Testing and Evaluation Protocol for Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security

T&E Protocol N42.48, 2010

Version 1.02

Table of Content

Testing and Evaluation Protocol Alarming Personal Radiation Detectors 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 N42.48, "American National Standard Performance Criteria for Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security."

2. References

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

[R1] ANSI/IEEE N42.48, "American National Standard Performance Criteria for Spectroscopic Personal Radiation Detectors (SPRDs) 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 N42.48 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^{SM}) 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

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, N42.48. 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 rational 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 rational 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 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.

Test Summary Sheet
ANSI N42.48

Manufacturer: _____

Model: _____

	Serial#		Serial#		Serial#	
Test Number	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						
5.12						
5.13						
5.14						
6.2						
6.3						
6.4						
6.5						
6.6						
6.7						
6.8						
6.9						
6.10.1						
6.10.2						
6.10.3						
6.10.4						
6.10.5						
6.10.6						
7.2						
7.3						
7.4						
7.5.2						
7.5.3						
7.6						
8.2						
8.3						
8.4						
8.5						
9.1						
9.2						
9.3						
10.0						

Comments: _____

Pre-Test
Data Sheet and Report

Manufacturer:

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	☐		☐
Electrical connection schematic	☐		☐
Spare parts list	☐		☐
Troubleshooting guide.	☐		☐
Description and protocol for communication methods of transmitting and receiving data	☐		☐
Contact information for the manufacturer including name, address, telephone #, fax #, email address, etc.	☐		☐
Power supply requirements	☐		☐
Recommended operational parameters such as: detector response and false alarm probability	☐		☐
Complete description of system or unit	☐		☐
Enclosure specification classification	☐		☐
Inclusion of any hazardous material that may require additional regulation	☐		☐
Description of data analysis software and radionuclide identification procedure	☐		☐
Description of operation and performance of the system or unit	☐		☐

Comments:

Completed by: **Date:**

Reviewed by: **Date:**

Controls
Data Sheet Section 5.1

Manufacturer:
Instrument:
Model: **Serial Number:**
Date Performed: **Test Location:**

Requirement: Controls shall be clearly identified, easily operable under conditions of expected use, and adequately protected from accidental operation. The on/off button or any other control that could cause the instrument not to function as expected by the user shall be protected from accidental operation.

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

1st Surface	Verify Yes	Verify No
Did the instrument turn off?		
Did the instrument change mode of operation of configuration?		

2nd Surface	Verify Yes	Verify No
Did the instrument turn off?		
Did the instrument change mode of operation of configuration?		

3rd Surface	Verify Yes	Verify No
Did the instrument turn off?		
Did the instrument change mode of operation of configuration?		

4th Surface	Verify Yes	Verify No
Did the instrument turn off?		
Did the instrument change mode of operation of configuration?		

5th Surface	Verify Yes	Verify No
Did the instrument turn off?		
Did the instrument change mode of operation of configuration?		

6th Surface	Verify Yes	Verify No
Did the instrument turn off?		
Did the instrument change mode of operation of configuration?		

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Documentation
Data Sheet Section 5.2

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: Manufacturers shall provide instructions to verify proper operation of the instrument.

Requirements are listed in Clause 10 (Documentation) of the ANSI/IEEE N42.48

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

Requirement	Yes		No
The manufacturer provides report for type test results?			
Verify that manufacturer contact information is available			
Verify that the detector types are described in the manual			
Verify that the type of instrument is described in the manual			
Verify that the exposure rate information is available in the manual			
Verify that reference point and reference orientation is describe in manual			
Verify that the radiation energy region is described in manual			
Verify that information on accuracy, linearity and lower limit of detections			
Verify that results of calibration tests are available			
Verify that information on weight and dimensions of instrument is available			
Verify that information power supply (battery) requirements is available			
Verify that information that test results under environmental conditions is available			
Verify that results of electrical tests are available			
Verify that results of mechanical tests are available			
The manufacturer provides operating instructions?			
The operating manual provides electrical diagrams?			
The operating manual provides list of spare parts?			
The operating manual provides instrument specifications?			
The operating manual provides a troubleshooting guide?			

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Displays
Data Sheet Section 5.3

Manufacturer:
Instrument:
Model: **Serial Number:**
Date Performed: **Test Location:**

Requirement: The instrument shall directly display the measured exposure rate or dose-equivalent rate with the associated radiological unit (e.g., µR/h, µGy/h, or µSv/h).

Radionuclide identification results shall be displayed on the instrument. If measurement results can be viewed via a wireless or network link on a secondary device, the failure of that or any secondary device shall not affect the operation of the instrument.

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

	Verify Yes	Verify No
Is the display backlit?		
Is the display continuously lit?		
Is the display readable in low light level (Verified in section 5.13)?		
Is the display readable in high light level (Verified in section 5.13)?		
Can measurement results be viewed by a secondary device?		
Continues to function properly when the secondary device is switched off?		
Are radionuclide identification results displayed on the instrument?		

Display LED ____ LCD ____ Other ____

Display type Exposure rate ____ Dose-equivalent rate ____ Other ____

Display range ____

Display units Units ____

Comments: ____

Performed by: ____ **Date:** ____

Reviewed by: ____ **Date:** ____

Effective Range of Measurement or Indication
Data Sheet Section 5.4

Manufacturer: _____
Instrument: _____

Model: _____ **Serial Number:** _____
Date Performed: _____ **Test Location:** _____

Requirement:

The effective range of measurement or indication shall be specified by the manufacturer and shall be from 5 µR/h to not less than 2 mR/h.

The instrument response over the effective range specified by the manufacturer shall be tested.When exposed to radiation fields that are greater than the effective range of measurement, the instrument shall indicate an over-range condition.

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

	Verify		
	Yes		No
For gammas; is the effective range at least 5 µR/h to 2 mR/h?			
The instrument has an over-range indication?			
For gammas; what is the effective range of measurement as stated by the manufacturer? (include units)			
For gammas; what is the display range shown by the instrument? (include units)			
For neutrons (if available); what is the effective range of measurement as stated by the manufacturer? (include units)			
For neutrons (if available); what is the display range shown by the instrument? (include units)			

Describe over-range display: _____

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Audible Alarm

Data Sheet Section 5.5

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Numbe** _____

Date Performed: _____ **Test Location:** _____

Requirements:

The instrument shall provide an audible alarm to indicate an increase in the radiation level that is greater than the alarm set point. Different techniques may be used to differentiate between the type of radiation detected (e.g., gamma, neutron, over-range). The frequency of an audible alarm signal shall be from 1000 Hz to at least 4000 Hz. Where an intermittent alarm signal is provided, the interval shall not exceed 2 s. The A-weighted alarm signal volume at a distance of 30 cm from the instrument shall be at least 80 dB(A) and shall not exceed 100 dB(A).

It shall not be possible to disable both the vibration and audible alarm indications simultaneously, except through the restricted mode. When both alarm signals are off, an indication shall be provided on the display to inform the user of this condition.

An earphone connection should be available to enable use of the audible function in a high-noise environment.

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

Test Equipment: _____

Instrument Mode of operation _____

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

Measurement Results

Alarm volume

	dB(A)	
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Mean	#DIV/0!	dB(A)
STD	#DIV/0!	dB(A)
COV %	#DIV/0!	

Frequency

	Hz	
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Mean	#DIV/0!	Hz
STD	#DIV/0!	Hz
COV %	#DIV/0!	

