



**Homeland  
Security**

Science and Technology

# Summary

**U.S. Department of Homeland Security**



**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 responder 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 Support Office.

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## High-Sensitivity Detectors

(AEL reference number 07RD-02-DRHS)

High-sensitivity detectors are portable devices that use high-resolution gamma spectroscopy to identify radionuclides. These detectors use high-purity germanium, which provides a more resolved spectra than devices that use other materials, such as sodium iodide. As a result of the better-resolved spectra, radionuclides that may have been challenging to recognize with a sodium iodide-based detector could be identified with the high-purity germanium device.

To provide emergency responders with information on currently available high-sensitivity detectors, National Security Technologies LLC conducted a comparative assessment of high-sensitivity detectors for the System Assessment and Validation for Emergency Responders (SAVER) Program in October 2010. Detailed findings are provided in the *High-Sensitivity Detectors Assessment Report*, which is available by request at <https://www.rkb.us/saver>.

## Assessment Methodology

Prior to the assessment, nine emergency responders were chosen from various jurisdictions to participate in a focus group. Each participant had some experience with high-sensitivity detectors. The focus group identified evaluation criteria and recommended product selection criteria and possible scenarios for assessment.

After identifying evaluation criteria, the focus group assigned each criterion to one of five SAVER categories, and then assigned a weight for its level of importance. Once the criteria were weighted, the five SAVER categories were assigned a percentage value to represent the level of each category's importance relative to the other categories.

Based on focus group recommendations and market research, the following high-sensitivity detectors were selected for assessment:

- Micro-trans-SPEC, ORTEC®;
- Trans-SPEC-EX-100, ORTEC; and
- Falcon 5000®, CANBERRA.



Ten responders served as evaluators for this assessment. All evaluators had at least 3 years of experience in disciplines including law enforcement, federal radiation control, and counterterrorism.

During the assessment, evaluators rated the high-sensitivity detectors based on evaluation criteria established by the focus group. The assessment was separated into two phases: the specification assessment and the operational assessment. Evaluators assessed the products based on vendor-provided information during the specification assessment. Hands-on experience with the products served as the basis for the operational assessment. During the operational assessment, evaluators performed search operations similar to those performed at large venues, such as sporting events, and conducted wide-area/land-based and wide-area/water-based searches. The water search was conducted to test the practicality of using the equipment in and around water.

SAVER Category Definitions	
<b>Affordability</b>	groups criteria related to life-cycle costs of a piece of equipment or system.
<b>Capability</b>	groups criteria related to the power, capacity, or features available for a piece of equipment or system to perform or assist the responder in performing one or more relevant tasks.
<b>Deployability</b>	groups criteria related to the movement, installation, or implementation of a piece of equipment or system by responders at the site of its intended use.
<b>Maintainability</b>	groups criteria related to the maintenance and restoration of a piece of equipment or system to operational condition by responders.
<b>Usability</b>	groups criteria related to the quality of the responders' experience with the operational employment of a piece of equipment or system. This includes the relative ease of use, efficiency, and overall satisfaction of the responders with the equipment or system.

## Assessment Results

The range of overall scores was very narrow. Table 1 displays the composite assessment scores as well as the category scores for each high-sensitivity detector. Higher scores indicate a more favorable rating by evaluators. The advantages and disadvantages of each detector, as identified by evaluators, are listed in table 2. To view how each high-sensitivity detector scored against the evaluation criteria assigned to the SAVER categories, see table 3. For specifications, see table 4.




The assessment results indicate that products are available with the features needed by the responder community to conduct field work. Given the similarities of the onboard software and supporting computer interface, as well as similar maintenance requirements, the Micro-trans-SPEC and Trans-SPEC-EX-100 were well received by evaluators. While evaluators appreciated the abilities of the Falcon 5000, its size and the separate tablet required for active operation created difficulties for field use; evaluators commented that this detector was better suited for use in a mobile laboratory.

Responder agencies that may be considering the purchase of a high-sensitivity detector should review the detailed findings in the *High-Sensitivity Detectors Assessment Report* and carefully consider each detector's overall capabilities and limitations in relation to their jurisdiction's operational needs. All reports in this series, as well as reports on other technologies, are available in the SAVER section of the Responder Knowledge Base (RKB) website, <https://www.rkb.us/saver>.


































































**Table 1. High-Sensitivity Detector Assessment Results**

Detector	Composite Score	Affordability (8% Weighting)	Capability (27% Weighting)	Deployability (25% Weighting)	Maintainability (10% Weighting)	Usability (30% Weighting)
Micro-trans-SPEC	3.8	3.4	4.0	3.4	3.6	4.0
Trans-SPEC-EX-100	3.7	3.5	4.0	3.4	3.5	3.7
Falcon 5000®	3.6	3.3	4.0	3.4	3.6	3.5





















