


Testing and Evaluation Protocol for Radiation Detection Portal Monitors for Use in Homeland Security

T&E Protocol N42.35, 2010

Version 2.02

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Testing and Evaluation Protocol for Radiation Detection Portal Monitors for Use in Homeland Security

1. Scope

This document establishes the protocol for testing alarming personal radiation detectors based on the performance requirements established in ANSI N42.35, “American National Standard for Evaluation and Performance of Radiation Detection Portal for Use in Homeland Security.”

2. References

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

[R1] ANSI N42.35, “American National Standard for Evaluation and Performance of Radiation Detection Portal for Use in 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 N42.35 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 (GRaDERSM) 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
- Perform the drop test, as required

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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, N42.35. 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.

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

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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. 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 N42.35

Manufacturer:					
Model:					

Test Number	Serial#	Status	Serial#	Status	Serial#	Status
5.1						
5.2						
5.3						
5.4						
5.5						
5.6						
5.7						
5.8						
5.9						
5.10						
6.3						
6.4						
6.5						
6.6						
6.7						
6.8						
7.1						
7.2						
7.3						
8.1						
8.2						
8.3						
8.4						
8.5						
8.6						
8.7						
9.1						
9.2						
10.0						

Comments:					

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Pre-Test Data Sheet and Report

Instrument:			
Model:		Serial Number:	
Date Performed:		Test Location:	
Requirement:	Verify that the manufacturer supplied an operation and maintenance manual containing the information listed below.		
Test Protocol:	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.		
Note:	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"/>

Comments:			
Completed by:		Date:	
Reviewed by:		Date:	

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Section 5.1 General characteristics Data Sheet and Report

Manufacturer:								
Model:					Serial Number:			
Requirement:	Monitors shall be capable of operating independently of any peripheral device or remote station and shall be unaffected by any malfunction of a peripheral device.							
	Monitors shall be able to operate including storing measurement data for up to 3 hours if there is a loss of external power and/ or data transfer capabilities to the remote station.							
	Monitors shall be classified according to use:							
	— Pedestrian							
	— Package (conveyor)							
	— Vehicle (which includes containerized cargo)							
	— Rail vehicle							
Note:	Comments are required when the requirement is not verified.							

	Yes	No
Can the monitor operate independently?		
Is the monitor capable of storing data for up to 3 hours ?		

Classification:	<input type="checkbox"/> Pedestrian	<input type="checkbox"/> Vehicle (including cargo)
	<input type="checkbox"/> Package (Conveyor)	<input type="checkbox"/> Rail vehicle


Comments:								
Completed by:					Date:			
Reviewed by:					Date:			

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Section 5.2 Physical Configuration Data Sheet and Report


Manufacturer:											
Model:						Serial Number:					
Requirement:	<p>Enclosure(s) provided for outdoor assemblies should be designed to meet NEMA 4 [R7] requirements and should be classified as IP54 as designated in IEC 60529.</p> <p>Manufacturer should provide guidance as to how to install the portal monitor.</p> <p>Controls and adjustments which 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>										
Note:	Comments are required when the requirement is not verified.										

	Yes	No
Does the manufacturer state that the enclosure meets NEMA 4 requirements?	<input type="checkbox"/>	<input type="checkbox"/>
Does the manufacturer state that the enclosure is classified as IP54?	<input type="checkbox"/>	<input type="checkbox"/>
Are the controls and adjustments designed to limit access?	<input type="checkbox"/>	<input type="checkbox"/>
Can the monitor be tested without the use of radiation sources?	<input type="checkbox"/>	<input type="checkbox"/>

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Type of radiation detector?	
size (depth, width, and length)?	
weight?	
Detection system construction?	
Operating parameters?	
gamma alarm setting:	
neutron alarm setting:	
energy windows:	
sigma values:	
measurement time:	
background integration period:	

Comments:	
Completed by:	Date:
Reviewed by:	Date:

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Section 5.3 Data Storage Data Sheet and Report