	Verify Yes	Verify No
Is the alarm frequency within 1000 to 4000 Hz?		
Where an intermittent alarm is provided, is the interval less than 2 seconds?		
Is the alarm volume at a distance of 30 cm within 85 dB(A) and 100 dB(A)?		
If the audible alarm can be disabled, does the instrument have a vibration or visual alarm?		
Is an earphone connection available?		
Alarms are distinguishable for different types of radiation (gamma, neutron, over-range)?		
If yes, describe differences:		
Does the instrument have preventive measures for disabling all the alarms?		
If yes, describe:		

Record intermittent alarm interval (seconds): _____

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Vibration Alarm
Data Sheet Section 5.6

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirements: The instrument shall have a vibration alarm signal capability. The vibration alarm shall have sufficient intensity to inform the user of an alarm condition.

The use of carrying pouches is discouraged. If a holder is used, there should be a rigid connection between the holder and the instrument such that there is no loss of vibration intensity to the user.

The intensity of the vibration at the surface of the instrument (instrument pouch or holder, when used) shall be greater than 0.8 g. The vibration motor used by the instrument should rotate between 9000 rpm and 11000 rpm.

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

Test Equipment: _____

Instrument Mode of operation: _____

Instrument and Motor Verification	Verify Yes	Verify No
Verify that new batteries are installed?		
Motor rotation between 9000 and 11000 rpm?		
What is the motor rpm?		

Measurement Results

	Intensity (g)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Mean intensity	#DIV/0!

	Verify	
	Yes	No
h measured reading greater than 0.8 g?		
Is the vibration signal intermittent?		

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Size, Mass, Reference point marking, and Explosive Atmospheres
Sections 5.7-5.10

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: **5.7 Size**

The overall dimensions of the instrument should be similar to that of a personal radiation detector (within the rectangular solid defined by 20 cm in length, 10 cm in width, and 5 cm in depth). Means shall be provided to securely fix the instrument to the user (for example, a clip, ring, or lanyard), with attention given to the necessary orientation of the detector and display.

5.8 Mass

The mass of the complete instrument should not exceed 400 g.

5.9 Reference point marking

The instrument shall have reference points on both the front, or back, and side indicating the effective center of the detector.

The instrument shall have an additional reference point indicating its orientation with respect to the wearer. The presence of a clip may be used as the reference point to indicate proper orientation.

All reference points shall be described in the instrument manual.

5.10 Explosive atmospheres

The manufacturer shall state whether the instrument is certified for use in explosive atmospheres. If certification is claimed, documentation shall be provided. Certification should be based on UL-913-2004.

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

	Verify	
	Yes	No
What are the dimensions (length x width x depth in cm)?		
Are the dimensions within 20 cm in length, 10 cm in width, and 5 cm in depth?		
Can the instrument be securely fixed to the user?		
What is the mass (grams)?		
Was the mass less than 400 g?		
Are the reference points marked on the front or back and side indicating the effective center of the detector?		
Does the manufacturer state if the instrument is certified for use in explosive atmospheres?		
Is a certificate provided?		
Is the certification based on UL-913 standard?		
If not, specify against which standard is the instrument certified to:		

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 5.11 Battery Lifetime
Data Sheet and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: If non-rechargeable batteries are used, they shall be widely available, not unique to the instrument, and be replaceable in the field without the use of special tools. When rechargeable batteries are used, provisions shall be made to permit recharging from ac or dc (12 V) power sources.

The batteries shall be capable of powering the instrument in a non-alarm state for a minimum of 16 h in a 50 µR/h (0.5 µGy/h) field. The batteries shall be capable of powering the audible alarm continuously for 30 min.

The instrument shall have a low battery indicator

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

Test Results

	Rechargeable	Non-Rechargeable
Battery type used	☐	☐

	Yes	No
Is a low battery indications provided?	☐	☐
The batteries powered the instrument for 16 h in a non-alarming condition in a field of 50 µR/h?	☐	☐
Was the alarm activated after the 16 h of non-alarming operation?	☐	☐
The batteries powered the instrument for 30 min in an alarming condition?	☐	☐
Did the instrument alarm when the low battery indication was displayed?	☐	☐

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 5.12 Data transmission
Data Sheet and Report

Manufacturer:

Instrument:

Model: **Serial Number:**

Date Performed: **Test Location:**

Requirement: The instrument shall have the ability to transfer data to an external device, such as a computer. The transfer should be based on a bi-directional port that meets the requirements of Ethernet, USB, wireless, or other electronic means, such as a removable media device. The technique used shall conform to applicable IEEE protocols. The transferred data shall be in the XML format following the format defined in ANSI N42.42. When used, wireless techniques shall have the ability to be encrypted.

Communication protocols shall be described in the technical manual. Proprietary communication formats\ shall not be used and any required drivers shall be made available to the user.

Proprietary software should not be required for remote data interpretation. If proprietary software is needed, the software shall be provided by the manufacturer..

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

Test Results

	Yes	No
Additional data transfer requirements were verified in 5.13 and 5.14?	☐	☐
Does the instrument transmit data to an external device?	☐	☐
Is the transfer bidirectional?	☐	☐
What type of port is used (e.g. Ethernet, USB, wireless, other)?		
The output file meets ANSI N42.42 requirements?	☐	☐
Is the data format described in the manual?	☐	☐
Is the communication protocol described in the manual?	☐	☐
Are proprietary communication formats used?	☐	☐
Are drivers provided to the users?	☐	☐
Is proprietary software used?	☐	☐
If yes, was the proprietary software provided?	☐	☐

Comments:

Completed by: **Date:**

Reviewed by: **Date:**

User Interface
Data Sheet Section 5.13

Manufacturer:

Instrument:

Model: **Serial Number:**

Date Performed: **Test Location:**

Requirement: The instrument shall include:

a) A display that is easily readable over the required temperature range and under different lighting conditions.
b) Controls that are user-friendly for routine operation.
c) Controls and switches that are designed in a way to minimize accidental operation.
d) A menu structure that is simple and easy to be followed intuitively.
e) Detect, search/localize, and identification functions.
f) The capability to operate if the user is wearing gloves.
g) A method to inform the user of the expected time required to collect a spectrum and a means to allow the user to extend or reduce the collection time.
h) An automated mode of operation that would automatically start spectrum collection and attempt to identify the radionuclide.
i) Provide a status indicator, such as a flashing LED or LCD heartbeat, to inform the user that the instrument is functioning properly, including visual indication of an alarm condition.

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

USER 1			
	Yes		No
Without Gloves in a low level light <150 lux			
It is possible to turn on the instrument?			
It is possible to calibrate the instrument?			
It is possible to go over the menu as described in the manual?			
It is possible to make an exposure rate measurement?			
It is possible to make an identification measurement?			
It is possible to save the data?			
Make a 137Cs identification measurement, was the collection time displayed?			
It is possible to extend the collection time?			
Is this extended time displayed?			
It is possible to reduce the collection time?			
Is this reduced time displayed?			
It is possible to transfer the data to an external device following the manufacturer provided information?			
Is wireless communication used?			
If wireless communication is used, is encryption available?			
It is possible to turn off the instrument?			
Without Gloves in a high level light > 10000 lux and < 32000 lux			
It is possible to turn on the instrument?			
It is possible to calibrate the instrument?			
It is possible to go over the menu as described in the manual?			
It is possible to make an exposure rate measurement?			
It is possible to make an identification measurement?			
It is possible to save the data?			
It is possible to turn off the instrument?			
With Gloves			
It is possible to turn on the instrument?			
It is possible to calibrate the instrument?			
It is possible to go over the menu as described in the manual?			
It is possible to make an exposure rate measurement?			
It is possible to make an identification measurement?			
It is possible to save the data?			
It is possible to turn off the instrument?			

