

National Synchrotron Light Source II/Brookhaven National Laboratory			
Subject:	NSLS-II Beamline 4-BM Radiological Interlock Test Checklist		
Number:	NSLSII-4BM-CHK-001	Revision:	1
Effective:	18JUL2017	Page:	1 of 16

NSLS-II Beamline 4-BM Radiological Interlock Test Checklist

Test Reason: <i>Initial Test</i>	Test Result: <input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed
Test Date: <i>7/18/2017</i>	Test Type: <input type="checkbox"/> Pre-Certification <input checked="" type="checkbox"/> Certification <input type="checkbox"/> Partial
Tester 1: <i>Thomas McDonald ; Brian Heneveld</i>	Start Time: <i>7/17/17</i> Finish Time: <i>7/18/17</i>
Tester 2: <i>Robert Chmiel ; Gabrielle Stone</i>	Assistant 1: <i>Accelerator Operations Group</i>
Tester 1 Signature: <i>Thomas P. McDonald</i>	Assistant 2:
*Reviewer 1:	Tester 2 Signature: <i>Rust Christ</i>
Reviewer 2:	Reviewer 1 Signature:
** Safety Signature 4-BM (Beamline HMI) A Chain: <i>E080 1956</i> B Chain: <i>02CB242F</i>	Reviewer 2 Signature:
** Safety Signature Pentant 2: Beamline (SR HMI) A Chain: <i>OSDE 2BBA</i> B Chain: <i>B397 6825</i>	Previous 4-BM SS# Date: / / A Chain: B Chain:
	Previous Pentant 2 SS# Date: / / A Chain: B Chain:

* A review by an Accelerator Safety Systems Engineer and a designated specialist (Reviewer 2) is only required upon a Test failure.
 **If Current Safety Signature number (found in top left corner on HMI) is different from previous number, contact the Accelerator Safety Systems Cognizant Engineer.

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* ✓

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SB1 illuminates

Close hutch door and press SBE

Hutch does NOT secure

A4 Search Timeout

Repeat steps for each 4-BM hutch.

A B C

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

Beamline Online A and B OFF

Enable beamline with key and perform a reset

Beamline Online A and B ON (**green**)

Search the FOE and B hutches

FE Shutter Permits A and B ON *after* Beam

Imminent Warning

Open FE Shutters

FE Shutters A and B indicate open (**green**)

"Beam On" sign is ON

Close FE Shutters

FE Shutters A and B indicate closed (**red**)

"Beam On" sign is OFF

A6 Emergency Stops (ES) FOE (A Hutch)

Search and Secure the B hutch

For each ES search FOE hutch.

ES1 ES2 ES3 ES4

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**)

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Left Maglock A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Press ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Interlocked A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permits A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Right Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Left Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Pull out ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ES Sum Latch OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Reset fault</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ES Sum Latch ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

A7 **Emergency Stops (ES) B Hutch**

For each ES search hutch.	<u>ES1</u>	<u>ES2</u>	<u>ES3</u>	<u>ES4</u>
<i>Open FE Shutters from keypad</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B Interlocked A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Front Maglock A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Press ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B Interlocked A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permit A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Front Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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<i>Pull out ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ES Sum Latch OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Reset fault</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ES Sum Latch ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

A8 Emergency Stops (ES) C Hutch

	<u>ES1</u>	<u>ES2</u>	<u>ES3</u>	<u>ES4</u>
For each ES search hutch.				
<i>Open FE Shutters and LIS1 Shutter from keypad</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
All Shutters A and B open (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C Interlocked A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LIS1 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Front Maglock A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Press ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LIS1 Shutter A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C Interlocked A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LIS1 Shutter Permit A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Front Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Pull out ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ES Sum Latch OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Reset fault</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ES Sum Latch ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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).

	<u>A</u>	<u>B</u>	<u>Latch</u>
<i>Search hutch</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Open FE Shutters and LIS1 Shutter from keypad</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
All Shutters A and B open (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C Interlocked A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LIS1 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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Cable Lab 1 Switches/Latch A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
L1S1 Shutter A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C Interlocked OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
L1S1 Shutter Permit OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cable Lab 1 Switch/Latch Permit OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Remove labyrinth actuators and close labyrinth door			<input checked="" type="checkbox"/>

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).

	<u>A</u>	<u>B</u>	<u>Reed</u>
B hutch is secure	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Search hutch</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Open FE Shutters from keypad</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Interlocked A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permits A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Interlocked OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permit OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Door Switch Sum OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Remove actuators and close door			<input checked="" type="checkbox"/>

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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).

