NSLS-II Beamline 6-BM Radiological Interlock Test Checklist

Test Reason: Initial Test	Test Result: ☑ Passed ☐ Failed Test Type: ☐ Pre-Certification ☑ Certification ☐ Partial
Test Date: 3/6 - 3/8/17	Start Time: Finish Time:
Tester 1: Thomas McDonald; Brian Heneveld	Assistant 1: Accelerator Operations Staff
Tester 2: Robert Chmiel; Gabrielle Stave	Assistant 2:
Tester 1 Signature: Thomas P. McDonald	Tester 2 Signature: Robert Chmiel
*Reviewer 1:	Reviewer 1 Signature:
Reviewer 2:	Reviewer 2 Signature:
** Safety Signature 6-BM (Beamline HMI) A Chain: 65E11DIC B Chain: 27C282BE	Previous 6-BM SS# Date: / / A Chain: B Chain:
** Safety Signature Pentant 3 Beamline (SR HMI) A Chain: 31384F57 B Chain: F66EFF17	Previous Pentant 3 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* ✓

Repeat steps for each 6-BM hutch.	A	B
Close all doors except the main door	✓	✓
"Entry Permitted" sign ON	✓	✓
Using the keypad, lock the closed doors	✓	✓
Press SB1	✓	✓
SB1 illuminates	✓	✓
Search sounder sounds	✓	✓
Search yellow beacon flashing	✓	✓
Press SB2	✓	✓
SB2 illuminates	✓	✓
Exit hutch and close main door	✓	✓
Press SBE and ***begin timing***	✓	✓
Beam imminent alarm sounds for 30 seconds	✓	✓
After warning, (FOE, B) Interlocked A and B ON (**green**), HMI	✓	✓
"Interlocked" sign ON	✓	✓
Maglock A and B ON (**green**), all doors, HMI	✓	✓
Press the SBE/Access Button	✓	✓
"Interlocked" sign OFF, "Entry Permitted" sign ON	✓	✓
FOE, B Interlocked A and B OFF, HMI	✓	✓
Maglock A OFF (may require opening Maglock on keypad)	✓	✓
Open door	✓	✓
Door opens, Maglock B OFF	✓	✓

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

Repeat steps for each 6-BM hutch.	A	B
Press SB2	✓	✓
SB2 does not illuminate	✓	✓
Press SB1	✓	✓

SB1 illuminates	✓	✓
Close hutch door and press SBE	✓	✓
Hutch does NOT secure	✓	✓

A4 ***Search Timeout***

Repeat steps for each 6-BM 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	✓	✓	✓	✓
Right Maglock A ON (**green**)	✓	✓	✓	✓

Left Maglock A ON (**green**)	✓	✓	✓	✓
Press ES	✓	✓	✓	✓
FE Shutters A and B closed (**red**)	✓	✓	✓	✓
FOE Interlocked A and B OFF	✓	✓	✓	✓
FE Shutter Permits A and B OFF	✓	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓	✓
Right Maglock A OFF	✓	✓	✓	✓
Left Maglock A OFF	✓	✓	✓	✓
Pull out ES	✓	✓	✓	✓
ES Sum Latch OFF	✓	✓	✓	✓
Reset fault	✓	✓	✓	✓
ES Sum Latch ON (**green**)	✓	✓	✓	✓

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

For each ES search hutch.	**ES1**	**ES2**	**ES3**
Open FE and L1S1 Shutters from keypad	✓	✓	✓
All Shutters A and B open (**green**)	✓	✓	✓
B Interlocked A and B ON (**green**)	✓	✓	✓
L1S1 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**)	✓	✓	✓
Press ES	✓	✓	✓
L1S1 Shutter A and B closed (**red**)	✓	✓	✓
B Interlocked A and B OFF	✓	✓	✓
L1S1 Shutter Permit A and B OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓
Right Maglock A OFF	✓	✓	✓
Left Maglock A OFF	✓	✓	✓

Pull out ES	✓	✓	✓
ES Sum Latch OFF	✓	✓	✓
Reset fault	✓	✓	✓
ES Sum Latch ON (**green**)	✓	✓	✓

A8 ***FOE 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).

	A	B	Latch
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**)	✓	✓	✓
Cable Lab 1 Switches/Latch 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	✓	✓	✓
Cable Lab 1 Switch/Latch Permit OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓
Replace switch actuator and reset fault	✓	✓	✓

Remove labyrinth actuators and close labyrinth door ✓

A9 ***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).

