


**Testing and Evaluation Protocol for Mobile and  
Transportable Radiation Monitors Used for Homeland  
Security**

**T&E Protocol N42.43, 2010**

**Version 1.02**

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## Testing and Evaluation Protocol for Mobile and Transportable Radiation Monitors Used for Homeland Security

### 1. Scope

This document establishes the protocol for testing alarming personal radiation detectors based on the performance requirements established in ANSI N42.43, “American National Standard for Evaluation and Performance of Mobile and Transportable Radiation Monitors Used for Homeland Security.”

### 2. References

This protocol shall be used in conjunction with the following documents:

[R1] ANSI N42.43, “American National Standard for Evaluation and Performance of Mobile and Transportable Radiation Monitors Used for Homeland Security.”

[R2] ANSI/IEEE N42.42, “Data Format Standard for Radiation Detectors Used for Homeland Security.”

[R3] NIST Handbook 150:2006, NVLAP Procedures and General Requirements

[R4] NIST Handbook 150-23:2007 (DRAFT) NVLAP Radiation Detection Instruments


### 3. Compliance Level Information

Instrument under test might meet all the requirements listed in the ANSI/IEEE N42.43 standard. Therefore, different agencies developed documents describing the compliance levels required for particular applications of the instruments under test. Examples of such compliance level requirements are those required by the Graduated Rad/Nuc Detector Evaluation and Reporting (GRaDER<sup>SM</sup>) program. For this program, information can be found in the “Compliance Level for GRaDER Instrument Performance” document located at <http://www.dhs.gov/GRaDER> .

### 4. Test and evaluation steps

It is recommended that testing laboratories perform the tests listed in this protocol in the following order:

- Check all items listed in the general requirements
- Perform the radiological tests
- Perform the temperature and humidity tests
- Perform the entire electrical and electromagnetic test except the Electrostatic Discharge (ESD) test
- Perform the impact and the vibration tests
- Perform the moisture and dust test
- Perform the ESD test

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- Perform the drop test, as required

Excel template sheets are provided by NIST to the testing laboratory to guarantee that all data required is being provided in the test report.

## 5. Recording test results


This Test and Evaluation protocol contains data sheets that shall be used to record and report all test results. Each data sheet is associated with a specific section(s) of the referenced ANSI standard, N42.43. An electronic version of the data sheets is provided in the form of spreadsheets that may be used to record and report the results of the tests. These spreadsheets were verified and validated (V&V) using Microsoft Excel 2007 (compatibility mode).

Instrument status shall be recorded on the “Test Summary” sheet as testing is performed. The comment section in each data sheet shall be used to record changes to the test requirements and methods listed in the ANSI standard. The comment section shall also include the rationale of the changes.

## 6. Test report

A test report summarizing the results of the test shall include the following sections:

- a. Laboratory equipment information:
  1. Identify all participating laboratory facilities. Include points of contact names, mailing address, telephone number, and electronic mail addresses.
  2. Identify the tests performed in the different facilities.
  3. List all supporting equipment name, model number and last day of calibration used for each test.
  
- b. Test equipment information :
  1. Include manufacturer name, instrument model, instrument serial number, software and firmware version identification, and last day of calibration.
  2. List the operating modes and parameter setting of the instrument and accessory kit(s) used in each test.
  
- c. Data sheets:
  1. The data sheets listed in this document shall be completed and provided as part of the report.
  2. Include changes to the ANSI standard test requirements or methods and rationale to the changes.

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## 7. Guidance for testing ANSI N42.42 data format requirements

The standard associated with this Test and Evaluation Protocol requires verification that an output data file is created that complies with ANSI/IEEE N42.42 standard requirements. The range of complexity of the N42.42 compliant instrument output file is extremely broad. Data output files from these instruments are simple files that can be checked manually using a text editor such as Notepad or WordPad. These files can also be verified using additional tools. In principle, all data output files that meet ANSI N42.42 can be verified manually using a text editor as these files are XML files. File reading software, such as Altova XMLSpy® 2009 Standard Edition can also be used for manual viewing and validating of structure and content.

N42.42 schemas can be used to validate the file format as specified in the ANSI/IEEE N42.42 standard. These schemas are available at the NIST web site

<http://physics.nist.gov/Divisions/Div846/Gp4/ANSIN4242/xml.html>.

There are several XML validators that can be used to verify the XML structure of the N42.42 compliant instrument output file. Examples of these validators can be found at


<http://www.xmlvalidation.com/> or <http://validator.w3.org/>.

## 8. Test modifications from ANSI/IEEE N42.43-2006 requirements

Some issues were observed and new considerations were taken about the enrichment of some of the sources listed in the ANSI/IEEE N42.43 standard. The testing laboratories should note that the source enrichment to be used for all the tests described in the ANSI/IEEE N42.43 standard is the following: HEU has an enrichment that is  $\geq 90\%$   $^{235}\text{U}$ , DU at  $0.2\%$   $^{235}\text{U}$ , and  $U_{\text{nat}}$  at  $0.7\%$   $^{235}\text{U}$ , RGPu containing  $\geq 10\%$   $^{240}\text{Pu}$ , and WGPu  $\leq 6\%$   $^{240}\text{Pu}$ .

## 9. Considerations

The standard establishes exposure rates for test in Roentgen per hour (R/h). When testing instruments that read in rem per hour, the test field shall be in rem/h instead of R/h. Refer to the “Units and Uncertainties” section in the standard for additional information.


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**Test Summary Sheet  
ANSI N42.43**

<b>Manufacturer:</b>	
<b>Model:</b>	

Test Number	Serial#		Serial#		Serial#	
	Date	Status	Date	Status	Date	Status
5.1						
5.2						
5.3						
5.4						
5.5						
5.6						
5.7						
5.8						
5.9						
5.10						
5.11						
6.7						
6.8						
6.9						
6.10						
6.11						
6.12						
6.13						
6.14.1						
6.14.2.2						
6.14.2.3						
6.14.3						
6.14.4						
6.14.5						
6.14.6						
6.15						
6.16						
7.1						
7.2						
7.3						
8.1						
8.2						
8.3						
8.4						
8.5						
8.6						
8.7						
9.1						
9.2						
9.3						
10.0						

<b>Comments:</b>	

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## Pre-Test Data Sheet and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	Verify that the manufacturer supplied an operation and maintenance manual containing the information listed below.		
<b>Test Protocol:</b>	Review the information provided and indicate whether the required information has been provided. Also verify that the documentation is complete and understandable. The documentation should not be in draft form with incomplete sections.		
<b>Note:</b>	Comments are required when the requirement is not verified.		

### Test Results

Requirement	Yes	No
Operating instructions and restrictions	<input type="checkbox"/>	<input type="checkbox"/>
Electrical connection schematic	<input type="checkbox"/>	<input type="checkbox"/>
Spare parts list	<input type="checkbox"/>	<input type="checkbox"/>
Troubleshooting guide.	<input type="checkbox"/>	<input type="checkbox"/>
Description and protocol for communication methods of transmitting and receiving data	<input type="checkbox"/>	<input type="checkbox"/>
Contact information for the manufacturer including name, address, telephone #, fax #, email address, etc.	<input type="checkbox"/>	<input type="checkbox"/>
Power supply requirements	<input type="checkbox"/>	<input type="checkbox"/>
Recommended operational parameters such as: detector response and false alarm probability	<input type="checkbox"/>	<input type="checkbox"/>
Complete description of system or unit	<input type="checkbox"/>	<input type="checkbox"/>
Enclosure specification classification	<input type="checkbox"/>	<input type="checkbox"/>
Inclusion of any hazardous material that may require additional regulation	<input type="checkbox"/>	<input type="checkbox"/>
Description of data analysis software and radionuclide identification procedure	<input type="checkbox"/>	<input type="checkbox"/>
Description of operation and performance of the system or unit	<input type="checkbox"/>	<input type="checkbox"/>


<b>Comments:</b>			
<b>Completed by:</b>		<b>Date:</b>	
<b>Reviewed by:</b>		<b>Date:</b>	

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### Section 5.1 General characteristics Data Sheet and Report


<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	<p>Following the manufacturer-provided information, it shall be possible to set up the monitor for use. The manufacturer shall provide the designation type for testing purposes (pedestrian, vehicle, rail, and/or package).</p> <p>The evaluation shall be performed without the benefit of any radiation shielding against the natural background, except for that shielding which is a permanent feature of the monitor.</p> <p>NOTE - If the monitor has multiple uses, it should be tested for each usage designation.</p>		
<b>Note:</b>	Comments are required when the requirement is not verified.		
<b>Test Results</b>			
<b>Classification:</b>	(choose one)	<input type="checkbox"/> Pedestrian <input type="checkbox"/> Vehicle <input type="checkbox"/> Area <input type="checkbox"/> Crane	<input type="checkbox"/> Containerized Cargo <input type="checkbox"/> Rail <input type="checkbox"/> Backpack
<b>Setup performed by:</b>	(choose one)	<input type="checkbox"/> Manufacturer	<input type="checkbox"/> Test Organization
Were all steps for setup clearly defined?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Was it necessary to seek technical assistance from the manufacturer?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Did the technical manual provide all steps necessary for setup?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Was all information necessary for setup (diagrams, schematics, etc.) provided in the technical manual?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<b>Comments:</b>			
<b>Completed by:</b>		<b>Date:</b>	
<b>Reviewed by:</b>		<b>Date:</b>	




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## Section 5.2 Physical Configuration Data Sheet and Report

<b>Manufacturer:</b>	
<b>Model:</b>	<b>Serial Number:</b>
<b>Date Performed:</b>	<b>Test Location:</b>
<b>Requirement:</b>	<p>Enclosure(s) provided for outdoor assemblies, including those worn as backpacks, should be designed to meet the IP54 designation as designated in IEC 60529. If the monitor is mounted on a vehicle or other platform that can be transported, the enclosure shall meet the requirements of the IP55 designation (no damage by jetted water). Vent holes should be avoided if at all possible. External mounting hardware should be made from material that is resistant to corrosion (i.e., road salt).</p> <p>The detection assemblies for road and rail vehicle monitoring or for use while in transit will be subjected to vibration and mechanical shock environments. Special precautions shall be taken to ensure safe transit and to reduce the transmission of shock and vibration to the monitoring system.</p> <p>Mounting techniques used for detection assemblies attached to powered or towed vehicles shall be designed to ensure a degree of protection to the occupants of a vehicle from dislodged components of the monitor system in the event of a crash. Although this is not a performance requirement of the monitor, it is recommended that the mounted monitor and mounting components be designed to meet the requirements specified in MIL-STD-810F. For this requirement, the peak acceleration is 75 g at 8 ms to 13 ms.</p> <p>Controls and adjustments that affect calibration and alarm settings shall be designed so that access to them is limited to authorized people.</p> <p>Provisions shall be made to permit testing of visual or sound warning indicators without the use of radiation sources.</p> <p>Provisions shall be made to permit testing of visual or sound warning indicators without the use of radiation sources. Displays shall be readable in low light levels (&lt;150 lux) and high light levels (&gt;10000 lux).</p>
<b>Note:</b>	Comments are required when the requirement is not verified.


