


# **Testing and Evaluation Protocol for Handheld Radionuclide Identifiers for Use in Homeland Security**

**T&E Protocol N42.34, 2010**

**Version 3.03**

## Table of Content

1.	Scope.....	1
2.	References.....	1
3.	Compliance Level Information.....	1
4.	Test and evaluation steps .....	1
5.	Recording test results.....	2
6.	Test report .....	2
7.	Guidance for testing ANSI N42.42 data format requirements .....	3
8.	Test modifications from ANSI/IEEE N42.34-2006 requirements.....	3
9.	Considerations .....	3
10.	“Source data” entry in data sheets .....	4

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 1 of 78

## Testing and Evaluation Protocol for Hand Held Radionuclide Identifiers 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 N42.34, "American National Standard Performance Criteria for Hand-held Instruments for the Detection and Identification of Radionuclides."

### 2. References

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

[R1] ANSI N42.34, "American National Standard Performance Criteria for Hand-held Instruments for the Detection and Identification of Radionuclides."

[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 N42.34 standard. Therefore, different agencies developed documents describing the compliance levels required for particular applications of the instruments under test. Examples of such compliance level requirements are those required by the Graduated Rad/Nuc Detector Evaluation and Reporting (GRaDER<sup>SM</sup>) program. For this program, information can be found in the "Compliance Level for GRaDER Instrument Performance" document located at <http://www.dhs.gov/GRaDER>.

### 4. Test and evaluation steps

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

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

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 2 of 78

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, N42.34. 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.

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 3 of 78

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

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

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

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

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

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

## 8. Test modifications from ANSI/IEEE N42.34-2006 requirements


Some issues were observed about the sources required for testing instruments against the ANSI/IEEE N42.34-2006 standard. These issues will require reconsidering the sources used for testing this type of instruments in the next revision of the standard. Therefore, testing laboratories are not required to test the instruments for the following list of radionuclides (Section 6.6 ANSIN42.34-2006):

- Unshielded -  $^{233}\text{U}$
- Behind 5 mm steel shielding -  $^{40}\text{K}$ ,  $^{125}\text{I}$ ,  $^{226}\text{Ra}$ ,  $^{233}\text{U}$ ,  $^{235}\text{U}$ ,  $^{238}\text{U}$ , Pu (RG Pu containing  $\geq 12\%$   $^{240}\text{Pu}$ ),  $^{241}\text{Am}$

In addition, new considerations were taken about the enrichment of some of the sources listed in the ANSI/IEEE N42.34 standard. The testing laboratories should note that the source enrichment to be used for all the tests described in the ANSI/IEEE N42.34 standard is the following: HEU has an enrichment that is  $\geq 90\%$   $^{235}\text{U}$ , DU at  $0.2\%$   $^{235}\text{U}$ , and  $\text{U}_{\text{nat}}$  at  $0.7\%$   $^{235}\text{U}$ , RGPu containing  $\geq 10\%$   $^{240}\text{Pu}$ , and WGPu  $\leq 6\%$   $^{240}\text{Pu}$ .

## 9. Considerations


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

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 4 of 78

#### 10. “Source data” entry in data sheets


The standard requires testing with different radionuclides to establish the instrument’s capability to correctly identify those radionuclides. The ANSI/IEEE N42.34 standard specified that these tests should be performed by placing the different radioactive sources in front the instrument to produce an exposure rate of 50  $\mu\text{R/h}$  at the reference point of the instrument (if reference point is marked) or at the front face of the instrument in the direction of use (if reference point is not marked). Based on these requirements, the “Source Data” entry in the data sheets should contain the following information:

- Source ID number
- Activity at reference time
- Reference time
- Activity at time of test
- Time of test
- Measured exposure rate
- Source to detector distance
- Calculated exposure rate

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 5 of 78

**Test Summary Sheet**  
**ANSI N42.34**

<b>Manufacturer:</b>						
<b>Model:</b>						
	<b>Serial#</b>		<b>Serial#</b>		<b>Serial#</b>	
<b>Test Number</b>	<b>Date</b>	<b>Status</b>	<b>Date</b>	<b>Status</b>	<b>Date</b>	<b>Status</b>
5.2						
5.3						
5.4						
5.5						
5.6						
5.7						
5.8						
5.9						
5.10						
5.11						
5.12						
6.2						
6.3						
6.4						
6.5						
6.6						
6.7						
6.8						
6.9						
6.10						
6.11						
6.12						
6.13						
6.14						
6.15						
6.16						
6.17						
6.18						
7.1						
7.2						
7.3						
7.4						
7.5						
8.1						
8.2						
8.3						
8.4						
8.5						
9.1						
9.2						
9.3						
10.0						
<b>Comments:</b>						

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 6 of 78

## Pre-Test Data Sheet and Report

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


### Test Results

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

**Comments:**

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




	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 7 of 78

## Section 5.2 - Test Preparation Test Data and Report

<b>Manufacturer:</b>					
<b>Model:</b>			<b>Serial Number:</b>		
<b>Requirements:</b>	<p><b>5.2.1 Manufacturer, Model and Serial Number</b> Record the manufacturer's name along with the model, serial number and firmware number of the instrument and detector, if separate.</p> <p><b>5.2.2 Documentation Supplied</b> Verify that instructions for operating and checking the operation of the instrument have been supplied, and record the result of this verification.</p> <p><b>5.2.3 Type of Radiation Detector – NaI, GM, CZT, etc., (Model &amp; S/N)</b> Identify and record the type of instrument (gamma only or gamma/neutron) and the radiation detector types used. Verify the type of alarm from manufacturer's documentation (audible, visible, vibratory), and record.</p> <p><b>5.2.4 Size</b> Measure the dimensions (thickness, width and length) of the instrument and record.</p> <p><b>5.2.5 Weight</b> Note the weight specified by the manufacturer.</p> <p><b>5.2.6 Case Construction</b> Examine the case to verify that it is smooth, rigid, has no uncovered openings to the interior space and has the reference point for the detector marked. Record the results of the examination.</p> <p><b>5.2.7 Photograph</b> Photograph the instrument and retain the photo in the record.</p>				
<b>Note:</b>	Comments are required when the requirement is not verified.				
<b>Firmware:</b>					
<b>Documentation</b>					
Manufacturer has supplied instructions for operating and checking the operations of the instrument.				<b>Yes</b>	<b>No</b>
				<input type="checkbox"/>	<input type="checkbox"/>
<b>Type of Detector:</b>	<input type="checkbox"/>	Gamma	<input type="checkbox"/>	Gamma/Neutron	
<b>Detector description (e.g., NaI(Tl), GM, He-3, etc.):</b>					
<b>Type of Alarm (Choose all the apply)</b>					
<input type="checkbox"/>	Audible	<input type="checkbox"/>	Visible	<input type="checkbox"/>	Vibration
<b>Size (cm):</b>		Width		Length	Thickness
<b>Weight (g):</b>					

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 8 of 78

<b>Case Construction (Choose all that apply)</b>			
	<input type="checkbox"/>	Smooth	<input type="checkbox"/> No uncovered openings to interior space
	<input type="checkbox"/>	Rigid	<input type="checkbox"/> Reference point for detector is marked
Photograph of Instrument			
<b>Comments:</b>			
<b>Performed by:</b>			<b>Date:</b>
<b>Reviewed by:</b>			<b>Date:</b>


	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 9 of 78

## Section 5.3 - Operating Modes Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Requirements:</b>	The instrument shall have at least two different operating modes as follows:		
	Routine mode: an operating mode that includes detection and identification of radionuclides, and exposure rate measurement. Also may be called the "simple mode."		
	Restricted mode: an advanced operating mode that can be accessed by an expert user (e.g., via password) to control the parameters that can affect the result of a measurement (i.e., radionuclide library, routine function control, calibration parameters, alarm thresholds, etc.). Also may be called the "advanced" or "expert" mode.		
<b>Note:</b>	Comments are required when the requirement is not verified.		

	Verify	
	Yes	No
Operating modes described in technical manual		
Operating modes displayed by instrument		
Is access to the restricted mode controlled?		

