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National Synchrotron Light Source II, Brookhaven National Laboratory

Doc No. PS-C-XFD-PRC-065  Author: M. Benmerrouche  Effective Date: 21Jun2016  Version 1

Title: Beamline ISR (04-ID) Radiation Survey Plan

VERSION HISTORY LOG

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ACRONYMS

BTS  Booster to Storage Ring  mrem/hr  Millirem per hour
DCM  Double Crystal Monochromator  NSLS-II  National Synchrotron Light Source II
DHRM Double Harmonic Rejection Mirror  PBS  Pink Beam Stop
ESH  Environment, Safety and Health  PSD  Photon Science Division
FE  Front End  PSH  Photon Shutter
FOE  First Optical Enclosure  RCT  Radiological Control Technician
GB  Gas Bremsstrahlung  SAF  Safety Approval Form
HFM  Horizontal Focusing Mirror  SBMS  Standards Based Management System
ID  Insertion Device  SOE  Second Optical Enclosure
ISR  In-situ and Resonant X-ray Studies  SSA  Secondary Source Aperture
IVU  In-vacuum Undulator  VFM  Vertical Focusing Mirror
LOTO  Lockout/Tagout  WBS  White Beam Stop
mrad  Millirad
Beamline ISR (04-ID, IVU 23)

Comprehensive Commissioning Radiation Survey Plan

Date: __________

Before Survey Begins:

- Authorization/approval from the NSLS-II Director to initiate commissioning of the beamline has been received.
- A Beamline System Readiness Checklist has been completed in accordance with PS-C-XFD-PRC-003, *Enabling Beamlines for Operations*.
- The area(s) around the beamline are posted in accordance with SBMS Program Description: *Radiological Control Manual*.
- All shutters closed.
- Front end slits wide open (near maximum extent range).
  
  **Note:** If FE slits cannot be wide open, record the FE slits parameter here: ______________________
- ID gap closed to minimum gap after first step of GB radiation survey.
  
  **Note:** If ID cannot be closed to minimum gap, record the gap value here: ______________________
- All beamline slits fully open.
- Monochromator Bragg angle moved to the lower limit (~0 degree)
- All mirrors retracted out from beam.

During Survey:

- Authorized Beamline Staff ensure that photon beam is where it should be using the appropriate diagnostic tools.
- Authorized Beamline Staff ensure that the FE Shutter remains open.
- If at any point during performance of this plan a radiation dose rate of 5 mrem/hr or higher is identified, the radiation survey shall be terminated and the cause investigated, and any hazards shall be mitigated before continuing.
- The step sequences of this procedure can be changed.
- This document, with the filled information from the measurements, will act as the "beamline radiation survey interim report," which shall be submitted to the PSD Director and the ESH Manager for review after the survey.
- Minor deviations from the procedure are allowed in the field; however, the discrepancy shall be documented in this procedure and submitted to the PSD Director and the ESH Manager for review after the survey.
- During surveys performed in top-off mode, top-off will be adjusted for more frequent injections to keep the stored beam current within the allowable specifications.

**Warning:** Execution of this Comprehensive Commissioning Radiation Survey Plan, along with the evaluation of the data collected, may only be used as a basis by the PSD Director and the ESH Manager to approve commissioning activities at an electron beam current of up to 3 times the electron beam current measured during this survey. Approval of commissioning of the beamline at a higher electron beam current requires re-execution of this Comprehensive Commissioning Radiation Survey Plan.

Initial Settings:
Electron Beam Current: __________ Injection Rate: __________ BTS Injection Efficiency: ________________

ID gap: ____________________ Straight Section Vacuum Condition: ________________________________

HFM settings: __________________

DCM settings: __________________

VFM settings: __________________

DHRM settings: __________________

Survey start date and time: __________________________

Authorized Beamline Staff & Radiological Control Technicians (RCTs):
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

Additional information if available: ____________________________

The following scenarios are covered:

I. **04 ID-A (FOE) integrity**: Beam on WBS, HFM, PBS, DCM, monochromatic beam on VFM and PSH.

II. **04 ID-B (SOE) and C/D integrity**: Monochromatic beam on Photon shutter, DHRM, beam stops, and target(s) (Al or Si).

**Note**: The transport pipe integrity check is included in this survey plan.

**Survey Conditions:**

**HOLD POINT**: Evaluate and ensure that all applicable controls listed in the Commissioning SAF are in place, including LOTO requirements for the beamline photon shutters (in accordance with PS-C-XFD-PRC-024, *Beamline Photon Shutter Centrally Controlled Lockout/Tagout Procedure*).

**HOLD POINT**: Before opening safety shutters in the front end, survey the upstream wall of the FOE to make sure no radiation comes through.

**Note**: Detailed diagrams of hutch A and B are included in Attachment A.
I. Check the integrity of FOE (04-ID-A), transport pipe, and Photon Shutter 1.

1. GB radiation survey: Gap open, FE slits wide open, GB on WBS, survey all walls and roof of the FOE (04-ID-A), and downstream pipe behind the downstream wall of FOE.

ID Gap: _______________________
Straight Section Vacuum Conditions: ______________
Radiation Survey Results: ______________
Additional information/comments:
________________________________________________________________________________________________________________
________________________________________________________________________________________________________________
________________________________________________________________________________________________________________
________________________________________________________________________________________________________________
________________________________________________________________________________________________________________

Signature (ESH) ____________________ Signature (Beamline) ____________________
2. **GB radiation survey**: Gap open, FE slits wide open, *Insert HFM*, survey all walls and roof of the FOE (04-ID-A), and the downstream pipe behind the downstream wall of FOE. **Retract HFM**

**ID Gap:** ______________________

**Straight Section Vacuum Conditions:** ____________

**Radiation Survey Results** ________________

**Additional information/comments:**

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**Signature (ESH)________________________Signature (Beamline)________________________**
3. **Close ID Gap, white beam on WBS**, survey all walls and roof of the FOE (04-ID-A), and downstream pipe behind downstream wall of FOE.