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		Yes	No
Does the manufacturer state that the enclosure is classified as IP54?			
Does the manufacturer state that the enclosure is classified as IP55?			
Are the controls and adjustments designed to limit access?			
Can the monitor be tested without the use of radiation sources?			
Are mounting techniques described?			
Are the monitor and the mounting component designed to meet the MIL-STD-810F standard?			
Are displays readable in low light levels (< 150 lux)?			
Are displays readable in high light levels (> 10000 lux)?			
<b>Comments:</b>			
<b>Completed by:</b>		<b>Date:</b>	
<b>Reviewed by:</b>		<b>Date:</b>	

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## Section 5.3 Data Storage Data Sheet and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	<p>The following list details monitor information for data storage:</p> <p>a) The monitor shall have the ability to internally store at least 1000 complete occupancy data sets if the monitor uses occupancy sensors. For monitors that do not use occupancy sensors, the monitor shall have the ability to store at least 3 h of continuous measurement data.</p> <p>b) Each occupancy data set shall contain collection results information including:</p> <ol style="list-style-type: none"> <li>1) Time and date in GMT format and local offset</li> <li>2) Occupancy time (if applicable)</li> <li>3) Monitor identification</li> <li>4) Monitor location (GPS for mobile systems)</li> <li>5) Monitor speed (when applicable)</li> <li>6) Alarm type (gamma-ray and/or neutron) and level (if applicable)</li> <li>7) Background (gamma and neutron) count rate</li> <li>8) Radionuclide identification results (when applicable)</li> <li>9) Radionuclide spectra (when applicable)</li> <li>10) Gamma-ray count rate (for individual detectors)</li> <li>11) Neutron count rate (for individual detectors if applicable)</li> </ol> <p>c) Monitors shall be able to store measurement data listed in item b), including background radiation levels and gamma-ray and neutron count rate time-history data locally, and shall have the ability to transfer user-selected portions of that data to a periphery device or location either through manual interface or remotely as required by the user and provided by the manufacturer.</p> <p>d) Monitors shall provide controlled access to real-time response data.</p> <p>e) Monitors shall have the ability to perform measurements with an object stationary in the detection zone or with the object moving through the detection zone either on its own, or with the object stationary and the monitor moving.</p> <p>Fixed measurement times shall be user-selectable and the data shall be observable while being collected. If measurements were performed using fixed measurement times from the manufacturer, the times used shall be provided.</p>		
<b>Note:</b>	Comments are required when the requirement is not verified.		

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	Yes	No
Does the monitor have the ability to internally store at least 1000 occupancies or 3 h of continuous measurement data?		
Does the occupancy data set have the following information:		
Time and data in GMT format and local offset?		
Occupancy time (if applicable)?		
Monitor identification?		
Monitor location (GPS for mobile systems)?		
Monitor speed (when applicable)?		
Gamma alarm?		
Gamma alarm level (if applicable)?		
Neutron alarm?		
Neutron alarm level (if applicable)?		
Gamma background count rate?		
Neutron background count rate?		
Radionuclide identification results (when applicable)?		
Gamma-ray count rate for individual detectors?		
Neutron count rate for individual detectors (if applicable)?		
Does the monitor have the ability to locally store time-history data?		
Does the monitor have the ability to transfer user-selectable portions of the time-history data to a periphery device either through manual interface or remotely?		
Does the monitor provide controlled access to real-time response data?		
Does the monitor have the ability to perform measurements with the object stationary in the detection zone?		
Does the monitor have the ability to perform measurements with the object moving through the detection zone?		
Does the monitor have the ability to perform measurements with the object stationary and monitor moving pass the object within the detection zone?		
Are the measurements times user-selectable?		
If not, does the manufacturer provide the fixed measurement time?		

**Comments:**

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**Completed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Reviewed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_


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## Section 5.4 Indication Features Data Sheet and Report

<b>Manufacturer:</b>											
<b>Model:</b>						<b>Serial Number:</b>					
<b>Date Performed:</b>						<b>Test Location:</b>					
<b>Requirement:</b>	<p>The monitor shall provide an indication of its operational status and alarm condition, and shall be capable of transmitting these signals to a remote station. The user shall have the ability to select the visibility of the status indication.</p> <p>All alarm indicators shall be automatically or manually reset as defined by the user The user shall have the ability to select the visibility of the status indication.</p> <p>Vehicle-based mobile systems shall have the ability to incorporate GPS for tracking purposes. For vehicle-based mobile systems, the operator shall be able to view the real-time GPS data on the user interface. GPS tracking data shall be recorded at each data-logging interval whenever a GPS is used on any system addressed by this standard.</p>										
<b>Note:</b>	Comments are required when the requirement is not verified.										

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		Yes	No
Does the monitor indicate its operational status condition?			
Does the monitor indicate an alarm condition?			
Is the monitor capable of transmitting the operational status condition to a remote station?			
Is the monitor capable of transmitting the alarms to a remote station?			
Can the user select the visibility of the status indication?			
Can the user select to manual or automatic reset the alarm indication?			
For vehicle-based mobile systems, does the system incorporate GPS information?			
For vehicle-based mobile systems, can the user view the real-time GPS data on the user interface?			
For vehicle-based mobile systems, is GPS tracking recorded at each data-logging interval?			
<b>Comments:</b>			
<b>Completed by:</b>		<b>Date:</b>	
<b>Reviewed by:</b>		<b>Date:</b>	

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## Section 5.5 Occupancy and Speed Sensors for Vehicle Monitors Data Sheet and Report

<b>Manufacturer:</b>								
<b>Model:</b>				<b>Serial Number:</b>				
<b>Date Performed:</b>				<b>Test Location:</b>				
<b>Requirement:</b>	<p>The following list details occupancy and speed sensors for vehicle monitors:</p> <p>a) Transportable monitors used primarily for vehicle monitoring applications shall have the ability to support occupancy sensors</p> <p>b) Transportable monitors used primarily for vehicle monitoring applications should have the ability to measure speed of the item as it passes through the detection zone or as the monitor passes the object</p> <p>c) If used, occupancy and speed sensors:</p> <ol style="list-style-type: none"> <li>1) Shall be able to detect presence and to estimate vehicle speed, indicate if a vehicle stops within the detection zone, and not count a single vehicle or object in the detection zone more than once</li> <li>2) Should be capable of operating on a mix of traffic (cars, vans, pickup trucks, buses, cargo trucks, trains, etc)</li> <li>3) Should function under all environmental conditions stated in this standard</li> </ol> <p>d) When systems are used to monitor rail vehicles, they should have the ability to approximate the location of an alarm when monitoring multi-car trains</p> <p>e) It shall be possible to trigger the occupancy sensor circuit using an external signal or through software for testing purposes</p>							
<b>Note:</b>	Comments are required when the requirement is not verified.							




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	Yes	No	N/A
Does the monitor have the ability to support occupancy sensors?			
Does the monitor have the ability to measure speed of the item as passes through the detection zone or as the monitor passes the object?			
If occupancy and speed sensors are used:			
Do they detect the presence of an object?			
Do they estimate speed?			
Do they indicate is an objects or vehicle stops within the detection zone?			
Do they count a single object or vehicle in the detection zone more than once?			
Do Rail monitors have the ability to approximate location of an alarm when monitoring multi-car trains?			
It is possible to trigger the occupancy sensor using an external signal or through software for testing purposes?			

**Comments:** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_


**Completed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Reviewed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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## Section 5.6 Markings Data Sheet and Report

<b>Manufacturer:</b>																					
<b>Model:</b>		<b>Serial Number:</b>																			
<b>Date Performed:</b>		<b>Test Location:</b>																			
<p><b>Requirement:</b> Internal controls shall be identified through markings on electrical circuit boards and/or individual components, and identification in technical manuals.</p> <p>Markings shall be easily readable and permanently fixed under normal conditions of use.</p> <p>Exterior markings shall be limited to the manufacturer's unique serial number, voltage and current requirements if equipped with an outlet plug, and meet minimum code requirements.</p>																					
<p><b>Note:</b> Comments are required when the requirement is not verified.</p>																					
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Are internal controls identified as required?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr style="background-color: #cccccc;"> <td colspan="3" style="padding: 5px;"> </td> </tr> <tr> <td style="text-align: center;">Are markings easily readable and permanently fixed?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr style="background-color: #cccccc;"> <td colspan="3" style="padding: 5px;"> </td> </tr> <tr> <td style="text-align: center;">Are exterior markings identified as required?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>					Yes	No	Are internal controls identified as required?	<input type="checkbox"/>	<input type="checkbox"/>				Are markings easily readable and permanently fixed?	<input type="checkbox"/>	<input type="checkbox"/>				Are exterior markings identified as required?	<input type="checkbox"/>	<input type="checkbox"/>
	Yes	No																			
Are internal controls identified as required?	<input type="checkbox"/>	<input type="checkbox"/>																			
Are markings easily readable and permanently fixed?	<input type="checkbox"/>	<input type="checkbox"/>																			
Are exterior markings identified as required?	<input type="checkbox"/>	<input type="checkbox"/>																			
<b>Comments:</b>																					
<b>Completed by:</b>		<b>Date:</b>																			
<b>Reviewed by:</b>		<b>Date:</b>																			


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## Section 5.7 Power Supply Data Sheet and Report

<b>Manufacturer:</b>											
<b>Model:</b>						<b>Serial Number:</b>					
<b>Date Performed:</b>						<b>Test Location:</b>					
<b>Requirement:</b>	<p>The following list details power supplies:</p> <ul style="list-style-type: none"> <li>• Monitors shall have the ability to operate from multiple power sources.</li> <li>• For AC, the monitor shall be able to operate from single-phase AC supply voltage of 100 V to 240 V and from 47 Hz to 63 Hz.</li> <li>• For DC, the monitor shall be able to operate from 12 V (11 V to 14.5 V).</li> <li>• If operated using consumable batteries, the batteries shall be widely available, not unique to the instrument, and be field replaceable (e.g., AA, 9 V) with no special tools. Battery chargers shall meet U.S. electrical standards.</li> <li>• Monitors designed for use on cranes shall be either self-powered (i.e., battery) or be capable of operation using power from the crane (i.e., 480 V AC).</li> </ul>										
<b>Note:</b>	Comments are required when the requirement is not verified.										


