

PROCEEDINGS OF SPIE

Optics and Photonics in Global Homeland Security IV

Craig S. Halvorson

Daniel Lehrfeld

Theodore T. Saito

Editors

17–20 March 2008

Orlando, Florida, USA

Sponsored and Published by
SPIE

Volume 6945

Proceedings of SPIE, 0277-786X, v. 6945

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 *Optics and Photonics in Global Homeland Security IV*, edited by Craig S. Halvorson, Daniel Lehrfeld, Theodore T. Saito, Proceedings of SPIE Vol. 6945 (SPIE, Bellingham, WA, 2008) Article CID Number.

ISSN 0277-786X
ISBN 9780819471369

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

ix Conference Committee

SESSION 1 RADIATION DETECTION

- 6945 03 **Iodine based compound semiconductors for room temperature gamma-ray spectroscopy [6945-02]**
A. T. Lintereur, W. Qiu, J. C. Nino, J. E. Baciak, Univ. of Florida (USA)
- 6945 04 **An equivalent n-source for WG²³³Pu derived from a spectrum-shifted PuBe source [6945-03]**
G. Ghita, G. Sjoden, J. Baciak, S. Walker, S. Cornelison, Univ. of Florida (USA)
- 6945 06 **A new integrated neutron/gamma radioisotope identification device evaluated under mixed radiation fields [6945-05]**
A. Ivan, B. A. Clothier, D. B. McDevitt, GE Global Research (USA); J. Williams, GE Energy (USA)
- 6945 07 **Improved plutonium identification and characterization results with NaI(Tl) detector using ASEDRa [6945-06]**
R. Detwiler, G. Sjoden, J. Baciak, E. LaVigne, Univ. of Florida (USA)
- 6945 08 **³He neutron detector design for active detection of cargo containers [6945-07]**
D. B. McDevitt, J. W. Eberhard, S. Zelakiewicz, A. Maschinot, GE Global Research Lab. (USA)
- 6945 09 **Development and performance of the Fast Neutron Imaging Telescope for SNM detection [6945-08]**
J. M. Ryan, U. Bravar, Univ. of New Hampshire (USA); E. O. Flückiger, Univ. of Bern (Switzerland); J. R. Macri, M. L. McConnell, Univ. of New Hampshire (USA); B. Pirard, Univ. of Bern (Switzerland); R. S. Woolf, Univ. of New Hampshire (USA)

SESSION 2 BIO-CHEM COUNTERMEASURES I

- 6945 0C **Point detection of bacterial and viral pathogens using oral samples [6945-10]**
D. Malamud, New York Univ. School of Medicine (USA)
- 6945 0D **Utility of point of care test devices for infectious disease testing of blood and oral fluid and application to rapid testing in the field [6945-11]**
S. R. Lee, K. W. Kardos, G. D. Yearwood, G. B. Guillou, L. A. Kurtz, V. K. Mokkapati, OraSure Technologies, Inc. (USA)

SESSION 3 BIO-CHEM COUNTERMEASURES II

- 6945 0F **New technology for early detection of health threats [6945-13]**
Š. O. Southern, G. W. Lilienthal, Gaia Medical Institute (USA)

- 6945 OH **Handheld and portable test systems for immunodiagnostics, nucleic acid detection and more** [6945-15]
K. Faulstich, K. Haberstroh, R. Gruler, M. Eberhard, T. Wiest, D. Lentzsch, ESE GmbH (Germany)
- 6945 OI **Wide area restoration following biological contamination** [6945-16]
L. Yang, Sandia National Labs. (USA); W. Hibbard, Lawrence Livermore National Lab. (USA); D. Edwards, D. Franco, J. Fruetel, M. Tucker, W. Einfeld, R. Knowlton, G. Brown, J. Brockmann, Sandia National Labs. (USA); R. Greenwalt, R. Miles, E. Raber, T. Carlsen, P. Krauter, M. Dillon, D. MacQueen, T. Intrepido, B. Hoppes, W. Wilson, S. Mancieri, Lawrence Livermore National Lab. (USA)

