**NSLS-II Beamline 4-BM Radiological Interlock Test Checklist**

<table>
<thead>
<tr>
<th>Test Reason:</th>
<th>Test Type:</th>
<th>Test Result:</th>
<th>Test Date:</th>
<th>Start Time:</th>
<th>Finish Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Test</td>
<td></td>
<td>☑ Passed</td>
<td>7/18/2017</td>
<td>7/17/17</td>
<td>7/18/17</td>
</tr>
</tbody>
</table>

**Tester 1:** Thomas McDonald ; Brian Hernandez  
**Tester 2:** Robert Chmiel ; Gabrielle Steele  
**Tester 1 Signature:** Thomas McDonald  
**Tester 2 Signature:** [Signature]

*Reviewer 1:*  
*Reviewer 2:*  

**Safety Signature 4-BM (Beamline HMI)**  
A Chain: 0080 1956 ; B Chain: 02492426  
**Safety Signature Pentatant 2: Beamline (SR HMI)**  
A Chain: 0086 228A ; B Chain: 0297 6825

---

**PREPARATION:**

I. All hutch door switches have been evaluated by NSLS-II Engineering for proper positioning  
II. Inform Control Room Lead Operator that testing will be done  
III. Obtain Beamline enable and PPS reset keys from Control Room  
IV. Verify that beamline vacuum and water interlocks are satisfied  
V. Place muffler on beam imminent sounder  
VI. Request Lead Operator enable Master Shutters

---

**A1 Verify System Lockouts**

- Gun HVPS Enable Switch  
- Linac modulator line cords (3) OR Booster Dipole F PS 480 V  
- Booster RF HVPS 480 V OR Booster low level RF drive termination  
- SR System C low level RF drive termination OR SR System C RF output connection to cavity  
- SR System D low level RF drive termination OR SR System D RF output connection to cavity

---

**A2 Verify Search and Time Beam Imminent Alarm**

Verify that search path is free from obstacles and line of sight is clear in search mirrors in accordance with PS-C-XFD-PRC-010, Beamline Enclosure Search and Secure and Breaking Security Procedure.
Repeat steps for each 4-BM hutch.

Close all doors except the main door

“Entry Permitted” sign is ON

Using the keypad, lock the closed doors

Press SB1

SB1 illuminates

Search sounder sounds

Search yellow beacon flashing

Press SB2

SB2 illuminates

Exit hutch and close main door

Press SBE and begin timing

Beam imminent alarm sounds for 30 seconds

After warning, (FOE, B, C) Interlocked A and B ON (green), HMI

“Interlocked” sign ON

Maglock A and B ON (green) all doors, HMI

Press the SBE/Access Button

“Interlocked” sign OFF, “Entry Permitted” sign ON

FOE, B C Interlocked A and B OFF, HMI

Maglock A OFF (may require opening Maglock on keypad)

Open door

Door opens, Maglock B OFF

A3 Out of Sequence Search in the FOE (A Hutch), B Hutch and C Hutch

Repeat steps for each 4-BM hutch.

Press SB2

SB2 does not illuminate

Press SB1
SB1 illuminates

Close hutch door and press SBE

Hutch does NOT secure

A4 Search Timeout

Repeat steps for each 4-BM hutch.

Press first search button and begin timing

Complete search without pressing Final Search button

Search sounders off in 2 minutes

Press Final Search button

Search does not complete

A5 Shutter Enable

Place actuators on FOE door switches and attach Maglock devices

Enable beamline with key and perform a reset

Search the FOE and B hutch

Open FE Shutters

Close FE Shutters

A6 Emergency Stops (ES) FOE (A Hutch)

Search and Secure the B hutch

For each ES search FOE hutch.

Open FE Shutters from keypad

FE Shutters A and B open (green)

FOE Interlocked A and B ON (green)

FE Shutter Permits A and B ON (green)

FE Critical Device Permits A and B ON

Right Maglock A and B ON (green)
The only official copy of this document is the one online in the NSLS-II SharePoint Document Center. Before using a printed copy, verify that it is current by checking the printed document’s revision history log with that of the online version.

