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

T&E Protocol N42.48, 2010

Version 1.02

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Testing and Evaluation Protocol Alarming Personal Radiation Detectors for use in Homeland Security

1. Scope

This document establishes the protocol for testing alarming personal radiation detectors based on the performance requirements established in ANSI N42.48, "American National Standard Performance Criteria for Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security."

2. References

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

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

[R2] ANSI/IEEE N42.42, "Data format standard for radiation detectors used for homeland security."

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

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

3. Compliance Level Information

Instrument under test might meet all the requirements listed in the ANSI/IEEE N42.48 standard. Therefore, different agencies developed documents describing the compliance levels required for particular applications of the instruments under test. Examples of such compliance level requirements are those required by the Graduated Rad/Nuc Detector Evaluation and Reporting (GRaDERSM) program. For this program, information can be found in the "Compliance Level for GRaDER Instrument Performance" document located at http://www.dhs.gov/GRaDER .

4. Test and evaluation steps

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

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

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

5. Recording test results

This Test and Evaluation protocol contains data sheets that shall be used to record and report all test results. Each data sheet is associated with a specific section(s) of the referenced ANSI standard, N42.48. An electronic version of the data sheets is provided in the form of spreadsheets that may be used to record and report the results of the tests. These spreadsheets were verified and validated (V&V) using Microsoft Excel 2007 (compatibility mode).

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

6. Test report

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

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

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

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

8. Considerations

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



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TEP NO.

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| | | Test | Summary S | heet | | |
|---------------|---------|--------|-------------|--------|---------|--------|
| | | | ANSI N42.48 | 3 | | |
| | | | | | | |
| Manufacturer: | | | | | | |
| Model: | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | Serial# | | Serial# | | Serial# | |
| Test Number | Date | Status | Date | Status | Date | Status |
| 5.1 | | | | | | |
| 5.2 | | | | | | |
| 5.3 | | | | | | |
| 5.4 | | | | | - | |
| 5.5 | | | | | | |
| 5.6 | | | | | | |
| 5.7 | | | | | | |
| 5.9 | | | | | | |
| 5.10 | | 1 | 1 | 1 | | |
| 5.11 | | 1 | 1 | 1 | | |
| 5.12 | | | | 1 | | |
| 5.13 | | | | | | |
| 5.14 | | | | | | |
| 6.2 | | | | | | |
| 6.3 | | | | | | |
| 6.4 | | | | | | |
| 6.5 | | | | | | |
| 6.6 | | | | | | |
| 6.7 | | - | _ | - | - | |
| 6.8 | | | | | | |
| 6.9 | | | - | | | |
| 6.10.1 | | | | | | |
| 6.10.3 | | | | | | |
| 6.10.4 | | | | | | |
| 6.10.5 | | | | | | |
| 6.10.6 | | | | | | |
| 7.2 | | | | | | |
| 7.3 | | | | | | |
| 7.4 | | | | | | |
| 7.5.2 | | | | | | |
| 7.5.3 | | _ | | | _ | |
| 7.6 | | | | | | |
| 8.2 | | - | _ | - | - | |
| 8.3 | | | _ | + | | |
| 8.4 o E | | + | | + | | |
| ō.ɔ 0 1 | | + | - | 1 | | |
| 9.1 | | + | | + | 1 | |
| 9,3 | | | | 1 | | |
| 10.0 | | 1 | | 1 | 1 | |
| | | | | | | |
| | | | | | | |
| Comments: | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
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| | | | Pre | e-Test | | | | | |
|------------------------------|----------|----------|--------------|---------------|---------------------------------------|-------------------|---------------|--------|-------|
| | | Da | ta She | et and F | Report | | | | |
| | | | | | - | | | | |
| Manufacturer: | | | | | | | | | |
| Instrument: | | | | | | | | | |
| | | | | | | | | | |
| Model: | | | | | Seri | al Number: | | | |
| Date Performed: | | | | | Te | st Location: | | | |
| | | | | | | | | | |
| Requirement: | Verify | /that th | ne manufact | urer supplie | ed an opera | ition and mai | ntenance ma | anual | |
| | conta | aining t | the informat | ion listed be | low. | | | | |
| | | | | | | | | | |
| Test Protocol: | Revie | ew the | information | n provided a | ind indicat | e whether the | e required in | ntorma | ation |
| | has I | been p | orovided. A | lso verity th | at the doc | umentation i | s complete | and | |
| | unde | erstand | able. The | documenta | tion should | a not be in di | att form with | 1 | |
| | Incol | npiete | sections. | | | | | | |
| Note: | Com | ments | are require | d when the i | requiremen | nt is not verifie | 2d | | |
| Note. | 00111 | | | | cquiremen | | | | |
| | | | Tos | t Rosulte | | | | | |
| | Rec | nuiren | nent | or ne suns | | Yes | | N | 0 |
| | 1.01 | 1411011 | liont | | | 100 | | | U |
| Operating instructions and i | restric | ctions | | | | | | L | 1 |
| Electrical connection schen | natic | | | | | | | Ē | |
| Spare parts list | | | | | | | | Ē | |
| Troubleshooting guide. | | | | | | T L | | Ē | |
| Description and protocol for | com | munica | ation metho | ods of trans | mitting and | | | 1 | 1 |
| receiving data | | | | | | | | | |
| Contact information for the | manu | facture | er including | name, add | ress, | | | I | 1 |
| telephone #, fax #, email ac | Idress | s, etc. | | | | - | | | |
| Power supply requirements | | | | | | | | | |
| Recommended operational | paran | neters | such as: d | etector res | ponse and | | | L | |
| Taise alarm probability | tom | | | | | | | | - |
| Complete description of sys | | or unit | | | | | | | - |
| Inclusion of any bazardous | mate | rial tha | t may requ | ire addition | al | | | | |
| | mate | | a may iequ | | u | | | L | |
| Description of data analysis | soft | vare a | nd radionuc | lide identifi | cation | | | | |
| procedure | | | | | | | | L | 1 |
| Description of operation and | d perfe | ormano | ce of the sy | stem or un | it | 1 | | , | |
| | | | | | | | | L | |
| | | | | | | | | | |
| Comments: | | | | | | | | | |
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| | <u> </u> | | 1 | i | , , , , , , , , , , , , , , , , , , , | | | | |
| | | | | | | D-1 | | | |
| Completed by: | | | | | | Date: | | | |
| Daviawad by | | | | | | Data | | | |
| Reviewed by: | | | ĺ | 1 | | Date: | | | |
| | | 1 | | | | 1 | | | |

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| | | Со | ntrols | | | |
|-----------------|--|---|--|--|------------------------------------|-----------|
| | Dat | a Sheet | Section 5 | .1 | | |
| Manufanturari | | | | | | |
| Instrument: | | | | | | |
| mat union. | | | | | | |
| Model: | | | | | Serial | Number: |
| Date Performed: | | | | | Test | Location: |
| Requirement: | Controls shall be expected use, and on/off button or an function as expected | clearly ident d adequately y other cont | ified, easily ope protected from rol that could ca | rable under condit accidental operat ause the instrume | tions of tion. The nt not to | |
| | operation. | | | | entai | |
| Note: | Comments are rec | quired when | the requirement | is not verified. | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | Ve | rify |
| | 1st Surface | | | | Yes | No |
| | | | Did the ins | strument turn off? | | |
| | | | | | | |
| | Did the instrumen | t change mo | ode of operation | of configuration? | | |
| | | | | | | |
| | | | | | | |
| | | | | | Ve | rify |
| | 2nd Surface | | | | Yes | No |
| | | | Did the ins | strument turn off? | | |
| | | | | | | |
| | Did the instrumen | t change mo | ode of operation | of configuration? | | |
| | | | | | | |
| | | | 1 | | | |
| | | | | | Ve | rify |
| | 3rd Surface | | | | Yes | No |
| | | | Did the ins | trument turn off? | | |
| | Did the instrument | t abanaa | de efeneration | of configuration? | | |
| | Dia the instrumen | t change mo | oue of operation | or configuration? | | |
| | | | | | | |
| | | | | | | |

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| | | Ve | rify | | | | | |
|---------------|-------------------|---|------------------|--------------------|-----|------|--|--|
| | 4th Surface | | | | Yes | No | | |
| | | | Did the ins | strument turn off? | | | | |
| | | | | | | | | |
| | Did the instrumen | t change mo | ode of operation | of configuration? | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | Ve | rify | | |
| | 5th Surface | | | F | Yes | No | | |
| | | | Did the ins | strument turn off? | | | | |
| | | | | | | | | |
| | Did the instrumen | Did the instrument change mode of operation of configuration? | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | Vo | rify | | | | | |
| | 6th Surface | Vas | No | | | | | |
| | | | Did the ins | strument turn off? | 103 | | | |
| | | | Bid the int | | | | | |
| | Did the instrumen | t change mo | ode of operation | of configuration? | | | | |
| | | | | | | | | |
| | | 1 | 1 | 1 | | | | |
| | | | | | | | | |
| Commonter | | | | | | | | |
| Comments. | | 1 | | r | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Deufeument I | | | | Dete | | | | |
| Performed by: | | | | Date: | | | | |
| Performed by: | | | | Date: | | | | |



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| Documentation | | | | | | | | | | |
|-----------------|--|-----------|--------------------------|----------------------|----------------------|---------|-------------|------|--|--|
| | | | | | | | | | | |
| Manufacturer: | | | | | | | | | | |
| Instrument: | | | | | | | | | | |
| | | | | | <u> </u> | | | | | |
| Model: | | | | | Serial Nu | mber: | | | | |
| Date Performed: | | | | | Test Loc | ation: | | | | |
| | | | | | | | | | | |
| Rea | uiromont: | Manufactu | rers shall provide instr | uctions to verify or | oner onerat | ion of | the instrum | ent | | |
| Ney | unement. | Manuactu | | uctions to verify pi | oper operat | | | ent. | | |
| | | | | | | | | _ | | |
| | | Requireme | ents are listed in Claus | e 10 (Documentat | ion) of the <i>i</i> | ANSI/II | EEE N42.4 | 8 | | |
| | | | | | | | | | | |
| | Note: Comments are required when the requirement is not verified | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

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| | | Require | ement | Yes | No | | | | |
|-------------------------|--|---------------|--|----------|----|--|--|--|--|
| | | | | | | | | | |
| | The | manufactu | urer provides report for type test results? | | | | | | |
| | Verifv | that man | ufacturer contact information is available | | | | | | |
| | | | | | | | | | |
| | Verify that the detector types are described in the manual | | | | | | | | |
| | Verify that | the type (| of instrument is described in the manua | | | | | | |
| | veniy that | | | | | | | | |
| Veri | fy that the ex | xposure ra | te information is available in the manua | 1 | | | | | |
|) (orify that | roforono no | int and raf | erenee erientetien is describe in menue | | | | | | |
| veniy that i | relerence po | int and rei | erence orientation is describe in marida | | | | | | |
| | Verify that | the radiation | on energy region is described in manua | 1 | | | | | |
| | | | | | | | | | |
| Verify that | information of | on accurac | cy, linearity and lower limit of detections | | | | | | |
| | | Verify that | results of calibration tests are available | 2 | | | | | |
| | | | | | | | | | |
| Verify that in | nformation or | n weight a | nd dimensions of instrument is available | | | | | | |
| Verify th | at informatio | n power s | upply (battery) requirements is available | <u> </u> | | | | | |
| | | in pontor o | | | | | | | |
| Verify that information | on that test i | results und | der environmental conditions is available | • | | | | | |
| | | Vorify the | at results of electrical tests are available | | | | | | |
| | | veniy the | | | | | | | |
| | V | erify that r | results of mechanical tests are available | ; | | | | | |
| | | | | | | | | | |
| | | The manu | facturer provides operating instructions? | > | | | | | |
| | T | ne operatir | ng manual provides electrical diagrams? |) | | | | | |
| | | | <u> </u> | | | | | | |
| | | The opera | ting manual provides list of spare parts? | | | | | | |
| | The one | erating mai | nual provides instrument specifications? |)) | | | | | |
| | ine ope | | | | | | | | |
| | The o | perating m | nanual provides a troubleshooting guide? | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Comments: | | | I | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Performed bv: | | | | Date: | | | | | |
| | | | | | | | | | |
| Reviewed by: | | | | Date: | | | | | |
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| | | | | Displa | ays | | | | |
|-----------------|---------------|------------------------------|--|---|---|---------------------|---|----------------------------|---------|
| | | | Data S | heet S | ection 5.3 | | | | |
| | | | | | | | | | |
| Manufacturer: | | | | | | | | | |
| instrument. | | | | | | | | | |
| Model: | | | | | Serial N | lumber: | | | |
| Date Performed: | | | | | Test Lo | ocation: | | | |
| | Requirement: | | | | | | | | |
| | | The ins radiolog | trument shall directly di gical unit (e.g., μR/h, μG | splay the Sy/h, or µS | measured exposur Sv/h). | e rate or | dose-equivalent rate wi | th the asso | ociated |
| | | Radion viewed shall no | uclide identification resultive a wireless or networe of affect the operation of the operation operation of the operation op | ults shall b k link on a f the instru | be displayed on the a secondary device ument. | instrume, the failu | ent. If measurement res ure of that or any secon | ults can be dary device | 9 |
| | | | | | | | | | |
| | Note: | Comme | ents are required when t | he require | ement is not verified | l. | | | |
| | | | | | | | | | |
| | | | | | | | | Ve | rify |
| | | | | | | | | Yes | No |
| | | | | | | | | | |
| | | | | | | | Is the display backlit? | | |
| | | | | | | Is the d | isplay continuously lit? | | |
| | | | Is the | e display r | eadable in low light | level (Ve | erified in section 5.13)? | | |
| | | | Is the | display re | adable in high light | level (Ve | erified in section 5.13)? | | |
| | | | (| Can meas | urement results be | viewed b | y a secondary device? | | |
| | | | Continues to f | unction p | roperly when the se | econdary | device is switched off? | | |
| | | | Are rac | dionuclide | identification result | ts display | yed on the instrument? | | |
| | | | | | | 1 | | | |
| Display | LED | | LCD | | Other | | | | |
| | | | | | | | | | |
| Display type | Exposure rate | | Dose-equivalent rate | | Other | | | | |
| | _ | | | | | | | | |
| Display range | | | | | | | | | |
| | | | | | | | | | |
| Display units | Units | | | | | | | | |
| | | | | 1 | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Comments: | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | Performed by: | | | | | | Date: | | |
| | | | | | | | | | |
| | Reviewed by: | | | | | | Date: | | |
| | | | | | | | | | |



Security.

| | | Effe | ctive Rang | ge of Meas | urement c | or Indicati | on | | | |
|------------------|--------------------|--|-------------------------------------|--|-------------------------------------|------------------------------------|----------------------------|--------------------------------|-------------------|-----------------------|
| | | | Da | ata Sheet S | ection 5.4 | | | | | |
| | | | | | | | | | | |
| Manufacturer: | | | | | | | | | _ | |
| matument. | | | | | | | | | | |
| Model: | | | | | Se | erial Number: | | | | |
| Date Performed: | | | | | T | est Location: | | | _ | |
| | Requirement: | | | | | | | | | |
| | | The effectiv less than 2 | e range of meas mR/h. | surement or indic | ation shall be s | pecified by the | manufactu | rer and shall | be from | 5 μR/h to not |
| | | The instrum radiation fie condition. | nent response o Ids that are gre | over the effective i ater than the effe | ange specified active range of m | by the manufact neasurement, th | turer shall ne instrume | be tested.W ent shall indic | hen exp ate an | osed to over-range |
| | | | | | | | | | | |
| | Note: | Comments | are required wh | nen the requireme | ent is not verified | d. | | | | |
| | | | | | | | | | | |
| | | | | | | | | | Verify | , |
| | | | | | | | | Yes | | No |
| | | | | | | | | | - | |
| | | | For g | gammas; is the e | effective range a | t least 5 µR/h t | o 2 mR/h? | | | |
| | | | | | | | | | 1 | |
| | | | | The | instrument has | an over-range i | ndication? | | | |
| | | | | | | | | | | |
| Fo | r gammas; what | is the effect | ive range of me | asurement as st | ated by the mar | nufacturer? (incl | ude units) | | | |
| | | | | | | | | | | |
| | | For gam | nmas; what is th | ne display range | shown by the in | strument? (incl | ude units) | | | |
| | | | | | | | | | | |
| For neutrons (if | f available); what | is the effect | ive range of me | asurement as sta | ated by the mar | nufacturer? (incl | ude units) | | | |
| | | | | | | | | | | |
| | For neut | rons (if avail | able); what is th | ne display range | shown by the in | strument? (inc | ude units) | | | |
| | | 1 | | 1 | 1 | | | | | |
| Decerility of | | | | | | | | | | |
| Describe over- | -range display: | | | | - | | | | | |
| | | | | | | | | | | |
| Commontes | | | | | | | | | | |
| Comments: | | | | 1 | | | | | - | |
| | | | | 1 | | | | | _ | |
| | | | | - | | | | | - | |
| | | | | | | | | | | |
| | Performed by: | | 1 | 1 | 1 | | Date: | | | |
| | Reviewed by: | | | | | | Date: | | | |
| | | | | | | | 24.0. | | | |



TEST AND EVALUATION PR

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPAR DIV682 | ED BY: |
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| | | | Aud | ible Ala | arm | | | | |
|-----------------|------------|--|--|--|--|---|--|--|---|
| | | C | Data She | eet Sec | ction 5.5 | | | | |
| | | | | | | | | | |
| Manufacturer: | | | | | | | | | |
| Instrument: | | | | | | | | | |
| Model: | | | | | Serial Numbe | | | | |
| Date Performed: | | | | | Test Location: | | | | |
| Requi | rements: | | | | | | | | |
| | | detected (e. 1000 Hz to exceed 2 s. least 80 dB It shall not t except throu the display An earphone | g., gamma, i at least 4000 The A-weigh (A) and shall be possible to ugh the restri to inform the e connection | blicter to neutron, ove) Hz. Where nted alarm s not exceed to disable bo icted mode. user of this should be a | er-range). The frequency e an intermittent alarm s signal volume at a distant I 100 dB(A). When both alarm signa condition. | of an audib ignal is prov nce of 30 cm lible alarm ir als are off, al | le alarm si ided, the ir from the i dications s n indication | in the type i gnal shall I nterval shal instrument simultaneo n shall be p in a high-n | be from ll not shall be at busly, provided on oise |
| | Ambient C | onditions: | °C | ; | %RH | | in HG | | |
| Te -4 F | | | | | | | | | |
| iest E | quipment: | | | | | | | | |
| Instrumen | nt Mode of | operation | | | | | | | |
| Note: | Comments | are required | d when the re | equirement i | s not verified. | | | | |

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| | | | suremen | t Results | | | | |
|----------------------|--------------------------|--------------|---------------|---------------|--------------------|--------------|-----------|----------|
| | | _ | | | | | _ | |
| | <u>Al</u> | arm volur | <u>ne</u> | | | | Frequency | <u>/</u> |
| | | dB(A) | 1 | | | | Hz | |
| | 1 | | | | | 1 | | |
| | 2 | | | | | 2 | | |
| | 3 | | | | | 3 | | |
| | 5 | | | | | 5 | | |
| | 6 | | | | | 6 | | |
| | 7 | | | | | 7 | | |
| | 9 | | | | | 8 | | |
| | 10 | | | | | 10 | | |
| | Mean | #DIV/0! | dB(A) | | | Mean | #DIV/0! | Hz |
| | STD | #DIV/0! | dB(A) | | | STD | #DIV/0! | Hz |
| | | #DIV/0! | | | | COV % | #DIV/0! | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | Ve | rify |
| | | | | | | | Yes | No |
| | | | | | | | | 1 |
| | | | Is the ala | rm frequen | cy within 1000 to | o 4000 Hz? | | |
| | | | | | | | | - |
| | Where an interm | ittent alarn | n is provide | d, is the int | erval less than 2 | 2 seconds? | | |
| | | | | | | | | |
| | Is the alarm volu | ume at a d | istance of 3 | 30 cm withi | n 85 dB(A) and | 100 dB(A)? | | |
| lf the au | udible alarm can be dis | abled, doe | es the instru | ument have | a vibration or vis | sual alarm? | | |
| | | · | | | | | | |
| | | | | ls an earp | hone connectior | n available? | | |
| Alarm | us are distinguishable f | or different | types of ra | diation (dar | mma neutron o | ver-range)? | | |
| If yes, describe dit | fferences: | | | diation (gai | | ver runge). | | |
| | | | | | | | ſ | T |
| lf yoo alaa adaa | Does the instru | ment have | preventive i | measures f | or disabling all t | he alarms? | | |
| ii yes, describe: | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Reco | ord intermittent alarn | n interval | (seconds): | | | | | |
| | | | | | | | | |
| C | omments: | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Perfe | ormed by: | | | | | Date: | | |
| Rev | iewed by: | | | | | Date: | | |
| 1.0 V | | | | | | Dutt. | | |