USER 2			
	Yes		No
Without Gloves in a low level light <150 lux			
It is possible to turn on the instrument?			
It is possible to calibrate the instrument?			
It is possible to go over the menu as described in the manual?			
It is possible to make an exposure rate measurement?			
It is possible to make an identification measurement?			
It is possible to save the data?			
Make a 137Cs identification measurement, was the collection time displayed?			
It is possible to extend the collection time?			
Is this extended time displayed?			
It is possible to reduce the collection time?			
Is this reduced time displayed?			
It is possible to transfer the data to an external device following the manufacturer provided information?			
Is wireless communication used?			
If wireless communication is used, is encryption available?			
It is possible to turn off the instrument?			
Without Gloves in a high level light > 10000 lux and < 32000 lux			
It is possible to turn on the instrument?			
It is possible to calibrate the instrument?			
It is possible to go over the menu as described in the manual?			
It is possible to make an exposure rate measurement?			
It is possible to make an identification measurement?			
It is possible to save the data?			
It is possible to turn off the instrument?			
With Gloves			
It is possible to turn on the instrument?			
It is possible to calibrate the instrument?			
It is possible to go over the menu as described in the manual?			
It is possible to make an exposure rate measurement?			
It is possible to make an identification measurement?			
It is possible to save the data?			
It is possible to turn off the instrument?			

USER 3			
	Yes		No
Without Gloves in a low level light <150 lux			
It is possible to turn on the instrument?			
It is possible to calibrate the instrument?			
It is possible to go over the menu as described in the manual?			
It is possible to make an exposure rate measurement?			
It is possible to make an identification measurement?			
It is possible to save the data?			
Make a 137Cs identification measurement, was the collection time displayed?			
It is possible to extend the collection time?			
Is this extended time displayed?			
It is possible to reduce the collection time?			
Is this reduced time displayed?			
It is possible to transfer the data to an external device following the manufacturer provided information?			
Is wireless communication used?			
If wireless communication is used, is encryption available?			
It is possible to turn off the instrument?			
Without Gloves in a high level light > 10000 lux and < 32000 lux			
It is possible to turn on the instrument?			
It is possible to calibrate the instrument?			
It is possible to go over the menu as described in the manual?			
It is possible to make an exposure rate measurement?			
It is possible to make an identification measurement?			
It is possible to save the data?			
It is possible to turn off the instrument?			
With Gloves			
It is possible to turn on the instrument?			
It is possible to calibrate the instrument?			
It is possible to go over the menu as described in the manual?			
It is possible to make an exposure rate measurement?			
It is possible to make an identification measurement?			
It is possible to save the data?			
It is possible to turn off the instrument?			

For additional users add more tables as needed.

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Spectral Identification
Data Sheet Section 5.14

Manufacturer:
Instrument:
Model: **Serial Number:**
Date Performed: **Test Location:**

Requirement: a) The instrument shall have the ability to store and transfer at least fifty complete (unprocessed) spectra. Each stored spectrum shall contain collection and identification results information in the ANSI N42.42 format including:
- Time and date
- Instrument type and serial number
- Hardware and software version
- Identified radionuclides and associated confidence indications
- Spectrum collection time interval
- Measured gamma-ray exposure rate
- Neutron count rate at the time of measurement, if provided

b) An indication shall be displayed or otherwise provided (e.g., “not identified,” “unknown radionuclide”) if a radionuclide cannot be identified.
c) The manufacturer shall describe the meaning of confidence indications.
d) The instrument shall indicate if the exposure rate is too high for radionuclide identification.

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

	Yes		No
Is the instrument capable of storing 50 complete unprocessed spectra?			
Is the instrument capable of transferring 50 complete unprocessed spectra?			
Is each spectral save in an ANSI N42.42 format?			
The instrument provides indication such as “not identified” or “unknown radionuclide” when a radionuclide cannot be identified? (Note- use data from test in section 6.10.5 to answer this question)			
The manual describes the meaning of the confidence indications?			
The instrument provides an indication when the exposure rate is too high for a radionuclide identification? (Note- use data from test in section 6.10.6 to answer this question)			

The Output File Contains the Following:	Yes		No
Time and date information?			
Instrument type and serial number information?			
Hardware and software version information?			
Identified radionuclide?			
Confidence indications for the radionuclides identified?			
Measured gamma-ray exposure rate?			
If provided, neutron count rate at the time of the measurement?			
Spectrum collection time interval?			

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Rate of False Alarms

Data Sheet Section 6.2

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirements: The false alarm rate for gamma and neutron (when applicable) shall be less or equal than 1 alarm per 10 hours when operated in a stable background environment.

The alarm threshold shall be the same as that used for the "time to alarm" test

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

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

Gamma Alarm Threshold: _____ **Instrument Mode of operation** _____

Neutron Alarm Threshold: _____

Gamma Background measurement _____ µR/h

Neutron Background measurement _____ (Add Units)

	Yes	No
For gammas; did the instrument alarm more than once over the test period ?		
If applicable, did the neutron alarm more than once over the test period?		

Record the number of gamma alarms during the test: _____

Record the number of neutron alarms during the test: _____

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Time to Alarm: Photons

Data Sheet Section 6.3

Manufacturer:							
Instrument:							
Model:				**Serial Number:**			
Date Performed:				**Test Location:**			
Requirement:	The alarm shall activate within 2 s after exposure to an increase in the ambient radiation level of 50 µR/h (0.5 µGy/h) that occurs over a period of not more than 0.5 s.						
Note:	Comments are required when the requirement is not verified.						
Ambient Conditions:		**°C**		**%RH**		**in HG**	
Test Equipment:							
Sources Data:							

Measurement Results

Background Field (Cs-137)		µR/h	**Alarm Threshold**		µR/h
Background Field (Am-241)		µR/h			
Background Field (Co-60)		µR/h	**Instrument Mode of operation**		
If not 50 µR/h enter:					
Testing Field (Cs-137)		µR/h	**Instrument reading (Cs-137)**		µR/h
Testing Field (Am-241)		µR/h	**Instrument reading (Am-241)**		µR/h
Testing Field (Co-60)		µR/h	**Instrument reading (Co-60)**		µR/h

Record in table if instrument alarmed or not within 2 seconds.

		Cs-137	Am-241	Co-60	
		time to alarm ≤2s	time to alarm ≤2s	time to alarm ≤2s	
OPERATIONAL NOTE:	1				(Yes/No entry)
	2				
If there is no alarm then a "No alarm" message needs to be recorded in the table	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				

	Yes	No
Did the instrument alarm within 2 seconds for Cs-137?		
Did the instrument alarm within 2 seconds for Am-241?		
Did the instrument alarm within 2 seconds for Co-60?		

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Time to alarm - Neutron

Data Sheet Section 6.4

Manufacturer:

Instrument:

Model: **Serial Number:**

Date Performed: **Test Location:**

Requirement: The neutron alarm shall activate within 5 s after exposure to an unmoderated neutron field that occurs over a period of not more than 2 s.

