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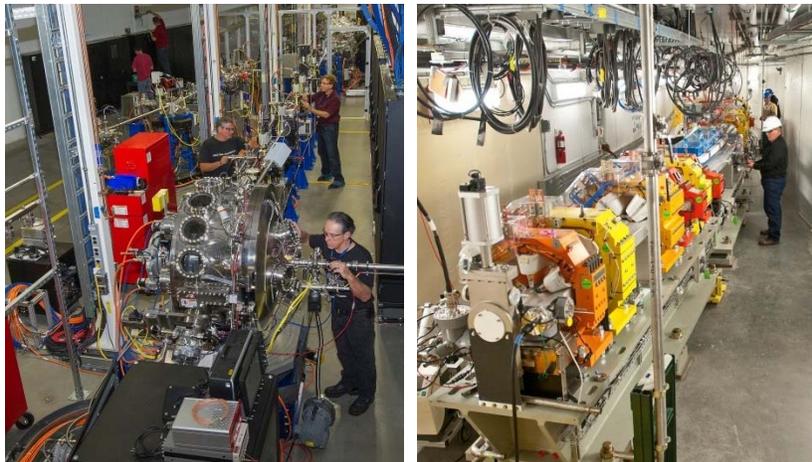
Doc No: NSLSII-4BM-PRC-001

NSLS-II PROCEDURE: BEAMLINER XFM (04-BM) RADIATION SURVEY PROCEDURE

August 18, 2017

Rev. 1

S. Chitra



 **Think Safety. Act Safely.**

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National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. NSLSII-4BM-PRC-001	Author: S. Chitra	Review Frequency: 3 yrs	Rev. 1
Title: Beamline XFM (04-BM) Radiation Survey Procedure			Effective Date: 18AUG2017

ESH Review:

8/21/2017

X Kim Wehunt

Kim Wehunt
Facility Support Representative
Signed by: Wehunt, Kimberly

By signing this Procedure I acknowledge that it complies with all ESH requirements and if performed correctly, will not present a significant hazard to personnel or equipment.

Beamline Review:

8/17/2017

X Ryan Tappero

Ryan Tappero
XFM Lead Beamline Scientist
Signed by: Tappero, Ryan

By signing this Procedure I acknowledge that it is comprehensive and can be performed as written at the beamline.

Authorization Basis Review:

8/17/2017

X 

Steve Moss
Authorization Basis Manager
Signed by: Moss, Steven H

By signing this Procedure I acknowledge that a USI Screening/Evaluation has been performed and this Procedure does not adversely impact the NSLS-II Authorization Basis Documents.

Approved:

8/17/2017

X 

Robert Lee
ESH Manager
Signed by: Ackerman, Andrew

By approving this Procedure I agree that the appropriate personnel have reviewed this document and I authorize this work to commence as written.

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REVISION HISTORY

REVISION	SECTION(S)	PAGE	DATE	List of Reviewers	DESCRIPTION
1	All	All	18AUG2017	M. Benmerrouche P. Northrup K. Rubino Z. Zhong	First Issue

ACRONYMS

3PW	Three-pole Wiggler	MBV	multi-beam viewer
BM	Bending Magnet	MSK	Fixed Mask
BTS	Booster to Storage Ring	NSLS-II	National Synchrotron Light Source II
CODI	Collimator and Diagnostics	PSD	Photon Science Division
DCM	Double Crystal Monochromator	PSH	Photon Shutter
ESH	Environment, Safety and Health	RCT	Radiological Control Technician
FE	Front End	RSC	Radiation Safety Components
FOE	First Optical Enclosure	RSL	Radiation Safety Limit
FS	Fluorescent Screen	SAF	Safety Approval Form
GB	Gas Bremsstrahlung	SBMS	Standards-Based Management System
IFB	Indistinguishable From Background	SOE	Second Optical Enclosure
LOTO	Lockout/Tagout	SR	Synchrotron Radiation
mrem/hr	millirem per hour	SSA	Secondary Source Aperture
M1	Mirror 1 (Focusing)	XFM	X-ray Fluorescence Microprobe
M2	Mirror 2 (Collimating)		

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1 PURPOSE AND SCOPE

This purpose of this procedure is to perform a comprehensive commissioning radiation survey on the 04-BM beamline, as directed by PS-C-XFD-PRC-004, *NSLS-II Beamlines Radiation Safety Commissioning Plan*.

The survey scenarios are covered in the *Beamline XFM (04-BM, 3PW) Comprehensive Commissioning Radiation Survey*, provided as Attachment A.

2 PREREQUISITES

- 2.1 Authorization/approval from the NSLS-II Director to initiate commissioning of the beamline has been received.
- 2.2 A Beamline System Readiness Checklist has been completed in accordance with PS-C-XFD-PRC-003, *Enabling Beamlines for Operations*.
- 2.3 The area(s) around the beamline are posted in accordance with SBMS Program Description: *Radiological Control Manual*.
- 2.4 All shutters closed.
- 2.5 FE slits fully open (near maximum extent range).

