HITACHI

TITLE: LENR Apparatus Test

TEST SPECIFICATION AND PROCEDURE

TEST NUMBER: DBR-002N5918-TSP-01-R2

DBR-002N5918 Revision 2

Prepared by: _____ Date: 12/11/15
Mike Kiernan, Test Requestor

Prepared by: _____ Date: 12/11/15
Fabrice Rocchiccioli, Test Requestor

Reviewed and Approved by: _____ Date: 12/11/15
Kristopher Zanotto, Test Engineer

Reviewed and Approved by: _____ Date: 12/11/15
Thomas Caine, Responsible Manager

Reviewed and Approved by: _____ Date: 12/11/15
Russell Stachowski, Responsible Chief Engineer

Reviewed and Approved by: _____ Date: 12/11/15
Juan Ayala, Radiation Safety Officer

Reviewed and Approved by: _____ Date: 12/11/15
Mark Leik, EHS Manager

Reviewed and Approved by: _____ Date: _____
McLarty Representative, Outside Party Approval

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CHANGE STATUS SHEET

Change	Description of Change	Approval

Approved By: _____ Date _____
Responsible Test Engineer

Approved By: _____ Date _____
Test Requestor

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SIGNATURE LOG SHEET

Name / Function	Signature	Initials
Test Requestor		
Responsible Test Engineer		

Table of Contents

1. SCOPE

This specification defines requirements for proof testing of the LENR Apparatus as described in the document references 2.1.1 and 2.1.2. This document will also list safety considerations and how they shall be addressed in the test procedure. Thus, the procedure and check-offs during testing will include checks relative to functional requirements and items deemed critical to safe test operation. A primary goal of testing the device is reproducing results seen in References 2.1.1. This procedure will also include activities to pretest the major system components to ensure safe operations during the final test with radioactive Co-60 (note this is really a mixture of Co-59 and Co-60 in order to keep activity level with-in reason). It will also include efforts to capture data that may help elucidate the mechanisms associated with results seen during present and previous testing.

Specifically, this test will involve testing the ability of the referenced device (a hydrogen pressurized box with an electric field) to promote a sizeable acceleration in the decay rate for the Co-60 radioisotope.

This effort will be broken into two phases called TEST-A and TEST-B. TEST-A is being performed both to help calibrate the system by getting variables that lead to temperature stability and to test the ability to control the reaction with the chemicals and just Co-59 in the Cobalt tray (See Figure 17-5). This will involve using various temperature measurements.

This allows basic testing and device calibration for the environment without using radioactive material. The second testing phase will involve using the Co-60 to determine if the reaction accelerates the decay rate of Co-60. This phase will involve comparing gamma counts per gram for the Co-60 material before and after the test. It will also entail performing ICPMS on the remaining Cobalt material after the testing.

2. APPLICABLE DOCUMENTS

2.1 GE Nuclear Energy Documents- The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest revision shall apply.

2.1.1 Proprietary PDF	Device Description and Testing Report
2.1.2 Proprietary PDF	Apparatus Description Questions
2.1.3 Proprietary PDF	Translated Answers
2.1.4 Proprietary PDF	Drawing of Device
2.1.5 Proprietary PDF	Pressure Vessel Pressure Test Documentation
2.1.6 Internal Procedure	20P0104/9 Gamma Counting Procedure
2.1.7 Internal Procedure	20P090 ICPMS Procedure
2.1.8 Proprietary PDF	Chemical Mix LENR - Procedure
2.1.9 Proprietary PDF	Cobalt 60-59 LENR Preparation Procedure
2.1.10 Proprietary PDF	Basic Procedure from Principals

All of these documents will be stored with the TS&P on the OPI drive. For purposes of this reference, the above documents will be stored in a subfolders of the TS&P under the name Reference 2.1.#.

2.2 Codes and Standards. OSHA

3. PURPOSE OF TEST

This is an exploratory test to determine the ability of the LENR apparatus to accelerate the decay of Radioisotopes. Specifically, this test will look to replicate past test results as recorded in References 2.1.1-2.1.3.

This is purely an exploratory test and is not intended to provide design basis information and there for is not explicitly following all test procedure requirements, but is using the template in order to best cover the particulars of this test.

4. HARDWARE SPECIFICATION

4.1 Test Facility This test will be performed in two labs in the Vallecitios Lab facility with working chemical hoods. The first non-radioactive test (TEST-A) will be performed in the in the welding hood in the non-radioactive shop in building 102. The 2nd part of the test (radioactive with Co-60) or (TEST-B) will be performed in the 101 lab in building 103 at the Vallecitos Lab Facility. Pictures and Videos for the report and for use by the Inventors may be used only after their approval by the EHS organization. These should be provided within ten days of completing the experiments.

4.2 Mockup N/A

4.3 Hardware The Hardware for this test includes 4 main systems, which are shown in schematics in section 17 (Figure 17-1 through Figure 17-6):

1- Device- This is the heart of the experiment and is where the Co-60 and chemicals are housed for the reaction. The device will ultimately house the reaction in up to a25 atmosphere environment of hydrogen at approximately 400 degrees centigrade. (See Figure 17-4 – Figure 17-6)
2- Outer Chamber- This is a large chamber made of a 30" diameter by 5' foot long piece of pipe with a platform at about 3.5 feet from the bottom. The platform has holes for gas communication and is where the device will sit during the time when the reaction is taking place as well as when the chemicals and Cobalt are being put into the device. The outer chamber provides a number of functions (inert environment for handling chemicals, protective chamber for the device during the reaction, a large volume for diluting hydrogen after the reaction, and a mechanism for controlling the cooling rate of the device during the reaction. (See Figure 17-3 and Figure 17-1). Figure 17-1 shows how the manifold system controls gas flow between the device and the outer chamber.

3- Manifold System- This is the system of valves, pressure gages and tubing connections that control the gas flow between the device, gas sources, and the outer chamber. A basic schematic of this system is provided in Figure 17-1.
4- Instrumentation System- This system includes the electronics and their associated sensors that are used to perform this experiment. A diagram of this system is included in Figure 17-2.

4.4 Tooling Basic Tool box with wrenches and screw drivers.

5. TESTING SPECIFICATIONS

5.1 Test Outline

This section outlines the testing procedure. It will cover some pre-test activities and some post-test activities relative to the primary testing, which is detailed in Sections 17 and 18. The primary testing, covered in Sections 17 and 18, breaks the test into different phases (each covered in a different subsection of Section 17 and 18) which include the following:

Device Preparation
Device Loading
Demo Set-up
Test Start-up
End of Testing
Sample and Smear Unloading
Emergency Shutdown

Prior to starting TEST-A management approval must be obtained. A second management approval must be obtained prior to starting TEST-B

(Note: After this portion of test, further analytical tests will need to be performed to characterize the results)

5.1.1 Ensure that all equipment meets the diagrams in Section 17 and that all equipment powers up as appropriate relative to operator manuals. Ensure that the pressure box is marked with the appropriate number and paper work confirms that the unit was pressure tested by the manufacturer. Also, ensure that equipment marking and configuration agrees with Figure 17-1. Ensure that plans are in place to follow are sub-procedures from Section 2.1.

5.1.2 Deleted - Redundant

5.1.3 Deleted Redundant

5.1.4 Deleted Redundant

5.1.5 Deleted - Redundant

5.1.6 Deleted- Redundant

5.1.7 Deleted - Redundant

5.1.8 Deleted Redundant

5.1.9 Deleted Redundant

5.1.10 Deleted Redundant

5.1.11 Deleted- Redundant

5.1.12 Deleted Redundant

5.1.13 Deleted_- Redundant

5.1.14 Deleted- Redundant

5.1.15 Deleted- Redundant

5.1.16 Deleted- Redundant

5.1.17 Deleted- Redundant

5.1.18 Deleted -Redundant

5.1.19 Deleted- Redundant

5.1.20 Deleted- Redundant

5.1.21 Deleted- Redundant

5.1.22 Deleted- Redundant

5.1.23 Deleted –Redundant

5.1.24 Deleted- Redundant

5.1.25 Deleted- Redundant

5.1.26 Deleted- Redundant

5.1.27 Deleted- Redundant

5.2 Test Equipment

1- Intelligent Heater from Clepco
2- Gamma Vision (Ortec)
3- InSpector 1000
4- Power Supply 3B Scientific Physics (High Voltage Power Supply 5kV (115V, 50/60 Hz))
5- Function Generator 4010A
6- Gas Monitor- Eagle 2
7- Ametek Neutron Counter
8- Eagle 2
9- ICPMS TOTALQUANT software
10-Yokogawa Digital Temperature Monitoring System

5.3 Test Parameters

5.3.1 Environment - For Test B, the test shall be performed in a lab approved to have radioactive materials and with the requisite approvals to have hydrogen gas and contain the other materials, such as Raney Nickel.

5.3.2 Parameters to be Measured, Instrumentation, and Accuracy - This test will involve measurements of process parameters and also measurements associated with the test results. A list of measurements is provided below with an explanation of their relevance to the test.

5.3.2.1 Device (See Figure 17-1 and Figure 17-2)

Range: 500 psig min. full scale
Instrumentation: Pressure gages on manifold system
Accuracy: Gage reading as-is; calibration not required.
Relevance: Used to control process

5.3.2.2 Outer Chamber

Range: 100 psig min. full scale
Instrumentation: Pressure gage
Accuracy: State accuracy needed and require calibration except when a wide range of values is acceptable.

