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 with procurement decisions.

Located within the Science and technology Directorate (S&T) of DHS, the SAVER Program conducts unbiased operational tests 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).

Information provided by the SAVER Program will be shared nationally with the responder community providing life- and cost-saving assets to DHS, as well as federal, state, and local responders.

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, please see the SAVER Web site or contact the SAVER Program Support Office.

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Mobile Radiation Detection Systems

Emergency responders must be prepared to encounter a variety of different situations. Given the increased threat of terrorism, radiation protection and detection methods and technologies have been pushed to the forefront of training and preparation efforts. Many agencies and jurisdictions have become more interested in interdiction methods and large-area scanning methods. As a result, one of the current areas of growth is mobile radiation detection equipment. A mobile radiation detection system allows a large area to be surveyed with expert detection efficiencies in a way that would seldom be recognized by the general public. The typical handheld radiation detector is limited in this application.

Detection System Types and Applications

Mobile radiation detection systems are mounted to and operated within a moving or stationary vehicle for the detection, identification, and quantification of radioactive material. The capabilities and potential applications of mobile detection systems vary widely. This TechNote discusses simple alarming systems and more sophisticated spectral systems that have gamma-spectroscopy capabilities and software with the ability to display radiation readings on a map in real time.

Alarming Systems

In response to an incident involving a radioactive material spill, a radiation dispersal device, or other consequence management situation, it is important for emergency responders to be aware of the presence and/or levels of radiation prior to exiting their response vehicle. Responders may also need to quickly establish a public exclusion zone. In these situations, using an alarming mobile radiation detection system would be better suited than using a handheld instrument, which would be too time consuming.

The majority of these systems are intended for use in land-based vehicles. Geiger-Mueller, ion chamber, or cadmium telluride based detectors are typically found in these systems. Sensitivities range from 1 µR/hr to as much as 500 R/hr. Lower-range (i.e., more sensitive) detectors lend themselves to more environmental detection needs or to situations when it is expected that the dose rates in the area will be less than a few mR/hr. Background radiation exposure rates are typically measured on the order of 10s of µR/hr, which means that these detectors can detect up to 1,000 times background levels.

To overcome this issue, users must select a detector with a range high enough to cover their needs. A general purpose range is about 10 µR/hr–1R/hr. This covers background levels to a fairly high exposure rate exceeding most published turn-back levels for responders.

A number of alarming systems are designed to be permanently mounted to the vehicle; therefore, the vehicle becomes a dedicated radiation response vehicle. However, many of the alarming systems are reasonably priced, which provides agencies an opportunity to purchase multiple systems to install in multiple vehicles. Installation locations of the systems within the vehicles include the front bumper, on the dashboard, in the interior roof, or in a faux light fixture on the hood.

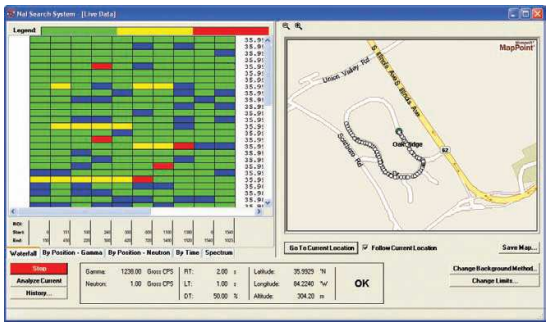
Alarming systems are simple and provide limited information. Typically the system will have some sort of an audible alarm along with a visual indicator that the predefined alarm radiation level has been reached.

Spectral Systems

Personnel responding to large-scale radiological emergencies, or searching for lost radiation sources, will need more information about the type of radiation detected. Simple alarming systems do not provide this information. Spectral systems are more sophisticated and are frequently carried by teams that have specialized missions tailored to radiological response. These systems offer capabilities that not only alert responders to the presence of radiation but also provide the identity of the radionuclide present. The systems can also record vehicle location along with radiation readings, known as a breadcrumb trail.

The more advanced systems can be installed in land, water, and air vehicles. Some of the systems are custom-built and cannot be purchased off-the-shelf. The detection media used in spectral systems are typically sodium iodide crystals or high-purity germanium crystals, both of which allow for gamma detection and identification. For systems with neutron detection capability, helium-3 is the standard detection medium used. Detection ranges for spectral capable mobile systems are broad. However, manufacturers tend to focus on sensitivity to lower-level radiation more than protection against high exposure-rate saturation. This is largely because the systems are designed to discover the presence of radioactive material intended for malicious activities during covert missions. In these instances high exposure rates are not anticipated and a more sensitive, low-range detector is preferred.

Spectral systems have two components: the detection system itself and a processing unit such as a laptop computer or handheld computing device. The detection system can be mounted in the backseat area of a van or on the luggage rack. The laptop or handheld device can be connected with hard wires or wirelessly to process the data flow from the detectors. Spectral systems may include the post-processing software required to convert the radiation energy signals and information into readable spectra and activity levels or exposure rates. Along with analysis of the radioactive material, some software will allow input from a Global Positioning System to be collected in real time with the radiation detection system information. This provides the user with the ability to track where radiation was detected as the vehicle is in motion.



Cost Considerations

With increased capabilities come increased costs. The simple alarming systems are priced from under $1,000 to $10,000, which is the average cost for a handheld radiation detection survey meter. The repair costs tend to be equally inexpensive. Spectral systems, however, can cost quite a bit more. The average off-the-shelf system ranges from $50,000 to $70,000, and repair costs can also be considerably more than an alarming system. More customized systems can cost as much as $250,000. It is important when considering the purchase of a mobile system to think about its intended purpose, the number of staff that can be devoted to the system and level of staff training. A staff well trained in radiation safety and electronics can significantly reduce maintenance costs as they can perform simple repairs and calibrations.

Resource

For more information on Mobile Radiation Detection Systems, refer to ANSI N42.43-2006, “American National Standard Performance Criteria for Mobile and Transportable Radiation Monitors Used for Homeland Security.”