Note: If FE slits cannot be fully open, record the FE slits parameter here: _____

- 2.6 All beamline slits fully open.
- 2.7 All mirrors and filters retracted out from beam.

3 HAZARDS, CONTROLS AND LIMITS

- 3.1 If at any point during performance of this procedure a radiation dose rate of 5 mrem/hr or higher on contact is identified, the radiation survey shall be terminated and the cause investigated, and any hazards shall be mitigated before continuing.
- 3.2 Minor deviations on Attachment A are allowed in the field; however the deviation shall be documented and submitted to the PSD Director and the ESH Manager for review after the survey.

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- 3.3 During surveys performed in top-off mode, top-off will be adjusted for more frequent injections to keep the stored beam current within the allowable specifications.

4 PROCEDURE

Note: Execution of this Comprehensive Commissioning Radiation Survey, along with the evaluation of the data collected, may only be used as a basis by the PSD Director and the ESH Manager to approve commissioning activities at an electron beam current of up to 3 times the electron beam current measured during this survey. Approval of commissioning of the beamline at a higher electron beam current requires re-execution of this Comprehensive Commissioning Radiation Survey.

Note: The step sequences of the survey may be completed out of sequence.

- 4.1 Authorized Beamline Staff and RCTs establish the initial conditions and record them on Attachment A, *Beamline XFM (04-BM, 3PW) Comprehensive Commissioning Radiation Survey*.
- 4.2 Authorized Beamline Staff and RCTs complete the Comprehensive Commissioning Radiation Survey in accordance with Attachment A.
- 4.3 Throughout the radiation survey, Authorized Beamline Staff ensure that the photon beam is where it should be using the appropriate diagnostic tools AND ensure that the FE shutter remains open.

Note: Attachment A, with the filled information from the measurements, acts as the Beamline Radiation Survey Interim Report.

- 4.4 After the survey, the RCT provides the completed Beamline Radiation Survey Interim Report to the PSD Director and the ESH Manager for review.

5 REFERENCES

- 5.1 PS-C-CMD-PRC-002, *Records Management Procedure*
- 5.2 PS-C-XFD-PRC-003, *Enabling Beamlines for Operations*
- 5.3 PS-C-XFD-PRC-004, *NSLS-II Beamlines Radiation Safety Commissioning Plan*

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5.4 PS-C-XFD-PRC-024, *Beamline Photon Shutter Centrally Controlled Lockout/Tagout Procedure*

5.5 SBMS Program Description: *Radiological Control Manual*

6 ATTACHMENTS

Attachment A, *Beamline XFM (04-BM, 3PW) Comprehensive Commissioning Radiation Survey*

Attachment B, *Beamline Enclosure Diagram, 04-BM-A and 04-BM-B/C*

7 DOCUMENTATION

The following records are generated as a result of this procedure, and shall be maintained in accordance with PS-C-CMD-PRC-002, *Records Management Procedure*:

- Completed Comprehensive Commissioning Radiation Surveys/Beamline Radiation Survey Interim Report

8 DEFINITIONS

None.

[If you have any questions or feedback regarding this document, please click this link.](#)

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Attachment A
Beamline XFM (04-BM, 3PW)
Comprehensive Commissioning Radiation Survey

Date: _____

The following scenarios are covered for GB/SR Radiation Survey:

1. Integrity of the 04-BM-A, 04-BM-B, 04-BM-C, transport pipe, RSCs and PSH with GB and SR (Pink Beam) on beamline fixed/moveable components.

Survey Conditions:

HOLD POINT: Evaluate and ensure that all applicable controls listed in the Commissioning SAF are in place, including LOTO requirements for the beamline photon shutters (in accordance with PS-C-XFD-PRC-024, *Beamline Photon Shutter Centrally Controlled Lockout/Tagout Procedure*).

HOLD POINT: Before opening safety shutters in the FE, survey the upstream wall of the FOE to make sure no radiation comes through.

RSLs to Be Identified: FE Slits, Electron Beam Current

General Area Surveys:

For general area surveys, the following steps identify the "key targets" to use during the surveys at a minimum (see the appropriate sections below for details):

1. Step 3
2. Step 7

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Initial Settings:

Electron Beam Current: _____

Injection Rate: _____ BTS Injection Efficiency: _____

Straight Section Vacuum Condition: _____

Mirror M1 setting: _____

Mirror M2 setting: _____

DCM Settings: _____

Set up neutron detectors at:

1. Outside the FOE in the vicinity of mirror (M1). This location is close to where the ARM is located.
2. Outside the FOE downstream wall, in the vicinity of the guillotine, outboard side.

Background Radiation Levels:

Gamma Dose Rate/Count Rate: _____ / _____

Neutron Dose Rate: _____

Survey start date and time: _____

Authorized Beamline Staff & RCTs:

Additional information: _____

Note: The step sequences of this procedure can be changed.

