of Standards and Technology (United States)
- 8493 0G **Absolute interferometric tests of spherical surfaces based on rotational and translational shears** [8493-15]
J. A. Soons, U. Griesmann, National Institute of Standards and Technology (United States)
- 8493 0H **Self calibration for slope-dependent errors in optical profilometry by using the random ball test** [8493-16]
Y. Zhou, The Univ. of North Carolina at Charlotte (United States); Y.-S. Ghim, Korea Research Institute of Standards and Science (Korea, Republic of); A. Davies, The Univ. of North Carolina at Charlotte (United States)

SESSION 5 FRINGE ANALYSIS

- 8493 0I **How to remove fundamental-frequency phase errors from phase-shifting results** [8493-19]
J. Burke, Bremer Institut für angewandte Strahltechnik GmbH (Germany)
- 8493 0J **Error estimation of phase detection algorithms and comparison of window functions** [8493-20]
R. Hanayama, The Graduate School for the Creation of New Photonics Industries (Japan);
K. Hibino, National Institute of Advanced Industrial Science and Technology (Japan)

- 8493 OK **Regularized self-tuning phase demodulation for phase-shifting interferometry with arbitrary phase shifts** [8493-21]
O. Medina, J. C. Estrada, M. Servin, Ctr. de Investigaciones en Óptica, A.C. (Mexico)
- 8493 OL **Analyzing of fringe patterns polluted by noise and nonlinearity using S-Transform** [8493-22]
M. Zhong, W. Chen, Sichuan Univ. (China)
- 8493 OM **Sinusoidal wavelength-scanning interferometer for profile measurement of metal surfaces** [8493-23]
O. Sasaki, T. Kurashige, S. Choi, T. Suzuki, Niigata Univ. (Japan)

SESSION 6 UNWRAPPING TECHNIQUES

- 8493 ON **Dynamic four-dimensional microscope system with automated background leveling (Invited Paper)** [8493-24]
G. Goldstein, 4D Technology Corp. (United States) and College of Optical Sciences, The Univ. of Arizona (United States); K. Creath, 4D Technology Corp. (United States), College of Optical Sciences, The Univ. of Arizona (United States), and Optineering (United States)
- 8493 OO **Generalized theory of phase unwrapping: approaches and optimal wavelength selection strategies for multiwavelength interferometric techniques** [8493-25]
K. Falaggis, D. P. Towers, C. E. Towers, Univ. of Leeds (United Kingdom)
- 8493 OP **Recursive linear systems for phase unwrapping** [8493-26]
J. C. Estrada, M. Servin, Ctr. de Investigaciones en Óptica, A.C. (Mexico)
- 8493 OQ **Phase unwrapping fitting local planes to phase gradient** [8493-27]
E. Gonzalez-Ramirez, E. de la Rosa Miranda, Univ. Autónoma de Zacatecas (Mexico); L. R. Berriel-Valdos, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); T. Saucedo Anaya, I. de la Rosa Vargas, M. Araiza Esquivel, Univ. Autónoma de Zacatecas (Mexico)

SESSION 7 SPECULAR AND TRANSLUCENT OBJECT MEASUREMENT

- 8493 OR **Deflectometry challenges interferometry: the competition gets tougher! (Invited Paper)** [8493-28]
C. Faber, E. Olesch, R. Krobot, G. Häusler, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)
- 8493 OS **Optimization of dynamic structured illumination for surface slope measurements** [8493-29]
G. P. Butel, G. A. Smith, J. H. Burge, College of Optical Sciences, The Univ. of Arizona (United States)
- 8493 OT **Recovering shapes of specular objects in motion via normal vector map consistency** [8493-30]
A. Pak, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)
- 8493 OU **Fast error simulation of optical 3D measurements at translucent objects** [8493-31]
P. Lutzke, P. Kühmstedt, G. Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany)