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

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

Test Equipment:

Source Data: **Instrument Mode of operation**

Background Field _____ (add units) **Alarm Threshold** _____ (add units)

Measurement Results

Record in table if instrument alarmed or not within 5 seconds.

OPERATIONAL NOTE:

If there is no alarm then a "No alarm" message needs to be recorded in the table

	Cf-252 time to alarm ≤5s	
1		(Yes/No entry)
2		
3		
4		
5		
6		
7		
8		
9		
10		

	Yes	No
Did the instrument alarm within 5 seconds for neutron?		

Comments: _____

Performed by: _____ Date: _____

Reviewed by: _____ Date: _____

Detection of gradually increasing gamma radiation levels and Neutron detection

Data Sheet Section 6.5

Manufacturer:			
Instrument:			
Model:		Serial Number:	
Date Performed:		Test Location:	

Requirement: The instrument's alarm threshold shall not be affected by slowly increasing radiation levels that may be caused when a wearer is slowly approaching or is being approached by a radiation source.

The alarm shall activate within 5 seconds after the instrument reaches the test position.

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

Ambient Conditions:		°C		%RH	in HG
Test Equipment:					
Source Data:					
Gamma Background Field:		µR/h	Neutron Background Field:		(add units)
Gamma Alarm Threshold:		µR/h	Neutron Alarm Threshold:		(add units)
Instrument Mode of operation					

Measurement Results

Record in table if instrument alarmed or not within 2 seconds for gammas and 5 seconds for neutrons.

OPERATIONAL NOTE:

If there is no alarm then a "No alarm" message needs to be recorded in the table

	Cs-137	Cf-252	
	time to alarm ≤2s	time to alarm ≤5s	
1			(Yes/No entry)
2			
3			
4			
5			
6			
7			
8			
9			
10			

	Yes	No
Did the instrument alarm within 2 seconds for gamma?		
Did the instrument alarm within 5 seconds for neutron?		

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Accuracy - Photons

Data Sheet Section 6.6

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: Displayed exposure rates, when provided, shall be within ±30 % of the conventionally true value of the applied exposure rate using Am-241, Cs-137, and Co-60.

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

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

Test Equipment: _____

Cs-137 Measurements

Source Data: _____ **Instrument Mode of operation** _____

Background _____ µR/h **at test location**

Gamma Alarm Threshold: _____ µR/h

Maximum instrument range display _____ mR/h

	For 400 µR/h	For 1 mR/h	For 80% max rate	
Radiation fields in mR/h	**0.40**	**1.00**	**0.00**	
Actual Radiation fields used in the test in mR/h				
1				(add instrument units)
2				
3				
4				
5				
6				
7				
8				
9				
10				
Mean	#DIV/0!	#DIV/0!	#DIV/0!	
Std dev	#DIV/0!	#DIV/0!	#DIV/0!	
COV %	#DIV/0!	#DIV/0!	#DIV/0!	
low (-30%)	0.28	0.70	0.00	
high (+30%)	0.52	1.30	0.00	

Am-241 Measurements

Source Data: _____ **Instrument Mode of operation** _____

Background _____ µR/h **at test location**

Gamma Alarm Threshold: _____ µR/h

Maximum instrument range display _____ mR/h

	For 400 µR/h	For 1 mR/h	For 80% max rate	
Radiation fields used for test in mR/h	**0.40**	**1.00**	**0.00**	
Actual Radiation fields used in the test in mR/h				
1				(add instrument units)
2				
3				
4				
5				
6				
7				
8				
9				
10				
Mean	#DIV/0!	#DIV/0!	#DIV/0!	
Std dev	#DIV/0!	#DIV/0!	#DIV/0!	
COV %	#DIV/0!	#DIV/0!	#DIV/0!	
low (-30%)	0.28	0.70	0.00	
high (+30%)	0.52	1.30	0.00	

Co-60 Measurements

Source Data: _____ **Instrument Mode of operation** _____

Background _____ µR/h **at test location**

Gamma Alarm Threshold: _____ µR/h

Maximum instrument range display _____ mR/h

	For 400 µR/h	For 1 mR/h	For 80% max rate	
Radiation fields used for test in mR/h	**0.40**	**1.00**	**0.00**	
Actual Radiation fields used in the test in mR/h				
1				(add instrument units)
2				
3				
4				
5				
6				
7				
8				
9				
10				
Mean	#DIV/0!	#DIV/0!	#DIV/0!	
Std dev	#DIV/0!	#DIV/0!	#DIV/0!	
COV %	#DIV/0!	#DIV/0!	#DIV/0!	
low (-30%)	0.28	0.70	0.00	
high (+30%)	0.52	1.30	0.00	

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Personal Radiation Alarm
Data Sheet Section 6.7

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: The instrument shall provide an alarm that will alert the user to the presence of a relatively high radiation field. The alarm shall be audible and visible, and be different than those associated with the radiation indication alarm described in step 6.3.

Using Cs-137, expose the instrument to a 10 mR/h (100 µGy/h) radiation field. The personal alarm shall be activated within 2 s of the exposure. Reduce the radiation field and repeat the exposure two additional times for a total of three trials. The alarm shall activate within the time specified for each trial.

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

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

Test Equipment: _____

Source Data: _____

Measurement Results

Background Field		µR/h	**Alarm Threshold**		µR/h
Instrument Mode of operation					
If not 10 mR/h enter:					
Testing Field (Cs-137)		mR/h	**Instrument reading (Cs-137)**		mR/h

Record in table if instrument alarmed or not within 2 seconds.

	Cs-137 time to alarm ≤2s	
1		(Yes/No entry)
2		
3		

OPERATIONAL NOTE:

If there is no alarm then a "No alarm" message needs to be recorded in the table

	Yes		**No**
Did the instrument alarm within 2 seconds for Cs-137?			
It has an audible personal radiation alarm?			
Is the alarm audible alarm different to that of the radiation indication alarm?			
If yes, then describe:			
It has an visible personal radiation alarm?			
Is the alarm visible alarm different to that of the radiation indication alarm?			
If yes, then describe:			

For Cs-137: Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Over-Range Response
Data Sheet Section 6.8

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: When exposed to an exposure rate that is two times the maximum exposure rate specified by the manufacturer, the indication of the instrument shall remain at the maximum of that range, and an over-range indication shall be displayed for the duration of the exposure. The instrument shall recover within 5 minute when the radiation field is reduced.

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

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

Test Equipment: _____

Source Data: _____

Instrument Mode of operation _____

Manufacturer-Stated Max Exposure Rate: _____ mR/h

Over-Range Test Exposure Rate: _____ mR/h

Over-Range Exposure Duration: _____ min.

	Verify	
	Yes	No
Was an over-range indication displayed?		
Did the instrument recover within 5 minutes?		

Recorded recovery time: _____ (add units)

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Interfering Ionizing Radiation

Data Sheet Section 6.9

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: If the instrument has a neutron detector, the neutron detector shall be insensitive to photon radiation.

The instrument shall be exposed to a ^{137}Cs radiation field of 10 mR/h for 1 min. The instrument shall not indicate a neutron alarm.

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

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

Test Equipment: _____

Gamma Source Data: _____

Instrument Mode of operation _____

	Verify Yes	Verify No
Did the neutron alarm went off when only exposed to the Cs-137 source?		
Were neutrons indicated during the exposure?		
If neutrons are indicated, record neutron indication (include units)		

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 6.10.1 Radionuclide Categorization
Data Sheet and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: The manufacturer shall state the radionuclides that the instrument can identify radionuclides by category. The categories selected should be based on the following list:

- Special Nuclear Materials: Uranium (used to indicate 233U, 235U), 237Np, Pu.

