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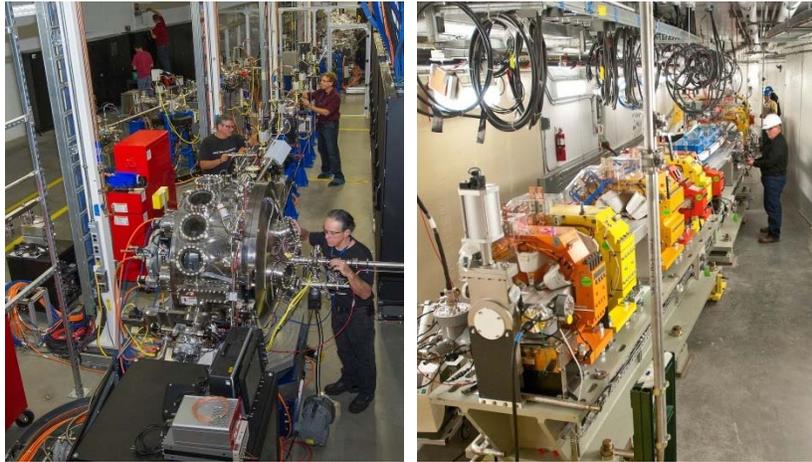
Doc No: NSLSII-02ID-PRC-001

NSLS-II PROCEDURE: BEAMLIN SIX (02-ID) RADIATION SURVEY PROCEDURE

January 13, 2017

Rev. 1

M. Benmerrouche



 **Think Safety. Act Safely.**

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Title: Beamline SIX (02-ID) Radiation Survey Procedure			Effective Date: 13JAN2017

ESH Review:

1/13/2017

1/13/2017

X 

Mo Benmerrouche
Physicist - Radiation Safety
Signed by: Benmerrouche, Mohamed

X John Aloï

John Aloï
Facility Support Representative
Signed by: Aloï Jr, John

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:

1/16/2017

X Ignace Jarrige

Ignace Jarrige
SIX Lead Beamline Scientist
Signed by: Jarrige, Ignace

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

Authorization Basis Review:

1/17/2017

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:

1/17/2017

X 

Robert Lee
ESH Manager
Signed by: Lee, Robert J

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	13JAN2017	A. Ackerman K. Rubino, K. Wehunt	First Issue. Validation waived by Author M. Benmerrouche and Acting Conduct of Operations Manager, S. Moss.

ACRONYMS

BTS	Booster to Storage Ring	PRBC	Primary Bremsstrahlung Collimator
ESH	Environment, Safety and Health	PRBS	Primary Bremsstrahlung Stop
FE	Front End	PSD	Photon Science Division
FOE	First Optical Enclosure	PSH	Photon Shutter
GB	Gas Bremsstrahlung	RCT	Radiological Control Technician
ID	Insertion Device	RSC	Radiation Safety Components
IFB	Indistinguishable From Background	SAF	Safety Approval Form
EPU57	Elliptical Polarized Undulator, 57mm period	SBMS	Standards-Based Management System
mrad	Millirad	SGBC	Secondary Gas Bremsstrahlung Collimator
mrem/hr	Millirem per hour	SIX	Soft Inelastic X-ray
NSLS-II	National Synchrotron Light Source II	WBM	White Beam Mask
PBM	Pink Beam Mask	WBS	White Beam Stop
PGM	Plane Grating Monochromator		

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1 PURPOSE AND SCOPE

This purpose of this procedure is to perform a comprehensive commissioning radiation survey on the 02-ID beamline, as directed by PS-C-XFD-PRC-004, *NSLS-II Beamlines Radiation Safety Commissioning Plan*.