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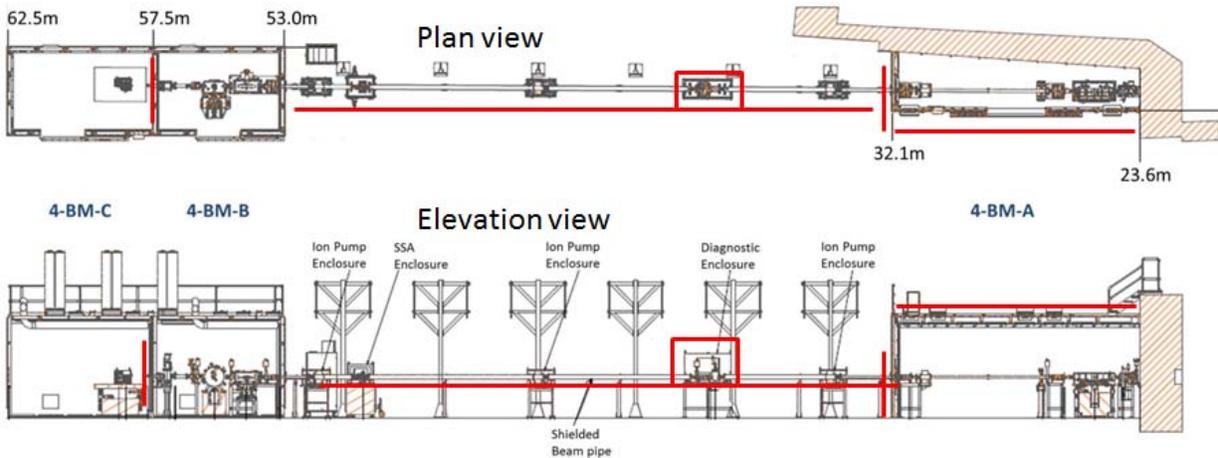
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1 FOE Slits as Scatter Target

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Closed	Out	Out	Fully Open	Out	Out	Out	Closed

1.1 Close horizontal and vertical FOE slits

Survey all walls and roof of 04-BM-A, the area around the shielded transport pipe as, well as at the exit of the beam transport pipe, inside the 04-BM-C enclosure to verify the integrity of the SOE PSH.



Straight Section Vacuum Conditions: _____

Position of FOE Slits _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

Signature (ESH) _____ **Signature (Beamline)** _____

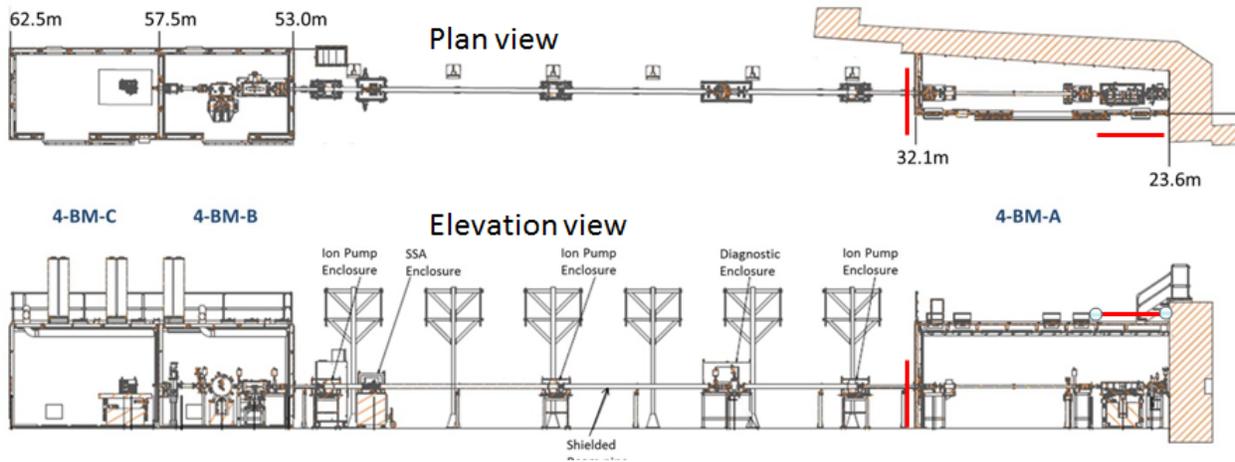
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1.2 Close horizontal FOE slits.