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| Vibration Alarm | | | | | | | | | | |
|------------------------|----------|---|--|-------------------------|----------------|-----------------------------|---------------------|---------------|--------------|---------|
| Data Sheet Section 5.6 | | | | | | | | | | |
| | | | | | | | | | | |
| Manufactures | | | | | | | | | | |
| Manufacturer: | | | | | | | | | | |
| matument. | | | | | | | | | | |
| Model: | | | | | Seria | al Number: | | | | |
| Date Performed: | | | | | Tes | t Location: | | | | |
| Domino | | The inet | | | hratian al | | anahilit <i>u</i> T | he sibretier | | llhava |
| Require | ments: | sufficien | t intensity to | nave a vi ninform th | ne user of | ann signaí c an alarm cc | apability. I | ne vibration | i alami sha | ii nave |
| | | | | | | | | | | |
| | | The use | The use of carrying pouches is discouraged. If a holder is used, there should be a rigid | | | | | | | |
| | | connect | ion between | the holde | er and the | instrument | such that th | here is no le | oss of vibra | tion |
| | | Intensity | ensity to the user. | | | | | | | |
| | | The inte | he intensity of the vibration at the surface of the instrument (instrument pouch or holder, when | | | | | | | |
| | | used) shall be greater than 0.8 g. The vibration motor used by the instrument should rotate | | | | | | | | |
| | | between | 1 9000 rpm a | and 11000 | rpm. | | , | | | |
| | | | · · · | | | | | | | |
| | | | | | | | | | | |
| | Note | Comme | nts are requi | red when | the require | ement is not | verified | | | |
| | Note: | | | | | | | | | |
| Test Equ | ipment: | | | | | | | | | |
| | | | | | | | | | | |
| Instrument Mo | de of op | eration: | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | - | - | | | - | | - | Ve | rify | |
| | Inst | rument | and Mot | or Verif | <u>ication</u> | | | Yes | No | |
| | | | | | | | | | • | |
| | | | | Verifv | that new | batteries are | e installed? | | | 1 |
| | | | | | | | | | • | |
| | | | Mo | tor rotatio | n betweer | n 9000 and 1 | 1000 rpm? | | | |
| | | | | | | | | - | - | |
| | | | | | V | Vhat is the r | notor rpm? | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

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| | Measure | ement R | esults | | | | |
|---------------|--------------------|-------------|------------|--------|---------|--|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | Intens | ity (g) | | |
| | | | 1 | | | | |
| | | | 2 | | | | |
| | | | 3 | | | | |
| | | | 4 | | | | |
| | | | 5 | | | | |
| | | | 6 | | | | |
| | | | 7 | | | | |
| | | | 8 | | | | |
| | | | 9 | | | | |
| | | | 10 | | | | |
| | | Mean | intensity | #ח# | //01 | | |
| | | Wear | Intensity | #DI | //0: | | |
| | | | - | Ve | rifv | | |
| | | | | Yes | No | | |
| | n measured reading | areater th | an 0.8 g? | | | | |
| | | <u>g </u> | <u></u> | | | | |
| | Is the vibration | signal inte | ermittent? | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Comments: | | | | | | | _ |
| | | | | | | | |
| | | | | | | | _ |
| | | | | | | | - |
| Performed by: | | | | | Date | | |
| r enormed by. | | | | | Date. | | - |
| Reviewed by: | | | | | Date | | |
| neviewed by. | | | | | Date. | | - |



| Size, Ma | ss, Ref | erence | point r | markin | g, and l | Explosive | Atmo | sphere | es |
|-----------------|---|--|-------------------------------------|----------------------------|--------------------------------|---|---------------------------|---------------------------|--------------|
| | | | Sect | ions 5. | 7-5.10 | | | | |
| | | | | | | | | | |
| Manufacturer: | | | | | | | | | |
| Instrument: | | | | | | | | | |
| | | | | | | | | | |
| Model: | | | | | ę | Serial Number: | | | |
| Date Performed: | | | | | | Test Location: | | | |
| Requirement: | 5 7 Size | | | | | | | | |
| | 5.7 Size The overall dimensions of the instrument should be similar to that of a personal radiation detector (within the rectangular solid defined by 20 cm in length, 10 cm in width, and 5 cm in depth). Means shall be provided to securely fix the instrument to the user (for example, a clip, ring, or lanyard), with attention given to the necessary orientation of the detector and display. 5.8 Mass The mass of the complete instrument should not exceed 400 g. 5.9 Reference point marking The instrument shall have reference points on both the front, or back, and side indicating the effective center of the detector. The instrument shall have an additional reference point indicating its orientation with respect to the wearer. The presence of a clip may be used as the reference point to indicate proper orientation. | | | | | | | | |
| | All referenc | e points sha | II be describ | ped in the ir | nstrument ma | anual. | | | |
| | 5.10 Explo The manufa certification | sive atmosp acturer shall a n is claimed, | oheres state wheth documentat | er the instrution shall be | ument is cert e provided. C | ified for use in ex ertification shoul | xplosive at d be based | mospheres. d on UL-913 | lf -2004. |
| | | | | | | | | | |
| Note: | Comments | are required | when the re | equirement | is not verified | 1. | | | |
| | | | | | | | | | |

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| | | | | | | | | Ve | rify |
|--|--------------|---------------|---------------|---|-----------------|-------------------|-------------|-----|------|
| | | | | | | | | Yes | No |
| What are the dimensions (length x width x depth in cm)? | | | | | | | | | |
| | | | | | | | | | F |
| | Are | the dimens | ions within 2 | 20 cm in ler | ngth, 10 cm ir | n width, and 5 cr | n in depth? | | |
| | | | | Can the i | nstrument be | securely fixed to | o the user? | | |
| | | | | Can the r | | Securely lixed to | | | |
| | | Wha | at is the ma | ss (grams) | ? | | | | |
| | | | | <u>, , , , , , , , , , , , , , , , , , , </u> | • | | | | |
| | | | | | Was | the mass less t | han 400 g? | | |
| | | | <u> </u> | | | | | | |
| Are the reference points marked on the front or back and side indicating the effective center of the detector? | | | | | | | | | |
| Does the manufacturer state if the instrument is certified for use in explosive atmospheres? | | | | | | | | | |
| | | | | | | | | | |
| Is a certificate provided? | | | | | | | | | |
| | | | | | | | | | |
| | | | | ls the | certification b | based on UL-913 | 3 standard? | | |
| If not, specify against v | which standa | rd is the ins | strument ce | rtified to: | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Comments: | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Dorf | ormod by: | | | | | | Data | | |
| Fell | onneu by. | | | | | | Date. | | |
| Rev | iewed bv: | | | | | | Date: | | |
| | _ | | | | | 1 | | | |



| Section 5.11 Battery Lifetime | | | | | | | | |
|-------------------------------|-------------|----------------|---------------|-------------------------|-------------------|---------------------|----------------------|----------------------|
| Data Sheet and Report | | | | | | | | |
| Manufacturer | | | | | | | | |
| Instrument: | | | | | | | | |
| | | | | | | | | |
| Model: | | | | | | Serial Number: | | |
| Date Performed: | | | | | | Test Location: | | |
| Requirement: | If non-rec | hargeable b | atteries are | used they | shall be wide | elv available not u | inique to the instru | iment and be |
| noquironiona | replaceab | le in the fiel | d without th | ne use of sp | ecial tools. V | Vhen rechargeable | e batteries are use | ed, provisions shall |
| | be made | to permit re | charging fro | m ac or dc | (12 V) power | sources. | | |
| | | - | | | | | | |
| | The batte | ries shall be | e capable of | f powering t | he instrumen | t in a non-alarm st | tate for a minimun | n of 16 h in a 50 |
| | µR/h (0.5 | µGy/h) field | I. The batter | ries shall be | e capable of p | powering the audit | ole alarm continuo | usly for 30 min. |
| | The instan | | hava a lavvi | h a t t a m i i a ali i | | | | |
| | The Instru | iment shall | nave a low l | battery indic | cator | | | |
| | | | | | | | | |
| Note: | Comment | s are require | ed when the | requiremen | t is not verified | d. | | |
| | | | | • | | | | |
| | | | | Test | Results | | | |
| | | | | | | | | |
| | | | | | | | <u> </u> | Non- |
| | | | | | | attony type used | Rechargeable | Rechargeable |
| | | | | | | allery type used | | |
| | | 1 | 1 | 1 | | | | |
| | <u>.</u> | | | | | l | Yes | No |
| | | | | ls a lov | v battery indi | cations provided? | | |
| The batteries power | ed the inst | rument for ' | 16 h in a no | n-alarming | condition in a | a field of 50 µR/h? | | |
| | W | as the alar | n activated | after the 16 | h of non-ala | rming operation? | | |
| | The batteri | es powered | the instrum | hent for 30 r | nin in an alar | ming condition? | | |
| l | Jid the ins | trument alar | m when the | e low batter | y indication v | vas displayed? | | |
| | 1 | 1 | 1 | | 1 | | | 1 |
| Comments: | | | | | | | | |
| connonio | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Completed by: | | | | | | Date: | | |
| D | | | | | | | | |
| Reviewed by: | | | | | | Date: | | |
| | | | | | | | | |

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|---|-----------|
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| Security. | |

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| | | Sectior | n 5.12 C |)ata trans | smissic | on | | |
|---------------------|---|--|--|--|---|---|--|---|
| | | Da | ta Shee | et and Re | eport | | | |
| Manufaaturari | | | | | | | | |
| Instrument: | | | | | | | | |
| mat amont. | | | | | | | | |
| Model: | | | | | Seria | I Number: | | |
| Date Performed: | | | | | Test | Location: | | |
| | | | | | | | | |
| Requirement: | The instrur computer. requiremer media devi transferred When user Communic communic to the user Proprietary software is | ment shall h The transfe nts of Ether ice. The tec data shall d, wireless cation protoc ation forma r. y software s needed, th | have the ab r should be net, USB, v shnique use be in the X techniques cols shall b ts\ shall no should not b he software | ility to transfer based on a b wireless, or ot d shall confor ML format follo shall have the e described in t be used and be required for shall be provio | r data to an bi-directiona her electror m to applic owing the fo e ability to l n the techni l any require remote dat ded by the | external de il port that r nic means, able IEEE p ormat define ce encrypte cal manual ed drivers s a interpreta manufactur | evice, such neets the such as a l protocols. T ed in ANSI ed. . Proprietar hall be mad tion. If prop er | as a removable he N42.42. y le available rrietary |
| Note: | Comments | are require | d when the | requirement is | not verified | | | |
| | | | Tes | t Results | | | | |
| | | | | | | | | |
| | | | | | | | Yes | No |
| | Additional | data transf | er requirem | ients were ver | ified in 5.13 | and 5.14? | ┝┥ | |
| | | Does the ir | nstrument t | ransmit data t | transfor bid | ial device? | | |
| What type of port i | is used (e c | Ethernet | USB wire | ess other)? | | irectional? | | |
| What type of point | 0 0000 (0.5 | <u>. Ethennet</u> , The | output file | meets ANSI N | 1 142.42 regu | irements? | | |
| | | | Is the da | ta format des | cribed in the | e manual? | ļ. | - ü |
| | | Is the com | munication | protocol des | cribed in the | e manual? | | |
| | | | Are proprie | tary communi | ication form | ats used? | ┝┫ | ┝┥ |
| | | | | | ietary softw | ne users? | | |
| | | | If yes. was | s the proprieta | ary software | provided? | | |
| | | | , ., | 1 | | | | |
| | | | | | | | | |
| Comments: | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Completed by: | | | | | | Date: | | |
| | | | | | | | | |
| Reviewed by: | | | | | | Date: | | |



Security.

I

| | | User Interface | ; | | | | |
|-----------------|--|--|--|---|--|--|---|
| |] | Data Sheet Section | า 5.13 | | | | |
| | | | | | | | |
| Manufacturer: | | | | | | | |
| instrument. | • | | | | | | |
| Model: | : | | | Seri | al Number: | | |
| Date Performed: | | | | Tes | st Location: | | |
| | | | | | | | |
| Requirement: | The instrument of | hall include: | | | | | |
| | a) A display that | is easily readable over the re | equired temperat | ure range and unde | r different lia | ntina condit | tions. |
| | a) A display that b) Controls that a c) Controls and s d) A menu struct e) Detect, search f) The capability f g) A method to ir to extend or reduination of the extend or reduination of the extend or reduination of the extend or a status functioning properties of the extend or provide a status functioning properties of the extend or provide a status functioning properties of the extend or provide a status functioning properties of the extend or provide a status functioning properties of the extend or provide a status function of the extend or provide | is easily readable over the re are user-friendly for routine op witches that are designed in ure that is simple and easy v/localize, and identification to to operate if the user is wear form the user of the expected ce the collection time. mode of operation that woul s indicator, such as a flashir rly, including visual indicatio | equired temperation or a way to minimi to be followed int functions. ing gloves. ed time required t d automatically s ng LED or LCD hin n of an alarm cor | ure range and unde ze accidental opera uitively. o collect a spectrum start spectrum colle eartbeat, to inform t ndition. | r different ligi ntion. n and a mea ction and att he user that | nting condit ins to allow empt to ide the instrun | tions. If the use entify the nent is |
| | a) A display that b) Controls that a c) Controls and s d) A menu struct e) Detect, search f) The capability f g) A method to ir to extend or redu h) An automated radionuclide. i) Provide a statu functioning proper | is easily readable over the re are user-friendly for routine op witches that are designed in ure that is simple and easy v/localize, and identification to operate if the user is wear form the user of the expecte ce the collection time. mode of operation that woul s indicator, such as a flashin rly, including visual indicatio | equired temperation peration. a way to minimi to be followed int functions. ing gloves. ad time required to d automatically so ng LED or LCD ho n of an alarm cor | ure range and unde ze accidental opera uitively. o collect a spectrum start spectrum colle eartbeat, to inform t ndition. | r different lig ntion. n and a mea ction and att he user that | nting condit | tions. the use entify the nent is |

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| View Yes No Without Gloves in a low level light <150 lux It is possible to turn on the instrument? It is possible to go over the menu as described in the manual? It is possible to go over the menu as described in the manual? It is possible to make an exposure rate measurement? It is possible to make an exposure rate measurement? It is possible to make an exposure rate measurement? It is possible to make an exposure rate measurement? It is possible to save the data? Make a 137Cs identification measurement, was the collection time? It is possible to extend the collection time? It is possible to reduce the collection time? It is possible to reduce the collection time? It is possible to transfer the data to an external device following the manufacturer provided information? It is possible to turn off the instrument? It is possible to transfer the data to an external device following the manufacturer provided information? It is possible to turn off the instrument? It is possible to turn off the instrument? It is possible to turn off the instrument? It is possible to allorate the instrument? Without Gloves in a high level light > 10000 lux and < 32000 lux It is possible to make an exposure rate measurement? It is possible to make an exposure rate measurement? It is possible to make an exposure rate measurement? It is possible to make an ex | USER 1 | | | |
|--|--|-----|---|----------|
| Without Gloves in a low level light <150 lux It is possible to turn on the instrument? It is possible to go over the menu as described in the manual? It is possible to make an exposure rate measurement? It is possible to make an exposure rate measurement? It is possible to make an exposure rate measurement? It is possible to make an identification measurement? It is possible to make an identification measurement? Make a 137Cs identification measurement, was the collection time displayed? It is possible to extend the collection time? It is possible to rate the collection time? It is possible to ratue the collection time? It is possible to ratue the data to an external device following the manufacturer provided information? It is possible to turn off the instrument? It is possible to transfer the data to an external device following the manufacturer provided information? It is possible to turn off the instrument? It wireless communication is used, is encryption available? It is possible to turn off the instrument? It is possible to go over the menu as described in the manual? It is possible to make an exposure rate measurement? It is possible to make an exposure rate measurement? It is possible to make an exposure rate measurement? It is possible to make an exposure rate measurement? It is possible to turn off the instrument? It is possible to make an exposure rate m | | Yes | | No |
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| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | |
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| USER 2 | | |
|--|-----|----|
| | Yes | No |
| Without Gloves in a low level light <150 lux | | |
| It is possible to turn on the instrument? | | |
| It is possible to calibrate the instrument? | | |
| It is possible to go over the menu as described in the manual? | | |
| It is possible to make an exposure rate measurement? | | |
| It is possible to make an identification measurement? | | |
| It is possible to save the data? | | |
| Make a 137Cs identification measurement, was the collection time displayed? | | |
| It is possible to extend the collection time? | | |
| Is this extended time displayed? | | |
| It is possible to reduce the collection time? | | |
| Is this reduced time displayed? | | |
| It is possible to transfer the data to an external device following the manufacturer | | |
| provided information? | | |
| Is wireless communication used? | | |
| If wireless communication is used, is encryption available? | | |
| It is possible to turn off the instrument? | | |
| | | |
| Without Gloves in a high level light > 10000 lux and < 32000 lux | | |
| It is possible to turn on the instrument? | | |
| It is possible to calibrate the instrument? | | |
| It is possible to go over the menu as described in the manual? | | |
| It is possible to make an exposure rate measurement? | | |
| It is possible to make an identification measurement? | | |
| It is possible to save the data? | | |
| It is possible to turn off the instrument? | | |
| | | |
| With Gloves | | |
| It is possible to turn on the instrument? | | |
| It is possible to calibrate the instrument? | | |
| It is possible to go over the menu as described in the manual? | | |
| It is possible to make an exposure rate measurement? | | |
| It is possible to make an identification measurement? | | |
| It is possible to save the data? | | |
| It is possible to turn off the instrument? | | |
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| USER 3 | | | |
|--|-----|---|----|
| | Yes | | No |
| Without Gloves in a low level light <150 lux | | | |
| It is possible to turn on the instrument? | | | |
| It is possible to calibrate the instrument? | | | |
| It is possible to go over the menu as described in the manual? | | | |
| It is possible to make an exposure rate measurement? | | | |
| It is possible to make an identification measurement? | | | |
| It is possible to save the data? | | | |
| Make a 137Cs identification measurement, was the collection time displayed? | | | |
| It is possible to extend the collection time? | | | |
| Is this extended time displayed? | | | |
| It is possible to reduce the collection time? | | | |
| Is this reduced time displayed? | | | |
| It is possible to transfer the data to an external device following the manufacturer | | | |
| provided information? | | | |
| Is wireless communication used? | | | |
| If wireless communication is used, is encryption available? | | | |
| It is possible to turn off the instrument? | | | |
| | | | |
| Without Gloves in a high level light > 10000 lux and < 32000 lux | | 1 | |
| It is possible to turn on the instrument? | | _ | |
| It is possible to calibrate the instrument? | | | |
| It is possible to go over the menu as described in the manual? | | | |
| It is possible to make an exposure rate measurement? | | | |
| It is possible to make an identification measurement? | | | |
| It is possible to save the data? | | | |
| It is possible to turn off the instrument? | | | |
| With Claves | | | |
| It is possible to turn on the instrument? | | 1 | |
| It is possible to full on the instrument? | | | |
| It is possible to go over the monu on departicle in the monual? | | - | |
| It is possible to go over the menu as described in the manual? | | + | |
| It is possible to make an exposure falle measurement? | | - | |
| it is possible to make an identification measurement? | | - | |
| It is possible to save the data? | | - | |
| | | 1 | |
| It is possible to save the data? It is possible to turn off the instrument? | | | |

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| | | For add | litional users add more tables as needed. | | | |
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| Comments: | | | | | | |
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TEP NO.