**Table 2. High-Sensitivity Detector Advantages and Disadvantages**

Detector	Advantages	Disadvantages
 <b>Micro-trans-SPEC</b> Composite Score: 3.8	<ul style="list-style-type: none"> <li>• Small size</li> <li>• Easily portable</li> <li>• User-friendly</li> </ul>	<ul style="list-style-type: none"> <li>• Inconsistent wireless connection</li> <li>• Efficiency (13 percent) is lower than the other high-sensitivity detectors evaluated</li> </ul>
 <b>Trans-SPEC-EX-100</b> Composite Score: 3.7	<ul style="list-style-type: none"> <li>• User-friendly</li> <li>• Multiple charging options</li> <li>• 40 percent efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Heavy</li> <li>• Poor ergonomics</li> <li>• Inconsistent wireless connection</li> </ul>
 <b>Falcon 5000®</b> Composite Score: 3.6	<ul style="list-style-type: none"> <li>• Potential instrument for mobile laboratory</li> <li>• Ability to “hot-swap” batteries</li> <li>• 20 percent efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Extremely heavy</li> <li>• Poor ergonomics</li> <li>• Separate tablet required to operate the unit</li> <li>• Inconsistent wireless connection</li> </ul>

**Table 3. High-Sensitivity Detector Criteria Ratings<sup>1</sup>**

KEY			
	Micro-trans-SPEC	Trans-SPEC-EX-100	Falcon 5000®
Strongly Disagree      Strongly Agree			
<b>Affordability</b>			
Training costs			
All-inclusive deployable cost			
Service contract			
Battery cost			
<b>Capability</b>			
Battery life			
Multiple charging options			
Identify over water			
Instrument resolution			
Battery life of tablet			
Temperature range			
Reachback capability			
Real-time identification			
Low battery indicator			
Identification accuracy			
Identification time			
Optimal distance indicator			
Data storage			
Wireless			
Library size			

**Table 3. High-Sensitivity Detector Criteria Ratings<sup>1</sup> (Continued)**

KEY			
	Micro-trans-SPEC	Trans-SPEC-EX-100	Falcon 5000
Strongly Disagree     Strongly Agree 			
<b>Capability (Continued)</b>			
Multiple functions			
Water resistance			
Anchor points			
Global positioning system			
Customization options			
<b>Deployability</b>			
Charge time			
Cooling time			
Ruggedness			
Setup time			
Quick-start guide			
Transport case			
Minimal training time			
Tablet not required			
Lockout feature			
<b>Maintainability</b>			
Downtime for maintenance			
Calibration frequency			
Authorized service center			
24-hour customer service			
CONUS-based customer support			
<b>Usability</b>			
Weight			
Vibration sensitivity			
Shoulder strap			
Ergonomics			
Personal protective equipment compatibility			
Button accessibility			
Viewable display			
Hot-swap batteries			
Self-testing with error alert			
Power options			
Ease of user interface			
Usable data format			
Software compatibility			
Ease of data retrieval			
Alarm/timer volume			

Note:

<sup>1</sup> Averaged criteria ratings for each assessed product are graphically represented by colored and shaded circles. Highest ratings are represented by full green circles.