SESSION 8 DIGITAL HOLOGRAPHY

- 8493 0V **Single-shot multiwavelength shape measurements with restricted aperture** [8493-33]
S. Huferath-von Luepke, E. N. Kamau, Th. Kreis, C. von Kopylow, Bremer Institut für angewandte Strahltechnik GmbH (Germany)
- 8493 0W **Instantaneously captured images using multiwavelength digital holography** [8493-34]
J. W. Haus, B. Dapore, N. J. Miller, P. P. Banerjee, G. Nehmetallah, P. Powers, P. McManamon, Univ. of Dayton (United States)
- 8493 0X **Accurate and quantitative phase retrieval methods for a series of defocused images with application to in-line Gabor microscopy** [8493-35]
K. Falaggis, T. Kozacki, M. Jozwik, M. Kujawinska, Warsaw Univ. of Technology (Poland)

SESSION 9 STRAIN AND SHAPE MEASUREMENT

- 8493 0Z **Image quality improvement of an achromatic DSPI interferometer** [8493-37]
M. R. Viotti, A. Albertazzi G. Jr., Univ. Federal de Santa Catarina (Brazil)
- 8493 10 **3D data processing with advanced computer graphics tools** [8493-38]
S. Zhang, L. Ekstrand, T. Grieve, D. J. Eisenmann, L. S. Chumbley, Iowa State Univ. (United States)
- 8493 11 **Analysis of solving the point correspondence problem by trifocal tensor for real-time phase measurement profilometry** [8493-39]
K. Zhong, Z. Li, Y. Shi, C. Wang, Huazhong Univ. of Science and Technology (China)
- 8493 12 **Improve Fourier transform profilometry by locally area modulating squared binary structured pattern** [8493-40]
W. Lohry, S. Zhang, Iowa State Univ. (United States)

POSTER SESSION

- 8493 13 **A real-time adaptive phase-shifting interferometry** [8493-41]
W. Zhao, G. Cao, Beijing Institute of Technology (China)
- 8493 15 **Towards a general theory for MxN pixelated carrier interferometry** [8493-43]
J. M. Padilla, M. Servin, J. C. Estrada, C. A. Gonzalez, Ctr. de Investigaciones en Óptica, A.C. (Mexico)
- 8493 16 **Study of the refractometric stability of an interferometer equipment for gauge block calibration** [8493-44]
J. Diz-Bugarín, B. V. Dorrió, J. Blanco, Univ. de Vigo (Spain); F. J. Yebra, I. Outomuro, M. Otero, J. Rodríguez, Lab. Oficial de Metroloxía de Galicia (Spain); M. Miranda, Univ. de Vigo (Spain); J. L. Valencia, Lab. Oficial de Metroloxía de Galicia (Spain)