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| | | ļ | Spectra | l Identifi | cation | | | | |
|------------------|---------------------------|---|---|--|--|---|----------------------|-------------|------|
| | | D | ata She | et Secti | on 5.14 | | | | |
| | | | | | | | | | |
| Manufacturer: | | | | | | | | | |
| instrument: | | | | | | | | | |
| Model: | | | | | | | Seria | I Number: | |
| Date Performed: | | | | | | | Test | Location: | |
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| | uirement: | a) The Inst (unprocess identification Time and Instrume Hardware Hardware Identified Spectrum Measured Neutron of b) An indice Wanknown in c) The mare d) The inst identification | rument shar sed) spectra on results in I date and softwa radionuclide n collection d gamma-ra count rate a count rate a radionuclide nufacturer sl rument shal on. | Each store formation in t serial numbe re version es and associ time interval y exposure rf t the time of t be displayed ") if a radionu nall describe I indicate if th | and the and the and the and the answer of the ANSI N42.42 form the ANSI N42.42 form r stated confidence ind ate measurement, if provide a structure control the meaning of confine exposure rate is the answer of the meaning of the answer of the | ided d (e.g., "not tified. dence indica oo high for r | identifie ations. | d," lide | |
| | Note | Comments | are require | d when the r | aquirement is not ver | ified | | | |
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| | · . | | | <u> </u> | | Yes | | No | |
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| The instrument p | orovides in (Note- use | dication suc | ch as "not id when a test in secti | entified" or "u radionuclide on 6.10.5 to | nknown radionuclide cannot be identified answer this question | " ?) | | | |
| | The man | ual describ | es the mean | aing of the se | nfidence indications | > | | | |
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| The instru | ment provi | des an indic | cation when | the exposure radio | e rate is too high for a nuclide identification | a ?) | | | |
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| The Output File Contains the Following: | Yes | No | _ |
|--|---------------------------------------|-------|---|
| Time and d | ate information? | | |
| | | | |
| Instrument type and serial num | ber information? | | |
| | | | |
| Hardware and software vers | ion information? | | |
| Idontifi | od radionuolido? | | |
| | | | |
| Confidence indications for the radionuc | lides identified? | | |
| | | | |
| Measured gamma-ray | exposure rate? | | |
| | | | |
| If provided, neutron count rate at the time of the | measurement? | | |
| | | | |
| Spectrum collectio | on time interval? | | |
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| | TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | | |
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| | | Rate of | False | Alarm | S | | | | |
|-----------------------------|---------------|----------------|---------------|-------------|-----------------|-----------------|---------------|-------------|----------|
| | | Data | Sheet | Sectio | - n 6.2 | | | | |
| | | | | | | | | | |
| Manufacturer: | | | | | | | | | |
| Instrument: | | | | | | | | | |
| Model | | | | | Sori | ial Numbor: | | | |
| Date Performed: | | | | | Te | st Location: | | | |
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| | | | | | | | | | |
| Requi | rements: | The false alar | m rate for c | amma and | neutron (whe | en annlicable |) shall he le | es or equa | l than 1 |
| | | alarm per 10 | hours when | operated i | n a stable ba | ckground en | /ironment. | .00 01 0400 | |
| | | The alarm thr | eshold shal | I be the sa | me as that us | sed for the "ti | me to alarn | n" test | |
| | | | | | | | | | |
| Note: | Comments | are required | when the re | quirement | is not verified | . | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Ambient C | conditions: | | °C | | %RH | | in HG | | |
| | | | | | | | | | |
| Gamma Alarm | Threshold: | | | | Instrume | ent Mode of | operation | | |
| | | | | | | | | | |
| Neutron Alarm | Threshold: | | | | | | | | |
| | | | | | | | | | |
| Gamma B | ackground | measurement | | µR/h | | | | | |
| | | | | | | | | | |
| Neutron B | ackground | measurement | | (Add Units | ;) | | | | |
| | | | Į | | Yes | No | | | |
| For gammas; did the instrum | ent alarm m | ore than once | e over the te | st period ? | | | | | |
| If applicable, did the neut | tron alarm r | nore than onc | e over the t | est neriod? | 1 | 1 | | | |
| | | | | eet polloui | | | | | |
| | | | | | | | | | |
| Record the numb | per of gamm | a alarms durir | ng the test: | | | | | | |
| | | | | | | | | | |
| Record the numb | per of neutro | n alarms durir | ng the test: | | | | | | |
| | | | | | | | | | |
| C | comments: | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Porf | ormed by: | | | | | | Date | | |
| reii | onneu by. | | | | | | Date. | | |
| Rev | viewed by: | | | | | | Date: | | |
| | | | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPAR DIV682 | ED BY: |
|--|-----------------------------|------------------|----------------------|
| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 30 of 94 |

| | Т | ime to Ala | rm: Phot | ons | | | |
|--------------------|-------------------------------------|--|---------------------------------------|---|-------------------|----------------|-------|
| | | Data Sheet | Section 6. | 3 | | | |
| | | | | | | | |
| Manufacturer: | | | | | | | |
| Instrument: | | | | | | | |
| | | | | | | | |
| Model: | | | | S | erial Number: | | |
| Date Performed: | | | | Test Location: | | | |
| Requirement: | The alarm shall (0.5 µGy/h) that | l activate within 2 coccurs over a po | s after exposure eriod of not more | to an increase in the ambi than 0.5 s. | ient radiation le | /el of 50 μR/h | |
| Note: | Comments are | required when the | e requirement is r | not verified. | | | |
| Ambie | ent Conditions: | | °C | | %RH | | in HG |
| Test Equipment: | | | | | | | |
| Sources Data: | | | | | | | |
| | | <u>Mea</u> | surement Res | <u>sults</u> | | | |
| Background | l Field (Cs-137) | | µR/h | Alarm Threshold | | µR/h | |
| Background | Field (Am-241) | | μR/h | | | | |
| Backgroun | d Field (Co-60) | | µR/h | Instrument Mode | e of operation | | |
| not 50 µR/h enter: | | | | | | | |
| Testing | Field (Cs-137) | | µR/h | Instrument re | ading (Cs-137) | | µR/h |
| Testing | Field (Am-241) | | μR/h | Instrument rea | ding (Am-241) | | µR/h |
| • | | | | | , | | |

| VIST | TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | | |
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| | | Cs-137 | Δm-241 | Co-60 | |
|--|-----------------|-----------------------|---------------------|-------------------|-----------------|
| | | time to alarm ≤2s | time to alarm ≤2s | time to alarm ≤2s | |
| PERATIONAL | 1 | | | | (Yes/No.entry) |
| NOTE | 2 | | | | (103/NO Chilly) |
| | 3 | | | | |
| If there is no alarm | 4 | | | | |
| hen a "No alarm" | 5 | | | | |
| nessage needs to be | 6 | | | | |
| ecorded in the table | 7 | | | | |
| | 8 | | | | |
| | 9 | | | | 1 |
| | 10 | | | | |
| | | | | | |
| | | | | Yes | No |
| | Did the instru | ment alarm within 2 | seconds for Cs-137? | | |
| | | | | - | - |
| | Did the instrun | nent alarm within 2 s | econds for Am-241? | | |
| | D:141 - 1 | | | | |
| | Did the instru | ument alarm within 2 | seconds for Co-60? | | |
| | | | 1 | 1 | 1 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Comments: | | | Date | | |
| Comments: Performed by: | | | Date: | | |
| Comments: Performed by: Reviewed by: | | | Date: | | |

| | TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPAR DIV682 | ED BY: |
|------|--|-----------------------------|-------------------------|----------------------|
| NIST | TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 32 of 94 |

| | | <u>Tir</u> | ne to alarm | - Neuti | <u>ron</u> | | | | |
|------------------------|-------------------------|---|-----------------------------------|-------------|------------|-------------|-----------------|-------------|---|
| | | D | ata Sheet Se | ction 6 | .4 | | | | |
| | | | | | | | | | |
| Manufacturer: | | | | | | | | | |
| mad ument. | | | | | | | | | |
| Model: | | | | | Seria | Number: | | | |
| Date Performed: | | | | | Test | Location: | | | |
| | | | | | | | | | |
| Re | quirement: | The neutron alarm shall a period of not more tha | activate within 5 s aft n 2 s. | er exposure | to an unmo | derated net | utron field tha | toccurs ove | r |
| Note: | Comments a | are required when the re | equirement is not ver | ified. | | | | | |
| | | | | | | | | | |
| Ambient | Conditions [.] | | °C | | %RH | | in HG | | |
| 7411010111 | eenantiene. | | • | | / | | | | |
| Test Equipment: | | | | | | | | | |
| | | | | | | | | | |
| Source Data: | | | | | Instrume | nt Mode o | f operation | | |
| | | | (| | | | (= - - | | |
| Васкд | ouna Fiela | | (add units) | Alarm | Inresnoid | | (add units) | | |
| | | | | | | | | | |
| | | | Measurement | Results | ļļ | | | | |
| | | | | | | | | | |
| Record in table if ins | trument alar | med or not within 5 sec | onds. | | | | | | |
| | | | | | | | | | |
| | | | Cf-252 | | | | | | |
| | TC . | | time to alarm ≤5s | | | | | | |
| OPERATIONAL NO | IE: | 1 | | (Yes/No e | ntry) | | | | |
| If there is no alarm | then a "No | 2 | | | | | | | |
| alarm" message nee | ds to be | 3 | | | | | | | |
| recorded in the table | | 4 | | | | | | | |
| | | 5 | | 4 | | | | | |
| | | 7 | | | | | | | |
| | | 8 | | 1 | | | | | |
| | | 9 | | 1 | | | | | |
| | | 10 | | 1 | | | | | |
| | | | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TOCOLTEP NO. N42.48PREPAR DIV682 | | | |
|--|--|---------------------|----------------------|--|
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| | | | | Yes | No | | |
|---------------|--------------|--------------------------|----------------------|-----|----|--|--|
| | Did the inst | trument alarm within 5 s | seconds for neutron? | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Comments: | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Performed by: | | | Date: | | | | |
| | | | | | | | |
| Reviewed by: | | | Date: | | | | |
| | | | | | | | |

| NIST | TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | |
|------|--|-----------------------------|-------------------------------|----------------------|
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| Dete | ction of gra | dually increa | asing gamm | a radiation I | evels and Ne | eutron detec | tion | | |
|-------------------------|--|---|----------------------|---------------|-------------------|----------------|-------------|--|--|
| | | Data Sheet Section 6.5 | | | | | | | |
| Manufacturer: | | | | | | | | | |
| Instrument: | | | | | | | | | |
| | | | | | | | | | |
| Model: | | Serial Number: | | | | | | | |
| Date Performed: | | | | | | Test Location: | | | |
| | Requirement: | ment: The instrument's alarm threshold shall not be affected by slowly increasing radiation levels that may be caused when a wearer is slowly approaching or is being approached by a radiation source. The alarm shall activate within 5 seconds after the instrument reaches the test position. | | | | | | | |
| Nata | Commonto ero roa | uired when the reg | viroment is not unif | ind | | | | | |
| Note: | Note: Comments are required when the requirement is not ventied. | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Ambient Conditions: | | | °C | | %RH | | in HG | | |
| | | | | | | | | | |
| Test Equipment: | | | | | | | | | |
| | | | | | | | | | |
| Source Data: | | | | | | | | | |
| | | | | | | | | | |
| Gamma Background Field: | | | µR/h | Neutron E | Background Field: | | (add units) | | |
| Gamma / | Alarm Threshold: | | µR/h | Neutron | Alarm Threshold: | | (add units) | | |
| | | | | | | | | | |
| Instrument M | ode of operation | | | | | | | | |
| | | | | | | | | | |
| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPAR DIV682 | ED BY: |
|--|-----------------------------|-------------------------|----------------------|
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| | | Ме | asurement Res | ults | | |
|--|----------------------|--------------------|---------------------|----------------|--|--|
| | | | | | | |
| Record in table if instrument alarmed of | or not within 2 seco | onds for gammas ar | nd 5 seconds for ne | utrons. | | |
| | | | | | | |
| | | Cs-137 | Cf-252 | | | |
| | | time to alarm ≤2s | time to alarm ≤5s | | | |
| OPERATIONAL NOTE: | 1 | | | (Yes/No entry) | | |
| If there is no clowe then a "Ne clowe" | 2 | | | | | |
| If there is no alarm then a "No alarm | 3 | | | | | |
| table | 4 | | | | | |
| | 5 | | | | | |
| | 6 | | | | | |
| | 7 | | | | | |
| | 8 | | | | | |
| | 9 | | | | | |
| | 10 | | | | | |
| | | | | | | |
| | | Yes | No | | | |
| Did the instrument alarm within 2 se | conds for gamma? | | | | | |
| Did the instrument clarm within 5 co | conde for poutron? | | 1 | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Comments: | | | | | | |
| | | | | | | |
| | | | | | | |
| Performed by: | | Date | | | | |
| | | Juic. | | | | |
| Reviewed by: | | Date: | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPAR DIV682 | ED BY: |
|---|-----------------------------|---------------------|-------------------------|
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| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPAR DIV682 | ED BY: |
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| | | | Accura | cy - Photon | <u>IS</u> | | | |
|-----------------|---------------|----------------|------------------------|----------------------|---------------------|------------------------|--------------------|-------|
| | | | Data She | et Section 6 | <u>.6</u> | | | |
| | | | | | | | | |
| Manufacturer: | | | | | | | | |
| Instrument: | | | | | | | | |
| | | | | | | | | |
| Model: | | | | | | Serial Number: | | |
| Date Performed: | | | | | | Test Location: | | |
| | | | | | | | | |
| R | equirement: | | | | | | | |
| | | Displayed ex | posure rates, when pr | ovided, shall be wit | hin ±30 % of the co | nventionally true valu | ue of the applied | |
| | | exposure rat | e using Am-241, Cs-1 | 37, and Co-60. | | | | |
| | | | | | | | | |
| Noto | Commonte | are required w | hon the requirement is | not vorified | | | | |
| Note: | Comments | ale lequileu w | | not vernieu. | | | | 1 |
| | | | | | | | | - |
| Ambiont | Conditions | | °C | | 0/DU | | in HC | |
| Amplent | conditions: | | U C | | 7011 | | | |
| Test Fouinment | | | | | | | | |
| rest Equipment. | | | | | | | | |
| | | | | | | | | |
| Cs-137 Measurem | ents | | | | | | | |
| | | | | | | | | |
| Source Data: | | | | | Instrument | Mode of operation | | |
| | | | | | | | | |
| | | | | | | | | |
| | | Background | | µR/h | at test location | | | |
| | | | | | | | | |
| Ga | amma Alarm | n Threshold: | | µR/h | | | | |
| | | | | | | | | |
| Maximum ii | nstrument ra | nge display | | mR/h | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | For 400 µR/h | For 1 mR/h | For 80% max rate | | |
| | | Rad | liation fields in mR/h | 0.40 | 1.00 | 0.00 | | |
| Ac | tual Radiatio | on fields use | d in the test in mR/h | | | | | |
| | | | 1 | | | | (add instrument ur | nits) |
| | | | 2 | | | | | |
| | | | 3 | | | | | |
| | | | 4 | | | | | |
| | | | 5 | | | | | |
| | | | 6 | | | | | |
| | | | 7 | | | | | |
| | | | 8 | | | | | |
| | | | 9 | | | | | |
| | | | 10 | | | ((D)) ((A)) | | |
| | | | Mean | #DIV/0! | #DIV/0! | #DIV/0! | | |
| | | | | #DIV/0! | #DIV/0! | #DIV/0! | | |
| | | | COV % | #DIV/0! | #DIV/0! | #DIV/0! | | |
| | | | | | | | | |
| | | | I (000() | 0.00 | 0.70 | 0.00 | | |
| | | | low (-30%) | 0.28 | 0.70 | 0.00 | | |
| | | | bigh (1200/) | 0.52 | 1 20 | 0.00 | l | |
| | | | riigri (+30%) | 0.52 | 1.30 | 0.00 | | |
| | | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48PREPARED B DIV682 | | |
|--|---------------------------------------|---------------------|----------------------|
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| Am-241 Measurem | ents | | | | | | | |
|------------------|--------------|-------------------|--------------------|--------------|------------------|--------------------|--------------------|--------|
| O | | | | | la starra e st | | | |
| Source Data: | | | | | Instrument | viode of operation | | |
| | | | | | | | | |
| | E | Background | | µR/h | at test location | | | |
| | | | | | | | | |
| Ga | mma Alarm | Threshold: | | µR/h | | | | |
| | | | | | | | | |
| Maximum in | strument ra | nge display | | mR/h | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | E (00 E# | | | | |
| | | | | For 400 µR/h | For 1 mR/h | For 80% max rate | | |
| | Radia | ation fields use | d for test in mR/h | 0.40 | 1.00 | 0.00 | | |
| ACT | ual Radiatio | on fields used in | | | | | (add instrument ur | nite) |
| | | | 2 | | | | | 11(3) |
| | | | 3 | | | | | |
| | | | 4 | | | | | |
| | | | 5 | 1 | | | | |
| | | | 6 | | | | | |
| | | | 7 | | | | | |
| | | | 8 | | | | | |
| | | | 9 | | | | | |
| | | | 10 | #DIV//01 | #DN//01 | #DIV (/QI | | |
| | | | Mean Std.dov | #DIV/0! | #DIV/0! | #DIV/0! | | |
| | | | | #DIV/0! | #DIV/0! | #DIV/0! | | |
| | | | 001/0 | #01070: | #01070: | #01070: | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | low (-30%) | 0.28 | 0.70 | 0.00 | | |
| | | | | | | | | |
| | | | high (+30%) | 0.52 | 1.30 | 0.00 | | |
| | | | | | | | | |
| Co.60 Monsuremen | | | | | | | | |
| CO-OU Weasuremen | 113 | | | | | | | |
| Source Data: | | | | | Instrument | Node of operation | | |
| Contro Dular | | | | | | | | |
| | | | | | | | | |
| | E | Background | | µR/h | at test location | | | |
| | | | | | | | | |
| Ga | mma Alarm | Threshold: | | µR/h | | | | |
| | | | | | | | | |
| Maximum in | strument ra | nge display | | mR/h | | | | |
| | | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | ED BY: | |
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| | | | For 400 uR/h | For 1 mR/h | For 80% max rate | | |
|---------------|--------------------|--------------------------|--------------|------------|------------------|-------------------|-------|
| | Radiation fiel | ds used for test in mR/h | 0.40 | 1 00 | 0.00 | | |
| Δctua | Radiation fields | used in the test in mR/h | 0.40 | | 0.00 | | |
| Actua | in Radiation netus | | | | | (add instrument u | nite) |
| | | 2 | | | | | |
| | | 3 | | | | | |
| | | 4 | | - | | 1 | |
| | | 5 | | | | 1 | |
| | | 6 | | | | | |
| | | 7 | | | | | |
| | | 8 | | | | 1 | |
| | | 9 | | | | | |
| | | 10 | | | | | |
| | | Mean | #DIV/0! | #DIV/0! | #DIV/0! | | |
| | | Std dev | #DIV/0! | #DIV/0! | #DIV/0! | | |
| | | COV % | #DIV/0! | #DIV/0! | #DIV/0! | Ì | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | low (-30%) | 0.28 | 0.70 | 0.00 | | |
| | | | | | | | |
| | | high (+30%) | 0.52 | 1.30 | 0.00 | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Comments: | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Performed by: | | Date: | | | | | |
| | | | | | | | |
| Reviewed by: | | Date: | | | | | |
| | | | | | | | |

| NIST |
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| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPAR DIV682 | ED BY: |
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| | P | ersonal Rad | diation Alarn | n | | | |
|-----------------|--|---|---|---|--|--|-------|
| | | Data Sheet | Section 6.7 | 1 | | | |
| Manufacturer: | | | | | | | |
| Instrument: | | | | | | | |
| Model: | | | | Se | rial Number: | | |
| Date Performed: | | | | Te | est Location: | | |
| Requirement: | The instrur radiation fie | nent shall provide ar eld. The alarm shall | alarm that will alert be audible and visible | the user to the pres e, and be different th | ence of a relation and those asso | tively high ociated with | |
| | Using Cs-1 shall be ac two additio | 137, expose the inst tivated within 2 s of anal times for a total | rument to a 10 mR/h the exposure. Reduc of three trials. The al | (100 µGy/h) radiatio the radiation field arm shall activate w | on field. The po and repeat the ithin the time | ersonal alarm e exposure specified for | |
| | each trial. | | 1 | 1 | | | |
| Note: | Comments | are required when t | he requirement is no | t verified. | | | |
| | | | | | | - | |
| Ambient C | onditions: | | °C | | %RH | | in HC |
| | | | | | | | шно |
| Test Equipment: | | | | | | | |

