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Hard X-Ray, Gamma-Ray, and Neutron Detector Physics XIV

**Ralph B. James
Arnold Burger
Larry A. Franks
Michael Fiederle**
Editors

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Contents

ix	Conference Committee
xiii	Introduction

SESSION 1 SCINTILLATORS I

- 8507 04 **Next generation CMOS SSPMs for scintillation detection applications** [8507-3]
X. J. Chen, E. B. Johnson, C. J. Stapels, C. Whitney, J. F. Christian, Radiation Monitoring Devices Inc. (United States)
- 8507 05 **Electronic structure, energy transport, and optical properties of halide scintillators** [8507-4]
M.-H. Du, K. Biswas, D. J. Singh, Oak Ridge National Lab. (United States)

SESSION 2 CZT I

- 8507 07 **Improving the growth of CZT crystals for radiation detectors: a modeling perspective (Invited Paper)** [8507-7]
J. J. Derby, N. Zhang, A. Yeckel, Univ. of Minnesota (United States)

SESSION 3 DETECTOR MATERIALS I

- 8507 0C **Assessment of 4H-SiC epitaxial layers and high resistivity bulk crystals for radiation detectors (Invited Paper)** [8507-12]
K. C. Mandal, P. G. Muzykov, S. K. Chaudhuri, Univ. of South Carolina (United States); J. R. Terry, Los Alamos National Lab. (United States)
- 8507 0F **Mercury and antimony chalcogenide semiconductors as new candidates for radiation detection applications at room temperature** [8507-15]
C. D. Malliakas, Northwestern Univ. (United States) and Argonne National Lab. (United States); A. C. Wibowo, Argonne National Lab. (United States); Z. Liu, J. A. Peters, M. Sebastian, H. Jin, Northwestern Univ. (United States); D.-Y. Chung, Argonne National Lab. (United States); A. J. Freeman, B. W. Wessels, Northwestern Univ. (United States); M. G. Kanatzidis, Northwestern Univ. (United States) and Argonne National Lab. (United States)

SESSION 4 CZT II

- 8507 0H **High energy γ -ray detection using CZT detectors with virtual Frisch grid** [8507-17]
S. K. Chaudhuri, R. M. Krishna, K. J. Zavalla, K. C. Mandal, Univ. of South Carolina (United States)

SESSION 5 DETECTOR MATERIALS II

- 8507 0M **Resistivity, carrier trapping, and polarization phenomenon in semiconductor radiation detection materials** [8507-22]
M.-H. Du, K. Biswas, D. J. Singh, Oak Ridge National Lab. (United States)
- 8507 0N **Control of the polytypes and line defects in radiation detector materials** [8507-23]
N. B. Singh, Univ. of Maryland, Baltimore County (United States); W. M. B. Duval, NASA Glenn Research Ctr. (United States); R. H. Hopkins, R. Mazelsky, D. K. Fox, M. Gottlieb, T. Henningsen, Hopkins Inc. (United States); S. R. Coriell, Consultant (United States); M. E. Glicksman, Florida Institute of Technology (United States)
- 8507 0O **Characterization of thallium-based ternary semiconductor compounds for radiation detection** [8507-24]
Z. Liu, J. A. Peters, S. Nguyen, M. Sebastian, B. W. Wessels, S. Wang, H. Jin, J. Im, A. J. Freeman, M. G. Kanatzidis, Northwestern Univ. (United States)

SESSION 6 NEUTRON DETECTORS

- 8507 0Q **Development of the new generation of glass-based neutron detection materials** [8507-26]
A. E. Dosovitskiy, G. A. Dosovitskiy, M. V. Korjik, NeoScint LLC (Russian Federation)
- 8507 0R **Metal-semiconductor-metal neutron detectors based on hexagonal boron nitride epitaxial layers** [8507-27]
S. Majety, J. Li, X. K. Cao, R. Dahal, J. Y. Lin, H. X. Jiang, Texas Tech Univ. (United States)
- 8507 0S **Direction sensitive neutron detectors in near field measurements** [8507-28]
S. Mukhopadhyay, Remote Sensing Lab. Andrews Operations (United States); S. Mitchell, NSTec (United States)