### Subject:
**NSLS-II Beamline 4-BM Radiological Interlock Test Checklist**

<table>
<thead>
<tr>
<th>Number:</th>
<th>NSLSII-4BMCHK-001</th>
<th>Revision:</th>
<th>1</th>
<th>Effective:</th>
<th>18JUL2017</th>
<th>Page: 4 of 16</th>
</tr>
</thead>
</table>

**Left Maglock A and B ON** *(green)*

- **Press ES**
  - FE Shutters A and B closed *(red)*
  - FOE Interlocked A and B OFF
  - FE Shutter Permits A and B OFF
  - FE Critical Device Permits A and B OFF
  - Right Maglock A OFF
  - Left Maglock A OFF

**Pull out ES**

- ES Sum Latch OFF

**Reset fault**

- ES Sum Latch ON *(green)*

---

**Emergency Stops (ES) B Hutch**

For each ES search hutch, **ES1** **ES2** **ES3** **ES4**

**Open FE Shutters from keypad**

- FE Shutters A and B open *(green)*
- B Interlocked A and B ON *(green)*
- FE Shutter Permit A and B ON *(green)*
- FE Critical Device Permits A and B ON
- Front Maglock A and B ON *(green)*

**Press ES**

- FE Shutter A and B closed *(red)*
- B Interlocked A and B OFF
- FE Shutter Permit A and B OFF
- FE Critical Device Permits A and B OFF
- Front Maglock A OFF
Pull out ES
   ES Sum Latch OFF
Reset fault
   ES Sum Latch ON (green)

A8 Emergency Stops (ES) C Hutch
For each ES search hutch.
Open FE Shutters and L1S1 Shutter from keypad
   All Shutters A and B open (green)
   C Interlocked A and B ON (green)
   L1S1 Shutter Permit A and B ON (green)
   FE Critical Device Permits A and B ON
   Front Maglock A and B ON (green)
Press ES
   L1S1 Shutter A and B closed (red)
   C Interlocked A and B OFF
   L1S1 Shutter Permit A and B OFF
   FE Critical Device Permits A and B OFF
   Front Maglock A OFF
Pull out ES
   ES Sum Latch OFF
Reset fault
   ES Sum Latch ON (green)

A9 C Hutch Labyrinth 1 Switches and Latches
Place actuators on the labyrinth switches/latches and downstream left door switches and Maglock.
Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1).

Search hutch
Open FE Shutters and L1S1 Shutter from keypad
   All Shutters A and B open (green)
   C Interlocked A and B ON (green)
   L1S1 Shutter Permit A and B ON (green)
The only official copy of this document is the one online in the NSLS-II SharePoint Document Center. Before using a printed copy, verify that it is current by checking the printed document's revision history log with that of the online version.

<table>
<thead>
<tr>
<th>Subject:</th>
<th>NSLS-II Beamline 4-BM Radiological Interlock Test Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td>NSLSII-4BM-CHK-001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>Reed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable Lab I Switches/Latch A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Critical Device Permits A and B ON</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Remove one switch actuator</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>L1S1 Shutter A and B closed (red)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C Interlocked OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>L1S1 Shutter Permit OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Cable Lab I Switch/Latch Permit OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Critical Device Permits A and B OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Replace switch actuator and reset fault</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Remove labyrinth actuators and close labyrinth door</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**A10 FOE Right Door Switches**

Place actuators on the door switches and Maglock.

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1).

B hutch is secure

Search hutch

Open FE Shutters from keypad

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>Reed</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE Shutters A and B open (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FOE Interlocked A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Shutter Permits A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FOE Door Switch Sum A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Critical Device Permits A and B ON</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Remove one switch actuator</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Shutters A and B closed (red)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FOE Interlocked OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Shutter Permit OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FOE Door Switch Sum OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Critical Device Permits A and B OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Replace switch actuator and reset fault</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Remove actuators and close door</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
A11 **FOE Left Door Switches**

Place actuators on the door switches and Maglock.

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A).