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| | | Meas | urement Results | 1 | 1 | 1 | |
|---------------------------|---------------|-----------------------------|-----------------------|----------------------|---------------|---------|------|
| Backgro | und Field | | uR/h | Alarm Threshold | | uR/h | |
| Buokgro | | | Profi | Alarmi micolola | | | |
| Instrument Mode of | operation | | | | | | |
| | | | | | | | |
| K mat 40 m D/h antam | | | | | | | |
| If not 10 mR/n enter: | d (Cc 127) | | mP/h | Instrument read | ding (Cc.127) | | mP/h |
| Testing Fle | iu (CS-137) | | | Instrument read | ung (CS-137) | | |
| | | | | | | | |
| | | | | | | | |
| Record in table if instru | ment alarm | ed or not within 2 se | conds. | | | | |
| | | 0. 407 | | | | | |
| | | US-137 time to alarm <2s | | OPERATIONAL NO | JIE: | | |
| | 1 | | (Yes/No entry) | If there is no alarm | n then a "No | | |
| | 2 | | | alarm" message ne | eds to be | | |
| | 3 | | | recorded in the tab | le | | |
| | | | J | | | | |
| | | | | | | | |
| | ÷ | | • | Yes | | No | |
| Di | d the instru | ment alarm within 2 | seconds for Cs-137? | | | | |
| | lt | has an audible perso | onal radiation alarm? | | | | |
| Is the alarm audible ala | arm different | t to that of the radiat | ion indication alarm? | | | | |
| If yes, then describe: | | | | | | | |
| | | | | | 1 | F | |
| | I | t has an visible perse | onal radiation alarm? | | | | |
| Is the alarm visible ala | arm different | t to that of the radiat | ion indication alarm? | | | | |
| If yes, then describe: | | | | | | | |
| | | | ; | 1 | | | |
| | | | | | | | |
| | | Dere ender | | | | | |
| For US-137: | | Record max | imum time to alarm: | | | seconas | |
| | | Record mir | imum time to alarm. | | | seconds | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Comments: | | | | | | | |
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| | | | | | | | |
| Performed by: | | | Date: | | | | |
| | | | | | | | |
| Reviewed by: | | | Date: | | | | |
| | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | | |
|--|-----------------------------|------------------------|----------------------|--|
| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 42 of 94 | |

| | | Ove | er-Rang | le Resp | onse | | | | | |
|-----------------|---------------|--|--|---|---|--|--|--|---|---------------------------------|
| | | | Data S | heet Se | ction 6. | 8 | | | | |
| | | | | | | | | | | |
| Manufacturer: | | | | | | | | | | |
| Instrument: | | | | | | | | | | |
| Model: | | | | Soria | al Number: | | | | | |
| Date Performed: | | | | Tes | t Location: | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Ret | quirement: | When expo manufactur range indic 5 minute w | osed to an ex rer, the indica ation shall b hen the radia | xposure rate ation of the e displayed ation field is | e that is two instrument s for the dura reduced. | times the n shall remain tion of the e | naximum ex at the maxin xposure. The | posure rate mum of that e instrument | specified b range, and shall reco | y the an over- ver within |
| Note: | Comments | are required | d when the re | equirement i | s not verifie | d. | | | | |
| | | | | | | | | | | |
| Ambient (| Conditions: | | °C | | %RH | | in HG | | | |
| Test E | quipment: | | | | | | | | | |
| | | | | | | | | | | |
| So | urce Data: | | | | | | | | | |
| Instrume | nt Mode of | operation | | | | | | | | |
| | | | | | | | | | | |
| Manufa | acturer-State | ed Max Exp | osure Rate: | | mR/h | | | | | |
| | 0 | | D.I. | | | | | | | |
| | Over-Ran | ge rest Exp | osure Rate: | | mR/n | | | | | |
| | Over-Ra | nge Exposu | re Duration: | | min. | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | Ver | ify No | |
| | | | | | | | | res | NO | |
| | | | | Was | an over-ranç | ge indicatior | ı displayed? | | | |
| | | | | Did the in | strument re | cover within | 5 minutes? | | | |
| | | | | Dia tric in | Strument re | | o minuco : | | | |
| | | | | | | | _ | | | |
| | | | | | | | | | | |
| | Rec | orded reco | overy time: | | | | (add units) | | | |
| | | | | | | | | | | |
| (| Comments: | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Per | formed by: | | | Date: | | | | | | |
| | | | | Dator | | | | | | |
| Rev | viewed by: | | | Date: | | | | | | |
| | | | | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | | |
|---|-----------------------------|-------------------------------|----------------------|--|
| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 43 of 94 | |

| | | lr | nterferi | ng lonizing | Radiation | | | | |
|--------------------------|---------------|----------------|--------------|--------------------------|--------------------------|------------------------|----------------|-------|--|
| | | | [| Data Sheet So | ection 6.9 | | | | |
| | | | | | | | | | |
| Manufacturer: | | | | | | | | | |
| Instrument: | | | | | | | | | |
| | | | | | | | | | |
| Model: | | | | | Serial Number: | | | | |
| Date Performed: | | | | | Test Location: | | | | |
| | | | | | | | | | |
| Re | quirement: | lf the instant | | | | | ton nodiotion | | |
| | | If the Instru | ment nas a | neutron detector, the | e neutron detector shall | be insensitive to pho | ton radiation. | | |
| | | The instrum | ont chall by | a avecaged to a 137 Ca | radiation field of 10 m |)/h for 1 min The ine | trumont chall | aat | |
| indicate a neutron alarm | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Note: | Comments | are required | when the r | equirement is not ve | rified. | | | | |
| | | | | | | | | | |
| Ambient | Conditions: | | °C | | %RH | in HG | | | |
| | | | | | | | | | |
| Test F | - Guinment | | | | | | | | |
| 1031 | _quipinent. | | | | | | | | |
| Gamma Sc | urce Data: | | | | | | | | |
| Califina Oc | | | | | | | | | |
| Instrume | ant Mode o | foneration | | | | | | | |
| matume | | | | | | | | | |
| | | | | | | | Va | rif., | |
| | | | | | | | Ve | No | |
| | | | | | | | Tes | NO | |
| | | | Did th | | 1 | 14-44-0-407 | - 0 | 1 | |
| | | | Dia th | e neutron alarm wen | t on when only exposed | to the CS-137 source | 3? | | |
| | | | | | Were neutrons indicate | ed during the exposure | <u>3?</u> | | |
| If neutron | s are indica | ited record r | eutron indi | cation (include units) | 1 | | | | |
| intection | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | Comments: | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Por | formed by: | | | Date | | | | | |
| rei | ionneu by. | | | Date. | | | | | |
| Re | viewed by: | | | Date | | | | | |
| | | | | | | | | | |



Detectors (SPRDs) for Homeland

TITLE: Spectroscopic Personal Radiation

Security.

2010-11-09

Section 6.10.1 Radionuclide Categorization Data Sheet and Report

| Manufacturer: | | | | | | | | | | |
|-----------------|---|---------------|--------------|--------------|-----------------|-----------------|--------------|-------------|--|--|
| Instrument: | | | | | | | | | | |
| | | | | | | | | | | |
| Model: | | | | Seria | I Number: | | | | | |
| Date Performed: | | | | Test | Location: | | | | | |
| | | | | | | | | | | |
| Requirement: | The manufacturer shall state the radionuclides that the instrument can identify radionuclides | | | | | | | | | |
| | by category. The categories selected should be based on the following list: | | | | | | | | | |
| | | | | | | | | | | |
| | - Special Nuclear Materials: Uranium (used to indicate 233U, 235U), 237Np, Pu. | | | | | | | | | |
| | | | | | | | | | | |
| | - Medical ra | adionuclides | s: 18F, 67Ga | a, 51Cr, 75S | e, 89Sr, 99I | Mo,99mTc, | 103Pd, 111I | n, lodine | | |
| | (1231, 1251, | , 131I), 1535 | Sm, 201TI, 1 | 33Xe. | | | | | | |
| | | _ | | | | | | | | |
| | - Naturally | occurring ra | dioactive ma | aterials (NO | RM): 40K, 2 | 26Ra, 232T | h and daugh | iters, 238U | | |
| | and daugh | ters. | | | | | | | | |
| | المراجع فالمراجع | | | 0- 4000- | 4070- 400 | | | 44.4 | | |
| | - Industrial | radionuciide | es: 57C0, 60 | JCo, 133Ba, | 137CS, 192 | 21r, 204 11, 22 | 26Ra, and 24 | 41AM. | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Note: | Comments | are require | d when the | requiremen | t is not verifi | ed. | | | | |
| | | - | | | | | | | | |

| | | | <u>Test</u> | Results | | | | |
|----------------------|---------------|--------------|---------------|-------------|-------------|-------------|-----|----|
| | | | | | | | | |
| | | | | | | | Yes | No |
| The manufacturer s | states the ra | adionuclides | s that the ir | nstrument o | an identify | by | Г | Г |
| category. | | | | | | | | |
| The instrument car | | | | | | | | |
| radionuclides listed | l in the requ | uirement. | | | | | I | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Comments: | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| On multiple did | | | | | | D -1 | | |
| Completed by: | | | | | | Date: | | |
| Poviowod by | | | | | | Data | | |
| Reviewed by: | | | | | | Date: | | |
| | | | | | | | | |



Security.

Section 6.10.2.2 Single Radionuclide Identification **Data Sheet and Report** Manufacturer: Instrument: Model: Serial Number: **Date Performed:** Test Location: Requirement: The instrument shall be able to identify the following radionuclides within the time specified by the manufacturer with a maximum of 5 min. The manufacturer shall provide radionuclide-specific test results. Medical radionuclides: 67Ga, 99mTc, lodine (123I, 131I), 201Tl NORM: 40K, 226Ra, 232Th Industrial radionuclides: 22Na, 57Co, 60Co, 133Ba, 137Cs, 152Eu, 192Ir, and 241Am Special nuclear materials: HEU (highly enriched uranium, 235U >90%), Pu [Reactor grade plutonium (> 6% 240Pu)l Note: Comments are required when the requirement is not verified.

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | | |
|--|-----------------------------|------------------------|----------------------|--|
| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 46 of 94 | |

| Single Radionuclide Identification Test Data | | | | | | | | | | | |
|--|---------|----------|----------|------------|---|---------|---------------|----------|------------|--|--|
| | | | | | | | | | | | |
| | Date Pe | rformed: | 22 | Na | | Date Pe | rformed: | 40K | | | |
| | | | Shielded | Unshielded | | | | Shielded | Unshielded | | |
| | | 1 | | | | | 1 | | | | |
| | | 2 | | | | | 2 | | | | |
| | | 4 | | | | | 4 | | | | |
| | | 5 | | | | | 5 | | | | |
| | | 6 | | | | | 6 | | | | |
| | | 7 | | | | | 7 | | | | |
| | | 8 | | | | | 8 | | | | |
| | | 9 | | | | | 9 | | | | |
| | | 10 | | | | | 10 | | | | |
| | | Corr | | | | | Corr | | | | |
| | Data Da | | 57. | | 1 | Data Da | uf a mus a de | 60, | | | |
| | Date Pe | rtormea: | | | | Date Pe | rtormea: | Co | | | |
| | | | Shielded | Unshielded | | | | Shielded | Unshielded | | |
| | | 1 | | | | | 1 | | | | |
| | | 2 | | | | | 2 | | | | |
| | | 3 | | | | | 3 | | | | |
| | | 4 | | | | | 4 | | | | |
| | | 5 | | | | | 5 | | | | |
| | | 7 | | | | | 7 | | | | |
| | | 8 | | | | | 8 | | | | |
| | | 9 | | | | | 9 | | | | |
| | | 10 | | | | | 10 | | | | |
| | | Corr | | | | | Corr | | | | |
| | | | | | | | | | | | |
| | Date Pe | rformed: | 67 | Ga | | Date Pe | rformed: | 99m | Tc | | |
| | | | Shielded | Unshielded | | | | Shielded | Unshielded | | |
| | | 1 | omended | Justiced | | | 1 | Unicided | Justiciaed | | |
| | | 2 | | | | | 2 | | | | |
| | | 3 | | | | | 3 | | | | |
| | | 4 | | | | | 4 | | | | |
| | | 5 | | | | | 5 | | | | |
| | | 6 | | | | | 6 | | | | |
| | | 7 | | | | | 7 | | | | |
| | | 8 | | | | | 8 | | | | |
| | | 9 | | ╏────┤ | | | 9 | | | | |
| | | Corr | | | | | Corr | | | | |
| | | 0011 | | <u></u> | | | 001 | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | | |
|--|-----------------------------|-------------------------------|-------------------------|--|
| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 47 of 94 | |

| Date Performed: | 1: | ²³ I | Date | Performed: | 13 | ¹ I |
|-----------------|----------|-----------------|------|------------|----------|----------------|
| | | | | | | |
| 1 | Shielded | Unshielded | | 1 | Shielded | Unshielded |
| 2 | | | | 2 | | |
| 3 | | | | 3 | | |
| 4 | | | | 4 | | |
| 5 | | | | 5 | | |
| 6 | | | | 6 | | |
| 7 | | | | 7 | | |
| 8 | | | | 8 | | |
| 9 | | | | 9 | | |
| 10 | | | | 10 | | |
| | | | | Coll | | |
| Date Performed: | 133 | Ba | Date | Performed: | 137 | Cs |
| | | | | | | |
| | Shielded | Unshielded | | | Shielded | Unshielded |
| 1 | | | | 1 | | |
| 2 | | | | 2 | | |
| | | | | 3 | | |
| | | | | 5 | | |
| 6 | | | | 6 | | |
| 7 | | | | 7 | | |
| 8 | | | | 8 | | |
| 9 | | | | 9 | | |
| 10 | | | | 10 | | |
| Corr | | | | Corr | | |
| | 451 | | | | 10 | |
| Date Performed: | | Eu | Date | Performed: | | ir |
| | Shielded | Unshielded | | | Shielded | Unshielded |
| 1 | | | | 1 | | |
| 2 | | | | 2 | | |
| 3 | | | | 3 | | |
| 4 | | | | 4 | | |
| 5 | | | | 5 | | |
| 0 | | | | 6 | | |
| <u>л</u> | | | | 8 | | |
| | | | | 9 | | |
| 10 | | | | 10 | | |
| Corr | | | | Corr | | |
| | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | ED BY: | |
|--|-----------------------------|---------------------|----------------------|
| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 48 of 94 |

| Date Perfe | ormed: | 201 | TI | Date Pe | rformed: | 226 | Ra |
|------------|--------|----------|-----------------|-------------|----------|------------------|------------------|
| | | Objected | l la abial da d | | | Objected and | Un a bia lata at |
| | 1 | Shielded | Unshielded | | 1 | Shielded | Unshielded |
| | 2 | | | | 2 | | |
| | 3 | | | | 3 | | |
| | 4 | | | | 4 | | |
| | 5 | | | | 5 | | |
| | 6 | | | | 6 | | |
| | 7 | | | | 7 | | |
| | 8 | | | | 8 | | |
| | 9 | | | | 9 | | |
| | 10 | | | | 10 | | |
| | Corr | | | | Corr | | |
| | F | | | | | | |
| Date Perfe | ormed: | 232 | Th | Date Pe | rformed: | HE | U |
| | | 01.1.1.1 | | | | 01.11.1 | |
| | 1 | Shielded | Unshielded | | 1 | Shielded | Unshielded |
| | 2 | | | | 2 | | |
| | 3 | | | | 3 | | |
| | 4 | | | | 4 | | |
| | 5 | | | | 5 | | |
| | 6 | | | | 6 | | |
| | 7 | | | | 7 | | |
| | 8 | | | | 8 | | |
| | 9 | | | | 9 | | |
| | 10 | | | | 10 | | |
| | Corr | | | | Corr | | |
| | | | | | li | | |
| Date Perfe | ormed: | RG | Pu | Date Pe | rformed: | ²⁴¹ / | \m |
| | | Shielded | Unchioldod | | | Shielded | Unshielded |
| | 1 | omended | Unamended | | 1 | onielded | Unshielded |
| | 2 | | | | 2 | | |
| | 3 | | | | 3 | | |
| | 4 | | | | 4 | | |
| | 5 | | | | 5 | | |
| | 6 | | | | 6 | | |
| | 7 | | | | 7 | | |
| | 8 | | | | 8 | | |
| | 9 | | | | 9 | | |
| | 10 | | | | 10 | | |
| | Corr | | | | Corr | | |
| | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPAR DIV682 | ED BY: |
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| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 49 of 94 |

