

# **Radiation Detector Standards to Meet Homeland Security Requirements**

## **Background**

Before 9/11, most radiation detectors were designed for use in laboratories. After 9/11, the new Office of Homeland Security, which became the Department of Homeland Security (DHS), needed to plan for the possibility that terrorists would try to smuggle “dirty bomb” components into the country. Consequently the first responder community needs radiation detectors that are accurate, reliable, rugged, and easy to use.

## **Problem**

DHS needed to develop and deploy rugged detector equipment that non-specialists and first responders could use easily to scan massive amounts of cargo for nuclear-radiological threats. DHS selected the National Institute of Standards and Technology (NIST) to lead the effort to “fast-track” standards that would meet this need. NIST chaired the Institute of Electrical and Electronics Engineers (IEEE)/ANSI N42 Radiation Detection Standards Program that coordinated and integrated the work of several diverse groups addressing radioactivity measurements, homeland security, and protection instrumentation. Composed of highly motivated, experienced, and well organized individuals, NIST and N42 were able to work with DHS to significantly shorten the standards development process.

## **Approach**

DHS called on experts from NIST, other government organizations, and the private sector to work with them in quickly creating standards for critical radiation detection equipment and equipment training. NIST served a pivotal role based on their experience reconciling conflicting technical arguments, creating comprehensive, useful standards, and conducting thorough, impartial testing. As chair of the primary N42 committee of the IEEE Radiation Detection Standards Program, NIST oversaw and coordinated the work of subcommittees N42.RM (Radioactivity Measurements), N42.RPI (Radiation Protection Instrumentation), and N42.HSI (Homeland Security Instrumentation).

Working with DHS, the N42 committee created a technical foundation for a suite of standards that responded to the complex challenges presented by equipment ranging from small hand-held detectors to large, port-screening monitors. The suite included standards for data formats to help detectors share data and for training the response community users to effectively deploy the equipment.

This initial stage in the standards development was accomplished over the period from 2002 to 2004. The initial effort published its first standard in fourteen months.

DHS subjected the standards that emerged in 2004 to two rounds of DHS-funded testing. Testing labs used the results to evaluate instruments. Manufacturers used them to

improve the performance of their products in homeland security applications. And users employed the results for selecting which instruments to purchase. Manufacturers found that their products did not meet some requirements of the standards, they began developing new equipment and, continued their participation in further refining the N42 standards.

After using the testing and evaluation protocols based on the 2004 standards, the N42 committees revised them from 2004 to 2006. Currently, IEEE/ANSI N42 lists nine standards including those for data format and training requirements.

The DHS Domestic Nuclear Detection Office (DNDO) next established the Graduated Rad/Nuc Detector Evaluation and Reporting (GRaDER) program to provide performance, suitability, and survivability information and related testing for radiological/nuclear (rad/nuc) detection equipment in the United States. GRaDER mandated the current ANSI N42 consensus standards as the basis for performance of radiation detectors.

The GRaDER program is working with NIST's National Voluntary Laboratory Accreditation Program (NVLAP) to set the requirements under which laboratories will perform independent and consistent testing of radiation detectors. DNDO's GRaDER program may evolve to include scenario based technical capability requirements, but rad/nuc detectors would first pass the minimum GRaDER requirements based on ANSI consensus standards before pursuing the testing to these capability requirements. Test results will be available to all levels of law enforcement and first responder agencies to influence procurement and grant awards.

### **Outcome**

Working with DHS, IEEE's ANSI-accredited National Committee on Radiation Instrumentation developed a suite of consensus standards for

- Personal radiation detectors
- Portable radiation detection instrumentation
- Hand-held instruments for detection and identification of radioactive materials
- Radiation detecting portal monitors
- Mobile and transportable radiation monitors
- Performance criteria for spectroscopy-based portal monitors
- Performance criteria for active detection systems
- Standard data formats for instrument read-outs
- Training for radiation detection instrumentation

The initial standards were developed in a process that was one-year faster than the norm, then revised in a similarly quick timeframe.

DHS proceeded to create and implement the GRaDER program which provides standards-based test results for radiation detection instrumentation that help law enforcement and first responder agencies procure the best equipment and to influence grant awards processes. The new harmonized detection, reporting and training standards

have increased confidence for buyers, vendors, and users that instruments meet requirements. And, most important, the new standards have increased public safety.