**ID Gap:**

**Straight Section Vacuum Conditions:**

**Radiation Survey Results:**

**Additional information/comments:**

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**Signature (ESH) ________________________ Signature (Beamline) _______________________**
4. Close ID to minimum gap (6.1 mm), insert HFM at 0.15 degrees (2.62 mrad) incident angle, white beam on HFM survey all walls and roof of the FOE (04-ID-A), and downstream pipe behind downstream wall of FOE. Survey exit mono beam transport pipe downstream from 04-ID-B to verify the integrity of 04-ID-A PSH.

ID Gap: _______________________
Straight Section Vacuum Conditions: _______________
Radiation Survey Results ________________
Additional information/comments:
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Signature (ESH) ___________________ Signature (Beamline) ___________________
5. **Set DCM Bragg angle to pass undulator harmonic (nominal values)**, survey all walls and roof of the FOE (04-ID-A), and downstream pipe behind downstream wall of FOE.

   
   
   

   **DCM Bragg Angle:**
   ____________________________

   **ID Gap:**
   ____________________________

   **Straight Section Vacuum Conditions:**
   ____________________________

   **Radiation Survey Results**
   ____________________________

   **Additional information/comments:**
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

   **Signature (ESH)_________________________**
   **Signature (Beamline)_____________________**
6. Insert VFM and set it to incident angle of 0.15 degrees (2.62 mrad), SOE Shutter open, survey all walls and roof of the FOE (04-ID-A), near Photon Shutter 1, and downstream pipe behind downstream wall of FOE and exit mono beam transport pipe to verify the integrity of 04-ID-A PSH.

**Diagram: Sheilding and Shutter Layout**

- **DCM Bragg Angle:** __________________________
- **ID Gap:** __________________________
- **Straight Section Vacuum Conditions:** __________________________
- **Radiation Survey Results:** __________________________
- **Additional information/comments:**

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**Signature (ESH)________________________ **Signature (Beamline)________________________
II. Check the integrity of 04-ID-B (SOE) and transport pipe.

7. Open 04-ID-A Photon Shutter 1 to allow beam into 04-ID-B enclosure, survey all walls and roof of the SOE (04-ID-B) and upstream/downstream pipes, and exit mono beam transport pipe.

DCM Bragg Angle: ______________________
ID Gap: ______________________
Straight Section Vacuum Conditions: ______________________
Radiation Survey Results: ______________________
Additional information/comments:
________________________________________________________________________________________________________________
________________________________________________________________________________________________________________
________________________________________________________________________________________________________________
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Signature (ESH) ______________________ Signature (Beamline) ______________________
8. **Same as step 9 but insert DHRM into the beam**, survey all walls and roof of the SOE (04-ID-B) and upstream/downstream pipes. **Retract DHRM**

**DCM Bragg Angle:** ______________________

**ID Gap:** ______________________

**Straight Section Vacuum Conditions:** ______________

**Radiation Survey Results:** ______________

**Additional information/comments:**

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**Signature (ESH) __________________ Signature (Beamline) __________________**
III. Check the integrity of 04-ID-C, delivery transport pipe and 04-ID-D

9. Open 04-ID-B Photon Shutter 2 to allow beam into 04-ID-C enclosure, insert sample target at sample location, survey all walls and roof of 04-ID-C, upstream pipes, and inside 04-ID-D.

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**DCM Bragg Angle:** __________________________

**ID Gap:** __________________________

**Straight Section Vacuum Conditions:** ________________

**Radiation Survey Results** __________________________

**Additional information/comments:**

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Signature (ESH) __________________________ Signature (Beamline) __________________________
10. Remove sample target in 04-ID-C to allow beam to strike movable beam stop on the downstream wall of 04-ID-C, survey all walls and roof of 04-ID-C, upstream pipes, and inside 04-ID-D.

**DCM Bragg Angle:**

**ID Gap:**

**Straight Section Vacuum Conditions:**

**Radiation Survey Results**

**Additional information/comments:**

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________________________________________________________________________________________________________________

________________________________________________________________________________________________________________

Signature (ESH) _________________________ Signature (Beamline) _________________________
11. Open 04-ID-C movable beam stop to allow beam to strike beam stop on the downstream wall of 04-ID-D, survey all walls and roof of 04-ID-D.

**DCM Bragg Angle:** __________________________

**ID Gap:** __________________________

**Straight Section Vacuum Conditions:** __________

**Radiation Survey Results** ________________

**Additional information/comments:**
__________________________________________
__________________________________________
__________________________________________
__________________________________________

**Signature (ESH) __________________________Signature (Beamline) __________________________**
12. **Insert sample target in 04-ID-D at sample location**, survey all walls and roof of 04-ID-D.

**DCM Bragg Angle:**

**ID Gap:**

**Straight Section Vacuum Conditions:**

**Radiation Survey Results**

**Additional information/comments:**

______________________________________________________________

______________________________________________________________

______________________________________________________________

**Signature (ESH)____________________Signature (Beamline)________________**

**Survey end date and time:**

**Additional attachment, information or comments:**

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Title: Beanline ISR (04-ID) Radiation Survey Plan

Intentionally blank for 2-sided printing
Attachment A – Beamline Enclosure Diagram, 4-ID-A (FOE)
Attachment A – Beamline Enclosure Diagram, 4-ID-B (SOE)