<b>List available modes of operation:</b>			
<b>Comments:</b>			
<b>Completed by:</b>			<b>Date:</b>
<b>Reviewed by:</b>			<b>Date:</b>


	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 10 of 78

## Section 5.4 - Markings Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Requirements:</b>	<p>All external instrument controls, displays, and adjustments shall be identified as to function. Internal controls needed for operation shall be identified through markings and identification in technical manuals. External markings shall be easily readable and permanently fixed under normal conditions of use (including use of normal decontamination procedures).</p> <p>The following markings shall appear on the exterior of the instrument or each major subassembly (i.e., detector probe) as appropriate:</p> <ul style="list-style-type: none"> <li>5.4.1.1 Manufacturer and model number,</li> <li>5.4.1.2 Unique serial number,</li> <li>5.4.1.3 Location of the effective center(s) or area(s) of detection (reference point)</li> <li>5.4.1.4 Function designation for controls, switches, and adjustments that are not menu or software driven.</li> </ul>		
	<b>Note:</b> Comments are required when the requirement is not verified.		

	Verify	
	Yes	No
Manufacturer and model number	<input type="checkbox"/>	<input type="checkbox"/>
Unique serial number	<input type="checkbox"/>	<input type="checkbox"/>
Location of the effective center(s) or area(s) of detection	<input type="checkbox"/>	<input type="checkbox"/>
Function designation for controls, switches, and adjustments that are not menu or software driven	<input type="checkbox"/>	<input type="checkbox"/>

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

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 11 of 78


### Sections 5.5 - Communication Interface Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Requirements:</b>	<p>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. Consideration should be given to data security when using wireless data transfer techniques. The technique used shall conform to applicable IEEE protocols. Communication protocols shall be described in the technical manual and proprietary formats shall not be used.</p> <p>Proprietary software should not be required for remote data interpretation. The transferred data shall be in the XML format. The manufacturer shall provide proprietary software for data interpretation, if needed. The data format defined in ANSI N42.42 shall be used.</p>		
<b>Note:</b>	Comments are required when the requirement is not verified.		

<b>Ambient Conditions:</b>		°C		%RH		in HG
<b>Test Equipment Used:</b>						
<b>Source Data:</b>						
<b>Describe the data transfer technique</b>						

	Verify		
	Yes	No	NA
<b>Does the monitor have the ability to transfer data to an external device?</b>			
<b>Is the transmission bi-directional?</b>			
<b>Is the transfer based on commonly available technology? (e.g. Ethernet, wireless, USB, RS-232)</b>			
<b>If the transfer is wireless, does it have the ability to encrypt the data?</b>			
<b>Is the transfer protocol described in the technical manual?</b>			
<b>Is the data format described in the technical manual?</b>			
<b>Is the data format in XML?</b>			
<b>Does the data format comply with ANSI N42.42 requirements?</b>			
<b>Did the manufacturer provide proprietary software for data interpretation?</b>			



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 13 of 78

## Sections 5.6 - User Interface Test Data and Report

**Manufacturer:**

**Model:**

**Serial Number:**

**Requirements:**


The instrument shall include:

- A display that is easily readable over the required temperature range and under different lighting conditions
- Controls that are user-friendly for routine operation
- Controls and switches that are designed in a way to minimize accidental operation
- A menu structure that is simple and easy to be followed intuitively
- At least two different operating modes (see 5.3)
- The capability to operate if the user is wearing gloves
- A user-definable radionuclide library with access via the restricted mode

**If more users perform this test then additional tables should be added.**


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

	Yes	No
Is the display readable over the required temperature range and under different lighting conditions?		
Controls are user-friendly for routine operations?		
Controls are switches are designed to minimize accidental operation?		
The menu structure is simple and easy to follow?		
There are at least two modes of operation?		
Can the user operate the instrument with gloves?		
Can the user define the radionuclide library with access via a restricted		


	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 14 of 78

<b>USER 1</b>		
<b>Without Gloves in a low level light &lt;150 lux</b>		
	<b>Yes</b>	<b>No</b>
Is it possible to turn on the instrument?		
Is it possible to calibrate the instrument?		
Is it possible to make an exposure rate measurement?		
Is it possible to make an identification measurement?		
Is it possible to save the data?		
Is it possible to transfer the data to an external device following the manufacturer provided information?		
Is it possible to access the radionuclide library?		
Is it possible to turn off the instrument?		
<b>Without Gloves in a high level light &gt;10 000 lux</b>		
	<b>Yes</b>	<b>No</b>
Is it possible to turn on the instrument?		
Is it possible to calibrate the instrument?		
Is it possible to make an exposure rate measurement?		
Is it possible to make an identification measurement?		
Is it possible to save the data?		
<b>With Gloves in a high level light &gt;10 000 lux</b>		
	<b>Yes</b>	<b>No</b>
Is it possible to turn on the instrument?		
Is it possible to calibrate the instrument?		
Is it possible to make an exposure rate measurement?		
Is it possible to make an identification measurement?		
Is it possible to save the data?		




	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 15 of 78

<b>USER 2</b>							
<b>Without Gloves in a low level light &lt;150 lux</b>							
						<b>Yes</b>	<b>No</b>
Is it possible to turn on the instrument?							
Is it possible to calibrate the instrument?							
Is it possible to make an exposure rate measurement?							
Is it possible to make an identification measurement?							
Is it possible to save the data?							
Is it possible to transfer the data to an external device following the manufacturer provided information?							
Is it possible to access the radionuclide library?							
Is it possible to turn off the instrument?							
<b>Without Gloves in a high level light &gt;10 000 lux</b>							
						<b>Yes</b>	<b>No</b>
Is it possible to turn on the instrument?							
Is it possible to calibrate the instrument?							
Is it possible to make an exposure rate measurement?							
Is it possible to make an identification measurement?							
Is it possible to save the data?							
<b>With Gloves in a high level light &gt;10 000 lux</b>							
						<b>Yes</b>	<b>No</b>
Is it possible to turn on the instrument?							
Is it possible to calibrate the instrument?							
Is it possible to make an exposure rate measurement?							
Is it possible to make an identification measurement?							
Is it possible to save the data?							

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 16 of 78

<b>USER 3</b>			
<b>Without Gloves in a low level light &lt;150 lux</b>			
		<b>Yes</b>	<b>No</b>
Is it possible to turn on the instrument?			
Is it possible to calibrate the instrument?			
Is it possible to make an exposure rate measurement?			
Is it possible to make an identification measurement?			
Is it possible to save the data?			
Is it possible to transfer the data to an external device following the manufacturer provided information?			
Is it possible to access the radionuclide library?			
Is it possible to turn off the instrument?			
<b>Without Gloves in a high level light &gt;10 000 lux</b>			
		<b>Yes</b>	<b>No</b>
Is it possible to turn on the instrument?			
Is it possible to calibrate the instrument?			
Is it possible to make an exposure rate measurement?			
Is it possible to make an identification measurement?			
Is it possible to save the data?			
<b>With Gloves in a high level light &gt;10 000 lux</b>			
		<b>Yes</b>	<b>No</b>
Is it possible to turn on the instrument?			
Is it possible to calibrate the instrument?			
Is it possible to make an exposure rate measurement?			
Is it possible to make an identification measurement?			
Is it possible to save the data?			
<b>Comments:</b>			
<b>Completed by:</b>		<b>Date:</b>	
<b>Reviewed by:</b>		<b>Date:</b>	

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 17 of 78

### Section 5.7 - Warm Up Time Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Requirements:</b>	The manufacturer shall state the time required for the instrument to become fully functional from either a dead start or when in a standby mode. The maximum time shall be less than 2 minutes.		
<b>Note:</b>	Comments are required when the requirement is not verified.		


<b>Ambient Conditions:</b>	°C	%RH	in HG	
<b>Source data:</b>				
<b>Test Equipment Used:</b>				

	Verify	
	Yes	No
The manufacturer stated the time for the instrument to be fully operational from dead start?		
The manufacturer stated the time for the instrument to be fully operational from standby mode?		
Is the warm-up time less or equal to 2 min?		
Is the instrument able to perform an exposure rate measurement after the warm-up time?		
Is the instrument able to perform a neutron measurement after the warm-up time?		
Is the instrument able to perform a radionuclide identification after the warm-up time?		