SESSION 7 CZT III

- 8507 0V **Growth of CdZnTe by the detached Bridgman method (Invited Paper)** [8507-31]
S. Motakef, P. Becla, S. Swider, K. Becla, J. Fiala, M. R. Overholt, CapeSym, Inc. (United States)
- 8507 0X **Growth of CZT using additionally zone-refined raw materials** [8507-33]
D. J. Knuteson, A. Berghmans, D. Kahler, B. Wagner, M. King, S. McLaughlin, Northrop Grumman Corp. (United States); A. Bolotnikov, R. James, Brookhaven National Lab. (United States); N. B. Singh, Univ. of Maryland, Baltimore County (United States)

SESSION 8 CZT IV

- 8507 10 **Correlation of dislocations and Te inclusions in detector-grade CdZnTe crystals grown by MVB method** [8507-36]
Y. Xu, Y. He, L. Xu, T. Wang, G. Zha, W. Jie, Northwestern Polytechnical Univ. (China)

- 8507 11 **Preliminary results on Bridgman grown CdZnTe detector crystals assisted by ampoule rotation** [8507-37]
A. Datta, S. Swain, Washington State Univ. (United States); Y. Cui, A. Burger, Fisk Univ. (United States); K. Lynn, Washington State Univ. (United States)
- 8507 15 **Reduced leakage currents of CdZnTe radiation detectors with HgTe/HgCdTe superlattice contacts** [8507-41]
Y. Chang, C. H. Grein, C. R. Becker, J. Huang, S. Ghosh, Univ. of Illinois at Chicago (United States); F. Aqariden, Sivananthan Labs., Inc. (United States); S. Sivananthan, Univ. of Illinois at Chicago (United States)

SESSION 9 SCINTILLATORS II

- 8507 16 **Latest advances in large diameter Srl:Eu and CLYC:Ce scintillators for isotope identification (Invited Paper)** [8507-42]
R. Hawrami, C. Hines, I. Abselem, V. Biteman, J. Vaghini, J. Glodo, P. O'Dougherty, K. S. Shah, Radiation Monitoring Devices, Inc. (United States); N. Cherepy, S. Payne, Lawrence Livermore National Lab. (United States); A. Burger, Fisk Univ. (United States); L. Boatner, Oak Ridge National Lab. (United States)
- 8507 17 **Transparent garnet ceramic scintillators for gamma-ray detection** [8507-43]
Y. Wang, G. Baldoni, Radiation Monitoring Devices, Inc. (United States); W. H. Rhodes, C. Brecher, ALEM Associates (United States); A. Shah, U. Shirwadkar, J. Glodo, Radiation Monitoring Devices, Inc. (United States); N. Cherepy, S. Payne, Lawrence Livermore National Lab. (United States)
- 8507 19 **CXBN: a blueprint for an improved measurement of the cosmological x-ray background** [8507-45]
L. M. Simms, Lawrence Livermore National Lab. (United States); J. G. Jernigan, Space Systems Lab. (United States); B. K. Malphrus, R. McNeil, K. Z. Brown, T. G. Rose, H. S. Lim, Morehead State Univ. (United States); S. Anderson, Sonoma State Univ. (United States); J. A. Kruth, Morehead State Univ. (United States); J. P. Doty, M. Wampler-Doty, Noqi Aerospace, Ltd. (United States); L. R. Cominsky, K. S. Prasad, Sonoma State Univ. (United States); E. T. Thomas, M. S. Combs, R. T. Kroll, B. J. Cahall, T. T. Turba, B. L. Molton, M. M. Powell, J. F. Fitzpatrick, D. C. Graves, Morehead State Univ. (United States); S. D. Gaalema, S. Sun, Black Forrest Engineering (United States)
- 8507 1B **Medical isotope identification with large mobile detection systems** [8507-47]
S. Mukhopadhyay, R. Maurer, National Security Technologies Inc. (United States)