- Medical radionuclides: 18F, 67Ga, 51Cr, 75Se, 89Sr, 99Mo, 99mTc, 103Pd, 111In, Iodine (123I, 125I, 131I), 153Sm, 201Tl, 133Xe.

- Naturally occurring radioactive materials (NORM): 40K, 226Ra, 232Th and daughters, 238U and daughters.

- Industrial radionuclides: 57Co, 60Co, 133Ba, 137Cs, 192Ir, 204Tl, 226Ra, and 241Am.

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

Test Results

	Yes	No
The manufacturer states the radionuclides that the instrument can identify by category.	☐	☐
The instrument can identify (at a minimum) the four different categories of radionuclides listed in the requirement.	☐	☐

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 6.10.2.2 Single Radionuclide Identification
Data Sheet and Report

Manufacturer:			
Instrument:			
Model:		**Serial Number:**	
Date Performed:		**Test Location:**	
Requirement:	The instrument shall be able to identify the following radionuclides within the time specified by the manufacturer with a maximum of 5 min. The manufacturer shall provide radionuclide-specific test results. Medical radionuclides: 67Ga, 99mTc, Iodine (123I, 131I), 201Tl NORM: 40K, 226Ra, 232Th Industrial radionuclides: 22Na, 57Co, 60Co, 133Ba, 137Cs, 152Eu, 192Ir, and 241Am Special nuclear materials: HEU (highly enriched uranium, 235U >90%), Pu [Reactor grade plutonium (> 6% 240Pu)]		
Note:	Comments are required when the requirement is not verified.		

Single Radionuclide Identification Test Data

Date Performed:

	^{22}Na	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:

	^{40}K	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:

	^{57}Co	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:

	^{60}Co	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:

	^{67}Ga	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:

	^{99m}Tc	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	^{123}I	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	^{131}I	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	^{133}Ba	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	^{137}Cs	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	^{152}Eu	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	^{192}Ir	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	^{201}Tl	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	^{226}Ra	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	^{232}Th	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	HEU	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	RGPu	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Date Performed:	^{241}Am	
	Shielded	Unshielded
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Corr		

Did the instrument ID correctly 8 out of 10 time?			
Unshielded			
Date of Test	Radionuclide	Yes	No
	^{22}Na	☐	☐
	^{40}K	☐	☐
	^{57}Co	☐	☐
	^{60}Co	☐	☐
	^{67}Ga	☐	☐
	^{99m}Tc	☐	☐
	^{123}I	☐	☐
	^{131}I	☐	☐
	^{133}Ba	☐	☐
	^{137}Cs	☐	☐
	^{152}Eu	☐	☐
	^{192}Ir	☐	☐
	^{201}Tl	☐	☐
	^{226}Ra	☐	☐
	^{232}Th	☐	☐
	HEU	☐	☐
	RGPu	☐	☐
	^{241}Am	☐	☐

Did the instrument ID correctly 8 out of 10 time?			
Shielded			
Date of Test	Radionuclide	Yes	No
	^{22}Na	☐	☐
	^{40}K	☐	☐
	^{57}Co	☐	☐
	^{60}Co	☐	☐
	^{67}Ga	☐	☐
	^{99m}Tc	☐	☐
	^{123}I	☐	☐
	^{131}I	☐	☐
	^{133}Ba	☐	☐
	^{137}Cs	☐	☐
	^{152}Eu	☐	☐
	^{192}Ir	☐	☐
	^{201}Tl	☐	☐
	^{226}Ra	☐	☐
	^{232}Th	☐	☐
	HEU	☐	☐
	RGPu	☐	☐
	^{241}Am	☐	☐

Source Information				
Unshielded				
Date	Radionuclide	Activity	Exposure rate	(add units)
	^{22}Na			
	^{40}K			
	^{57}Co			
	^{60}Co			
	^{67}Ga			
	^{99m}Tc			
	^{123}I			
	^{131}I			
	^{133}Ba			
	^{137}Cs			
	^{152}Eu			
	^{192}Ir			
	^{201}Tl			
	^{226}Ra			
	^{232}Th			
	HEU			
	RGPu			
	^{241}Am			

Source Information				
Shielded				
Date	Radionuclide	Activity	Exposure rate	(add units)
	^{22}Na			
	^{40}K			
	^{57}Co			
	^{60}Co			
	^{67}Ga			
	^{99m}Tc			
	^{123}I			
	^{131}I			
	^{133}Ba			
	^{137}Cs			
	^{152}Eu			
	^{192}Ir			
	^{201}Tl			
	^{226}Ra			
	^{232}Th			
	HEU			
	RGPu			
	^{241}Am			

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 6.10.3 Simultaneous Radionuclide Identification Data Sheet and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: The instrument shall be able to identify at least two radionuclides simultaneously.

Use ^{99m}Tc + ^{137}Cs for the test.

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

Simultaneous Radionuclide Identification Test Data

Date Performed: _____

^{99m}Tc Source data: _____

^{137}Cs Source data: _____

	^{99m}Tc + ^{137}Cs
	Unshielded
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Corr	

Did the instrument categorized correctly 8 out of 10 time?			
Date of Test	Radionuclide	Yes	No
	$^{99m}Tc + ^{137}Cs$	☐	☐

Did the instrument ID correctly 8 out of 10 time?			
Date of Test	Radionuclide	Yes	No
	$^{99m}Tc + ^{137}Cs$	☐	☐

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 6.10.4 Masking Identification
Test Data and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: The instrument shall provide an indication (e.g., the correct identification, "unknown," "unable to identify") when exposed to a radionuclide masked by another radionuclide that is not listed in the library or that has a much higher radiation intensity than the unmasked radionuclide.

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

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

Test Equipment Used: _____

Test using: ^{67}Ga and ^{54}Mn

Date Performed: _____

	^{67}Ga + ^{54}Mn
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Number Correct	

^{67}Ga Source data: _____

^{54}Mn Source data: _____

(check that ^{54}Mn is not in the instrument library, if in library need to choose a different radionuclide for this test)

Did the instrument ID correctly 8 out of 10 time?			
Date of Test	Radionuclide	Yes	No
	^{67}Ga + ^{54}Mn	☐	☐

Test using: HEU + (^{67}Ga or ^{99m}Tc)

Date Performed:

		(enter sources used)
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
Number Correct		

^{99m}Tc or ^{67}Ga Source data:

^{137}Cs Source data:

Did the instrument ID correctly 8 out of 10 time?

Date of Test	Radionuclide	Yes	No
	(^{99m}Tc or ^{67}Ga) + ^{137}Cs	☐	☐

Test using: Pu + ^{137}Cs

Date Performed:		Pu + ^{137}Cs
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	Number Correct	

Pu Source data: _____

^{137}Cs Source data: _____

Did the instrument ID correctly 8 out of 10 time?			
Date of Test	Radionuclide	Yes	No
	Pu + ^{137}Cs	☐	☐

Comments: _____

Completed by: _____ Date: _____

Reviewed by: _____ Date: _____

Section 6.10.5 Response to Unknown Radionuclide Test Data and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: The instrument shall provide an indication (e.g., "unknown," "unable to identify," "not in library") when exposed to radionuclides that are not in the library.