B hutch is secure

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>Reed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search hutch</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Open FE Shutters from keypad*

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>Reed</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE Shutters A and B open (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FOE Interlocked A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Shutter Permits A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FOE Door Switch Sum A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Critical Device Permits A and B ON</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Remove one switch actuator*

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>Reed</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE Shutters A and B closed (red)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FOE Interlocked OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Shutter Permit OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FOE Door Switch Sum OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Critical Device Permits A and B OFF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Replace switch actuator and reset fault*

Remove actuators and close door

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>Reed</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

A12 **B Hutch Front Door Switches**

Place actuators on the door switches and Maglock.

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A).

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>Reed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search hutch</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Open FE Shutters and L1S1 Shutter from keypad*

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>Reed</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Shutters A and B open (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B Interlocked A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>L1S1 Shutter Permit A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B Door Switch Sum A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Critical Device Permits A and B ON</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Remove one switch actuator

- L1S1 Shutter A and B closed (red)
- B Interlocked OFF
- L1S1 Shutter Permit OFF
- B Door Switch Sum OFF
- FE Critical Device Permits A and B OFF

Replace switch actuator and reset fault

Remove actuators and close door

---

A13 **C Hutch Front Door Switches**

Place actuators on the door switches and Maglock.

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A).

---

**Search hutch**

**Open FE Shutters and L1S1 Shutter from keypad**

- All Shutters A and B open (green)
- C Interlocked A and B ON (green)
- L1S1 Shutter Permit A and B ON (green)
- C Door Switch Sum A and B ON (green)
- FE Critical Device Permits A and B ON

Remove one switch actuator

- L1S1 Shutter A and B closed (red)
- C Interlocked OFF
- L1S1 Shutter Permit OFF
- C Door Switch Sum OFF
- FE Critical Device Permits A and B OFF

Replace switch actuator and reset fault

Remove actuators and close door
**A14 Magnetic Lock Test (FOE)**

Connect the FOE test box to the PPS cabinet. Use the box to turn ON the Maglocks (set switches to “Normal”).

Repeat steps for each door: Right (R) and Left (L)

<table>
<thead>
<tr>
<th>Search hutch</th>
<th>R</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOE Interlocked A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Shutter Permits A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Door Maglock A and B ON (green)</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Open FE Shutters</th>
<th>R</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE Shutters open (green)</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Using FOE test box, turn OFF Maglock**

<table>
<thead>
<tr>
<th>Door Maglock A OFF</th>
<th>R</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE Shutters closed (red)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FOE Interlocked A OFF</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>FE Shutter Permit A OFF</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Turn On Maglock and reset fault**

<table>
<thead>
<tr>
<th>Search hutch</th>
<th>R</th>
<th>L</th>
</tr>
</thead>
</table>

**Using FE Shutter test fixture, Open FE Shutters**

| FE Critical Device Permits A and B ON | R | ✓ |

**Using FOE test box, turn OFF Maglock**

**Within 3 seconds:**

| FE Critical Device Permit A chain OFF | ✓ | ✓ |

**Close FE Shutters and reset fault**

**Disconnect FOE test box**

**A15 Magnetic Lock Test (B Hutch)**

Connect the FOE test box to the PPS cabinet. Use the box to turn ON the Maglocks (set switches to “Normal”).
A.16 **Magnetic Lock Test (C-Hutch)**

Connect the FOE test box to the PPS cabinet. Use the box to turn ON the Maglocks (set switches to "Normal").

<table>
<thead>
<tr>
<th>Search hutch</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Interlocked A and B ON (green)</td>
</tr>
<tr>
<td>L1S1 Shutter Permit A and B ON (green)</td>
</tr>
<tr>
<td>Door Maglock A and B ON (green)</td>
</tr>
</tbody>
</table>
Open FE Shutters and L1S1 Shutter

- All Shutters open (green)

Using FOE test box, turn OFF Maglock

- Door Maglock A OFF
- L1S1 Shutter closed (red)
- C Interlocked A OFF
- L1S1 Shutter Permit A OFF

Turn On Maglock and reset fault

Search hutch

Using FE Shutter test fixture, Open FE Shutters and L1S1 Shutter

- FE Critical Device Permits A and B ON

Using FOE test box, turn OFF Maglock

Within 3 seconds:

- FE Critical Device Permit A chain OFF

Close FE Shutters and reset fault

- Disconnect FOE test box

A17 Observe Beamline Photon Shutter Operation

Close Beamline Photon Shutter

- Shutter indicates closed A and B (red), HMI

Open Beamline Photon Shutter

- Shutter opens smoothly without hesitation
- Shutter indicates open A and B (green), HMI

Close Beamline Photon Shutter

- Shutter indicates closed A and B (red), HMI

A18 Observe FE Safety Shutter(s) Operation

With Maintenance Door open, connect FE Shutter test fixture.