5.3.2.3 Temperature (10 degrees centigrade up to 1350 degrees centigrade)

Range: 10 degrees to 1350 degrees Centigrade
Instrumentation: Thermocouple in both device and outer chamber
Accuracy:

5.3.2.4 Gamma Monitor

Range: 0 to 100 mrem/hr
Instrumentation:
Accuracy:

5.3.2.5 Post Test ICPMS measurement to identify material

Range: 10 ppb to 100 ppm
Instrumentation:
Accuracy: 2%

5.3.2.6 Material weights

Range: 2 micrograms to 20 grams
Instrumentation:
Accuracy: 1 microgram

5.3.2.7 Neutron Count with Ortec Neutron Counting System Version 1.0.0

Range: N/A for application
Instrumentation:
Accuracy: N/A

5.3.3 Test Iterations- The system will be operated at test specification conditions for at least 6 hours for TEST-B. TEST-B will be performed at least 4 times.

5.4 Test Process Requirements

5.4.1 The outer chamber must operate without any discernable leakage of hydrogen. A means of detecting hydrogen shall be present in the outer vessel.

5.4.2 The Co-60 should decay over six hours to the point that less than 40% of the original Co-60 still exists.

5.4.3 The system shall maintain the ability to measure temperature. The temperature shall be recorded at least every 30 minutes and directly before and after any new power source is turned on. Writing data in provided tables may be supplemented by saving data into computer files for automated retrieval, with high resolution.

5.4.4 The vessel shall meet stress analysis to show that the vessel will be able to meet 25 atmospheres of internal pressure.

5.4.5 All Gamma Scan records shall be electrically stored on the LENR Shared Folder. Gamma Scans will be taken of the Co-60 after the mass of the sample is taken before and after the experiment in order to determine counts per gram before and after the experiment.

5.4.6 All ICPMS Material characterization work shall be electrically stored on the LENR Shared Folder. Standard procedures will be followed to identify isotopes in the residual Co-60 isotope material.

5.4.7 Deleted- Redundant

5.5 Expected Test Results and Pretest Predictions The test is expected to accelerate the decay of isotopes that are processed according to the procedure and operating parameters as given in this document. It is expected that this accelerated isotope decay can be monitored via gamma decay during the system operation and ICPMS analysis of isotope material at test conclusion (along with taking gamma counts and then weighing materials both prior to testing and after testing to determine differences in activity).

5.6 Performance/Acceptance Criteria (As dictated in this document)

5.6.1 60% of Co-60 Decays during the 6 hour test time.

6. STANDARD REQUIREMENTS

6.1 Safety classification; See CP-03-02

_X___ Not Safety Related
_____ Safety Related

6.2 Test Type per WI-03-100-32 Attachment 2

__X__ A2-1, Development
_____ A2-2, Design Basis Data
_____ A2-3, Design Qualification
_____ A2-4, Manufacturing
_____ A2-5, Special Tests (See WI-03-100-32 Attachment 3 for Special Tests)
_____ Other: Describe

6.3 Archived Record Number:

6.4 Archive Custodian:

This test specification shall be electronically archived in the OPI Shared Folder for this project by Mike Kiernan or Kris Zanotta.

6.5 Form, fit, function, material and/or process minimums and maximums

_____ None
__X__ Yes: This test is to determine if we can accelerate the decay of Co-60 so that 40% of the material decays in 6 hours after starting the reaction and reaching temperature

6.6 Special or unique safety or chemical hazard conditions associated with the test.

_____ None
_X__ Yes: Hydrogen, medium voltage, Raney Nickel, Co-60, High Pressure, High Temperature

6.7 Test Facility Requirements

_____ BWR Training Center standard practice
__X__ Laboratory standard practice
checkout and shakedown: _X__ Not required; _____ Yes: Describe

6.8 Test facility safety requirements: (WI-03-100-32, A1-1.8)

_____ BWR Training Center standard practice.
__X__ Laboratory standard practice.
Specific hazards analyses and accident response plan:
_____ Not required; __X__ Yes: Describe

The experiment will be carried out in Vallecitos laboratories that will be operating under their standard plan. The biggest risk is if the reaction causes pressures and temperatures to exceed expected values. The plan calls for shutting down the reaction if pressure or temperature goes above limits. The pre-job brief will make sure everyone is well aware of the limits and knows how to shut-down the reaction. Protocol will be to have all non-essential observers to clear the area if temperature or pressure limits are exceeded. Also, all personnel will be reminded that surfaces of metal may be hot and that when first touching any surface, that care should be taken to slowly move your hand toward the surface to sense if it is too hot before quickly touching it.

6.9 Test Quality Assurance Requirements

6.9.1 N/A

6.9.2 N/A

6.9.3 N/A

6.10 N/A.

6.11 N/A

6.12 Records retention requirements

This TS&P will be filed in the OPI secure folder for this project for a period of at least one month.

6.13 An Intermediate Test Report (After Test A) and a Final Test Report (After Test B) requirements (WI-03-100-32, A1-1.15)

The Intermediate Test Report should present all data taken during Test A and should provide a write-up of any lesson's learned during the test. The signature on this report is required before continuing to Test B (Testing of Co-60).
The Final Test Report is to be forwarded to the Test Requestor for approval 10 days following completion of test and data reduction. The tested components description and the test results can be achieved by reference to the TS&P. This report is to be approved by the Chief's

Office, The Inventor, and a representative of McLarty Associates, LLC. Data taken during testing will be immediately available in its raw state.

6.14 Disposition of tested equipment/material (WI-03-100-32, A1-1.16)

This Project will produce waste which must be controlled including Raney Nickel and Co-60. Also, there will be a collection of Hydrogen gas which must be safely discharged per directions in this procedure.

6.15 Special requirements resulting from a Technical Risk Evaluation/Legal Risk Evaluation (WI-03-100-32, A1-1.17)

____ None
__X__ Yes: This is project includes OPI and also includes special safety precautions due to issues described above. The overall project is also being assessed by an HRE.

6.16 The product qualification requirements specification authorized by the applicable TS must be applied for environmental qualification testing.

__X__ Not applicable (WI-03-100-32, A1-1.9)
____ Explain

6.17 Test Plan and Procedure (TP&P) required? (WI-03-100-32)

__X__ Yes; this document includes the TP&P content. See sections 12 and 13.

6.18 Test Witness/Test Engineer Requirements

6.18.1 Definition - A test witness/test engineer is someone approved by the RTE who performs the following duties.

- Present to witness/engineer the test proceedings.
- Record data as required.
- Provide test direction according to the test plan.
- Sign for verification of test results.
- Make changes to the test procedure as necessary with RTE approval.
- Write Non-Conformance Reports as necessary. (CP-03-125-F01)
- Write Testing Anomaly Reports as necessary. (WI-03-100-32-F325)

6.18.2 Test Witness/Test Engineer Responsibilities:

6.18.2.1 Observe the testing process to assure the test procedure activities were performed and provide a sign-off for test plan verifications with the date.

6.18.2.2 Record test data and notations in test plan document and forms as required.

6.18.2.3 Perform and maintain the test procedure record keeping function consisting of the following.

- Print data and notations legibly so that the test process described can clearly read and understood by others.
- Initial and date all data or text entrees. Some data sheets may have a line for signature and date. Otherwise, initial and date the bottom of the page or adjacent to a short text entree.
- Maintain a series time log of the test process using the "Engineering Special Test Log" sheet. Note the date, time, and paragraph serial sequence. Add extra descriptive notes or comments as applicable.

6.18.2.4 Give direction to test performers as required to assure the test plan is followed.

6.18.2.5 As the test is being performed, sometimes the text in the test procedure may not correctly describe the process performed. The test procedure should be corrected by making changes with red ink (red lining). New insert sheets can be added if room on the page is not adequate. Initial and date all red lines. Any changes made during Test B shall be approved by the RSO. The RTE must approve all red line changes. Keep the RTE informed of all red lines by personal contact, telephone, or e-mail, as applicable. Any changes to the body of Section 18 that cause a deviation from what was done in Section 17 needs EHS approval.

6.18.2.6 N/A

6.18.2.7 N/A

6.19 Test Data Observer Requirements

6.19.1 Print legibly so others can easily read. Keep in mind someone else must be able to read and understand the test process described.

6.19.2 Initial and date all data or text entrees. Some data sheets may have a line for signature and date. Otherwise, initial and date the bottom of the page or adjacent to a short text entree.

7. QUALITY ASSURANCE REQUIREMENTS (WI-03-100-32, D2)

7.1 Deleted

7.2 Deleted

8. DATA REDUCTION (WI-03-100-32, A4-7)

FULL SECTION DELETED

9. COMPUTER PROGRAM CONTROL

FULL SECTION DELETED

10. SAFETY (WI-03-100-32, A4-1)

This test involves using radioactive material which must be handled with care under very controlled operations as stated in the Radiation Work Permit (RWP). Also, this test involves using flammable materials Raney Nickel and Hydrogen. This will involve following careful directions that preclude conditions that might lead to fire. Additionally, the hydrogen will be under high pressure in a closed device. The device shall be tested before use to ensure that it is capable of handling anticipated stresses at full pressure. In addition, testing must be performed slowly and pressures monitored to avoid over pressure. In addition, a pressure relief valve will be used to avoid any chance of the device being over

pressured. Finally, the device will be internal to a larger outer pressure chamber which will be closed off and kept under 2 atmospheres actual pressure or 14.7 psi gauge pressure.

11. TEST SEQUENCING

Safety concerns require careful attention to testing sequence. Thus, this testing should follow the detailed procedures as detailed in section 17. It is important to not let the hydrogen interact with oxygen in the atmosphere and to keep the Raney Nickel in an inert environment. This all depends on careful sequencing relative to introducing materials and gases to the test environment.