Manufacturer:							
Model:				Serial Number:			
Requirement:	<p>The data storage shall meet the following criteria:</p> <p>a) The monitor shall have the ability to internally store at least 1000 complete occupancy data sets. For monitors that do not use occupancy sensors, the monitor shall have the ability to store at least 3 h of measurement data.</p> <p>b) Each occupancy data set shall contain collection results information including:</p> <ul style="list-style-type: none"> - Time and date - Occupancy time - Monitor identification - Alarm condition (gamma-ray and/or neutron) - Background (gamma-ray and neutron) count rate - Gamma-ray count rate - Neutron count rate <p>c) The monitor shall have the ability to store background count rate and transfer that information at user-selectable intervals to an external device, such as a computer.</p> <p>d) The monitor shall have the ability to store gamma-ray and neutron count rate time-history data.</p> <p>e) The monitor shall have the ability to perform measurements with an object stationary in the detection zone. This function shall be user selectable. The recommended measurement time shall be stated by the manufacturer and should be less than or equal to 2 min.</p>						
Note:	Comments are required when the requirement is not verified.						

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	Yes	No
Does the monitor have the ability to store information for up to 3 hours or 1000 complete occupancy data sets?		
Does each occupancy set contain the following required information:		
Time and date ?		
Occupancy time ?		
Monitor identification ?		
Alarm condition (gamma-ray and/or neutron) ?		
Background (gamma-ray and neutron) count rate ?		
Gamma-ray count rate ?		
Neutron count rate ?		
Does the monitor have the ability to store and transfer background data?		
Does the monitor have the ability to store time-history data?		
Does the user have the ability to select measuring a stationary object?		
Is the stationary measurement function user selectable?		
Is the recommended stationary measurement time stated by the manufacturer?		
Is this recommended stationary measurement time less than or equal to 2 min?		

Comments:	
Completed by:	Date:
Reviewed by:	Date:


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Section 5.4 Indication Features Data Sheet and Report

Manufacturer:											
Model:						Serial Number:					
Requirement:	<p>The monitor shall provide an indication of its operational status and alarm condition, and shall be capable of transmitting these signals to additional remote stations at a distance of at least 50 m. The user shall have the ability to select the visibility of the status indication.</p> <p>All alarm indicators shall automatically or manually reset as defined by the user.</p>										
Note:	Comments are required when the requirement is not verified.										

	Yes	No
Does the monitor indicate its operational status and alarm condition?	<input type="checkbox"/>	<input type="checkbox"/>
Does the monitor have the ability to transmit signals to remote stations?	<input type="checkbox"/>	<input type="checkbox"/>
Does the user have the option to select the visibility of the status indication?	<input type="checkbox"/>	<input type="checkbox"/>
Are alarm indicators reset automatically or manually at the option of the user?	<input type="checkbox"/>	<input type="checkbox"/>

Comments:											
Completed by:						Date:					
Reviewed by:						Date:					


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

Manufacturer:			
Model:		Serial Number:	
Requirement:	<p>Monitors shall have the ability to support occupancy sensors and should have the ability to measure speed. If used, occupancy and speed sensors:</p> <ul style="list-style-type: none"> - 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, - Should be capable of operating on a mix of traffic (cars, vans, pickup trucks, buses, cargo trucks, trains, etc.), and - Should function under all environmental conditions stated in this protocol. <p>Rail monitors should have the ability to approximate the location of an alarm when monitoring multi-car trains.</p> <p>A system that incorporates an occupancy sensor should have the ability to perform a user-selected series of consecutive occupancies automatically without the need to activate the occupancy sensor. Function variables such as occupancy time and time between occupancies shall be user-selectable.</p>		
Note:	Comments are required when the requirement is not verified.		

	Yes	No
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

Manufacturer:			
Model:		Serial Number:	
Requirement:	Internal controls shall be identified through markings on electrical circuit boards and/or individual components, and identification in technical manuals.		
	Markings shall be easily readable and permanently fixed under normal conditions of use.		
	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.		
Note:	Comments are required when the requirement is not verified.		

