

National Synchrotron Light Source II, Brookhaven National Laboratory			
Subject:	NSLS-II Beamline 18-ID Radiological Interlock Test Checklist		
Number:	NSLSII-18ID-CHK-001	Revision:	1
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NSLS-II Beamline 18-ID Radiological Interlock Test Checklist

Test Reason: <i>Initial Test</i>	Test Result: <input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed
Test Date: <i>9/26/2017</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>9/25/17</i> Finish Time: <i>9/26/17</i>
Tester 2: <i>Robert Chmiel; Gabrielle Stuve</i>	Assistant 1: <i>Accelerator Operations Staff</i>
Tester 1 Signature: <i>Thomas J. McDonald</i>	Assistant 2:
*Reviewer 1:	Tester 2 Signature: <i>B Chmiel</i>
Reviewer 2:	Reviewer 1 Signature:
** Safety Signature 18-ID (Beamline HMI) A Chain: <i>08C0B39A</i> B Chain: <i>6590CB39</i>	Reviewer 2 Signature:
** Safety Signature Pentant 5 Beamline (SR HMI) A Chain: <i>B527 2SIC</i> B Chain: <i>0D73 AAC1</i>	Previous 18-ID SS# Date: / / A Chain: B Chain:
	Previous Pentant 5 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

✓ ✓

Press SB3

✓ ✓

SB3 does not illuminate

✓ ✓

Close hutch door and press SBE

✓ ✓

Hutch does NOT secure

✓ ✓

A4 Search Timeout

Repeat steps for each 18-ID hutch.

A **B**

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)

✓

“Beam On” sign is OFF

✓

✓

A6 Emergency Stops (ES) FOE (A 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

✓ ✓ ✓ ✓

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Right Maglock A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
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.	ES1	ES2	ES3	ES4
<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"/>
B 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"/>
Right Maglock A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
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"/>
LIS1 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"/>
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"/>
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"/>

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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 B 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"/>
B 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"/>
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"/>
LIS1 Shutter A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B Interlocked OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LIS1 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

A9 B Hutch Labyrinth 2 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"/>

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B Interlocked A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
L1S1 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cable Lab 2 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"/>
B 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 2 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>
<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"/>

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Replace switch actuator and reset fault

✓ ✓ ✓

Remove actuators and close door

✓

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>
Search hutch	<u>✓</u>	<u>✓</u>	<u>✓</u>
Open FE Shutters from keypad	<u>✓</u>	<u>✓</u>	<u>✓</u>
FE Shutters A and B open (green)	<u>✓</u>	<u>✓</u>	<u>✓</u>
FOE Interlocked A and B ON (green)	<u>✓</u>	<u>✓</u>	<u>✓</u>
FE Shutter Permits A and B ON (green)	<u>✓</u>	<u>✓</u>	<u>✓</u>
FOE 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>
FE Shutters A and B closed (red)	<u>✓</u>	<u>✓</u>	<u>✓</u>
FOE Interlocked OFF	<u>✓</u>	<u>✓</u>	<u>✓</u>
FE Shutter Permit OFF	<u>✓</u>	<u>✓</u>	<u>✓</u>
FOE 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

✓

A12 B Hutch 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 A).

	<u>A</u>	<u>B</u>	<u>Reed</u>
Search hutch	<u>✓</u>	<u>✓</u>	<u>✓</u>
Open FE Shutters and LIS1 Shutter from keypad	<u>✓</u>	<u>✓</u>	<u>✓</u>
All Shutters A and B open (green)	<u>✓</u>	<u>✓</u>	<u>✓</u>
B Interlocked A and B ON (green)	<u>✓</u>	<u>✓</u>	<u>✓</u>

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L1S1 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B 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"/>
L1S1 Shutter A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B 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"/>
B 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"/>

A13 B Hutch 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>
<i>Search hutch</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Open FE Shutters and L1S1 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"/>
B Interlocked A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
L1S1 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B 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"/>
L1S1 Shutter A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B 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"/>
B 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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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)

	R	L
<i>Search hutch</i>	<u>✓</u>	<u>✓</u>
FOE Interlocked A and B ON (green)	<u>✓</u>	<u>✓</u>
FE Shutter Permits 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:</i>		
FE Critical Device Permit A chain OFF	<u>✓</u>	<u>✓</u>
<i>Close FE Shutters and reset fault</i>	<u>✓</u>	<u>✓</u>
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").