	Stated Warm Up Time From Dead Start		seconds
	Stated Warm Up Time From Standby Mode		seconds


<b>Comments:</b>			

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


	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 18 of 78

### Section 5.8 Battery Power Test Data and Report


<b>Manufacturer:</b>	
<b>Model:</b>	<b>Serial Number:</b>
<b>Requirements:</b>	<p>The following requirements shall be verified through the performance of the same ordered test methods listed in 5.8.2:</p> <ul style="list-style-type: none"> <li>a) Instruments shall be equipped with a test circuit or other visible direct indicator of battery condition for each battery circuit.</li> <li>b) The manufacturer shall state the expected continuous operating time using the recommended batteries and the conditions (functional and environmental) used to determine this time.</li> <li>c) The instrument shall be fully operational for a minimum of two continuous hours after warm-up under standard test conditions. The low-battery indication shall be no lower than the minimum voltage required for proper operation.</li> <li>d) If operated using consumable batteries, the batteries shall be widely available, shall not be unique to the instrument, and shall be field replaceable (e.g., AA, 9 V) with no special tools. Battery chargers shall meet U.S. electrical standards.</li> <li>e) The instrument should be capable of operating from an external DC source. Adequate protection from reverse polarity, over-voltage, and electrical noise must be provided. DC power sources include: <ul style="list-style-type: none"> <li>1) Nominal 12 VDC, as would be obtained from a 12 V vehicle electrical system</li> <li>2) A portable battery pack, such as one that can be worn, that supplies 9 VDC to 14 VDC</li> <li>3) A regulated 12 VDC power supply operating from utility power</li> </ul> </li> </ul>
<b>Note:</b>	Comments are required when the requirement is not verified.

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 19 of 78

<b>Ambient Conditions:</b>	_____ °C	_____ %RH	_____ in HG
<b>Source data:</b>	_____		
<b>Test Equipment Used:</b>	_____		
		<b>Yes</b>	<b>No</b>
The instrument is equipped with a test circuit or a visible indication of battery condition?			
The manufacturer states the expected continuous operating time?			
The manufacturer states the conditions (functional and environmental) used to determine the expected continuous operating time?			
The instrument was fully operational for at least 2 hours after warm-up, to answer this question use test data summarized in table below?			
The low-battery indication is not lower than the minimum voltage required for proper operation?			
If it uses consumable batteries, the batteries are widely available?			
If it uses consumable batteries, the batteries are not unique to the instrument?			
If it uses consumable batteries, the batteries can be field replaced with no special tools?			
Is the instrument capable of operating from an external DC power source?			
<b>If yes, to this last question, then:</b>		<b>Yes</b>	<b>No</b>
Does it have adequate protection from reversed polarity?			
Does it have adequate protection from over-voltage?			
Does it have adequate protection from electrical noise?			
Does the DC power source include a nominal 12 VDC as that obtained from a vehicle electrical system?			
Does the DC power source include a portable battery pack that supplies 9 VDC to 14 VDC?			
Does the DC power source include a regulated 12 VDC power supply operating from utility power?			

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 20 of 78

To verify item c) in the list of requirements							
	Fully charged batteries		After 2 hours of normal operation		Low-battery indication activated		
	Yes	No	Yes	No	Yes	No	
Was the instrument able to perform an Exposure Rate reading?							
Did the instrument respond to Neutrons?							
Was the instrument able to perform a Radionuclide Identification?							
<b>Comments:</b>							
<b>Completed by:</b>				<b>Date:</b>			
<b>Reviewed by:</b>				<b>Date:</b>			

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 21 of 78

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

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Requirements:</b>	The effective gamma energy response range shall be stated by the manufacturer, and should be from 25 keV to 3 MeV. The manufacturer shall also state the range for gamma exposure rate measurement and for neutron count rate indication.		
	Verify by review manufacturer provided information.		
<b>Note:</b>	Comments are required when the requirement is not verified.		


Verify	Yes	No
The energy response range, and the gamma and neutron count rate range are indicated.	<input type="checkbox"/>	<input type="checkbox"/>

Energy response range:	
Gamma exposure rate range:	
Neutron count rate range:	

<b>Comments:</b>			

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


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

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 22 of 78


### Section 5.10 Spectral Identification Test Data and Report

<b>Manufacturer:</b>					
<b>Model:</b>			<b>Serial Number:</b>		
<b>Requirements:</b>	<p>The following requirements shall be verified through the performance of the same ordered test methods listed in 5.10.2.</p> <p>a) A display of the gamma-ray spectrum shall be available for review.</p> <p>The instrument shall have the ability to store and transfer at least 50 complete (unprocessed) spectra. Each spectrum shall also contain collection and identification results information including:</p> <ul style="list-style-type: none"> <li>- Time and date</li> <li>- Identified radionuclides, categories, and associated confidence indications</li> <li>- Spectrum integration time</li> <li>- Measured gamma-ray exposure rate</li> <li>- Neutron count rate at the time of measurement</li> </ul> <p>NOTE—The data transfer format is defined in ANSI N42.42.</p> <p>b) An indication shall be displayed or otherwise provided (i.e., “not identified”) if a radionuclide cannot be identified.</p> <p>c) The manufacturer shall describe the meaning of reliability or confidence indications.</p>				
<b>Note:</b>	Comments are required when the requirement is not verified.				



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 23 of 78

Requirement	Yes	No
The instrument can display a gamma-ray spectrum for review?		
The instrument has the ability to store at least 50 complete (unprocessed data)?		
The instrument has the ability to transfer at least 50 complete (unprocessed data)?		
Each spectrum contains:		
Time and date information?		
Identified radionuclides?		
Radionuclide categories?		
Associated confidence indications?		
Spectrum integration time?		
Measured gamma-ray exposure rate?		
Neutron count rate?		
The instrument provides an indication when a radionuclide cannot be identified?		
The manufacturer described the meaning of reliability or confidence indications?		
The instrument indicates if the exposure rate is too high or too low for radionuclide identification?		
<b>Comments:</b>		
<b>Completed by:</b>		<b>Date:</b>
<b>Reviewed by:</b>		<b>Date:</b>

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 24 of 78

## Section 5.11 Personnel Protection Alarm Test Data and Report


<b>Manufacturer:</b>				
<b>Model:</b>		<b>Serial Number:</b>		
<b>Requirements:</b>	An alarm shall be provided to alert the user when the measured exposure rate is above a user-selected threshold level. The alarm shall be both audible and visual, and be adjustable through the restricted mode. The alarm shall have an "acknowledge" or other similar control to silence the audible function. It shall not be possible to switch off all alarm indicators at the same time.			
	<b>Note:</b> Comments are required when the requirement is not verified.			

<b>Ambient Conditions:</b>	°C	%RH	in HG	
<b>Test Equipment Used:</b>				

### Test Results

	Yes	No
An alarm is provided to alert the user when the measured exposure rate is above a user-selected threshold level.		
The alarm is both audible and visual, and is adjustable through the restricted mode.		
The alarm has an "acknowledge" or other similar control to silence the audible function.		
The user can not switch off all the alarms simultaneously		
Does the vibratory alarm function as specified, if available?		

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


	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 25 of 78

## Section 5.12 - Explosive Atmospheres Test Data and Report

<b>Manufacturer:</b>								
<b>Model:</b>					<b>Serial Number:</b>			
<b>Requirements:</b>	The manufacturer shall state in its manual whether the instrument is certified for use in explosive atmospheres. If certification is claimed, documentation shall be provided by the manufacturer. Certification shall be based on UL-913-2002.							
<b>Note:</b>	Comments are required when the requirement is not verified.							

	Verify	
	Yes	No
Is the instrument certified for explosive atmospheres?		
If certified, has documented proof been provided?		
Is compliance based on testing done in accordance with UL-913-2002?		

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

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 26 of 78

## Section 6.2 Radiation Detection Response Test Data and Report


<b>Manufacturer:</b>				
<b>Model:</b>			<b>Serial Number:</b>	
<b>Requirement:</b>	Significant changes in the measured radiation level shall be indicated visually and shall be proportional to the exposure rate. A mutable audible indication that is proportional to the field's intensity shall also be available.			
	The instrument shall indicate a change in exposure rate within 2 s.			
<b>Note:</b>	Comments are required when the requirement is not verified.			