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		Volts	Hertz
What are the power requirements of the monitor?			
		<b>Yes</b>	<b>No</b>
Does the monitor have the ability to operate from multiple power sources?			
Describe the power sources use:			
For AC operated monitor, does the monitor have the ability to operate from single-phase AC supply voltage of 100 V to 240 V and 47 Hz to 63 Hz?			
For DC operated monitors, does the monitor have the ability to operate from 12 V (11 V to 14.5 V)?			
For monitors operated with consumable batteries, are the batteries widely available, not unique to the instrument and field replaceable with no special tools?			
For crane mounted monitors, are the monitors self-powered (i.e. Battery) or capable of operating using power from the crane (i.e. 480 V AC)?			
For rechargeable batteries, do changers meet U.S. electrical standards?			
<b>Comments:</b>			
<b>Completed by:</b>		<b>Date:</b>	
<b>Reviewed by:</b>		<b>Date:</b>	

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## Section 5.8 Protection of Switches Data Sheet and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	Switches and other controls should be designed to ensure that the monitor could be operated properly while minimizing accidental switch operation.		
<b>Note:</b>	Comments are required when the requirement is not verified.		
			<b>Yes</b>
			<b>No</b>
Are monitor switches and controls designed to minimize accidental operation?			
<b>Comments:</b>			
<b>Completed by:</b>			<b>Date:</b>
<b>Reviewed by:</b>			<b>Date:</b>

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## Section 5.9 Effective Range of Measurement Data Sheet and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	<p>The following list details effective ranges of measurement:</p> <ul style="list-style-type: none"> <li>• The effective gamma-ray energy response range shall be stated by the manufacturer, and should be at least 50 keV to 3000 keV.</li> <li>• The manufacturer shall state the range for gamma-ray count rate measurement and for neutron count rate indication.</li> </ul>		
<b>Note:</b>	Comments are required when the requirement is not verified.		
What is the stated gamma energy range?			
What is the stated gamma count rate range?			
What is the stated neutron count rate range?			
<b>Comments:</b>			
<b>Completed by:</b>			<b>Date:</b>
<b>Reviewed by:</b>			<b>Date:</b>


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## Section 5.10 Software and Data Analysis Data Sheet and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	<p><b>5.10.1 Communications protocol and data format</b>  The monitor shall have the ability to transfer data to an external device, such as a computer. The transfer shall be based on a commonly available technology such as Ethernet, USB, RS-232, wireless (i.e., 802.11), or RS-485. Consideration should be given to data security when using wireless data transfer techniques.</p> <p>When used, wireless techniques shall have the ability to be encrypted.</p> <p>The transfer protocol and format shall be fully described in the technical manual and be freely distributable.</p> <p>Data format shall be as defined in ANSI N42.42.</p> <p><b>5.10.2.1 Warning/status indicators</b>  The following indications shall be provided at the user interface when applicable, as a minimum.</p> <ul style="list-style-type: none"> <li>• Background changes that can affect the overall sensitivity of the monitor</li> <li>• High-low detector count rate conditions (indication of background condition)</li> <li>• Energy stabilization invalid or not acceptable</li> <li>• Occupancy sensor failure, if occupancy sensors are used</li> <li>• Changes in operational status (i.e., occupied, alarm, monitoring background, fault, blocked, etc)</li> <li>• Low power</li> <li>• Loss of line power</li> <li>• Battery status</li> <li>• Excessive speed (when applicable for vehicle portal monitoring)</li> <li>• Overload indication</li> <li>• Alarm indication</li> <li>• Visual and audible, with alarm type (gamma or neutron) and level</li> </ul> <p><b>5.10.2.2 Basic indications and functions</b>  The following information and control shall be provided for the trained user:</p> <ul style="list-style-type: none"> <li>• View operational status</li> <li>• View alarm indication.</li> <li>• Ability to reset alarms</li> </ul> <p><b>5.10.2.3 Advanced indications and functions</b>  The following information and control shall be provided for the supervisory user through the use of access controls or special commands.</p> <ul style="list-style-type: none"> <li>• Access to and control of operating parameters (alarm control)</li> <li>• Access to and control of data logging intervals</li> <li>• Access to alarm history</li> <li>• Access to control of basic indication function</li> <li>• Access to occupancy data set (if occupancy sensors are used)</li> <li>• Access to vehicle photo (if available)</li> <li>• Access to radiation profiles (count rate time history data)</li> <li>• Access to background radiation information</li> <li>• Access to alarm selection criteria</li> </ul> <p><b>5.10.3 Radiation response indication</b>  The following information and control shall be provided at the user display:</p> <ul style="list-style-type: none"> <li>• Strip-chart display of gamma and neutron counts</li> <li>• Spectral display from gamma detectors, if applicable</li> <li>• Real-time access to data stored as listed in item b) of 5.3</li> <li>• Real-time mapping with GPS data and alarm locations (for mobile systems).</li> </ul>		
<b>Note:</b>	Comments are required when the requirement is not verified.		





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### Section 5.11.1 Operating Parameters Data Sheet and Report


<b>Manufacturer:</b>			
<b>Model:</b>			<b>Serial Number:</b>
<b>Date Performed:</b>			<b>Test Location:</b>
<b>Requirement:</b>	The manufacturer shall provide the list of recommended operating parameters (e.g., alarm thresholds, detector voltage, gain). These parameters shall be used throughout testing.		
<b>Note:</b> Comments are required when the requirement is not verified.			

Test Results		
	Yes	No
Did manufacturer provide a list of recommended operating parameters?	<input type="checkbox"/>	<input type="checkbox"/>

<b>List the parameters provided by the manufacturer:</b>			
<b>Comments:</b>			
<b>Completed by:</b>			<b>Date:</b>
<b>Reviewed by:</b>			<b>Date:</b>





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Test Results

Source												
	<sup>241</sup> Am		<sup>137</sup> Cs		<sup>60</sup> Co		<sup>228</sup> Th		<sup>133</sup> Ba		<sup>57</sup> Co	
Source Data:												
Source Activity:												
	Number of Trials	Number of Alarms	Number of Trials	Number of Alarms	Number of Trials	Number of Alarms	Number of Trials	Number of Alarms	Number of Trials	Number of Alarms	Number of Trials	Number of Alarms
Bottom												
Mid-Point Bottom/Middle												
Middle												
Mid-Point Middle/Top												
Top												


Comments:


Completed by:


Date:


Reviewed by:


Date:


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## Section 6.9 Detector Response to Neutron Radiation Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	<p>An alarm shall be triggered when the monitor is exposed to a <sup>252</sup>Cf neutron emission rate of 20,000 n/s for a duration specified by the manufacture or at the passage speed as appropriate for the monitor type being tested.</p> <p>The instrument response is acceptable when a minimum of 59 alarms occur in 60 occupancies.</p>		
<b>Note:</b> Comments are required when the requirement is not verified.			


<b>Background Reading:</b>		(add units)	<b>Test Equipment:</b>		
<b>Temperature:</b>	° C	<b>Humidity:</b>	%	<b>Pressure:</b>	In. Hg.

### Test Results

	<b>Source</b>	
	<sup>252</sup> Cf	
<b>Source Data:</b>		
<b>Source Activity:</b>		
	<b>Number of Trials</b>	<b>Number of Alarms</b>
<b>Horizontal Plane</b>		
<b>Bottom</b>		
<b>Mid-Point Bottom/Middle</b>		
<b>Middle</b>		
<b>Mid-Point Middle/Top</b>		
<b>Top</b>		

<b>Comments:</b>			
<b>Completed by:</b>		<b>Date:</b>	
<b>Reviewed by:</b>		<b>Date:</b>	



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	Count Rate Beginning	Alarm		Count Rate End	The time to recover is ≤1min	
		Y	N		Yes	No
	1		<input type="checkbox"/>	<input type="checkbox"/>		
2		<input type="checkbox"/>	<input type="checkbox"/>			
3		<input type="checkbox"/>	<input type="checkbox"/>			

	Yes	No
Did the monitor provide an overload indication?		
Describe:		
Did the monitor alarm?		
For DC operated monitors, does the monitor have the ability to operate from 12 V (11 V to 14.5 V)?		
Did the alarm remain until the radiation field was reduced to the pre-test level?		
Did the monitor return to the pre-test count rate within 1 min from the removal of the source?		

**Comments:**

---



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---



---

**Completed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Reviewed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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**Section 6.11 Neutron Indication in the Presence of Photons  
Test Data and Report**

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	Gamma radiation at exposure rates of up to 10 mR/h (100 µGy/h) (at the face of the center of the detection assembly) shall not trigger the neutron alarm. In addition, the monitor shall be able to detect an increase in neutron radiation while being exposed to gamma radiation.		
<b>Note:</b>	Comments are required when the requirement is not verified.		


<b>Temperature:</b>	° C	<b>Humidity:</b>	%	<b>Pressure:</b>	In. Hg.
<b>Gamma Source Data:</b>					
<b>Neutron Source Data:</b>					

Test Data

	Gamma Only		Gamma + unmoderated neutrons		Gamma + moderated neutrons	
	Neutron Alarm		Neutron Alarm		Neutron Alarm	
	Y	N	Y	N	Y	N
1						
2						
3						

<b>Comments:</b>			
<b>Completed by:</b>		<b>Date:</b>	
<b>Reviewed by:</b>		<b>Date:</b>	



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## Section 6.12 Background Effects (Stationary) Test Data and Report

**Manufacturer:** \_\_\_\_\_

**Model:** \_\_\_\_\_

**Serial Number:** \_\_\_\_\_

**Date Performed:** \_\_\_\_\_

**Test Location:** \_\_\_\_\_

**Requirement:**

The monitor shall provide a warning indication when a change in background is large enough to cause a substantial change in alarm probability. The indication shall be visual and/or audible (the type of alarm shall be user selectable) and shall be different than monitoring alarms.

**Note:** Comments are required when the requirement is not verified.

**Gamma-ray Background Reading:** \_\_\_\_\_

**Neutron Background Reading:** \_\_\_\_\_

**Test Equipment:** \_\_\_\_\_

**Temperature:** \_\_\_\_\_


° C

**Humidity:** \_\_\_\_\_


%

**Pressure:** \_\_\_\_\_

in Hg.

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<b>Source Data:</b>								
		<b>Test Data</b>						
		<sup>137</sup> Cs				<sup>252</sup> Cf		
		<b>Background Change Indication</b>				<b>Background Change Indication</b>		
		Yes		No		Yes		No
Trial 1								
Trial 2								
Trial 3								
		<b>Test Results</b>						
						Yes	No	
		Is the visual indication different from the monitoring alarm?						
		Describe:						
						Yes	No	
		Is the audible indication different from the monitoring alarm?						
		Describe:						
<b>Comments:</b>								
<b>Completed by:</b>						<b>Date:</b>		
<b>Reviewed by:</b>						<b>Date:</b>		

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**Section 6.13 Background Effects (Mobile)  
Test Data and Report**

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	<p>Mobile monitors shall function normally when exposed to changing background situations that may be encountered during normal use. The monitor shall provide a warning indication when a change in background is large enough to cause a substantial change in alarm probability, such as what may be caused when moving from different road surfaces or near different building materials. The indication shall be visual and/or audible (the type of alarm shall be user selectable) and shall be different than monitoring alarms.</p>		
<b>Note:</b>	Comments are required when the requirement is not verified.		