SESSION 4 BIO-CHEM COUNTERMEASURES III

- 6945 OM **Bioluminescent bioreporter assays for targeted detection of chemical and biological agents** [6945-20]
S. Ripp, P. Jegier, C. Johnson, S. Moser, S. Islam, G. Sayler, Univ. of Tennessee (USA)
- 6945 ON **Considerations in detecting CDC select agents under field conditions** [6945-21]
C. Spinelli, The Boeing Co. (USA); S. Soelberg, Univ. of Washington (USA); N. Swanson, Seattle Sensor Systems, Inc. (USA); C. Furlong, Univ. of Washington (USA); P. Baker, Seattle Sensor Systems, Inc. (USA)
- 6945 OQ **Self-assembled quantum dot-bioconjugates: characterization and use for sensing proteolytic activity** [6945-24]
I. L. Medintz, T. Pons, K. E. Sapsford, U.S. Naval Research Lab. (USA); P. E. Dawson, The Scripps Research Institute (USA); H. Mattoucci, U.S. Naval Research Lab. (USA)
- 6945 OR **Analysis of flow-cytometer scattering and fluorescence data to identify particle mixtures** [6945-25]
T. A. Reichardt, S. E. Bisson, R. W. Crocker, T. J. Kulp, Sandia National Labs. (USA)
- 6945 OS **Confirmatory measurement channels for LIF-based bioaerosol instrumentation** [6945-26]
S. E. Bisson, R. W. Crocker, T. J. Kulp, T. A. Reichardt, Sandia National Labs. (USA); P. T. A. Reilly, W. B. Whitten, Oak Ridge National Lab. (USA)

SESSION 5 MARITIME DOMAIN AWARENESS

- 6945 OU **Enhanced ship detection from overhead imagery** [6945-63]
H. Buck, E. Sharghi, C. Guillas, J. Stastny, W. Morgart, B. Schalcosky, SPAWAR Systems Ctr. (USA); K. Pifko, Univ. of Pennsylvania (USA)

SESSION 6 MARITIME SECURITY

- 6945 OV **Small maritime target detection through false color fusion** [6945-27]
A. Toet, TNO Human Factors (Netherlands); T. Wu, Jiangsu Univ. of Science and Technology (China)

- 6945 0W **Anomaly detection in the maritime domain** [6945-28]
J. Roy, Defence R&D Canada (Canada)
- 6945 0X **Comparing a MWIR and LWIR polarimetric imaging for surface swimmer detection** [6945-29]
J. S. Harchanko, L. Pezzaniti, D. Chenault, G. Eades, Polaris Sensor Technologies, Inc. (USA)
- 6945 0Z **Flight test capabilities for real-time multiple target detection and tracking for airborne surveillance and maritime domain awareness** [6945-31]
B. A. Gorin, A. Waxman, BAE Systems (USA)
- 6945 10 **Evaluation of information visualization approaches for an enhanced recognized maritime picture** [6945-32]
A. Bouchard, A.-L. S. Lapinski, J. Lavoie, J. Roy, Defence R&D Canada (Canada)
- 6945 11 **Automatic sensor management: challenges and solutions** [6945-33]
T. van Valkenburg-van Haarst, CAMS-Force Vision (Netherlands) and Univ. of Amsterdam (Netherlands); W. van Norden, CAMS-Force Vision (Netherlands) and Delft Univ. of Technology (Netherlands); F. Bolderheij, CAMS-Force Vision (Netherlands)
- 6945 12 **SeaSpider: automated information gathering on vessel movements in support of marine intelligence, surveillance, and reconnaissance** [6945-34]
S. Tatar, Bilkent Univ. (Turkey); D. M. F. Chapman, Defence R&D Canada (Canada)
- 6945 13 **Passive acoustic threat detection in estuarine environments** [6945-35]
B. Borowski, A. Sutin, H.-S. Roh, B. Bunin, Stevens Institute of Technology (USA)
- 6945 14 **Fusion of acoustic measurements with video surveillance for estuarine threat detection** [6945-36]
B. Bunin, A. Sutin, G. Kamberov, H.-S. Roh, B. Luczynski, M. Burlick, Stevens Institute of Technology (USA)
- 6945 15 **Variability of SCUBA diver's acoustic emission** [6945-37]
D. M. Donskoy, N. A. Sedunov, A. N. Sedunov, M. A. Tsionskiy, Stevens Institute of Technology (USA)