| | Unshie | laea | T .: | | Shie | laea | 1 | |
|--------------|---|----------|----------|------------------|---|-----------|----------|----|
| Date of Test | Radionuclide | Yes | No | Date of T | Test Radionuclide | Yes | No | _ |
| | 40 K | <u> </u> | ┟──┣┥── | | Na | | | |
| | ™K | | ┝┝┥ | | ™K | | | _ |
| | ^{5/} Co | | | | 5/Co | | | |
| | ^₀ Co | | | | °°Co | | | |
| | ⁶⁷ Ga | | | | ⁶⁷ Ga | | | |
| | ^{99m} Tc | | | | ^{99m} Tc | | | |
| | ¹²³ | | | | ¹²³ | | | |
| | ¹³¹ I | | | | ¹³¹ I | | | |
| | ¹³³ Ba | | | | ¹³³ Ba | | | |
| | ¹³⁷ Cs | | L | | ¹³⁷ Cs | | | |
| | ¹⁵² Eu | | | | ¹⁵² Eu | | | |
| | ¹⁹² lr | | Ū | | ¹⁹² lr | Ē | | |
| | ²⁰¹ TI | | | | ²⁰¹ TI | Ē | | |
| | ²²⁶ Ra | | | | ²²⁶ Ra | | | |
| | ²³² Th | | | 1 1 | ²³² Th | | | 1 |
| | HEU | | | | HEU | | | |
| | RGPu | <u></u> | | ╢ ╟──── | RGPu | | | 1 |
| | ²⁴¹ Am | <u> </u> | | | ²⁴¹ Am | | | |
| | | | | | | | | |
| | | | | | | | | - |
| | Source Inf | ormation | | 1 i | Source In | formation | | 1 |
| | Unship | Ided | | | Source In | Ided | | |
| | | | Exposure | | | | Exposure | |
| Date | Radionuclide | Activity | rate | (add units) Date | e Radionuclide | Activity | rate | (a |
| | ²² Na | | | | ²² Na | | | |
| | ⁴⁰ K | | | | ⁴⁰ K | | | |
| | ⁵⁷ Co | | | | ⁵⁷ Co | | | |
| | ⁶⁰ Co | | | | ⁶⁰ Co | | | 1 |
| | ⁶⁷ Ga | | | | ⁶⁷ Ga | | 1 | 1 |
| | ^{99m} Tc | | | | ^{99m} Tc | | | 1 |
| | ¹²³ | | 1 | | 123 | | | |
| | 131. | | | | ¹³¹ | | | |
| | 101 | | | | | | | |
| | ¹³¹ I | | | | ¹³³ Ba | | | |
| | ¹³³ Ba | | | | ¹³³ Ba | | | |
| | ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu | | | | ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu | | | |
| | ¹³³ Ba ¹³³ Cs ¹⁵² Eu ¹⁹² Ir | | | | ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir | | | |
| | ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir ²⁰¹ TI | | | | ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir ²⁰¹ Ti | | | |
| | ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir ²⁰¹ TI ²²⁶ Ba | | | | 1 ¹³³ Ba 1 ¹³⁷ Cs 1 ⁵² Eu 1 ⁹² Ιr 2 ⁰¹ Π 2 ²⁶ P ₂ | | | |
| | ¹³¹ Ba ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir ²⁰¹ TI ²²⁶ Ra ²²² Tb | | | | ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ιr ²⁰¹ Π ²²⁶ Ra ²³² Tb | | | |
| | ¹³¹ Ba ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² IT ²⁰¹ T ²²⁶ Ra ²²² Th | | | | 133Ba 137Cs 152Eu 192Ir 201Π 226Ra 232Th | | | |
| | ¹³¹ Ba ¹³³ Cs ¹⁵² Eu ¹⁵² Fu ²⁰¹ T ²²⁶ Ra ²³² Th HEU RGPU | | | | ¹³³ Ва ¹³⁷ Сs ¹⁵² Eu ¹⁹² Ir ²⁰¹ П ²⁰⁶ Rа ²³² Th HEU PCPu | | | |
| | ¹³¹ Ba ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir ²⁰¹ Tl ²²⁶ Ra ²³² Th HEU HEU RGPu ²⁴¹ Am | | | | 133Ва 137Сs 152Eu 192Ir 201П 226Ra 232Th HEU RGPu 241Am | | | |
| | ¹³¹ Ba ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir ²⁰¹ TI ²²⁶ Ra ²³² Th HEU RGPu ²⁴¹ Am | | | | 133Ва 137Сs 152Eu 192Ir 201П 226Ra 232Th HEU RGPu 241Am | | | |
| | ¹³¹ Ba ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir ²⁰¹ TI ²²⁶ Ra ²³² Th HEU RGPu ²⁴¹ Am | | | | 133Ва 137Сs 152Eu 192Ir 201П 226Ra 232Th HEU RGPu 241Am | | | |
| | ¹³¹ Ba ¹³³ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir ²⁰¹ TI ²²⁶ Ra ²³² Th HEU RGPu ²⁴¹ Am | | | | 133Ba 137Cs 152Eu 192Ir 201TI 226Ra 232Th HEU RGPu 241Am | | | |
| Comments: | ¹³⁷ Cs ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir ²⁰¹ TI ²²⁸ Ra ²³² Th HEU RGPu ²⁴¹ Am | | | | 133Ba 137Cs 152Eu 192Ir 201TI 226Ra 232Th HEU RGPu 241Am | | | |
| Comments: | ¹³¹ Ba ¹³⁷ Cs ¹⁵² Eu ¹⁹² Ir ²⁰¹ TI ²²⁸ Ra ²³² Th HEU RGPu ²⁴¹ Am | | | | 133Ва 137Сs 152Eu 192Ir 201П 226Ra 232Th HEU RGPu 241Am | | | |
| Comments: | 131 133Ba 137Cs 152Eu 152Ir 201TI 226Ra 232Th HEU RGPu 241Am | | | | 133Ва 137Сs 152Eu 192Ir 201П 226Ra 232Th HEU RGPu 241Am | | | |
| Comments: | 131 133Ba 137Cs 152Eu 152Ir 201TI 226Ra 232Th HEU RGPu 241Am | | | | 133Ва 137Сs 152Eu 192Ir 201П 226Ra 232Th HEU RGPu 241Am | | | |
| Comments: | 131 133Ba 137Cs 182Eu 192Ir 201TI 201TI 206Ra 222Th HEU RGPu 241Am | | | | 133Ва 137Сs 152Eu 192Ir 201П 226Ra 232Th HEU RGPu 241Am | | | |
| Comments: | 131 133Ba 137Cs 182Eu 192Ir 201TI 201TI 226Ra 222Th HEU RGPu 241Am | | | | 1 ¹³³ Ba 1 ¹³⁷ Cs 1 ¹⁵² Eu 1 ¹⁹² Ir 2 ²⁰¹ Tl 2 ²⁶ Ra 2 ²³² Th HEU RGPu 2 ⁴¹ Am | | | |
| Comments: | 131 133Ba 137Cs 152Eu 192Ir 201TI 201TI 206Ra 232Th HEU RGPu 241Am | | | | Date: | | | |



TITLE: Spectroscopic Personal Radiation

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| Sectio | on 6.10.3 | Simultane | eous Rad | lionucli | ide Ident | ification | |
|----------------|-------------------------|-----------------------------------|------------------|---------------|---------------------|---------------|--|
| | | Data Sh | eet and | Report | | | |
| | | | | - | | | |
| Manufacturer | · | | | | | | |
| Instrumen | it: | | | | | | |
| Mode | 1: | | | Seri | ial Number: | | |
| Date Performed | d: | | | Те | st Location: | | |
| | | | | | | | |
| | | | | | | | |
| Requiremen | t: The instrum | ent shall be able | to identify at l | east two rad | ionuclides sir | nultaneously. | |
| | Use ^{99m} Tc + | ¹³⁷ Cs for the test | | | | | |
| | | | | | | | |
| | | | | | | | |
| Note | e: Comments | are required whe | n the requirer | nent is not v | erified. | ` | |
| | | | | | | | |
| | | | | | | | |
| | _ | Simultane | ous Radion | uclide Iden | tification Te | est Data | |
| Date P | erformed [.] | ^{99m} Tc + ¹³ | ⁷ Cs | | ^{99m} Tc S | ource data: | |
| Duto I | l | | | | | | |
| | | Unshield | led | | | | |
| | 1 | | | | | | |
| | 2 | | | | | | |
| | 3 | | | | 127 | | |
| | 4 | | | | ¹³ 'Cs S | ource data: | |
| | 5 | | | | | | |
| | 7 | | | | | | |
| | 8 | | | | | | |
| | 9 | | | | | | |
| | 10 | | | | | | |
| | Corr | | | | | | |
| | | | | | | | |
| | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | |
|--|-----------------------------|-------------------------------|----------------------|
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| | Did the instru | ment categorized co | rrectly 8 out of | 10 time? | |
|---------------|---------------------------------------|---------------------------------------|------------------|----------|--|
| | Date of Test | Radionuclide | Yes | No | |
| | | ^{99m} Tc ^{+ 137} Cs | L | L | |
| | | | | | |
| | Did the i | nstrument ID correct | y 8 out of 10 ti | me? | |
| | Date of Test | Radionuclide | Yes | No | |
| | | ^{99m} Tc ^{+ 137} Cs | | | |
| | | | | | |
| Commontor | | | | | |
| comments. | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Completed by: | | | Date: | | |
| | | | | | |
| Reviewed by: | · · · · · · · · · · · · · · · · · · · | | Date | I | |



| | | Sectior | n 6.10.4 | Masking | g Identific | cation | |
|-----------------|--------------|---|--|--|---|---|---|
| | | | Test D | ata and I | Report | | |
| Ma | nufacturor | | | | | | |
| IVIA | Instrument: | | | | | | |
| | | | | | | | |
| | Model: | | | | Sei | rial Number: | |
| Date | Performed: | | | | Te | est Location: | |
| | | | | | | | |
| Re | quirement: | The instrumer "unable to ide that is not list unmasked rac | nt shall prov ntify") when ted in the lib dionuclide. | ide an indicat exposed to a rary or that h | ion (e.g., the radionuclide as a much hig | correct identifica masked by ano gher radiation int | ation, "unknown," ther radionuclide ensity than the |
| | Note: | Comments ar | e required v | hen the requi | irement is not | verified. | |
| | Ambien | t Conditions: | | °C | | %RH | in HG |
| | Test Equi | pment Used: | | | | | |
| | | | | | | | |
| | | <u>T</u> (| est using: | ⁶⁷ Ga and ⁵⁴ N | <u>In</u> | | |
| | | | | | | | |
| | | 67.0.54.4 | | | 67 - | | |
| Date Performed: | 1 | °°Ga + °°ivin | | | "Ga S | Source data: | |
| | 2 | | | | | | |
| | 3 | | | | | | |
| | 4 | | | | | | |
| | 5 | | | | 54Mm 6 | Source data: | |
| | 7 | | | | | | |
| | 8 | | | | | | |
| | 9 | | | | | | |
| | 10 | | | (-h) (1) | 54.4 | | 11 |
| Nun | iber Correct | | | need to cho | ose a differen | it radionuclide fo | indrary, if in library ir this test) |
| | | | | | | | |
| | Did th | e instrument | ID correct | ly 8 out of 10 |) time? | | |
| | Date of Test | Radion | uclide | Yes | No | | |
| | | ⁶⁷ Ga + | ⁵⁴ Mn | | | | |
| | | | | | | | |
| | | | | | | | |

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| | | <u>Test</u> | using: HEU | + (⁶⁷ Ga or ⁹⁹ | ^{əm} Tc) | | | |
|-----------------|--------------|--------------------------------------|-------------------------|---------------------------------------|---------------------|--------------------------|------------|--|
| | | | | | | | | |
| Date Performed: | | | (enter source | es used) | ^{99m} T | c or ⁶⁷ Ga So | urce data: | |
| | 1 | | | | | | | |
| | 2 | | | | | | | |
| | 3 | | | | | | | |
| | 4 | | | | | | | |
| | 6 | | | | ¹³⁷ Cs S | ource data: | | |
| | 7 | | | | | | | |
| | 8 | | | | | | | |
| | 9 | | | | | | | |
| | 10 | | | | | | | |
| Nu | mber Correct | | ļ | | | | | |
| | | | | | | | | |
| | | | | | | 7 | | |
| | Did th | e instrumen | t ID correctly | / 8 out of 10 | time? | | | |
| | Deter (Terri | D. I' | | N | N. | | | |
| | Date of Test | Radior | nuclide | Yes | NO | | | |
| | | (^{99m} Tc or ⁶⁷ | Ga) + ¹³⁷ Cs | | | | | |
| | | | | | | | | |
| | | | | | | | | |

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| | | <u>Test u</u> | sing: Pu + ¹³⁷ Cs | <u> </u> | | |
|---------------|----------------|-----------------------|------------------------------|----------|--------------|--|
| | | | | | | |
| Date Performe | ed: P | u + ¹³⁷ Cs | | Pu | Source data: | |
| | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | | | 137 | Course dates | |
| | 6 | | | US : | Source data: | |
| | 8 | | | | | |
| | 9 | | | | | |
| | 10 | | | | | |
| | Number Correct | | | | | |
| | | | | | | |
| | | | | | | |
| | Did the i | nstrument ID corr | ectly 8 out of 10 | 0 time? | | |
| | Data of Toot | Dedienuslide | No a | Ne | | |
| | Date of Test | | res | | | |
| | | Pu + ^{ss} Cs | | | | |
| | | | | | | |
| | | | | | | |
| | Comments: | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | Completed by | | | | Data | |
| | Completed by: | | | | Date: | |
| | Reviewed by: | | | | Date: | |
| | | | | | | |

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| | Section | on 6.10.5 | Respor | nse to U | nknown | Radionu | clide | |
|---------|-------------|----------------|----------------------|-----------------------|------------------|--------------------------|----------------|-------------|
| | | | Test Da | ata and | Report | | | |
| Ma | nufacturar | | | | | | | |
| Ma | Instrument | | | | | | | |
| | mat ament. | | | | | | | |
| | Model: | | | | Ser | ial Number: | | |
| Date | Performed: | | | | Те | st Location: | | |
| | | | | | | | | |
| | | | | | | | | |
| Re | quirement: | The instrume | ent shall provi | ide an indica | ation (e.g., "un | known," "unab | le to identif | y," "not in |
| | | library") wher | n exposed to | radionuclide | es that are not | in the library. | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | Note: | Comments a | re required w | /hen the rea | uirement is no | t verified | | |
| | | | | | | | | |
| | | | | | | | | - |
| | Ambient | Conditions: | | °C | | %RH | | in HG |
| | | | | | | | | |
| | Test Equip | oment Used: | | | | | | |
| | | | | | | | | |
| | | Iso | tope Identif | ication Res | sults | | | |
| | | | | 8 | | | | |
| | | | | (enter sour | ce used) | | | |
| Date Pe | erformed: | 1 | | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| | | 4 | | | ⁵⁴ Mn | or ^{166m} Ho So | ource data: | |
| | | 5 | | | | | | |
| | | 6 | | | | | | |
| | | 7 | | | | | | |
| | | 8 | | | (check that | one of these s | ources is n | ot in the |
| | | 9 10 | | | instrument li | ibrary if both i | in library ne | |
| | Num | ber Correct | | | choose a dif | ferent radionu | clide for this | s test) |
| | | | | <u>.</u> | | | | |
| | | | | | | | | |
| | | Did th | e instrumen | t ID correct | tly 8 out of 10 | time? | | |
| | | Dia an | | | | | | |
| | | Date of Test | Radio | nuclide | Yes | No | | |
| | | | (⁵⁴ Mn o | r ^{166m} Ho) | | | | |
| | | | (| | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | Comments: | | | | | | | |
| | | | | [| | | | 1 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Co | mpleted by: | | | | | Date: | | |
| _ | | | | | | | | |
| R | eviewed by: | | | | | Date: | | |
| | | | | | | | | |



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Section 6.10.6 Over-Range Characteristics for Identification **Test Data and Report** Manufacturer: Instrument: Model: Serial Number: Date Performed: Test Location: Requirement: The manufacturer shall state the maximum exposure rate (relative to ¹³⁷Cs) for identification. Note: Comments are required when the requirement is not verified. °C **Ambient Conditions:** %RH in HG Test Equipment Used: Source Data: Manufacturer stated maximum exposure rate: (add units) Measurement Results Exposure rate used in the test: Cs-137 0 (add units) 2 3 Yes No 4 Did instrument provide indication that exposure 5 rate was too high? 6 7 8 Did the instrument ID correctly 8 out of 10 time? 9 10 Number Correct Date of Test Radionuclide Yes No ¹³⁷Cs Comments: Performed by: Date: Reviewed by: Date:

|--|

TEST AND EVALUATION P

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| | | Test Da | ta and Renor | + | | | |
|---------------------------------|---|--|---|---------------------------------|-----------------|---|------|
| | | 1031 Da | | | | | |
| Manufacturer: | | | | | | | |
| Instrument: | | | | | | | |
| | | | | | | | |
| Model: | | | Serial | Number: | | | |
| Date Performed: | | | lest L | ocation: | | | |
| Pequirements | The instrument | shall function | correctly at temper | atures from _2 | 20 °C to +50 °C | | hall |
| | | | | | | | |
| | Relative humidi NOTE: Record | ty shall be wit units displaye | thin the range specif | ed in Table 1. | | | |
| | Relative humidi | ty shall be wit units displaye | thin the range specif | ed in Table 1. | | | |
| Note: | Relative humidi NOTE: Record Comments are | ty shall be wit units displaye required wher | thin the range specified by instrument | ed in Table 1. | | | |
| Note: | Relative humidi NOTE: Record Comments are | ty shall be wit units displaye required wher | thin the range specif ed by instrument n the requirement is | ed in Table 1. | | | |
| Note: | Relative humidi NOTE: Record Comments are | ty shall be wit units displaye required when °C | thin the range specified by instrument | ed in Table 1. not verified. | in H0 | 3 | |
| Ambient Conditions: Test Equ | Relative humidi NOTE: Record Comments are Jipment Used: | ty shall be wit units displaye required when °C | thin the range specified by instrument | ed in Table 1. | in HC | 3 | |
| Ambient Conditions: Test Equ | Relative humidi NOTE: Record Comments are | ty shall be wit units displaye required when °C | thin the range specified by instrument | ed in Table 1. | in HC | 3 | |

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| | | | | <u>Mea</u> | surement F | <u>Results</u> | 1 | | | 1 | | | |
|----------|-------------------|--------------------------------------|---------------|------------------|---------------|--------------------|--------------------|--------------------|----------|----------|-------------|---------|--|
| | Evenoure ret | a ¹³⁷ Ca | 22° C | 30° C | 40° C | 50° C | 10° C | 0° C | 10° C | 20° C | | | |
| | Exposure rat | e Cs | as read | 30 C | 40 C | as read | as read | as read | -10 C | -20 C | | | |
| | | 1 | | | | | | | | | (add units) | | |
| | | 2 | | | | | | | | | (auu units) | | |
| | | 3 | | | | | | | | | | | |
| | | 3 | | | | | | | | | | | |
| | | 4 | | | | | | | | 1 | | | |
| | | 5 | | | | | | | | | | | |
| | | 7 | | | | | | | | | | | |
| | | 1 | - | | | | | | | | | | |
| | | 0 | | | | | | | | | | | |
| | | 9 | | | | | | | | | | | |
| | | Moon | #DIV//01 | #DIV//01 | #DIV//01 | #DIV//01 | #DN//01 | #DIV//01 | #DIV//01 | #DIV//01 | | | |
| | | STD | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! #DIV/0! | #DIV/0! #DIV/0! | #DIV/0! #DIV/0! | #DIV/0! | #DIV/0! | | | |
| | | COV % | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | | | |
| | | | | | | | | | | | | | |
| Readings | within acceptance | Yes | | | | | | | | | | | |
| | range? | No | | | | | | | | 1 | | | |
| | | | | | | | | | | | | | |
| | Gamma alarm | Yes | | | | | | | | | | | |
| | (within 2s) | No | | | | | | | | | | | |
| | Neutron alarm | Yes | | | | | | | | | | | |
| | (within 5s) | No | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | ID Trial 1 | 133Ba+137Cs | | | | | | | | | Reco | rd all | |
| | ID Trial 2 | ¹³³ Ba+ ¹³⁷ Cs | | | | | | | | | Radion | uclides | |
| | ID Trial 3 | ¹³³ Ba+ ¹³⁷ Cs | | | | | | | | | Ident | ified | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | (± 15%) Accep | otance Range: | #DIV/0! | to | #DIV/0! | | | | | |
| | | | | | | -15% | | + 15 % | | | | | |
| | | | | | | | | | | | | | |
| | Gamma alarm: | F | Record maximu | m time to alarm: | | | seconds | | | | | | |
| | | | | | | | | | | | | | |
| | | | Record minimu | m time to alarm: | | | seconds | | | | | | |
| | | | | | | | | | | | | | |
| | Neutron alarm | F | Record maximu | m time to alarm. | | | seconds | | | | | | |
| | (if appplicable) | | | | | | | | | | | | |
| | | | Record minimu | m time to alarm: | | | seconds | | | | | | |
| | | | | | | | | | | | | | |
| | Co | | | | | | | | | | | | |
| | Comments: | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | Co | mpleted by: | | | | | Date: | | | | | | |
| | | | | | | | | | | | | | |
| | Re | eviewed by: | | | | | Date: | | | | | | |
| | | | | | | | | | | | | | |

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| | | | | | Section | on 7.3 1 | Tempe | ratur | e Sho | ock | | | | | | | |
|----------------------|-------------------------|-------------|-------------|------------|--------------|--------------|-------------|-----------|-----------|---------------|----------|-------------|---------|------|---|---|--|
| | | | | | • | Test Da | ata and | Rep | ort | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Manufacturer: | | | | | | | | | | | | | | | | | |
| Instrument: | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Model: | | | | | Seria | I Number | : | | _ | | | | | | | | |
| Date Performed: | | | | | Tes | Location | : | | _ | | | | | | | | |
| made in less tha | in 5 min. occur as a | result of t | the changin | g temper | ature condit | ions alone. | Relative hu | ımidity s | hall be w | vithin the ra | ange spe | cified in T | able 1. | | | | |
| Note: | Comment | s are ren | uired when | the reau | irement is | not verified | | | | | | | | | | | |
| | | 0 0.0 109 | | i ino roqe | | | | | | | | | | | | | |
| Ambient C | onditions: | | | °C | | %RH | | in HG | | | | | | | | | |
| Test Equipment Used: | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Sources Data: | | | | | | | | | | | 1 | , | , | | 1 | 1 | |
| | | | | | | | | | | | | | | | | | |