<b>Gamma-ray Background Reading:</b>		(add units)
<b>Neutron Background Reading:</b>		(add units)
<b>Test Equipment:</b>		
<b>Temperature:</b> _____ ° C	<b>Humidity:</b> _____ %	<b>Pressure:</b> _____ in Hg
<b>Sources Data:</b>		

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Test Data


Monitor allowed to update background while positioned in an area where the background is a factor of 5 greater than the normal background in that area

Without initiating a measurement cycle (if applicable)

Without sources							
	Gamma				Neutron		
	Background Change Indication				Background Change Indication		
	Yes	No	No		Yes	No	No
Trial 1							(alarms are recorded)
Trial 2							
Trial 3							
Trial 4							
Trial 5							
Trial 6							
Trial 7							
Trial 8							
Trial 9							
Trial 10							

Without initiating a measurement cycle (if applicable)

With additional <sup>137</sup> Cs source							
	Gamma				Neutron		
	Background Change Indication				Background Change Indication		
	Yes	No	No		Yes	No	No
Trial 1							(alarms are recorded)
Trial 2							
Trial 3							
Trial 4							
Trial 5							
Trial 6							
Trial 7							
Trial 8							
Trial 9							
Trial 10							

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Monitor allowed to update background while positioned in the normal background area

Without initiating a measurement cycle (if applicable)


Without sources							
Gamma Background Change Indication				Neutron Background Change Indication			
Yes		No		Yes		No	
Trial 1							
Trial 2							
Trial 3							
Trial 4							
Trial 5							
Trial 6							
Trial 7							
Trial 8							
Trial 9							
Trial 10							

Without initiating a measurement cycle (if applicable)

With additional <sup>137</sup> Cs source							
Gamma Background Change Indication				Neutron Background Change Indication			
Yes		No		Yes		No	
Trial 1							
Trial 2							
Trial 3							
Trial 4							
Trial 5							
Trial 6							
Trial 7							
Trial 8							
Trial 9							
Trial 10							

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Test Results		
	Yes	No
Is the visual indication different from the monitoring alarm?	<input type="checkbox"/>	<input type="checkbox"/>
Describe:		
Is the audible indication different from the monitoring alarm?	<input type="checkbox"/>	<input type="checkbox"/>
Describe:		
<b>Comments:</b>		
<b>Completed by:</b>	<b>Date:</b>	
<b>Reviewed by:</b>	<b>Date:</b>	

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## Section 6.14.1 Radionuclide Categorization Data Sheet and Report

<b>Manufacturer:</b>			
<b>Model:</b>			<b>Serial Number:</b>
<b>Date Performed:</b>			<b>Test Location:</b>
<b>Requirement:</b>	<p>The manufacturer shall state the radionuclides that the monitor can identify and their categories. The categories selected should be based on the list shown in 6.14.1. The list shall contain as a minimum, the radionuclides listed (Table 4):</p> <ul style="list-style-type: none"> <li>- Special Nuclear Materials: Uranium (used to indicate 233U, 235U), 237Np, Pu.</li> <li>- Medical radionuclides: 18F, 67Ga, 51Cr, 75Se, 89Sr, 99Mo, 99mTc, 103Pd, 111In, Iodine (123I, 125I, 131I), 153Sm, 201Tl, 133Xe.</li> <li>- Naturally occurring radioactive materials (NORM): 40K, 226Ra, 232Th and daughters, 238U and daughters.</li> <li>- Industrial radionuclides: 57Co, 60Co, 133Ba, 137Cs, 192Ir, 204Tl, 226Ra, and 241Am.</li> </ul>		
<b>Note:</b>	Comments are required when the requirement is not verified.		

### Test Results

	Yes	No
The manufacturer states the radionuclides that the monitor can identify by category.	<input type="checkbox"/>	<input type="checkbox"/>
The monitor can identify (at a minimum) the four different categories of radionuclides listed in the requirement.	<input type="checkbox"/>	<input type="checkbox"/>
Does the list provided by the manufacturer contain all the radionuclides listed in Table 4 of the standard?	<input type="checkbox"/>	<input type="checkbox"/>

<b>Comments:</b>			
<b>Completed by:</b>			<b>Date:</b>
<b>Reviewed by:</b>			<b>Date:</b>

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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### Section 6.14.2.2 Single Radionuclide Identification - Unshielded Data Sheet and Report


<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	<p>The manufacturer shall provide a list of radionuclides that the monitor can identify. The list should contain the following radionuclides:</p> <p><math>^{40}\text{K}</math>, <math>^{57}\text{Co}</math>, <math>^{60}\text{Co}</math>, <math>^{67}\text{Ga}</math>, <math>^{99\text{m}}\text{Tc}</math>, <math>^{131}\text{I}</math>, <math>^{133}\text{Ba}</math>, <math>^{137}\text{Cs}</math>, <math>^{192}\text{Ir}</math>, <math>^{201}\text{Tl}</math>, <math>^{226}\text{Ra}</math>, <math>^{232}\text{Th}</math>, DU, RGPu, <math>^{241}\text{Am}</math>, HEU, WGPu, <math>^{237}\text{Np}</math>.</p> <p>If the manufacturer claims the ability to detect Highly Enriched Uranium (HEU), Reactor Grade Plutonium (RGPu), or Weapons Grade Plutonium (WGPu), perform 6.14.2.3. If no claims are made, 6.14.2.3 is not required.</p>		
<b>Note:</b>	Comments are required when the requirement is not verified.		

#### Single Radionuclide Identification Test Data

Transitory measurements


<b>Date Performed:</b>	$^{40}\text{K}$		
	<b>Bottom</b>	<b>Middle</b>	<b>Top</b>
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Corr			




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<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 40 of 121

<b><sup>57</sup>Co</b>			
<b>Date Performed:</b>			
	<b>Bottom</b>	<b>Middle</b>	<b>Top</b>
1			
2			
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7			
8			
9			
10			
Corr			
<b><sup>60</sup>Co</b>			
<b>Date Performed:</b>			
	<b>Bottom</b>	<b>Middle</b>	<b>Top</b>
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10			
Corr			
<b><sup>67</sup>Ga</b>			
<b>Date Performed:</b>			
	<b>Bottom</b>	<b>Middle</b>	<b>Top</b>
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	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 41 of 121

		<b><sup>99m</sup>Tc</b>		
	<b>Date Performed:</b>		<b>Bottom</b>	<b>Middle</b>
		1		
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		9		
		10		
		Corr		
		<b><sup>131</sup>I</b>		
	<b>Date Performed:</b>		<b>Bottom</b>	<b>Middle</b>
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		2		
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		7		
		8		
		9		
		10		
		Corr		
		<b><sup>133</sup>Ba</b>		
	<b>Date Performed:</b>		<b>Bottom</b>	<b>Middle</b>
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		10		
		Corr		

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 42 of 121

<b><sup>137</sup>Cs</b>		
<b>Date Performed:</b>		
		<b>Bottom      Middle      Top</b>
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9		
10		
Corr		
<b><sup>192</sup>Ir</b>		
<b>Date Performed:</b>		
		<b>Bottom      Middle      Top</b>
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Corr		
<b><sup>201</sup>Tl</b>		
<b>Date Performed:</b>		
		<b>Bottom      Middle      Top</b>
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Corr		

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 43 of 121

<sup>226</sup> Ra		
<b>Date Performed:</b>		
	<b>Bottom</b>	<b>Middle</b>
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7		
8		
9		
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Corr		

<sup>232</sup> Th		
<b>Date Performed:</b>		
	<b>Bottom</b>	<b>Middle</b>
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9		
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Corr		

DU		
<b>Date Performed:</b>		
	<b>Bottom</b>	<b>Middle</b>
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2		
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Corr		

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 44 of 121

		<b><sup>241</sup>Am</b>					
<b>Date Performed:</b>		<b>Bottom</b>	<b>Middle</b>	<b>Top</b>			
	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	Corr						

Source Information			
Date	Radionuclide	Activity	Exposure rate
	<sup>40</sup> K		
	<sup>57</sup> Co		
	<sup>60</sup> Co		
	<sup>67</sup> Ga		
	<sup>99m</sup> Tc		
	<sup>131</sup> I		
	<sup>133</sup> Ba		
	<sup>137</sup> Cs		
	<sup>192</sup> Ir		
	<sup>201</sup> Tl		
	<sup>226</sup> Ra		
	<sup>232</sup> Th		
	DU		
	<sup>241</sup> Am		

(add units)

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 45 of 121

**Stationary measurements**

Measurement time: \_\_\_\_\_ min

**Date Performed:** \_\_\_\_\_


<sup>40</sup> K			
	Bottom	Middle	Top
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Corr			

**Date Performed:** \_\_\_\_\_

<sup>57</sup> Co			
	Bottom	Middle	Top
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Corr			

**Date Performed:** \_\_\_\_\_

<sup>60</sup> Co			
	Bottom	Middle	Top
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Corr			

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable          Radiation Monitors Used for Homeland          Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 46 of 121

			<sup>67</sup> Ga		
Date Performed:			Bottom	Middle	Top
		1			
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		Corr			


  

			<sup>99m</sup> Tc		
Date Performed:			Bottom	Middle	Top
		1			
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		Corr			


  

			<sup>131</sup> I		
Date Performed:			Bottom	Middle	Top
		1			
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		Corr			




	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 47 of 121

		<b><sup>133</sup>Ba</b>		
	<b>Date Performed:</b>		<b>Bottom</b>	<b>Middle</b>
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		Corr		
		<b><sup>137</sup>Cs</b>		
	<b>Date Performed:</b>		<b>Bottom</b>	<b>Middle</b>
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		Corr		
		<b><sup>192</sup>Ir</b>		
	<b>Date Performed:</b>		<b>Bottom</b>	<b>Middle</b>
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		Corr		

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable          Radiation Monitors Used for Homeland          Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 48 of 121

			<b><sup>201</sup>Tl</b>					
<b>Date Performed:</b>			<b>Bottom</b>	<b>Middle</b>	<b>Top</b>			
		1						
		2						
		3						
		4						
		5						
		6						
		7						
		8						
		9						
		10						
		Corr						
			<b><sup>226</sup>Ra</b>					
<b>Date Performed:</b>			<b>Bottom</b>	<b>Middle</b>	<b>Top</b>			
		1						
		2						
		3						
		4						
		5						
		6						
		7						
		8						
		9						
		10						
		Corr						
			<b><sup>232</sup>Th</b>					
<b>Date Performed:</b>			<b>Bottom</b>	<b>Middle</b>	<b>Top</b>			
		1						
		2						
		3						
		4						
		5						
		6						
		7						
		8						
		9						
		10						
		Corr						



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable          Radiation Monitors Used for Homeland          Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 50 of 121

Source Information			
Date	Radionuclide	Activity	Exposure rate
	<sup>40</sup> K		
	<sup>57</sup> Co		
	<sup>60</sup> Co		
	<sup>67</sup> Ga		
	<sup>99m</sup> Tc		
	<sup>131</sup> I		
	<sup>133</sup> Ba		
	<sup>137</sup> Cs		
	<sup>192</sup> Ir		
	<sup>201</sup> Tl		
	<sup>226</sup> Ra		
	<sup>232</sup> Th		
	DU		
	<sup>241</sup> Am		

(add units)

**Comments:**

**Completed by:**

**Date:**

**Reviewed by:**

**Date:**

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 51 of 121

### Section 6.14.2.3 Single Radionuclide - Unshielded SNM Data Sheet and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	Repeat the test described in 6.14.2.2 using HEU, RGPu, and/or WGPu.		
<b>Note:</b>	Comments are required when the requirement is not verified.		