<b>Ambient Conditions:</b>	°C	%RH	in HG	
<b>Source data:</b>				
<b>Test Equipment Used:</b>				

### Test Results

Requirement	Yes	No
The instrument indicated an increase in the level of radiation within 2 seconds following an exposure to an instantaneous increase in the ambient radiation field of 50 µR/h above the ambient background level from a <sup>137</sup> Cs source .	<input type="checkbox"/>	<input type="checkbox"/>
The displayed exposure rate indication was within ± 50% of the new radiation level within 5 seconds of the increase in the level of radiation.	<input type="checkbox"/>	<input type="checkbox"/>
The instrument indicated a decrease in the radiation level within 2 seconds when the radiation field was returned to its original level.	<input type="checkbox"/>	<input type="checkbox"/>
The displayed exposure rate indication was within ± 50% of the new radiation level within 5 seconds of the decrease of the level of radiation.	<input type="checkbox"/>	<input type="checkbox"/>

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

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 27 of 78

## Section 6.3 Gamma Exposure Rate Indication


### Test Data and Report

<b>Manufacturer:</b>					
<b>Model:</b>			<b>Serial Number:</b>		
<b>Requirement:</b>	The relative intrinsic error in the response of the instrument to the reference gamma radiation from <sup>137</sup> Cs shall not exceed ± 30% for exposure rates from 0.1 mR/hr to the manufacturer-stated maximum exposure rate.				
<b>Note:</b>	Comments are required when the requirement is not verified.				


<b>Ambient Conditions:</b>	°C	%RH	in HG
<b>Source data:</b>			
<b>Test Equipment Used:</b>			
<b>Manufacturer stated maximum range:</b>			mR/h

#### Measurement Results

	0.1 mR/h	5 mR/h	0.0	mR/h		
1	mR/h	mR/h		mR/h		
2	mR/h	mR/h		mR/h		
3	mR/h	mR/h		mR/h		
4	mR/h	mR/h		mR/h		
5	mR/h	mR/h		mR/h		
6	mR/h	mR/h		mR/h		
7	mR/h	mR/h		mR/h		
8	mR/h	mR/h		mR/h		
9	mR/h	mR/h		mR/h		
10	mR/h	mR/h		mR/h		
Mean	mR/h	mR/h		mR/h		
<b>Acceptance Range</b>	0.07	0.13	3.50	6.50	0.00	0.00
	-30%	+ 30 %	-30%	+ 30 %	-30%	+ 30 %

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 28 of 78

<u>Test Results</u>					
Verify that results are within the acceptance range					
<b>0.1 mR/h</b>		<b>5 mR/h</b>		<b>80 % of maximum range</b>	
<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>
<b>Comments:</b>					
<b>Completed by:</b>			<b>Date:</b>		
<b>Reviewed by:</b>			<b>Date:</b>		

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 29 of 78

## Section 6.4 Radiation Detection Alarm

### Test Data and Report


<b>Manufacturer:</b>					
<b>Model:</b>			<b>Serial Number:</b>		
<b>Requirement:</b>	The instrument shall alarm when exposed to an exposure rate that is greater than the alarm threshold.				
	The test shall be performed using the techniques in 6.4.2 and 6.4.3.				
<b>Note:</b>	Comments are required when the requirement is not verified.				

<b>Ambient Conditions:</b>		°C		%RH		in HG
<b>Source data:</b>						
<b>Test Equipment Used:</b>						

#### Test Results

Requirement	Yes	No
When the alarm threshold was set to 1 mR/hr and the instrument was exposed to a 2 mR/hr radiation field produced by <sup>137</sup> Cs, the alarm activated within 3 seconds of the increased exposure.	<input type="checkbox"/>	<input type="checkbox"/>
When the instrument was exposed to a <sup>252</sup> Cf neutron field equivalent to the flux emitted from an unmoderated <sup>252</sup> Cf source with a fluence rate of $2 \times 10^4$ n/s $\pm$ 20 % (~0.01 $\mu$ g) placed approximately 25 cm from the instrument, the neutron alarm activated within 2 seconds.	<input type="checkbox"/>	<input type="checkbox"/>

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


	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 30 of 78

## Section 6.5 Radionuclide Identification


### Test Data and Report

<b>Manufacturer:</b>	
<b>Model:</b>	<b>Serial Number:</b>
<b>Requirement:</b>	<p>When identifying radionuclides, test results are considered acceptable when an instrument identifies the radionuclide(s) of interest, or that radionuclide(s) and expected daughter(s). It is considered not acceptable if the instrument identifies unexpected radionuclides or only the daughter(s) of the radionuclide(s) of interest.</p> <p>If a library is used as part of the identification process, it shall contain the radionuclides listed in 6.5.1 for test purposes as a minimum, and it shall not be altered during the entire testing process.</p> <p>Manufacturers shall specify which analysis modes are available for instrument operation. Some examples are:</p> <ul style="list-style-type: none"> <li>a) Region summing</li> <li>b) Peak fitting</li> <li>c) Least-squares analysis of library spectra (both manufacturers and user supplied)</li> <li>d) Automatic switching</li> <li>e) Operation of user supplied spectral analysis software</li> <li>f) Other manufacturer spectral analysis techniques</li> </ul> <p>Test requirements shall be applied to each available mode, unless the instrument selects the analysis mode automatically.</p>
<b>Categorization</b>	<p>6.5.1 The radionuclides of greatest interest and those most likely to be encountered are listed in four different categories.</p> <p>NOTE—This is an informative list and should not be considered as all-inclusive.</p> <p>Special Nuclear Materials: Uranium (used to indicate <math>^{233}\text{U}</math>, <math>^{235}\text{U}</math>), <math>^{237}\text{Np}</math>, Pu.</p> <p>Medical radionuclides: <math>^{18}\text{F}</math>, <math>^{67}\text{Ga}</math>, <math>^{51}\text{Cr}</math>, <math>^{75}\text{Se}</math>, <math>^{89}\text{Sr}</math>, <math>^{99}\text{Mo}</math>, <math>^{99\text{m}}\text{Tc}</math>, <math>^{103}\text{Pd}</math>, <math>^{111}\text{In}</math>, Iodine (<math>^{123}\text{I}</math>, <math>^{125}\text{I}</math>, <math>^{131}\text{I}</math>), <math>^{153}\text{Sm}</math>, <math>^{201}\text{Tl}</math>, <math>^{133}\text{Xe}</math>.</p> <p>Naturally occurring radioactive materials (NORM): <math>^{40}\text{K}</math>, <math>^{226}\text{Ra}</math>, <math>^{232}\text{Th}</math> and daughters, <math>^{238}\text{U}</math> and daughters.</p> <p>Industrial radionuclides: <math>^{57}\text{Co}</math>, <math>^{60}\text{Co}</math>, <math>^{133}\text{Ba}</math>, <math>^{137}\text{Cs}</math>, <math>^{192}\text{Ir}</math>, <math>^{204}\text{Tl}</math>, <math>^{226}\text{Ra}</math>, and <math>^{241}\text{Am}</math>.</p>
<b>Requirements:</b>	<p>6.5.2 The manufacturer shall state the radionuclides that the instrument can identify and their category. The categories selected should be based on the list shown in 6.5.1.</p> <p>The instrument shall display the identified radionuclide(s) and its category, and store the results as stated in 5.10.</p>
<b>Note:</b>	Comments are required when the requirement is not verified.



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 31 of 78

List analysis modes used to identify radionuclides:							
				<b>Yes</b>	<b>No</b>		
The manufacturer provided a list of radionuclides and the list is categorized							
Does the instrument library contain the radionuclides listed in section 6.5.1?							
The instrument displays the identified radionuclide and its category							
<b>Comments</b>							
<b>Prepared By:</b>				<b>Date:</b>			
<b>Reviewed By:</b>				<b>Date:</b>			

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 32 of 78

**Section 6.6 - Single Radionuclide Identification  
Test Data and Report**

<b>Manufacturer:</b>			
<b>Model:</b>	<b>Serial Number:</b>		
<b>Requirement:</b>	The instrument shall be able to identify the following radionuclides within the time specified by the manufacturer with a maximum of 2 minutes. The manufacturer shall provide radionuclide-specific test results.		
	<b>Unshielded:</b> <sup>40</sup> K, <sup>57</sup> Co, <sup>60</sup> Co, <sup>67</sup> Ga, <sup>99m</sup> Tc, <sup>125</sup> I, <sup>131</sup> I, <sup>133</sup> Ba, <sup>137</sup> Cs, <sup>192</sup> Ir, <sup>201</sup> Tl, <sup>226</sup> Ra, <sup>232</sup> Th, <sup>233</sup> U, <sup>235</sup> U, <sup>238</sup> U, Pu*, <sup>241</sup> Am.		
	<b>Behind 5 mm steel shielding:</b> <sup>40</sup> K, <sup>57</sup> Co, <sup>60</sup> Co, <sup>67</sup> Ga, <sup>99m</sup> Tc, <sup>125</sup> I, <sup>131</sup> I, <sup>133</sup> Ba, <sup>137</sup> Cs, <sup>192</sup> Ir, <sup>201</sup> Tl, <sup>226</sup> Ra, <sup>232</sup> Th, <sup>233</sup> U, <sup>235</sup> U, <sup>238</sup> U, Pu*, <sup>241</sup> Am.		
	* Reactor grade plutonium		
<b>Note:</b>	Comments are required when the requirement is not verified.		


