PROCEEDINGS OF SPIE

Penetrating Radiation Systems and Applications XIV

Gary P. Grim H. Bradford Barber Editors

28 August 2013 San Diego, California, United States

Sponsored and Published by SPIE

Volume 8854

Proceedings of SPIE 0277-786-786X, V.8854

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

Penetrating Radiation Systems and Applications XIV, edited by Gary P. Grim, H. Bradford Barber, Proc. of SPIE Vol. 8854, 885401 · © 2013 SPIE · CCC code: 0277-786X/13/\$18 doi: 10.1117/12.2045920

Proc. of SPIE Vol. 8854 885401-1

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 *Penetrating Radiation Systems and Applications XIV*, edited by Gary P. Grim, H. Bradford Barber, Proceedings of SPIE Vol. 8854 (SPIE, Bellingham, WA, 2013) Article CID Number.

ISSN: 0277-786X ISBN: 9780819497048

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.



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 Conference Committee

SESSION 1 NEW SCINTILLATORS

- 8854 02 **Dual gamma/neutron directional elpasolite detector (Invited Paper)** [8854-1] P. Guss, S. Mukhopadhyay, National Security Technologies, LLC (United States)
- 8854 05 Impact of fano factor on position and energy estimation in scintillation detectors [8854-18]
 V. Bora, H. H. Barrett, College of Optical Sciences, The Univ. of Arizona (United States);
 A. K. Jha, Johns Hopkins Medical Institutions (United States); E. Clarkson, College of Optical Sciences, The Univ. of Arizona (United States)

Studies on Ca²⁺-doped CeBr₃ scintillating materials [8854-4] P. Guss, National Security Technologies Inc., LLC (United States); M. E. Foster, B. M. Wong, F. P. Doty, Sandia National Labs. (United States); K. Shah, M. R. Squillante, U. Shirwadkar, R. Hawrami, J. Tower, Radiation Monitoring Devices, Inc. (United States); D. Yuan, National Security Technologies Inc., LLC (United States)

SESSION 2 SYSTEMS AND ANALYSIS

- Real-time active cosmic neutron background reduction methods (Invited Paper) [8854-6]
 S. Mukhopadhyay, R. Maurer, R. Wolff, S. Mitchell, P. Guss, National Security Technologies Inc., LLC (United States)
- 8854 09 Preparing for the 100-megapixel detector: reconstructing a multi-terabyte computed-tomography dataset [8854-7]
 L. J. Orr, E. S. Jimenez, Sandia National Labs. (United States)
- Rethinking the union of computed tomography reconstruction and GPGPU computing [8854-8]
 E. S. Jimenez, L. J. Orr, Sandia National Labs. (United States)

SESSION 3 DETECTORS FOR ICF: JOINT SESSION WITH CONFERENCES 8850 AND 8854

8854 OF Testing of a gamma ray imaging system at Omega [8854-12]
 D. A. Lemieux, Los Alamos National Lab. (United States) and The Univ. of Arizona (United States); H. B. Barber, The Univ. of Arizona (United States); G. P. Grim, D. D. Clark, C. R. Danly, R. Aragonez, J. Griego, V. Fatherley, Los Alamos National Lab. (United States); D. Fastje, The Univ. of Arizona (United States)

The 27.3 meter neutron time-of-flight system for the National Ignition Facility [8854-13]
G. P. Grim, G. L. Morgan, R. Aragonez, T. N. Archuleta, Los Alamos National Lab. (United States); D. E. Bower, Lawrence Livermore National Lab. (United States); C. R. Danly, Los Alamos National Lab. (United States); O. B. Drury, J. M. Dzenitis, Lawrence Livermore National Lab. (United States); V. E. Fatherley, Los Alamos National Lab. (United States); B. Felker, D. N. Fittinghoff, Lawrence Livermore National Lab. (United States); N. Guler, F. E. Merrill, J. A. Oertel, C. H. Wilde, M. D. Wilke, Los Alamos National Lab. (United States)

SESSION 4 OTHER APPLICATIONS

- 8854 0H Penetrating radiation: applications at Los Alamos National Laboratory (Invited Paper) [8854-14]
 S. Watson, J. Hunter, C. Morris, Los Alamos National Lab. (United States)
- 8854 0J Preliminary investigation fo the non-linear response of image intensifiers used for gamma-ray imaging [8854-16]
 D. Fastje, H. B. Barber, V. Bora, The Univ. of Arizona (United States); D. Lemieux, The Univ. of

Arizona (United States) and Los Alamos National Lab. (United States); B. Miller, College of Optical Sciences, The Univ. of Arizona (United States) and Pacific Northwest National Lab. (United States); G. P. Grim, Los Alamos National Lab. (United States)

Author Index

Conference Committee

Program Track Chair

Carolyn A. MacDonald, University at Albany (United States)

Conference Chairs

Gary P. Grim, Los Alamos National Laboratory (United States) H. Bradford Barber, College of Optical Sciences, The University of Arizona (United States)

Conference Program Committee

Patrick Feng, Sandia National Laboratories, California (United States)
Paul Guss, National Security Technologies, LLC (United States)
Khalid M. Hattar, Sandia National Laboratories (United States)
Ralph B. James, Brookhaven National Laboratory (United States)
Edward Steven Jimenez, Sandia National Laboratories (United States)
Will E. Johns, Vanderbilt University (United States)
Michael J. King, Rapiscan Systems Laboratories (United States)
Edward A. McKigney, Los Alamos National Laboratory (United States)
Wondwosen Mengesha, Physical Optics Corporation (United States)
Frank Merrill, Los Alamos National Laboratory (United States)
Michael R. Squillante, Radiation Monitoring Devices, Inc. (United States)

Session Chairs

- 1 New Scintillators
 - H. Bradford Barber, College of Optical Sciences, The University of Arizona (United States)
- 2 Systems and Analysis Daniel Lemieux, College of Optical Sciences, The University of Arizona (United States)
- 3 Detectors for ICF: Joint Session with Conferences 8850 and 8854 Edward S. Jimenez, Sandia National Laboratories (United States)
- 4 Other Applications Gary P. Grim, Los Alamos National Laboratory (United States)