	<u>A</u>	<u>B</u>	<u>Reed</u>
B hutch is secure	✓	✓	✓
Search 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)	✓	✓	✓
FOE Door Switch Sum A and B ON (green)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Remove one switch actuator	✓	✓	✓
FE Shutters A and B closed (red)	✓	✓	✓
FOE Interlocked OFF	✓	✓	✓
FE Shutter Permit OFF	✓	✓	✓
FOE Door Switch Sum OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓
Replace switch actuator and reset fault	✓	✓	✓
Remove actuators and close door			✓

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).

	<u>A</u>	<u>B</u>	<u>Reed</u>
Search hutch	✓	✓	✓
Open FE Shutters and LIS1 Shutter from keypad	✓	✓	✓
All Shutters A and B open (green)	✓	✓	✓
B Interlocked A and B ON (green)	✓	✓	✓
LIS1 Shutter Permit A and B ON (green)	✓	✓	✓
B Door Switch Sum A and B ON (green)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓

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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).

	<u>A</u>	<u>B</u>	<u>Reed</u>
Search hutch	<u>✓</u>	<u>✓</u>	<u>✓</u>
Open FE Shutters and L1S1 Shutter from keypad	<u>✓</u>	<u>✓</u>	<u>✓</u>
All Shutters A and B open (green)	<u>✓</u>	<u>✓</u>	<u>✓</u>
C Interlocked A and B ON (green)	<u>✓</u>	<u>✓</u>	<u>✓</u>
L1S1 Shutter Permit A and B ON (green)	<u>✓</u>	<u>✓</u>	<u>✓</u>
C Door Switch Sum A and B ON (green)	<u>✓</u>	<u>✓</u>	<u>✓</u>
FE Critical Device Permits A and B ON	<u>✓</u>	<u>✓</u>	<u>✓</u>
Remove one switch actuator	<u>✓</u>	<u>✓</u>	<u>✓</u>
L1S1 Shutter A and B closed (red)	<u>✓</u>	<u>✓</u>	<u>✓</u>
C Interlocked OFF	<u>✓</u>	<u>✓</u>	<u>✓</u>
L1S1 Shutter Permit OFF	<u>✓</u>	<u>✓</u>	<u>✓</u>
C Door Switch Sum OFF	<u>✓</u>	<u>✓</u>	<u>✓</u>
FE Critical Device Permits A and B OFF	<u>✓</u>	<u>✓</u>	<u>✓</u>
Replace switch actuator and reset fault	<u>✓</u>	<u>✓</u>	<u>✓</u>
Remove actuators and close door			<u>✓</u>

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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)

	<u>R</u>	<u>L</u>
<i>Search hutch</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Interlocked A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permits A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Door Maglock A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Open FE Shutters</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters open (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Using FOE test box, turn OFF Maglock</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Door Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Interlocked A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permit A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Turn On Maglock and reset fault</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Search hutch</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Using FE Shutter test fixture, Open FE Shutters</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Using FOE test box, turn OFF Maglock</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Within 3 seconds:</i>		
FE Critical Device Permit A chain OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Close FE Shutters and reset fault</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
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").



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- FR**
- Search hutch* ✓
 - B Interlocked A and B ON (green) ✓
 - FE Shutter Permit A and B ON (green) ✓
 - Door Maglock A and B ON (green) ✓
 - Open FE Shutters* ✓
 - FE Shutters open (green) ✓
 - Using FOE test box, turn OFF Maglock* ✓
 - Door Maglock A OFF ✓
 - FE Shutter closed (red) ✓
 - B Interlocked A OFF ✓
 - FE Shutter Permit A OFF ✓
 - Turn On Maglock and reset fault* ✓
 - Search hutch* ✓
 - Using FE Shutter test fixture, Open FE Shutters* ✓
 - 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 ✓

A16 **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"). ✓

- FR**
- Search hutch* ✓
 - C Interlocked A and B ON (green) ✓
 - L1S1 Shutter Permit A and B ON (green) ✓
 - Door Maglock A and B ON (green) ✓

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Turn the "Air" switch ON



Open FE SsA and B and Photon Shutter

Shutters open freely without hesitation



Shutters are in the open (up) position



FE Shuttters A and B open (green), HMI



Actuate Shuttters closed

FE Shuttters A and B closed (red), HMI



A19 FE Safety Shuttters 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 Shuttters