12. PRE-TEST PREPARATIONS (WI-03-100-32, A4-2)

Full Section Deleted

13. OVERALL TEST ORCHESTRATION

13.1 Check that paperwork for CA and HRE is in place and what phase of Testing is approved (Ensure that TEST-A is approved and authorization to proceed is given and documented before performing any of the steps associated with TEST-B). Assure that management review is complete and all actions closed.

13.2 Make final check of facility and perform pre-job brief with all team members. Ensure that all safety items have been discussed and that the team understands how to safely shutdown the system.

13.3 Start the official part of testing

The tests shall be kept track of as TEST-A-# and TEST-B-#, where # goes from 1 to ever how many tests are performed for TEST-A or TEST-B.

SECTIONS 13.3.1-13.3.22 WHERE DELETED

14. DISPOSITION OF TEST SPECIMENS

14.1 At the conclusion of the test all materials shall be collected and determined to be either controlled radioactive waste or clean. Unreacted Raney Nickel is a hazardous waste and needs to be controlled as such. All unused Raney Nickel will be placed in a lab pack for disposal. As directed by EHS a Satellite storage location may be established. Raney Nickel that has been used with radioactive material is considered Mixed Waste unless specific analysis or assessment shows otherwise. [GE1] Unreacted Raney Nickel that has been in contact with radioactive material will be disposed of in accordance with Purchase Order with a licensed disposal company that will be in place prior to the start of Test B. No material shall be disposed of without appropriate EHS sign-off.

14.2 Test product samples shall be returned to the Test Requestor for disposition.

15. TEST REPORT (WI-03-100-32, A4-8)

15.1 The test report shall be prepared to the requirements identified in section 6.14.

15.2 The test report shall be submitted to the Test Requestor for review and approval.

15.3 The test report shall state rather the test was a success or failure based on criteria in section 5.1.26.

16. DATA SHEETS

The following pages contain data sheets that may be used for recording various kinds of test activities. As required, make copies from these pages for information recording. These records should be included in the intermediate and final reports.

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GEH INSTRUMENT RECORD & CONTROL SHEET

1. INSTRUMENT: _____ _____ _____ _____
(Type) (manufacturer) (Model Number) (IC. Number)
CALIBRATION
DATES: _____ _____ Post/Recall Required (Yes___No___)
Present Due
TECHNICIAN: _____ ____/____/____ REQUIRED ACCURACY:
(Signature) (Date)

2. INSTRUMENT: _____ _____ _____ _____
(Type) (manufacturer) (Model Number) (IC. Number)
CALIBRATION
DATES: _____ _____ Post/Recall Required (Yes___No___)
Present Due
TECHNICIAN: _____ ____/____/____ REQUIRED ACCURACY:
(Signature) (Date)

3. INSTRUMENT: _____ _____ _____ _____
(Type) (manufacturer) (Model Number) (IC. Number)
CALIBRATION
DATES: _____ _____ Post/Recall Required (Yes___No___)
Present Due
TECHNICIAN: _____ ____/____/____ REQUIRED ACCURACY:
(Signature) (Date)

4. INSTRUMENT: _____ _____ _____ _____
(Type) (manufacturer) (Model Number) (IC. Number)
CALIBRATION
DATES: _____ _____ Post/Recall Required (Yes___No___)
Present Due
TECHNICIAN: _____ ____/____/____ REQUIRED ACCURACY:
(Signature) (Date)

5. INSTRUMENT: _____ _____ _____ _____
(Type) (manufacturer) (Model Number) (IC. Number)
CALIBRATION
DATES: _____ _____ Post/Recall Required (Yes___No___)
Present Due
TECHNICIAN: _____ ____/____/____ REQUIRED ACCURACY:
(Signature) (Date)

6. INSTRUMENT: _____ _____ _____ _____
(Type) (manufacturer) (Model Number) (IC. Number)
CALIBRATION
DATES: _____ _____ Post/Recall Required (Yes___No___)
Present Due
TECHNICIAN: _____ ____/____/____ REQUIRED ACCURACY:
(Signature) (Date)

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ENGINEERING SPECIAL TEST LOG

ENGINEERING SPECIAL TEST LOG

PROCEDURE: _____ REV. __0__ SHEET _____ OF _____

PROJECT NAME: _____

Design Basis Specification # _____ DATE _____

REF. PARA	: START : TIME	: END : TIME	:

PERFORMER _____ DATE _____

RTE _____ DATE _____

REQUESTOR _____ DATE _____

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NON-CONFORMANCE REPORT SHEET

SITE/PROJECT:	REPORT No:
AREA OR LOCATION WHERE SURVEILLANCE PERFORMED:	DATE:
TP&P No:	Design Basis Specification No:

DESCRIPTION OF NONCONFORMANCE:

SIGNATURE _____ DATE _____/_____/_____

RECOMMENDED CORRECTIVE ACTION:

CONCURRANCE _____ SIGNATURE _____ DATE _____/_____/_____

ACTUAL CORRECTIVE ACTION:

SIGNATURE _____ DATE _____/_____/_____

VERIFICATION INSPECTION: (IF REQUIRED)

TEST ENG TO WITNESS AND DOCUMENT

SIGNATURE _____ DATE _____/_____/_____

REQUIRED ACTIONS COMPLETED: 10CFR21 Review: _____Is _____Is Not Reportable

PROJECT MANAGER _____ DATE _____/_____/_____ RTE _____ DATE _____/_____/_____

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GEH TESTING ANOMALY REPORT (TAR)

PROJECT:	**REPORT No: TAR-01**
TOOL DESCRIPTION:	**DATE:**
Test Plan# (eg. TVTP, TP&P, TS&P):	**DRF#:**

DESCRIPTION OF ANOMALY (A test requirement that does not meet its acceptance criteria, but can be resolved in a timely manner without a design change or test requirement change.):

RESPONSIBLE TEST ENGINEER (RTE)_____DATE _____/_____/_____

Or DESIGNATED TEST ENGNEER (TE)

RECOMMENDED CORRECTIVE ACTION:

RESPONSIBLE TEST ENGINEER (RTE)_____ DATE _____/_____/_____

FINAL CORRECTIVE ACTION:

RESPONSIBLE ENGINEER (RE) _____ DATE _____/_____/_____

OR TEST REQUESTOR (TR)

***APPROVAL:**
RESPONSIBLE TEST ENGINEER (RTE) _____ DATE _____/_____/_____

*** Verify tool drawings, if applicable, have been updated and are electronically archived or a hard copy of the drawings have been supplied stamped "Control Copy".**

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TEST LOG SHEET

Sheet Number	Date Added	By	Date Removed	By	Location	Date Returned

PHOTOGRAPHIC LOG

Photo No.	Description	Date
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

TEST LOG FOR TEST PERFORMED

TEST DATE START	TEST-A or TEST-B	TEST Name	Comments

PRESSURE TEMPERATURE LOG

TEST NAME__________________________________ SHEET ____ of _____ for this test

Date-Time	P1 Value	P2 Value	P3 Value	T1 Value	T2 Value	T3 Value

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LOG for Gamma Detector and Neutron Detector Files

TEST NAME_____ SHEET ____ of _____ for this test

Date-Time	Gamma File Name	Neutron File Name

17. PROCEDURE TEST A

17.1 Device preparation

17.1.1 Ensure at least two of the valves attached to the top and bottom vent lines are on the wide open position.

17.1.2 Ensure all valves throughout the manifold are in the closed position.

17.1.3 Ensure all regulators, H2/ N2 / Helium cylinders and Liquid Nitrogen tank valves are in the closed position.

17.1.4 Use wrench to take off large bolts and open the top of the Outer Chamber by removing the transparent Lexan window.

17.1.5 Slowly lift and place the device on the center of the platform inside the outer chamber. Device's front door should be sealed.

17.1.6 Connect the manifold connection D1 and D2, located inside the outer chamber, to the nozzles in the back of the device. D1 connects to the upper nozzle. D2 connects to the lower nozzle.

17.1.7 Run the three Thermocouple wires through the three designated grommets located on the wall of the outer chamber. The order does not matter but each wire should run through a single grommet.

17.1.8 Run the two wires of the first heater cartridge through designated grommets located on the wall of the outer chamber. The order does not matter but each wire should run through a single grommet.

17.1.9 Repeat 17.1.8 for second heater cartridge.

17.1.10 Run the two Electrodes color coded (red and black) wires through designated grommets located on the wall of the outer chamber. Each wire should run through a single grommet. Check that alligator clamps are properly attached to electrodes inside the outer chamber. Attach the ground (green) wire from the power supply to the ground.

17.1.11 Hand tighten grommets and ensure that no open holes exist on the surface of the outter chamber.

17.1.12 Ensure vent lines are open (see 17.1.1) and make sure no nitrogen (either LN or bottle nitrogen) is turned on until ready for test.

17.1.13 Open regulator from helium cylinder to approx. 50PSI

17.1.14 Open V2

17.1.15 Slowly open V14

17.1.16 Slowly open V13

17.1.17 Slowly open V8. Re-zero P2.

17.1.18 Slowly crack open V1

17.1.19 After20 seconds Close V8 and raise pressure up to 25PSI on pressure gauge P2. Then close V1. If over-pressurized, crack open V6 to release pressure as needed.

17.1.20 Test manifold for leaks using pressure gauge P2. Monitor pressure for 60 seconds. Leak rate <0.3PSI per minute is acceptable.

17.1.21 If no leak detected, proceed to 17.1.22. If leak detected, tighten manifold connections and repeat steps 17.1.18 to 17.1.20.