Survey walls and roof of 04-BM-A in the vicinity of FOE slits.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Closed	Out	Out	Fully Open	Out	Out	Out	Closed



Straight Section Vacuum Conditions: _____

Position of FOE Slits _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

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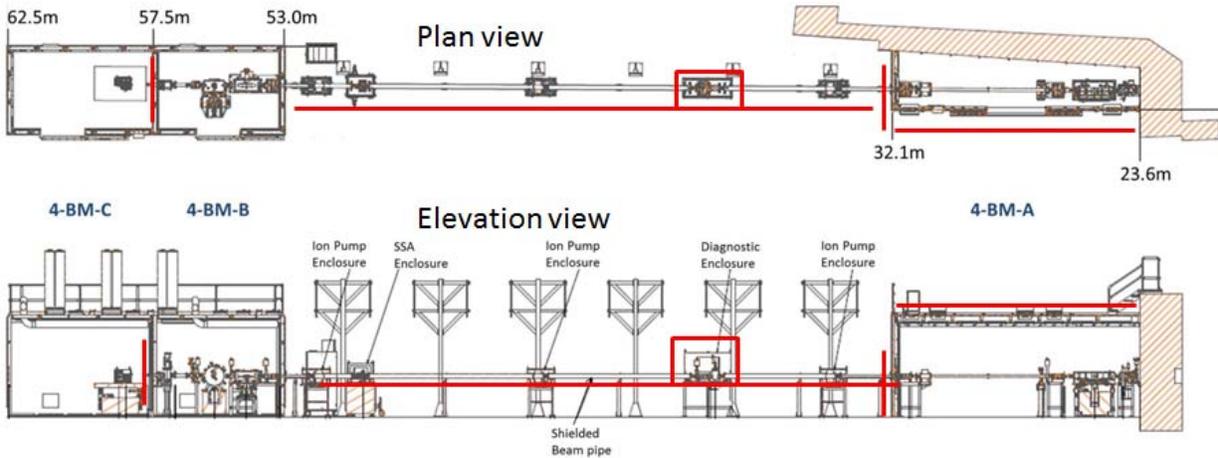
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2 MSK1 as Scatter target

Keep FE slits fully open, FE shutters open, FOE slits open, M1, SSA, M2, DCM, screens and filters out of the beam, and SOE PSH closed. Direct the white beam on MSK1.

Survey all walls and roof of 04-BM-A, the area around the shielded transport pipe, as well as at the exit of beam transport pipe inside the 04-BM-C enclosure, to verify the integrity of the SOE PSH.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Open	Out	Out	Fully Open	Out	Out	Out	Closed



Straight Section Vacuum Conditions: _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

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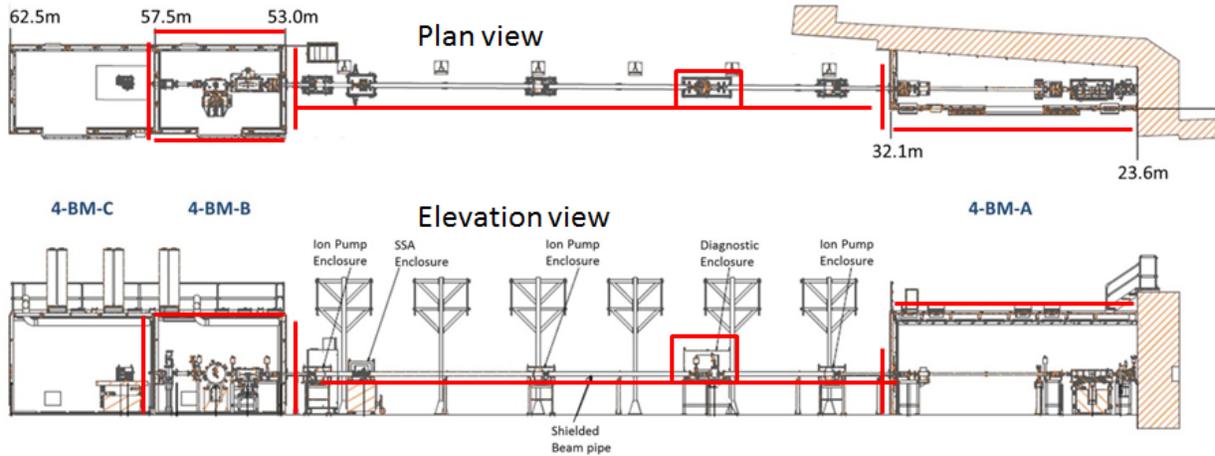
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3 Pink Beam Stop (MSK5) as Scatter Target

Open FOE slits. Insert M1 in its nominal position (3.0 mrad) and bring beam onto MSK5.

Survey all walls and roof of 04-BM-A, all walls and roof of 04-BM-B, the area around the shielded transport pipe, as well as at the exit of beam transport pipe inside the 04-BM-C enclosure, to verify the integrity of the SOE PSH.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Open	In	Out	Fully Open	Out	Out	Out	Closed