SESSION 7 EXPLOSIVES DETECTION

- 6945 16 **X-ray backscatter imaging (Invited Paper)** [6945-38]
D.-C. Dinca, J. R. Schubert, J. Callerame, American Science and Engineering, Inc. (USA)
- 6945 17 **Differential spectroscopic imaging of particulate explosives residue** [6945-39]
B. E. Bernacki, N. Hô, Pacific Northwest National Lab. (USA)
- 6945 1A **High efficiency angular selective detection of thermal and cold neutrons** [6945-41]
A. S. Tremsin, J. B. McPhate, J. V. Vallerga, O. H. W. Siegmund, Univ. of California, Berkeley (USA); W. B. Feller, Nova Scientific, Inc. (USA); L. Crow, R. G. Cooper, Oak Ridge National Lab. (USA)
- 6945 1B **Spectral signatures for volatile impurities in TNT and RDX based explosives** [6945-42]
T. Osborn, S. Kaimal, W. Burns, A. R. Ford, S. W. Reeve, Arkansas State Univ. (USA)

SESSION 8 TRANSPORTATION SECURITY

- 6945 1H **Detection of security relevant substances within the cooperative project SAFE XUV** [6945-48]
E. Schramm, Helmholtz Zentrum Muenchen (Germany) and Univ. of Augsburg (Germany); S. Bormann, Max Planck Institute for Chemistry (Germany); J. Curtius, Univ. of Mainz (Germany); A. Goertler, Coherent GmbH (Germany); T. Heindl, Technische Univ. Muenchen (Germany); A. Kuerten, Helmholtz Zentrum Muenchen (Germany) and Max Planck Institute for Chemistry (Germany); A. McNeish, Smiths Heimann GmbH (Germany); S. Mitschke, Helmholtz Zentrum Muenchen (Germany); A. Morozov, Technische Univ. Muenchen (Germany); F. Muehlberger, Helmholtz Zentrum Muenchen (Germany); M. Puetz, Federal Criminal Police Office (Germany); G. Reichardt, BESSY GmbH (Germany); H. Ries, P. Schall, Smiths Heimann GmbH (Germany); R. Schulte-Ladbeck, Federal Criminal Police Office (Germany); R. Schultze, Optimare GmbH (Germany); M. Sklorz, Helmholtz Zentrum Muenchen (Germany); R. Trebbe, Federal Office of Civil Protection and Disaster Assistance (Germany); A. Ulrich, Technische Univ. Muenchen (Germany); J. Wieser, Coherent GmbH (Germany); R. Zimmermann, Helmholtz Zentrum Muenchen (Germany) and Univ. of Augsburg (Germany)

SESSION 9 WATER SECURITY

- 6945 1I **Requirements of biological detection technologies by municipal water laboratories** [6945-49]
T. A. Spain, Univ. of South Florida (USA)
- 6945 1K **A true real-time, on-line security system for waterborne pathogen surveillance** [6945-51]
J. A. Adams, D. L. McCarty, JMAR Technologies, Inc. (USA)

SESSION 10 BORDER SECURITY

- 6945 1L **Diffraction-based optical sensor detection system for capture-restricted environments** [6945-52]
R. M. Khandekar, V. V. Nikulin, SUNY, Binghamton (USA)
- 6945 1M **Rapid 3D measurement of human faces for biometric application by digital fringe projection with digital light projection (DLP®)** [6945-53]
C. Benderoth, GFMesstechnik GmbH (Germany); R. L. Bell, GFM-3D-Metrology USA, Inc. (USA); G. Frankowski, GFMesstechnik GmbH (Germany)
- 6945 1N **Development of UV image intensifier tube with GaN photocathode** [6945-54]
I. Mizuno, T. Nihashi, T. Nagai, M. Niigaki, Y. Shimizu, K. Shimano, K. Katoh, T. Ihara, K. Okano, M. Matsumoto, M. Tachino, Hamamatsu Photonics K.K. (Japan)