#### Single Radionuclide Identification Test Data

Transitory measurements

<b>Date Performed:</b>	<b>HEU</b>		
	<b>Bottom</b>	<b>Middle</b>	<b>Top</b>
1			
2			
3			
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5			
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7			
8			
9			
10			
Corr			

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 52 of 121

<b>Date Performed:</b>		<b>RGPu</b>		
		<b>Bottom</b>	<b>Middle</b>	<b>Top</b>
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Corr				

Source Information			
Date	Radionuclide	Activity	Exposure rate
	HEU		
	WGPu		
	RGPu		

(add units)

**Stationary measurements**

**Measurement time:** \_\_\_\_\_ **min**

<b>Date Performed:</b>		<b>HEU</b>		
		<b>Bottom</b>	<b>Middle</b>	<b>Top</b>
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Corr				

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 53 of 121

<b>Date Performed:</b>	<b>RGPu</b>			
	<b>Bottom</b>	<b>Middle</b>	<b>Top</b>	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Corr				

Source Information			
Date	Radionuclide	Activity	Exposure rate
	HEU		
	WGPu		
	RGPu		

(add units)

**Comments:**

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**Completed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Reviewed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 54 of 121

### Section 6.14.3 Identification of Shielded Radionuclides

#### Data Sheet and Report


<b>Manufacturer:</b>			
<b>Model:</b>			<b>Serial Number:</b>
<b>Date Performed:</b>			<b>Test Location:</b>
<b>Requirement:</b>	<p><b>6.14.3.1 Requirements based on shielding related to shipping containers</b>          The manufacturer shall provide a list of shielded radionuclides that the monitor can identify. For this standard, the source is surrounded by 3 cm of steel on all sides. The list shall contain the following radionuclides, as a minimum:          133Ba, 137Cs, and 60Co          NOTE—3 cm steel is based on possible shipping container configurations and attenuation of gamma-ray emissions from each radionuclide.</p> <p><b>6.14.3.2 Requirements based on medical treatments</b>          The manufacturer shall provide a list of radionuclides that the monitor can identify when monitoring people with medical treatments. For this standard, the source is surrounded by 7.62 cm of polymethyl methacrylate (PMMA). The list shall contain the following radionuclides, as a minimum:          67Ga, 99mTc, 131I, and 201Tl</p>		
<b>Note:</b>	Comments are required when the requirement is not verified.		

#### Single Radionuclide Identification Test Data

##### Transitory measurements

<b>Date Performed:</b>	<b><sup>60</sup>Co</b>		
	<b>Bottom</b>	<b>Middle</b>	<b>Top</b>
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Corr			



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 55 of 121

<b><sup>67</sup>Ga</b>		
<b>Date Performed:</b>		
		<b>Bottom      Middle      Top</b>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		
<b><sup>99m</sup>Tc</b>		
<b>Date Performed:</b>		
		<b>Bottom      Middle      Top</b>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		
<b><sup>131</sup>I</b>		
<b>Date Performed:</b>		
		<b>Bottom      Middle      Top</b>
1		
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4		
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7		
8		
9		
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Corr		



<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 57 of 121

Source Information			
Date	Radionuclide	Activity	Exposure rate
	<sup>60</sup> Co		
	<sup>67</sup> Ga		
	<sup>99m</sup> Tc		
	<sup>131</sup> I		
	<sup>133</sup> Ba		
	<sup>137</sup> Cs		
	<sup>201</sup> Tl		

(add units)

**Stationary measurements**


Measurement time: \_\_\_\_\_ min

Date Performed: \_\_\_\_\_

<sup>60</sup> Co			
	Bottom	Middle	Top
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Corr			

Date Performed: \_\_\_\_\_


<sup>67</sup> Ga			
	Bottom	Middle	Top
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Corr			

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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<b><sup>99m</sup>Tc</b>		
<b>Date Performed:</b>		
	<b>Bottom</b>	<b>Middle</b>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		
<b><sup>131</sup>I</b>		
<b>Date Performed:</b>		
	<b>Bottom</b>	<b>Middle</b>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		
<b><sup>133</sup>Ba</b>		
<b>Date Performed:</b>		
	<b>Bottom</b>	<b>Middle</b>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 59 of 121

<sup>137</sup> Cs					
Date Performed:			Bottom	Middle	Top
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	Corr				
<sup>201</sup> Tl					
Date Performed:			Bottom	Middle	Top
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	Corr				

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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Source Information				(add units)
Date	Radionuclide	Activity	Exposure rate	
	<sup>60</sup> Co			
	<sup>67</sup> Ga			
	<sup>99m</sup> Tc			
	<sup>131</sup> I			
	<sup>133</sup> Ba			
	<sup>137</sup> Cs			
	<sup>201</sup> Tl			
<b>Comments:</b>				
<b>Completed by:</b>			<b>Date:</b>	
<b>Reviewed by:</b>			<b>Date:</b>	

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 61 of 121

### Section 6.14.4 Simultaneous Radionuclide Identification Data Sheet and Report

<b>Manufacturer:</b>				<b>Serial Number:</b>			
<b>Model:</b>				<b>Test Location:</b>			
<b>Date Performed:</b>							
<b>Requirement:</b> The monitor shall have the ability to identify more than one radionuclide simultaneously. Simultaneous identification ability shall consist of radionuclides from separate categories (e.g., 99mTc + 137Cs, 131I + RGPu).							
The monitor shall have the ability to identify a radionuclide of interest when combined with other radionuclides.							
<b>Note:</b> Comments are required when the requirement is not verified.							

**Transitory Tests**

#### Simultaneous Radionuclide Identification Test Data

**Date Performed:**

$^{40}\text{K} + ^{226}\text{Ra} + ^{232}\text{Th} + \text{RGPu}$				
	Bottom		Middle	Top
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Corr				

**Date Performed:**

$^{40}\text{K} + ^{226}\text{Ra} + ^{232}\text{Th} + \text{DU}$				
	Bottom		Middle	Top
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Corr				

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Mobile and Transportable Radiation Monitors Used for Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 1.02	<b>PAGE</b> 62 of 121

Date Performed:

<sup>99m</sup> Tc+ DU					
	Bottom		Middle		Top
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Corr					

Date Performed:

<sup>131</sup> I + RGPu					
	Bottom		Middle		Top
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Corr					

Source Information				
Date	Mix	Radionuclide	Activity	Exposure rate
	<sup>40</sup> K + <sup>226</sup> Ra + <sup>232</sup> Th + RGPu	<sup>40</sup> K		
		<sup>226</sup> Ra		
		<sup>232</sup> Th		
		RGPu		
	<sup>40</sup> K + <sup>226</sup> Ra + <sup>232</sup> Th + DU	<sup>40</sup> K		
		<sup>226</sup> Ra		
		<sup>232</sup> Th		
		DU		
	<sup>99m</sup> Tc + DU	<sup>99m</sup> Tc		
		DU		
	<sup>99m</sup> Tc + RGPu	<sup>99m</sup> Tc		
		RGPu		

(add units)



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**Stationary Tests**

Measurement time: \_\_\_\_\_ min

**Simultaneous Radionuclide Identification Test Data**

Date Performed: \_\_\_\_\_

$^{40}\text{K} + ^{226}\text{Ra} + ^{232}\text{Th} + \text{RGPu}$				
	Bottom		Middle	Top
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Corr				

Date Performed: \_\_\_\_\_

$^{40}\text{K} + ^{226}\text{Ra} + ^{232}\text{Th} + \text{DU}$				
	Bottom		Middle	Top
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Corr				

Date Performed: \_\_\_\_\_

$^{99m}\text{Tc} + \text{DU}$				
	Bottom		Middle	Top
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Corr				

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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<b>Date Performed:</b>	<b><sup>131</sup>I + RGPu</b>			
	<b>Bottom</b>		<b>Middle</b>	<b>Top</b>
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Corr				

Source Information				
Date	Mix	Radionuclide	Activity	Exposure rate
	<sup>40</sup> K + <sup>226</sup> Ra + <sup>232</sup> Th + RGPu	<sup>40</sup> K		
		<sup>226</sup> Ra		
		<sup>232</sup> Th		
		RGPu		
	<sup>40</sup> K + <sup>226</sup> Ra + <sup>232</sup> Th + DU	<sup>40</sup> K		
		<sup>226</sup> Ra		
		<sup>232</sup> Th		
	<sup>99m</sup> Tc + DU	DU		
		<sup>99m</sup> Tc		
	<sup>99m</sup> Tc + RGPu	DU		
		<sup>99m</sup> Tc		
		RGPu		

(add units)

**Comments:**

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**Completed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Reviewed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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### Section 6.14.5 Overload Characteristics for Identification Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	The manufacturer shall state the maximum gamma-ray exposure rate ( $\mu\text{R/h}$ ) relative to $^{137}\text{Cs}$ for identification.		
<b>Note:</b>	Comments are required when the requirement is not verified.		

<b>Maximum exposure rate stated by manufacturer:</b>	(add units)				
<b>Background Reading:</b>	(add units)				
<b>Temperature:</b>	° C	<b>Humidity:</b>	%	<b>Pressure:</b>	in Hg
<b>Source Data:</b>					

**Transitory measurements**

Test Data Identified	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Correct	0%

(Yes/No entry)

Test Report		
The monitor correctly identified $^{60}\text{Co}$ in 8 out of 10 trials	Yes	No
	<input type="checkbox"/>	<input type="checkbox"/>

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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**Stationary measurements**

Measurement time: \_\_\_\_\_ min

Test Data Identified	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Correct	0%

(Yes/No entry)

Test Report		
The monitor correctly identified <sup>60</sup> Co in 8 out of 10 trials	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Comments:

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Completed by: \_\_\_\_\_

Date: \_\_\_\_\_

Reviewed by: \_\_\_\_\_

Date: \_\_\_\_\_

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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### Section 6.14.6 Pile-Up Effects Test Data and Report


<b>Manufacturer:</b>				
<b>Model:</b>			<b>Serial Number:</b>	
<b>Date Performed:</b>			<b>Test Location:</b>	
<b>Requirement:</b>	The monitor shall correctly identify radionuclides that are associated with people who have recently received radiation therapy treatments (131I).			
<b>Note:</b>	Comments are required when the requirement is not verified.			
<b>Background Reading:</b>			(add units)	
<b>Temperature:</b>	° C	<b>Humidity:</b>	%	<b>Pressure:</b> In. Hg.
<b>Source Data:</b>				

**Transitory measurements**

Test Data Identified	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Correct	0%

(Yes/No entry)

Test Report		
The monitor correctly identified <sup>131</sup> I in 8 out of 10 trials	Yes <input type="checkbox"/>	No <input type="checkbox"/>

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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**Stationary measurements**

Measurement time: \_\_\_\_\_ min

Test Data Identified	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Correct	0%

(Yes/No entry)

Test Report		
The monitor correctly identified <sup>131</sup> I in 8 out of 10 trials	Yes <input type="checkbox"/>	No <input type="checkbox"/>


**Comments:**

**Completed by:** \_\_\_\_\_

**Date:** \_\_\_\_\_


**Reviewed by:** \_\_\_\_\_

**Date:** \_\_\_\_\_

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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**Section 6.15 Determination of Efficiency  
Data Sheet**

<b>Manufacturer:</b>				
<b>Model:</b>			<b>Serial Number:</b>	
<b>Date Performed:</b>			<b>Test Location:</b>	
<b>Requirement:</b>	<p>The manufacturer shall state the full-energy-peak efficiency for <sup>57</sup>Co (122 keV at 85.51%, T<sub>1/2</sub> = 272 d), <sup>133</sup>Ba (356 keV at 62.05%, T<sub>1/2</sub> = 10.5 y), <sup>137</sup>Cs (662 keV at 85.1%, T<sub>1/2</sub> = 30 y), and <sup>60</sup>Co (1173 and 1332 keV at 99.857% and 99.983%, respectively, T<sub>1/2</sub> = 5.27 y).</p> <p>NOTE—Data from Evaluated Nuclear Structure Data File (ENSDF) and Bureau National de Métrologie-Laboratoire National Henri Becquerel/Commissariat à l'énergie atomique (BNM-LNHB/CEA)</p>			
<b>Notes:</b>	Comments are required when the requirement is not verified.			
<b><u>Test Results (Peak Efficiency)</u></b>				
<b>Temperature:</b>		° C	<b>Humidity:</b>	%
			<b>Pressure:</b>	in Hg
<b>Test Equipment Used:</b>				
<i>Note: if the monitor uses multiple detectors the information below needs to be recorded for each detector</i>				

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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Detector 1

**Efficiency Results**

Source	Measured Efficiency	Manufacturer Stated Efficiency
Co-57	#VALUE!	
<sup>60</sup> Co, Pk1	#VALUE!	
<sup>60</sup> Co, Pk2	#VALUE!	
Ba-133	#VALUE!	
Cs-137	#VALUE!	