<b>Ambient Conditions:</b>	°C	%RH	in HG
<b>Test Equipment Used:</b>			

**Radionuclide Identification Results - Unshielded**


	K-40	Co-57	Co-60	Ga-67	Tc-99m	I-125	I-131	Ba-133
<b>Source ID</b>								
<b>Date</b>								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
<b># Correct</b>								

	Cs-137	Ir-192	Tl-201	Ra-226	Th-232	U-233	U-235	U-238
<b>Source ID</b>								
<b>Date</b>								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
<b># Correct</b>								



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 34 of 78

	RGPu	Am-241				
<b>Source ID</b>						
<b>Date</b>						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
<b># Correct</b>						
			<b>Yes</b>	<b>No</b>		
			The manufacturer provided radionuclide-specific test results?			
<b>Comments:</b>						
<b>Performed by:</b>					<b>Date:</b>	
<b>Reviewed by:</b>					<b>Date:</b>	

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 35 of 78

## Section 6.7 Simultaneous Radionuclide Identification

### Test Data and Report

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

**Requirement:** The instrument shall be able to identify a minimum of two radionuclides simultaneously.

NOTE - All identifications shall be performed within the time specified by the manufacturer or 2 min, whichever is less.

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

**Ambient Conditions:** \_\_\_\_\_ °C      \_\_\_\_\_ %RH      \_\_\_\_\_ in HG

**Source data:** \_\_\_\_\_

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


#### Isotope Identification Results

	Ba <sup>133</sup> & RGPu
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Number Correct	

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


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

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


	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 36 of 78

### Section 6.8 and 6.9 Interfering Ionizing Radiation Test Data and Report

<b>Manufacturer:</b>					
<b>Model:</b>			<b>Serial Number:</b>		
<b>Requirement:</b>	<p><b>6.8.1 Requirement for Gamma</b></p> <p>The instrument shall be able to identify the radionuclide of interest in the presence of an increased gamma background from natural thorium.</p> <p>NOTE—The identification of <sup>232</sup>Th together with the radionuclides of interest is correct unless a background update is performed after exposure to the <sup>232</sup>Th source and before exposure to the <sup>241</sup>Am and <sup>60</sup>Co sources.</p>				
<b>Requirement:</b>	<p><b>6.9.1 Requirement for Beta</b></p> <p>The instrument shall identify a radionuclide of interest when exposed to the radiation emitted from a shielded pure beta-emitting radionuclide.</p> <p>When exposed to the shielded beta emitter only, the identification result shall not include any unexpected radionuclides and should indicate “not identified” radionuclide or “suspected beta emitter”.</p>				
<b>Notes:</b>	Comments are required when the requirement is not verified.				

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 37 of 78

	<b>Ambient Conditions:</b>		°C		%RH		in HG
	<b>Source data:</b>						
	<b>gamma-ray interference</b>						
	<b>Source data:</b>						
	<b>beta interference</b>						
	<b>Test Equipment Used:</b>						
<b>Radionuclide Identification Results</b>							
<b>Gamma - Th-232</b>				<b>Beta</b>			
	<b>Am-241</b>	<b>Co-60</b>		<b>Cs-137</b>	<b>Beta Only</b>		
<b>Date</b>			<b>Date</b>				
1			1				
2			2				
3			3				
4			4				
5			5				
6			6				
7			7				
8			8				
9			9				
10			10				
<b>Number Correct</b>			<b>Number Correct</b>				
<b>Comments:</b>							
<b>Completed by:</b>				<b>Date:</b>			
<b>Reviewed by:</b>				<b>Date:</b>			

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 38 of 78

## Section 6.10 False Identification Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Requirement:</b>	The instrument shall not identify a radionuclide that is not present when operated in a stable and low ambient radiation background. An indication shall also be provided stating that the field is too low to perform an identification.		

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

<b>Ambient Conditions:</b>		°C		%RH		in HG
<b>Test Equipment Used:</b>						


### Isotope Identification Results

	ID no source		Yes	No
1		Did instrument state "move closer" or "field too low", etc?		
2				
3				
4				
5				
6				
7				
8				
9				
10				
<b>Number Correct</b>				


**Comments:**

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



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 39 of 78

<b>Section 6.11 Interference from Surrounding Material</b>			
<b>Test Data and Report</b>			
<b>Manufacturer:</b>			
<b>Model:</b>	<b>Serial Number:</b>		
<b>Requirement:</b>	The instrument shall be able to identify radionuclides in the presence of backscattered radiation		
<b>Note:</b>	Comments are required when the requirement is not verified.		
<b>Ambient Conditions:</b>	°C	%RH	in HG
<b>Source data:</b>			
<b>Test Equipment Used:</b>			
<b>Radionuclide Identification Results</b>			
	1	<b>Cs-137</b>	
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
	10		
	<b>Number Correct</b>		
<b>Comments:</b>			
<b>Performed by:</b>			<b>Date:</b>
<b>Reviewed by:</b>			<b>Date:</b>

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 40 of 78

**Section 6.12 Variation of Identification based on Angle of Incidence**  
**Test Data and Report**

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Requirements:</b>	The identification of radionuclides shall be acceptable over incident angles from 0° to ± 45°. Include pictures of orientation.		
<b>Note:</b>	Comments are required when the requirement is not verified.		

<b>Ambient Conditions:</b>		°C		%RH		in HG
----------------------------	--	----	--	-----	--	-------


<b>Source data:</b>
---------------------

<b>Test Equipment Used:</b>
-----------------------------

Am-241

	Radionuclide Identification			Radionuclide Identification		
	Vertical Plane			Horizontal Plane		
	Position A	Position B	Position C	Position A	Position B	Position C
	0	-45	45	0	-45	45
	Degree	Degree	Degree	Degree	Degree	Degree
ID 1						
ID 2						
ID 3						
ID 4						
ID 5						
ID 6						
ID 7						
ID 8						
ID 9						
ID 10						
Number Correct						

**Isotopes Identified:**  
A: Am-241  
B:  
C:

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 41 of 78

Co-60

	Radionuclide Identification			Radionuclide Identification		
	Vertical Plane			Horizontal Plane		
	Position A	Position B	Position C	Position A	Position B	Position C
	0	-45	45	0	-45	45
	Degree	Degree	Degree	Degree	Degree	Degree
ID 1						
ID 2						
ID 3						
ID 4						
ID 5						
ID 6						
ID 7						
ID 9						
ID 10						
Number Correct						

**Isotopes Identified:**

- A: Co-60
- B:
- C:

Cs-137

	Radionuclide Identification			Radionuclide Identification		
	Vertical Plane			Horizontal Plane		
	Position A	Position B	Position C	Position A	Position B	Position C
	0	-45	45	0	-45	45
	Degree	Degree	Degree	Degree	Degree	Degree
ID 1						
ID 2						
ID 3						
ID 4						
ID 5						
ID 6						
ID 7						
ID 8						
ID 9						
ID 10						
Number Correct						

**Isotopes Identified:**

- A: Cs-137
- B:
- C:


**Comments:**

**Performed by:**

**Date:**

**Reviewed by:**

**Date:**

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 42 of 78


### Section 6.13 Neutron Response Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>	<b>Serial Number:</b>		
<b>Requirement:</b>	<p>The instrument shall indicate the presence of neutron radiation. If the instrument responds in count rate, no further testing other than that stated in 6.4.3 is required.</p> <p>If the instrument provides a dose equivalent rate response, the response shall be linear over its range and within <math>\pm 50\%</math> of the CVT.</p>		
<b>Note:</b>	<p>Comments are required when the requirement is not verified. If this test does not apply, enter N/A for each of the ten readings.</p>		

<b>Ambient Conditions:</b>		°C		%RH		in HG
<b>Test Equipment Used:</b>						
<b>Manufacturer stated maximum response range:</b>	mrem/h					
<b>Source Data:</b>						

