

# SMART

## Detection and Identification of Radioactive Materials

### Overview

Sandia's **SMART** (Sensor for Measurement and Analysis of Radiation Transients) system detects and identifies radioactive material located within a few meters of the sensor. It detects these sources in real time and indicates the level of confidence that the material has been identified correctly, with particular attention paid to identification of special nuclear material (SNM). This technology was developed under sponsorship of the Department of Energy and has now transitioned to the Department of Homeland Security (DHS).

SMART can be placed in a stationary configuration at control points in facility entrances, passenger terminals, vehicle border crossings, package/mail distribution centers, and maritime ports to sense radioactive material as it passes by. It also can be deployed in a vehicle for *mobile* detection of radioactive materials.

SMART is part of a suite of radiation sensors deployed at several commercial venues under the sponsorship of the DHS Science and Technology Directorate.

### Technology

SMART is currently configured to provide:

- Detection of gamma-ray and neutron-emitting materials located within a few meters of the sensor
- Isotopic identification of the materials detected, including mixed sources, and classification of the materials as *Natural*, *Medical*, *Industrial*, or *SNM*
- Capture and display of a video image of the persons/containers present at the time of detection and a spectrum for each of the isotopes identified
- Transmission of spectral data and the video image to a base station computer by means of a radio-frequency (RF) modem
- Log of activity including images and analysis results



*SMART deployed at a maritime commerce hub*

### System Development

SMART is deployed in a maritime venue that allows analysts to:

- Evaluate the effectiveness of different sensor technologies in an operational setting
- Explore different methods for screening containers
- Determine the potential impact of these screening methods on port operations
- Develop and test response protocols that could be used in a maritime venue
- Generate requirements for future sensor development to better address user needs



*SMART Cart deployed in a mobile configuration*



Analysts are using the data gathered from these field tests to determine the probability of detection for defined threats, equipment reliability, and false alarm rate. They also are examining how the nuisance alarm rate varies as a function of various threshold and alarm settings and are evaluating the effectiveness of strategies to resolve nuisance alarms. Based on test results, analysts also will be able to provide advice and support to first responders who must react appropriately when sensors detect radioactive materials. Finally, an important objective is helping users to estimate the cost and impact on commerce of deployed sensor systems.

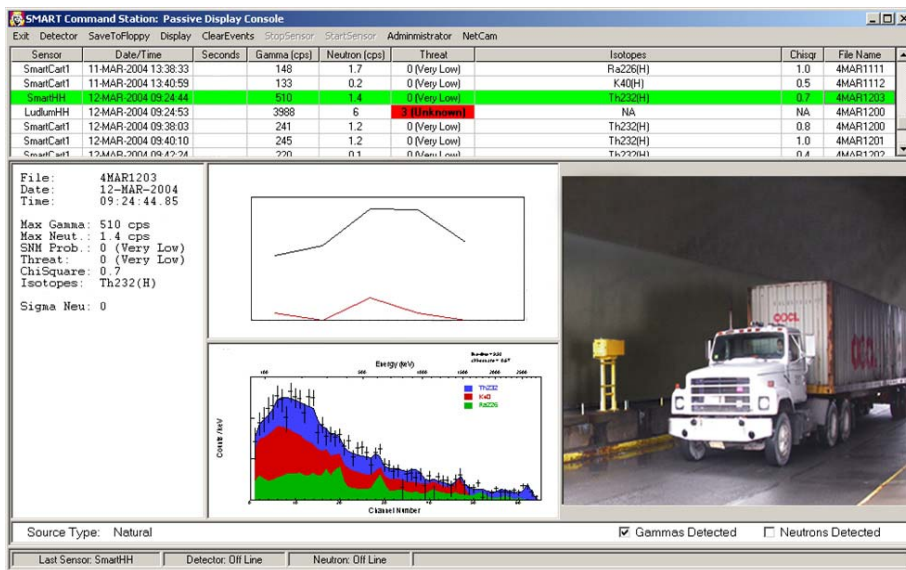
Analysts believe that, by combining commercial hardware with Sandia's customized electronics and analysis software, SMART will be able to provide high sensitivity with a low number of false negatives as well as a low false alarm rate. SMART should be able to handle high-volume, multi-lane traffic in outdoor or high-shock environments with minimal impact to port operations. Notification and identification of the radioactive materials detected needs to be unambiguous, requiring minimal training for operators and low maintenance.



The incorporation of the SMART sensor into a crane system is under development in a configuration that will enable the sensor to withstand the high-shock environment

## On-going Research

SMART is the most recent in a series of radiation sensors built at Sandia National Laboratories for government sponsors. Its predecessors include the RAID (Radiation Assessment Identification and Detection) System, which was built for US Customs using DOE funds, and the RIS (Radiation Identification System) developed for the Defense Threat Reduction Agency.



A typical SMART sensor alarm display

Sandia continues to enhance the SMART analysis software, reduce the size of the units, and increase capabilities. Our goal is to commercialize the technology by partnering with industry to accomplish high-volume manufacturing of the SMART units and make them available for a variety of homeland security applications. To achieve this, Sandia has entered into a technology transfer agreement with ThermoElectron Corporation.

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