	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"/>

Comments:			
Completed by:		Date:	
Reviewed by:		Date:	

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Section 5.7 Power Supply Data Sheet and Report

Manufacturer:			
Model:		Serial Number:	
Requirement:	Line operated assemblies should be designed to operate from single-phase AC supply voltage of 100 to 240 V (Volts) and from 47 to 63 Hz (Hertz).		
	The monitor shall be able to operate including storing measurement data for a minimum of 3 hours if there is a loss of external power from an alternative power supply. Compliance shall be based on tests performed at the reference temperature (Table 1).		
Note:	Comments are required when the requirement is not verified.		

Reference Temperature:	
-------------------------------	--

	Volts	Hertz
What are the power requirements for the monitor?		
	Yes	No
Can the monitor operate for 3 hours with loss of external power?		

Comments:			
Completed by:		Date:	
Reviewed by:		Date:	


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Section 5.8 Protection of Switches Data Sheet and Report

Manufacturer:							
Model:				Serial Number:			
Requirement:	Switches and other controls should be designed to ensure that the monitor could be operated properly while minimizing accidental switch operation.						
Note:	Comments are required when the requirement is not verified.						

	Yes	No
Are monitor switches and controls designed to minimize accidental operation?	<input type="checkbox"/>	<input type="checkbox"/>

Comments:							
Completed by:				Date:			
Reviewed by:				Date:			


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Section 5.9 Effective Range of Measurement Data Sheet and Report

Manufacturer:											
Model:						Serial Number:					
Requirement:	The effective gamma-ray energy response range shall be stated by the manufacturer, and should be at least 60 keV to 3 MeV.										
	The manufacturer shall state the range for gamma-ray count rate measurement and for neutron count rate indication.										
Note:	Comments are required when the requirement is not verified.										


	Record Values
What is the stated gamma energy range?	
What is the stated gamma count rate range?	
What is the stated neutron count rate range?	

Comments:											
Completed by:						Date:					
Reviewed by:						Date:					


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Section 5.10 Software and Data Analysis Data Sheet and Report

Manufacturer:	
Model:	Serial Number:
Requirement:	<p>5.10.1 Communications protocol and data format 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, wireless, RS-232, or RS-485. Consideration should be given to data security when using wireless data transfer techniques. When used, wireless techniques shall have the ability to be encrypted. Proprietary software should not be required for remote data interpretation. The transferred data shall be in the XML format that meets ANSI N42.42 requirements. The manufacturer shall provide proprietary software for data interpretation, if needed.</p> <p>5.10.2 User Interface 5.10.2.1 Warning indicators The following indications shall be provided at the user interface as a minimum:</p> <ul style="list-style-type: none"> - Background changes during non-occupancies that can affect the overall sensitivity of the monitor - High-low detector count rate conditions (indication of background condition) - Energy stabilization invalid or not acceptable - Occupancy sensor failure, if occupancy sensors are used - Changes in operational status (e.g., occupied, alarm, monitoring background, fault, blocked) - Battery status - Loss of line power - Over-range indication <p>5.10.2.2 Basic indications and functions The following information and control shall be provided for the trained user:</p> <ul style="list-style-type: none"> - View operational status - View alarm indication - Ability to reset alarms <p>5.10.2.3 Advanced indications and functions 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"> - Access to and control of operating parameters (alarm control) - Access to and control of data logging intervals - Access to alarm history - Access to control of basic indication function - Access to occupancy data set (if occupancy sensors are used) - Access to vehicle photo (if available) - Access to radiation profiles (count rate time history data) - Access to background radiation information - Access to alarm selection criteria
Note:	Comments are required when the requirement is not verified.