Measurement Results						
		20% max range	50% max range	80% max range		
		0 mrem/h	0 mrem/h	0 mrem/h		
Acceptance Range		0 - 0	0 - 0	0 - 0		
	1	mrem/h	mrem/h	mrem/h		
	2	mrem/h	mrem/h	mrem/h		
	3	mrem/h	mrem/h	mrem/h		
	4	mrem/h	mrem/h	mrem/h		
	5	mrem/h	mrem/h	mrem/h		
	6	mrem/h	mrem/h	mrem/h		
	7	mrem/h	mrem/h	mrem/h		
	8	mrem/h	mrem/h	mrem/h		
	9	mrem/h	mrem/h	mrem/h		
	10	mrem/h	mrem/h	mrem/h		
	Mean	#DIV/0! mrem/h	#DIV/0! mrem/h	#DIV/0! mrem/h		

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

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 43 of 78

### Section 6.14 Over-Range Characteristics for Identification Test Data and Report

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

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

**Requirement:** The manufacturer shall state the maximum exposure rate (relative to <sup>137</sup>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:** \_\_\_\_\_ mR/h

#### Measurement Results

**Exposure rate during test:** \_\_\_\_\_ mR/h

	ID Cs-137		Yes	No
1		Did instrument provide indication that exposure rate was too high?		
2				
3				
4				
5				
6				
7				
8				
9				
10				
Number Correct				

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

\_\_\_\_\_


\_\_\_\_\_

**Performed by:** \_\_\_\_\_

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


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

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

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 44 of 78

## Section 6.15 Efficiency Test Data and Report

<b>Manufacturer:</b>					
<b>Model:</b>			<b>Serial Number:</b>		
<b>Requirement:</b>	The manufacturer shall state the full-energy-peak efficiency for <sup>57</sup> Co (122 keV at 85.51%, T1/2 = 272 d), <sup>133</sup> Ba (356 keV at 62.05%, T1/2 = 10.5 y), <sup>137</sup> Cs (662 keV at 85.1%, T1/2 = 30 y), and <sup>60</sup> Co (1173 and 1332 keV at 99.857% and 99.983%, respectively, T1/2 = 5.27 y).				
	NOTE—Data from Evaluated Nuclear Structure Data File (ENSDF) and Bureau National de Métrologie-Laboratoire National Henri Becquerel/Commissariat à l'énergie atomique (BNM-LNHB/CEA)				
<b>Notes:</b>	Comments are required when the requirement is not verified.				
<b>Ambient Conditions:</b>		°C		%RH	in HG
<b>Test Equipment Used:</b>					

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 45 of 78

**Efficiency Results**

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

**Test Measurements (Peak Efficiency)**

**Table 1. Peak dps computations**

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

**Table 2. Net Peak cps computations**

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


**Comments:**

**Completed by:**

**Date:**

**Reviewed by:**


**Date:**

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 46 of 78


## Section 6.16 Full-Width Half Maximum Test Data and Report

<b>Manufacturer:</b>				
<b>Model:</b>			<b>Serial Number:</b>	
<b>Requirement:</b>	The manufacturer shall state the FWHM as defined in the IEEE standard appropriate to the detector used for 137Cs (662 keV at 85.1%).			
<b>Notes:</b>	Comments are required when the requirement is not verified.			
<b>Ambient Conditions:</b>	°C	%RH	in HG	
<b>Test Equipment Used:</b>				
<b>Source Data:</b>				
<b>Full Width Half Maximum Measurements</b>				
	<b>Manufacturer's Stated FWHM Cs-137 (keV)</b>		<b>Measured value FWHM Cs-137 (keV)</b>	
	<b>Acceptance Range (Based on Manufacturer's Stated)</b>			
	0.00	0.00		
	- 20 %	+ 20 %		
<b>Comments:</b>				
<b>Completed by:</b>			<b>Date:</b>	
<b>Reviewed by:</b>			<b>Date:</b>	




	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 47 of 78

Section 6.17 Over-Range Characteristics for Exposure Rate Indication Test Data and Report				
<b>Manufacturer:</b>				
<b>Model:</b>			<b>Serial Number:</b>	
<b>Requirement:</b>	The instrument shall indicate that an over-range condition exists when the ambient exposure rate is greater than the manufacturer-stated maximum exposure rate.			
<b>Note:</b>	Comments are required when the requirement is not verified.			
<hr/>				
<b>Ambient Conditions:</b>	°C	%RH	in HG	
<b>Test Equipment Used:</b>				
<b>Source Data:</b>				
<u>Measurement Results</u>				
Manufacturer's Stated Maximum Exposure Rate:			mR/h	
Over-Range Test Exposure Rate:			mR/h	
Indication of Over-Range within 5 seconds:				
Over-Range Exposure Duration:			min.	
Recovery Time:			min.	
<b>Comments:</b>				
<b>Performed by:</b>			<b>Date:</b>	
<b>Reviewed by:</b>			<b>Date:</b>	

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 48 of 78

<b>Section 6.18 Neutron Indication in the Presence of Photons</b>					
<b>Test Data and Report</b>					
<b>Manufacturer:</b>					
<b>Model:</b>		<b>Serial Number:</b>			
<b>Requirement:</b>	The neutron indication shall be insensitive to gamma radiation at gamma exposure rates up to the manufacturer-stated maximum gamma exposure rate.				
	The instrument shall indicate the presence of neutron radiation in the presence of gamma radiation.				
<b>Note:</b>	Comments are required when the requirement is not verified.				
<hr/>					
<b>Ambient Conditions:</b>		°C		%RH	in HG
<b>Test Equipment Used:</b>					
<b>Gamma Source Data:</b>					
<b>Neutron Source Data:</b>					
<b><u>Measurement Results</u></b>					
	Applied gamma exposure rate:				
	Neutron response without neutron field				
	Neutron response with neutron field				
<b>Comments:</b>					
<b>Performed by:</b>				<b>Date:</b>	
<b>Reviewed by:</b>				<b>Date:</b>	

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 49 of 78

**Section 7.1 Ambient Temperature Influence  
Test Data and Report**

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

**Requirement:** The instrument shall be operational at temperatures from -20 °C to +50 °C.

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

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


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

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


**Gamma Exposure Rate Measurement Results**

	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									
<b>Mean</b>	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
<b>STD</b>	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
<b>COV%</b>	#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!	
	Conf-Int (+)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

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

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 50 of 78

Radionuclide Identification Results									
	22° C	30° C	40° C	50° C	10° C	0° C	-10° C	-20° C	
ID 1									
ID 2									
ID 3									
ID 4									
ID 5									
ID 6									
ID 7									
ID 8									
ID 9									
ID 10									
<b>Number Correct</b>									
<b>Neutron (Cf-252) cps</b>									
<b>Did instrument alarm due to the temperature test alone?</b>	Yes								
	No								
<b>Comments:</b>									
<b>Performed by:</b>						<b>Date:</b>			
<b>Reviewed by:</b>						<b>Date:</b>			

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 51 of 78

### Section 7.2 Temperature Shock Test Data and Report

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

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

**Requirement:** The instrument shall be fully functional within one hour 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. The instrument shall provide an indication if it is not fully functional.


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

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

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

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

	22° C		22 to -20° C				- 20 to 22° C				22 to 50° C				50 to 22° C			
			15	30	45	60	15	30	45	60	15	30	45	60	15	30	45	60
1	(add units)																	
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
<b>Mean</b>	<b>#DIV/0!</b>	<b>Mean</b>	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
<b>STD</b>	<b>#DIV/0!</b>	<b>STD</b>	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
<b>COV%</b>	<b>#DIV/0!</b>	<b>COV%</b>	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
		<b>Conf-Int (-)</b>	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
		<b>Conf-Int (+)</b>	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
<b>Nominal Mean</b>																		
<b>Acceptance Range</b>																		
<b>#DIV/0!</b>	<b>to</b>	<b>#DIV/0!</b>																
low		high																
(-15%)		(+15%)																

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 52 of 78

	22° C	22 to -20° C				- 20 to 22° C				22 to 50° C				50 to 22° C			
		15	30	45	60	15	30	45	60	15	30	45	60	15	30	45	60
ID 1																	
ID 2																	
ID 3																	
<b>Number Correct</b>																	
<b>Neutron (Cf-252) cps</b>																	

<p>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.</p>
---

A: Am-241, Co-60  
 B:  
 C:  
 D:


**Comments:**


**Performed by:**

**Date:**

**Reviewed by:**

**Date:**

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 53 of 78

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 54 of 78

### Section 7.3 Humidity Test Results Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Requirement:</b>	The instrument shall be fully functional over the range of humidity from 40% to 93% relative humidity (RH) at 35 °C.		
<b>Note:</b>	Comments are required when the requirement is not verified.		