Straight Section Vacuum Conditions: _____

Angle of Mirror M1 _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

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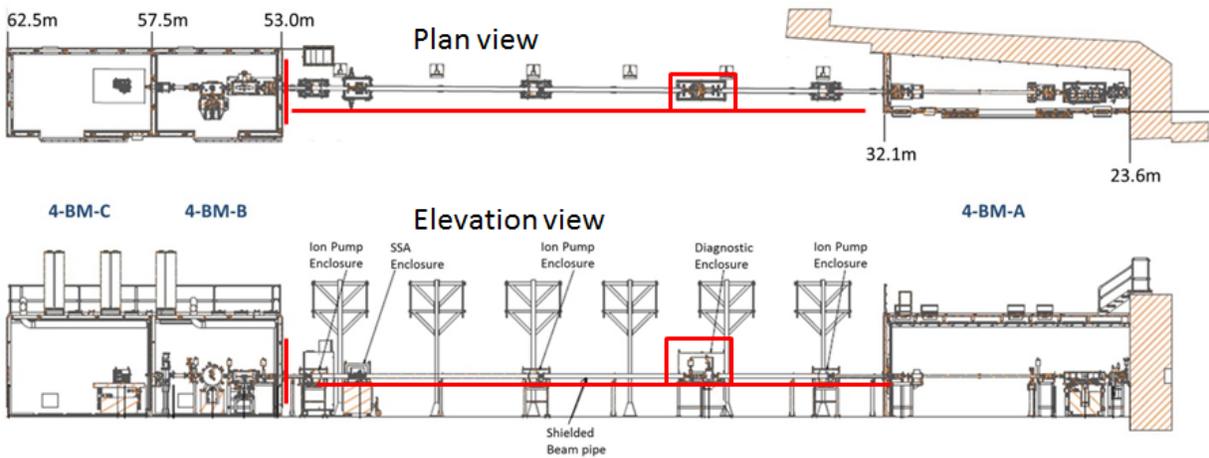
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4 MSK2, MSK3 and MSK4 as Scatter Targets

Start by scanning M1 to maximize beam on MSK5 in SOE. Then, for the following steps, survey the shielded transport pipe and the back wall of 04-BM-B.

- 4.1 Slightly mis-steer until the beam disappears from MBV to illuminate MSK4.
- 4.2 Further mis-steer until the beam appears in MSK2.
- 4.3 Mis-steer the beam back half way from nominal to illuminate MSK3.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Open	In	Out	Fully Open	Out	Out	In	Closed



Straight Section Vacuum Conditions: _____

Step	Angle of M1	Direct Frisk	Survey Results
4.1		<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)
4.2		<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)
4.3		<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)

Additional information/comments:

Signature (ESH) _____ Signature (Beamline) _____

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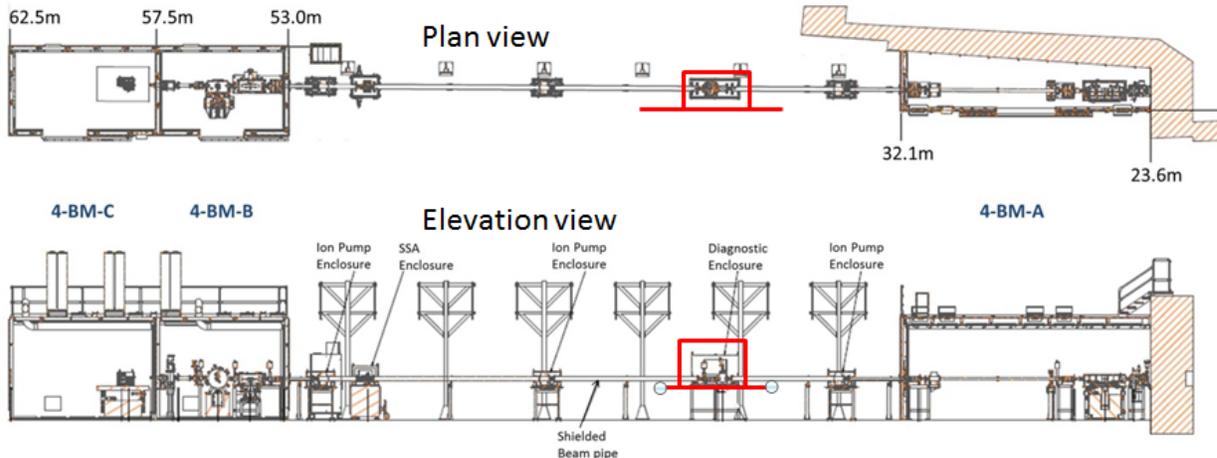
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5 Configure Fluorescence Screen (FS) and Multi-Beam Viewer (MBV) as Scatter Targets

5.1 Fluorescence Screen (FS) as Scatter Target

Insert Fluorescence Screen (FS) and survey the CODI enclosure on the beam transport pipe.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Open	In	In	Fully Open	Out	Out	Out	Closed