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		Yes	No	NA
Communications protocol and data format				
Does the monitor have the ability to transfer data to an external device?				
Describe the technology used to transfer data:				
If wireless techniques are used, does it have the ability to encrypt the data being transmitted?				
Is the transfer protocol and format described in the technical manual?				
Is the transfer protocol and format described freely distributable?				
Is the data format as defined in the ANSI N42.42 standard?				
Warning/status indicators				
When applicable, are the following indications provided at the user interface:				
Background changes that can affect the overall sensitivity?				
High-low detector count rate conditions?				
Energy stabilization invalid or not acceptable?				
(If occupancy sensors are used) Occupancy sensor failure?				
Changes in operational status?				
Loss of line power?				
Battery status?				
Over-range indication?				
Basic indications and functions				
Are the following information and controls provided to the trained users:				
View of operational status?				
View alarm indication?				
Ability to reset alarms?				
Advanced indications and functions				
Are the following information and controls provided for the supervisory user through the use of access controls or special commands:				
Access to and control of operating parameters?				
Access to and control of data logging intervals?				
Access to alarm history?				
Access to control of basic indication functions?				
Access to occupancy data set? (if available)				
Access to vehicle photo? (if available)				
Access to radiation profiles?				
Access to background radiation information?				
Access to alarm selection criteria?				
Comments:				
Completed by:		Date:		
Reviewed by:		Date:		

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Section 6.3 False Alarm Test Data Sheet and Report


Manufacturer:								
Model:					Serial Number:			
Requirement:	<p>When tested in an area with a stable background (only natural fluctuations) at the levels stated in Table 1, the false alarm rate shall be less than 1 per 1000 occupancies for systems that use occupancy sensors or one alarm in 2 h for monitors that do not use occupancy sensors.</p> <p>The manufacturer shall provide an estimate of the background level at which the monitor will no longer meet these requirements.</p>							
Note:	Comments are required when more than one alarm is observed.							

Test Equipment:									
Gamma Background Reading:					(add units)				
Neutron Background Reading:					(add units)				
Ambient Conditions:			°C			%RH			in HG

Test Results

Number of Passes/Time for 1000 Monitoring Cycles (Specify)	Number of Alarms	Number of gamma alarms	Number of neutron alarms

Comments:								
Completed by:					Date:			
Reviewed by:					Date:			

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**Section 6.4 Detector Response to Gamma Radiation
Test Data and Report**

Manufacturer:									
Model:						Serial Number:			
Requirement:	An alarm shall be triggered when the measured count rate is greater than the alarm setting. This requirement shall be verified using ²⁴¹ Am, ²³² Th, ¹³⁷ Cs, ¹³³ Ba, ⁶⁰ Co and ⁵⁷ Co. Source activities for this test are given in Table 4.								
	The instrument response is acceptable when a minimum of 59 alarms occur in 60 occupancies.								
Note:	Comments are required when the requirement is not verified.								

Test Equipment:								
Gamma Background Reading:	(add units)							
Ambient Conditions:	°C	%RH	in HG					
Test Results								

	Source							
	²⁴¹ Am		¹³⁷ Cs		⁶⁰ Co		²²⁸ Th	
Source Number:								
Source Activity:								
	Number of occupancies	Number of alarms	Number of occupancies	Number of alarms	Number of occupancies	Number of alarms	Number of occupancies	Number of alarms
Bottom								
Mid-Point Bottom/Middle								
Middle								
Mid-Point Middle/Top								
Top								

Comments:									
Completed by:						Date:			
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Section 6.5 Detector Response to Neutron Radiation Test Data and Report

Manufacturer: _____

Model: _____ **Serial Number:** _____

Requirement: An alarm shall be triggered when the monitor is exposed to a ²⁵²Cf 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.

The instrument response is acceptable when a minimum of 59 alarms occur in 60 occupancies.

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

Test Equipment: _____

Neutron Background Reading: _____ (add units)

Ambient Conditions: _____ °C _____ %RH _____ in HG


Test Results

	Source	
	²⁵² Cf	
Source Number:		
Source Activity:		
	Number of occupancies	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 6.6 Over-Range Test Test Data and Report

Manufacturer:				
Model:			Serial Number:	
Requirement:	<p>If a monitor is exposed to a radiation field that is greater than the manufacturer-stated maximum during an occupancy or when performing measurements without an occupancy sensor, an alarm indicating for example "high background" or "high counts" shall be activated and shall remain activated until the radiation field is reduced or the alarm is reset/acknowledged by the user.</p> <p>The time required to return to non-alarm condition after the exposure rate is returned to background shall not be greater than 1 min.</p>			
Note:	Comments are required when the requirement is not verified.			