	A	B	Latch
Search hutch	✓	✓	✓
Open FE and LIS1 Shutters from keypad	✓	✓	✓
All Shutters A and B open (**green**)	✓	✓	✓

B Interlocked A and B ON (**green**)	✓	✓	✓
L1S1 Shutter Permit A and B ON (**green**)	✓	✓	✓
Cable Lab 1 Switches/Latch A and B ON (**green**)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Remove one switch actuator	✓	✓	✓
L1S1 Shutter A and B closed (**red**)	✓	✓	✓
B Interlocked OFF	✓	✓	✓
L1S1 Shutter Permit OFF	✓	✓	✓
Cable Lab 1 Switch/Latch Permit OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓
Replace switch actuator and reset fault	✓	✓	✓
Remove labyrinth actuators and close labyrinth door			✓

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).

	A	B	Reed
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	✓	✓	✓

L1S1 Shutter Permit A and B ON (**green**)	✓	✓	✓
B Door Switch Sum A and B ON (**green**)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Remove one switch actuator	✓	✓	✓
L1S1 Shutter A and B closed (**red**)	✓	✓	✓
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 ***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).

	A	B	Reed
Search hutch	✓	✓	✓
Open FE and L1S1 Shutters from keypad	✓	✓	✓
All Shutters A and B open (**green**)	✓	✓	✓
B Interlocked A and B ON (**green**)	✓	✓	✓
L1S1 Shutter Permit A and B ON (**green**)	✓	✓	✓
B Door Switch Sum A and B ON (**green**)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Remove one switch actuator	✓	✓	✓
L1S1 Shutter A and B closed (**red**)	✓	✓	✓
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			✓

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).

	A	B	Reed	
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 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).

	A	B	Reed
Search hutch	✓	✓	✓
Open FE and L1S1 Shutters from keypad	✓	✓	✓
All Shutters A and B open (**green**)	✓	✓	✓
B Interlocked A and B ON (**green**)	✓	✓	✓

B Interlocked A and B ON (**green**)	✓	✓
L1S1 Shutter Permit A and B ON (**green**)	✓	✓
Door Maglock A and B ON (**green**)	✓	✓
Open FE and L1S1 Shutters	✓	✓
All Shutters open (**green**)	✓	✓
Using FOE test box, turn OFF Maglock	✓	✓
Door Maglock A OFF	✓	✓
L1S1 Shutter closed (**red**)	✓	✓
B Interlocked A OFF	✓	✓
L1S1 Shutter Permit A OFF	✓	✓
Turn On Maglock and reset fault	✓	✓
Search hutch	✓	✓
Using FE Shutter test fixture, Open FE and L1S1 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 ***Water Interlock***

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

Meter Reading	Meter Reading	Current STA A	Current STA B
A1= 0.7	B1= 0.73	A STA1= 0.7	B STA1= 0.73

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: 0.5 GPM	0.43 GPM	A STA1= 0.5	B STA1= 0.5

	PPS1
Open FE Shutters	✓
FE Shutters A and B open (**green**)	✓

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
Search hutch	✓	✓
FOE Interlocked A and B ON (**green**)	✓	✓
FE Shutter Permits 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 Shutters closed (**red**)	✓	✓
FOE 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 Crtical 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 ✓

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
Search hutch	✓	✓

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***

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 ✓

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		✓
Reset fault	FE Critical Device Permits A and B ON (**green**), HMI	✓
Open FE SSB	SSB Open	✓
Open FE Photon Shutter	FE Critical Device Permits A and B OFF, HMI	✓
Close Shutters		✓
Reset fault	FE Critical Device Permits A and B ON (**green**), HMI	✓

A21 ***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 Shutters	FE Critical Device Permits A and B OFF	✓
Using FE Shutter test fixture, Close FE Shutters		✓
Replace beamline enable key and reset faults	Beamline Online A and B ON (**green**)	✓

Live Testing

A22 ***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	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit A and B ON (**green**), SR HMI	✓
Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permits A and B LEDs ON	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum A and B LEDs ON	✓
Check Dipole PS (positive) Beamline Interface	A and B Permits ON, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	A and B Permits ON, Dipole PS Neg. Interface	✓
Check SR RF System C HVPS Beamline Interface	A and B Permits ON, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	A and B Permits ON, SR RF System D HVPS Interface	✓
Operator enables SR Dipole PS	SR Dipole PS is ON	✓
Operator enables SR RF System C HVPS	SR RF System C HVPS is ON	✓
Operator enables SR RF System D HVPS	SR RF System D HVPS is ON	✓
Using FE Shutter test fixture, open the FE Shutters (SSA, SSB and Photon)		✓
	FE Shutters open	✓
*Remove an "**A chain**" door switch actuator from beamline hutch door*		✓
	FOE Interlocked A OFF, HMI	✓
	FE Critical Device Permit A OFF, HMI	✓

Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permit A LED OFF	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum A LED OFF	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit A OFF (**red**), SR HMI	✓
Check SR RF System C HVPS Beamline Interface	A Permit OFF, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	A Permit OFF, SR RF System D HVPS Interface	✓
Check Dipole PS (positive) Beamline Interface	A Permit OFF, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	A Permit OFF, Dipole PS Neg. Interface	✓
	SR RF System C HVPS is OFF	✓
	SR RF System D HVPS is OFF	✓
	SR Dipole PS is OFF	✓
Close FE Shutters with FE Shutter test fixture	FE Shutters closed	✓
Replace ***"A chain"*** door switch actuator and reset fault(s)		✓
Search hutch		✓
	FOE Interlocked A and B ON (**green**), HMI	✓
	FE Critical Device Permits A and B ON (**green**), HMI	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit A and B ON (**green**), SR HMI	✓
Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permits A and B LEDs ON	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum A and B LEDs ON	✓
Check Dipole PS (positive) Beamline Interface	A and B Permits ON, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	A and B Permits ON, Dipole PS Neg. Interface	✓
Check SR RF System C HVPS Beamline Interface	A and B Permits ON, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	A and B Permits ON, SR RF System D HVPS Interface	✓
Operator enables SR Dipole PS	SR Dipole PS is ON	✓
Operator enables SR RF System C HVPS	SR RF System C HVPS is ON	✓
Operator enables SR RF System D HVPS	SR RF System D HVPS is ON	✓
Using FE Shutter test fixture, open the FE Shutters (SSA, SSB and Photon)		✓
	FE Shutters open	✓
Remove "***B chain***" switch actuator	FOE Interlocked B OFF, HMI	✓
	FE Critical Device Permit B OFF, HMI	✓

Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permit B LED OFF	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit B OFF (**red**), SR HMI	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum B LED OFF	✓
Check SR RF System C HVPS Beamline Interface	B Permit OFF, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	B Permit OFF, SR RF System D HVPS Interface	✓
Check Dipole PS (positive) Beamline Interface	B Permit OFF, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	B Permit OFF, Dipole PS Neg. Interface	✓
	SR Dipole PS is OFF	✓
	SR RF System C HVPS is OFF	✓
	SR RF System D HVPS is OFF	✓
Close FE Shutters with FE Shutter test fixture	FE Shutters closed	✓
Remove beamline hutch switch actuators and Maglock actuator		✓

A23 ***Water Interlock (Live)***

Search FOE	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	✓
Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permits A and B LEDs ON	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum A and B LEDs ON	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit A and B ON (**green**), SR HMI	✓
Check Dipole PS (positive) Beamline Interface	A and B Permits ON, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	A and B Permits ON, Dipole PS Neg. Interface	✓
Check SR RF System C HVPS Beamline Interface	A and B Permits ON, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	A and B Permits ON, SR RF System C HVPS Interface	✓
Operator enables SR Dipole PS	SR Dipole PS is ON	✓
Operator enables SR RF System C HVPS	SR RF System C HVPS is ON	✓
Operator enables SR RF System D HVPS	SR RF System D HVPS is ON	✓
Using FE Shutter test fixture, turn on air and open SSs then Photon Shutter		✓
	FE Shutters indicate open (**green**), HMI	✓

Using Water trip points in step A16, lower flow to one meter		✓
	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	✓
Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permits A and B LEDs OFF	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum A and B LEDs OFF	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit A and B OFF (**red**), SR HMI	✓
Check SR RF System C HVPS Beamline Interface	A and B Permits OFF, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	A and B Permits OFF, SR RF System D HVPS Interface	✓
Check Dipole PS (positive) Beamline Interface	A and B Permits OFF, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	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	✓
Close FE Shutters with FE Shutter test fixture	FE Shutters closed	✓
Return water flow to recorded level		✓
Reset fault(s)		✓

A24 ***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		✓

A25 ***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 -

Reviewed by:

3/21/2017

X Ewart Orr

Ewart Orr
Accelerator Safety Systems Engineer
Signed by: Orr, Ewart

3/13/2017

X Robert Chmiel

Robert Chmiel
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Approved by:

3/15/2017

X

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

Revision History

Revision	Description	Date
1	First Issue.	08MAR2017

Addendum to 6-BM Initial Radiological Interlock test Certification March 8, 2017

Meter Reading	Meter Reading	Current STA A	Current STA B
A1= 0.53	B1= 0.55	A STA1= 0.53	B STA1= 0.55

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: 0.26 GPM	0.26 GPM	A STA1= 0.25	B STA1= 0.25

	PPS1
Water Permits A and B ON (**green**), HMI	✓
Using the valve, turn water flow to trip point	✓
Water Permits A and B OFF, HMI	✓
Recorded STA A and B levels within 15%	✓
Return water flow to pretest values	✓
Water Permits A and B remain OFF, HMI	✓
Reset fault at PPS cabinet	✓
Water Permits ON (**green**), HMI	✓

Test Result:	☑ Passed	☐ Failed

Tested By: [signature] Date: 7/5/17

Tested By: [signature] Date: 7/5/17