Homeland Security
Science and Technology

TechNote

U.S. Department of Homeland Security

SAVER
System Assessment and Validation for Emergency Responders

The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) Program to assist emergency responders making procurement decisions.

Located within the Science and Technology Directorate (S&T) of DHS, the SAVER Program conducts objective assessments and validations on commercial equipment and systems and provides those results along with other relevant equipment information to the emergency response community in an operationally useful form. SAVER provides information on equipment that falls within the categories listed in the DHS Authorized Equipment List (AEL).

The SAVER Program is supported by a network of technical agents who perform assessment and validation activities. Further, SAVER focuses primarily on two main questions for the emergency responder community: "What equipment is available?" and "How does it perform?"

For more information on this and other technologies, contact the SAVER Program by e-mail or visit the SAVER website.

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NUSTL

Portable Radiation Portal Monitors

Portable radiation portal monitors (PRPMs) are used by police, security, and emergency response personnel to screen persons and objects for the presence of radioactive materials. The main application for these devices is monitoring large numbers of citizens for contamination after a radiological or nuclear incident. They may also be used to screen persons entering or leaving a sensitive area. PRPMs typically weigh about 100 pounds, come in transportable cases with wheels, and can be set up and operational in 5 to 10 minutes. They may detect gamma, beta, and neutron radiation, depending upon the application.

Technology Overview

PRPMs are detection systems that are designed to be easily assembled, disassembled, and transported to locations where they are used to screen individuals for the presence of radioactive materials. They are deemed to be "portable" if they can be disassembled into a case designed for ease of transport. The main components of a PRPM system are two vertical panels containing detectors and a top panel that connects them and provides stability. The width and height of the portal may be adjustable, but many systems have fixed dimensions that are typically about 32 inches wide by 80 inches high. Other common components and features include a display panel, audible and visible alarms, and an infrared beam-breaking occupancy sensor (Figure 1). Most PRPMs can operate on battery power (typically three D cells are needed) for 24 hours. They are normally operated in walk-through mode, in which the detectors collect data during an occupancy period. With a typical walk-though time of approximately 2 seconds, many individuals can be rapidly screened.

Most commercially available PRPMs contain plastic scintillation detectors on each vertical panel, which provide head-to-toe coverage for persons passing through the portal. Plastic scintillators have good sensitivity, large size, low cost, and a high level of robustness compared with other detector types, such as sodium iodide. When struck by ionizing radiation such as gamma rays or beta particles, they emit light pulses that are measured and converted into electronic pulses by a photomultiplier tube and associated electronics. The pulse count is proportional to the radiation dose rate, and an alarm is generated when the dose rate is sufficiently above the background radiation level after taking into account the normal background level variations.

Figure 1. A typical PRPM
Photo courtesy of Canberra Industries, Inc.

Applications

Population Monitoring

An essential element of emergency response planning for radiological and nuclear events is monitoring the population for radiological contamination that may be deposited on the skin and clothing. Population monitoring can identify individuals in need of decontamination and/or medical treatment, and can prevent cross-contamination among individuals. In the initial stages of an incident, state, local, and tribal governments should be prepared to perform large-scale radiological contamination monitoring as part of their emergency response plans.

PRPMs work well for population monitoring because of their portability, ease of use, and ability to monitor many individuals in a short amount of time. They are designed to make quick yes-or-no decisions about whether or not decontamination is needed based upon the amount of radiation emitted from individuals. PRPMs can be brought near the site of a radiological event to screen affected individuals or be set up at community reception centers (CRCs) (Figure 2), where citizens who believe they may have been affected can go for screening. At CRCs, contaminated individuals can be decontaminated by washing with soap and warm water and changing clothes. Those found to be contaminated can then be screened medically for internal contamination and registered for long-term health monitoring. Citizens concerned about health effects should be encouraged to go to their local CRC instead of clogging hospitals and medical facilities.

Figure 2. A PRPM in use at a community reception center
Photo from Resource 1

PRPMs used for population monitoring in emergency response situations should meet Federal Emergency Management Agency (FEMA) standard REP-21. This standard specifies that a portal monitor must detect a 1-microcurie cesium-137 source, which may be positioned at any point along a vertical line centered between the two side columns and between 0.5 and 5.5 feet above the instrument base. Individuals cleared by a portal meeting this standard will have no significant risk of detrimental health effects due to contamination on the skin and clothing.

Security Screening

Although most PRPMs are not primarily designed for security screening, they can also be used for this purpose. A typical application may involve screening passengers entering a railway station. The plastic scintillators will detect individuals who have an elevated radiation level, but will not be able to determine the type of radiation. An investigation using secondary screening tools, such as radionuclide identification devices (RIDs), will be needed for these individuals to determine the type of radioactive material that is present and its threat potential. Some vendors of PRPMs add sodium iodide detectors and/or neutron detectors to their panels for customers with security screening needs. It should be noted that although sodium iodide detectors have much better gamma energy resolution than plastic scintillators, they may still have trouble identifying the radionuclide causing the alarm when employed on PRPMs with short walk-through times.

Some PRPMs can be used to screen vehicles when the top panel is removed (Figure 3). In this configuration, the minimum detectable source activity for any given radionuclide will depend upon portal width, vehicle speed, and detector sensitivity.

Figure 3. A vehicle chokepoint using a PRPM
Photo courtesy of Thermo Scientific, Inc.

Resources

1. Population Monitoring in Radiation Emergencies, A Guide for State and Local Health Planners, Centers for Disease Control and Prevention, April 2014.

2. Contamination Monitoring Standard for a Portal Monitor Used for Radiological Emergency Response, FEMA-REP-21, March 1995.

3. Use of Transportable Portal Monitors Near a Nuclear Power Plant, Application Note, Canberra Industries, Inc.