Test Equipment:				
Gamma Background Reading:			(add units)	
Ambient Conditions:	°C	%RH	in HG	
Source Used:				

Test Results							
Trial Number	Photon reading pre-test	Photon reading during test	Alarm		Photon reading post-test	The time to recover is ≤1min	
			Yes	No		Yes	No
1							
2							
3							

Comments:				
Completed by:			Date:	
Reviewed by:			Date:	

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Section 6.7 Neutron Indication in the Presence of Photons Test Data and Report

Manufacturer:											
Model:						Serial Number:					
Requirement:	Gamma radiation at exposure rates of up to 10 mR/h (at the face of the center of the detection assembly) shall not trigger the neutron alarm.										
Note:	Comments are required when the requirement is not verified.										

Ambient Conditions:		°C		%RH		in HG
Source Used:						

Test Results		
Trial Number	Neutron Alarm	
	Yes	No
1		
2		
3		

Comments:											
Completed by:						Date:					
Reviewed by:						Date:					


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Section 6.8 Background Effects Test Data and Report


Manufacturer:			
Model:		Serial Number:	
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 audible, and shall be different than monitoring alarms.		
Note:	Comments are required when the requirement is not verified.		

Test Equipment:			
Gamma Background Reading:		(add units)	
Neutron Background Reading:		(add units)	
Ambient Conditions:	°C	%RH	in HG
Gamma Source Data:			
Neutron Source Data:			

Test Data							
Test Number	¹³⁷ Cs				²⁵² Cf		
	Background Change Indication				Background Change Indication		
	Yes		No		Yes		No
1							
2							
3							

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Test Results		
	Yes	No
Monitor indicated background change during exposure to ¹³⁷ Cs	<input type="checkbox"/>	<input type="checkbox"/>
Monitor indicated background change during exposure to ²⁵² Cf	<input type="checkbox"/>	<input type="checkbox"/>
Is the visual indication for gammas different from the gamma monitoring alarm?	<input type="checkbox"/>	<input type="checkbox"/>
Is the audible indication for gammas different from the gamma monitoring alarm?	<input type="checkbox"/>	<input type="checkbox"/>
Is the visual indication for neutrons different from the neutron monitoring alarm?	<input type="checkbox"/>	<input type="checkbox"/>
Is the audible indication for neutrons different from the neutron monitoring alarm?	<input type="checkbox"/>	<input type="checkbox"/>
Comments:		
Completed by:		Date:
Reviewed by:		Date:

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Section 7.1 Ambient Temperature Test Data and Report

Manufacturer:					
Model:			Serial Number:		
Requirement:	The monitor shall be able to operate over an ambient temperature range from -30°C to +55°C.				
Note:	Comments are required when the requirement is not verified.				

Gamma Source Data:					
Neutron Source Data:					

Test Data

	Pre-Test 22°C			Pre-Test 22°C		Acceptance Range Gamma Background		
	Ambient Gamma Background	Gamma		Ambient Neutron Background	Neutron	#DIV/0!	to	#DIV/0!
1			(add units)			-15%		+15%
2								
3						#DIV/0!	to	#DIV/0!
4						-15%		+15%
5								
6								
7								
8								
9						#DIV/0!	to	#DIV/0!
10						-15%		+15%
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 - Neutron		
						#DIV/0!	to	#DIV/0!
						-15%		+15%

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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				

Comments:

Completed by: _____

Reviewed by: _____

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Section 7.2 Relative Humidity Test Data and Report

Manufacturer: _____

Model: _____ **Serial Number:** _____

Requirement: 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.