17.1.22 Close all valves

17.1.23 Open V2

17.1.24 Open V3

17.1.25 Open V10

17.1.26 Open V5

17.1.27 Open V6

17.1.28 Open V8

17.1.29 Crack open V1

17.1.30 After20 seconds close V8, throttle V10 and close V1. Raise pressure up to 25PSI on pressure gauge P2. Then close V1 and V10

17.1.31 Test manifold for leaks (see 17.1.20).

17.1.32 If no leak detected, proceed to 17.1.33. If leak detected, tighten manifold connections and repeat step 17.1.29 to 17.1.31.

17.1.33 Place copper trays, vial containing chemical mix, vial containing cobalt 60[GE2], an hermetic plastic container to collect chemical mix and cobalt mix in their respective trays

after experiment, two smear pads, two wide mouth 250 ml plastic containers to collect smears and a wrench to open and close the door of the device on the platform. Place a large tray to collect any spill in front of the device. Ensure everything is reachable with rubber gloves from the glove ports of the outer pressure chamber. Add extra sets of nuts and washers for the door.

17.1.34 From above the Outer chgmber, open front door of device with wrench and collect all nuts and washers in a container. Ensure container can be reached with rubber gloves from the glove port of the outer pressure chamber.

17.1.35 Remove front door. Ensure door can be reached with rubber gloves from the glove port of the outer pressure chamber. Inspect door and O ring. Clean if necessary, replace Oring if damaged.

17.1.36 Place Lexan window onto top flange with gasket on top of the outer chamber, then put all bolts through holes, put nuts on all bolts hand thread until bolts are lightly contacting the bottom of flange, then tighten each bolt/nut with a wrench. Tighten bolts in a star pattern to help place even pressure on the sealing surface.

17.2 Device loading

17.2.1 Close all valves throughout the manifold system. Ensure exhaust lines are left open.

17.2.2 Connect O2/H2 gas monitor.

17.2.3 Ensure M1 through M5 are on the close position.

17.2.4 Open M3 then start O2/H2 gas monitor.

17.2.5 Crack open the valve on the LN tank and allow for light nitrogen flow throughout the outer chamber. Purge the chamber until O2 level readout in gas monitor reaches 0.0%.. Turn-up LN pressure control slowly to maximum of 1.5 atm then close LN valve and plug both exhaust lines. No nitrogen flow should be allowed while handling powdered chemical mix and/or cobalt 59 mix.

17.2.6 Open all valves in the manifold to equalize pressure across the manifold with the outer chamber and wait 30 second to reach equilibrium at P2.

17.2.7 Close all manifold valves except V13

17.2.8 Ensure Oxygen environment is at 0% in chamber and device using O2/H2 gas monitor readout at M1 and M3 by opening M1 then closing M3, then opening M3 and closing M1.

17.2.9 Open chemical mix vial and pour content in larger tray. Ensure that it was properly processed per 2.1.8.

17.2.10 Slowly place tray on the lower electrode in the device.

17.2.11 Open cobalt 59 mix containers and pour content in smaller trays. Ensure that it was properly processed per 2.1.9.

17.2.12 Slowly place the smaller cobalt 59 tray onto the lower electrode in the device on top of the previous larger tray containing chemicals mix, so that the two trays are stacked on the bottom electrode. Check that electrodes remain parallel.

17.2.13 Slowly pick up door then place the door over bolts. Gently press on device face, slowly put nuts onto each bolt until touching door face, torque each nut in a star pattern. Special care should be taken to not jostle or tip the device. If this part of the process causes any undue motion to the device, the process should be stopped and the device should be reopened to check that chemicals have not been disturbed so as to impair the test.

17.2.14 After checking that all bolts are tight, pull gloves into the end of the outer chamber. Ensure gloves do not touch device.

17.2.15 Place outer pressure chamber stop plates over glove port openings and loosely bolt the plate into place using at least 3 nuts and bolts for each of the two plates.

17.3 Demo setup

17.3.1 Close all manifold valves. Close all gas bottle valves.

17.3.2 Open V13

17.3.3 Open vents valves (at least 2 valves in both vents should be in the open positon) Open LN regulator. Slowly turn-up LN regulator to pressure that keeps the outer vessel pressure below 16 psi.

17.3.4 To test device's front door seal, Open V14

17.3.5 Open Helium gas bottle to approx. 300PSI. Then, Open V1

17.3.6 Turn Helium pressure up to 249 psi very slowly by throttling V2.

17.3.7 When at 249 psi in the device (monitor P2), close V1 and V2. Hold until pressure stabilizes. .

17.3.8 Monitor Pressure at P2. If pressure loss in 20 minutes is less than a 0.5 psi loss, the device front door will be considered sealed. If not, then you will need to complete extra items at step 17.3.13.

17.3.9 Open V5 and V10 very slowly and let helium bleed into outer chamber until ~1.1 atm (17 PSI) is reached on P2, then close V5 and V10.

17.3.10 Close all manifold valves except V13 and V14 and regulators (leave the valves on the venting pipes open).

17.3.11 If the seal door test failed at step 17.3.8, then open the glove port plates and use the glove port access to fix the seal issue and bolt the box. Then repeat steps starting at 17.3.4. If leak test is successful proceed to next step.

17.3.12 Open V8 and allow Helium to bleed out of the device and into the outer chamber then close V8.

17.3.13 Ensure O2 level inside the outer chamber is at 0.0%.

17.3.14 Open H2 regulator very slowly until reaching approx.. 50psi.

17.3.15 Ensure V13 and V14 are open

17.3.16 Open V3

17.3.17 Throttle V6 until 20PSI on P2

17.3.18 Close V6

17.3.19 Open M1, close M3

17.3.20 Crack open V6

Crack open V10 and let H2 slowly flush the system until H2 content at location M1 reaches 80% keeping P2 at around 20PSI. Immediately close V10 and V6

17.3.21 Close V3

17.3.22 Open M3

17.3.23 Close M1

17.3.24 if H2>3% purge with LN. Use bottle nitrogen to circulate air in containment chamber

17.3.25 Proceed to next step when H2 level reaches 0.0%

17.3.26 Slowly open H2 regulator up to 9 atm (140 PSI) then switch P2 to Bar

17.3.27 Open V6 until P2 reads 9 bar.

17.3.28 When 9 atm is reached close V6

17.3.29 Close H2 regulator and bottle

17.3.30 Ensure all manifold valves EXCEPT V13 and V14 are closed.

17.3.31 Connect Thermocouple wires to readout device

17.3.32 Connect heater wires into heater controller, ensure heater connector located outside outer chamber is connected, then power on heater and ensure heater is set to temperature below ambient. (the heaters themselves should not be activated)

17.3.33 Unplug electrode power supply from high voltage supply if necessary. Connect Voltmeter red and black plugs on the high voltage supply. Switch ON power supply, Set voltage at 130volt using voltmeter, then power OFF the power supply, Do not disconnect the ground (green) wire

17.3.34 Unplug Voltmeter and plug red and black power cables connected to electrodes to the power supply. Do not disconnect the ground (green) wire. DO NOT POWER ON THE POWER SUPPLY.

17.4 Test startup

17.4.1 Ensure that Heaters / Thermocouple Controller is powered up,

17.4.2 Set heaters to 300C (572F). Do not press ENTER.

17.4.3 Take TC and pressure gauge readings at t=0.

17.4.4 Start heater (press ENTER) and start timer. Record data every 1 minutes

17.4.5 When temperature at T2 reaches 110C (270F), (the assumed chemical mix activation temperature), turn on power supply to the electrodes.

17.4.6 When temperature at T2 reach a plateau increase record data to 2,3 then 5 minutes.

17.4.7 Ensure LN flow is appropriate to maintain wall temperature of the device at 234 to 235 C. Open or close LN valve if necessary during the test.

17.4.8 Ensure that temperature and pressure are within limits during the entirety of the test. Temperature (including temperature calculated from pressure gauge readings) should not exceed 400 degrees C. Pressure should not exceed 25atm. See emergency shutdown procedure in section 17.7. SHUT DOWN IF TEMPERATURE EXCEEDS 400 C or PRESSURE EXCEEDS 25atm or if pressure drops independent of temperature at a rate that indicates a leak.

17.4.9 Test end 6 hours after T2 reaches 572F..

17.5 End of testing

17.5.1 Ensure M3 is open

17.5.2 Slowly release 1 atm of hydrogen by slowly opening V5 and V10 throttle valve. NOTE: Tubing will be hot.

17.5.3 Close V5 and V10.

17.5.4 Slowly add nitrogen by opening nitrogen bottle regulator to approx.. 1 atm greater than P2 is reading.

17.5.5 Slowly open V2 until P2 reaches 1atm greater than when H2 was released. Then close V2.

17.5.6 Wait for H level in Vent M3 to stabilize back to less than 3%. if H2>3% purge with LN. Use bottle nitrogen to circulate air in containment chamber

17.5.7 Close all manifold valves except V13 and V14

17.5.8 Turn the heater down to below 50F

17.5.9 Turn off power to Voltage Supply

17.5.10 Continue bleeding H2 using V10 and V5 at a rate of approx.. 1 atm at a time as outlined in 17.5.2 until hydrogen in the system is not detectable in the outer chamber via M3. Monitor temperatures and pressures for unusual behavior as temperature drops to target value of 22 degrees centigrade.

17.6 Samples and smears unloading

17.6.1 Leave LN flow throughout the Outer device until device temperature at T2 reaches temperature below 70C degrees centigrade then turn off LN regulator and close all valve throughout the manifold. Ensure all gas bottle are closed. Allow the device to cool down ~~overnight~~ to ambient temperature.

17.6.2 On the following day, crack open LN tank and allow gas monitor to reach O2 level of 0.0%.

17.6.3 Open Helium gas bottle valve and set pressure at regulator to approx.. 50 PSI

17.6.4 Open V1 slowly.

17.6.5 Open V14 slowly.

17.6.6 Open V13 slowly

17.6.7 Open V5

17.6.8 Slowly open V10.

17.6.9 Slowly crack open V2 and allow Helium to circulate through the device and remove remaining H2 in the manifold and the device.

