Doc No: NSLSII-8BM-PRC-001

NSLS-II PROCEDURE: BEAMLINE TES (8-BM) RADIATION SURVEY PROCEDURE

August 5, 2016
Rev. 1
M. Benmerrouche

Think Safety. Act Safely.
By signing this Procedure I acknowledge that it complies with all ESH requirements and if performed correctly, will not present a significant hazard to personnel or equipment.

Beamline Review:
8/4/2016

Paul Northrup
Paul Northrup
TES Lead Beamline Scientist
Signed by: Northrup, Paul

By signing this Procedure I acknowledge that it is comprehensive and can be performed as written at the beamline.

Authorization Basis Review:
8/5/2016

Steve Moss
Authorization Basis Manager
Signed by: Moss, Steven H

By signing this Procedure I acknowledge that a USI Screening/Evaluation has been performed and this Procedure does not adversely impact the NSLS-II Authorization Basis Documents.

Approved:
8/5/2016

Robert Lee
ESH Manager
Signed by: Lee, Robert J

By approving this Procedure I agree that the appropriate personnel have reviewed this document and I authorize this work to commence as written.
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### REVISION HISTORY

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### ACRONYMS

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<thead>
<tr>
<th>Acronym</th>
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<tr>
<td>Be</td>
<td>Beryllium</td>
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<tr>
<td>BLW</td>
<td>Bellows</td>
</tr>
<tr>
<td>BM</td>
<td>Bending Magnet</td>
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<tr>
<td>BPM</td>
<td>Beam Position Monitor</td>
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<tr>
<td>BTS</td>
<td>Booster to Storage Ring</td>
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<tr>
<td>CO</td>
<td>Collimator</td>
</tr>
<tr>
<td>ESH</td>
<td>Environment, Safety and Health</td>
</tr>
<tr>
<td>FE</td>
<td>Front End</td>
</tr>
<tr>
<td>FOE</td>
<td>First Optical Enclosure</td>
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<tr>
<td>GB</td>
<td>Gas Bremsstrahlung</td>
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<tr>
<td>GV</td>
<td>Gate Valve</td>
</tr>
<tr>
<td>IP</td>
<td>Ion Pump</td>
</tr>
<tr>
<td>KB</td>
<td>Kirkpatrick-Baez</td>
</tr>
<tr>
<td>LOTO</td>
<td>Lockout/Tagout</td>
</tr>
<tr>
<td>MONO</td>
<td>Monochromator</td>
</tr>
<tr>
<td>mrem/hr</td>
<td>Millirem per hour</td>
</tr>
<tr>
<td>MSK</td>
<td>Mask</td>
</tr>
<tr>
<td>NSLS-II</td>
<td>National Synchrotron Light Source II</td>
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<tr>
<td>PBS</td>
<td>Pink Beam Stop</td>
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<tr>
<td>PFM</td>
<td>Primary (toroidal) Focusing Mirror</td>
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<tr>
<td>PSD</td>
<td>Photon Science Division</td>
</tr>
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<td>PSH</td>
<td>Photon Shutter</td>
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<tr>
<td>RCT</td>
<td>Radiological Control Technician</td>
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<tr>
<td>SAF</td>
<td>Safety Approval Form</td>
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<tr>
<td>SBMS</td>
<td>Standards-Based Management System</td>
</tr>
<tr>
<td>SR</td>
<td>Synchrotron Radiation</td>
</tr>
<tr>
<td>SSA</td>
<td>Secondary Source Aperture</td>
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<tr>
<td>TES</td>
<td>Tender Energy Spectroscopy and Imaging</td>
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1 PURPOSE AND SCOPE

This purpose of this procedure is to perform a comprehensive commissioning radiation survey on the 8-BM beamline, as directed by PS-C-XFD-PRC-004, *NSLS-II Beamlines Radiation Safety Commissioning Plan*.

The following scenarios are covered in the *Beamline TES (08-BM, BM) Comprehensive Commissioning Radiation Survey*, provided as Attachment A:

I. GB Radiation Survey
   a. Integrity of FOE (08-BM-A) and FOE photon shutter.
   b. Integrity of components outside the FOE including transport pipe from 08-BM-A to 08-BM-B and inside 08-BM-B.

II. SR Radiation Survey
   a. Integrity of enclosure 08-BM-A and FOE photon shutter.
   b. Integrity of transport pipe from 08-BM-A to 08-BM-B.
   c. Integrity of enclosure 08-BM-B and beam stop on the downstream of 08-BM-B.