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

Gamma Source Data: _____

Neutron Source Data: _____

Test Data


	Pre-Test 22°C			Pre-Test 22°C	
	Ambient Gamma Backgrou	Gamma		Ambient Neutron Backgrou	Neutron Response
1			(add units)		(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 Background		
#DIV/0!	to	#DIV/0!
-15%		+15%


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

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

Acceptance Range - Neutron		
#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			
	Mean	#DIV/0!	#DIV/0!	Mean	#DIV/0!	#DIV/0!	Mean	#DIV/0!	#DIV/0!
Did the occupancy sensor trigger?	Yes								
	No								
				Yes	No				
		Where there observable effects from the exposure?							
		Describe:							
		Comments:							
		Completed by:				Date:			
		Reviewed by:				Date:			

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Section 7.3 Moisture and Dust Protection Test Data and Report

Manufacturer:			
Model:		Serial Number:	
Requirement:	The monitor including components designed for use in an unprotected environment shall meet the requirements stated for IP code 54 (see IEC 60529). The instrument shall be protected from the ingress of dust and splashing water. For IP54, the ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the instrument or to impair safety, and water splashed against the enclosure from any direction shall have no harmful effects.		
	Note: Comments are required when the requirement is not verified.		

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

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Test Data - Moisture

	Pre-Test ¹³⁷ Cs	Post-Test ¹³⁷ Cs
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Mean	#DIV/0!	#DIV/0!
STD	#DIV/0!	#DIV/0!
COV	#DIV/0!	#DIV/0!

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

Inspection Results

Did the occupancy sensor trigger after test?			
Dust Test		Moisture Test	
Yes	No	Yes	No


Comments:

Completed by:

Date:


Reviewed by:

Date:


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Section 8.1 Radio Frequency Susceptibility Test Data and Report


Manufacturer:			
Model:	Serial Number:		
Requirement:	The monitor should not be affected by RF fields over the frequency range of 80 MHz to 2500 MHz at an intensity of 10 volts per meter (V/m).		
Note:	Comments are required when the requirement is not verified.		
Ambient Conditions:	°C	%RH	In. Hg
Test Equipment Used:			
Frequency Scan Observations Without Sources			

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

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	Comments:						
	Completed by:				Date:		
	Reviewed by:				Date:		


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Section 8.2 Radiated Emissions Test Data and Report

Manufacturer:					
Model:			Serial Number:		
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.				

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

Comments:					
	Completed by:		Date:		
	Reviewed by:		Date:		

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Section 8.3 AC Line Voltage Operation Test Data and Report

Manufacturer: _____

Model: _____ **Serial Number:** _____

Requirement: 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.

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

Ambient Conditions: _____ °C _____ %RH _____ in HG

Gamma Source Data: _____

Neutron Source Data: _____

Test Data


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

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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!

Are Results Within Range?	
	Yes no
Voltage +12%	
Voltage -12%	
58 Hz	
62 Hz	

Comments:

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

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Section 8.4 Battery Lifetime Data Sheet and Report


Test Data and Report

Manufacturer:								
Model:					Serial Number:			
Requirement:	Monitors shall be able to operate including storing measurement data for up to 3 hours if there is a loss of external power.							
Note:	Comments are required when the requirement is not verified.							

Test Results

	Yes	No
The monitor performed as required for 3 hours following removal of power?		
All the required information was stores for each occupancy?		
Was the low battery indication activated during the 3 h period?		

Comments:								
Completed by:					Date:			
Reviewed by:					Date:			

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Section 8.5 Electrostatic Discharge (ESD) Test Data and Report

Manufacturer: _____
Model: _____ **Serial Number:** _____

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.