- Shutters are in the closed (down) position
- FE Shutters A and B closed (red), HMI
Turn the “Air” switch ON

Open FE SSA A and B and Photon Shutter
Shutters are open freely without hesitation
Shutters are in the open (up) position

Actuate Shutters closed
FE Shutters A and B open (green), HMI

A19 FE Safety Shutters can only be Closed if FE Photon Shutter is Closed
Search hutch
FOE Interlocked A and B ON (green), HMI
FE Critical Device Permits A and B ON (green), HMI

Open FE SSA
SSA open

Open FE Photon Shutter
FE Critical Device Permits A and B OFF, HMI

Close Shutters

Reset fault
FE Critical Device Permits A and B ON (green), HMI

Open FE SSB
SSB open

Open FE Photon Shutter
FE Critical Device Permits A and B OFF, HMI

Close Shutters

Reset fault
FE Critical Device Permits A and B ON (green), HMI

A20 Beamline Enable Key (Opening Shutter Without Key Trips SR RF and Dipole PS)
Remove beamline enable key
Beamline Online A and B OFF

Search FOE
FOE Interlocked A and B ON (green), HMI
FE Critical Device Permits A and B ON (green), HMI

Using FE Shutter test fixture, Open FE Shutter
FE Critical Device Permits A and B OFF

Using FE Shutter test fixture, Close FE Shutter

Replace beamline enable key and reset faults
Beamline Online A and B ON (green)

Live Testing

A21 Reach Back FOE Door Switches
Secure P1 through P5
SR Secure, A and B chain, SR HMI

Place actuators on FOE hutch door switches and Maglock

Search hutch
FOE Interlocked A and B ON (green), HMI
FE Critical Device Permits A and B ON (green), HMI
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|-----------------|---------------------------------|
| Number: NSLSII-4BM-CHK-001 | Revision: 1 |
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- **Check I/O Box 4BM Beamline Enable Panel**: FE Critical Device Permits A and B LEDs ON
- **Check I/O Box 28 Beamline Enable Panel**: FE Critical Device Permit Sum A and B LEDs ON
- **Check Dipole PS (positive) Beamline Interface**: A and B Permits ON, Dipole PS Pos. Interface
- **Check Dipole PS (negative) Beamline Interface**: A and B Permits ON, Dipole PS Neg. Interface
- **Check SR RF System C HVPS Beamline Interface**: A and B Permits ON, SR RF System C HVPS Interface
- **Check SR RF System D HVPS Beamline Interface**: A and B Permits ON, SR RF System D HVPS Interface
- **Operator enables SR Dipole PS**: SR Dipole PS is ON
- **Operator enables SR RF System C HVPS**: SR RF System C HVPS is ON
- **Operator enables SR RF System D HVPS**: SR RF System D HVPS is ON
- **Using FE Shutter test fixture, open the FE Shutters (SSA, SSB and Photon)**: 
  - FE Shutters open
  - FOE Interlocked B OFF, HMI
  - FE Critical Device Permit B OFF, HMI
  - FE Critical Device Permit B LED OFF
- **Check I/O Box 4BM Beamline Enable Panel**: 
  - FE Critical Device Permit B OFF (red), SR HMI
- **Check Control Room SR HMI (Beamline Page)**: 
  - FE Critical Device Permit Sum B LED OFF
- **Check I/O Box 28 Beamline Enable Panel**: 
  - B Permit OFF, SR RF System C HVPS Interface
- **Check SR RF System C HVPS Beamline Interface**: 
  - B Permit OFF, SR RF System D HVPS Interface
- **Check SR RF System D HVPS Beamline Interface**: 
  - B Permit OFF, Dipole PS Pos. Interface
- **Check Dipole PS (positive) Beamline Interface**: 
  - B Permit OFF, Dipole PS Neg. Interface
  - SR Dipole PS is OFF
  - SR RF System C HVPS is OFF
  - SR RF System D HVPS is OFF
- **Check Dipole PS (negative) Beamline Interface**: 
  - SR Dipole PS is OFF
- **Close FE Shutters with FE Shutter test fixture**: 
  - FE Shutters closed
- **Remove beamline hutch switch actuators and Maglock actuator**:

### A22 Observe All Shutters Closed Sum
- **Check I/O Box 28 Beamline Enable Panel**: 
  - FE Shutters closed A chain light ON
  - FE Shutters closed B chain light ON
- **Using FE Shutter test fixture open both FE SSS and then Photon Shutter**: 
  - FE Shutters open (green), HMI
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### NSLS-II Beamline 4-BM Radiological Interlock Test Checklist

| Check Control Room SR HMI (Beamline Page) | FE Critical Device Permit A and B ON (green), SR HMI |
| Check I/O Box 4BM Beamline Enable Panel | FE Critical Device Permits A and B LEDs ON |
| Check I/O Box 28 Beamline Enable Panel | FE Critical Device Permit Sum A and B LEDs ON |
| Check Dipole PS (positive) Beamline Interface | A and B Permits ON, Dipole PS Pos. Interface |
| Check Dipole PS (negative) Beamline Interface | A and B Permits ON, Dipole PS Neg. Interface |
| Check SR RF System C HVPS Beamline Interface | A and B Permits ON, SR RF System C HVPS Interface |
| Check SR RF System D HVPS Beamline Interface | A and B Permits ON, SR RF System D HVPS Interface |
| Operator enables SR Dipole PS | SR Dipole PS is ON |
| Operator enables SR RF System C HVPS | SR RF System C HVPS is ON |
| Operator enables SR RF System D HVPS | SR RF System D HVPS is ON |
| Using FE Shutter test fixture, open the FE Shutters (SSA, SSB and Photon) | FE Shutter open |

Remove an "A chain" door switch actuator from beamline hutch door

Check I/O Box 4BM Beamline Enable Panel | FE Critical Device Permit A OFF, HMI |
Check I/O Box 28 Beamline Enable Panel | FE Critical Device Permit A LED OFF |
Check Control Room SR HMI (Beamline Page) | FE Critical Device Permit A OFF (red), SR HMI |
Check SR RF System C HVPS Beamline Interface | A Permit OFF, SR RF System C HVPS Interface |
Check SR RF System D HVPS Beamline Interface | A Permit OFF, SR RF System D HVPS Interface |
Check Dipole PS (positive) Beamline Interface | A Permit OFF, Dipole PS Pos. Interface |
Check Dipole PS (negative) Beamline Interface | A Permit OFF, Dipole PS Neg. Interface, SR RF System C HVPS is OFF |
| SR RF System D HVPS is OFF |
| SR Dipole PS is OFF |
| Close FE Shutters with FE Shutter test fixture | FE Shutters closed |
| Replace "A chain" door switch actuator and reset fault(s) |  |
Search hutch | FOE Interlocked A and B OFF, HMI |
Check Control Room SR HMI (Beamline Page) | FE Critical Device Permit A and B ON (green), SR HMI |
Check I/O Box 28 Beamline Enable Panel
FE Shutters closed A chain light OFF ✓
FE Shutters closed B chain light OFF ✓

Close FE Shutters and remove FE shutter test fixture ✓

A23 **FOE Area Radiation Monitor**

Refer to PS-C-ASD-PRC-008, *NSLS-II Area Radiation Monitor PPS Test* and complete Attachment D, *NSLS-II Beamline (FOE) Area Radiation Monitor Checklist.*

FRM 4-BM Test Checklist Completed ✓

A24 **Test Completion**

Inspect all hutch doors and labyrinths to ensure all PPS switch and Maglock actuators have been removed ✓
Return Beamline enable key and Beamline PPS reset key to the Control Room ✓
Remove muffler from beam imminent sounder ✓
Ensure PPS cabinets are secure and locked; challenge locks ✓
Remove all LOTO ✓
Inform Lead Operator that testing is complete ✓