2 PREREQUISITES

2.1 Authorization/approval from the NSLS-II Director to initiate commissioning of the beamline has been received.

2.2 A Beamline System Readiness Checklist has been completed in accordance with PS-C-XFD-PRC-003, *Enabling Beamlines for Operations*.

2.3 The area(s) around the beamline are posted in accordance with SBMS Program Description: *Radiological Control Manual*.

2.4 All shutters closed.

2.5 FE slits wide open (near maximum extent range).

**Note:** If FE slits cannot be wide open, record the FE slits parameter here: ______________________

2.6 All beamline slits fully open.

2.7 Monochromator Bragg angle moved to the lower limit (~10 degrees)
2.8 All mirrors retracted out from beam.

3 HAZARDS, CONTROLS AND LIMITS

3.1 If at any point during performance of this Procedure 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.

3.2 Minor deviations on Attachment A are allowed in the field; however the deviation shall be documented on the attachment and submitted to the PSD Director and the ESH Manager for review after the survey.

3.3 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.

4 PROCEDURE

Warning: Execution of this Comprehensive Commissioning Radiation Survey, 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.

Note: The step sequences of this procedure can be changed.

4.1 Authorized Beamline Staff and RCTs establish the initial conditions and record them on Attachment A, Beamline TES (08-BM, BM) Comprehensive Commissioning Radiation Survey.

4.2 Authorized Beamline Staff and RCTs complete the comprehensive commissioning radiation survey in accordance with Attachment A.

4.3 Throughout the radiation survey, Authorized Beamline Staff ensure that the photon beam is where it should be using the appropriate diagnostic tools AND ensure that the FE shutter remains open.
Note: Attachment A, with the filled information from the measurements, acts as the “Beamline Radiation Survey Interim Report.”

4.4 After the survey, the RCT provides the completed Beamline Radiation Survey Interim Report to the PSD Director and the ESH Manager for review.

5 REFERENCES

5.1 PS-C-CMD-PRC-002, Records Management Procedure

5.2 PS-C-XFD-PRC-003, Enabling Beamlines for Operations

5.3 PS-C-XFD-PRC-004, NSLS-II Beamlines Radiation Safety Commissioning Plan

5.4 PS-C-XFD-PRC-024, Beamline Photon Shutter Centrally Controlled Lockout/Tagout Procedure

5.5 SBMS Program Description: Radiological Control Manual

6 ATTACHMENTS

Attachment A, Beamline TES (08-BM, BM) Comprehensive Commissioning Radiation Survey

Attachment B, Elevation View inside TES FOE (Enclosure 8-BM-A)

Attachment C, Elevation View, Upstream half of TES Beam Transport Line (FOE to BLW10)

Attachment D, Elevation View, Downstream half of TES Beam Transport Line (Downstream of BLW10)

7 DOCUMENTATION

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

- Completed Comprehensive Commissioning Radiation Surveys / Beamline Radiation Survey Interim Report
8 DEFINITIONS

None.

If you have any questions or feedback regarding this document, please click this link.
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Attachment A

Beamline TES (08-BM, BM)
Comprehensive Commissioning Radiation Survey

Date: __________

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

Straight Section Vacuum Condition: ________________________________

M1 settings: ___________________________ M2 settings: ___________________________

Monochromator settings: ___________________________

PFM settings: ___________________________

KB Mirrors settings: ___________________________

Survey start date and time: ___________________________

Authorized Beamline Staff & RCTs:
________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________

Additional information if available: ________________________________

The following scenarios are covered:

I. **GB Radiation Survey**
   a. Integrity of FOE (08-BM-A) and FOE photon shutter.
   b. Integrity of components outside the FOE including transport pipe from 08-BM-A to 08-BM-B and inside 08-BM-B.

II. **SR Radiation Survey**
   a. Integrity of enclosure 08-BM-A and FEO photon shutter.
   b. Integrity of transport pipe from 08-BM-A to 08-BM-B.
   c. Integrity of enclosure 08-BM-B and beam stop on the downstream of 08-BM-B.
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 FE, survey the upstream wall of the FOE to make sure no radiation comes through.

**Note:** Detailed diagrams of 08-BM are included in Attachments B, C and D.
I. Check the integrity of FOE (08-BM-A), transport pipe, and Photon Shutter 1.

1. GB radiation survey: FE slits fully open, FE shutters open, PSH closed, mirrors M1, M2, and PFM 'out of the beam' position. Set MONO to nominal position. Survey all walls and roof of 08-BM-A, the area around the transport pipe as well as inside 08-BM-B enclosure to verify the integrity of PSH.