Ambient Conditions: _____ °C _____ %RH _____ in HG

Test Equipment: _____

Gamma Source Data: _____

Neutron Source Data: _____

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

(add units)

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

(add units)

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

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

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

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

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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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**Section 8.6 Conducted Disturbances
Induced by Bursts and Radio Frequencies
Test Data and Report**

Manufacturer:			
Model:		Serial Number:	
Requirement:	The monitor shall not be affected by RF fields that can be conducted onto the monitor through an external conducting cable.		
Note:	Comments are required when the requirement is not verified.		
Ambient Conditions:	°C	%RH	In. Hg


Occupancy Mode

Test Equipment Used:

Frequency Scan Observations Without Sources

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

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Non-Occupancy Mode

Test Equipment Used: _____

Frequency Scan Observations Without Sources			

With Cs-137 and Cf-252 Sources


	Nominal No RF Gamma		Gamma Source Data:	_____
1		(add units)	Neutron Source Data:	_____
2				
3				
	Acceptance Range (Gamma)			
4	#DIV/0!		to	#DIV/0!
5	low (-15%)			high (+15%)
6				
	Acceptance Range (Neutron)			
8	#DIV/0!		to	#DIV/0!
9	low (-15%)			high (+15%)
10				
Mean	#DIV/0!			
STD	#DIV/0!			
COV	#DIV/0!			

Frequency Scan Observations with Sources			

	Nominal No RF Neutron	
1		(add units)
2		
3		
4		
5		
6		
7		
8		
9		
10		
Mean	#DIV/0!	
STD	#DIV/0!	
COV	#DIV/0!	

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	Comments:							
	Completed by:					Date:		
	Reviewed by:					Date:		

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Section 8.7 Surges and Oscillatory Waves Test Data and Report

Manufacturer: _____
Model: _____ **Serial Number:** _____

Requirement: The monitor should not be affected by surges or oscillatory waves of up to 2 kV that are classified as ring waves or combination waves at 1.2/50 μ s and 8/20 μ s.

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

Ambient Conditions: _____ °C _____ %RH _____ in HG

Test Equipment: _____

Gamma Source Data: _____

Neutron Source Data: _____

	Pre-Test		(add units)	Pre-Test		(add units)
	Ambient Gamma Background	Gamma		Ambient Neutron Background	Neutron Response	
1						
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 Background		
#DIV/0!	to	#DIV/0!
-15%		+15%

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

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

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


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Occupancy Mode


Mode without Sources (Check if alarms)		Cs-137 Source With Sources (Check if out of tolerance)		Cf-252 Source With Sources (Check if out of tolerance)	
Combination Wave	Ring Wave	Combination Wave	Ring Wave	Combination Wave	Ring Wave
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
		Mean	#DIV/0!	#DIV/0!	
		STD	#DIV/0!	#DIV/0!	
		COV	#DIV/0!	#DIV/0!	

Non-Occupancy Mode

Mode without Sources (Check if alarms)		Cs-137 Source With Sources (Check if out of tolerance)		Cf-252 Source With Sources (Check if out of tolerance)	
Combination Wave	Ring Wave	Combination Wave	Ring Wave	Combination Wave	Ring Wave
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
		Mean	#DIV/0!	#DIV/0!	
		STD	#DIV/0!	#DIV/0!	
		COV	#DIV/0!	#DIV/0!	

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			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				
Comments:				
Completed by:			Date:	
Reviewed by:			Date:	


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Section 9.1 Microphonics/Impact Test Data and Report


Manufacturer:			
Model:	Serial Number:		
Date Performed:	Test Location:		
Temperature:	°C	Humidity:	% Pressure: in Hg.
Requirement:	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).		
Note:	Comments are required when the requirement is not verified.		

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


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		Acceptance Range - Neutron		
6		6		#DIV/0!	to	#DIV/0!
7		7		low		high
8		8				
9		9				
10		10				
Mean	#DIV/0!	Mean	#DIV/0!			
STD	#DIV/0!	STD	#DIV/0!			
COV	#DIV/0!	COV	#DIV/0!			

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

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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									
Comments:									
Completed by:								Date:	
Reviewed by:								Date:	

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Section 9.2 Vibration Test Data and Report

Manufacturer:			
Model:		Serial Number:	
Requirement:	The monitor shall function normally when exposed to vibrations associated with equipment installed in non-weather protected locations of up to 0.5 gn over a frequency range from 10 Hz to 150 Hz. 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).		
Note:	Comments are required when the requirement is not verified.		