The following scenarios are covered in the *Beamline SIX (02-ID, EPU57) Comprehensive Commissioning Radiation Survey*, provided as Attachment A:

I. **GB Radiation Survey**

- a. Integrity of the FOE and RSC with GB on Fixed and moveable components.
- b. Integrity of components outside the FOE including the pink beam transport pipe, PGM housing, and RSC

II. **Synchrotron Radiation Survey**

- a. Integrity of the FOE and RSC with GB, White Beam, and Pink beam on beamline fixed and moveable components.
- b. Integrity of components outside the FOE including the pink beam transport pipe, PGM housing, and RSC

III. **Monochromatic Beam Radiation Survey**

- a. Integrity of monochromatic beam transport pipe and beam stop.

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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 wide open (near maximum extent range).

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

- 2.6 ID gap closed to minimum gap after first step of GB radiation survey.

Note: If ID cannot be closed to the minimum gap, record the gap value here: _____

- 2.7 All beamline slits fully open.
- 2.8 All mirrors 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.
- 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.

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4 PROCEDURE

Warning: 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 this procedure can be changed.

- 4.1 Authorized Beamline Staff and RCTs establish the initial conditions and record them on Attachment A, *Beamline SIX (02-ID, EPU57) 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.

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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*
- 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 SMI (02-ID, EPU57) Comprehensive Commissioning Radiation Survey*

Attachment B, *Beamline Enclosure Diagram, 02-ID-A (FOE)*

Attachment C, *Beamline Components outside the FOE*

Attachment D, *Beamline Endstation*

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 SIX (02-ID, EPU57)
Comprehensive Commissioning Radiation Survey

Date: _____

Initial Settings:

ID gap: _____ Electron Beam Current: _____

Injection Rate: _____ BTS Injection Efficiency: _____

Straight Section Vacuum Condition: _____

Mirror M1 setting: _____ Mirror M2 setting: _____

Grating setting: _____

Mirror M3 setting: _____ Mirror M4 setting: _____

Set up neutron detectors at:

1. FOE, in the vicinity of the white beam mask, outboard.
2. FOE, downstream wall edge of guillotine inboard.

Survey start date and time: _____

Background Radiation Levels:

Gamma Dose Rate / Count Rate: _____ / _____

Neutron Dose Rate: _____

Authorized Beamline Staff & RCTs:

Additional information: _____

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The following scenarios are covered:

I. GB Radiation Survey

- a. Integrity of the FOE and RSC with GB on Fixed and moveable components.
- b. Integrity of components outside the FOE including the pink beam transport pipe, PGM housing, and RSC

II. Synchrotron Radiation Survey

- a. Integrity of the FOE and RSC with GB, White Beam, and Pink beam on beamline fixed and moveable components.
- b. Integrity of components outside the FOE including the pink beam transport pipe, PGM housing, and RSC

III. Monochromatic Beam Radiation Survey

- a. Integrity of monochromatic beam transport pipe and beam stop.

Survey Conditions:

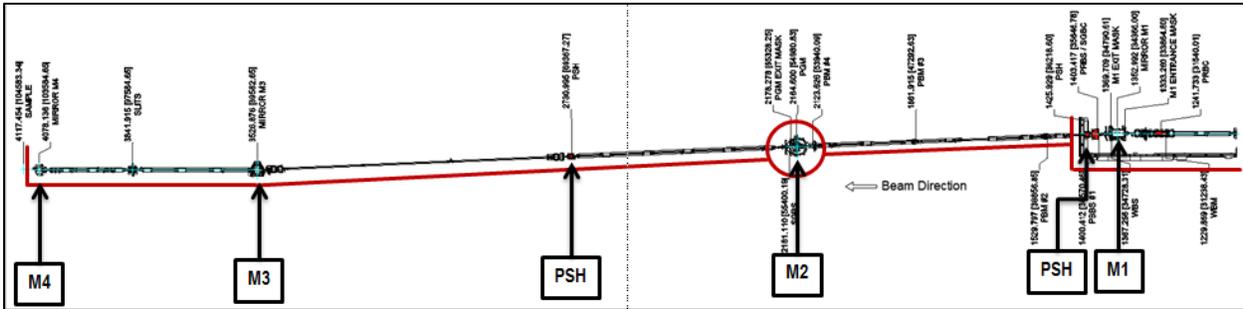
HOLD POINT: Evaluate and ensure that all applicable controls listed in the Commissioning SAF are in place, including LOTO requirements for the beamline photon shutters (in accordance with PS-C-XFD-PRC-024, *Beamline Photon Shutter Centrally Controlled Lockout/Tagout Procedure*).