**Table 4. High-Sensitivity Detector Specifications<sup>1</sup>**

Specifications	Micro-trans-SPEC	Trans-SPEC-EX-100	Falcon 5000®
Weight	15 pounds	24.4 pounds	34.1 to 37.1 pounds
Vibration sensitivity (vibration reduction mechanism)	Digital noise suppression using low frequency rejecter (LFR) filter	Digital noise suppression using LFR filter	Micro phonic effect is reduced using a pulse tube cooler design
Shoulder strap	Included	Included	Included
Self-testing with error alert	Yes — no alert	Yes — no alert	Yes — with alert
Power options	<ul style="list-style-type: none"> <li>• 10 to 17 volts of direct current (VDC) from internal lithium ion battery</li> <li>• DC power supply</li> <li>• Automobile battery (any 12 VDC)</li> </ul>	<ul style="list-style-type: none"> <li>• 10 to 17 VDC from internal lithium ion battery</li> <li>• DC power supply</li> <li>• Automobile battery (any 12 VDC)</li> </ul>	<ul style="list-style-type: none"> <li>• 18.5 volts from removable lithium ion battery</li> <li>• Alternating current power supply</li> <li>• Automobile battery (any 12 VDC)</li> <li>• Optional rechargeable travel batteries (comply with airline travel restrictions on lithium batteries)</li> </ul>
Battery life	Greater than 3 hours	Greater than 3 hours	Up to 8 hours
Low battery indicator	Yes	Yes	Yes
Hot-swap batteries	Internal battery cannot be changed by users; automatic switchover to optional external battery without interruption of data collection	Internal battery cannot be changed by users; automatic switchover to optional external battery without interruption of data collection	Yes, two hot-swappable batteries supplied
Multiple charging options	<ul style="list-style-type: none"> <li>• International outlet</li> <li>• Automobile battery (any 12 VDC)</li> </ul>	<ul style="list-style-type: none"> <li>• International outlet</li> <li>• Automobile battery (any 12 VDC)</li> </ul>	<ul style="list-style-type: none"> <li>• International outlet</li> <li>• Automobile battery (any 12 VDC)</li> </ul>
Battery charge time	Less than 4 hours	Less than 4 hours	Less than 4 hours
Exported data file format	<ul style="list-style-type: none"> <li>• Ethnograph data file (.CHN)</li> <li>• 2D graphic (.SPC)</li> </ul>	<ul style="list-style-type: none"> <li>• Ethnograph data file (.CHN)</li> <li>• 2D graphic (.SPC)</li> </ul>	Configuration file (.CNF)
Tablet required for operation	No	No	Yes
Battery life of tablet	Tablet not required	Tablet not required	3 hours
Software compatibility	Personal computer (PC)/Windows®	PC/Windows	Supplied tablet operates with Windows
Alarm/timer volume	Yes	Yes	Yes
Temperature range	14 degrees Fahrenheit (°F) to 104°F	32°F to 104°F	-4°F to 122°F
Reachback capability	Yes	Yes	Yes
Optimal distance indicator	No	No	No
Wireless	Optional WiFi® 802.11g	Optional WiFi 802.11g	WiFi 802.11g
Data storage	<ul style="list-style-type: none"> <li>• Internal memory</li> <li>• Secure Digital (SD) card (onboard option)</li> <li>• Optional universal serial bus (USB) connection to PC</li> </ul>	<ul style="list-style-type: none"> <li>• Internal memory</li> <li>• SD card (onboard option)</li> <li>• Optional USB connection to PC</li> </ul>	<ul style="list-style-type: none"> <li>• Internal memory</li> <li>• Additional storage on tablet when connected</li> </ul>
Library size	Onboard with Maestro-32, expandable with connected PC using Gamma Vision	Onboard with Maestro-32, expandable with connected PC using Gamma Vision	Configurable library with full nuclide editor

**Table 4. High-Sensitivity Detector Specification<sup>1</sup> (Continued)**

Specifications	Micro-trans-SPEC	Trans-SPEC-EX-100	Falcon 5000
Multiple functions	<ul style="list-style-type: none"> <li>• Spectrum mode</li> <li>• Identification mode</li> <li>• Special Nuclear Material (SNM) mode</li> <li>• Search mode</li> </ul>	<ul style="list-style-type: none"> <li>• Spectrum mode</li> <li>• Identification mode</li> <li>• SNM mode</li> <li>• Search mode</li> </ul>	<ul style="list-style-type: none"> <li>• Spectrum mode</li> <li>• Identification mode</li> <li>• Dose mode</li> <li>• Locate mode</li> </ul>
Ruggedness	Enclosure, display, and all connections sealed against moisture and dust	Rugged and compact with no interconnections	Not in manufacturer specifications
Transport case	Yes	Yes	Yes
Water resistance	Water spray resistant; optional waterproof transport case available	Water spray resistant	No
Anchor points	No	No	No
Global positioning system	Yes	Yes	Yes
Customization options	Yes	Yes	Yes
Cooling time	Less than 12 hours	Less than 12 hours	3 hours
Quick-start guide	Yes, included in the main manual	Yes, included in the main manual	No, full instructions only
Lockout feature	Yes	Yes	Yes
Downtime for maintenance	No standard maintenance required	No standard maintenance required	No standard maintenance required
Calibration frequency	<ul style="list-style-type: none"> <li>• No factory calibration required</li> <li>• Weekly in-field calibration check is recommended</li> </ul>	<ul style="list-style-type: none"> <li>• No factory calibration required</li> <li>• Weekly in-field calibration check is recommended</li> </ul>	No factory calibration required
Authorized service center	No	No	No
24-hour customer support	No	No	No
CONUS-based customer support	Yes	Yes	Yes
All-inclusive deployable cost	\$93,376	\$79,485	From \$69,998, depending on configuration
Battery cost	\$300	\$300	\$600
Service contract	Yes, purchaser designs service contract based on needs	Yes, purchaser designs service contract based on needs	Yes, three levels based on response time: <ul style="list-style-type: none"> <li>• Basic: 72-hour response time</li> <li>• Advanced: 48-hour response time</li> <li>• Critical: 24-hour response time</li> </ul>

Note:

<sup>1</sup> Information was provided by manufacturers and has not been independently verified by the SAVER Program.