POSTER SESSION

- 6945 1O **Detection of residual traces of explosives by surface enhanced Raman scattering using gold coated substrates produced by nanospheres imprint technique** [6945-55]
F. A. Calzzani, Jr., R. Sileschi, A. Kassu, J. M. Taguenang, A. Chowdhury, A. Sharma, Alabama A&M Univ. (USA); P. B. Ruffin, C. Brantley, E. Edwards, U.S. Army RDECOM (USA)

- 6945 1P **Two step signal processing of optical fiber mesh for intruder detection** [6945-56]
I.-B. Kwon, D.-C. Seo, C.-Y. Kim, D.-J. Yoon, Korea Research Institute of Standards and Science (South Korea)
- 6945 1Q **Nuclear material detection techniques** [6945-57]
J. F. Christian, R. Sia, P. Dokhale, I. Shestakova, V. Nagarkar, K. Shah, E. B. Johnson, C. J. Stapels, Radiation Monitoring Devices, Inc. (USA); J. M. Ryan, J. Macri, U. Bravar, Univ. of New Hampshire (USA); K.-N. Leung, Lawrence Berkeley National Lab. (USA); M. R. Squillante, Radiation Monitoring Devices, Inc. (USA)
- 6945 1R **Carbosilane polymers with hydrogen bond acidic functionalization for chemical preconcentrator applications** [6945-58]
D. L. Simonson, R. A. McGill, B. A. Higgins, U.S. Naval Research Lab. (USA)
- 6945 1S **Spectral signatures for RDX-based explosives in the 3 micron region** [6945-59]
T. Osborn, S. Kaimal, S. W. Reeve, W. Burns, Arkansas State Univ. (USA)
- 6945 1T **neu-VISION: an explosives detection system for transportation security** [6945-61]
K. Warman, D. Penn, Applied Signal Technology, Inc. (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

Edward M. Carapezza, University of Connecticut (USA) and Defense Advanced Research Projects Agency (USA)

Conference Chairs

Craig S. Halvorson, Lawrence Livermore National Laboratory (USA)

Daniel Lehrfeld, Photonic Products Group, Inc. (USA)

Theodore T. Saito, Lawrence Livermore National Laboratory (USA)

Program Committee

Michael J. DeWeert, BAE Systems (USA)

Refael Gatt, Global Security Devices (Israel)

Jeffrey S. Gordon, GE Global Research (USA)

Susan F. Hallowell, Transportation Security Laboratory (USA)

Dan J. Kroll, Hach Company, Inc. (USA)

Han Q. Le, University of Houston (USA)

Ashok K. Sood, Magnolia Optical Technologies, Inc. (USA)

Sárká O. Southern, Gaia Medical Institute (USA)

Session Chairs

- 1 Radiation Detection

Jeffrey S. Gordon, GE Global Research (USA)

- 2 Bio-chem Countermeasures I

Sárká O. Southern, Gaia Medical Institute (USA)

- 3 Bio-chem Countermeasures II

Sárká O. Southern, Gaia Medical Institute (USA)

- 4 Bio-chem Countermeasures III
Sárká O. Southern, Gaia Medical Institute (USA)
- 5 Maritime Domain Awareness
Chung-Hye Read, National Geospatial-Intelligence Agency (USA)
- 6 Maritime Security
Michael J. DeWeert, BAE Systems (USA)
- 7 Explosives Detection
Refael Gatt, Global Security Devices (Israel)
- 8 Transportation Security
Daniel Lehrfeld, Photonic Products Group, Inc. (USA)
- 9 Water Security
Craig S. Halvorson, Lawrence Livermore National Laboratory (USA)
- 10 Border Security
Ashok K. Sood, Magnolia Optical Technologies, Inc. (USA)