17.6.10 Check H level in Chamber at location M1 and M3. Ensure that level is lower than 3%.

17.6.11 After 20 seconds, close helium gas bottle.

17.6.12 Close LN valve, then close the valves on the 2 vent lines.

17.6.13 Open all valves throughout the manifold to allow for P2 to equilibrate.

17.6.14 Ensure H2 level at M1 and M3 locations is below 3% and stabilized. Ensure O2 level remains at 0.0%

17.6.15 Close all manifold valves

17.6.16 Use wrench to loosen nuts in star pattern. Do not totally disengage a nut until all nuts have been loosened to point where the cover is no longer in compression, support the door so it doesn't fall on hand, and support the door with one hand when loosening the last nut.

17.6.17 Extract smaller tray from device

17.6.18 Place Cobalt 60 mix tray into a hermetic plastic container

17.6.19 Chemical mix can be reused for multiple tests and does not need to be extracted out of the containment chamber until the final test is conducted. If final test occurred, slowly extract both trays from device at once and place into a hermetic plastic container

17.6.20 Seal the plastic container securely.

17.6.21 At the end of test A series, use smear pads to smear the inside of the device and drop the pads into the 250ml wide mouth plastic container.

17.6.22 Slowly pick up door, check gasket, place the door over bolts and press on device face, slowly put nuts onto each bolt until touching door face, torque nuts in a star pattern.

17.6.23 Close all valves not previously closed.

17.6.24 Use wrench to take off large bolts and open the top of the outer chamber by removing the transparent Lexan window.

17.6.25 Slowly lift and retrieve the chemical sample(s) in the plastic container and transfer to radiochem for transfer into pre-weighted glass vial for analysis. Retrieve the two plastic bottles containing the smears. \

17.7 Emergency procedure

17.7.1 Start release of hydrogen through valve combination of V10 and/or V8 in as controlled a manner as possible. It is not desirable to blast all the hydrogen out at once and this should be avoided if at all possible. Add nitrogen by opening regulator to 1 atm greater than current P2 is reading. Then open V2 and open V14. As possible, continue the controlled release of hydrogen through the V10 valve (keeping M3 well below 3% for Hydrogen as best as possible). If necessary open V8 to quickly drain hydrogen from the device. Adjust LN flow through V16 if necessary to increase dilution.

17.7.2 While waiting for M3 to stabilize to less than 3% oxygen if possible - Turn off the heater if not already off

17.7.3 If controlled shutdown is possible continue to add nitrogen by keeping the nitrogen regulator to 1 atm greater than P1 is reading. Ensure V2 and V14 are open. When P1 and P2 match (1 atm has been added), then close V2 and V14. Then slowly release 1 atm of hydrogen through V8 throttle valve (keeping M3 well below 3% for Hydrogen). Wait for H level in Vent M3 to stabilize back to less than 2. Then continue process until temperature at T2 starts on a steady descent.

17.7.4 Turn off Voltage supply

17.7.5 If possible Continue with process outlined in 17.7.1 until hydrogen in the system is not detectable via M3. At that point, the process in 17.5.1 can be continued in order to expedite the cooling process or the device can be left to cool on its own.

17.7.6 Monitor temperatures and pressures for unusual behavior as temperature drops to target value of 22 degrees centigrade.

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18. PROCEDURE TEST B

18.1 Device preparation

18.1.1 Connect venting hoses to each of the valves attached to the vent lines and ensure hose opening is located under the hood.

18.1.2 Ensure at least three of the valves attached to the top and bottom vent lines are on the wide open position.

18.1.3 Ensure all valves throughout the manifold are in the closed position.

18.1.4 Ensure all regulators, H2/ N2 / Helium cylinders and Liquid Nitrogen tank valves are in the closed position.

18.1.5 Use wrench to take off large bolts and open the top of the Outer Chamber by removing the transparent Lexan window.

18.1.6 Slowly lift and place the device on the center of the platform inside the outer chamber. Device's front door should be sealed.

18.1.7 Connect the manifold connection D1 and D2, located inside the outer chamber, to the nozzles in the back of the device. D1 connects to the upper nozzle. D2 connects to the lower nozzle.

18.1.8 Run the three Thermocouple wires through the three designated grommets located on the wall of the outer chamber. The order does not matter but each wire should run through a single grommet.

18.1.9 Run the two wires of the first heater cartridge through designated grommets located on the wall of the outer chamber. The order does not matter but each wire should run through a single grommet.

18.1.10 Repeat 18.1.9 for second heater cartridge.

18.1.11 Run the two Electrodes color coded (red and black) wires through designated grommets located on the wall of the outer chamber. Each wire should run through a single grommet. Check that alligator clamps are properly attached to electrodes inside the outer chamber. Attach the ground (green) wire from the power supply to the ground.

18.1.12 Hand tighten grommets and ensure that no open holes exist on the surface of the outer chamber.

18.1.13 Ensure vent lines are open (see 18.1.2) and make sure no nitrogen (either LN or bottle nitrogen) is turned on until ready for test.

18.1.14 Open regulator from helium cylinder to approx. 50PSI

18.1.15 Open V2

18.1.16 Slowly open V14

18.1.17 Slowly open V13

18.1.18 Slowly open V8. Re-zero P2.

18.1.19 Slowly crack open V1

18.1.20 After20 seconds Close V8 and raise pressure up to 25PSI on pressure gauge P2. Then close V1. If over-pressurized, crack open V6 to release pressure as needed.

18.1.21 Test manifold for leaks using pressure gauge P2. Monitor pressure for 60 seconds. Leak rate <0.3PSI per minute is acceptable.

18.1.22 If no leak detected, proceed to 18.1.23. If leak detected, tighten manifold connections and repeat steps 18.1.19 to 18.1.21.

18.1.23 Close all valves

18.1.24 Open V2

18.1.25 Open V3

18.1.26 Open V10

18.1.27 Open V5

18.1.28 Open V6

18.1.29 Open V8

18.1.30 Crack open V1

18.1.31 After20 seconds close V8, throttle V10 and close V1. Raise pressure up to 25PSI on pressure gauge P2. Then close V1 and V10

18.1.32 Test manifold for leaks (see 18.1.21).

18.1.33 If no leak detected, proceed to 18.1.34. If leak detected, tighten manifold connections and repeat step 18.1.30 to 18.1.32.

18.1.34 Ensure steps in RWP in place (PPE, access restrictions, etc.)

18.1.35 Place copper trays, vial containing chemical mix, vial containing cobalt 60[GE3], an hermetic plastic container to collect chemical mix and cobalt mix in their respective trays after experiment, two smear pads, two wide mouth 250 ml plastic containers to collect smears and a wrench to open and close the door of the device on the platform. Place a large tray to collect any spill in front of the device. Ensure everything is reachable with rubber gloves from the glove ports of the outer pressure chamber. Add extra sets of nuts and washers for the door.

18.1.36 From above the open Outer chamber, open front door of device with wrench and collect all nuts and washers in a container. Ensure container can be reached with rubber gloves from the glove port of the outer pressure chamber.

18.1.37 Remove front door. Ensure door can be reached with rubber gloves from the glove port of the outer pressure chamber. Closely inspect door and Oring. Clean if necessary, replace Oring if damaged.

18.1.38 Place Lexan window onto top flange with gasket on top of the outer chamber, then put all bolts through holes, put nuts on all bolts hand thread until bolts are lightly contacting the bottom of flange, then tighten each bolt/nut with a wrench. Tighten bolts in a star pattern to help place even pressure on the sealing surface.

18.2 Device loading

18.2.1 Close all valves throughout the manifold system. Ensure exhaust lines are left open.

18.2.2 Connect O2/H2 gas monitor.

18.2.3 Ensure M1 through M5 are on the close position.

18.2.4 Open M3 then start O2/H2 gas monitor.

18.2.5 Crack open the valve on the LN tank and allow for light nitrogen flow throughout the outer chamber. Purge the chamber until O2 level readout in gas monitor reaches 0.0%.. Turn-up LN pressure control slowly to maximum of 1.5 atm then close LN valve and plug both exhaust lines. No nitrogen flow should be allowed while handling powdered chemical mix and/or cobalt 60/59 mix.

18.2.6 Open all valves to equalize pressure across the manifold with the outer chamber and wait 30 second to reach equilibrium at P2.

18.2.7 Close all manifold valves except V13

18.2.8 Ensure Oxygen environment is at 0% in chamber and device using O2/H2 gas monitor readout at M1 and M3 by opening M1 then closing M3, then opening M3 and closing M1..

18.2.9 Open chemical mix vial and pour content in larger tray. Ensure that it was properly processed per 2.1.8.

18.2.10 Slowly place tray on the lower electrode in the device.

18.2.11 Open cobalt 60 mix containers and pour content in smaller trays. Ensure that it was properly processed per 2.1.9.

18.2.12 Slowly place the smaller cobalt 60 tray onto the lower electrode in the device on top of the previous larger tray containing chemicals mix, so that the two trays are stacked on the bottom electrode. Check that electrodes remain parallel.

18.2.13 Slowly pick up door then place the door over bolts. Gently press on device face, slowly put nuts onto each bolt until touching door face, torque each nut in a star pattern. Special care should be taken to not jostle or tip the device. If this part of the process causes any undue motion to the device, the process should be stopped and the device should be reopened to check that chemicals have not been disturbed so as to impair the test.

18.2.14 After checking that all bolts are tight, pull gloves into the end of the outer chamber. Ensure gloves do not touch device.

