

PROCEEDINGS OF SPIE

***Enabling Photonics Technologies
for Defense, Security, and
Aerospace Applications IV***

**Michael J. Hayduk
Peter J. Delfyett, Jr.
Andrew R. Pirich
Eric J. Donkor**
Editors

**17–18 March 2008
Orlando, Florida, USA**

Sponsored and Published by
SPIE

Volume 6975

Proceedings of SPIE, 0277-786X, v. 6975

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 *Enabling Photonics Technologies for Defense, Security, and Aerospace Applications IV*, edited by Michael J. Hayduk, Peter J. Delfyett, Jr., Andrew R. Pirich, Eric J. Donkor, Proceedings of SPIE Vol. 6975 (SPIE, Bellingham, WA, 2008) Article CID Number.

ISSN 0277-786X
ISBN 9780819471666

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 © 2008, 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/08/\$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 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 *Conference Committee*

SESSION 1 PHOTONIC SYSTEMS AND SUBSYSTEMS

- 6975 02 **Managing thermal emission: plasmon/photon coupling using diffractive optics technology (Invited Paper)** [6975-01]
S. A. Kemme, A. A. Cruz-Cabrera, D. W. Peters, A. R. Ellis, R. D. Briggs, Sandia National Labs. (USA); T. R. Carter, S. Samora, L&M Technologies (USA)
- 6975 03 **A new electro-optic waveguide architecture and the unprecedented devices it enables** [6975-02]
S. R. Davis, S. D. Rommel, G. Farca, M. H. Anderson, Vescent Photonics, Inc. (USA)
- 6975 04 **Experimental results for a photonic time reversal processor for the adaptive control of an ultra wideband phased array antenna** [6975-03]
H. Zmuda, Univ. of Florida (USA); M. Fanto, T. McEwen, Air Force Research Lab. (USA)
- 6975 05 **Demonstration of an all-optical flip-flop using a Lyot filter and a semiconductor optical amplifier arrangement** [6975-04]
C. Emmons, P. Kumavor, E. Donkor, Univ. of Connecticut (USA)
- 6975 06 **Photonicly enabled RF spectrum analyzer demonstration** [6975-05]
E. T. Kunkee, K. Tsai, A. D. Smith, T. Jung, L. Lembo, R. Davis, Northrop Grumman Space Technology (USA); W. R. Babbitt, R. Krishna-Mohan, Montana State Univ., Bozeman (USA); Z. Cole, Scientific Materials (USA); K. D. Merkel, S2 Corp. (USA); K. H. Wagner, Univ. of Colorado, Boulder (USA)
- 6975 07 **Improved technique for high precision FSR measurement** [6975-06]
I. Ozdur, S. Ozharar, F. Quinlan, S. Gee, P. Delfyett, College of Optics and Photonics, Univ. of Central Florida (USA)

SESSION 2 OPTICAL COMMUNICATIONS

- 6975 08 **Free-space, laser-based data transmission: satellite communication as a technology driver for the development of fast, reliable terrestrial data networks** [6975-07]
M. Gerken, G. Luichtel, Carl Zeiss Optronics GmbH (Germany)
- 6975 0A **Security of reconfigurable FSO mesh networks and application to disaster areas** [6975-09]
S. V. Kartalopoulos, Univ. of Oklahoma (USA)
- 6975 0C **Performance of an optical identification and interrogation system** [6975-11]
A. Venugopalan, A. K. Ghosh, P. Verma, S. Cheng, Univ. of Oklahoma, Tulsa (USA)

SESSION 3 KEYNOTE PRESENTATION

- 6975 0D **Optically compressed image sensing using random aperture coding (Keynote Paper)** [6975-13]
A. Stern, Y. Rivenson, Ben Gurion Univ. of the Negev (Israel); B. Javidi, Univ. of Connecticut (USA)

SESSION 4 PHOTONIC ANALOG TO DIGITAL CONVERTERS

- 6975 0E **Optically-synchronized encoder and multiplexer scheme for interleaved photonics analog-to-digital conversion** [6975-14]
C. Villa, P. Kumavor, E. Donkor, Univ. of Connecticut (USA)
- 6975 0F **A photonic recirculating delay line for analog-to-digital conversion and other applications** [6975-15]
H. Zmuda, Univ. of Florida (USA); M. Fanto, T. McEwen, Air Force Research Lab. Photonics Ctr. (USA); J. Pawloski, State Univ. of New York (USA); K. Norelli, Syracuse Univ. (USA)
- 6975 0G **High speed optoelectronics polyphase scheme for sampling and demultiplexing RF analog signals** [6975-16]
C. Villa, P. Kumavor, A. Feldstein, J. Hernandez, E. Donkor, Univ. of Connecticut (USA)