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

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

Test Equipment Used: _____

Isotope Identification Results

		(enter source used)
Date Performed:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	Number Correct	

^{54}Mn or ^{166m}Ho Source data: _____

(check that one of these sources is not in the instrument library, if both in library need to choose a different radionuclide for this test)

Did the instrument ID correctly 8 out of 10 time?			
Date of Test	**Radionuclide**	**Yes**	**No**
	(^{54}Mn or ^{166m}Ho)	☐	☐

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 6.10.6 Over-Range Characteristics for Identification
Test Data and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: The manufacturer shall state the maximum exposure rate (relative to ^{137}Cs) for identification.

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

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

Test Equipment Used: _____

Source Data: _____

Manufacturer stated maximum exposure rate: _____ (add units)

Measurement Results

	Cs-137
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Number Correct	

Exposure rate used in the test: 0 (add units)

	Yes	No
Did instrument provide indication that exposure rate was too high?		

Did the instrument ID correctly 8 out of 10 time?

Date of Test	Radionuclide	Yes	No
	^{137}Cs	☐	☐

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Sections 7.2 - Temperature
Test Data and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirements: The instrument shall function correctly at temperatures from –20 °C to +50 °C. No alarms shall occur as a result of the temperature conditions alone. If the manufacturer specifies a broader operating temperature range, the instrument shall be tested at the broader temperature range as specified by the manufacturer.

Relative humidity shall be within the range specified in Table 1.

NOTE: Record units displayed by instrument

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

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

Test Equipment Used: _____

Source Data: _____

Measurement Results

Exposure rate ^{137}Cs		22° C as read	30° C as read	40° C as read	50° C as read	10° C as read	0° C as read	-10° C as read	-20° C as read	
	1									(add units)
	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!	
	STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	COV %	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Readings within acceptance range?	**Yes**									
	No									
Gamma alarm (within 2s)	**Yes**									
	No									
Neutron alarm (within 5s)	**Yes**									
	No									
ID Trial 1 ^{133}Ba+^{137}Cs										Record all Radionuclides Identified
ID Trial 2 ^{133}Ba+^{137}Cs										
ID Trial 3 ^{133}Ba+^{137}Cs										

(± 15%) Acceptance Range: #DIV/0! (-15%) to #DIV/0! (+ 15 %)

Gamma alarm: Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Neutron alarm: (if appplicable) Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 7.3 Temperature Shock

Test Data and Report

Manufacturer: _____

Instrument: _____

Model: _____ Serial Number: _____

Date Performed: _____ Test Location: _____

Requirement: The instrument shall be fully functional within 1 h of exposure to rapid temperature changes from 22 °C to –20 °C, –20 °C to 22 °C, 22 °C to 50 °C, and 50 °C to 22 °C, with each change being made in less than 5 min.

No alarms shall occur as a result of the changing temperature conditions alone. Relative humidity shall be within the range specified in Table 1.

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

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

Test Equipment Used: _____

Sources Data: _____

Measurement Results

	22° C	Exposure rate ^{137}Cs	22 to -20° C				- 20 to 22° C				22 to 50° C				50 to 22° C				(add units)
			15	30	45	60	15	30	45	60	15	30	45	60	15	30	45	60	
1		Nominal Mean																	
2		Acceptance Range																	
3		#DIV/0! to #DIV/0!																	
4		low high																	
5		(-15%) (+15%)																	
6																			
7																			
8																			
9																			
10																			
Mean	#DIV/0!	Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
STD	#DIV/0!	STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
COV%	#DIV/0!	COV%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
		Conf-Int (-)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
		Conf-Int (+)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
		Readings within acceptance range? Yes																	
		Readings within acceptance range? No																	
		Gamma alarm (within 2s) Yes																	
		Gamma alarm (within 2s) No																	
		Neutron alarm (within 5s) Yes																	
		Neutron alarm (within 5s) No																	
		ID Trial 1 ^{133}Ba+^{137}Cs																	Record all Radionuclides Identified
		ID Trial 2 ^{133}Ba+^{137}Cs																	
		ID Trial 3 ^{133}Ba+^{137}Cs																	

ID Acceptance Criteria:
Correct Radionuclides ID: (A is correct)
Temperature shock Pass/Fail: Comparison of ID results at test points with the ID results at ambient temperature being the baseline.

A: Ba-133, Cs-137
B:
C:
D:

Gamma alarm: Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Neutron alarm: (if applicable) Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Sections 7.4 - Humidity
Test Data and Report

Manufacturer:							
Instrument:							
Model:				**Serial Number:**			
Date Performed:				**Test Location:**			
Requirements:	The instrument shall function correctly over the range of relative humidity up to 93% RH at 35 °C. No alarms shall occur as a result of the humidity conditions alone.						
Note:	Comments are required when the requirement is not verified.						
Ambient Conditions:		°C		%RH		in HG	
Test Equipment Used:							
Source Data:							

Measurement Results

	Nominal 40% RH 22° C	93% RH 35° C	40% RH 35° C	
	Exposure Rate Readings			
1				(add units)
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 Exposure Rate

#DIV/0!	to	#DIV/0!
low 15%		high 15%

Readings within acceptance range?	**Yes**				
	No				
Gamma alarm (within 2s)	**Yes**				
	No				
Neutron alarm (within 5s)	**Yes**				
	No				

ID Trial 1 $^{133}Ba+^{137}Cs$				Record all Radionuclides Identified
ID Trial 2 $^{133}Ba+^{137}Cs$				
ID Trial 3 $^{133}Ba+^{137}Cs$				

Gamma alarm: Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Neutron alarm: (if appplicable) Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Sections 7.5.2 - Moisture and Dust Protection - Dust Test Data and Report

Manufacturer:							
Instrument:							
Model:					**Serial Number:**		
Date Performed:					**Test Location:**		
Requirements:	The instrument case design shall meet the requirements stated for IP code 53 [R13], which means that the instrument shall be protected from the ingress of dust and spraying water. For IP53, 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 sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects.						
Note:	Comments are required when the requirement is not verified.						
Ambient Conditions:		°C		%RH		in HG	
Test Equipment Used:							
Source Data:							

	Pre-Test Response	Post Test Response	
	Photon Readings		(add units)
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

#DIV/0!	to	#DIV/0!
low 15%		high 15%

Was the post-test response within the acceptance range?	**Yes**		
	No		
Gamma alarm (within 2s)	**Yes**		
	No		
Neutron alarm (within 5s)	**Yes**		
	No		
ID Trial 1 ^{133}Ba+^{137}Cs			Record all Radionuclides Identified
ID Trial 2 ^{133}Ba+^{137}Cs			
ID Trial 3 ^{133}Ba+^{137}Cs			

Gamma alarm: Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Neutron alarm: (if applicable) Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

	Yes	**No**
Did dust penetrate the instrument to the extent where operation could be impacted?		

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Sections 7.5.3 - Moisture and Dust Protection, Moisture Test Data and Report

Manufacturer:			
Instrument:			
Model:		**Serial Number:**	
Date Performed:		**Test Location:**	
Requirements:	The test shall be made using a suitable nozzle (see IEC 60068-2-75:1997) with the water pressure adjusted to give flow rate of 10 L/min ±5%, which should be kept constant during the test. The water temperature should not differ by more than 5 °C from the temperature of the instrument under test. The test duration is 1 min/m2 of the calculated surface area of the instrument with a minimum duration of 5 min.		
Note:	Comments are required when the requirement is not verified.		

