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

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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.

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