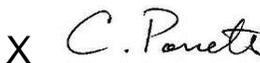
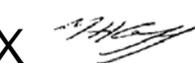


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**Reviewed by:**

11/9/2015	12/7/2015	11/9/2015
 <hr/> Christopher Porretto Quality Assurance Manager Signed by: Porretto, Christopher J	 <hr/> Paul Zschack Photon Science Division Director Signed by: Zschack, Paul	 <hr/> Steve Moss Acting Conduct of Operations Manager Signed by: Moss, Steven H
11/9/2015	11/9/2015	11/12/2015
 <hr/> Bruce Lein Training Group Leader Signed by: Lein, Bruce	 <hr/> Andrew Ackerman Deputy ESH Manager Signed by: Ackerman, Andrew	 <hr/> Michael Gaffney BNL ODH Safety Engineer Signed by: Gaffney, Michael
11/17/2015	11/9/2015	
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<b>USI Screening/Resolution</b>	<b>Procedure Validation*</b>
11/9/2015	11/9/2015
 <hr/> Steve Moss Authorization Basis Manager Signed by: Moss, Steven H	 <hr/> Brian Heneveld ESH Engineer Signed by: Heneveld, Brian *for Operations/Technical procedures only

**Approved by:**

11/13/2015


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 Robert Lee  
 ESH Manager  
 Signed by: Lee, Robert J

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### VERSION HISTORY LOG

VERSION	DESCRIPTION	DATE
1	First Issue	29May2014
2	Changed "hutch" to Beamline Enclosures throughout procedure; added section 6.2 and Attachment B for system inspection requirements; added Technical Authority sign-off to Attachment A. Minor edits and formatting throughout. Title changed to include Inspection.	21Aug2014
3	Added Cryogen Fill Stations to procedure; removed all references to Photon Science Division and replaced with NSLS-II.	13Nov2015

### ACRONYMS

BNL	Brookhaven National Laboratory	O <sub>2</sub>	Oxygen
ESH	Environment, Safety and Health	ODH	Oxygen Deficiency Hazard
FLOCO	Floor Coordinator	POM	Personal Oxygen Monitor
LN <sub>2</sub>	Liquid Nitrogen		
NSLS-II	National Synchrotron Light Source II		

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## 1 PURPOSE AND SCOPE

The purpose of this procedure is to provide instructions for the certification and inspection of the PureAire Air Check O<sub>2</sub> Oxygen Deficiency Monitors and associated alarms for the NSLS-II Beamline Enclosures and Cryogen Fill Stations identified to be at risk of oxygen deficiency under specific cryogen system failure scenarios. The PureAire Air Check O<sub>2</sub> Oxygen Deficiency Monitors and associated alarms are required to be inspected and re-certified every 12 months; not to exceed 15 months.

The scope of this procedure includes:

- System Inspection:
  - Visual inspection of each system
  - Verifying the status of each system component
  - Determination and implementation of any required corrective actions/maintenance activities based upon the visual inspection
- System Certification:
  - Performance of functionality testing using a challenge gas to activate a system response
  - Verification of the activation of the sounder/strobes located within the beamline enclosures and cryogen fill stations and at all exterior entrances to the beamline enclosures and cryogen fill stations
  - Verification that a communication means (e.g., telephone) is readily available or automated to contact the Control Room

## 2 DEFINITIONS

- 2.1 Verification: A process of confirming that system testing results in the expected outcome.
- 2.2 Challenge Gas: The gas introduced to the monitoring sensor to ensure that the ODH monitor responds as expected under ODH conditions.

## 3 RESPONSIBILITIES

- 3.1 Testers/Inspectors

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- 3.1.1 Coordinate and perform ODH Monitoring System inspection and certification.
- 3.1.2 Complete Attachment A, *Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Inspection Data Sheet* and Attachment B, *Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Certification*, as required and forward to the Configuration Management Specialist.
- 3.2 Assistants
  - 3.2.1 Assist the Tester in performing the testing actions and observations when directed by the Tester.
  - 3.2.2 Report all test observations to the Tester.
- 3.3 Configuration Management Specialist
  - 3.3.1 Posts the completed Attachment A, *Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Inspection Data Sheet* and/or Attachment B, *Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Certification* on the SharePoint Document Center.