- END -
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### Subject:
**NSLS-II Beamline 4-BM Radiological Interlock Test Checklist**

### Number:
NSLSII-4BM-CHK-001

### Revision:
1

### Effective:
18JUL2017

### Page:
16 of 16

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### Reviewed by:

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7/20/2017

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Robert Chmiel  
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7/20/2017

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7/21/2017

**X** Robert Lee  
NSLS-II ESH Manager  
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### Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Description</th>
<th>Date</th>
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<tbody>
<tr>
<td>1</td>
<td>First Issue.</td>
<td>18JUL2017</td>
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</table>
### Attachment D

#### NSLS-II Beamline (FOE) Area Radiation Monitor Checklist

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

<table>
<thead>
<tr>
<th>Monitor #</th>
<th>ID #</th>
<th>Beamline</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERM-BM05</td>
<td>1NO7573</td>
<td>48M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monitor Reason</th>
<th>Replacement/Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Date: 7/17/17</td>
<td></td>
</tr>
<tr>
<td>Tester: Thomas McDonald</td>
<td>RCD: Morris Buckman</td>
</tr>
<tr>
<td>Tester Signature:</td>
<td>RCD Signature:</td>
</tr>
</tbody>
</table>

**Fail Alarm:** Place checkmark (✓) in checkbox (☐) for each correct response.

<table>
<thead>
<tr>
<th>Local Expected Observation</th>
<th>HMI/CR Expected Observation</th>
<th>Linac HMI</th>
<th>CR HMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator turns on Gun</td>
<td>Gun HVPS is ON ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCD Disables Monitor</td>
<td>Alarm sounds in Control Room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silence CR Alarm</td>
<td>Alarm silences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gun turns OFF</td>
<td>Gun HVPS is OFF ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return monitor to normal</td>
<td>Gun HVPS remains OFF</td>
<td>Fail alarm remains ON HMI</td>
<td></td>
</tr>
<tr>
<td>Reset fault in Control Room</td>
<td>Monitor normal HMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCD ensures ARM is locked</td>
<td>ARM is locked ✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Low Alarm:** Place checkmark (✓) in checkbox (☐) for each correct response.

<table>
<thead>
<tr>
<th>Local Expected Observation</th>
<th>HMI/CR Expected Observation</th>
<th>Beamline HMI</th>
<th>CR HMI/EPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opens FE shutter (w/keypad)</td>
<td>FE Shutters open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply source until low alarm</td>
<td>Yellow light on Monitor ✓</td>
<td>Radiation level increases on EPICS</td>
<td></td>
</tr>
<tr>
<td>Return monitor to normal</td>
<td></td>
<td>Monitor normal, HMI</td>
<td></td>
</tr>
<tr>
<td>Apply source until low alarm</td>
<td>Yellow light on Monitor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return monitor to normal</td>
<td>FE Critical Device Permit A chain ON</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**High Alarm:** Place checkmark (✓) in checkbox (☐) for each correct response.

<table>
<thead>
<tr>
<th>Local Expected Observation</th>
<th>HMI/CR Expected Observation</th>
<th>Linac HMI</th>
<th>CR HMI/EPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator turns on Gun</td>
<td>Gun HVPS is ON ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply source until high alarm</td>
<td>Red light on Monitor</td>
<td>Radiation level increases on EPICS</td>
<td></td>
</tr>
<tr>
<td>Silence Alarm</td>
<td>Monitor alarm sounds</td>
<td>Alarm sounds in Control Room</td>
<td></td>
</tr>
<tr>
<td>Gun turns OFF</td>
<td>Gun HVPS is OFF ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return monitor to normal</td>
<td>Gun HVPS remains OFF</td>
<td>High level alarm remains ON, HMI</td>
<td></td>
</tr>
<tr>
<td>Reset fault in Control Room</td>
<td></td>
<td>Monitor normal, HMI</td>
<td></td>
</tr>
</tbody>
</table>

**Description of Test Failures (if any):**