<b>Test Equipment Used:</b>	
<b>Gamma Source Data:</b>	
<b>Neutron Source Data:</b>	


#### Measurement Results

	Nominal		
	40% RH 22° C	93% RH 35° C	40% RH 35° C
1			(add units)
2			
3			
4			
5			
6			
7			
8			
9			
10			
<b>Mean</b>	#DIV/0!	#DIV/0!	#DIV/0!
<b>STD</b>	#DIV/0!	#DIV/0!	#DIV/0!
<b>COV%</b>	#DIV/0!	#DIV/0!	#DIV/0!
	Conf-Int (-)	#DIV/0!	#DIV/0!
	Conf-Int (+)	#DIV/0!	#DIV/0!


#### Acceptance Range

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



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 55 of 78

Radionuclide Identification Results			
	40% 22° C Baseline	93% 35° C	40% 35° C
ID 1			
ID 2			
ID 3			
ID 4			
ID 5			
ID 6			
ID 7			
ID 8			
ID 9			
ID 10			
<b>Number Correct</b>			
<b>Neutron (Cf-252) cps</b>			
<p><u>ID Acceptance Criteria:</u>            Correct Radionuclides ID: (A is correct)            Humidity Pass/Fail: Comparison of Radionuclide ID results at elevated humidity/temperatures with the Radionuclide ID results at ambient humidity/temperature being the baseline.</p>			
	A: Am-241, Co-60 B: C: D:		
<b>Comments:</b>			
<b>Performed by:</b>			<b>Date:</b>
<b>Reviewed by:</b>			<b>Date:</b>

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 56 of 78

## Section 7.4 Moisture and dust protection Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Requirement:</b>	The instrument case design shall meet the requirements stated for IP code 53 (see IEC 60529), 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.		
<b>Note:</b>	Comments are required when the requirement is not verified.		

<b>Ambient Conditions:</b>	°C	%RH	in HG
<b>Test Equipment Used:</b>			
<b>Source Data:</b>			

### Measurement Results - Dust


	Pre-Test	Post-Test		Inspection Results:
1			(add units)	
2				
3				
4				
5				
6				
7				
8				
9				
10				
<b>Mean</b>	#DIV/0!	#DIV/0!		
<b>STD</b>	#DIV/0!	#DIV/0!		
<b>COV%</b>	#DIV/0!	#DIV/0!		
	<b>Conf-Int (-)</b>	#DIV/0!		
	<b>Conf-Int (+)</b>	#DIV/0!		

### Acceptance Range

	#DIV/0!	to	#DIV/0!	
	low (-15%)		high (+15%)	
				<b>Yes</b>
				<b>No</b>
Did the instrument respond throughout the dust test?				

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 57 of 78

<b>Measurement Results - Moisture</b>					
	Pre-Test	Post-Test	Inspection Results:		
1		(add units)			
2					
3					
4					
5					
6					
7					
8					
9					
10					
<b>Mean</b>	#DIV/0!	#DIV/0!			
<b>STD</b>	#DIV/0!	#DIV/0!			
<b>COV%</b>	#DIV/0!	#DIV/0!			
	<b>Conf-Int (-)</b>	#DIV/0!			
	<b>Conf-Int (+)</b>	#DIV/0!			
<b>Acceptance Range</b>					
	#DIV/0!	to	#DIV/0!		
	low (-15%)		high (+15%)		
				<b>Yes</b>	<b>No</b>
	Did the instrument respond throughout the moisture test?				
<b>Comments</b>					
<b>Performed by:</b>			<b>Date:</b>		
<b>Reviewed by:</b>			<b>Date:</b>		

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 58 of 78

## Section 7.5 Cold Temperature Start Up Test Data and Report

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

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

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

**Requirement:** The instrument shall be able to operate when switched on at the cold temperature limit (-20 °C).

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

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

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


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

### Measurement Results


	Nominal	- 20 °C	
			(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!	
	Conf-Int (-)	#DIV/0!	
	Conf-Int (+)	#DIV/0!	

### Acceptance Range

<b>#DIV/0!</b>	to	<b>#DIV/0!</b>
low 15%		high 15%

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 59 of 78

Radionuclide Identification Results			
		Nominal	- 20 °C
	ID 1		
	ID 2		
	ID 3		
	ID 4		
	ID 5		
	ID 6		
	ID 7		
	ID 8		
	ID 9		
	ID 10		
	Number Correct		
	Neutron (Cf-252) cps		
<b>Definitions of Radionuclides identified:</b> A: Am-241, Co-60 B: C: D:			
<b>Comments:</b>			
<b>Performed by:</b>		<b>Date:</b>	
<b>Reviewed by:</b>		<b>Date:</b>	

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 60 of 78

## Section 8.1 Electrostatic Discharge Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>		<b>Serial Number:</b>	
<b>Requirement:</b>	The instrument shall be function properly during and after exposure to contact electrostatic discharges at intensities of up to 6 kV.		
<b>Note:</b>	Comments are required when the requirement is not		


<b>Ambient Conditions:</b>	°C	% RH	in Hg
<b>Test Equipment Used:</b>			
<b>Gamma Source Data:</b>			
<b>Neutron Source Data:</b>			

### Exposure and/or Count Rate Response


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

### Acceptance Range

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

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 61 of 78

<b>Radionuclide Identification Test Results</b>					<b>Radionuclides Identified</b>	
	Pre Test	2 kV	4 kV	6 kV		
ID 1					A	Am-241, Co-60
					B	
					C	
<b>Did instrument alarm due to the ESD test alone? No source present</b>	Yes					
	No					
<b>Comments:</b>						
<b>Performed by:</b>				<b>Date:</b>		
<b>Reviewed by:</b>				<b>Date:</b>		

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 62 of 78

## Section 8.2 Radio Frequency Susceptibility Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>			<b>Serial Number:</b>
<b>Requirement:</b>	The instrument 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).		
<b>Note:</b>	Comments are required when the requirement is not verified.		
<b>Ambient Conditions:</b>	°C	%RH	In. Hg
<b>Test Equipment Used:</b>			
<b>Frequency Scan Observations Without Sources</b>			
<b>Were susceptibilities observed?</b>			
Yes		No	



<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	TITLE: Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 63 of 78

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

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 64 of 78

### Section 8.3 Radiated Emissions Test Data and Report

<b>Manufacturer:</b>				
<b>Model:</b>			<b>Serial Number:</b>	
<b>Requirement:</b>	The emission limits when measured at three meters from the instrument shall be less than what is shown below:			
	<b>Emission Frequency Range (MHz)</b>	<b>Field Strength (micro volts/meter)</b>		
	30 – 88	100		
	88 – 216	150		
	216 – 960	200		
	Above 960	500		
<b>Note:</b>	Comments are required when the requirement is not verified.			
<b>Ambient Conditions:</b>	°C	%RH	in HG	
<b>Test Equipment Used:</b>				
		<b>Yes</b>	<b>No</b>	
	<b>Were emissions above the limits?</b>			
<b>Comments:</b>				
<b>Performed by:</b>			<b>Date:</b>	
<b>Reviewed by:</b>			<b>Date:</b>	

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 65 of 78

### Section 8.4 Conducted Immunity Test Data and Report

<b>Manufacturer:</b>				
<b>Model:</b>			<b>Serial Number:</b>	
<b>Requirement:</b>	The instrument should not be affected by RF fields that can be conducted onto the instrument through an external conducting cable. Instruments that do not have at least one external conducting cable for routine operation are excluded.			
<b>Note:</b>	Comments are required when the requirement is not verified.			