18.2.15 Place outer pressure chamber stop plates over glove port openings and loosely bolt the plate into place using at least 3 nuts and bolts for each of the two plates.

18.3 Demo setup

18.3.1 Close all manifold valves. Also close all gas bottles valves.

18.3.2 Open V13

18.3.3 Open vents valves (at least 3 valves in both vents should be in the open positon) Open LN regulator. Slowly turn-up LN regulator to pressure that keeps the outer vessel pressure below 16 psi.

18.3.4 To test device's front door seal, Open V14

18.3.5 Open Helium gas bottle valve and set to approx. 300PSI. Then, open V1

18.3.6 Turn Helium pressure up to 249 psi very slowly by throttling V2..

18.3.7 When at 249 psi in the device (monitor P2), close V1 and V2. Hold until pressure stabilizes. .

18.3.8 Monitor Pressure at P2. If pressure loss in 20 minutes is less than a 0.5 psi loss, the device front door will be considered sealed. If not, then you will need to complete extra items at step 17.3.13.

18.3.9 Open V5 and V10 very slowly and let helium bleed into outer chamber until ~1.1 atm (17 PSI) is reached on P2, then close V5 and V10.

18.3.10 Close all manifold valves except V13 and V14 and regulators (leave the valves on the venting pipes open).

18.3.11 If the seal door test failed at step 17.3.8, then open the glove port plates and use the glove port access to fix the seal issue and bolt the box. Then repeat steps starting at 17.3.4. If leak test is successful proceed to next step.

18.3.12 Open V8 and allow Helium to bleed out of the device and into the outer chamber then close V8.

18.3.13 Ensure O2 level inside the outer chamber is at 0.0%.

18.3.14 Open H2 regulator very slowly until reaching approx. 50PS.

18.3.15 Ensure V13 and V14 are open

18.3.16 Open V3

18.3.17 Throttle V6 until 20PSI on P2

18.3.18 Close V6

18.3.19 Open M1, close M3

18.3.20 Crack open V6

Crack open V10 and let H2 slowly flush the system until H2 content at location M1 reaches 80% keeping P2 at around 20PSI. Immediately close V10 and V6.

18.3.21 Close V3

18.3.22 Open M3

18.3.23 Close M1

18.3.24 if H2>3% purge with LN. Use bottle nitrogen to circulate air in containment chamber

18.3.25 Proceed to next step when H2 level reaches 0.0%

18.3.26 Slowly open H2 regulator up to 9 atm (140 PSI) then switch P2 to Bar

18.3.27 Open V6 until P2 reads 9 bar.

18.3.28 When 9 atm is reached close V6

18.3.29 Close H2 regulator and bottle

18.3.30 Ensure all manifold valves EXCEPT V13 and V14 are closed.

18.3.31 Connect Thermocouple wires to readout device

18.3.32 Connect heater wires into heater controller, ensure heater connector located outside outer chamber is connected, then power on heater and ensure heater is set to temperature below ambient. (the heaters themselves should not be activated)

18.3.33 Place Gamma detector on top of the Lexan window. Connect to InSpecter 1000 portable monitoring device. Ensure that gamma signal is adequate for monitoring.

18.3.34 Unplug electrode power supply from high voltage supply if necessary. Connect Voltmeter red and black plugs on the high voltage supply. Switch ON power supply, Set voltage at 130volt using voltmeter, then power OFF the power supply, Do not disconnect the ground (green) wire

18.3.35 Unplug Voltmeter and plug red and black power cables connected to electrodes to the power supply. Do not disconnect the ground (green) wire. DO NOT POWER ON THE POWER SUPPLY.

18.4 Test startup

18.4.1 Ensure that Heaters / Thermocouple Controller is powered up,

18.4.2 Set heaters to 300C (572F). Do not press ENTER.

18.4.3 Begin Gamma detection. Set timer to 10 minutes acquisition time. Save and repeat immediately until 572F is reached at T2

18.4.4 Take TC and pressure gauge readings at t=0.

18.4.5 Start heater (press ENTER) and start timer. Record data every 1 minutes

18.4.6 When temperature at T2 reaches 110C (270F), (the assumed chemical mix activation temperature), turn on power supply to the electrodes.

18.4.7 When temperature at T2 reach a plateau increase record data to 2,3 then 5 minutes.

18.4.8 Ensure LN flow is appropriate to maintain wall temperature of the device at 234 to 235 C. Open or close LN valve if necessary during the test.

18.4.9 Ensure that temperature and pressure are within limits during the entirety of the test. Temperature (including temperature calculated from pressure gauge readings) should not exceed 400 degrees C. Pressure should not exceed 25atm. See emergency shutdown procedure in section 18.7. SHUT DOWN IF TEMPERATURE EXCEEDS 400 C or PRESSURE EXCEEDS 25atm or if pressure drops independent of temperature at a rate that indicates a leak.

18.4.10 Test end 6 hours after T2 reaches 572F..

18.4.9 For the duration of the test, record gamma spectrum, with a repeating 30 minute acquisition time. Repeat and save until the end of the test.

18.5 End of testing

18.5.1 Ensure M3 is open

18.5.2 Slowly release 1 atm of hydrogen by slowly opening V5 and V10 throttle valve. NOTE: Tubing will be hot.

18.5.3 Close V5 and V10.

18.5.4 Slowly add nitrogen by opening nitrogen bottle regulator to approx.. 1 atm greater than P2 is reading.

18.5.5 Slowly open V2 until P2 reaches 1atm greater than when H2 was released. Then close V2.

18.5.6 Wait for H level in Vent M3 to stabilize back to less than 3%. if H2>3% purge with LN. Use bottle nitrogen to circulate air in containment chamber

18.5.7 Close all manifold valves except V13 and V14

18.5.8 Turn the heater down to below 50F

18.5.9 Turn off power to Voltage Supply

18.5.10 Turn off Gamma spectrometer

18.5.11 Continue bleeding H2 using V10 and V5 at a rate of approx.. 1 atm at a time as outlined in 18.5.2 until hydrogen in the system is not detectable in the outer chamber via M3.

18.5.12 Monitor temperatures and pressures for unusual behavior as temperature drops to target value of 22 degrees centigrade.

18.6 Samples and smears unloading

18.6.1 Leave LN flow throughout the Outer device until device temperature at T2 reaches temperature below 70C degrees centigrade then turn off LN regulator and close all valve throughout the manifold. Ensure all gas bottle are closed. Allow the device to cool down ~~overnight~~ to ambient temperature.

18.6.2 On the following day, crack open LN tank and allow gas monitor to reach O2 level of 0.0%.

18.6.3 Open Helium gas bottle valve and set pressure at regulator to approx.. 50 PSI

18.6.4 Open V1 slowly.

18.6.5 Open V14 slowly.

18.6.6 Open V13 slowly

18.6.7 Open V5

18.6.8 Slowly open V10.

18.6.9 Slowly crack open V2 and allow Helium to circulate through the device and remove remaining H2 in the manifold and the device.

18.6.10 Check H level in Chamber at location M1 and M3. Ensure that level is lower than 3%.

18.6.11 After 20 seconds, close helium gas bottle.

18.6.12 Close LN valve, then close the valves on the 2 vent lines.

18.6.13 Open all valves throughout the manifold to allow for P2 to equilibrate.

18.6.14 Ensure H2 level at M1 and M3 locations is below 3% and stabilized. Ensure O2 level remains at 0.0%

18.6.15 Close all manifold valves

18.6.16 Use wrench to loosen nuts in star pattern. Do not totally disengage a nut until all nuts have been loosened to point where the cover is no longer in compression, support the door so it doesn't fall on hand, and support the door with one hand when loosening the last nut.

18.6.17 Extract smaller tray from device

18.6.18 Place Cobalt 60 mix tray into a hermetic plastic container

18.6.19 Chemical mix can be reused for multiple tests and does not need to be extracted out of the containment chamber until the final test is conducted. If final test occurred, slowly extract both trays from device at once and place into a hermetic plastic container

18.6.20 Seal the plastic container securely.

18.6.21 At the end of test B series, use smear pads to smear the inside of the device and drop the pads into the 250ml wide mouth plastic container.

18.6.22 Slowly pick up door, check gasket, place the door over bolts and press on device face, slowly put nuts onto each bolt until touching door face, torque nuts in a star pattern.

18.6.23 Close all valves not previously closed.

18.6.24 Use wrench to take off large bolts and open the top of the outer chamber by removing the transparent Lexan window.

18.6.25 Slowly lift and retrieve the chemical sample(s) in the plastic container and transfer to radiochem for transfer into pre-weighted glass vial for analysis. Retrieve the two plastic bottles containing the smears. \

18.7 Emergency procedure

18.7.1 Start release of hydrogen through valve combination of V10 and/or V8 in as controlled a manner as possible. It is not desirable to blast all the hydrogen out at once and this should be avoided if at all possible. Add nitrogen by opening regulator to 1 atm greater than current P2 is reading. Then open V2 and open V14. As possible, continue the controlled release of hydrogen through the V10 valve (keeping M3 well below 3% for Hydrogen as best as possible). If necessary open V8 to quickly drain hydrogen from the device. Adjust LN flow through V16 if necessary to increase dilution.

18.7.2 While waiting for M3 to stabilize to less than 3% oxygen if possible - Turn off the heater if not already off

18.7.3 If controlled shutdown is possible continue to add nitrogen by keeping the nitrogen regulator to 1 atm greater than P1 is reading. Ensure V2 and V14 are open. When P1 and P2 match (1 atm has been added), then close V2 and V14. Then slowly release 1 atm of hydrogen through V8 throttle valve (keeping M3 well below 3% for Hydrogen). Wait for H level in Vent M3 to stabilize back to less than 2. Then continue process until temperature at T2 starts on a steady descent.