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 Shuttters



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 Shuttters

FE Critical Device Permits A and B OFF



Using FE Shutter test fixture, Close FE Shuttters



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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<i>Check I/O Box 4BM Beamline Enable Panel</i>	FE Critical Device Permits A and B LEDs ON	✓
<i>Check I/O Box 28 Beamline Enable Panel</i>	FE Critical Device Permit Sum A and B LEDs ON	✓
<i>Check Dipole PS (positive) Beamline Interface</i>	A and B Permits ON, Dipole PS Pos. Interface	✓
<i>Check Dipole PS (negative) Beamline Interface</i>	A and B Permits ON, Dipole PS Neg. Interface	✓
<i>Check SR RF System C HVPS Beamline Interface</i>	A and B Permits ON, SR RF System C HVPS Interface	✓
<i>Check SR RF System D HVPS Beamline Interface</i>	A and B Permits ON, SR RF System D HVPS Interface	✓
<i>Operator enables SR Dipole PS</i>	SR Dipole PS is ON	✓
<i>Operator enables SR RF System C HVPS</i>	SR RF System C HVPS is ON	✓
<i>Operator enables SR RF System D HVPS</i>	SR RF System D HVPS is ON	✓
<i>Using FE Shutter test fixture, open the FE Shutters (SSA, SSB and Photon)</i>	FE Shutters open	✓
Remove "B chain" switch actuator	FOE Interlocked B OFF, HMI	✓
	FE Critical Device Permit B OFF, HMI	✓
<i>Check I/O Box 4BM Beamline Enable Panel</i>	FE Critical Device Permit B LED OFF	✓
<i>Check Control Room SR HMI (Beamline Page)</i>	FE Critical Device Permit B OFF (red), SR HMI	✓
<i>Check I/O Box 28 Beamline Enable Panel</i>	FE Critical Device Permit Sum B LED OFF	✓
<i>Check SR RF System C HVPS Beamline Interface</i>	B Permit OFF, SR RF System C HVPS Interface	✓
<i>Check SR RF System D HVPS Beamline Interface</i>	B Permit OFF, SR RF System D HVPS Interface	✓
<i>Check Dipole PS (positive) Beamline Interface</i>	B Permit OFF, Dipole PS Pos. Interface	✓
<i>Check Dipole PS (negative) Beamline Interface</i>	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	✓
<i>Close FE Shutters with FE Shutter test fixture</i>	FE Shutters closed	✓
<i>Remove beamline hutch switch actuators and Maglock actuator</i>		✓

A22 Observe All Shutters Closed Sum

<i>Check I/O Box 28 Beamline Enable Panel</i>	FE Shutters closed A chain light ON	✓
	FE Shutters closed B chain light ON	✓
<i>Using FE Shutter test fixture open both FE SSs and then Photon Shutter</i>		✓
	FE Shutters open (green), HMI	✓

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<i>Check Control Room SR HMI (Beamline Page)</i>	FE Critical Device Permit A and B ON (green), SR HMI	✓
<i>Check I/O Box 4BM Beamline Enable Panel</i>	FE Critical Device Permits A and B LEDs ON	✓
<i>Check I/O Box 28 Beamline Enable Panel</i>	FE Critical Device Permit Sum A and B LEDs ON	✓
<i>Check Dipole PS (positive) Beamline Interface</i>	A and B Permits ON, Dipole PS Pos. Interface	✓
<i>Check Dipole PS (negative) Beamline Interface</i>	A and B Permits ON, Dipole PS Neg. Interface	✓
<i>Check SR RF System C HVPS Beamline Interface</i>	A and B Permits ON, SR RF System C HVPS Interface	✓
<i>Check SR RF System D HVPS Beamline Interface</i>	A and B Permits ON, SR RF System D HVPS Interface	✓
<i>Operator enables SR Dipole PS</i>	SR Dipole PS is ON	✓
<i>Operator enables SR RF System C HVPS</i>	SR RF System C HVPS is ON	✓
<i>Operator enables SR RF System D HVPS</i>	SR RF System D HVPS is ON	✓
<i>Using FE Shutter test fixture, open the FE Shutters (SSA, SSB and Photon)</i>		✓
	FE Shutters open	✓
<i>Remove an "A chain" door switch actuator from beamline hatch door</i>		✓
	FOE Interlocked A OFF, HMI	✓
	FE Critical Device Permit A OFF, HMI	✓
<i>Check I/O Box 4BM Beamline Enable Panel</i>	FE Critical Device Permit A LED OFF	✓
<i>Check I/O Box 28 Beamline Enable Panel</i>	FE Critical Device Permit Sum A LED OFF	✓
<i>Check Control Room SR HMI (Beamline Page)</i>	FE Critical Device Permit A OFF (red), SR HMI	✓
<i>Check SR RF System C HVPS Beamline Interface</i>	A Permit OFF, SR RF System C HVPS Interface	✓
<i>Check SR RF System D HVPS Beamline Interface</i>	A Permit OFF, SR RF System D HVPS Interface	✓
<i>Check Dipole PS (positive) Beamline Interface</i>	A Permit OFF, Dipole PS Pos. Interface	✓
<i>Check Dipole PS (negative) Beamline Interface</i>	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	✓
<i>Close FE Shutters with FE Shutter test fixture</i>	FE Shutters closed	✓
<i>Replace "A chain" door switch actuator and reset fault(s)</i>		✓
<i>Search hatch</i>		✓
	FOE Interlocked A and B ON (green), HMI	✓
	FE Critical Device Permits A and B ON (green), HMI	✓
<i>Check Control Room SR HMI (Beamline Page)</i>	FE Critical Device Permit A and B ON (green), SR HMI	✓