- 8507 1D **Design and tests of the hard x-ray polarimeter X-Calibur (Invited Paper)** [8507-49]
M. Beilicke, Washington Univ. in St. Louis (United States); M. G. Baring, Rice Univ. (United States); S. Barthelmy, NASA Goddard Space Flight Ctr. (United States); W. R. Binns, J. Buckley, R. Cowsik, P. Dowkontt, A. Garson, Q. Guo, Washington Univ. in St. Louis (United States); Y. Haba, Nagoya Univ. (Japan); M. H. Israel, F. Kislak, Washington Univ. in St. Louis (United States); H. Kunieda, Nagoya Univ. (Japan); K. Lee, J. Martin, Washington Univ. in St. Louis (United States); H. Matsumoto, T. Miyazawa, Nagoya Univ. (Japan); T. Okajima, J. Schnittman, NASA Goddard Space Flight Ctr. (United States); K. Tamura, Nagoya Univ. (Japan); J. Tueller, NASA Goddard Space Flight Ctr. (United States); H. Krawczynski, Washington Univ. in St. Louis (United States)

POSTER SESSION

- 8507 1I **Transport properties and spectrometric performances of CdZnTe gamma-ray detectors** [8507-54]
A. A. Zakharchenko, A. V. Rybka, V. E. Kutny, A. I. Skrypyuk, M. A. Khazhmuradov, National Science Ctr. Kharkov Institute of Physics and Technology (Ukraine); P. M. Fochuk, Chernivtsi National Univ. (Ukraine); A. E. Bolotnikov, R. B. James, Brookhaven National Lab. (United States)
- 8507 1J **Structural characteristics of $\text{Zn}_{1-x}\text{Mn}_x\text{Te}$ polycrystalline films** [8507-55]
D. I. Kurbatov, O. V. Klymov, A. S. Opanasyuk, Sumy State Univ. (Ukraine); A. G. Ponomarev, Institute of Applied Physics (Ukraine); P. M. Fochuk, Chernivtsi National Univ. (United States); H. M. Khlyap, TU Kaiserslautern (Germany)
- 8507 1K **Some structural and optical properties of thin and thick CdTe and $\text{Cd}_x\text{Mn}_{1-x}\text{Te}$ films** [8507-56]
A. S. Opanasyuk, P. V. Koval, Sumy State Univ. (Ukraine); V. V. Kosyak, The Univ. of Utah (United States); P. M. Fochuk, Chernivtsi National Univ. (Ukraine); A. E. Bolotnikov, R. B. James, Brookhaven National Lab. (United States)
- 8507 1L **High-temperature treatment of In-doped CZT crystals grown by the high-pressure Bridgman method** [8507-57]
P. Fochuk, I. Nakonechnyi, O. Kopach, Y. Verzhak, O. Panchuk, Chernivtsi National Univ. (Ukraine); V. Komar, I. Terzin, Institute of Single Crystals (Ukraine); V. Kutnij, A. Rybka, National Science Ctr. Kharkov Institute of Physics and Technology (Ukraine); Y. Nykoniuk, National Univ. of Water Management and Nature Resources Use (Ukraine); A. E. Bolotnikov, G. C. Camarda, Y. Cui, A. Hossain, K. H. Kim, G. Yang, R. B. James, Brookhaven National Lab. (United States)
- 8507 1N **Registration of high-intensity electron and x-ray fields with polycrystalline CVD diamond detectors** [8507-59]
L. N. Davydov, A. V. Rybka, A. A. Vierovkin, S. F. Dudnik, V. I. Gritsyna, V. E. Kutny, O. A. Opalev, V. A. Shevchenko, I. N. Shlyahov, V. E. Strelnitsky, A. E. Tenishev, V. L. Uvarov, National Science Ctr. Kharkov Institute of Physics and Technology (Ukraine); R. B. James, A. E. Bolotnikov, Brookhaven National Lab. (United States); P. M. Fochuk, Chernivtsi National Univ. (Ukraine)