#### 4 PREREQUISITES

- 4.1 The Tester/Inspector shall be ESH Staff or personnel authorized by ESH Staff.
- 4.2 Assistants shall be designated by the Testers.
- 4.3 All Testers and Assistants shall be current in Oxygen Deficiency Hazard - Class 0 (TQ-ODH) training.
- 4.4 The following have been notified that the test will be performed:
  - Staff present at the testing location
  - Staff adjacent to the testing location
  - Control Room
  - FLOCO
- 4.5 An announcement has been made on the Building 740 public address system notifying personnel of the testing.

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4.6 The appropriate functionality testing materials are available:

- Challenge gas in Tedlar bag
- Tubing

4.7 The Monitor Display indicates an oxygen concentration at or between 20.4% and 21.4%.

**Note:** The Enable Lights are located adjacent to the sounder/strobe and indicate that the alarm is powered and connected to the monitoring device.

4.8 All Enable Lights are illuminated (Figure 4-1).



**Figure 4-1:** ODH Monitor with Blue Sounder/Strobe and Green Enable Light

## 5 PRECAUTIONS AND LIMITATIONS

5.1 Entering the beamline enclosures to perform ODH functionality testing or inspection requires coordination with beamline scientists to minimize disruption and ensure that safe entry procedures are followed.

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- 5.2 No beamline enclosures or cryogen fill stations shall be entered if the alarm system is activated under a potential LN<sub>2</sub> System failure condition prior to evaluation and authorization by BNL Fire/Rescue.
- 5.3 Any replacement of components during maintenance activities in a beamline enclosure requires a Safety System Work Permit in accordance with PS-ESH-PRM-3.4.1, *Procedure for Safety System Work Permits* and re-certification of the system in accordance with PS-C-XFD-PRC-035, *NSLS-II Beamline Enclosures ODH Monitoring and Alarm System Configuration Management*.

## 6 PROCEDURE

**Note:** System inspection and certification is required every 12 months; not to exceed 15 months.

### 6.1 System Inspection

**Note:** Attachment A, *Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Inspection Data Sheet* shall be completed for each beamline enclosure or cryogen fill station inspected.

#### 6.1.1 Visual Inspection

**Note:** Maintenance is performed in accordance with the PureAire Air Check O<sub>2</sub> Deficiency 0-25% Monitor Instruction Manual if any of the conditions below are not met.

- a. Perform a visual inspection of the entire monitoring system including:

- Sensor
- Cable conduit
- Alarm units

- a.1 Upon inspection, verify the following:

- The monitor display is indicating 20.4% – 21.4% oxygen
- The monitor is securely mounted
- No dust or other material has accumulated in and around the sensor diffusion port
- All green enable lights are illuminated
- All conduit containing power and alarm cables are intact and in good condition

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- b. Verify that the Zirconium O<sub>2</sub> sensor is within 10 years of service by inspecting the calibration sticker located on the upper left corner of the display face of the PureAire Air Check O<sub>2</sub> Oxygen Deficiency Monitor.

**Note:** Replacement of the Zirconium O<sub>2</sub> sensor requires the use of a Safety System Work Permit in accordance with PS-ESH-PM-3.4.1, *Procedure for Safety System Work Permits*.

- c. IF the Zirconium O<sub>2</sub> sensor is not within 10 years of service, THEN replace the Zirconium O<sub>2</sub> sensor.
- d. IF any inspection results deviate from the expected configuration, THEN contact the Technical Authority.

## 6.2 System Certification

### 6.2.1 Alarm Activation

**Note:** Attachment B, *Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Certification* shall be completed for each beamline enclosure and cryogen fill station tested.

- a. Verify that the monitor display indicates 20.4% - 21.4% oxygen.
- b. Using the appropriate diameter tubing, place the challenge gas in proximity to the monitor in a manner that will ensure that the gas will adequately impact the diffusion sensor as indicated in Figure 6-1 below.