**Test Measurements (Peak Efficiency)**

**Table 1. Peak dps computations**


Source	ID	Decayed activity to date (uCi)	Decayed Activity (Bq)	Abundance (Abd)	Peak (gammas/s)
<sup>57</sup> Co			#VALUE!	0.8551	#VALUE!
<sup>60</sup> Co, Pk1			#VALUE!	0.99857	#VALUE!
<sup>60</sup> Co, Pk2			#VALUE!	0.99983	#VALUE!
<sup>133</sup> Ba			#VALUE!	0.6205	#VALUE!
<sup>137</sup> Cs			#VALUE!	0.851	#VALUE!

**Table 2. Net Peak cps computations**

Source	Gross Peak Area	Peak Bkg	Net Peak Area	Acquisition time seconds	Net Peak Count Rate	Measured efficiency
<sup>57</sup> Co			#VALUE!		#VALUE!	#VALUE!
<sup>60</sup> Co, Pk1			#VALUE!		#VALUE!	#VALUE!
<sup>60</sup> Co, Pk2			#VALUE!		#VALUE!	#VALUE!
<sup>133</sup> Ba			#VALUE!		#VALUE!	#VALUE!
<sup>137</sup> Cs			#VALUE!		#VALUE!	#VALUE!






	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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**Section 6.16 Determination of Full Width Half Maximum (FWHM)  
Data Sheet and Report**


<b>Manufacturer:</b>							
<b>Model:</b>				<b>Serial Number:</b>			
<b>Date Performed:</b>				<b>Test Location:</b>			
<b>Requirement:</b>	The manufacturer shall state the FWHM as defined in the IEEE standard appropriate to the detector used for 137Cs (662 keV at 85.1%).						
<b>Notes:</b>	Comments are required when the requirement is not verified.						
<b>Temperature:</b>		° C	<b>Humidity:</b>		%	<b>Pressure:</b>	
							in Hg
<b>Test Equipment Used:</b>							
<b>Source Data:</b>							
<i>Note: if the monitor uses multiple detectors the information below needs to be recorded for each detector</i>							

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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<u>Detector 1</u>	<b>Full Width Half Maximum Measurements</b>			
	<b>Manufacturer's Stated</b>			<b>Measured value</b>
	<b>FWHM Cs-137 (keV)</b>			<b>FWHM Cs-137 (keV)</b>
	<b>Acceptance Range</b>			
	<b>(Based on</b>			
	0.00	0.00		
	- 20 %	+ 20 %		
<u>Detector 2</u>	<b>Full Width Half Maximum Measurements</b>			
	<b>Manufacturer's Stated</b>			<b>Measured value</b>
	<b>FWHM Cs-137 (keV)</b>			<b>FWHM Cs-137 (keV)</b>
	<b>Acceptance Range</b>			
	<b>(Based on</b>			
	0.00	0.00		
	- 20 %	+ 20 %		
<b>Comments:</b>				
<b>Completed by:</b>				<b>Date:</b>
<b>Reviewed by:</b>				<b>Date:</b>





	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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**TEST AND EVALUATION PROTOCOL**

**TEP NO.**  
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	Post-Test 22°C		(add units)	Post-Test 22°C		(add units)
	Ambient Gamma Background	Gamma Response		Ambient Neutron Background	Neutron Response	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Mean	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	

	Did the occupancy sensor trigger?					
	Beginning		8hrs		16hrs	
	Yes	No	Yes	No	Yes	No
-30°C						
+55°C						

	Did the occupancy sensor trigger?			
	Beginning		4hrs	
	Yes	No	Yes	No
-20°C				
0°C				
+40°C				

**Test Data —spectroscopic systems**

Gamma Background Reading: \_\_\_\_\_ (add units)

Neutron Background Reading: \_\_\_\_\_ (add units)

Humidity: \_\_\_\_\_ %      Pressure: \_\_\_\_\_ in Hg

Gamma Source Data: \_\_\_\_\_

Neutron Source Data: \_\_\_\_\_

	Pre-test 22°C		
	Gamma Response (add units)	Neutron Response (add units)	Isotopes Identified
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Mean	#DIV/0!	#DIV/0!	
STD	#DIV/0!	#DIV/0!	
CV	#DIV/0!	#DIV/0!	

Isotope Key	
A -	<sup>57</sup> Co
B -	<sup>60</sup> Co

Acceptance Range - Gamma		
#DIV/0!	to	#DIV/0!
-15%		+15%

Acceptance Range - Neutron		
#DIV/0!	to	#DIV/0!
-15%		+15%

Identification Acceptance Range	
of	_____





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Post-test 22°C			
	Gamma Response (add units)	Neutron Response (add units)	Isotopes Identified
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Mean	#DIV/0!	#DIV/0!	
STD	#DIV/0!	#DIV/0!	
CV	#DIV/0!	#DIV/0!	

**Test Report**

Verify if monitor responses are within the acceptance ranges

	Gamma Response		Neutron Response		Identification	
	Yes	No	Yes	No	Yes	No
55°C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40°C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0°C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-20°C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-30°C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pre-Test 22°C			
	Ambient Background	Gamma Response	Neutron Response
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Mean	#DIV/0!	#DIV/0!	#DIV/0!
STD	#DIV/0!	#DIV/0!	#DIV/0!
COV	#DIV/0!	#DIV/0!	#DIV/0!

Acceptance Range		
#DIV/0!	to	#DIV/0!
-15%		+15%

Acceptance Range - Gamma		
#DIV/0!	to	#DIV/0!
-15%		+15%


Acceptance Range - Neutron		
#DIV/0!	to	#DIV/0!
-15%		+15%

Did Occupancy Sensor Trigger?			Enter Yes/No
----------------------------------	--	--	--------------

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-30°C						
Beginning		8hrs		16 hrs		
Gamma Response	Neutron Response	Gamma Response	Neutron Response	Gamma Response	Neutron Response	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Did Occupancy						Enter Yes/No
-20°C		0°C		+40°C		
Gamma Response	Neutron Response	Gamma Response	Neutron Response	Gamma Response	Neutron Response	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Did Occupancy						Enter Yes/No
Beginning		8hrs		16 hrs		
Gamma Response	Neutron Response	Gamma Response	Neutron Response	Gamma Response	Neutron Response	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Did Occupancy						Enter Yes/No



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### Section 7.2 Relative Humidity Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	The monitor shall be able to operate during and after exposure to relative humidity (RH) levels of up to 93% RH at an ambient temperature of +40°C.		
	There shall not be any observable effects from the exposure.		
	<b>Note:</b> Comments are required when the requirement is not verified.		

<b>Gamma Source Data:</b>			
<b>Neutron Source Data:</b>			

#### Test Data

	Pre-Test 22°C		(add units)	Pre-Test 22°C		(add units)
	Ambient Gamma Backgrou	Gamma		Ambient Neutron Backgrou	Neutron Response	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
<b>Mean</b>	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	
<b>STD</b>	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	
<b>COV</b>	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	


<b>Acceptance Range</b>		
Gamma Background		
#DIV/0!	to	#DIV/0!
-15%		+15%

<b>Acceptance Range - Gamma</b>		
#DIV/0!	to	#DIV/0!
-15%		+15%

<b>Acceptance Range</b>		
Neutron Background		
#DIV/0!	to	#DIV/0!
-15%		+15%

<b>Acceptance Range - Neutron</b>		
#DIV/0!	to	#DIV/0!
-15%		+15%



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		93% Relative Humidity at 40°C				65% Relative Humidity at 40°C				65% Relative Humidity at 22°C	
		Hour 16									
		Gamma	Neutron			Gamma	Neutron			Gamma	Neutron
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
<b>Mean</b>		#DIV/0!	#DIV/0!	<b>Mean</b>		#DIV/0!	#DIV/0!	<b>Mean</b>		#DIV/0!	#DIV/0!
<b>Did the occupancy sensor trigger?</b>		Yes									
		No									

		Yes	No
Where there observable effects from the exposure?			
Describe:			

**Comments:**

---



---




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**Completed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Reviewed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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**Test Data - Moisture**

	Pre-Test <small><sup>137</sup> Cs</small>	Post-Test <small><sup>137</sup> Cs</small>	Acceptance Range - Gamma		
1			#DIV/0!	to	#DIV/0!
2			-15%		+15%
3			Inspection Results		
4					
5					
6					
7					
8					
9					
10					
Mean	#DIV/0!	#DIV/0!			
STD	#DIV/0!	#DIV/0!			
COV	#DIV/0!	#DIV/0!			

**Occupancy sensor triggers**

	Yes	No
Did occupancy sensor trigger (Dust)?		
Did occupancy sensor trigger (Moisture)?		