Straight Section Vacuum Conditions: _____

Angle of Mirror M1 _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

Signature (ESH) _____ **Signature (Beamline)** _____

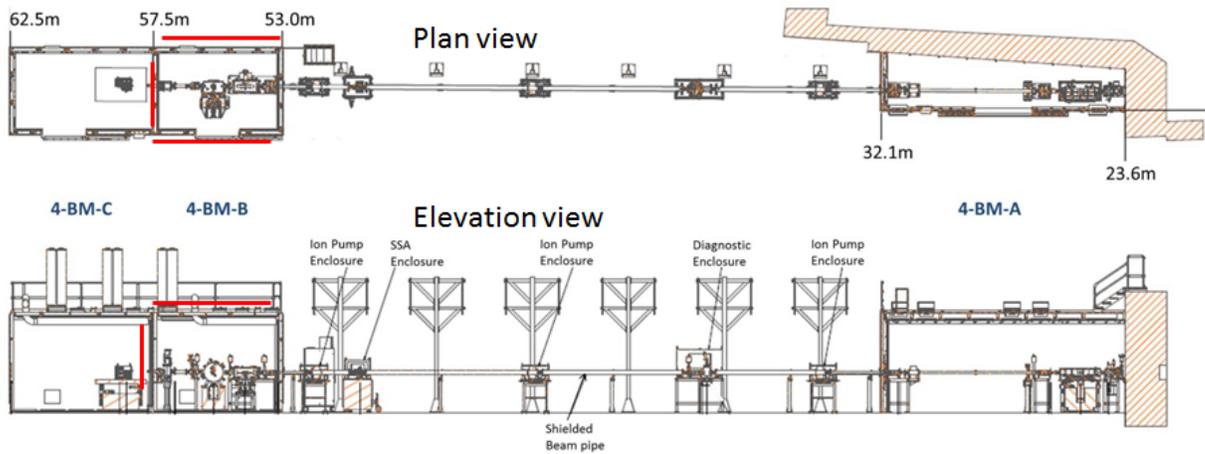
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5.2 Multi-Beam Viewer (MBV) as Scatter Target

Retract FS and insert Multi-Beam Viewer (MBV) and survey the walls and roof of 04-BM-B in the vicinity of MBV.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Open	In	Out	Fully Open	Out	Out	In	Closed



Straight Section Vacuum Conditions: _____

Angle of Mirror M1 _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

Signature (ESH) _____ **Signature (Beamline)** _____

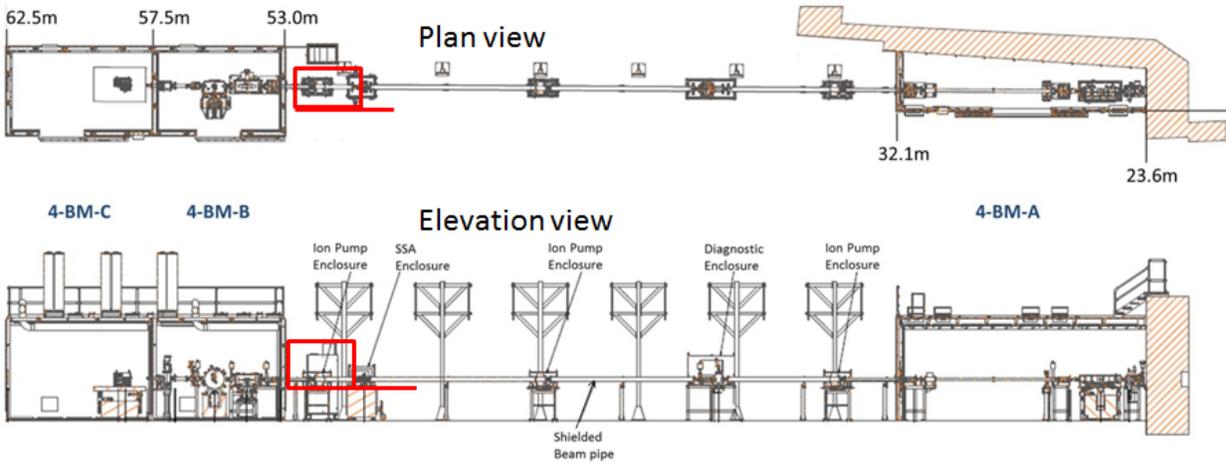
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6 SSA as Scatter Target

Retract FS and MBV, close Secondary Source Aperture (SSA). Survey the SSA enclosure.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Open	In	Out	Closed	Out	Out	Out	Closed