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**Figure 6-1:** Configuration of Tubing for Testing

- c. Place tubing in position AND open the valve to allow gas flow.
- d. Verify that both visual AND audible alarms have activated at the following locations:
  - Within the beamline enclosure or cryogen fill station area
  - At all exterior entrances to the beamline enclosure or cryogen fill station area
- e. Verify that communication with the Control Room is readily available or an automated communication has occurred.

#### 6.2.2 Alarm Return to Normal

- a. Close the valve of the challenge gas.
- b. Remove tubing.
- c. WHEN the monitor indicates an oxygen concentration of greater than 19.5%, THEN verify that both visual AND audible alarms have returned to normal (non-activated) at the following locations:

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- Within the beamline enclosure or cryogen fill station area
  - At all exterior entrances to the beamline enclosure or cryogen fill station area
- d. IF the test was unsuccessful, THEN post the beamline enclosure or cryogen fill station area indicating that “Calibrated POMs are Required for Entry” AND notify the Technical Authority.

### 6.3 Documentation

6.3.1 Provide the completed Attachment A, *Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Inspection Data Sheet* and/or Attachment B, *Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Certification* to the Configuration Management Specialist for posting on the SharePoint Document Center.

## 7 REFERENCES

- 7.1 PS-C-XFD-PRC-035, *NSLS-II Beamline Enclosures ODH Monitoring and Alarm System Configuration Management*
- 7.2 PS-C-CMD-PRC-002, *Records Management Procedure*
- 7.3 PS-ESH-PM-3.4.1, *Procedure for Safety System Work Permits*
- 7.4 PureAire Air Check O<sub>2</sub> Deficiency 0-25% Monitor Instruction Manual

## 8 ATTACHMENTS

Attachment A, *Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Inspection Data Sheet*

Attachment B, *Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Certification*

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## 9 DOCUMENTATION

The following documents are generated as a result of this procedure and shall be maintained in accordance with PS-C-CMD-PRC-002, *Records Management Procedure*:

- Completed Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Inspection Data Sheets
- Completed Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Certifications

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### Attachment A

## Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Inspection Data Sheet

**Enclosure/Cryogen Fill Station** \_\_\_\_\_

- Monitor display indicating 20.4% – 21.4% oxygen Yes  No
- Monitor is securely mounted Yes  No
- Diffusion port is free of dust or other material accumulation Yes  No
- All enable lights are illuminated Yes  No
- All conduit containing power and alarm cables are intact and secure Yes  No
- Zirconium O<sub>2</sub> sensor is within 10 years of service Yes  No

Maintenance activities to be performed (if required):

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**Note:** Signatures below indicate that the inspection has been completed.

Inspection Reason:	Inspection Result: <input type="checkbox"/> Passed <input type="checkbox"/> Failed	
Inspection Date:	Start Time:	Finish Time:
Inspector:	Assistant:	
Inspector Signature:	Assistant Signature:	
Technical Authority:	Technical Authority Signature:	

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## Attachment B

### Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Certification

#### Beamline Enclosure/Cryogen Fill Station \_\_\_\_\_

##### *Pre-test Conditions*

The following have been notified that the test will be performed: Yes  No

- Staff at the testing location
- Staff in adjacent areas
- Control Room
- FLOCO

Monitor Display indicating 20.4% – 21.4% oxygen Yes  No

Announcement made over PA system Yes  No

All enable lights are illuminated Yes  No

##### *Test Conditions with Challenge Gas*

Monitor display indicating less than 18% oxygen Yes  No

Audible and visual alarm activated inside enclosure/fill station Yes  No

Audible and visual alarm activated outside enclosure/fill station at each entrance Yes  No

Communication with Control Room readily available or automated Yes  No

##### *Return to Normal Operation*

Monitor Display indicating 20.4% – 21.4% oxygen Yes  No

Audible and visual alarm deactivated inside enclosure/fill station Yes  No

Audible and visual alarm deactivated outside enclosure/fill station at each entrance Yes  No

**Note:** Signatures below indicate that the test has been completed.

Test Reason:	Test Result: <input type="checkbox"/> Passed <input type="checkbox"/> Failed	
Test Date:	Start Time:	Finish Time:
Tester:	Assistant:	
Tester Signature:	Assistant Signature:	
Technical Authority:	Technical Authority Signature:	