SESSION 5 LASERS AND EMITTERS

- 6975 0H **Interband optical pulse injection locking of quantum dot mode-locked semiconductor laser** [6975-17]
J. Kim, P. J. Delfyett, College of Optics and Photonics, Univ. of Central Florida (USA)
- 6975 0J **Optical frequency comb generation by direct modulation of CW light** [6975-19]
S. Ozharar, I. Ozdur, F. Quinlan, P. J. Delfyett, College of Optics and Photonics, Univ. of Central Florida (USA)
- 6975 0K **Low noise high power ultra-stable diode pumped Er-Yb phosphate glass laser** [6975-20]
R. van Leeuwen, B. Xu, L. S. Watkins, Q. Wang, C. Ghosh, Princeton Optronics, Inc. (USA)
- 6975 0L **Linearly chirped nanosecond stretched pulses from an extreme chirped pulse semiconductor mode-locked oscillator** [6975-21]
S. Lee, D. Mandridis, P. J. Delfyett, Jr., CREOL, Univ. of Central Florida (USA)

SESSION 6 RF LINKS AND COMPONENTS

- 6975 0N **Characterization of an electroabsorption modulator design with high-dynamic range for broadband analog applications** [6975-23]
R. Bussjager, R. Erdmann, R. Michalak, P. Cook, B. McKeon, Air Force Research Lab. (USA); H. Zmuda, Univ. of Florida (USA); S. Tan, N. Stoffel, C. Schick, T. McDonald, Infotonics Technology Ctr. (USA); P. Yu, I. Shubin, X. Xie, Univ. of California, San Diego (USA)

6975 0O **Design and development of a package for a diluted waveguide electro-absorption modulator (Invited Paper)** [6975-24]
S. Tan, N. Stoffel, C. Shick, T. McDonald, A. Whitbeck, Infotonics Technology Ctr. (USA); R. Erdmann, R. J. Michalak, R. Bussjager, Air Force Research Lab. (USA); I. Shubin, P. K. L. Yu, Univ. of California at San Diego (USA)

6975 0Q **Measurement of SFDR and noise in EDF amplified analog RF links using all-optical down-conversion and balanced receivers** [6975-26]
C. Middleton, M. Borbath, J. Wyatt, R. DeSalvo, Harris Corp. (USA)

6975 0R **High-power handling, ultra-fast, GRIN lens-coupled photodetectors** [6975-27]
A. Joshi, D. Becker, S. Datta, Discovery Semiconductors, Inc. (USA)

POSTER SESSION

6975 0S **Picosecond standoff multiphoton detection of gas phase species: initial results** [6975-12]
J. B. Johnson, K. Lyon, W. D. Murry, D. R. Britton, Arkansas State Univ. (USA); M. J. Johnson, Brigham Young Univ. (USA)

Author Index

Conference Committee

Symposium Chair

Larry B. Stotts, Defense Advanced Research Projects Agency (USA)

Symposium Cochair

Ray O. Johnson, Lockheed Martin Corporation (USA)

Program Track Chair

Andrew R. Pirich, ACP Consulting (USA)

Conference Chairs

Michael J. Hayduk, Air Force Research Laboratory (USA)

Peter J. Delfyett, Jr., College of Optics and Photonics, University of Central Florida (USA)

Conference Cochairs

Andrew R. Pirich, ACP Consulting (USA)

Eric J. Donkor, University of Connecticut (USA)

Program Committee

John P. Barrios, Air Force Research Laboratory (USA)

H. John Caulfield, Diversified Research Corporation (USA)

Reinhard K. Erdmann, Air Force Research Laboratory (USA)

Michael L. Fanto, Air Force Research Laboratory (USA)

Bahram Javidi, University of Connecticut (USA)

Robert L. Kaminski, Air Force Research Laboratory (USA)

Guifang Li, College of Optics and Photonics, University of Central Florida (USA)

Joseph M. Osman, Air Force Research Laboratory (USA)

Monte Ross, FastMetrix, Inc. (USA)

Edward W. Taylor, International Photonics Consultants, Inc. (USA)

Henry Zmuda, University of Florida (USA)

Session Chairs

- 1 Photonic Systems and Subsystems
Andrew R. Pirich, ACP Consulting (USA)
Guifang Li, College of Optics and Photonics, University of Central Florida (USA)
- 2 Optical Communications
Eric J. Donkor, University of Connecticut (USA)
Joseph M. Osman, Air Force Research Laboratory (USA)
- 3 Keynote Presentation
Michael J. Hayduk, Air Force Research Laboratory (USA)
Peter J. Delfyett, Jr., College of Optics and Photonics, University of Central Florida (USA)
- 4 Photonic Analog to Digital Converters
Michael J. Hayduk, Air Force Research Laboratory (USA)
Peter J. Delfyett, Jr., College of Optics and Photonics, University of Central Florida (USA)
- 5 Lasers and Emitters
Michael L. Fanto, Air Force Research Laboratory (USA)
Eric J. Donkor, University of Connecticut (USA)
- 6 RF Links and Components
Peter J. Delfyett, Jr., College of Optics and Photonics, University of Central Florida (USA)
Andrew R. Pirich, ACP Consulting (USA)