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HARD X-RAY AND GAMMA-RAY DETECTOR PHYSICS VIII (OP325)

PAPER TITLE: "FIELD DEPLOYABLE GAMMA RADIATION DETECTORS FOR DHS USE"

AUTHOR: Sanjoy Mukhopadhyay[1]
National Security Technologies, LLC
Remote Sensing Laboratory–Andrews Operations
2001 Victor Wharf Access Road, Pearl City, HI 96782
Tel: (808) 474–2654 Fax: (808) 474-9354

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BIOGRAPHY

The principal author and presenter Dr. Sanjoy Mukhopadhyay is a supervisor with National Security Technologies, LLC, at Remote Sensing Laboratory-Andrews Operations. He has a Ph.D. in intermediate energy experimental nuclear physics from Northwestern University, Evanston, Illinois. Dr. Mukhopadhyay has 5 years of postdoctoral experience in university and industrial environments, developing and designing large-scale radiation detection and data acquisition systems while he worked at different national and international accelerator facilities. His professional experience for the last 13 years has been in areas of field deployable radiation detectors for various emergency response and nuclear non-proliferation programs funded by the National Nuclear Security Administration.

ABSTRACT

Recently, the U.S. Department of Homeland Security (DHS) has integrated all nuclear detection research, development, testing, evaluation, acquisition, and operational support into a single office: the Domestic Nuclear Detection Office (DNDO). The DNDO has specific requirements set for all commercial and government off-the-shelf radiation detection equipment and data acquisition systems. This article would investigate several recent developments in field deployable gamma radiation detectors that are attempting to meet the DNDO specifications. Commercially available, transportable, handheld radio isotope identification devices (RIID) are inadequate for DHS's requirements in terms of sensitivity, resolution, response time and reach back capability. The leading commercial vendor manufacturing handheld gamma spectrometer in the United States is Thermo Electron Corporation. Thermo Electron's identiFINDER™, which primarily uses sodium iodide crystals (3.18-cm x 2.54-cm cylinders) as gamma detector, has a Full-Width-at-Half-Maximum energy resolution of 7 percent at 662 keV. Thermo Electron has just recently come up with a reach-back

[1] E-mail: Sanjoy.Mukhopadhyay@navsoc.socom.mil

capability patented as RadReachBack™ that enables emergency personnel to obtain real-time technical analysis of radiation samples they find in the field. The current project has the goal to build a prototype handheld gamma spectrometer, equipped with a digital camera and an embedded cell phone to be used as an RIID with higher sensitivity (comparable to that of a 7.62-cm x 7.62-cm sodium iodide crystal at low gamma energy ranging from 30 keV to 3,000 keV), better resolution (< 3.0 percent at 662 keV), faster response time (able to detect the presence of gamma-emitting radio isotopes within 5 seconds of approach), which will make it useful as a field deployable tool. The handheld equipment continuously monitors the ambient gamma radiation and, if it comes across any radiation anomalies with higher than normal gamma gross counts, it sets an alarm condition. When a substantial alarm level is reached, the system auto triggers saving of relevant spectral data and software-triggers the digital camera to take a snapshot. The spectral data including in situ analysis and the imagery data will be packaged in a suitable format and sent to a command post using an imbedded cell phone.

KEYWORDS: Radio Isotope Identification Device (RIID), Resolution, Reach back capability

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