Ambient Conditions:		°C		%RH	in HG
Test Equipment Used:					
Source Data:					

	Pre-Test Response	Post Test Response	
	Photon Readings		(add units)
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

#DIV/0!	to	#DIV/0!
low 15%		high 15%

Was the post-test response within the acceptance range?	**Yes**		
	No		
Gamma alarm (within 2s)	**Yes**		
	No		
Neutron alarm (within 5s)	**Yes**		
	No		
ID Trial 1 $^{133}Ba+^{137}Cs$			Record all Radionuclides Identified
ID Trial 2 $^{133}Ba+^{137}Cs$			
ID Trial 3 $^{133}Ba+^{137}Cs$			

Gamma alarm: Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Neutron alarm: (if applicable) Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

	Yes	No
Did water penetrate the instrument?		

Comments: _____

_____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Sections 7.6 - Cold Temperature Start Up
Test Data and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirements: The instrument shall be able to operate when switched on at the cold temperature limit (-20 ºC).

Pre-Test and Post-Test are made at 22 ºC

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

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

Manufacturers stated warm-up time: _____ (add units)

Test Equipment Used: _____

Source Data: _____

	Pre-Test Readings	Post-Test Readings	Readings at - 20 °C	
	Photon Readings			
1				(add units)
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!
low 15%		high 15%

Were the results within the acceptance range?	Yes				
	No				
Gamma alarm (within 2s)	Yes				
	No				
Neutron alarm (within 5s)	Yes				
	No				
ID Trial 1 $^{133}Ba+^{137}Cs$				Record all Radionuclides Identified	
ID Trial 2 $^{133}Ba+^{137}Cs$					
ID Trial 3 $^{133}Ba+^{137}Cs$					

Gamma alarm: Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Neutron alarm: (if applicable) Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 8.2 Electrostatic Discharge
Test Data and Report

Manufacturer:
Instrument:
Model: **Serial Number:**
Date Performed: **Test Location:**

Requirement: During exposure to electrostatic discharges at intensities of up to 6 kV using the contact discharge technique, the instrument shall function correctly. No alarms shall occur as a result of the electrostatic discharge alone.

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

Ambient Conditions: °C % RH in Hg

Test Equipment Used:

Source Data:

Measurement Results

Test with sources

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

Acceptance Range

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

		Post-test Readings			
		Gamma Exposure rate			
		2 kV	4 kV	6 kV	
1					(add units)
2					
3					
4					
5					
6					
7					
8					
9					
10					
Mean		#DIV/0!	#DIV/0!	#DIV/0!	
Were the results within the acceptance range?	Yes				
	No				
Gamma alarm (within 2s)	Yes				
	No				
Neutron alarm (within 5s)	Yes				
	No				
ID Trial 1 ^{133}Ba+^{137}Cs					Record all Radionuclides Identified
ID Trial 2 ^{133}Ba+^{137}Cs					
ID Trial 3 ^{133}Ba+^{137}Cs					

Gamma alarm: Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Neutron alarm: (if applicable) Record maximum time to alarm: _____ seconds

Record minimum time to alarm: _____ seconds

Test without sources

Did the instrument alarm during testing?

	2 kV	4 kV	6 kV
Yes			
No			

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 8.3 Radio Frequency
Test Data and Report

Manufacturer:
Instrument:
Model: **Serial Number:**
Date Performed: **Test Location:**

Requirement: The instrument shall not be affected by radio frequency (RF) fields over the frequency range of 80 MHz to 2.5 GHz at an intensity of 50 volts per meter (V/m). When exposed to these RF fields, the instrument shall function correctly. No alarms shall occur as a result of the RF field alone.

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

Ambient Conditions: °C %RH In. Hg

Test Equipment Used:

Frequency Scan Observations Without Radioactive Sources

Were susceptibilities observed?

Yes		No	

Did the unit alarm during testing?

Yes		No	

With ^{137}Cs Source

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

Source Data: _____

Acceptance Range

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

Frequency Scan Observations with Radioactive Sources

Were susceptibilities observed?

Yes		No	

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Sections 8.4 - Magnetic Fields
Test Data and Report

Manufacturer:							
Instrument:							
Model:				**Serial Number:**			
Date Performed:				**Test Location:**			
Requirements:	When exposed to direct current (dc) magnetic fields in all three mutually orthogonal orientations relative to a 10 gauss (1 mT) magnetic field, the instrument shall function correctly. No alarms shall occur as a result of the magnetic field alone						
Note:	Comments are required when the requirement is not verified.						
Ambient Conditions:		°C		%RH		in HG	
Test Equipment Used:							

Measurement Results Without Source

	Initial Orientation		Second Orientation		Third Orientation		
	Nominal Zero Intensity	10 Gauss (DC)	Nominal Zero Intensity	10 Gauss (DC)	Nominal Zero Intensity	10 Gauss (DC)	
1							(add units)
2							
3							
4							
5							
6							
7							
8							
9							
10							
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
COV%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
							Yes
							No

Did the instrument alarm during the test?

	Acceptance Range		
Initial Orientation:	#DIV/0!	to	#DIV/0!
Second Orientation:	#DIV/0!	to	#DIV/0!
Third Orientation:	#DIV/0!	to	#DIV/0!
	low -15%		high +15%

	Yes	No
Were there any functional changes?		

Observations: _____

Measurement Results With Sources

Source Data: _____

Measurement Results With Cs-137

	Initial Orientation		Second Orientation		Third Orientation		
	Nominal Zero Intensity	10 Gauss (DC)	Nominal Zero Intensity	10 Gauss (DC)	Nominal Zero Intensity	10 Gauss (DC)	
1							(add units)
2							
3							
4							
5							
6							
7							
8							
9							
10							
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
COV%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Acceptance Range

Initial Orientation:	#DIV/0!	to	#DIV/0!
Second Orientation:	#DIV/0!	to	#DIV/0!
Third Orientation:	#DIV/0!	to	#DIV/0!
	low -15%		high +15%

	Yes	No
Were there any functional changes?		

Observations: _____

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 8.5 Radiated Emissions
Test Data and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: RF emissions from an instrument shall be less than that which can interfere with other equipment located in the area of use. RF emissions when measured at 3 m shall be less than those shown below:

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

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

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

Test Equipment Used: _____

	Yes	No
Were RF emissions above the limits?		

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 9.1 Vibration
Test Data and Report

Manufacturer:

Instrument:

Model: **Serial Number:**

Date Performed: **Test Location:**

Requirement: The instrument shall withstand exposure to vibrations associated with the operation of handheld or hand-carried equipment. The physical condition and functionality of the instrument shall 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.

Ambient Conditions: °C %RH in HG

Test Equipment Used:

Source Data:

	Pre-test	After Position A	After Position B	After Position C		Acceptance Range		
	Exposure Rate Readings					#DIV/0!	to	#DIV/0!
1					(add units)			
2								
3								
4								
5								
6								
7								
8								
9								
10								
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		-15%		15%
STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!				
COV%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!				

Readings within acceptance range?	Yes				
	No				
Gamma alarm (within 2s)	Yes				
	No				
Neutron alarm (within 5s)	Yes				
	No				
ID Trial 1 $^{133}Ba+^{137}Cs$					Record all Radionuclides Identified
ID Trial 2 $^{133}Ba+^{137}Cs$					
ID Trial 3 $^{133}Ba+^{137}Cs$					
Did the instrument controls function properly?	Yes				
	No				
Did the instrument show visible external damage?	Yes				
	No				

Comments: _____

Performed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Section 9.2 Drop Test
Test Data and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: After being subjected to drops on each of its six surfaces from a height of 1.5 m onto a concrete floor, the instrument shall function correctly and alarm at a change in the radiation field. It is acceptable if a transient alarm occurs at the moment of exposure.