- 8493 17 **Fabrication of Mach-Zehnder interferometers with conventional fiber optics in detection applications of micro-displacement and liquids** [8493-46]
M. C. Hernández-Luna, Univ. de Guanajuato (Mexico); J. C. Hernández-García, Ctr. de Investigaciones en Óptica, A.C. (Mexico); J. M. Estudillo-Ayala, R. Rojas-Laguna, Univ. de Guanajuato (Mexico); O. Pottiez, Ctr. de Investigaciones en Óptica, A.C. (Mexico); R. I. Mata-Chávez, E. Alvarado-Mendez, H. J. Estrada-García, J. G. Aviña-Cervantes, Univ. de Guanajuato (Mexico)
- 8493 18 **Evaluation of interferometric patterns of supersonic fluid flows by the differential Fourier transform method** [8493-47]
F. Rodríguez-Lorenzo, ALMEN Technology Ctr. (Spain); B. V. Dorrió, J. Blanco, Univ. de Vigo (Spain)
- 8493 19 **Polynomial fitting model for phase reconstruction: interferograms with high fringe density** [8493-48]
A. Téllez-Quiñones, Instituto Politécnico Nacional (Mexico); D. Malacara-Doblado, J. García-Márquez, Ctr. de Investigaciones en Óptica, A.C. (Mexico)
- 8493 1B **Selection of phase-recovery algorithms for fringe processing in optical measurement of micro-surface** [8493-50]
Y. Zhu, Zhejiang Univ. of Science and Technology (China) and Jilin Univ. (China); W. Pan, Zhejiang Univ. of Science and Technology (China); A. Li, Tongji Univ. (China); Y. Zhi, Shanghai Institute of Optics & Fine Mechanics (China)
- 8493 1C **Digital holographic interferometry applied to mixed-mode fracture analysis** [8493-51]
F. S. de Oliveira, G. N. de Oliveira, L. C. S. Nunes, P. A. M. dos Santos, Univ. Federal Fluminense (Brazil)
- 8493 1D **SCOTS: a useful tool for specifying and testing optics in slope space** [8493-52]
M. Z. Dominguez, J. Armstrong, P. Su, R. E. Parks, J. H. Burge, College of Optical Sciences, The Univ. of Arizona (United States)
- 8493 1E **Precision improving of double beam shadow moiré interferometer by phase shifting interferometry for the stress of flexible substrate** [8493-53]
K.-T. Huang, H.-C. Chen, S.-F. Lin, K.-M. Lin, H.-Y. Syue, National Yunlin Univ. of Science and Technology (Taiwan)
- 8493 1F **Photorefractive moiré like pattern as optical numerical code generator** [8493-54]
G. N. de Oliveira, M. E. de Oliveira, P. A. M. dos Santos, Univ. Federal Fluminense (Brazil)

Author Index

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- 1 On the Fringe
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Optineering (United States) and The University of Arizona (United States)
- 2 Optical Coherence Tomography
Jannick P. Rolland, University of Rochester (United States)
- 3 Spatial Structures and Aberrations
Brent C. Bergner, Spectrum Scientific, Inc. (United States)
- 4 Calibration Techniques
Michael B. North Morris, 4D Technology Corporation (United States)
- 5 Fringe Analysis
Yukitoshi Otani, Utsunomiya University (Japan)
- 6 Unwrapping Techniques
Benito Vazquez Dorrío, Universidade de Vigo (Spain)
- 7 Specular and Translucent Object Measurement
Jan Burke, Bremer Institut für angewandte Strahltechnik GmbH
(Germany)
- 8 Digital Holography
Ulf Griesmann, National Institute of Standards and Technology
(United States)
- 9 Strain and Shape Measurement
Joanna Schmit, Bruker Nano Surfaces Division (United States)

Introduction

We thank SPIE, the program committee, the authors, and everyone attending this sixteenth Interferometry conference. SPIE continues to provide this productive forum for us to exchange ideas and share our latest research in interferometry and related fields. Like students before a big test, authors often find themselves anxious before presenting at a conference: Have I thought of everything? What if someone asks a question I cannot answer? However, these meetings are not exams; rather, they are the equivalent of coming to our colleagues, lab book in hand, and asking "what do you think about this", only on a global scale, involving the worldwide community. These meetings are, in part, about hearing the questions we cannot answer – not yet. In this regard, we are all forever students. From the technical nitty-gritty to the megatrends, we come together to explain what works and discuss what does not, hearing from old friends and making some new ones. We find inspiration and clever ideas to admire and build on; sometimes we discover links we would not have considered by ourselves, and always leave with new ideas and a renewed sense of purpose and enthusiasm.

Interferometry XVI continues the Interferometry series and consists of two complementary conferences, one dedicated to Techniques and Analysis and the other to Applications. This two-part structure reflects the fact that on the one hand there is still a lot of research to do, and on the other hand, the discipline has matured enough to have spawned a large number of techniques that are of vital use to the optics industry. Far from being an exhausted discipline, optics is recognized around the world as being one of the major research disciplines of the future, with new phenomena constantly requiring new metrology.