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| | | | | | | | INIE | asureme | nt Res | ults_ | | | | | | | | | | | |
|--------------------------------------|-----------|---|--|---|---|--|-------------------------|--|-----------|------------|------------|---------|---------|----------------------|---------|----------|----------|---------|---------|----------|--------------------------|
| 22° C | Exposur | e rate ¹³⁷ | Cs | | | 22 to | -20° C | | | - 20 to | 22° C | | | 22 to | 50° C | | | 50 to | 22° C | <u> </u> | |
| | Exposu | e rate | | | 15 | 30 | 45 | 60 | 15 | 30 | 45 | 60 | 15 | 30 | 45 | 60 | 15 | 30 | 45 | 60 | (add units) |
| 1 | <u>N</u> | lominal M | lean | | | | | | | | | | | | | | | | | | |
| 2 | Acc | eptance | Range | | | | | | | | | | | | | | | | | | |
| 3 | #DIV/U! | to | #DIV/U! | | | | | | | | | | | | | | | | | | |
| 5 | (-15%) | | (+15%) | | | | | | | | | | | | | | | | | | |
| 6 | (, | | (, | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | | | |
| n #DIV/01 | | | | Mean | #DI\//01 | #DIV/01 | #DIV/0 | #DIV/01 | #DIV/01 | #DIV/01 | #DIV/01 | #DIV/01 | #DIV/01 | #DIV/01 | #DIV/01 | #DIV/01 | #DIV/0I | #DIV/01 | #DIV/01 | #DIV/0I | |
| #DIV/0! | | | | STD | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | |
| 6 #DIV/0! | | | | COV% | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | |
| | | | Co | onf-Int (-) | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | |
| | | | Co | nf-Int (+) | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | |
| | | | | | | - | - | 1 | | 1 | 1 | 1 | u | | | | r | | 1 | | |
| | | Readir | ngs within | Yes | | | | | | | | | | | | | | | | | |
| | | acceptan | ce range? | No | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | Gamma | a alarm | Yes | | | | | | | | | | | | | | | | | |
| | | (withi | n 2s) | No | | | | | | | | | | | | | | | | | |
| | | Neutror | n alarm | Yes | | | | | | | | | | | | | | | | | |
| | | (withi | n 5s) | No | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | ID Tria | 1 1 ¹³³ Ra+ | 137 | | | | | | | | | | | | | | | | | Deee |
| | | | ים שני | 03 | | | | | | | | | | | | | | | | | Reco |
| | | ID Tria | ll 2 ¹³³ Ba+ | - ¹³⁷ Cs | | | | | | | | | | | | | | | | | Radion |
| | | ID Tria ID Tria | ll 2 ¹³³ Ba+ ll 3 ¹³³ Ba+ | - ¹³⁷ Cs - ¹³⁷ Cs | | | | | | | | | | | | | | | | | Radion |
| | | ID Tria ID Tria | I 2 ¹³³ Ba+ I 3 ¹³³ Ba+ | - ¹³⁷ Cs - ¹³⁷ Cs | | | | | | | | | | | | | | | | | Radion |
| | | ID Tria ID Tria | I 2 ¹³³ Ba+ I 3 ¹³³ Ba+ | - ¹³⁷ Cs - ¹³⁷ Cs | | | | | | | | | | | | | | | | | Radion |
| | | ID Tria ID Tria | II 2 ¹³³ Ba+ | ⁻¹³⁷ Cs ⁻¹³⁷ Cs | teria: | | | | | | | | | Δ. | Ba-133 | Cs-137 | | | | | Radion |
| | | ID Tria ID Tria | I 2 ¹³³ Ba+ I 3 ¹³³ Ba+ | - ¹³⁷ Cs - ¹³⁷ Cs - ¹³⁷ Cs Dtance Crit | teria: des ID: (A | is correct | | | | | | | | A: B: | Ba-133 | , Cs-137 | | | | | Reco Radioni Ident |
| | | ID Tria ID Tria | ID Accept Correct F | tance Cri Radionucli | teria: des ID: (A k Pass/Fa | is correct il: Compar |) ison of ID I | esults at | test poin | ts with th | ne ID resu | lts at | | A: B: C: | Ba-133 | , Cs-137 | | | | | Reco Radioni Ident |
| | | ID Tria ID Tria | ID Accep Correct F Tempera ambient | tance Cri Radionucli ture shocl | teria: des ID: (A k Pass/Fa ire being ti | is correct il: Compar he baselin |) ison of ID r e. | esults at | test poin | ts with th | ne ID resu | lts at | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | Reco Radioni Ident |
| | | ID Tria | I 2 ¹³³ Ba+ I 3 ¹³³ Ba+ I A Correct F Correct F Tempera ambient | 1 ¹³⁷ Cs 1 ¹³⁷ Cs | teria: des ID: (A k Pass/Fa ire being ti | is correct il: Compar he baselin |) ison of ID I | esults at | test poin | ts with th | ne ID resu | lts at | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | Radion |
| | | ID Tria | I 2 ¹³³ Ba+ I 3 ¹³³ Ba+ I A Ccep Correct F Tempera ambient | 137Cs 137Cs 137Cs 137Cs 137Cs 137Cs 137Cs 1400nucli ture shocl temperatu | teria: des ID: (A k Pass/Fa ire being ti | is correct il: Compar he baselin |) ison of ID 1 e. | esults at | test poin | ts with th | ne ID resu | Its at | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | Reco |
| | | ID Tria | ID Accep Correct F Tempera ambient | ¹³⁷ Cs ¹³⁷ Cs ¹³⁷ Cs ¹³⁷ Cs ¹³⁷ Cs ¹³⁷ Cs ¹³⁷ Cs ¹³⁷ Cs ¹³⁷ Cs ¹³⁷ Cs | teria: des ID: (A k Pass/Fa ire being ti | is correct il: Compar he baselini |) ison of ID i | esults at | test poin | ts with th | ne ID resu | lts at | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | Reco |
| a alarm: | | ID Tria | ID Acception of the second sec | 137Cs 137Cs 137Cs 137Cs Dance Crit Radionucli ture shocl temperatu | teria: des ID: (A k Pass/Fa ire being t to alarm: | is correct il: Compar he baselin |) ison of ID r e. | esults at seconds | test poin | ts with th | e ID resu | Its at | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | Reco |
| a alarm: | | ID Tria | ID Acception 13 Control 12 Control 13 Contro | 137Cs | teria: des ID: (A k Pass/Fa ire being ti to alarm: | is correct il: Compar he baselin |) ison of ID r e. | esults at seconds | test poin | ts with th | ie ID resu | lts at | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | Reco |
| a alarm: | | ID Tria ID Tria Rec | ID Acception of the second maximum cord mining and the second maximum cord mining and the second maximum cord mining and the second | 137 Cs 137 Cs 137 Cs 137 Cs 137 Cs 137 Cs 147 Cs 14 | teria: des ID: (A k Pass/Fa ire being ti to alarm: to alarm: | is correct il: Compar ile baselini |) ison of ID r e. | esults at seconds | test poin | ts with th | ne ID resu | lits at | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | Radion |
| a alarm: | | ID Tria ID Tria Rec | ID Acception of the second maximum of the second minimum of the second maximum of the se | 137 Cs 137 Cs 137 Cs 137 Cs Datance Crii Radionucli ture shocl temperatu mum time | teria: des ID: (A k Pass/Fa ire being ti to alarm: to alarm: | is correct il: Compar he baselin |) ison of ID r e. | esults at seconds | test poin | ts with th | ne ID resu | lts at | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | Redo |
| a alarm: | | ID Tria | ID Acception of the second maximum condition of the second maximum condition of the second maximum condition of the second maximum condition of th | 137 Cs 137 Cs 137 Cs 137 Cs 137 Cs 100 100 100 100 100 100 100 10 | teria: des ID: (A k Pass/Fa ire being ti to alarm: to alarm: | is correct il: Compar he baselini |) ison of ID r e. | esults at seconds seconds | test poin | ts with th | ne ID resu | lits at | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | Redom |
| a alarm: picable) | | ID Tria | ID Acception of the second maximum cord maxi | 137 Cs 1137 Cs | teria: des ID: (A k Pass/Fa rre being ti to alarm: to alarm: to alarm: | is correct il: Compar he baselin |) ison of ID r e. | esults at seconds seconds | test poin | ts with tr | ne ID resu | lits at | | | Ba-133 | , Cs-137 | | | | | |
| a alarm: plicable) | | ID Tria | I 2 ¹³³ Ba+ I 3 ¹³³ Ba+ I 3 ¹³³ Ba+ I 3 ¹³³ Ba+ Correct F Tempera ambient | 137Cs | teria: des ID: (A k Pass/Fa rre being ti to alarm: to alarm: to alarm: to alarm: | is correct il: Compar he baselini |) ison of ID I e. | esults at seconds seconds seconds | test poin | ts with th | e ID resu | its at | | | Ba-133 | Ca-137 | | | | | |
| a alarm: plicable) | | ID Tria ID Tria Rec Rec Rec | ID Accep Correct F Tempera ambient | 137Cs 137Cs 137Cs 137Cs 137Cs 1400nucli ture shocl temperatu mum time mum time mum time | teria: des ID: (A k Pass/Fa re being ti to alarm: to alarm: to alarm: to alarm: | is correct il: Compar he baselini |) ison of ID I e. | esults at seconds seconds seconds | test poin | ts with th | e ID resu | its at | | | Ba-133 | , Ca-137 | | | | | |
| a alarm: plicable) | | ID Tria | ID Accep Correct F Tempera ambient | 137Cs 137Cs 137Cs 137Cs 24dionucli ture shocl temperatu mum time mum time mum time | teria: des ID: (A k Pass/Fa re being ti to alarm: to alarm: to alarm: to alarm: | is correct il: Compar he baselini |) ison of ID I e. | esults at seconds seconds seconds | test poin | ts with th | e ID resu | its at | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | |
| a alarm: plicable) | | ID Tria | I 2 ¹³³ Ba+ I 3 ¹³³ Ba+ I 3 ¹³³ Ba+ I 3 ¹³³ Ba+ Correct F Tempera ambient | 137Cs 137Cs 137Cs 137Cs 137Cs 1400nucli ture shocl temperatu mum time mum time mum time | teria: des ID: (A k Pass/Fa ire being ti to alarm: to alarm: to alarm: to alarm: | is correct il: Compar he baselin |) ison of ID I e. | esults at seconds seconds seconds | test poin | ts with th | ie ID resu | lits at | | | Ba-133 | , Cs-137 | | | | | |
| a alarm: | Comments: | ID Tria | I 2 ¹³³ Ba+ I 3 ¹³³ Ba+ I 3 ¹³³ Ba+ I 3 ¹³³ Ba+ Correct F Tempera ambient | 137 Cs 137 Cs 137 Cs 137 Cs 137 Cs 137 Cs 147 Cs | teria: des ID: (A k Pass/Fa ire being ti to alarm: to alarm: to alarm: | is correct il: Compar he baselin |) ison of ID r e. | esults at seconds seconds seconds | test poin | ts with th | ie ID resu | lits at | | | Ba-133 | Cs-137 | | | | | |
| a alarm: | Comments: | ID Tria | ID Accept I a ¹³³ Ba+ I a ¹³³ Ba+ ID Accept Correct F Tempera ambient cord maxing cord | 137 Cs 137 Cs 137 Cs 137 Cs 137 Cs 137 Cs 147 Cs | teria: des ID: (A k Pass/Fa ire being ti to alarm: to alarm: to alarm: | is correct il: Compar he baselin |) ison of ID r e. | esults at seconds seconds seconds | test poin | ts with th | ie ID resu | lts at | | | Ba-133 | , Cs-137 | | | | | |
| a alarm: pincable) | Comments: | ID Tria | ID Accept I 2 ¹³³ Ba+ I 3 ¹³³ Ba+ ID Accept Correct F Tempera ambient cord maxim cord maxim cord maxim | 137Cs 137Cs 137Cs 137Cs 137Cs 147Cs | teria: des ID: (A k Pass/Fa ire being ti to alarm: to alarm: to alarm: | is correct il: Comparing he baseline |) ison of ID r e. | esults at seconds seconds seconds | test poin | ts with th | ie ID resu | lts at | | | Ba-133 | , Cs-137 | | | | | |
| a alarm: pincable) | Comments: | ID Tria | ID Accept and a standard stand | 137Cs 137Cs 137Cs 137Cs 137Cs 147Cs | teria: des ID: (A k Pass/Fa tre being ti to alarm: to alarm: to alarm: | is correct il: Compar he baselin |) ison of ID r e. | esults at seconds seconds seconds | test poin | | ie ID resu | | | | Ba-133 | , Cs-137 | | | | | |
| a alarm: | Comments: | ID Tria | ID Acception of the second maximum of the se | 137Cs | teria: des ID: (A k Pass/Fa rre being ti to alarm: to alarm: to alarm: to alarm: | is correct il: Compar he baselini |) ison of ID i e. | esults at seconds seconds seconds | test poin | ts with th | e ID resu | | | | Ba-133 | | | | | | |
| a alarm: pin alarm: pin cable) | Comments: | ID Tria | ID Acception of the second maximum of the se | 137Cs 137Cs 137Cs 137Cs 137Cs 137Cs 137Cs mutance Cri Radionucli ture shock temperatu mum time mum time mum time | teria: des ID: (A k Pass/Fa ire being ti to alarm: to alarm: to alarm: | is correct il: Compar he baselini |) ison of ID i e. | esults at seconds seconds seconds | test poin | ts with th | e ID resu | | | A: B: C: D: | Ba-133 | , Cs-137 | | | | | |

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| | Se | ections 7.4 - | Humidity | | |
|-------------------|----------------------|----------------------|-----------------------------|----------------|-----------|
| | Т | est Data an | d Report | | |
| | | | | | |
| Manufacturer: | | | | | |
| Instrument: | | | | | |
| Model: | | | | Serial Number: | |
| Date Performed: | | | | Test Location: | |
| | | | | | |
| | The instrument ch | all function correct | ly over the range of relati | | 02% DH at |
| Requirements: | 35 °C No alarma | | sult of the humidity conc | titions alone | 95% RH al |
| | 55 C. NO didititis s | | | attoris alone. | |
| | | | | | |
| Note | Comments are req | uired when the rea | wirement is not verified | | |
| Note. | Commente die req | | | | |
| 1 | | | | | |
| mbient Conditions | | °C | %RH | | in HG |
| | | | //// | | |
| Test | Equipment Used: | | | | |
| | | | | | |
| | | | | | |
| | Source Data: | | | | |

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| | | Meas | surement Res | sults_ | | | | | |
|-----------------|---|---------------|------------------|--------------|--------------|---------------|---------|-----------|------|
| | | | | | | | | | |
| | | Nominal | | | | | | | |
| | | 40% RH | 93% RH | 40% RH | | | | | |
| | | 22° C | 35° C | 35° C | | | | | |
| | | Expo | sure Rate Rea | idings | | | | | |
| | 1 | | | | (add units) | | | | |
| | 2 | | | | | | | | |
| | 3 | | | | | | | | |
| | 4 | | | | | | | | |
| | 5 | | | | | | | | |
| | 6 | | | | | | | | |
| | 7 | | | | | | | | |
| | 8 | | | | A | cceptance | Range E | xposure F | Rate |
| | 9 | | | | | #DIV/0! | to | #DIV/0! | |
| | 10 | | | | | low 15% | _ | hiah 15% | |
| | Mean | #DN//0I | #DIV/01 | #DIV/01 | | | | 5 | |
| | | #DN//01 | #DIV/0 | #DN/0 | | | | | |
| | | #DIV/0! | #DIV/0! | | | | | | |
| | COV % | #DIV/0! | #DIV/0! | #DIV/0! | | | | | |
| | | | | | | | | | |
| Readings with | nin Yes | | | | · | | | | |
| acceptance rang | er No | | | | | | | | |
| | | | | | | | | | |
| Gamma alarm | Yes | | | | | | | | |
| (within 2s) | No | | | | | | | | |
| Neutron alarm | Yes | | | | | | | | |
| (within 5s) | No | | | | | | | | |
| | | | | | | | | | |
| | ID Trial 1 133Ba+137Cs | | | | | | 1 | | |
| | ID Trial 2 ¹³³ Ba+ ¹³⁷ Cs | | | | Record all F | Radionuclides | | | |
| | ID Trial 3 ¹³³ Ba+ ¹³⁷ Cs | | | | lder | itilied | | | |
| | | | | | | | | | |
| | | | ļ | | | | | | |
| | | | | | | | | | |
| Gamma aları | m: Ri | ecord maximu | m time to alarm. | | | seconds | | | |
| | | | | | | | | | |
| | F | Record minimu | m time to alarm: | | | seconds | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Neutron aları | m: R | ecord maximu | m time to alarm: | | | seconds | | | |
| (if appplicab | le) | | m time te elermi | | | aaaanda | | | |
| | | | m time to alam. | | | seconds | | | |
| | | | | | | | | - | |
| Comments: | | | | | | | | | |
| - | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Completed b | oy: | | | Date: | | | | | |
| B | | | | D - / | | | | | |
| Reviewed b | ру: | | | Date: | | | | | |
| | | | | | | | | | |

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| | Secti | ions 7.5.2 - N | loisture | and Dust F | Protection - | Dust | |
|-------------------------------------|-----------------------------------|--|--|---|--|--|----|
| | | Т | est Data | and Repor | t | | |
| Manufa | acturer: | | | | | | |
| Inst | trument: | | | | | | |
| | Model: | | | | Seri | ial Number: | |
| Date Per | rformed: | | | | Те | st Location: | |
| Requir | rements: | The instrument cas means that the ins For IP53, the ingre quantity to interfere water sprayed at a effects. | e design sha trument shall ss of dust is r e with satisfac n angle up to | Il meet the requir be protected from not totally prevent tory operation of 60° on either side | ements stated for n the ingress of du ted, but dust shall the instrument or e of the vertical sh | IP code 53 [R13], whi ust and spraying water not penetrate in a to impair safety, and hall have no harmful | ch |
| | Note: | Comments are req | uired when the | e requirement is | not verified. | | |
| Ambient Cor Test Equipme Sour | nditions: nt Used: ce Data: | | °C | | %RH | in HG | |

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| E | ST AND EVALUATION PROTOCOL FLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | ST AND EVALUATION PROTOCOLTEP NO. N42.48 FLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. EFF. DATE 2010-11-09 | ST AND EVALUATION PROTOCOLTEP NO. N42.48PREPARI DIV682TLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security.EFF. DATE 2010-11-09REV. 1.02 |

| | | Pre-Test | Post Test | | | | |
|----------------------|--|----------------|-------------------|--------------|--------------|-----------------|-----------|
| | | Response | Response | | | | |
| | | Photon | Readings | (add units) | | | |
| | 1 | | | (, | | | |
| | · · | | | | | | |
| | 2 | | | | | | |
| | 3 | | | | | | |
| | 4 | | | | | | |
| | 5 | | | | | | |
| | 6 | | | | Acce | ptance Ra | nge |
| | 7 | | | | | | |
| | 8 | | | | #DIV/0! | to | #DIV/0! |
| | 0 | | | | low 15% | | high 15% |
| | 9 | | | | 1010 1370 | | nigh 1576 |
| | 10 | | | | | | |
| | Mean | #DIV/0! | #DIV/0! | | | | |
| | STD | #DIV/0! | #DIV/0! | | | | |
| | COV % | #DIV/0! | #DIV/0! | | | | |
| | | | | | | | |
| Was the next test re | snonse within the | V | | | | | |
| was the post-test re | ccontance range? | Yes | | | | | |
| a | cceptance range: | No | | | | | |
| | | | | | | | |
| Gamma alarm | Yes | | | | | | |
| (within 2s) | No | | | | | | |
| Neutron alarm | Yes | | | | | | |
| (within 5s) | No | | | | | | |
| (| NO | | | | | | |
| | | | | | | - | |
| ID | Trial 1 ¹³³ Ba+ ¹³⁷ Cs | | | Record all P | adionuclidae | | |
| ID | Trial 2 ¹³³ Ba+ ¹³⁷ Cs | | | Record all R | tified | | |
| ID | Trial 3 ¹³³ Ba+ ¹³⁷ Cs | | | luen | lineu | | |
| | | | | | | 4 | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Gamma alarm: | R | ecord maximur | n time to alarm: | | | seconds | |
| | | | | | | | |
| | F | Record minimur | n time to alarm: | | 1 | seconds | |
| | | | | | | | |
| | ~ | | | | | | |
| Neutron alarm: | R | ecora maximur | ii time to alarm: | | ī | seconas | |
| (it applicable) | - | | n time to alars | | | a a a a a a a a | |
| | ŀ | xecora minimur | ii time to alarm: | | 1 | seconas | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | Yes | No | { | |
| Did dus | t penetrate the ins | trument to the | extent where | | | | |
| | op | peration could | be impacted? | L | |] | |
| | | | | | | | |
| | | | | | | | |
| Comments: | | | | | | | _ |
| | | | | | | | _ |
| | | | | | | | |
| Completed by: | | | | Date: | | | _ |
| | | | | | | | |
| Reviewed by: | | | | Date: | | | _ |
| | | | | | | | |



