

National Synchrotron Light Source II, Brookhaven National Laboratory			
Subject:	NSLS-II Beamline 21-ID Radiological Interlock Test Checklist		
Number:	NSLSII-21ID-CHK-001	Revision:	1
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NSLS-II Beamline 21-ID Radiological Interlock Test Checklist

Test Reason: 6 month (w/2 month extension- RCD waived)	Test Result: <input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed
	Test Type: <input type="checkbox"/> Pre-Certification <input checked="" type="checkbox"/> Certification <input type="checkbox"/> Partial
Test Date: 12/16 - 1/3/2017	Start Time: Finish Time:
Tester 1: Thomas McDonald; Brian Heneveld	Assistant 1: AD Operations Staff
Tester 2: Robert Chmiel; Gabrielle Sture	Assistant 2:
Tester 1 Signature: <i>Thomas McDonald</i>	Tester 2 Signature: <i>Robert Chmiel</i>
*Reviewer 1:	Reviewer 1 Signature:
Reviewer 2:	Reviewer 2 Signature:
** Safety Signature 21-ID (Beamline HMI)	Previous 21-ID SS# Date: 5/25/16
A Chain: 5421 503F B Chain: CC39C84D	A Chain: 5421503F B Chain: CC39C84D
** Safety Signature Pentant 5 Beamline (SR HMI)	Previous Pentant 5 SS# Date: 5/25/16
A Chain: CD804572 B Chain: 076774D9	A Chain: 447A6ED7 B Chain: 718CC902

* 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. 21-ID Beamline Staff close isolation vacuum valves in preparation for vacuum sensor test steps	✓
VI. Place muffler on beam imminent sounder	✓
VII. 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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	<u>A</u>
<i>Close the Right door</i>	✓
"Entry Permitted" sign is ON	✓
<i>Using the keypad, lock the closed doors</i>	✓
<i>Press SB1</i>	✓
SB1 illuminates	✓
Search sounder sounds	✓
Search yellow beacon flashing	✓
<i>Press SB2</i>	✓
SB2 illuminates	✓
<i>Exit hatch and close main door</i>	✓
<i>Press SBE and begin timing</i>	✓
Beam imminent alarm sounds for 30 seconds	✓
After warning, FOE Interlocked A and B ON (green), HMI	✓
"Interlocked" sign is ON	✓
Maglock A and B ON (green), all doors, HMI	✓
<i>Press the SBE/Access Button</i>	✓
"Interlocked" sign OFF, "Entry Permitted" sign is ON	✓
FOE Interlocked A and B OFF, HMI	✓
Maglock A OFF (may require opening Maglock on key pad)	✓
<i>Open door</i>	✓
Door opens, Maglock B OFF	✓

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A3 **Out of Sequence Search in the FOE (A Hutch)**

	A
Press SB2	✓
SB2 does not illuminate	✓
Press SB1	✓
SB1 illuminates	✓
Close hutch door and press SBE	✓
Hutch does NOT secure	✓

A4 **Search Timeout**

	A
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	✓
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)	✓
Line 1 Enable Key is out of place	✓
L1S1 Shutter A and B Permits OFF, HMI	✓
Cycle Line 1 Key in place	✓
L1S1 Shutter A and B Permits ON (green), HMI	✓
Open L1S1 Shutter	✓
L1S1 Shutter A and B indicate open (green)	✓
Cycle Line 1 Key out of place	✓
L1S1 Shutter A and B indicate closed (red)	✓
L1S1 Shutter A and B Permits OFF, HMI	✓
Line 2 Enable Key is out of place	✓
L2S2 Shutter A and B Permits OFF, HMI	✓
Cycle Line 2 Key in place	✓
L2S2 Shutter A and B Permits ON (green), HMI	✓

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- Open L2S2 Shutter L2S2 Shutter A and B indicate open (green) ✓
- Cycle Line 2 Key out of place L2S2 Shutter A and B indicate closed (red) ✓
- Rotate Keys to enable both lines L2S2 Shutter A and B Permits OFF, HMI ✓
- L1S1 and L2S2 A and B Permits ON (green), HMI ✓

A6 Emergency Stops (ES) FOE (A Hutch)