<b>Ambient Conditions:</b>		°C		%RH		In. Hg
----------------------------	--	----	--	-----	--	--------


<b>Test Equipment Used:</b>					
-----------------------------	--	--	--	--	--

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

<b>Were susceptibilities observed?</b>			
<b>Yes</b>		<b>No</b>	

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 66 of 78

		<b>With Cs-137 and Cf-252 Sources</b>			
	<b>Nominal No RF Gamma</b>		<b>Gamma Source Data:</b>		
1	(add units)		<b>Neutron Source Data:</b>		
2					
3					
4			<b>Acceptance Range (Gamma)</b>		
5		<b>#DIV/0!</b>	<b>to</b>	<b>#DIV/0!</b>	
6		low (-15%)		high (+15%)	
7					
8			<b>Acceptance Range (Neutron)</b>		
9		<b>#DIV/0!</b>	<b>to</b>	<b>#DIV/0!</b>	
10		low (-15%)		high (+15%)	
Mean		<b>#DIV/0!</b>			
STD		<b>#DIV/0!</b>			
COV%		<b>#DIV/0!</b>			
<b>Frequency Scan Observations with Sources</b>					
1	<b>Nominal No RF Neutron</b>	(add units)	<div style="border: 1px solid black; height: 150px; width: 100%;"></div>		
2					
3					
4					
5					
6					
7					
8					
9					
10					
Mean		<b>#DIV/0!</b>			
STD		<b>#DIV/0!</b>			
COV%		<b>#DIV/0!</b>			
<b>Were susceptibilities observed?</b>					
		Yes		No	
<b>Comments:</b>					
<b>Completed by:</b>			<b>Date:</b>		
<b>Reviewed by:</b>			<b>Date:</b>		

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 67 of 78

### Section 8.5 Magnetic Field Test and Data Report

<b>Manufacturer:</b>						
<b>Model:</b>				<b>Serial Number:</b>		
<b>Requirement:</b>	The instrument should be fully functional when exposed to DC magnetic fields in three orientations relative to a 10 gauss magnetic field. Provide pictures of					
<b>Note:</b>	Comments are required when the requirement is not verified.					
<b>Ambient Conditions:</b>		°C		%RH		in HG
<b>Test Equipment Used:</b>						
<b>Gamma Source Data:</b>						
<b>Neutron Source Data:</b>						
<b>Measurement Results Without Sources</b>						
	Yes			No		
<b>Were there any functional changes?</b>						
NOTE – functional changes include alarms or spurious indications.						
	<b>Orientation</b>					
	Initial		Second		Third	
	Yes	No	Yes	No	Yes	No
<b>Did the instrument alarm during the test?</b>						
<b>Did the instrument display spurious indications?</b>						
<b>Observations:</b>						

<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE: Hand Held Radionuclide Identifiers for use in Homeland Security</b>	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 68 of 78

**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!	
	Conf-Int (-)	#DIV/0!	Conf-Int (-)	#DIV/0!	Conf-Int (-)	#DIV/0!	
	Conf-Int (+)	#DIV/0!	Conf-Int (+)	#DIV/0!	Conf-Int (+)	#DIV/0!	

**Acceptance Range**

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

**Measurement Results With Cf-252**

	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!	
	Conf-Int (-)	#DIV/0!	Conf-Int (-)	#DIV/0!	Conf-Int (-)	#DIV/0!	
	Conf-Int (+)	#DIV/0!	Conf-Int (+)	#DIV/0!	Conf-Int (+)	#DIV/0!	

**Acceptance Range**

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

**Comments:**

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**Performed by:**

**Date:**

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**Reviewed by:**

**Date:**

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	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 69 of 78


## Section 9.1 Vibration Test Data and Report

<b>Manufacturer:</b>				
<b>Model:</b>			<b>Serial Number:</b>	
<b>Requirement:</b>	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).			
<b>Note:</b>	Comments are required when the requirement is not verified.			
<b>Ambient Conditions:</b>		°C		%RH
				in HG
<b>Test Equipment Used:</b>				
<b>Gamma Source Data:</b>				
<b>Neutron Source Data:</b>				

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 70 of 78

		Pre-test	After Position A	After Position B	After Position C			
	1					(add units)		
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		<b>Acceptance Range:</b>	
	STD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	to	#DIV/0!
	COV%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	low (-15%)		high (+15%)
		<b>Did the instrument respond to neutrons?</b>						
			Pre-test	Position A	Position B	Position C		
		Yes						
		No						
	<b>Inspection Results:</b>							
	<b>Comments:</b>							
	<b>Performed by:</b>					<b>Date:</b>		
	<b>Reviewed by:</b>					<b>Date:</b>		

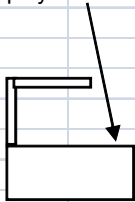
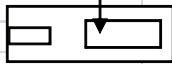
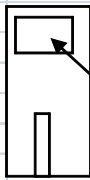



	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 71 of 78

### Section 9.2 Mechanical Shock Test Data and Report

<b>Manufacturer:</b>					
<b>Model:</b>			<b>Serial Number:</b>		
<b>Requirement:</b>	The instrument shall withstand exposure to 10 shock pulses of 50 g peak acceleration, each applied for a nominal 18 ms in each of three mutually orthogonal axes. The physical condition and functionality of the instrument shall not be affected by these shocks (e.g., solder joints shall hold, nuts and bolts shall not come loose).				
<b>Note:</b>	Comments are required when the requirement is not verified.				
<b>Ambient Conditions:</b>	°C	%RH	in HG		
<b>Test Equipment Used:</b>					
<b>Gamma Source Data:</b>					
<b>Neutron Source Data:</b>					
	Pre-test	After Position A	After Position B	After Position C	(add units)
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!	#DIV/0!    to    #DIV/0! low (-15%)                      high (+15%)
COV%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
<b>Did the instrument respond to neutrons?</b>					
	Pre-test	Position A	Position B	Position C	
Yes					
No					


<b>NIST</b>	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	TITLE: Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 72 of 78

<b>Inspection Results:</b>				
<b>Comments:</b>				
<b>Performed by:</b>			<b>Date:</b>	
<b>Reviewed by:</b>			<b>Date:</b>	
<b>Orientations:</b>				
<b>Position A</b>	LCD Display		<b>Position B</b>	LCD Display
				
	<b>Position C</b>			
				

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 73 of 78

### Section 9.3 Impact (Microphonics) Test Data and Report

<b>Manufacturer:</b>								
<b>Model:</b>				<b>Serial Number:</b>				
<b>Requirement:</b>	The instrument's response, both gamma and neutron, shall be unaffected by microphonic conditions such as those that may occur from low intensity impacts from sharp contact with hard surfaces.							
<b>Note:</b>	Comments are required when the requirement is not verified.							
<hr/>								
<b>Ambient Conditions:</b>		°C		%RH		in HG		
<b>Test Equipment Used:</b>								
<b>Gamma Source Data:</b>								
<b>Neutron Source Data:</b>								

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 74 of 78

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?												

Gamma and Neutron Tests

Pretest Response	Gamma	(add units)	Impact Number	Side No. 1	Side No. 2	Side No. 3	Side No. 4	Side No. 5	Side No. 6
			Readings After Each Impact						
1			1						
2			2						
3			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 %)


Pretest Response	Neutron	(add units)	Impact Number	Side No. 1	Side No. 2	Side No. 3	Side No. 4	Side No. 5	Side No. 6
			Readings After Each Impact						
1			1						
2			2						
3			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 %)

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

Completed by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 75 of 78

	<b>TEST AND EVALUATION PROTOCOL</b>	<b>TEP NO.</b> N42.34	<b>PREPARED BY:</b> DIV682	
	<b>TITLE:</b> Hand Held Radionuclide Identifiers for use in Homeland Security	<b>EFF. DATE</b> 2010-11-09	<b>REV.</b> 3.03	<b>PAGE</b> 76 of 78

## Sections 10 - Documentation Test Data and Report

<b>Manufacturer:</b>			
<b>Model:</b>			<b>Serial Number:</b>
<b>Requirements:</b>	<b>10.1 Certificate</b>		
	A certificate shall accompany each hand held nuclide identifier, giving at least the following information:		
	<ul style="list-style-type: none"> <li>a) Manufacturer's name or registered trademark,</li> <li>b) Type of the instrument and serial number,</li> <li>c) List of radionuclides to which the instrument was tested,</li> <li>d) Exposure rate range,</li> <li>e) Tests performed</li> </ul>		
	<b>10.2 Operation and maintenance manual</b>		
	Each instrument shall be supplied with operating instructions, maintenance, and technical documentation.		
	<b>Note:</b> Only one data sheet per model is required. Comments are required when the requirement is not verified.		

		Verify	
		Yes	No
<b>Did a certificate accompany the instrument?</b>			
<b>If yes, did it included the following information:</b>			
Manufacturer's name of registered trademark?			
Type of instrument and serial number?			
List of radionuclides to which the instrument was tested?			
Exposure rate range?			
Tests performed?			
<b>Was the following documentation supplied?</b>		<b>Yes</b>	<b>No</b>
Operating instrumetions			
Maintenance documentation			
Technical documentation			

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