18.7.4 Turn off Voltage supply

18.7.5 Turn off Gamma monitoring device[RES4]

18.7.6 If possible Continue with process outlined in 18.7.1 until hydrogen in the system is not detectable via M3. At that point, the process in 18.5.1 can be continued in order to expedite the cooling process or the device can be left to cool on its own.

18.7.7 Monitor temperatures and pressures for unusual behavior as temperature drops to target value of 22 degrees centigrade.

19. SAMPLE PROCESSING AND ANALYSIS

19.1 EHS should release samples for further testing

19.2 Transfer cobalt-59/60 samples to counting lab (209 B103)

19.3 Transfer chemical mix sample to Preparation lab (204 B103)

19.4 Analyze cobalt sample using standard gamma analysis procedure in place

19.5 Prepare chemical mix sample for digestion and ICPMS using standard ICPMS procedure in place.

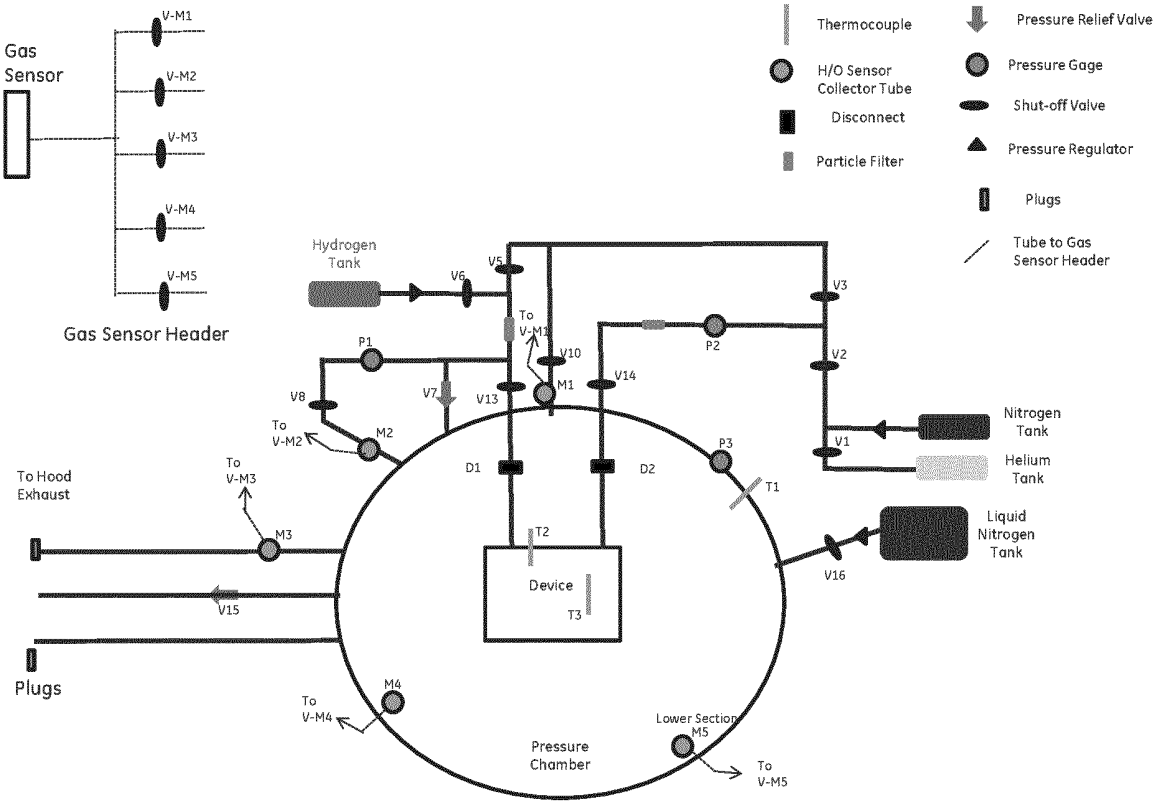

Figure 17-1- Diagram for use with Test Procedure

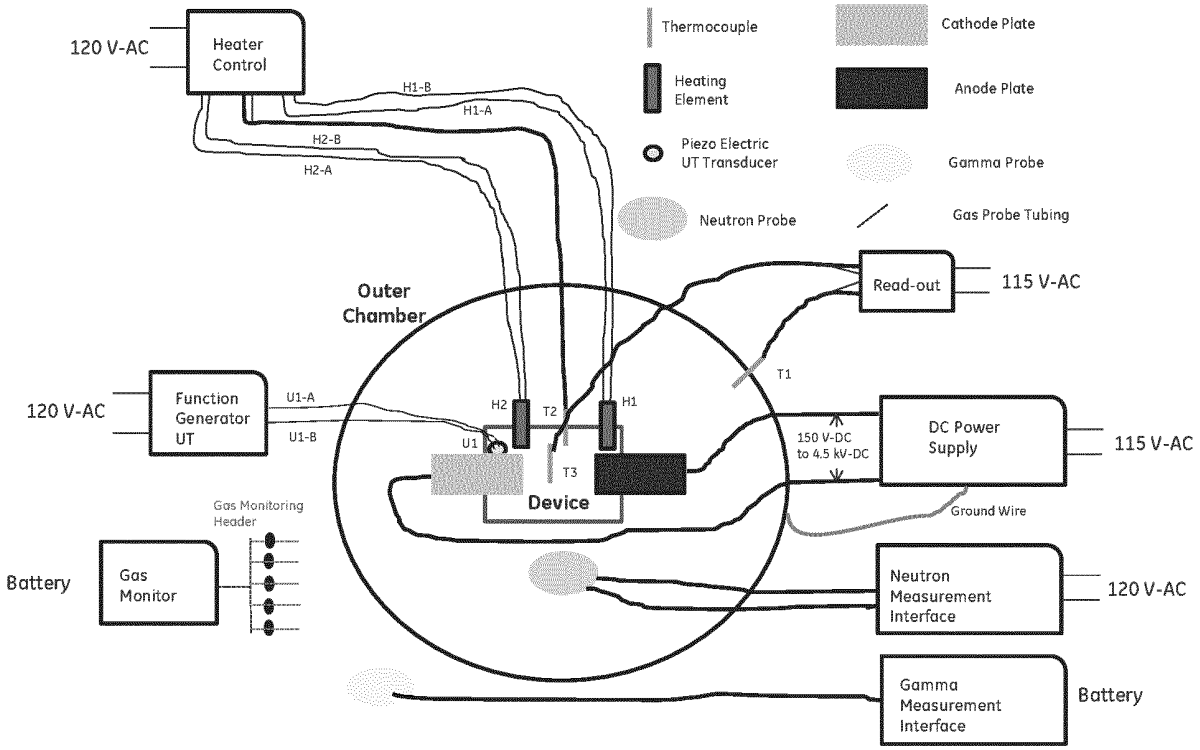

Figure 17-2- Electrical Schematic (Note that T3 is to be placed on the outer surface on top of the device and that T1 is for measuring the temperature inside the outer chamber)