	<u>ES1</u>	<u>ES2</u>	<u>ES3</u>
For each ES search FOE hutch	✓	✓	✓
<i>Open FE Shutters from keypad</i>	✓	✓	✓
FE Shutters A and B open (green)	✓	✓	✓
FOE Interlocked A and B ON (green)	✓	✓	✓
FE Shutter Permit A and B ON (green)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Right Maglock A ON (green)	✓	✓	✓
Left Maglock A ON (green)	✓	✓	✓
<i>Press ES</i>	✓	✓	✓
FE Shutters A and B closed (red)	✓	✓	✓
FOE Interlocked A and B OFF	✓	✓	✓
FE Shutter Permit A and B OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓
Right Maglock A OFF	✓	✓	✓
Left Maglock A OFF	✓	✓	✓
<i>Pull out ES</i>	✓	✓	✓
ES Sum Latch OFF	✓	✓	✓
<i>Reset fault</i>	✓	✓	✓
ES Sum Latch ON (green)	✓	✓	✓

A7 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>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
<i>Search hutch</i>	✓	✓	✓	✓	✓
<i>Open FE Shutters from keypad</i>	✓	✓	✓	✓	✓
FE Shutters A and B open (green)	✓	✓	✓	✓	✓

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FOE Interlocked A and B ON (green)	✓	✓	✓	✓	✓
FE Shutter Permit A and B ON (green)	✓	✓	✓	✓	✓
FOE Door Switch Sum A and B ON (green)	✓	✓	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓	✓	✓
<i>Remove one switch actuator</i>	✓	✓	✓	✓	✓
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	✓	✓	✓	✓	✓
<i>Replace switch actuator and reset fault</i>	✓	✓	✓	✓	✓
Remove actuators and close door					✓

A8 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 A1).

	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
<i>Search hutch</i>	✓	✓	✓	✓	✓
<i>Open FE Shutters from keypad</i>	✓	✓	✓	✓	✓
FE Shutters A and B open (green)	✓	✓	✓	✓	✓
FOE Interlocked A and B ON (green)	✓	✓	✓	✓	✓
FE Shutter Permit A and B ON (green)	✓	✓	✓	✓	✓
FOE Door Switch Sum A and B ON (green)	✓	✓	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓	✓	✓
<i>Remove one switch actuator</i>	✓	✓	✓	✓	✓
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	✓	✓	✓	✓	✓
<i>Replace switch actuator and reset fault</i>	✓	✓	✓	✓	✓
Remove actuators and close door					✓

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A9 **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>	<u>✓</u>	<u>✓</u>
FOE Interlocked A and B ON (green)	<u>✓</u>	<u>✓</u>
FE Shutter Permit A and B ON (green)	<u>✓</u>	<u>✓</u>
Door Maglock A and B ON (green)	<u>✓</u>	<u>✓</u>
<i>Open FE Shutters</i>	<u>✓</u>	<u>✓</u>
FE Shutters open (green)	<u>✓</u>	<u>✓</u>
<i>Using FOE test box, turn OFF Maglock</i>	<u>✓</u>	<u>✓</u>
Door Maglock A OFF	<u>✓</u>	<u>✓</u>
FE Shutters closed (red)	<u>✓</u>	<u>✓</u>
FOE Interlocked A OFF	<u>✓</u>	<u>✓</u>
FE Shutter Permit A OFF	<u>✓</u>	<u>✓</u>
<i>Turn On Maglock and reset fault</i>	<u>✓</u>	<u>✓</u>
<i>Search hutch</i>	<u>✓</u>	<u>✓</u>
<i>Using FE Shutter test fixture, Open FE Shutters</i>	<u>✓</u>	<u>✓</u>
FE Critical Device Permits A and B ON	<u>✓</u>	<u>✓</u>
<i>Using FOE test box, turn OFF Maglock</i>	<u>✓</u>	<u>✓</u>
<i>Within 3 seconds: FE Critical Device Permit A Chain OFF</i>	<u>✓</u>	<u>✓</u>
<i>Close FE Shutters and reset fault</i>	<u>✓</u>	<u>✓</u>
Disconnect FOE test box	<u>✓</u>	<u>✓</u>

A10 **Vacuum Sensors Beamline 21-ID-1**

Qualified Beamline Staff will perform vacuum venting.