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

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

Test Equipment Used: _____

Source Data: _____

		Pre-test	Drop 1	Drop 2	Drop 3	Drop 4	Drop 5	Drop 6	
		Exposure Rate Readings							(add Units)
	1								
	2								
	3								
	4								
	5								
	6								Acceptance Range
	7								
	8								#DIV/0! to #DIV/0!
	9								low (-15%) high (+15%)
	10								
	Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	COV %	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Readings within acceptance range?	Yes								
	No								
Gamma alarm (within 2s)	Yes								
	No								
Neutron alarm (within 5s)	Yes								
	No								
ID Trial 1 $^{133}Ba+^{137}Cs$									Record all Radionuclides Identified
ID Trial 2 $^{133}Ba+^{137}Cs$									
ID Trial 3 $^{133}Ba+^{137}Cs$									
Did the instrument controls function properly?	Yes								
	No								
Did the instrument show visible external damage?	Yes								
	No								

Comments:

Performed by: **Date:**

Reviewed by: **Date:**

Section 9.3 Impact (Microphonics)
Test Data and Report

Manufacturer: _____

Instrument: _____

Model: _____ **Serial Number:** _____

Date Performed: _____ **Test Location:** _____

Requirement: The instrument shall be unaffected by microphonic conditions such as those that may occur from low intensity impacts from sharp contact with hard surfaces. The physical condition and functionality of the instrument shall 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.

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

Test Equipment Used: _____

Measurement Results - Without sources

	Side No. 1		Side No. 2		Side No. 3		Side No. 4		Side No. 5		Side No. 6	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Did the gamma response remain stable during the test?												
Did the neutron reading change?												
Did the instrument alarm during the test?												
Were there any functional changes due to the impacts?												
Did the instrument display spurious indications?												

Measurement Results - With Sources

Source Data: _____

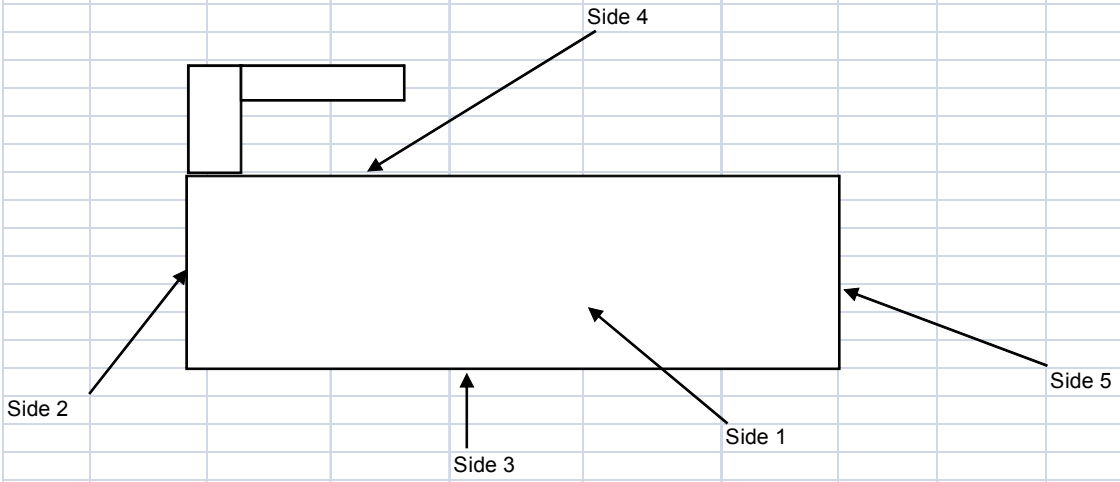
	Pretest Response	Post-test Response	
1			(add units)
2			
3			
4			Acceptance Range
5			#DIV/0! to #DIV/0!
6			low (-15 %) high (+15 %)
7			
8			
9			
10			
Mean	#DIV/0!	#DIV/0!	
STD	#DIV/0!	#DIV/0!	
COV%	#DIV/0!	#DIV/0!	

Readings within acceptance range?	Yes		
	No		
Gamma alarm (within 2s)	Yes		
	No		
Neutron alarm (within 5s)	Yes		
	No		
ID Trial 1 $^{133}Ba+^{137}Cs$			Record all Radionuclides Identified
ID Trial 2 $^{133}Ba+^{137}Cs$			
ID Trial 3 $^{133}Ba+^{137}Cs$			
Did the instrument controls function properly?	Yes		
	No		
Did the instrument show visible external damage?	Yes		
	No		

Comments: _____

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____



Note: Side 6 is opposite to Side 1.

Sections 10 - Documentation

Test Data and Report

Manufacturer:			
Instrument:			
Model:		**Serial Number:**	
Date Performed:		**Test Location:**	

Requirements:

10.1 Type test report

The manufacturer shall provide a report covering the type tests performed in accordance with the requirements of this standard.

10.2 Certificate

The manufacturer shall provide a certificate or other documentation containing at least the following information:

– Contacts for the manufacturer including, but not limited to, name, address, telephone number, fax number, e-mail address, etc.
– Type of instrument, detector, and types of radiation the instrument is designed to measure
– Range of exposure rates the instrument is designed to measure
– Reference points and reference orientation for radiation source used for calibration
– Location and dimensions of the sensitive volumes of the detectors
– Response of the instrument to different appropriate radiation energies
– Results of tests for accuracy, linearity, and lower limit of detection
– Results of calibration tests (isotopes calibration with and date of next calibration due date)
– Weight and dimensions of the instrument
– Power supply (battery) requirements
– Results of tests under environmental conditions
– Results of electrical and mechanical tests
– List of radionuclides to which the instrument was tested
– FWHM and efficiency for 137Cs

10.3 Operation and maintenance manuals

The manufacturer shall supply an operation and maintenance manual containing at least the following information for the user:

– Operating instructions and restrictions. Instructions shall include information regarding alarm threshold adjustments.
– Troubleshooting guide.

Note: Only one data sheet per model is required. Comments are required when the requirement is not verified.

Requirement	Yes	No
Did the manufacturer provide a report on the tests performed?		
Was contact information provided in the manual?		
Did the manual describe the results of calibration tests (isotopes calibration with and date of next calibration due date)?		
Did the manual describe the type of instrument?		
Did the manual describe the type of radiation the instrument is designed to measure?		
Was the exposure rate range defined in the manual?		
Were the reference points described?		
Were the reference orientations described?		
Was information provided about the location of sensitive volume of detectors?		
Was information provided about the dimensions of sensitive volume of detectors?		
Did the manual provide information about the instrument response to different radiation energies?		
Where calibration results provided?		
Was information on accuracy, linearity and lower limit of detections provided?		
Was the weight and dimensions provided?		
Did the manual contain information about battery requirements?		
Were results under environmental conditions provided?		
Were results of electrical tests provided?		
Was the list of radionuclides to which the instrument was tested provided?		
Were FWHM and efficiency for Cs-137 provided?		
Did the manufacturer provided an operation and maintenance manual?		
Did the manual contain operating instructions and restriction?		
Did the instructions contained information regarding alarm threshold adjustments?		
Was a troubleshooting guide provided?		

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