Straight Section Vacuum Conditions: _____

Position of SSA Slits _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

Signature (ESH) _____ **Signature (Beamline)** _____

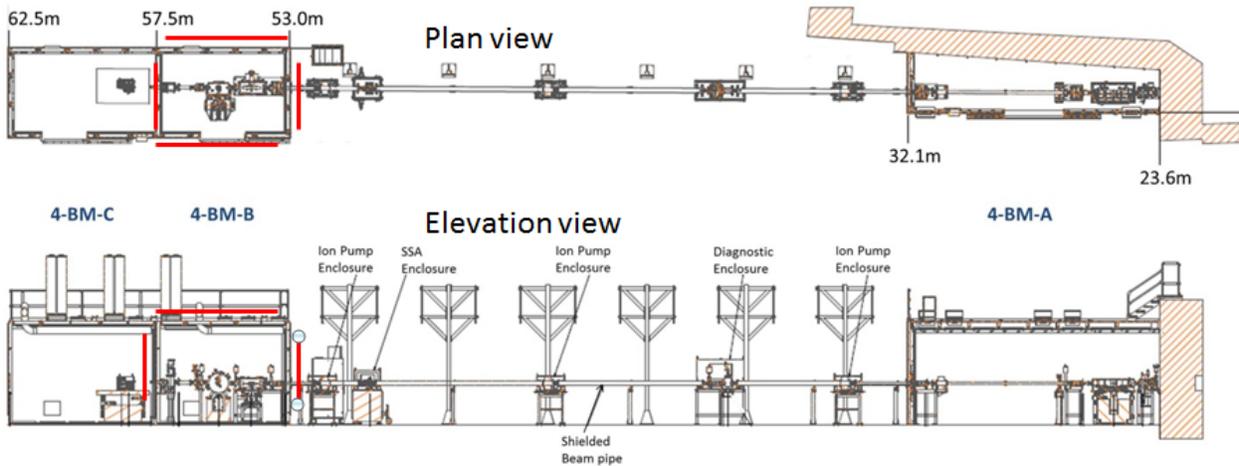
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7 M2 as Scatter Target

Open SSA slits. Insert M2 in its nominal position (3.0 mrad). Survey all walls and roof of 04-BM-B and inside the 04-BM-C enclosure.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Open	In	Out	Fully Open	In	Out	In	Closed



Straight Section Vacuum Conditions: _____

Angle of Mirror M1 _____

Angle of Mirror M2 _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

Signature (ESH) _____ **Signature (Beamline)** _____

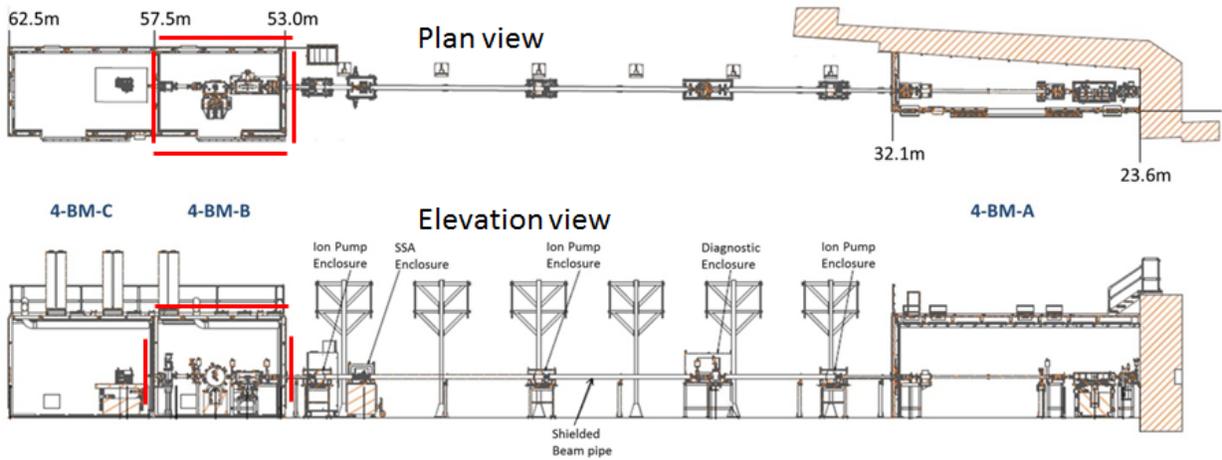
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8 DCM as Scatter Target

Insert DCM in its nominal position. Survey all walls and roof of 04-BM-B and the exit of beam transport pipe inside the 04-BM-C enclosure.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Open	In	Out	Fully Open	In	In	In	Closed