	<u>SW4</u>
Vacuum sensor SW A and B ON (green)	<u>✓</u>
L1S1 Shutter A and B Permits ON (green)	<u>✓</u>
<i>Open Beamline Photon Shutter L1S1</i>	<u>✓</u>
L1S1 Shutter open (green)	<u>✓</u>

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Beamline Staff vents up section

Vacuum sensor SW A and B OFF

L1S1 Shutter A and B Permits OFF

L1S1 Shutter closed (**red**)

Beamline Staff returns vacuum

Vacuum sensor SW A and B ON (**green**)

L1S1 Shutter A and B Permits OFF

Reset fault

L1S1 Shutter A and B Permits ON (**green**)

Open Beamline Photon Shutter L1S1

L1S1 Shutter open (**green**)

A11 **Vacuum Sensors Beamline 21-ID-2**

Qualified Beamline Staff will perform vacuum venting.

Vacuum sensor SW A and B ON (**green**)

L2S2 Shutter A and B Permits ON (**green**)

Open Beamline Photon Shutter L2S2

L2S2 Shutter open (**green**)

Beamline Staff vents up section

Vacuum sensor SW A and B OFF

L2S2 Shutter A and B Permits OFF

L2S2 Shutter closed (**red**)

Beamline Staff returns vacuum

Vacuum sensor SW A and B ON (**green**)

L2S2 Shutter A and B Permits OFF

Reset fault

L2S2 Shutter A and B Permits ON (**green**)

Open Beamline Photon Shutter L2S2

L2S2 Shutter open (**green**)

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

SW5

✓

✓

✓

✓

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Figure 1: Water Flow Meters (PPS 1, 2, and 3)

The PPS Water Safety Test Amplifiers (STA) are located in the cabinet to the upper right of the meters on top of the hutch (Figure 2).



Figure 2: PPS Water STAs

Record the pretest water flows for the PPS meters in GPM.

Meter Reading	Meter Reading	Current STA A	Current STA B
A1= <u>1.05</u>	B1= <u>1.03</u>	A STA1= <u>1.05</u>	B STA1= <u>1.03</u>
A2= <u>0.94</u>	B2= <u>0.94</u>	A STA2= <u>0.94</u>	B STA2= <u>0.94</u>
A3= <u>1.68</u>	B3= <u>1.72</u>	A STA3= <u>1.68</u>	B STA3= <u>1.72</u>
A4= <u>0.93</u>	B4= <u>0.93</u>	A STA4= <u>0.93</u>	B STA4= <u>0.925</u>
A5= <u>0.52</u>	B5= <u>0.5</u>	A STA5= <u>0.52</u>	B STA5= <u>0.52</u>

The current programmed trip settings for the amplifiers are in column 1. The STA readouts for each tested A and B chain STAs will be recorded in columns 3 and 4. These recordings should be within 15% of the programmed trip point (column 2).

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Trip Points	Trip Points (- 15 %)	Recorded A Trip	Recorded B Trip
PPS 1: 1.0 GPM	0.85 GPM	A STA1= <u>1.0</u>	B STA1= <u>1.0</u>
PPS 2: 0.7 GPM	0.6 GPM	A STA2= <u>0.7</u>	B STA2= <u>0.7</u>
PPS 3: 1.2 GPM	1.0 GPM	A STA3= <u>1.2</u>	B STA3= <u>1.2</u>
PPS 4: 0.7 GPM	0.6 GPM	A STA4= <u>0.7</u>	B STA4= <u>0.7</u>
PPS 5: 0.4 GPM	0.34 GPM	A STA5= <u>0.4</u>	B STA5= <u>0.4</u>

Repeat each step for all water flow meters

Open FE Shutters

FE Shutters A and B open (green)

Water Permits A and B ON (green), HMI

FE Shutter Permits A and B ON (green), HMI

Using the valve, lower water flow to trip point

FE Shutters A and B closed (red)

In 5 seconds: FE Shutter Permits A and B OFF, HMI

Water Permits A and B OFF, HMI

Recorded STA A and B levels above within 15%

Return water flow to pretest values

Water Permits A and B remain OFF, HMI

Reset fault at PPS cabinet

Water Permits A and B ON (green), HMI

FE Shutter Permits A and B ON (green), HMI

PPS1	PPS2	PPS3	PPS4	PPS5
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓

A15 Water Safety Test Amplifier Faults

Repeat each step for all water flow meters

Open FE Shutters with keypad

FE Shutters A and B open (green)

