

PROCEEDINGS OF SPIE

Reflection, Scattering, and Diffraction from Surfaces IV

Leonard M. Hanssen
Editor

17–18 August 2014
San Diego, California, United States

Sponsored and Published by
SPIE

Volume 9205

Proceedings of SPIE 0277-786X, V. 9205

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

Reflection, Scattering, and Diffraction from Surfaces IV, edited by Leonard M. Hanssen,
Proc. of SPIE Vol. 9205, 920501 · © 2014 SPIE · CCC code: 0277-786X/14/\$18
doi: 10.1117/12.2084706

Proc. of SPIE Vol. 9205 920501-1

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 *Reflection, Scattering, and Diffraction from Surfaces IV*, edited by Leonard M. Hanssen, Proceedings of SPIE Vol. 9205 (SPIE, Bellingham, WA, 2014) Article CID Number.

ISSN: 0277-786X

ISBN: 9781628412321

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 © 2014, 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/14/\$18.00.

Printed in the United States of America.

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



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

- v Authors
- vii *Conference Committee*
- ix *Radiance and photon noise: Imaging in geometrical optics, physical optics, quantum optics and radiology* (Plenary Paper) [9193-200]
- xxvii *Optical design for consumer products* (Plenary Paper) [9197-201]

SESSION 1 SCATTER INSTRUMENTATION AND MEASUREMENT I

- 9205 02 **Dynamic data driven bidirectional reflectance distribution function measurement system (Invited Paper)** [9205-1]
- 9205 03 **Temperature dependent BRDF facility** [9205-2]

SESSION 2 SCATTER THEORY AND MODELING I

- 9205 04 **Surface-plasmon field controlled quantum-dot light absorption and spontaneous emission** [9205-4]
- 9205 05 **The inversion of incoherent light scattering data to obtain statistical and optical properties of a two-dimensional randomly rough dielectric surface.** [9205-5]
- 9205 06 **Robust categorization of microfacet BRDF models to enable flexible application-specific BRDF adaptation** [9205-6]

SESSION 3 SURFACE PROFILING

- 9205 07 **A sensitive optical probe for surface topography based on an optimized astigmatic method** [9205-7]
- 9205 09 **Study of surface roughness of corroded metals using plastic optical fiber sensor** [9205-9]

SESSION 4 SCATTER INSTRUMENTATION AND MEASUREMENT II

- 9205 0A **Diffusers, properties, and performance in BSDF (Invited Paper)** [9205-10]
- 9205 0B **Near specular scatter analysis method with a new goniophotometer** [9205-11]
- 9205 0C **The low-frequency Raman spectra and nanostructure of As-Se-S and As-Se-Te chalcogenide semiconductors doped by samarium** [9205-12]

SESSION 5 APPLICATIONS

- 9205 0D **Light propagation in phosphor-filled matrices for photovoltaic PL down-shifting (Invited Paper)** [9205-13]
- 9205 0G **Measurement of spatial coherence through the shadow of small obscurations** [9205-33]

SESSION 6 SCATTER THEORY AND MODELING II

- 9205 0I **Modeling stray light from rough surfaces and subsurface scatter (Invited Paper)** [9205-18]
- 9205 0J **The scattering of partially coherent electromagnetic beam illumination from a statistically rough surface modeled as a perfect electrical conductor** [9205-19]
- 9205 0K **Scattering models for range profiling and 2D-3D laser imagery** [9205-20]

SESSION 7 IMAGING METHODS AND APPLICATIONS

- 9205 0L **3D laser imaging for concealed object identification (Invited Paper)** [9205-21]
- 9205 0M **IR-imaging based system for detecting the defects of conductive materials** [9205-22]
- 9205 0N **3D measurement of both front and back surfaces of transparent objects by polarization imaging** [9205-23]
- 9205 0O **Cone beam x-ray luminescence computed tomography reconstruction with a priori anatomical information** [9205-24]

POSTER SESSION

- 9205 0Q **Light scattering by aerosol particles and air in the molecular condensation nuclei (MCN) detector** [9205-25]
- 9205 0S **Intermediate field measurement to characterize the wavefront of high power laser large optics** [9205-27]
- 9205 0T **Investigation of interaction of structured illumination with random scattering media** [9205-28]
- 9205 0U **A Mach-Zehnder interferometer for the fine control of the polarization status of a beam** [9205-29]
- 9205 0V **A multifunctional automated system of 2D laser polarimetry of biological tissues** [9205-30]
- 9205 0W **Transmission of UV/visible light through model human epidermis at varying ambient humidity** [9205-31]
- 9205 0X **Scattering by three-dimensional slit-shape curves** [9205-32]

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.