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| Manufacturer: | | | 1 | Fest Data a | nd Report | | | |
|---|--------------------|-------------------------------------|--|--|--|--|---------------------------------------|-------------|
| Instrument: Serial Number: Model: Serial Number: Date Performed: Test Location: Requirements: The test shall be made using a suitable nozzle (see IEC 60068-2-75: 1997) with the water pressure adjusted to give flow rate of 10 L/min ±5%, which should be kept constant during the test. The water temperature should not differ by more than 5 °C from the temperature of the instrument under test. The test duration is 1 min/m2 of the calculated surface area of the instrument with a minimum duration of 5 min. Note: Comments are required when the requirement is not verified. mbient Conditions: °C %RH in HG st Equipment Used: In HG In HG In HG | Мэ | nufacturer | | | | | | |
| Model: Serial Number: Date Performed: Test Location: Requirements: The test shall be made using a suitable nozzle (see IEC 60068-2-75:1997) with the water pressure adjusted to give flow rate of 10 L/min ±5%, which should be kept constant during the test. The water temperature should not differ by more than 5 °C from the temperature of the instrument with a minimum duration of 5 min. Note: Comments are required when the requirement is not verified. mbient Conditions: °C %RH in HG st Equipment Used: Source Data: In HG In HG | Ina | Instrument: | | | | | | |
| Model: Serial Number: Date Performed: Test Location: Requirements: The test shall be made using a suitable nozzle (see IEC 60068-2-75:1997) with the water pressure adjusted to give flow rate of 10 L/min ±5%, which should be kept constant during the test. The water temperature should not differ by more than 5 °C from the temperature of the instrument under test. The test duration is 1 min/m2 of the calculated surface area of the instrument with a minimum duration of 5 min. Note: Comments are required when the requirement is not verified. mbient Conditions: °C %RH in HG st Equipment Used: Note: Commentaries Note: | | | | | | | | |
| Requirements: The test shall be made using a suitable nozzle (see IEC 60068-2-75:1997) with the water pressure adjusted to give flow rate of 10 L/min ±5%, which should be kept constant during the test. The water temperature should not differ by more than 5 °C from the temperature of the instrument under test. The test duration is 1 min/m2 of the calculated surface area of the instrument with a minimum duration of 5 min. Note: Comments are required when the requirement is not verified. # °C %RH in HG st Equipment Used: | Date | Model: Performed: | | | | Seria | I Number: | |
| Requirements: The test shall be made using a suitable nozzle (see IEC 60068-2-75:1997) with the water pressure adjusted to give flow rate of 10 L/min ±5%, which should be kept constant during the test. The water temperature should not differ by more than 5 °C from the temperature of the instrument under test. The test duration is 1 min/m2 of the calculated surface area of the instrument with a minimum duration of 5 min. Note: Comments are required when the requirement is not verified. mbient Conditions: °C %RH in HG st Equipment Used: In HG In HG In HG | | | | | | | | |
| Note: Comments are required when the requirement is not verified. mbient Conditions: °C %RH in HG st Equipment Used: Source Data: Source Data: Source Data: | | | the temperature | the test. The wa | ter temperature she | ould not differ by | / more thar min/m2 of | 1 5 °C from |
| mbient Conditions: °C %RH in HG | | | constant during the temperature calculated surfa | the test. The war of the instrumen ace area of the ins | ter temperature sho it under test. The to strument with a min | ould not differ by est duration is 1 himum duration | / more thar min/m2 of of 5 min. | the |
| st Equipment Used: | | Note: | constant during the temperature calculated surfa | the test. The war of the instrumen ace area of the ins | ter temperature sho it under test. The to strument with a min e requirement is no | ould not differ by est duration is 1 himum duration t verified. | / more thar min/m2 of of 5 min. | the |
| Source Data: | mbient | Note: Conditions: | constant during the temperature calculated surfa | of the test. The war of the instrument ace area of the instrument required when the °C | ter temperature sho it under test. The to strument with a min e requirement is no | ould not differ by est duration is 1 nimum duration t verified. | / more thar min/m2 of of 5 min. | in HG |
| | mbient st Equip | Note: Conditions: oment Used: | Constant during the temperature calculated surfa | of the test. The war of the instrument ace area of the instrument required when the °C | ter temperature sho it under test. The to strument with a min e requirement is no | ould not differ by est duration is 1 nimum duration t verified. | / more thar min/m2 of of 5 min. | in HG |

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| | | Pre-Test | Post Test | | | | |
|----------------------|---|------------------|------------------|------------------|---------|-----------|----------|
| | | Response Respons | | | | | |
| | | Photon R | Readings | (add units) | | | |
| | 1 | | | | | | |
| | 2 | | | | | | |
| | 3 | | | | | | |
| | 4 | | | | | | |
| | 5 | | | | | | |
| | 5 | | | | | | |
| | | | | | A | ntanaa F | |
| | 1 | | | | Acce | еріансе г | kange |
| | 8 | | | | | | |
| | 9 | | | | #DIV/0! | to | #DIV/0! |
| | 10 | | | | low 15% | | high 15% |
| | Mean | #DIV/0! | #DIV/0! | | | | |
| | STD | #DIV/0! | #DIV/0! | | | | |
| | COV % | #DIV/0! | #DIV/0! | | | | |
| Was the post-test re | esponse within the | Yes | | | | | |
| . a | icceptance range? | No | | | | | |
| | - | | | | | | |
| Commo olorm | No. | | | | | | |
| (within 2s) | res | | | | | | |
| (within 23) | No | | | | | | |
| Neutron alarm | Yes | | | | | | |
| (within 5s) | No | | | | | | |
| | | | | | | | |
| |) Trial 1 ¹³³ Ba+ ¹³⁷ Cs | | | Deserved all Des | | | |
| IC | ID Trial 2 ¹³³ Ba+ ¹³⁷ Cs | | | Record all Rad | | | |
| IC |) Trial 3 ¹³³ Ba+ ¹³⁷ Cs | | | Identified | | | |
| | | | | | | <u>.</u> | |
| | | | | | | | |
| | | | | | | | |
| Gamma alarm | • | Record maximum | n time to alarm: | | | seconds | |
| Gainna alarni | • | | | | | 3600103 | |
| | | Record minimun | n time to alarm: | | | seconds | |
| | | | | | | | |
| | | | | | | | |
| Neutron alarm | : | Record maximum | n time to alarm: | | | seconds | |
| (if applicable |) | | | | | | |
| | | Record minimun | n time to alarm: | | | seconds | |
| | | | | | | | |
| | | | | | | | |
| | • • • • • • | | Yes | No | | | |
| Dic | d water penetrate f | the instrument? | | | | | |
| | | | | | | | |
| Commonto | • | | | | | | |
| comments | - | | | | | | - |
| | | | | | | | - |
| Completed by | : | | | Date: | | | |
| | | | | | | | _ |
| Reviewed by | : | | | Date: | | | |
| | | | | | | | |



TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland

Security.

EFF. DATE

2010-11-09

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| | | Sections 7.6 | - Cold T | emperatur | e Start Up | | | |
|------------------------------------|---|---|-------------|------------|------------|-----------|------|--|
| | | Те | st Data | and Report | - | | | |
| Manu | facturer: | | | | | | | |
| Instrument: | | | | | | | | |
| | Model: | | | | Seria | I Number: | | |
| Date Performed: | | | | Test | Location: | | | |
| Requ | irements: | Image: Second state The instrument shall be able to operate when switched on at the cold temperature limit (-20 °C). Pre-Test and Post-Test are made at 22 °C | | | | | | |
| | Note: Comments are required when the requirement is not verified. | | | | | | | |
| Ambient Co | onditions: | | °C | | %RH | i | n HG | |
| Manufacturers stated warm-up time: | | | (add units) | | | | | |
| | Test | Equipment Used: | | | | | | |
| | | Source Data: | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | | |
|---|---|---|--|--|
| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 70 of 94 | |
| 1 | FEST AND EVALUATION PROTOCOL FITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security | TEST AND EVALUATION PROTOCOLTEP NO. N42.48FITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland SecurityEFF. DATE 2010-11-09 | TEST AND EVALUATION PROTOCOLTEP NO. N42.48PREPARE DIV682TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland SecurityEFF. DATE 2010-11-09REV. 1.02 | |

| | | | Pre-Test | Post-Test | Readings at | | | | |
|------------|---|--|---------------|------------------|-------------|---------------|-----------|----------|------------|
| | | | Readings | Readings | - 20 °C | | | | |
| | | | P | hoton Reading | gs | | | | |
| | | 1 | | | | (add units) | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 4 | | | | | | | |
| | | 5 | | | | | | | |
| | | 6 | | | | | 1 000 | ntanaa F | longo |
| | | 7 | | | | | Acce | рансе г | lange |
| | | 0 | | | | | #רוע | to | #רוע |
| | | 10 | | | | | HDIV70: | 10 | high 15% |
| | | Mean | #DIV/01 | #DIV/01 | #DIV/01 | | 1011 1070 | | night 1070 |
| | | STD | #DIV/0! | #DIV/0! | #DIV/0! | | | | |
| | | COV % | #DIV/0! | #DIV/0! | #DIV/0! | | | | |
| | Were the | results within the | Yes | <i></i> | | | | | |
| | accep | tance range? | No | | | | | | |
| | | _ | | | | | | | |
| Gamma | alarm | Vas | | | | | | | |
| (withir | n 2s) | No | | | | | | | |
| Neutron | alarm | Yes | | | | | | | |
| (within | 1 5s) | No | | | | | | | |
| | | | | | | | | | |
| | ID | Trial 1 ¹³³ Ba+ ¹³⁷ Cs | | | | Reco | rd all | | |
| | ID Trial 2 ¹³³ Ba+ ¹³⁷ Cs | | | | | Radionuclides | | | |
| | ID Trial 3 ¹³³ Ba+ ¹³⁷ Cs | | | | | lden | tified | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Gamı | ma alarm: | R | ecord maximur | m time to alarm: | | | seconds | | |
| | | | Poord minimum | n time te elerm: | | | aaaanda | | |
| | | F | | n time to alarm. | | | seconds | | |
| | | | | | | | | | |
| Neutr | Neutron alarm: R | | | m time to alarm: | | | seconds | | |
| (if | (if applicable) | | | - time to slave. | | | | | |
| | | r | | n time to alarm. | | 1 | seconds | | |
| | | | | | | | | | |
| Comments: | | | | | | | | | |
| oonnients. | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Com | nleted by: | | | | Date | | | | |
| Com | pieteu by. | | | | Dale. | | | | |
| Rev | iewed by: | | | | Date: | | | | |
| | | | | | | | | | |


Security.

| | | Section | 8.2 Ele | ctrosta | tic Discl | harge | | |
|-------------------|-------------|-------------|---------------|----------------|--------------|---------------|---------------|-----------------|
| | | | Test Da | ta and | Report | 0 | | |
| Manufacturer: | | | | | | | | |
| Instrument | : | | | | | | | |
| | | | | | | | | |
| Model | : | | | Seria | al Number: | | | |
| Date Performed | : | | | les | t Location: | | | |
| R | equirement: | During exp | osure to elec | ctrostatic dis | scharges at | intensities | of up to 6 kV | using the |
| | 1 | contact dis | charge tech | nique, the ir | nstrument sh | all function | correctly. | lo alarms shall |
| | | occur as a | result of the | electrostati | c discharge | alone. | | |
| | | | | | | | | |
| | Note | Comments | are required | when the r | equirement i | s not verifie | d | |
| | Note. | Comments | | | equilement | 3 HOL VEHILE | | |
| | | | | | | | | |
| | Ambient (| Conditions: | | °C | | % RH | | in Hg |
| | | | | | | | | |
| | Test Equip | nentUsed: | | | | | | |
| | S. | urco Data: | | | | | | |
| | 30 | | | | | | | |
| | | | Meas | urement R | esults | | | |
| Test with sources | | | | | | | | |
| | Pre-Test | | | | | | | |
| | Response | | | | | | | |
| | | | | | | | | |
| | | (add units) | | | | | | |
| | 2 | | Acc | ontanco Pa | ngo | | | |
| | 1 | | ALL | epiance na | inge | | | |
| | 5 | | #DIV/0! | to | #DIV/0! | | | |
| (| 6 | | low (-15%) | | high (+15%) | | | |
| | 7 | | | | | | | |
| 8 | 3 | | | | | | | |
| | | | | | | | | |
| Maar | | | | | | | | |
| str | #DIV/0! | | | | | | | |
| COV | #DIV/0 | | | | | | | |
| | | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | |
|--|-----------------------------|-------------------------------|-------------------------|
| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 72 of 94 |

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| | | | Post-test Readings | | | | | |
|----------------------|--------------|--------------------------------------|--------------------|-----------|---------|-------------|---------|---|
| | | | Gamn | na Exposu | re rate | | | |
| | | | 2 kV | 4 kV | 6 kV | | | |
| | | | | | | | | |
| | | 1 | | | | (add units) | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| | | 4 | | | | | | |
| | | 5 | | | | | | |
| | | 6 | | | | | | |
| | | 7 | | | | | | |
| | | 8 | | | | | | |
| | | 9 | | | | | | |
| | | 10 | | | | | | |
| | | Mean | #DIV/0! | #DIV/0! | #DIV/0! | | | |
| Were the res | sults within | Yes | | | | | | |
| the acceptar | nce range? | No | | | | | | |
| | | | | | | | | |
| Gamma | alarm | Yes | | | | | | |
| (within | 1 2s) | No | | | | | | |
| Neutron | alarm | Yes | | | | | | |
| (within | 1 55) | No | | | | | | |
| | | | | | | | | 1 |
| | ID Trial 1 | ¹³³ Ba+ ¹³⁷ Cs | | | | Reco | ord all | |
| | ID Trial 2 | ¹³³ Ba+ ¹³⁷ Cs | | | | Radion | uclides | |
| | ID Trial 3 | Ba+ 'S'Cs | | | | iuen | unieu | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Gamma alarm | Record n | naximum tim | ne to alarm: | | | seconds | | |
| | Pecord | minimum tim | ne to alarm: | | | seconds | | |
| | Recolu | | | | | Seconds | | |
| | | | | | | | | |
| Neutron alarm | Record n | naximum tim | ne to alarm: | | | seconds | | |
| (if applicable) | | | | | | | | |
| | Record | minimum tirr | ne to alarm: | | | seconds | | |
| | | | | | | | | |
| | | | | | | | | |
| Test without sources | | | | | | | | |
| | | | | | | | | |
| | Did the in | strument al | arm during | testing? | | | | |
| | Vee | 2 kV | 4 kV | 6 kV | l | | | |
| | Tes No | | | | { | | | |
| | | | | | _ | | | |
| | | | | | | | | |
| | | | | | | | | |
| | • | | | | | | | |
| | Comments: | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Pe | erformed by: | | | | Date: | | | |
| | | | | | | | | |
| R | eviewed by: | | | | Date: | | | |
| | | | | | | | | |



TEST AND EVALUATION PROTOCOL

Security.

TEP NO. **PREPARED BY:** N42.48 DIV682 PAGE **TITLE:** Spectroscopic Personal Radiation EFF. DATE REV. Detectors (SPRDs) for Homeland 74 of 94 2010-11-09 1.02

| | 30 | | | ····• | | |
|-----------------|--|--|---|--------------------------------------|-------------------------------|--------------------------------|
| I | | Test Data | and Repor | t | | |
| | | | | | | |
| Manufacturer: | - | | | | | |
| Instrument: | | | | | | |
| Model: | | | | Seri | al Number: | |
| Date Performed: | | | | Tes | st Location: | |
| Requirement: | The instrumen | t shall not be affe | ected by radio freq | uency (RF) fiel | ds over the fi | requency range |
| | of 80 MHz to 2 RF fields, the RF field alone | 2.5 GHz at an intension in the second s | ensity of 50 volts function correctly. | per meter (V/m No alarms sha |). When exp Ill occur as a | osed to these result of the |
| Note: | Comments are | e required when t | he requirement is | not verified. | | |
| nt Conditions: | | °C | | %RH | | In. Hg |
| Test Equ | ipment Used: | | | | | |
| Fre | quency Scan | Observations W | /ithout Radioact | ve Sources | | |
| | · · | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | 1 | 1 | | | |
| | | We | ara sussantihiliti | as absorvad? | | |
| | | We | ere susceptibiliti | es observed? | | |
| | | We Yes | ere susceptibilitio | es observed? No | | |
| | | We Yes Did | ere susceptibilitio | es observed? No uring testing? | | |
| | | We Yes Did Yes | ere susceptibilitie the unit alarm d | es observed? No uring testing? | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | |
|---|-----------------------------|-------------------------------|-------------------------|
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| | | | With ¹³⁷ (| Cs Source | | | | |
|-------|----------------------------|-------------|---|--------------------|---------------|-------------|--------------|--|
| | | | <u>, , , , , , , , , , , , , , , , , , , </u> | <u> </u> | | | | |
| | Nominal Response (µR/h) | | | Source Data: | | | | |
| | - No RF | | | | | | | |
| 1 | | (add units) | | | | | | |
| 2 | | | | _ | | | | |
| 3 | | | AC | ceptance Range | "DU (/01 | | | |
| 4 | | | #DIV/0! | to | #DIV/0! | | | |
| 5 | | | low (-15%) | | high (+15%) | | | |
| 6 | | | _ | 0.01 | | | | |
| 1 | | | Fre | quency Scan Ob | oservations w | ith Radioac | tive Sources | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| Maara | #DIV//01 | | | | | | | |
| wean | #DIV/0! | | | | | | | |
| SID | #DIV/0! | | | | | | | |
| COV% | #DIV/0! | | | | | | | |
| | | | | | | | | |
| | | | We | re susceptibilitie | s observed? | | | |
| | | | Yes | | No | | | |
| | | | | | | | 4 | |
| | | | | | | | | |
| | Comments: | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | Completed by: | | | | Date: | | | |
| | | | | | | | | |
| | Reviewed by: | | | | Date: | | | |
| | | | | | | | | |
| | | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | |
|--|-----------------------------|-------------------------------|-------------------------|
| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 76 of 94 |

| | Section | ons 8.4 - | Magnetic | Fields | | | |
|----------------------|--|------------------|------------------|-------------------|-----------------|---------------|--|
| | Т | est Data | and Repo | ort | | | |
| | | | | | | | |
| Manufacturer: | | | | | | | |
| Instrument: | | | | | | | |
| | | | | | | | |
| Model: | | | | Se | rial Number: | | |
| Date Performed: | | | | Te | est Location: | | |
| | | | | | | | |
| Requirements: | When expose | ed to direct cur | rrent (dc) magn | etic fields in al | I three mutual | ly orthogonal | |
| | orientations relative to a 10 gauss (1 mT) magnetic field, the instrument shall function | | | | | | |
| | correctly. No | alarms shall o | occur as a resul | t of the magne | tic field alone | | |
| | | | | | | | |
| Note: | Comments a | re required whe | en the requirem | ent is not verifi | ed. | | |
| | | | | | | | |
| | | | | | | | |
| Ambient Conditions: | | °C | | %RH | | in HG | |
| Test Equipment Used: | | | | | | | |
| reat Equipment obcu. | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | |
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| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 77 of 94 |