Straight Section Vacuum Conditions: ____________
Radiation Survey Results_____________

Additional information/comments:
Angle of M1 ______________________ Angle of M2 ______________________
Angle of MONO ______________________ Angle of PFM ______________________
__________________________________
__________________________________
__________________________________
__________________________________

Signature (ESH) ________________ Signature (Beamline) ________________
2. GB/SR radiation survey: FE slits fully open, FE shutters open, PSH closed, mirrors M1 and M2 and MONO in nominal positions, PFM ‘out of the beam’ position. Survey all walls and roof of 08-BM-A, the area around the transport pipe as well as inside 08-BM-B enclosure to verify the integrity of PSH.

Straight Section Vacuum Conditions: ____________
Radiation Survey Results _________________

Additional information/comments:
Angle of M1 ________________ Angle of M2 ________________
Angle of MONO ________________ Angle of PFM ________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Signature (ESH) ________________ Signature (Beamline) ________________
II. Check the integrity of 08-BM-B and transport pipe.
3. GB/SR radiation survey: Repeat Step 2 with the PSH open. Survey all walls and roof of 08-BM-B, and the area around the transport pipe downstream of the PSH.

Straight Section Vacuum Conditions: 
Radiation Survey Results 

Additional information/comments:
Angle of M1  
Angle of M2  
Angle of MONO  
Angle of PFM  

Signature (ESH)  
Signature (Beamline)  

A5
4. **Monochromatic beam survey:** FE slits fully open, FE shutters open, PSH open, mirrors M1, M2 and MONO in nominal positions, PFM in nominal position. Insert scatterers (diagnostic screens, GVs, and slits) one at a time upstream and downstream of PSH. Survey area around the transport pipe in the vicinity of the inserted target.

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**Straight Section Vacuum Conditions:**

**Radiation Survey Results**

**Additional information/comments:**

Angle of M1 ________________  Angle of M2 ________________

Angle of MONO ________________  Angle of PFM ________________

Scatterers: GV8, Diagnostic 2 (insertable fluorescent screen), GV at Diagnostic 2, GV upstream of BPM, BPM entrance slits and fluorescent screen, GV downstream of BPM, PSH, SSA slits and fluorescent screen, Diagnostic 3 (slits and fluorescent screen), entrance slits (in beam pipe upstream of endstation).

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**Signature (ESH)____________________Signature (Beamline)____________________**
5. Monochromatic beam survey (mis-steering): FE slits fully open, FE shutters open, PSH open, mirrors M1 and M2 and MONO in nominal positions, set PFM to mis-steer mono beam up and down the transport pipe. Survey all walls and roof of 08-BM-B, and the area around the transport pipe upstream & downstream of the PSH.

Straight Section Vacuum Conditions: ___________
Radiation Survey Results _________________

Additional information/comments:
Angle of M1 ________________________ Angle of M2 ________________________
Angle of MONO ________________________ Angle of PFM ________________________

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Signature (ESH) __________________________ Signature (Beamline) ___________________
6. **Monochromatic beam survey:** FE slits fully open, FE shutters open, PSH open, mirrors M1, M2 and MONO in nominal positions, PFM in nominal position, KB Mirrors out of the beam, beam on mono beam stop. Survey all walls and roof of 08-BM-B, and the area around the transport pipe downstream of the PSH.

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**Straight Section Vacuum Conditions:**

**Radiation Survey Results**

**Additional information/comments:**

Angle of M1  
Angle of M2  
Angle of MONO  
Angle of PFM  

__________________________________________________________  
__________________________________________________________  
__________________________________________________________  
__________________________________________________________  

**Signature (ESH)________________________Signature (Beamline)________________________**
7. Monochromatic beam survey: FE slits fully open, FE shutters open, PSH open, mirrors M1, M2 and MONO in nominal positions, PFM in nominal position, KB Mirrors into the beam. Survey all walls and roof of 08-BM-B, and the area around the transport pipe downstream of the PSH.

Straight Section Vacuum Conditions: ____________
Radiation Survey Results______________

Additional information/comments:
Angle of M1 ________________ Angle of M2 ________________
Angle of MONO ________________ Angle of PFM ________________
________________________________________________________________________________________________________________
________________________________________________________________________________________________________________
________________________________________________________________________________________________________________
________________________________________________________________________________________________________________

Signature (ESH) ________________ Signature (Beamline) ________________

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Attachment B

Elevation View inside TES FOE (Enclosure 8-BM-A)
Attachment C

Elevation View, Upstream Half of TES Beam Transport Line (FOE to BLW10)
Attachment D

Elevation View, Downstream Half of TES Beam Transport Line (Downstream of BLW10)