**Comments:**


**Completed by:**

**Date:**

**Reviewed by:**

**Date:**




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**Section 8.1 Radio Frequency Susceptibility  
Test Data and Report**

<b>Manufacturer:</b>			
<b>Model:</b>			<b>Serial Number:</b>
<b>Date Performed:</b>			<b>Test Location:</b>
<b>Requirement:</b>	The monitor should not be affected by RF fields over the frequency range of 80 MHz to 2500 MHz at an intensity of 10 V/m. Because backpacks are typically used where they may be exposed to the higher intensities found in close proximity to cell phones, the performance requirement for RF is 50 V/m.		
<b>Note:</b>	Comments are required when the requirement is not verified.		
<b>Temperature:</b>	°C	<b>Humidity:</b>	%
		<b>Pressure:</b>	in Hg.
<b>Test Equipment Used:</b>			
<b>Frequency Scan Observations Without Sources</b>			

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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With Cs-137 and Cf-252 Sources																													
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; text-align: center;"><b>Nominal No RF Gamma</b></td> <td style="border: 1px solid black; padding: 2px;"><b>Source Data:</b></td> </tr> <tr> <td style="text-align: center;">1</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">2</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">3</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">4</td> <td style="border: 1px solid black; text-align: center;"><b>Acceptance Range (Gamma)</b></td> </tr> <tr> <td style="text-align: center;">5</td> <td style="border: 1px solid black; text-align: center;">#DIV/0! to #DIV/0!</td> </tr> <tr> <td style="text-align: center;">6</td> <td style="border: 1px solid black; text-align: center;">low (-15%) high (+15%)</td> </tr> <tr> <td style="text-align: center;">7</td> <td style="border: 1px solid black; text-align: center;"><b>Acceptance Range (Neutron)</b></td> </tr> <tr> <td style="text-align: center;">8</td> <td style="border: 1px solid black; text-align: center;">#DIV/0! to #DIV/0!</td> </tr> <tr> <td style="text-align: center;">9</td> <td style="border: 1px solid black; text-align: center;">low (-15%) high (+15%)</td> </tr> <tr> <td style="text-align: center;">10</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">Mean</td> <td style="border: 1px solid black; text-align: center;">#DIV/0!</td> </tr> <tr> <td style="text-align: center;">STD</td> <td style="border: 1px solid black; text-align: center;">#DIV/0!</td> </tr> <tr> <td style="text-align: center;">COV</td> <td style="border: 1px solid black; text-align: center;">#DIV/0!</td> </tr> </table>	<b>Nominal No RF Gamma</b>	<b>Source Data:</b>	1		2		3		4	<b>Acceptance Range (Gamma)</b>	5	#DIV/0! to #DIV/0!	6	low (-15%) high (+15%)	7	<b>Acceptance Range (Neutron)</b>	8	#DIV/0! to #DIV/0!	9	low (-15%) high (+15%)	10		Mean	#DIV/0!	STD	#DIV/0!	COV	#DIV/0!
<b>Nominal No RF Gamma</b>	<b>Source Data:</b>																												
1																													
2																													
3																													
4	<b>Acceptance Range (Gamma)</b>																												
5	#DIV/0! to #DIV/0!																												
6	low (-15%) high (+15%)																												
7	<b>Acceptance Range (Neutron)</b>																												
8	#DIV/0! to #DIV/0!																												
9	low (-15%) high (+15%)																												
10																													
Mean	#DIV/0!																												
STD	#DIV/0!																												
COV	#DIV/0!																												
	<b>Frequency Scan Observations with Sources</b>																												
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; text-align: center;"><b>Nominal No RF Neutron</b></td> <td style="border: 1px solid black; padding: 2px;"></td> </tr> <tr> <td style="text-align: center;">1</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">2</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">3</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">4</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">5</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">6</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">7</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">8</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">9</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">10</td> <td style="border: 1px solid black; height: 15px;"></td> </tr> <tr> <td style="text-align: center;">Mean</td> <td style="border: 1px solid black; text-align: center;">#DIV/0!</td> </tr> <tr> <td style="text-align: center;">STD</td> <td style="border: 1px solid black; text-align: center;">#DIV/0!</td> </tr> <tr> <td style="text-align: center;">COV</td> <td style="border: 1px solid black; text-align: center;">#DIV/0!</td> </tr> </table>	<b>Nominal No RF Neutron</b>		1		2		3		4		5		6		7		8		9		10		Mean	#DIV/0!	STD	#DIV/0!	COV	#DIV/0!
<b>Nominal No RF Neutron</b>																													
1																													
2																													
3																													
4																													
5																													
6																													
7																													
8																													
9																													
10																													
Mean	#DIV/0!																												
STD	#DIV/0!																												
COV	#DIV/0!																												
	<b>Comments:</b>																												
	<b>Completed by:</b>																												
	<b>Date:</b>																												
	<b>Reviewed by:</b>																												
	<b>Date:</b>																												

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## Section 8.2 Radiated Emissions Test Data and Report

**Manufacturer:** \_\_\_\_\_

**Model:** \_\_\_\_\_ **Serial Number:** \_\_\_\_\_

**Date Performed:** \_\_\_\_\_ **Test Location:** \_\_\_\_\_

**Requirement:** The emission limits when measured at three meters from the monitoring system shall be less than what is shown below:

Emission Frequency Range	
(MHz)	Field Strength (micro volts/meter)
30 – 88	100
88 – 216	150
216 – 960	200
>960	500

**Note:** Comments are required when the requirement is not verified.

### Occupancy operations

Test Report		
Emissions were within acceptable limits	Yes <input type="checkbox"/>	No <input type="checkbox"/>

### Non-occupancy operations

Test Report		
Emissions were within acceptable limits	Yes <input type="checkbox"/>	No <input type="checkbox"/>


**Comments:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Completed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Reviewed by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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### Section 8.3 AC Line Voltage Operation Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	
<b>Requirement:</b>	For those monitors capable of operating from 120/240 volts power, the requirement is: AC lines with a supply voltage that is within $\pm 12\%$ of the nominal voltage and within $\pm 3\%$ frequency.		
<b>Note:</b>	Comments are required when the requirement is not verified.		

<b>Temperature:</b>		°C	<b>Humidity:</b>		%	<b>Pressure:</b>		in Hg.
<b>Gamma Source Data:</b>								
<b>Neutron Source Data:</b>								

#### Test Data


	Nominal Voltage	
	Gamma	Neutron
<b>Readings</b>		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
<b>Mean</b>	#DIV/0!	#DIV/0!
<b>STD</b>	#DIV/0!	#DIV/0!
<b>COV</b>	#DIV/0!	#DIV/0!

#### Acceptance Range - Gamma

#DIV/0!	to	#DIV/0!	(add units)
-15%		+15%	

#### Acceptance Range - Neutron

#DIV/0!	to	#DIV/0!	(add units)
-15%		+15%	

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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	Voltage +12%		Voltage -12%		58Hz		62Hz	
	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron
Readings								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

<b>Are Results Within Range?</b>	
<b>Voltage +12%</b>	Yes    no
<b>Voltage -12%</b>	
<b>58 Hz</b>	
<b>62 Hz</b>	


**Comments:**

**Completed by:**

**Date:**

**Reviewed by:**

**Date:**

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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## Section 8.4 Battery Lifetime Data Sheet and Report


### Test Data and Report

<b>Manufacturer:</b>				<b>Serial Number:</b>			
<b>Model:</b>				<b>Test Location:</b>			
<b>Date Performed:</b>							
<b>Requirement:</b>	Monitors other than those designed for use on cranes shall be able to operate including storing measurement data for up to 8 h if there is a loss of external power.						
<b>Note:</b>	Comments are required when the requirement is not verified.						

#### Test Results

	Yes	No
The monitor performed as required for 8 hours following removal of power?		
All the required information was stores for each occupancy?		
Was the low battery indication activated during the 8 h period?		

<b>Comments:</b>							
<b>Completed by:</b>				<b>Date:</b>			
<b>Reviewed by:</b>				<b>Date:</b>			

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## Section 8.5 Electrostatic Discharge (ESD) Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Date Performed:</b>		<b>Test Location:</b>	

**Requirement:** The instrument shall not be affected by exposure to electrostatic discharges at intensities of up to 6 kV using the contact discharge technique.

**Note:** Comments are required when the requirement is not verified.

<b>Temperature:</b>		°C	<b>Humidity:</b>		%	<b>Pressure:</b>		in Hg.
<b>Test Equipment:</b>								
<b>Gamma Source Data:</b>								
<b>Neutron Source Data:</b>								

	Pre-Test			Pre-Test	
	Ambient Gamma	Gamma		Ambient Neutron	Neutron
1			(add units)		(add units)
2					
3					
4					
5					
6					
7					
8					
9					
10					
<b>Mean</b>	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!
<b>STD</b>	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!
<b>COV</b>	#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!

<b>Acceptance Range</b>		
Gamma Background		
#DIV/0!	to	#DIV/0!
-15%		+15%

<b>Acceptance Range - Gamma</b>		
#DIV/0!	to	#DIV/0!
-15%		+15%

<b>Acceptance Range</b>		
Neutron Background		
#DIV/0!	to	#DIV/0!
-15%		+15%

<b>Acceptance Range - Neutron</b>		
#DIV/0!	to	#DIV/0!
-15%		+15%












<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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Non-Occupancy Mode without Sources (Check if alarms) - 6kV										
	Point 1		Point 2		Point 3		Point 4		Point 5	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Non-Occupancy Mode with Sources (Check if out of tolerance) - 6kV										
	Point 1		Point 2		Point 3		Point 4		Point 5	
	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!


6kV - Test Report		
	Yes	No
In occupancy mode, system alarm		
In occupancy mode, readings within range		
In non-occupancy mode, system alarm		
In non-occupancy mode, readings within range		



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With Cs-137 and Cf-252 Sources				
	<b>Nominal No RF Gamma</b>		<b>Gamma Source Data:</b>	
			<b>Neutron Source Data:</b>	
1	(add units)			
2				
3				
4			<b>Acceptance Range (Gamma)</b>	
5			#DIV/0! to #DIV/0!	
6			low (-15%) high (+15%)	
7				
8			<b>Acceptance Range (Neutron)</b>	
9			#DIV/0! to #DIV/0!	
10			low (-15%) high (+15%)	
Mean	#DIV/0!			
STD	#DIV/0!			
COV	#DIV/0!			
<b>Frequency Scan Observations with Sources</b>				
	<b>Nominal No RF Neutron</b>			
1	(add units)			
2				
3				
4				
5				
6				
7				
8				
9				
10				
Mean	#DIV/0!			
STD	#DIV/0!			
COV	#DIV/0!			

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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**Non-Occupancy Mode**

**Test Equipment Used:** \_\_\_\_\_

<b>Frequency Scan Observations Without Sources</b>
--

**With Cs-137 and Cf-252 Sources**

<b>Nominal No RF Gamma</b>	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Mean	#DIV/0!
STD	#DIV/0!
COV	#DIV/0!

(add units)

**Gamma Source Data:** \_\_\_\_\_

**Neutron Source Data:** \_\_\_\_\_

**Acceptance Range (Gamma)**

#DIV/0!	to	#DIV/0!
low (-15%)		high (+15%)

**Acceptance Range (Neutron)**

#DIV/0!	to	#DIV/0!
low (-15%)		high (+15%)

Mean  
STD  
COV

<b>Nominal No RF Neutron</b>	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Mean	#DIV/0!
STD	#DIV/0!
COV	#DIV/0!

(add units)

**Frequency Scan Observations with Sources**

<b>Frequency Scan Observations with Sources</b>
---












	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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### Section 9.1 Microphonics/Impact Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>	<b>Serial Number:</b>		
<b>Date Performed:</b>	<b>Test Location:</b>		
<b>Requirement:</b>	The monitor shall be unaffected by microphonic conditions such as those that may occur from low intensity sharp contacts at energies of up to 1.0 joules (J). 1.0 J is equivalent to a mass of 1 kg moving at 1.4 m/s over a distance of 0.1 m (IEC 60068-2-75).		
<b>Note:</b>	Comments are required when the requirement is not verified.		