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

	R	L
<i>Search hutch</i>	<u>✓</u>	<u>✓</u>

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B Interlocked A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
L1S1 Shutter Permit 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 and L1S1 Shutter</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
All 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"/>
L1S1 Shutter closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B Interlocked A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
L1S1 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 and L1S1 Shutter</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		<input checked="" type="checkbox"/>

A16 Water Interlock

Record the pretest water flows for the 2 PPS meters in GPM.

Meter Reading	Meter Reading	Current STA A	Current STA B
A1= <u>1.6</u>	B1= <u>1.6</u>	A STA1= <u>1.6</u>	B STA1= <u>1.6</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).

Trip Points	Trip Points (- 15 %)	Recorded A Trip	Recorded B Trip
PPS 1: 1.3 GPM	1.1 GPM	A STA1= <u>1.3</u>	B STA1= <u>1.3</u>

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PPS1

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

A17 **Water Safety Test Amplifier Faults**

PPS1

Open FE Shutters with keypad

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

Water Permits A and B ON (**green**), HMI

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

Press A chain fault/reset button

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

Water Permit A OFF, HMI

In 5 seconds: FE Shutter Permit A OFF, HMI

Reset fault

Open FE Shutters with keypad

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

Water Permits A and B ON (**green**), HMI

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

Press B chain fault/reset button

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

✓

Water Permit B OFF, HMI

✓

In 5 seconds: FE Shutter Permit B OFF, HMI

✓

Reset fault

✓

A18 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

✓

A19 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 SSs A and B and Photon Shutter

Shutters open freely without hesitation

✓

Shutters are in the open (up) position

✓

FE Shutters A and B open (**green**), HMI

✓

Actuate Shutters closed

FE Shutters A and B closed (**red**), HMI

✓

A20 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

✓

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<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	✓

A21 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)	✓
	FE Critical Device Permits A and B ON (green), HMI	✓

Live Testing

A22 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	✓
<i>Check I/O Box 18 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	✓

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<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 18 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>		✓
	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 18 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	✓

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<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 18 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>		✓

A23 **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 18 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	✓

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<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 C 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 SSs then Photon Shutter</i>		✓
	FE Shutters indicate open (green), HMI	✓
<i>Using water trip points in step A16, lower flow to one meter</i>		✓
	Water Permits A and B OFF, HMI	✓
Within 5 seconds	FE Shutter Permits A and B OFF, HMI	✓
	FE Critical Device Permits A and B OFF, HMI	✓
<i>Check I/O Box 18 Beamline Enable Panel</i>	FE Critical Device Permits A and B LEDs 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 (red), 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	✓
	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>Return water flow to recorded level</i>		✓
<i>Reset fault(s)</i>		✓

A24 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>		✓

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- 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* ✓

A25 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 18-ID Test Checklist Completed ✓

A26 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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Reviewed by:

9/28/2017

X Scott Buda

Scott Buda
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9/28/2017

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Revision History

Revision	Description	Date
1	First Issue.	28SEP2017

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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# *INO 7241*

Monitor # <i>FRM-TD18</i>	ID # <i>INO7569</i>	Beamline: <i>18 ID</i>
Test Reason: <input checked="" type="checkbox"/> Beamline Certification <input type="checkbox"/> Replacement/Repair		
Test Date: <i>9/25/2017</i>	Test Result <input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed	
Tester: <i>Thomas McDonald</i>	RCD: <i>J Dobric</i>	
Tester Signature: <i>Thomas J. McDonald</i>	RCD Signature: <i>J Dobric</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"/>	<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"/>	<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"/>	<input checked="" type="checkbox"/>
	FE Shutters Closed <input checked="" type="checkbox"/>	Alarm sounds in Control Room	<input checked="" type="checkbox"/>	<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"/>	<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"/>	<input checked="" type="checkbox"/>
	Monitor alarm sounds	Alarm sounds in Control Room	<input checked="" type="checkbox"/>	<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"/>	<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): _____

