## PROCEEDINGS OF SPIE

# Hard X-Ray, Gamma-Ray, and Neutron Detector Physics XXIII

Nerine J. Cherepy Michael Fiederle Ralph B. James Editors

1–5 August 2021 San Diego, California, United States

Sponsored and Published by SPIE

Volume 11838

Proceedings of SPIE 0277-786X, V. 11838

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

The papers 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. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIEDigitalLibrary.org.

The papers 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 these proceedings: Author(s), "Title of Paper," in Hard X-Ray, Gamma-Ray, and Neutron Detector Physics XXIII, edited by Nerine J. Cherepy, Michael Fiederle, Ralph B. James, Proc. of SPIE 11838, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X ISSN: 1996-756X (electronic)

ISBN: 9781510645141 ISBN: 9781510645158 (electronic)

Published by **SPIE** P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) SPIE.org Copyright © 2021 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center 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.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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



**Paper Numbering:** A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of 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 and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

• The first five 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.

### Contents

	CZT
11838 05	Evaluation and benchmarking of a commercial cadmium zinc telluride (CZT) gamma imaging camera [11838-4]
11838 06	A CdZnTeSe gamma spectrometer trained by deep convolutional neural network for radioisotope identification [11838-5]
	SCINTILLATOR DETECTORS
11838 07	Ultra-compact high detection efficiency detectors with high-density scintillators on SiPM [11838-7]
11838 0A	Evaluation of novel bismuth-loaded plastic arrays for fast neutron radiography [11838-10]
	PEROVSKITES
11838 OB	Perovskite detectors for x-ray imaging and gamma spectroscopy: overview and current state-of-the-art (Invited Paper) [11838-11]
	INORGANIC SCINTILLATORS
11838 0G	Bright infrared scintillators for gamma spectroscopy (Invited Paper) [11838-16]
11838 01	Progress on inorganic scintillators for future HEP experiments (Invited Paper) [11838-18]
	RADIOGRAPHY AND CT
11838 OK	Improved x-ray CT feature identification with complementary fast neutron CT (Invited Paper) [11838-20]
11838 OL	Fast neutron computed tomography of multi-material complex objects [11838-21]
11838 ON	A large area detector with indirect conversion, charge integration and photon counting operation [11838-23]

#### ORGANIC SCINTILLATORS

- 11838 OR Nano-segmented optical fibers containing molecular organic glass scintillator for fast neutron imaging (Invited Paper) [11838-27]
- 11838 0S Organic liquid and nanocomposite scintillators for gamma spectroscopic detections [11838-28]

#### INSTRUMENTATION

- 11838 0U Novel technologies for Linac-based radiotherapy (Invited Paper) [11838-30]
- 11838 0V Analytic von Hamos geometry optimization and calibration [11838-31]

#### ALTERNATIVE SEMICONDUCTORS

- 11838 12 The electron detection performance of the "Icarus" hCMOS imaging sensor [11838-38]
- 11838 13 Simplification of imaging system for estimating changes in image contrast due to different weighting of x-ray energy [11838-39]
- 11838 14Direct current response of a thin scCVD diamond detector under increased applied field to 14.1<br/>MeV neutrons [11838-40]
- 11838 15 **Observation of minority carrier traps using C-DLTS in Au/SiO<sub>2</sub>/n-4H-SiC vertical MOS capacitor** [11838-41]
- 11838 16 High-resolution 4H-SiC Schottky barrier radiation detectors on 250 µm epitaxial layers for harsh environment applications [11838-42]

#### POSTER SESSION

- 11838 17High radiation resistant crystals for x-ray and γ-radiation detectors [11838-43]
- 11838 19 Thermodynamics and crystal growth of Cd<sub>1-x-y</sub>Mn<sub>x</sub>Zn<sub>y</sub>Te (x=0.10, 0.20, y=0.15) [11838-45]
- 11838 1B Radiation resistance of Hg<sub>3</sub>In<sub>2</sub>Te<sub>6</sub> near-infrared photodiodes [11838-47]
- 11838 1C **3D expression with rendering method for photon counting multi energy x-ray CT** [11838-48]
- 11838 1E Demonstration of polarization behavior of TIBr x-ray imager with silver electrodes [11838-50]