Figure 17-3 – Outer Chamber with Device Inside

Figure 17-4 – Front of Device

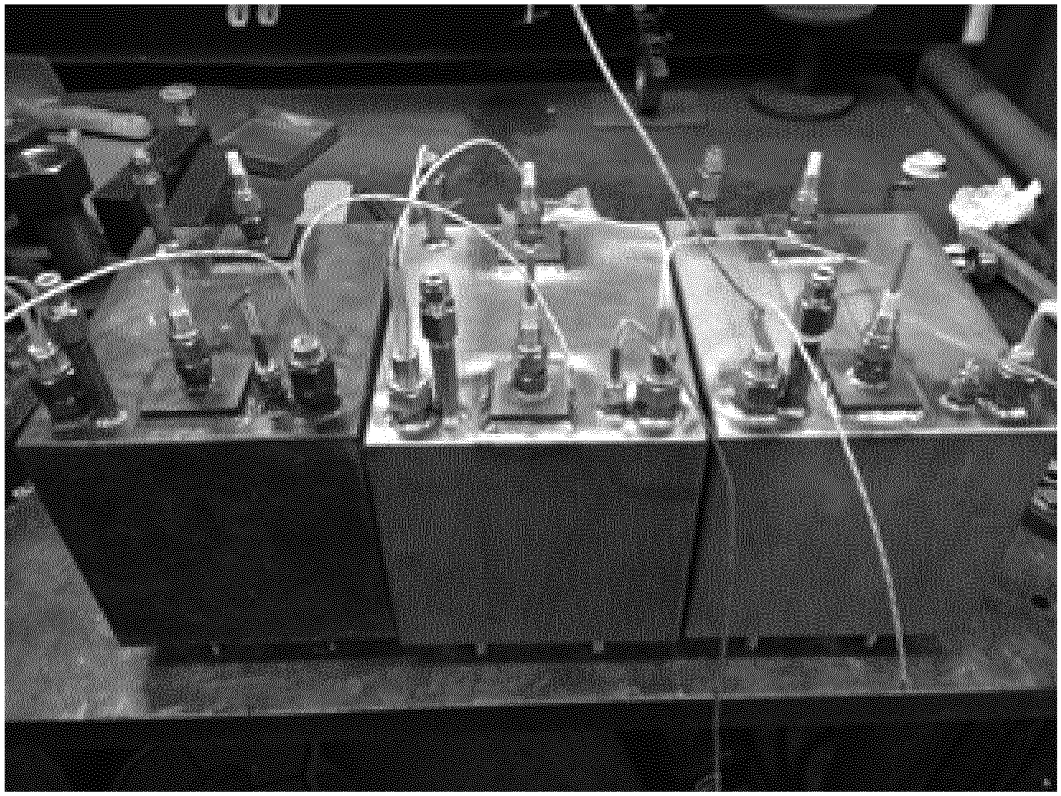

Figure 17-5- Back of Device

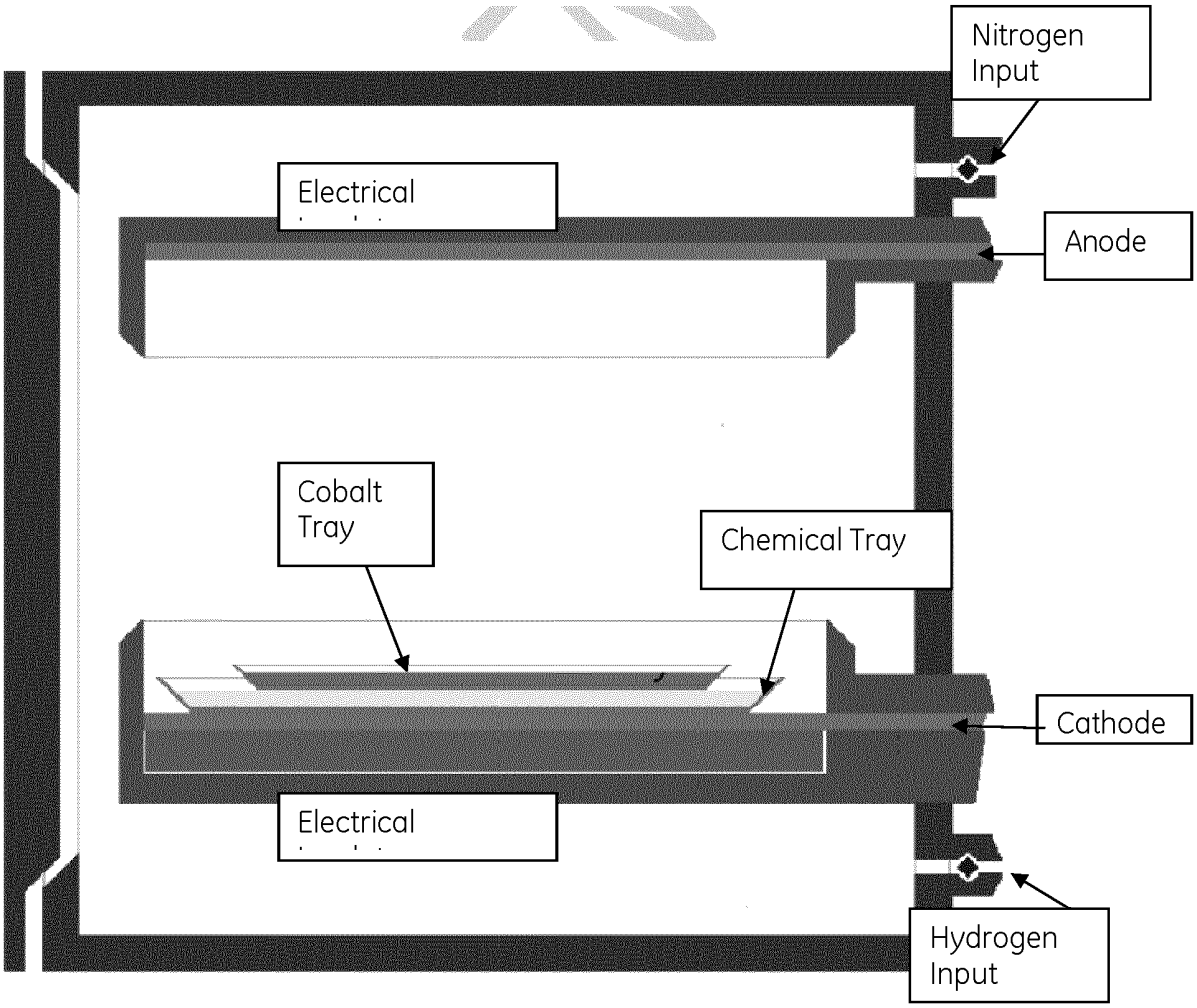

Figure 17-6- Side View of Device with Electrodes and Trays in Place for Test (Note this diagram does not include items inside the device other than electrodes/insulation and trays and is used only to show general component positions)

LENR Test B

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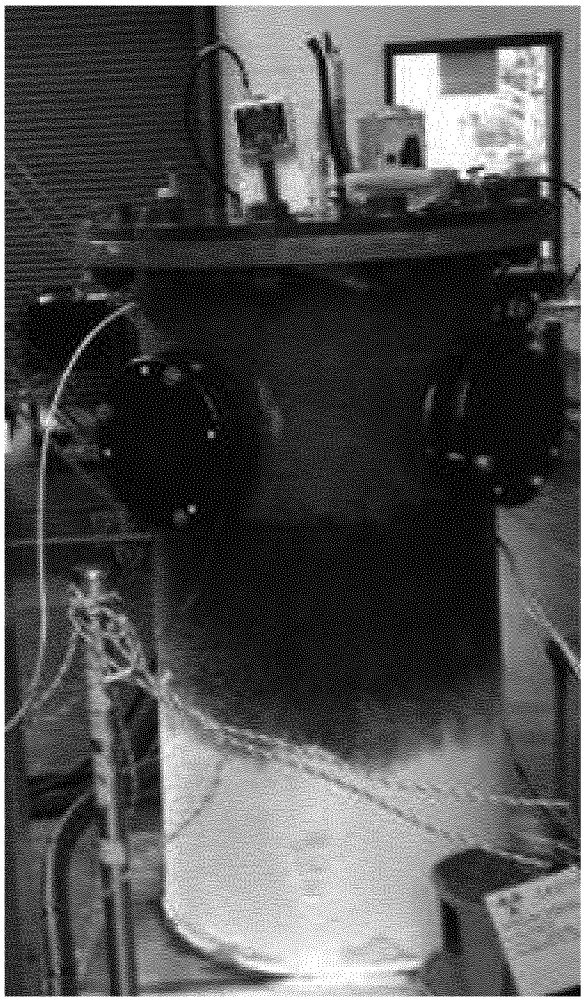

Summary

- Test 1 heated on 12/12. Test 2 heated on 12/14.
- Characteristic bulk temperature greater than heater thermocouple temperature was not observed.
- No change from background noted on instrumentation, but background was high
- Chemical change occurred to cobalt.
- Initial dose rate results substantially lower
- Specific activity of Test B1 ~3% lower than initial. TestB2 ~10%

Specific Activity Test B1

	Unreacted (UR)	Post Test (PTB1)	Unreacted Test 2 (UR)	Post Test (PTB2)					
Sample Weight	2.059	1.35	2.01	1.20					
Disolved in 50 ml of	water	nitric		nitric					
diluted with	4% nitric	4% nitric	4% nitric	4% nitric					
10 ml diluted by a factor of 2									
for mass spec diluted again to 1 in 2,500 (two 1 in 50 steps)									
	UR-1	UR-2	UR-3	UR ave	PTB1-1	PTB1-2	PTB1-3	PTB1-ave	
g of material	0.31	0.31	0.3		0.3	0.3	0.29		
uCi/measured sample	3.82	3.57	3.44		4.97	4.95	4.21		
uCi/sample	1.91	1.785	1.72		2.485	2.475	2.105		
uCi/g sample	6.16	5.76	5.73		8.28	8.25	7.26		
uCi (in sample weight)	12.69	11.86	11.80	12.12	11.18	11.14	9.80	10.71	
ug/liter Ni	18301	17096	16499		25517	27283	22792		
ug/liter Co	553140	507594	491586		745596	752197	607844		
g Co/sample	0.11	0.10	0.10		0.15	0.15	0.12		
g Co/ (sample weight)	0.73	0.67	0.67		0.67	0.68	0.57		
ug/liter metal	571441	524690	508085		771113	779480	630636		
g metal/sample	0.11	0.10	0.10		0.15	0.16	0.13		% reduction
g metal / (sample weight)	0.76	0.70	0.70		0.69	0.70	0.59		
uCi/g Co	17.27	17.58	17.49	17.4	16.66	16.45	17.32	16.8	3.65
uCi/g metal	16.71	17.01	16.93	16.9	16.11	15.88	16.69	16.2	3.89
uCl/(sample weight)	16.71	17.01	16.93		16.11	15.88	16.69		

Specific Activity Test B2

					PTB2-1	PTB2-2	PTB2-3	PTB2-ave	
g of material	0.31	0.31	0.3		0.3	0.3	0.3		
uCi/ml	3.82	3.57	3.44		5.32	5.02	5.01		
uCi/sample	1.91	1.785	1.72		2.66	2.51	2.505		
uCi/g sample	6.16	5.76	5.73		8.87	8.37	8.35		
uCi (in sample weight)	12.69	11.86	11.80	12.12	10.64	10.04	10.02	10.23	
ug/liter Ni	18301	17096	16499		27676	25549	26999		
ug/liter Co	553140	507594	491586		851309	790440	805682		
g Co/sample	0.11	0.10	0.10		0.17	0.16	0.16		
g Co/ (sample weight)	0.73	0.67	0.67		0.68	0.63	0.64		
ug/liter metal	571441	524690	508085		878985	815989	832681		
g metal/sample	0.11	0.10	0.10		0.18	0.16	0.17		% reduction
g metal / (sample weight)	0.76	0.70	0.70		0.70	0.65	0.67		
uCi/g Co	17	18	17	17	15.62	15.88	15.55	15.7	10.12
uCi/g metal	17	17	17	17	15.13	15.38	15.04	15.2	10.06
uCl/(sample weight)	17	17	17		15.13	15.38	15.04		