Straight Section Vacuum Conditions: _____

Angle of Mirror M1 _____

Angle of Mirror M2 _____

Angle of DCM _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

Signature (ESH) _____ **Signature (Beamline)** _____

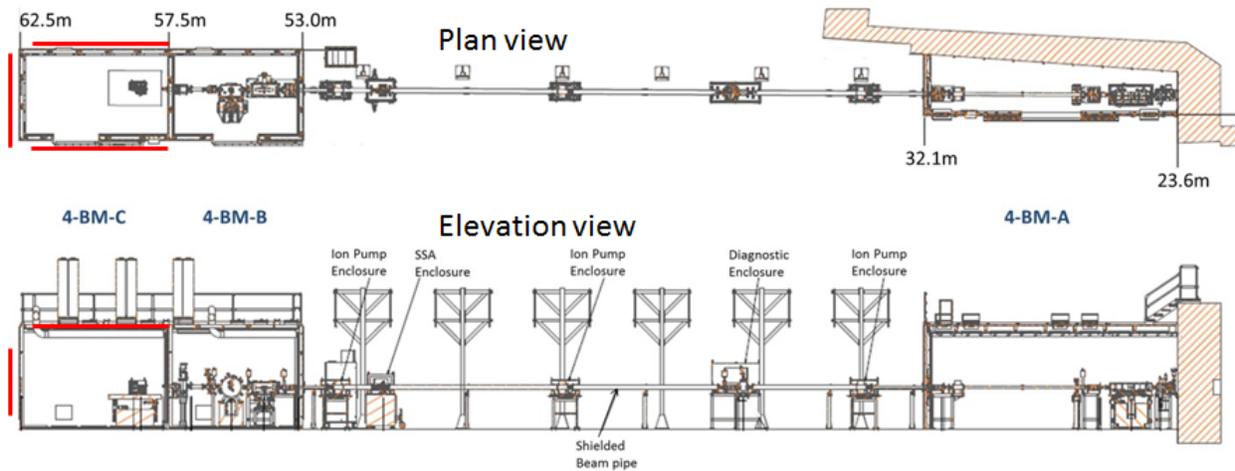
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9 Beam Hitting the Beam Stop.

Retract DCM and open the SOE PSH to direct the reflected pink beam onto the beam stop. Survey all walls and roof of 04-BM-C enclosure.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Open	In	Out	Fully Open	In	Out	Out	Open



Straight Section Vacuum Conditions: _____

Angle of Mirror M1 _____

Angle of Mirror M2 _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

Signature (ESH) _____ **Signature (Beamline)** _____

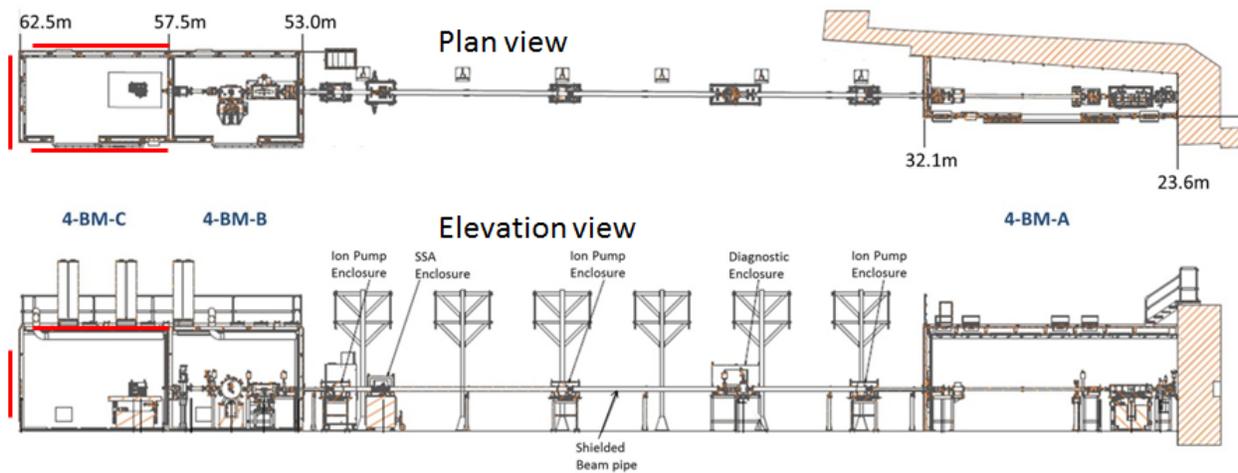
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10 Sample as Scatter Target in 04-BM-C

With M2 in nominal position, bring pink beam onto a scatter target (e.g. Al) at the sample position in 04-BM-C. Survey all walls and roof of 04-BM-C enclosure.

Component:	FE Slits	FE Shutter	FOE Slits	M1	FS	SSA	M2	DCM	MBV	SOE PSH
Position:	Fully Open	Open	Open	In	Out	Fully Open	In	In	Out	Open



Straight Section Vacuum Conditions: _____

Angle of Mirror M1 _____

Angle of Mirror M2 _____

DCM position _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

Signature (ESH) _____ **Signature (Beamline)** _____

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Integrated Survey Results:

*Integrated readings are performed for the duration of the survey.

1) Neutron

a) Meter location: _____

- Survey duration: _____
- Result: _____
- Dose rate: _____

b) Meter location: _____

- Survey duration: _____
- Result: _____
- Dose rate: _____

c) Meter location: _____

- Survey duration: _____
- Result: _____
- Dose rate: _____

2) Gamma

a) Meter location: _____

- Survey duration: _____
- Result: _____
- Exposure rate: _____

b) Meter location: _____

- Survey duration: _____
- Result: _____
- Exposure rate: _____

c) Meter location: _____

- Survey duration: _____
- Result: _____
- Exposure rate: _____

d) Meter location: _____

- Survey Duration: _____
- Result: _____
- Exposure rate: _____

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Attachment B – Beamline Enclosure Diagram for 04-BM-A and 04-BM-B/C