Water Permits A and B ON (green), HMI

PPS1	PPS2	PPS3	PPS4	PPS5
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓

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FE Shutter Permits A and B ON (green), HMI	✓	✓	✓	✓	✓
<i>Press A chain fault/reset button</i>	✓	✓	✓	✓	✓
FE Shutters A and B closed (red)	✓	✓	✓	✓	✓
Water Permit A OFF, HMI	✓	✓	✓	✓	✓
In 5 seconds: FE Shutter Permit A OFF, HMI	✓	✓	✓	✓	✓
<i>Reset fault</i>	✓	✓	✓	✓	✓
<i>Open FE Shutters with keypad</i>	✓	✓	✓	✓	✓
FE Shutters A and B open (green)	✓	✓	✓	✓	✓
Water Permits A and B ON (green), HMI	✓	✓	✓	✓	✓
FE Shutter Permits A and B ON (green), HMI	✓	✓	✓	✓	✓
<i>Press B chain fault/reset button</i>	✓	✓	✓	✓	✓
FE Shutters A and B closed (red)	✓	✓	✓	✓	✓
Water Permit B OFF, HMI	✓	✓	✓	✓	✓
In 5 seconds: FE Shutter Permit B OFF, HMI	✓	✓	✓	✓	✓
<i>Reset fault</i>	✓	✓	✓	✓	✓

A16 **Observe Beamline Photon Shutter Operation**

	<u>FOE</u>	<u>L1S1</u>	<u>L2S2</u>
<i>Close Beamline Photon Shutter</i>	✓	✓	✓
Shutter indicates closed A and B (red), HMI	✓	✓	✓
<i>Open Beamline Photon Shutter</i>	✓	✓	✓
Shutter opens smoothly without hesitation	✓	✓	✓
Shutter indicates open A and B (green), HMI	✓	✓	✓
<i>Close Beamline Photon Shutter</i>	✓	✓	✓
Shutter indicates closed A and B (red), HMI	✓	✓	✓

A17 **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	✓
<i>Turn the "Air" switch ON</i>	✓
<i>Open FE Photon Shutter and SSs A and B</i>	✓
Shutters open freely without hesitation	✓

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	Shutters are in the open (up) position	✓
	FE Shutters A and B open (green), HMI	✓
<i>Actuate Shutters closed</i>	FE Shutters A and B closed (red), HMI	✓
A18	FE Safety Shutters can only be Closed if FE Photon Shutter is Closed	
<i>Search hutch</i>	FOE Interlocked A and B ON (green), HMI	✓
	FE Critical Device Permits A and B ON (green), HMI	✓
<i>Open FE SSA</i>	SSA Open	✓
<i>Open FE Photon Shutter</i>	FE Critical Device Permits A and B OFF, HMI	✓
<i>Close Shutters</i>		✓
<i>Reset fault</i>	FE Critical Device Permits A and B ON (green), HMI	✓
<i>Open FE SSB</i>	SSB Open	✓
<i>Open FE Photon Shutter</i>	FE Critical Device Permits A and B OFF, HMI	✓
<i>Close Shutters</i>		✓
<i>Reset fault</i>	FE Critical Device Permits A and B ON (green), HMI	✓
A19	Beamline Enable Key (Opening Shutter without key trips SR RF and Dipole PS)	
<i>Remove beamline enable key</i>	Beamline Online A and B OFF	✓
<i>Search FOE</i>	FOE Interlocked A and B ON (green), HMI	✓
	FE Critical Device Permits A and B ON (green), HMI	✓
<i>Using FE Shutter test fixture, Open FE Shutters</i>	FE Critical Device Permits A and B OFF	✓
<i>Using FE Shutter test fixture, Close FE Shutters</i>		✓
<i>Replace beamline enable key and reset faults</i>	Beamline Online A and B ON (green)	✓
	Live Testing	
A20	Reach Back FOE Door Switches	
<i>Secure P1 through P5</i>	SR Secure, A and B chain, SR HMI	✓
<i>Place actuators on FOE hutch door switches and Maglock</i>		✓
<i>Search hutch</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 (MCR beamline 1)</i>	FE Critical Device Permit A and B ON (green), SR HMI	✓