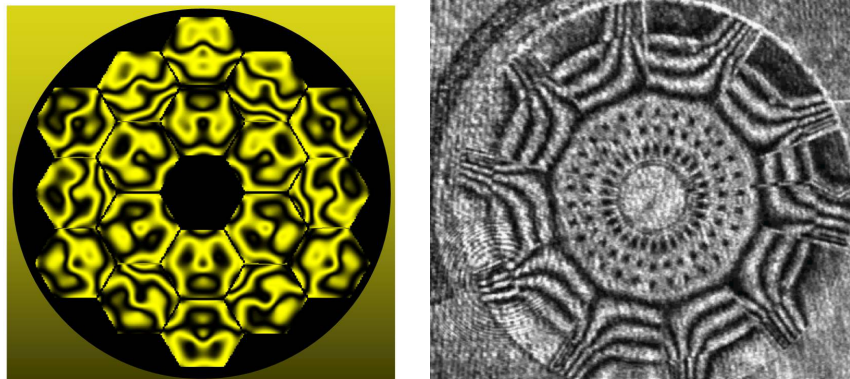
The first conference presents recent developments mostly in fringe analysis, interferometric or otherwise, for measurements of various natural and man-made objects and materials and their parameters. The second conference presents the application of such techniques to a wide range of tasks and systems. The proceedings of the two conferences comprising Interferometry XVI are published in two separate volumes *Interferometry XVI: Techniques and Analysis*, Proceedings of SPIE Vol. 8493, and *Interferometry XVI: Applications*, Proceedings of SPIE Vol. 8494. Although the contributions deal with very recent results and are therefore sometimes preliminary in nature, these proceedings are peer-reviewed to ensure a high scientific standard.

The demand for reliable measurements of increasingly complex devices pushes optical metrology to innovate and develop better techniques. Everywhere we look – from the semiconductor industry and optoelectronics, where devices keep on shrinking, to space sciences, where instruments of unprecedented size are under development and construction, to the biosciences, where the optical materials and detection methods are sometimes difficult to model and understand – we need to see more detail in space and time than we currently can. Incredible optical solutions have been developed in response to these challenges, and amazing metrology has been created to validate them. This process continues as do the challenges.

This conference on Interferometric Techniques and Analysis highlights developments in optical coherence tomography, spatial characterization and its errors, calibration techniques, advanced fringe analysis and phase unwrapping, digital holography and strain and shape measurement. We also have contributions to the metrology of material properties and small-object geometries, and numerous one-of-a-kind solutions for very specific problems, bearing witness to the versatility of light as a measurement tool.

Once again, the authors, from 15 countries and five continents, have brought a large number of inspiring papers to this forum, which we are very pleased to present in this book. It contains 47 papers presented at the SPIE 57th Annual Meeting in San Diego on August 12-16, 2012. Thirty-seven of these papers were presented orally.

During our last conference in 2010, we had a fun time at the Fringe Art competition, choosing our favorite fringe patterns from those brought along by attendees. The favorite fringe pattern, selected by the attendees, was a fringe pattern submitted by Conrad Wells from ITT Exelis Inc., USA. This image shows modeled results for the James Webb Space Telescope wave front test, the unique contours are due to the gravity sag of the primary mirror 18 segments in the optical axis vertical configuration.



The second fringe pattern, selected by the attendees, was a fringe pattern movie submitted by Christophe Gorecki from FEMTO-ST, France. These are Bessel fringes captured for the higher modes of out-of-plane resonant motion of silicon membrane in thin layer excited by PZT. The fringe patterns displayed ranged from everyday observations to intricate phenomena on the microscale. This is testimony to the fact that with a suitably trained (some might say deviant) eye and mind, it is possible to see fringe patterns almost anywhere. Beautiful and interesting images appeal to our human curiosity and our sense of wonder. During the Interferometry XVI conference, we have continued this tradition of celebrating beauty in science, and the favorite fringe pattern will be presented in the Interferometry XVII proceedings.

Until then, may the Fringe be with you.

Joanna Schmit
Katherine Creath
Catherine Towers
Jan Burke