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

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I. GB Radiation Survey.

EPU57 gap fully open: FE slits fully open and FE shutters open. Monochromatic PSH open and ALL Slits fully open. M1 out the beam to maximize GB on WBS. M2 parallel to the beam. Establish EPU beam on DiagON. FOE PSH closed.



Straight Section Vacuum Conditions: _____

ID Gap: _____

Angle of mirror M1 _____ Angle of mirror M2 _____
 Angle of mirror M3 _____ Angle of mirror M4 _____

1. Survey all walls and roof of the FOE, as well as the area around the pink beam transport pipe and the PGM, and behind beam stop downstream of M4.

Dose Rate Survey Results: IFB other (described below)

2. **Set M1 mirror in its nominal position (typically 1.235 deg).** Survey all walls and roof of the FOE, as well as the area around the pink beam transport pipe and the PGM, and behind beam stop downstream of M4.

Angle of mirror M1 _____

Dose Rate Survey Results: IFB other (described below)

3. **Open FOE PSH.** Survey downstream wall of the FOE, as well as the area around the transport pipes, PGM housing, behind beam stop downstream of M4.

Dose Rate Survey Results: IFB other (described below)

4. **Set M1 out of the beam.** Survey downstream wall of the FOE, as well as the area around the transport pipes, PGM housing, behind beam stop downstream of M4.

Angle of mirror M1 _____

Dose Rate Survey Results: IFB other (described below)

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5. **Set M1 in its nominal position (typically 1.235 deg). Close Slits downstream of M1 and upstream of the PGM.** Survey in the area around the slits.

Angle of mirror M1 _____

Slits settings _____

Dose Rate Survey Results: IFB other (described below)

6. **Set M2 and grating to their nominal position.** Survey around PGM housing, monochromatic beam transport pipe, and behind beam stop downstream of M4.

Angle of mirror M2 and Grating _____

Dose Rate Survey Results: IFB other (described below)

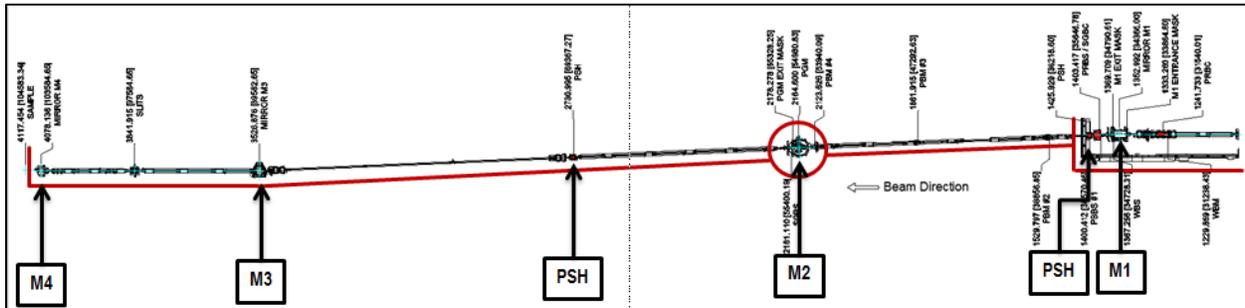
Additional information/comments:

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

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II. Synchrotron Radiation Survey.