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<i>Check I/O Box 21 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 hutch door</i>		✓
	FOE Interlocked A OFF, HMI	✓
	FE Critical Device Permit A OFF, HMI	✓
<i>Check I/O Box 21 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 (MCR beamline 1)</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 hutch</i>		✓

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	FOE Interlocked A and B ON (green), HMI	✓
	FE Critical Device Permits A and B ON (green), HMI	✓
<i>Check Control Room SR HMI (MCR beamline 1)</i>	FE Critical Device Permit A and B ON (green), SR HMI	✓
<i>Check I/O Box 21 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 "B chain" switch actuator</i>	FOE Interlocked B OFF, HMI	✓
	FE Critical Device Permit B OFF, HMI	✓
<i>Check I/O Box 21 Beamline Enable Panel</i>	FE Critical Device Permit B LED OFF	✓
<i>Check Control Room SR HMI (MCR beamline 1)</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>		✓

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A21 Water Interlock (Live)

<i>Search FOE</i>	FOE Interlocked A and B ON (green), HMI	✓
	FE Shutter Permits A and B ON (green), HMI	✓
	FE Critical Device Permits A and B ON (green), HMI	✓
<i>Check I/O Box 21 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 Control Room SR HMI (MCR beamline 1)</i>	FE Critical Device Permit A and B ON (green), SR HMI	✓
<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, turn on air and open Photon then SSs</i>		
	FE Shutters indicate open (green), HMI	✓
<i>Using water trip points in Step A14, lower flow to one meter</i>		✓
	Water Permits A and B OFF, HMI	✓
	FE Shutter Permits A and B OFF, HMI	✓
<i>Within 5 seconds</i>	FE Critical Device Permits A and B OFF, HMI	✓
<i>Check I/O Box 21 Beamline Enable Panel</i>	FE Critical Device Permits A and B OFF	✓
<i>Check I/O Box 28 Beamline Enable Panel</i>	FE Critical Device Permit Sum A and B LEDs OFF	✓
<i>Check Control Room SR HMI (MCR beamline 1)</i>	FE Critical Device Permit A and B OFF, SR HMI	✓
<i>Check SR RF System C HVPS Beamline Interface</i>	A and B Permits OFF, SR RF System C HVPS Interface	✓
<i>Check SR RF System D HVPS Beamline Interface</i>	A and B Permits OFF, SR RF System D HVPS Interface	✓
<i>Check Dipole PS (positive) Beamline Interface</i>	A and B Permits OFF, Dipole PS Pos. Interface	✓
<i>Check Dipole PS (negative) Beamline Interface</i>	A and B Permits OFF, Dipole PS Neg. Interface	✓
	SR RF System C HVPS is OFF	✓

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- SR RF System D HVPS is OFF ✓
- SR Dipole PS is OFF ✓
- Close FE Shutters with FE Shutter test fixture ✓
- Return water flow to recorded level ✓
- Reset fault(s) ✓
- 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 ✓
- 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 21-ID 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-

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.

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Reviewed by:

X

Scott Buda
Accelerator Safety Systems Group Leader

12/22/2016

X

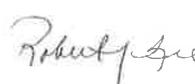
Robert Chmiel

Robert Chmiel
NSLS-II Safety Officer
Signed by: Chmiel, Robert

Approved by:

12/22/2016

X



Robert Lee
NSLS-II ESH Manager
Signed by: Lee, Robert J

Revision History

Revision	Description	Date
1	First Issue.	23DEC2016

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: NLSL-II Area Radiation Monitor PPS Test			Technical

Attachment D

NLSL-II Beamline (FOE) Area Radiation Monitor Checklist

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

Monitor # ERM-FD21	ID # EN02575 DA# IN07472	Beamline: 21 JD
Test Reason: <input checked="" type="checkbox"/> Beamline Certification <input type="checkbox"/> Replacement/Repair		
Test Date: 12/28 - 12/30/16	Test Result <input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed	
Tester: Thomas McDonald	RCD: SHAWN BUCKALEW	
Tester Signature: <i>Thomas McDonald</i>	RCD Signature: <i>Shawn Buckalew</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 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 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): _____