Airola, Marc B., 03
Alekberov, R. I., 0C
Alonso, Miguel A., 0G
Aubretton, Olivier, 0N
Audo, Frédéric, 0S
Barrett, Harrison H., ix
Basu, Santasri, 0J
Batentschuk, Miroslaw, 0D
Berechet, Ion, 0L
Berechet, Stefan, 0L
Berginc, Gérard, 0K, 0L
Bonaldo, Stefano, 0U
Bouillet, Stéphane, 0S
Brabec, Christoph J., 0D
Brown, Andrea M., 03
Brown, Thomas G., 0G
Butler, Samuel D., 06
Cardimona, Dave A., 04
Caucci, Luca, ix
Chaikina, E. I., 05
Chakrabarti, S., 05
Chang, C. Allen, 0O
Chen, Jian, 07
Chen, Jyh-Cheng, 0O
Chiang, Huihua Kenny, 0O
Chico, Sandrine, 0S
Congdon, Elizabeth A., 03
Corso, Alain Jody, 0U
Daurios, Jérôme, 0S
De los Santos, S. I., 0X
Dong, Jingtao, 07
Drouet, Florence, 0N
Easter, Michelle, 04
Fabritius, Tapio, 0M
Farley, Carlton W., III, 0W
Forberich, Karen, 0D
Freda, Sam, 02
Goryunov, Artem E., 0T
Goshy, John J., 0I
Gumbs, Godfrey, 04
Gupta, Anurag, xxvii
Gür, Bilgehan, 0A
Hahn, Daniel V., 03
Harvey, James E., 0I
Heller, Peter, 0B
Huang, Danhong, 04
Hyde, Milo W., IV, 0J
Isayev, A. I., 0C
Isayeva, G. A., 0C
Jin, Shih-Chun, 0O
Kassu, Aschalew, 0W
Katelevsky, Vadim Y., 0Q
Kuptsov, Vladimir D., 0Q
Laligant, Olivier, 0N
Leppänen, Kimmo, 0M
Lin, Meng-Lung, 0O
Lin, Shawn-Yu, 04
Lin, Syue-Liang, 0O
Lipovšek, Benjamin, 0D
Lo, Pei-An, 0O
Maradudin, A. A., 04, 05
Marciniak, Michael A., 02, 06, 0J
Martinez-Niconoff, G., 0X
Martinez-Vara, P., 0X
Mehoke, Douglas, 03
Mekhtiyeva, S. I., 0C
Meyen, Stephanie, 0B
Munoz-Lopez, J., 0X
Myers, Kyle, ix
Nauyoks, Stephen E., 02
Pachava, Vengalrao, 09
Pavlov, Pavel V., 0T
Pelizzo, Maria Guglielmina, 0U
Petrov, Nikolay V., 0T
Pfisterer, Richard N., 0I
Radchenko, Kostiantyn O., 0V
Raju, M. Esakkimuthu, 09
Ravi, Kumar, 09
Rybin, Evgeniy N., 0Q
Saarela, Juha, 0M
Sadate, Sandra, 0W
Sengupta, Dipankar, 09
Sharma, Anup, 0W
Sharma, Katelynn A., 0G
Simonsen, I., 05
Solodovnyk, Anastasiia, 0D
Spencer, Mark F., 0J
Stern, Edda, 0D
Stolz, Christophe, 0N
Sutter, Florian, 0B
Tessarolo, Enrico, 0U
Thomas, Michael E., 03
Topič, Marko, 0D
Vadakkapattu Canthadai, Badrinath, 09
Valyukhov, Vladimir P., 0Q
van Brug, Hedser, 0A
Vela, Elizabeth, 0A
Wood, James K., 0G

Wu, Zhouling, 07
Xiao, Gang, 07
Xu, Man, 0A
Zabolotna, Natalia I., 0V
Zhang, Xiang, 04
Zuppella, Paola, 0U

Conference Committee

Program Track Chair

Katherine Creath, Optineering (United States) and The University of Arizona (United States)

Conference Chair

Leonard M. Hanssen, National Institute of Standards and Technology (United States)

Conference Program Committee

G rard Berginc, Thales Optronique S.A.S. (France)
Andrea M. Brown, Johns Hopkins University Applied Physics Laboratory (United States)
Aristide C. Dogariu, CREOL, The College of Optics and Photonics, University of Central Florida (United States)
John C. Fleming, Ball Aerospace & Technologies Corporation (United States)
Hsueh-Mei W. Graham, Lockheed Martin Aeronautics Company (United States)
Brian G. Hoover, Advanced Optical Technologies (United States)
Danhong Huang, Air Force Research Laboratory (United States)
Alexei A. Maradudin, University of California, Irvine (United States)
Michael A. Marciniak, Air Force Institute of Technology (United States)
Richard N. Pfisterer, Photon Engineering LLC (United States)
Shouhong Tang, KLA-Tencor Corporation (United States)
Benjamin K. Tsai, National Institute of Standards and Technology (United States)

Session Chairs

- 1 Scatter Instrumentation and Measurement I
Andrea M. Brown, Johns Hopkins University Applied Physics Laboratory (United States)
- 2 Scatter Theory and Modeling I
G rard Berginc, Thales Optronique S.A.S. (France)
- 3 Surface Profiling
John C. Fleming, Ball Aerospace & Technologies Corporation (United States)

- 4 Scatter Instrumentation and Measurement II
Michael A. Marciniak, Air Force Institute of Technology (United States)
- 5 Applications
Hsueh-Mei W. Graham, Lockheed Martin Aeronautics Company
(United States)
- 6 Scatter Theory and Modeling II
Danhong Huang, Air Force Research Laboratory (United States)
- 7 Imaging Methods and Applications
Richard N. Pfisterer, Photon Engineering LLC (United States)