| | | Mea | surement Res | ults Without | Source | | | | | | |
|------|------------------------------------|---------------|----------------|--------------|-------------------|----------|-------------|-------------------------|-------------|-------|------------|
| | | | | | | | | | | | |
| | Initial O | rientation | Second C | Drientation | Third Orientation | | | | | | |
| | Nominal | 10 Gauss | Nominal | 10 Gauss | Nominal | 10 Gauss | | | | | |
| | Zero Intensity | (DC) | Zero Intensity | (DC) | Zero Intensity | (DC) | | | | | |
| 1 | | | | | | | (add units) | | | | |
| 2 | | | | | | | _ | | Acceptance | Range | ((5)) ((2) |
| 3 | | | | | | | | Initial Orientation | n: #DIV/0! | to | #DIV/0! |
| 4 | | | | | | | - | Third Orientatio | n: #DIV/0! | to | #DIV/0! |
| 5 | | | | | | | | Third Orientation | IOW -15% | - 10 | #DIV/0! |
| 7 | | | | | | | - | | 1000 - 1070 | | night 1370 |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| Mean | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | | | | | |
| STD | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | | | | | |
| COV% | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | | | | | |
| | | | | | | | | | | | |
| | | | | | | | Yes | Did the instrument alar | n | | |
| | | | | | | | No | during the test? | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | Yes | No | | | | | |
| | Were there any functional changes? | | I changes? | | | | | | | | |
| | | | | | | | | | | | |
| | C | Observations: | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | |
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| | | Measuren | nent Results W | ith Sources | | | | | | | | |
|-----------|------------------------|-------------|----------------|---------------|----------------|----------|-------------|--------|-----------------|----------|----------|-----------|
| | | | | | | | | | | | | |
| | Source Data: | | | | | | | | | | | |
| | Jourge Party | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | M | aguromont P | oculte With C | c_127 | | | | | | | |
| | | INIT | | | <u>5-151</u> | | | | | | | |
| | Initial Ori | entation | Second C | Drientation | Third Ori | entation | | | | | | |
| | Nominal | 10 Gauss | Nominal | 10 Gauss | Nominal | 10 Gauss | | | | | | |
| | Zero Intensity | (DC) | Zero Intensity | (DC) | Zero Intensity | (DC) | | | | | | |
| 1 | | | | | | | (add units) | | | Acconton | oo Bongo | |
| 3 | ┣────┤ | | | | | | | Initia | al Orientation: | #DIV/0! | to to | #DIV/0! |
| 4 | | | | | | | | Secon | d Orientation: | #DIV/0! | to | #DIV/0! |
| 5 | | | | | | | | Thir | d Orientation: | #DIV/0! | to | #DIV/0! |
| 6 | | | | | | | | | | low -15% | | high +15% |
| 8 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| Mean | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | | | | | | |
| STD | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | | | | | | |
| COV% | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | Yes | No | | | | | | | |
| | Were there a | ny function | al changes? | | | | | | | | | |
| | <u>Dhaa muatia mar</u> | | | | | | | | | | | |
| | Juservations. | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Comments: | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| C | ompleted by: | | | | | Date: | | | | | | |
| | | | | | | | | | | | | |
| F | Reviewed by: | | | | ļļ | Date: | | | | | | |
| | | | | | | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | | |
|---|-----------------------------|-------------------------------|-------------------------|--|
| TITLE: Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security. | EFF. DATE 2010-11-09 | REV. 1.02 | PAGE 79 of 94 | |

| | Secti | on 8.5 R | adiated Em | nissions | | |
|----------------------|---------------|----------------|-------------------|----------------|-------------------|-------------|
| | | Test Dat | ta and Rep | ort | | |
| | | | | | | |
| Manufacturer: | | | | | | |
| Instrument: | | | | | | |
| Model: | | | | Ś | Serial Number: | |
| Date Performed: | | | | | Test Location: | |
| | | | | | | |
| Requirement: | RF emissior | ns from an ins | strument shall be | less than tha | at which can inte | erfere with |
| | other equipn | nent located i | n the area of use | e. RF emissio | ns when measu | red at 3 m |
| | shall be less | s than those s | shown below: | | | |
| | | | | | | |
| | | Emissior R | Strength | | | |
| | | (| MHz) | (micro v | olts/meter) | |
| | | 30 |) – 88 | | 100 | |
| | | 88 | - 216 | | 150 | |
| | | Abc | ove 960 | | 200 | |
| | | 7.000 | | | | |
| Note: | Comments a | are required w | hen the requirer | nent is not ve | rified. | |
| | | | | | | |
| Ambient Conditions | | °C | | %RH | | in HG |
| | | | | , | | |
| Test Equipment Used: | | | | | | |
| | | | | | | |
| | | | | Yes | No | |
| | Were RF e | missions ab | ove the limits? | | | |
| | | | | | | |
| | | | | | | |
| Comments: | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Performed by: | | | | Date: | | |
| Reviewed by | | | | Date: | | |
| | | | | 24.01 | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | |
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| | Section | on 9.1 Vibra | tion | | | | |
|-----------------|---|---|--|--|--|-------|--|
| | Test | Data and Re | port | | | | |
| Manufacturer | | | | | | | |
| Instrument: | | | | | | | |
| Model: | | | Seria | l Number: | | | |
| Date Performed: | | | Test | Location: | | | |
| Requirement: | The instrument sha operation of handhe functionality of the joints shall hold, nu Comments are requ | Il withstand exposi eld or hand-carried instrument shall no its and bolts shall i uired when the requ | ure to vibrations equipment. The t be affected by not come loose) irement is not w | associated physical c exposure (erified. | with the ondition and e.g.: solder | | |
| Ambient | Conditions: | °C | | %RH | | in HG | |
| Test Equip | ment Used: | | | | | | |
| S | ource Data: | | | | | | |

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|---|-----------------------------|-------------------------------|-------------------------|--|
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| | | | | 1 | | r | | | | |
|--------------------|------------------|--------------------------------------|----------|------------|---------------------|---------------------|---------------------------------------|---------|------------|---------|
| | | | | After | Aftor | Aftor | | | | |
| | | | Dre teet | Aiter A | Allei Desition D | Ailei Desition C | | | | |
| | | | Pre-test | Position A | Position B | Position C | | | | |
| | | | | Exposure R | ate Readings | | | | | |
| | | 1 | | | | | (add units) | | | |
| | | 2 | | | | | | | | |
| | | 3 | | | | | | | | |
| | | 4 | | | | | | | | |
| | | 5 | | | | | | | | |
| | | 6 | | | | | | | | |
| | | 7 | | | | | | | | |
| | | 8 | | | | | | | | |
| | | 9 | | | | | | Acc | eptance Ra | ange |
| | | 10 | | | | | | #DIV/0! | to | #DIV/0! |
| | | Mean | #DIV/0I | #DIV/01 | #DIV/01 | #DIV/01 | | -15% | | 15% |
| | | STD | #DIV/0 | #DIV/0! | #DIV/0 | #DIV/0 | | -1070 | | 1570 |
| | | COV% | #DIV/0 | #DIV/0! | #DIV/01 | #DIV/0 | | | | |
| | | 00 //0 | #DIV/0 | #DIV/0 | #DIV/0: | #DIV/0: | | | | |
| | | | | | | | | | | |
| Readings with | thin acceptance | Yes | | | | | | | | |
| | range? | No | | | | | | | | |
| | | | | | | | | | | |
| Comme | | | | | | | · · · · · · · · · · · · · · · · · · · | | | |
| Gamma | | Yes | | | | | | | | |
| (Withi | n 28) | No | | | | | | | | |
| Neutron | alarm | Yes | | | | | | | | |
| (within | n 5s) | No | | | | | | | | |
| | | | | | | | | | | |
| | | 122- 127- | | | | | | | | |
| | ID Trial 1 | ¹³⁵ Ba+ ¹³⁷ Cs | | | | | Recor | d all | | |
| | ID Trial 2 | ¹³³ Ba+ ¹³⁷ Cs | | | | | Radionu | iclides | | |
| | ID Trial 3 | ¹³³ Ba+ ¹³⁷ Cs | | | | | ldenti | fied | | |
| | | | | | | | | | | |
| D :141 - 14 | | | | | | | | | | |
| Did the inst | rument controls | Yes | | | | | | | | |
| fu | nction properly? | No | | | | | | | | |
| | | | | | | | | | | |
| Did the instrum | ent show visible | Vac | | | | | ſ | | | |
| | rternal damage? | 162 | | | | | ľ | | | |
| e^ | attar aattage! | NO | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Comments: | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Performed by: | | | | | Date: | | | | | |
| | | | | 1 | | | | | | |
| Reviewed by: | | | | | Date: | | | | | |
| | | | | | | | | | | |
| 1 | | | | | | | | | | |

| TEST AND EVALUATION PROTOCOL | TEP NO. N42.48 | PREPARED BY: DIV682 | |
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| | | Section 9 | 2 Drop rest | | | |
|-----------------|---|--|---|--|---------------------------------------|--------------------------|
| | | Test Data | and Report | | | |
| Manufacturar | | | | | | |
| Instrument: | | | | | _ | _ |
| maramona | | | | | | - |
| Model: | | | Serial Numbe | er: | | |
| Date Performed: | | | Test Locatio | n: | | |
| | | | | | | |
| Requirement: | After being subjected to | drops on oach of its six | curfaces from a beight of 1.5 | m onto a concret | o floor the instr | umont chall |
| Requirement: | After being subjected to function correctly and ala exposure. | drops on each of its six arm at a change in the i | surfaces from a height of 1.5 radiation field. It is acceptable | m onto a concre f a transient alar | e floor, the instr m occurs at the | ument shall moment of |
| Requirement: | After being subjected to function correctly and ala exposure. | drops on each of its six arm at a change in the r | surfaces from a height of 1.5 radiation field. It is acceptable | m onto a concrei f a transient alar | e floor, the instr m occurs at the | ument shall moment of |
| Requirement: | After being subjected to function correctly and all exposure. | drops on each of its six arm at a change in the r when the requirement is | s not verified. | m onto a concrei f a transient alar | e floor, the instr m occurs at the | ument shall moment of |
| Note: | After being subjected to function correctly and all exposure. | drops on each of its six arm at a change in the when the requirement is | x surfaces from a height of 1.5 radiation field. It is acceptable s not verified. | m onto a concrei f a transient alar | e floor, the instr m occurs at the | ument shall moment of |
| Note: | After being subjected to function correctly and al- exposure. Comments are required | drops on each of its six arm at a change in the i when the requirement is °C | s not verified. | m onto a concrei f a transient alar | e floor, the instr m occurs at the | ument shall moment of |
| Note: | After being subjected to function correctly and al- exposure. Comments are required ient Conditions: | drops on each of its six arm at a change in the r when the requirement is | s not verified. | m onto a concrei f a transient alar | in HG | ument shall moment of |
| Note: | After being subjected to function correctly and al- exposure. Comments are required ient Conditions: iquipment Used: Source Data: | drops on each of its six arm at a change in the requirement is when the requirement is °C | s not verified. | m onto a concrei f a transient alar | in HG | ument shall moment of |

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| | | | Pre-test | Drop 1 | Drop 2 | Drop 3 | Drop 4 | Drop 5 | Drop 6 | | | | | |
|---------------|-----------------|--|----------|---------|---------|---------------|---------|---------|---------|------------|------------|----------|-------------|---|
| | | | | | Expo | sure Rate Rea | dings | | | (add Units |) | | | |
| | | 1 | | | | | | | | 1 | | | | |
| | | 2 | | | | | | | | | | | | |
| | | 3 | | | | | | | | | | | | |
| | | 4 | | | | | | | | Į | | | | |
| | | 5 | | | | | | | | | A000 | ntanaa D | ango | |
| | | 7 | | | | | | | | ł | Acce | | ange | |
| | | 8 | | | | | | | | 1 | #DIV/0! | to | #DIV/0! | |
| | | 9 | | | | | | | | | low (-15%) | | high (+15%) |) |
| | | 10 | | | | | | | | í | | | | |
| | | Mean | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | | | | | |
| | | STD | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | | | | | |
| | | COV % | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | | | | | |
| | | | | | | | | | | | | | | |
| F | Readings within | Yes | | | | | | | | | | | | |
| acc | eptance range? | No | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Gamr | na alarm | Yes | | | | | | | | | | | | |
| (wit | hin 2s) | No | | | | | | | | | | | | |
| Neutro | on alarm | Yes | | | | | | | | | | | | |
| (wit | hin 5s) | No | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | ID Tr | ial 1 133Ba+137Cs | | | | | | | | Reco | ord all | | | |
| | ID Tr | ial 2 133Ba+137Cs | | | | | | | | Radior | nuclides | | | |
| | ID Tr | ial 3 ¹³³ Ba+ ¹³⁷ Cs | | | | | | | | Iden | tified | | | |
| | | | | | | | | | | | | | | |
| Did the instr | ument controls | Yes | | | | | | | | ĺ | | | | |
| fur | ction properly? | No | | | | 1 | | | | i | | | | |
| | | | | | | | | | | | | | | |
| Did the in | strument show | Yes | | | | | | | | i | | | | |
| visible ext | emal damage? | No | | | | | | | | 1 | | | | |
| | <u> </u> | 10 | | | | | | | | 1 | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | Comments: | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | Performed by: | | | Date: | | | | | | | | | | |
| | | | | 2010. | | | | | | | | | | |
| | Reviewed by: | | | Date: | | | | | | | | | | |
| | | | | | | | | | | | | | | |

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| | | S | Section 9 | 9.3 Impac | t (Microp | honics) | | | | |
|---|-------------|---------------|----------------|----------------|---|---------------|-------------|--------------|------------|--|
| Test Data and Report | | | | | | | | | | |
| | | | | | | | | | | |
| Mai | nufacturer: | | | | | | | | | |
| Instrument: | | | | | | | | | | |
| | | | | | | | | | | |
| | Model: | | | | Seri | al Number: | | | | |
| Date | Performed: | | | | Те | st Location: | | | | |
| | | | | | | | | | | |
| Requirement: The instrument shall be unaffected by microphonic conditions such as those that may occur from | | | | | | | | | | |
| | | low intensity | impacts fror | n sharp conta | ct with hard su | rfaces. The p | hysical co | ondition and | | |
| | | functionality | of the instru | ment shall not | be affected by | exposure (e | .g., solder | joints shall | hold, nuts | |
| | | and bolts sha | all not come | loose). | | | | | | |
| | | | | | | | | | | |
| | | <u> </u> | · | | <u>, , , , , , , , , , , , , , , , , </u> | | | | | |
| | Note: | Comments a | ire required v | vnen the requi | rement is not v | erified. | | | | |
| | | | | | | | | | | |
| | | | | | | 0/ DI I | | | | |
| | Ambient | Conditions: | | °C | | %RH | | in HG | | |
| | | | | | | | | | | |
| | Test Equip | ment Used: | | | | | | | | |
| | | | | | | | | | | |

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| | | | | | | Measu | rement Re | esults - Wit | hout sour | ces | | | | | | | |
|--------|----------------|-------------------|--------------------------------------|---------------|----------------|-------------|-----------|--------------|------------|------|-------|------|-------|------|-------|------|-------|
| | | | | | | | | | | | | | | | | | |
| | | | | | | Side I | No. 1 | Side | No. 2 | Side | No. 3 | Side | No. 4 | Side | No. 5 | Side | No. 6 |
| | Did the | | | in chable du | ring the test? | Yes | No | Yes | No | Yes | NO | Yes | No | Yes | NO | Yes | No |
| | Dia the | gamma res | Did the | neutron read | ling the test? | | | | | | | | | | | | |
| | | Did | the instrume | ent alarm du | ring the test? | | | | | | | | | | | | |
| | Were t | nere any fui | nctional cha | inges due to | the impacts? | | | | | | | | | | | | |
| | | Did the ins | trument dis | olay spurious | indications? | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | Meas | urement l | Results - W | ith Source | s | | | | | | | |
| | | Defer | | | | | | | | | | | | | | | |
| | 50 | burce Data: | | | | | | | | | | | | | | | |
| | | | | Pretest | Post-test | | | | | | | | | | | | |
| | | | | Response | Response | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 1 | | | (add units) | | | | | | | | | | | |
| | | | 2 | | | | | | | | | | | | | | |
| | | | 3 | | | | • • • | | | | | | | | | | |
| | | | 4 | | | | | eptance Ra | #DIV/0 | | | | | | | | |
| | | | 6 | | | la | | 10 | high (+15 | %) | | | | | | | |
| | | | 7 | | | | | | | ,0, | | | | | | | |
| | | | 8 | | | | | | | | | | | | | | |
| | | | 9 | | | | | | | | | | | | | | |
| | | | 10 | | | | | | | | | | | | | | |
| | | | Mean | #DIV/0! | #DIV/0! | | | | | | | | | | | | |
| | | | SID | #DIV/0! | #DIV/0! | | | | | | | | | | | | |
| | | | 007/0 | #DIV/0! | #DIV/0! | | | | | | | | | | | | |
| | Date | alia ang suddhing | | | | | | | | | | | | | | | |
| | Rea | aings within | res | | | | | | | | | | | | | | |
| | accept | ance range: | NO | | | | | | | | | | | | | | |
| | 0 | | | | | | | | | | | | | | | | |
| | Gamma | n 2e) | Yes | | | | | | | | | | | | | | |
| | (with | . 23) | No | | | | | | | | | | | | | | |
| | Neutror | n alarm | Yes | | | | | | | | | | | | | | |
| | (with | 11 08) | No | | | | | | | | | | | | | | |
| | | | 100 107 | | | | | - | | | | | | | | | |
| | | ID Trial 1 | 133Ba+137Cs | | | Recor | d all | | | | | | | | | | |
| | | ID Trial 2 | 135Ba+13/Cs | | | Radionu | iclides | | | | | | | | | | |
| | | ID Trial 3 | ¹³³ Ba+ ¹³⁷ Cs | | | identi | iieu | ļ | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Di | id the instrum | ent controls | Yes | | | | | | | | | | | | | | |
| | functi | on properly? | No | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Did th | e instrument | show visible | Yes | | | | | | | | | | | | | | |
| | exterr | al damage? | No | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

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| | | | Sections 1 | 0 - Documen | itation | | | | |
|-----------------|---|--|--|---|---|---|--|--|--------------------|
| | | | Test D | ata and Repo | ort | | | | |
| Manufacturer: | | | | | | | | | |
| Instrument: | | | | | | | | | |
| | | | | | | | | | |
| Model: | | | | | | Ser | ial Number: | · | |
| Jate Performed: | | | | | | Ie | st Location: | | - |
| | The manuf The manuf 10.2 Certif The manuf – Contacts – Type of i – Range o – Reference – Location – Respons – Results – Results – Results – Results – Results – List of ra – FWHM a 10.3 Open The manuf – Operatin – Troubles | facturer shall pro icate facturer shall pro icate facturer shall pro is for the manufact instrument, dete of exposure rates ce points and ref or and dimensions se of the instrum of tests for accu of calibration tes and dimensions upply (battery) re of tests under er of electrical and adionuclides to w and efficiency for ation and mainter facturer shall sup g instructions an shooting guide. | wide a report covering wide a certificate or o cturer including, but r ctor, and types of rac the instrument is de erence orientation for s of the sensitive volu ent to different appro- racy, linearity, and lo sts (isotopes calibrati of the instrument equirements invironmental condition mechanical tests which the instrument r 137Cs enance manuals oply an operation and nd restrictions. Instru | the type tests perform ther documentation of the documentation of the documentation of the instrument signed to measure radiation source use mes of the detectors priate radiation energ wer limit of detection on with and date of m ms was tested maintenance manual ctions shall include i | rmed in accordance containing at least t address, telephone t is designed to mea ed for calibration jes n next calibration due | e with the re he following number, fa asure date) date) st the follow g alarm thre | equirements g information ax number, e- ving informati eshold adjusi | of this star -mail addre on for the u tments. | udard. Iss, etc |
| | | | | | | | | | |
| Note: | Only one of | data sheet per m | nodel is required. Co | mments are required | when the requireme | ent is not v | erified. | | |

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

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| Comments: | | | | |
|--------------|------------|--|-------|------|
| | | | | |
| | | | | |
| Com | pleted by: | | Date: | |
| | | | | |
| Reviewed by: | | | Date: | |
| | | | | |

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