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

Test Data

Readings within acceptance range with sources present

Pre-Test			Post Test			
	Gamma	Neutron		Gamma	Neutron	
1			(add units)	1		(add units)
2				2		
3				3		
4				4		
5				5		
6				6		
7				7		
8				8		
9				9		
10				10		
Mean	#DIV/0!	#DIV/0!		Mean	#DIV/0!	#DIV/0!
STD	#DIV/0!	#DIV/0!		STD	#DIV/0!	#DIV/0!
CV	#DIV/0!	#DIV/0!		CV	#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%	

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Alarms with no source present

Gamma Alarms		Neutron Alarms			
	Yes	No		Yes	No
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
Number of alarms			Number of alarms		

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?		


Comments:

Completed by:


Date:

Reviewed by:

Date:

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Section 10 Documentation									
Data Sheet and Report									
Manufacturer:									
Model:					Serial Number:				
Requirement:	<p>10.1 Type test report 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>10.2 Certification The manufacturer shall provide a certificate and evaluation report containing at least the following information:</p> <ul style="list-style-type: none"> - Contact information for the manufacturer including name, address, telephone number, fax number, e-mail address, etc. - Type of instrument, detector, and types of radiation the instrument is designed to measure - Evaluated portal width and mounting parameter - 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 - Power supply requirements - Results of tests under environmental conditions - Results of electrical and mechanical tests - Recommended operational parameters such as detector response and false alarm probability - Complete description of the evaluated monitor. <p>10.3 Operation and maintenance manual The manufacturer shall supply an operational and maintenance manual containing the following information to the user:</p> <ul style="list-style-type: none"> - Operating instructions and restrictions - Schematic electrical diagrams plus spare parts list and specifications - Troubleshooting guide - A detailed training manual or instructions for operators and users - Description and protocol for communication methods of transmitting and receiving data. 								
Note:	Comments are required when the requirement is not verified.								

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Test Results

	Yes	No
Type test report		
Is the type tests performed to the requirements of the available from the manufacturer ?	<input type="checkbox"/>	<input type="checkbox"/>
Certification.		
The manufacturer provided a certificate and evaluation report containing at least the following information:		
Contact information for the manufacturer including name, address, telephone number, fax number, email address, etc.	<input type="checkbox"/>	<input type="checkbox"/>
Type of instrument, detector and types of radiation the instrument is designed to measure.	<input type="checkbox"/>	<input type="checkbox"/>
Evaluated portal width and mounting parameter.	<input type="checkbox"/>	<input type="checkbox"/>
Sensitivity switch settings, detector bias level (lower level discriminator setting), and all significant calibration parameters such as ¹³⁷ Cs 662 keV gamma-ray pulse height in scintillation detectors or neutron pulse height in ³ He proportional counters.	<input type="checkbox"/>	<input type="checkbox"/>
Power supply requirements.	<input type="checkbox"/>	<input type="checkbox"/>
Results of tests under environmental conditions	<input type="checkbox"/>	<input type="checkbox"/>
Results of electrical and mechanical tests.	<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 the evaluated monitor.	<input type="checkbox"/>	<input type="checkbox"/>
Operation and maintenance manual.		
The manufacturer supplied an operational and maintenance manual containing the following information to the user:		
Operating instructions and restrictions.	<input type="checkbox"/>	<input type="checkbox"/>
Schematic electrical diagrams plus spare parts list and specifications.	<input type="checkbox"/>	<input type="checkbox"/>
Troubleshooting guide	<input type="checkbox"/>	<input type="checkbox"/>
A detailed training manual or instructions for operators and users.	<input type="checkbox"/>	<input type="checkbox"/>
Description and protocol for communication methods of transmitting and receiving data.	<input type="checkbox"/>	<input type="checkbox"/>

Comments:

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____