<b>Test Equipment:</b>			
<b>Gamma Background Reading:</b>	(add units)	<b>Neutron Background Reading:</b>	(add units)
<b>Temperature:</b>	°C	<b>Humidity:</b>	%
<b>Pressure:</b>	in Hg.		
<b>Gamma Source Data:</b>			
<b>Neutron Source Data:</b>			

	Pretest Response			Pretest Response		Acceptance Range - Gamma		
	Gamma	(add units)		Neutron	(add units)	#DIV/0!	to	#DIV/0!
1			1		low			high
2			2					
3			3					
4			4					
5			5					
6			6					
7			7					
8			8					
9			9					
10			10					
Mean	#DIV/0!		Mean	#DIV/0!				
STD	#DIV/0!		STD	#DIV/0!				
COV	#DIV/0!		COV	#DIV/0!				

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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Test Data - Occupancy Mode

Without Sources


Impact Number	Side No. 1		Side No. 2		Side No. 3	
	Record if monitor alarm during the test (Yes/No)					
	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron
1						
2						
3						
<b>No. of alarms</b>						


Impact Number	Side No. 4		Side No. 5		Side No. 6	
	Record if monitor alarm during the test (Yes/No)					
	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron
1						
2						
3						
<b>No. of alarms</b>						

With Sources

Impact Number	Side No. 1		Side No. 2		Side No. 3	
	Response After Each Impact					
	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron
1						
2						
3						
<b>No. of alarms</b>						

Impact Number	Side No. 4		Side No. 5		Side No. 6	
	Response After Each Impact					
	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron
1						
2						
3						
<b>No. of alarms</b>						

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<b>Non-Occupancy Mode</b>												
Test Equipment: _____												
Gamma Background Reading: _____ (add units)					Neutron Background Reading: _____ (add units)							
Temperature: _____ °C		Humidity: _____ %			Pressure: _____ in Hg.							
Gamma Source Data: _____												
Neutron Source Data: _____												
	<b>Pretest Response</b>					<b>Pretest Response</b>				<b>Acceptance Range - Gamma</b>		
	<b>Gamma</b>					<b>Neutron</b>				#DIV/0!	to	#DIV/0!
1	(add units)				1	(add units)				low		high
2					2							
3					3							
4					4							
5					5							
6					6					<b>Acceptance Range - Neutron</b>		
7					7					#DIV/0!	to	#DIV/0!
8					8					low		high
9					9							
10					10							
Mean	#DIV/0!				Mean	#DIV/0!						
STD	#DIV/0!				STD	#DIV/0!						
COV	#DIV/0!				COV	#DIV/0!						


**Test Data - Non-Occupancy Mode**

**Without Sources**

Impact Number	Side No. 1		Side No. 2		Side No. 3	
	Record if monitor alarm during the test (Yes/No)					
	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron
1						
2						
3						
No. of alarms						

Impact Number	Side No. 4		Side No. 5		Side No. 6	
	Record if monitor alarm during the test (Yes/No)					
	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron
1						
2						
3						
No. of alarms						



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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With Sources

Impact Number	Side No. 1		Side No. 2		Side No. 3	
	Response After Each Impact					
	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron
1						
2						
3						
No. of alarms						

Impact Number	Side No. 4		Side No. 5		Side No. 6	
	Response After Each Impact					
	Gamma	Neutron	Gamma	Neutron	Gamma	Neutron
1						
2						
3						
No. of alarms						

Test Report		
	Yes	No
In occupancy mode, system alarm		
In occupancy mode, readings within range		
In non-occupancy mode, system alarm		
non-occupancy mode, readings within range		


Comments:

Completed by:


Date:

Reviewed by:

Date:

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.43	<b>PREPARED BY:</b> DIV682	
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<b>Section 9.2 Vibration Test Data and Report</b>					
<b>Manufacturer:</b>					
<b>Model:</b>			<b>Serial Number:</b>		
<b>Date Performed:</b>			<b>Test Location:</b>		
<b>Requirement: Fixed operations:</b>					
<p>The radiation monitoring system shall function normally after exposure to conditions associated with truck transportation over U.S. highways for two-wheeled trailers and wheeled vehicles. The limits are discussed in MIL-STD-810F, Category 4. See Table 6.</p> <p>The physical condition of the monitor should not be affected by exposure (e.g., solder joints shall hold, nuts and bolts shall not come loose).</p>					
<b>Mobile operations, including backpacks:</b>					
<p>The monitor should function normally during exposure to the vibration environments described in 9.2.1.</p>					
<b>Note:</b> Comments are required when the requirement is not verified.					
<hr/>					
<b>Mixed Operations:</b>			<b>Mobile Operations:</b>	(select one mode of operation)	
<b>Temperature:</b>	°C	<b>Humidity:</b>	%	<b>Pressure:</b>	in Hg.
<b>Gamma Source Data:</b>					
<b>Neutron Source Data:</b>					
<b>Gamma Background Reading:</b>			(add units)	<b>Neutron Background Reading:</b>	
				(add units)	
<b>Test Equipment Used:</b>					

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Gammas					
	Pretest	After Position A	After Position B	After Position C	
1					(add units)
2					
3					
4					
5					
6					
7					
8					
9					
10					
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
COV%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Acceptance Range - Gamma		
#DIV/0!	to	#DIV/0!
-15%		+15%


Neutrons					
	Pretest	After Position A	After Position B	After Position C	
1					(add units)
2					
3					
4					
5					
6					
7					
8					
9					
10					
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
COV%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	


Acceptance Range - Neutrons		
#DIV/0!	to	#DIV/0!
-15%		+15%

Alarms - No sources present					
	Pretest	After Position A	After Position B	After Position C	
1					(yes/no entry)
2					
3					
4					
5					
6					
7					
8					
9					
10					
<b>Number of alarms</b>					


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Test Report		
	Yes	No
Did the system alarm during the test?		
Where the post-test readings within range?		
Where there any mechanical damage and/or loose components?		
<b>Comments:</b>		
<b>Performed by:</b>		<b>Date:</b>
<b>Reviewed by:</b>		<b>Date:</b>

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### Section 9.3 Mechanical Shock Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>			<b>Serial Number:</b>
<b>Date Performed:</b>			<b>Test Location:</b>
<b>Requirement:</b>	<p><b>9.3.1 Fixed operations requirement</b> The radiation monitoring system shall function normally after exposure to 30 g mechanical shocks in the vertical direction. The physical condition of the monitor should not be affected by exposure (e.g.: solder joints shall hold, nuts and bolts shall not come loose).</p> <p><b>9.3.2 Requirement—mobile operations, not including backpacks</b> The monitor should function normally during exposure to 30 g mechanical shocks in the vertical direction.  The physical condition of the monitor should not be affected by exposure (e.g., solder joints shall hold, nuts and bolts shall not come loose).</p> <p><b>9.3.3 Requirement—mobile operations, backpacks</b> The monitor should function normally during exposure to ten shock pulses of 50 g peak acceleration, each applied for a nominal 18 ms in each of three mutually orthogonal axes. The physical condition of instruments shall not be affected by these shocks (e.g., solder joints shall hold; nuts and bolts shall not come loose).</p> <p><b>9.3.4 Requirement—crane-mounted systems</b> Monitors shall be designed to function normally when exposed to shock levels of 200 g.</p>		
<b>Note:</b>	Comments are required when the requirement is not verified.		
<b>Fixed Operations:</b>	<b>Mobile Operations (no backpacks):</b>		(select one mode of operation)
<b>Crane-mounted:</b>	<b>Mobile Operations (backpacks):</b>		
<b>Temperature:</b>	°C	<b>Humidity:</b>	%
		<b>Pressure:</b>	in Hg.
<b>Gamma Source Data:</b>			
<b>Neutron Source Data:</b>			
<b>Gamma Background Reading:</b>			(add units)
	<b>Neutron Background Reading:</b>		(add units)
<b>Test Equipment Used:</b>			

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Gammas					
	Pretest	After Position A	After Position B	After Position C	
1					(add units)
2					
3					
4					
5					
6					
7					
8					
9					
10					
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
COV%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	


Acceptance Range - Gamma		
#DIV/0! -15%	to	#DIV/0! +15%

Neutrons					
	Pretest	After Position A	After Position B	After Position C	
1					(add units)
2					
3					
4					
5					
6					
7					
8					
9					
10					
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
COV%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Acceptance Range - Neutrons		
#DIV/0! -15%	to	#DIV/0! +15%


Alarms - No sources present					
	Pretest	After Position A	After Position B	After Position C	
1					(yes/no entry)
2					
3					
4					
5					
6					
7					
8					
9					
10					
<b>Number of alarms</b>					



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<b>Sections 10 - Documentation</b>				
<b>Test Data and Report</b>				
<b>Manufacturer:</b>				
<b>Model:</b>			<b>Serial Number:</b>	
<b>Date Performed:</b>			<b>Test Location:</b>	
<b>Requirements:</b>	<p><b>10.1 Type test report</b> The manufacturer shall make available, at the request of the purchaser, the report on the type tests performed to the requirements of this standard.</p> <p><b>10.2 Certification</b> The manufacturer shall provide a certificate and evaluation report containing at least this information:</p> <ul style="list-style-type: none"> <li>- Contact information for the manufacturer including name, address, telephone #, fax #, email address, etc</li> <li>- Type of instrument, detector and types of radiation the instrument is designed to measure</li> <li>- Evaluated portal width and mounting parameter</li> <li>- Sensitivity switch settings, detector bias level (lower level discriminator setting), and all significant calibration parameters such as 137Cs 662 keV gamma-ray pulse height in scintillation detectors or neutron pulse height in 3He proportional counters</li> <li>- Power supply requirements</li> <li>- Results of tests under environmental conditions</li> <li>- Results of electrical and mechanical tests</li> <li>- Recommended operational parameters such as: detector response and false alarm probability</li> <li>- Complete description of the evaluated monitor</li> </ul> <p><b>10.3 Operation and maintenance manual</b> The manufacturer shall supply an operational and maintenance manual containing the following information to the user:</p> <ul style="list-style-type: none"> <li>- Operating instructions and restrictions</li> <li>- Schematic electrical diagrams plus spare parts list and specifications</li> <li>- Troubleshooting guide</li> <li>- A detailed training manual or instructions for operators and users</li> <li>- Description and protocol for communication methods of transmitting and receiving data</li> </ul>			
	<b>Note:</b> Only one data sheet per model is required. Comments are required when the requirement is not verified.			



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				Yes	No
Did the manufacturer provide a report on the type tests performed?					
Was contact information provided in the manual?					
Did the manual describe the type of instrument, detectors and type of radiation measured?					
Was the mounting parameters and evaluated portal width provided?					
Information about sensitivity switch settings, detector bias level and calibration parameters was provided?					
Were the power supply requirements provided?					
Results of tests under environmental conditions were provided?					
Results of electrical test were provided?					
Results of mechanical test were provided?					
Recommended operating parameters were provided?					
A complete description of the evaluated monitor was provided?					
Were manuals with operating instructions and restrictions provided?					
Were manuals with module connection schematics provided?					
Were manuals with electrical connection schematics provided?					
Were manuals with spare parts list provided?					
Were manuals with troubleshooting guides provided?					
Did the manual provide a description and protocols for communication methods of transmitting and receiving data?					
<b>Comments:</b>					
<b>Completed by:</b>				<b>Date:</b>	
<b>Reviewed by:</b>				<b>Date:</b>	