- 8507 1S **Surface processing of CdZnTe crystals** [8507-65]
V. A. Gnatyuk, V. E. Lashkaryov Institute of Semiconductor Physics (Ukraine) and Shizuoka Univ. (Japan); O. I. Vlasenko, S. N. Levytskyi, V. E. Lashkaryov Institute of Semiconductor Physics (Ukraine); E. Dieguez, J. Crocco, H. Bensalah, Univ. Autónoma de Madrid (Spain); M. Fiederle, A. Fauler, Freiburger Materialforschungszentrum (Germany); T. Aoki, Shizuoka Univ. (Japan)
- 8507 1U **Photoluminescence and absorption properties of the surface functional layer of CdTe crystals** [8507-67]
D. V. Gnatyuk, L. V. Poperenko, I. V. Yurgelevych, O. Dacenko, Taras Shevchenko National Univ. of Kyiv (Ukraine); T. Aoki, M. Kimura, Shizuoka Univ. (Japan)

Author Index

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Session Chairs

- 1 Scintillators I
Ralph B. James, Brookhaven National Laboratory (United States)
- 2 CZT I
Robert D. McLaren, Consultant (United States)
- 3 Detector Materials I
Michael Fiederle, Albert-Ludwigs-Universität Freiburg (Germany)
- 4 CZT II
Robert D. McLaren, Consultant (United States)
- 5 Detector Materials II
Aleksey E. Bolotnikov, Brookhaven National Laboratory (United States)
- 6 Neutron Detectors
Robert D. McLaren, Consultant (United States)
- 7 CZT III
Krishna C. Mandal, University of South Carolina (United States)

- 8 CZT IV
Sanjoy Mukhopadhyay, National Security Technologies, LLC (United States)
- 9 Scintillators II
Robert D. McLaren, Consultant (United States)
- 10 CZT V
David J. Knuteson, Northrop Grumman Electronic Systems (United States)

Introduction

This book contains the proceedings of the SPIE conference on Hard X-Ray, Gamma-Ray and Neutron Detector Physics XIV. The conference was held on August 13-15, 2012 in San Diego, California. The conference was organized into technical sessions on cadmium zinc telluride (CZT), cadmium telluride, scintillators, methodology, imaging, neutron detectors, and alternative semiconductor detector materials. Plenary and poster sessions were also provided.

The purpose of the conference was to provide a forum for scientists and engineers from the detector development and user communities to present and evaluate the most recent results on X-ray, gamma-ray, and neutron detectors and to discuss the requirements for a variety of radiation-sensing and imaging applications. The primary theme of the conference was on the development of improved semiconductor and scintillator radiation detectors and imaging arrays, which combine the advantages of room-temperature operation with the ability to spectrally resolve the energies of emitted X- and gamma-rays. By eliminating the cryogen, new radiation-sensing instruments, such as spectrometers, gamma cameras and radiographic systems, can be manufactured that are portable, lightweight, easy to operate, and relatively maintenance-free. Recent research and development on detectors have resulted in measurable progress in the availability of single detectors and imaging arrays. In addition, recent reports of the material properties limiting the performance of semiconductor and scintillator detectors have provided new insights and directions to address deficiencies in the crystals and devices.

Despite the limitations on efficiency and relatively high cost of current room-temperature semiconductor detectors and new emerging scintillators, they have been increasingly deployed in systems useful for medical diagnostics, space applications, safeguarding of nuclear materials, material identification, baggage scanning, position sensing, and gamma-ray spectroscopy. Although significant progress has occurred over recent years, there is still a pressing need to lower the cost of the detectors and to increase the efficiency of the detectors while improving their spectral performance.

A total of 67 presentations, including 15 posters, were given at the conference. Although the number of attendees varied with the session and day of week, the attendance averaged approximately 75 people with a substantial fraction of those in attendance representing organizations outside of the U.S.

This book provides detailed documentation describing a portion of the presentations. The editors hope that it will serve as an important record of the meeting, provide an update on the status of X-ray, gamma-ray, and neutron

detector technology, and serve as a useful source of information for those working in the field.

The Conference Chairs would like to thank the session chairs and members of the Conference Program Committees, who offered their time to enlist the involvement of many researchers working in the field.

Ralph B. James
Arnold Burger
Larry A. Franks
Michael Fiederle