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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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National Synchrotron Light Source II/Brookhaven National Laboratory							
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Reviewed by:

7/26/2017

X Scott Buda

Scott Buda
Accelerator Safety Systems Group Leader
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7/20/2017

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Approved by:

7/21/2017

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Robert Lee
NSLS-II ESH Manager
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Revision History

Revision	Description	Date
1	First Issue.	18JUL2017

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National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-ASD-PRC-008	Author: T. McDonald	Effective Date: 17 April 2015 Review Frequency: 3 yrs	Version 4
Title: NSLS-II Area Radiation Monitor PPS Test			Technical

Attachment D

NSLS-II Beamline (FOE) Area Radiation Monitor Checklist

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

DET 1N07363

Monitor # FRM-BM04	ID # 1N07573	Beamline: 4BM
Test Reason: <input checked="" type="checkbox"/> Beamline Certification <input type="checkbox"/> Replacement/Repair		
Test Date: 3/17/17	Test Result <input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed	
Tester: Thomas McDonald	RCD: Shawn Buckley	
Tester Signature: <i>Shawn Buckley</i>	RCD Signature: <i>Tom McDonald</i>	

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

	Local Expected Observation	HMI/CR Expected Observation	Linac HMI	CR HMI
Operator turns on Gun	Gun HVPS is ON <input checked="" type="checkbox"/>	Gun Contactor ON A Chain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RCD Disables Monitor		Alarm sounds in Control Room		<input checked="" type="checkbox"/>
	Fail alarm ON HMI (yellow border around ARM icon)		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Silence CR Alarm		Alarm silences		<input checked="" type="checkbox"/>
Gun turns OFF	Gun HVPS is OFF <input checked="" type="checkbox"/>	Gun Contactor OFF A Chain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Return monitor to normal	Gun HVPS remains OFF <input checked="" type="checkbox"/>	Fail alarm remains ON HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Reset fault in Control Room		Monitor normal HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RCD ensures ARM is locked	ARM is locked <input checked="" type="checkbox"/>			

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

	Local Expected Observation	HMI/CR Expected Observation	Beamline HMI	CR HMI/EPICS
Opens FE shutter (w/keypad)	FE Shutters open <input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Apply source until low alarm	Yellow light on Monitor <input checked="" type="checkbox"/>	Radiation level increases on EPICS		<input checked="" type="checkbox"/>
	FE Shutters Closed <input checked="" type="checkbox"/>	Alarm sounds in Control Room		<input checked="" type="checkbox"/>
		Low level alarm ON, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Return monitor to normal		Monitor normal, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	FE Critical Device Permit A chain ON		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Apply source until low alarm	Yellow light on Monitor <input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
	FE Critical Device Permit A chain OFF		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Return monitor to normal		Monitor normal, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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

	Local Expected Observation	HMI/CR Expected Observation	Linac HMI	CR HMI/EPICS
Operator turns on Gun	Gun HVPS is ON <input checked="" type="checkbox"/>	Gun Contactor ON A Chain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Apply source until high alarm	Red light on Monitor <input checked="" type="checkbox"/>	Radiation level increases on EPICS		<input checked="" type="checkbox"/>
	Monitor alarm sounds	Alarm sounds in Control Room		<input checked="" type="checkbox"/>
		High level alarm ON, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Silence Alarm		Alarm silences		<input checked="" type="checkbox"/>
Gun turns OFF	Gun HVPS is OFF <input checked="" type="checkbox"/>	Gun Contactor OFF A Chain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Return monitor to normal	Gun HVPS remains OFF <input checked="" type="checkbox"/>	High level alarm remains ON, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Reset fault in Control Room		Monitor normal, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Description of Test Failures (if any): _____