EPU57 gap to minimum permitted setting. FE slits fully open, FE shutters open. Monochromatic PSH open and ALL Slits open. M1 out the beam to maximize GB on WBS. M2 parallel to the beam. Establish Beam on WBS. FOE PSH closed.



Straight Section Vacuum Conditions: _____

ID Gap: _____

Angle of mirror M1 _____ Angle of mirror M2 _____

Angle of mirror M3 _____ Angle of mirror M4 _____

1. Survey all walls and roof of the FOE, as well as the area around the pink beam transport pipe and the PGM, and behind beam stop downstream of M4.

Direct Frisk Survey Results: IFB other (described below)

2. **Set M1 mirror in its nominal position (typically 1.235 deg).** Survey all walls and roof of the FOE, as well as the area around the pink beam transport pipe and the PGM, and behind beam stop downstream of M4.

Angle of mirror M1 _____

Direct Frisk Survey Results: IFB other (described below)

3. **Open FOE PSH.** Survey downstream wall of the FOE, as well as the area around the transport pipes, PGM housing, behind beam stop downstream of M4.

Direct Frisk Survey Results: IFB other (described below)

4. **Close Slits downstream of M1 and upstream of the PGM.** Survey in the vicinity of the Slits.

Slits settings _____

Direct Frisk Survey Results: IFB other (described below)

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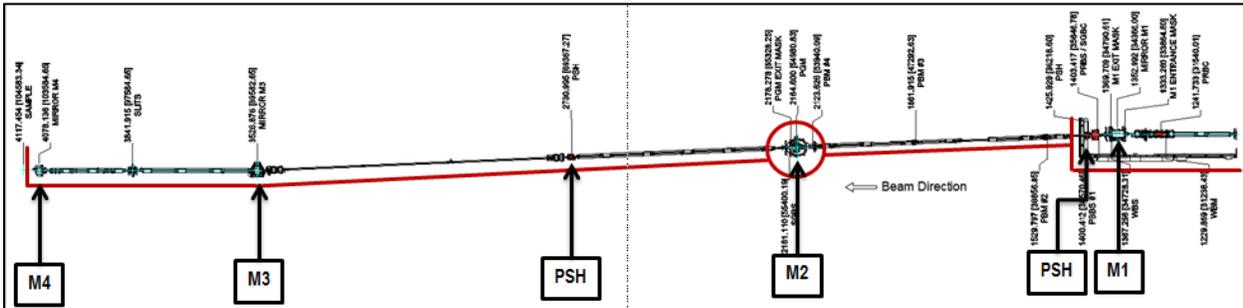
Additional information/comments:

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

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III. Zero-order Beam Survey.

EPU57 gap to minimum permitted setting. FE slits fully open, FE shutters open. FOE and monochromatic PSH open and ALL Slits open. M1 in its nominal position (typically 1.235 deg). Set M2 and gratings in zero-order beam configuration. Establish monochromatic beam on diagnostic downstream of PGM. Set M3 in its nominal position.



Straight Section Vacuum Conditions: _____

ID Gap: _____

Angle of mirror M1 _____ **Angle of mirror M2** _____

Angle of mirror M3 _____ **Angle of mirror M4** _____

1. Survey area around the PGM, monochromatic transport pipe, and behind beam stop downstream of M4.

Direct Frisk Survey Results: IFB other (described below)

2. Close each slits/valve/shutter downstream of the PGM successively and survey in its vicinity.

Slits settings _____

Direct Frisk Survey Results: IFB other (described below)

3. Survey behind beam stop downstream of M4.

Direct Frisk Survey Results: IFB other (described below)

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

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Integrated Survey Results:

1) Neutron

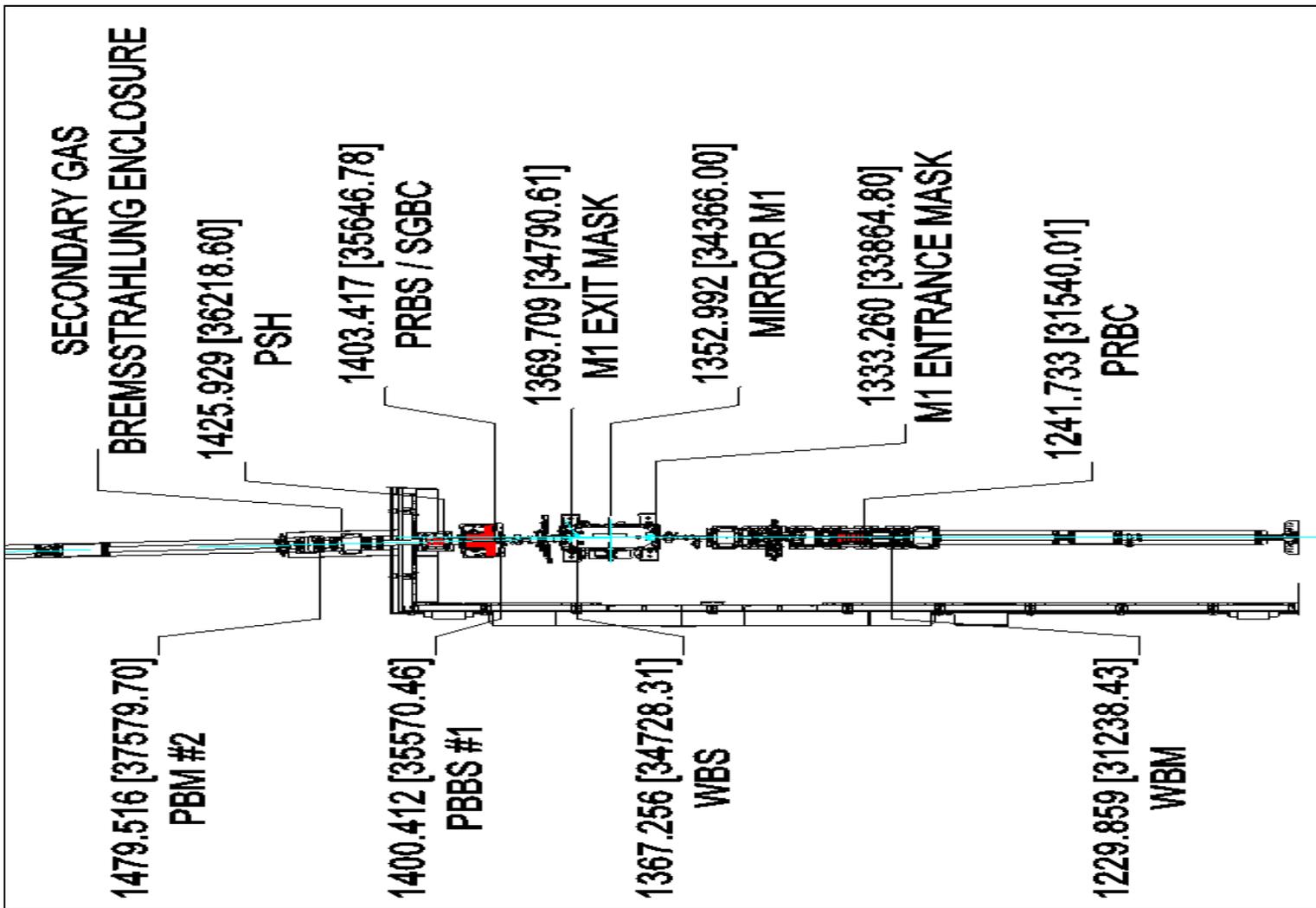
- a) Meter location: _____
 - Survey duration: _____
 - Result: _____
 - Dose rate: _____
- b) Meter location: _____
 - Survey duration: _____
 - Result: _____
 - Dose rate: _____
- c) Meter location: _____
 - Survey duration: _____
 - Result: _____
 - Dose rate: _____

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: _____

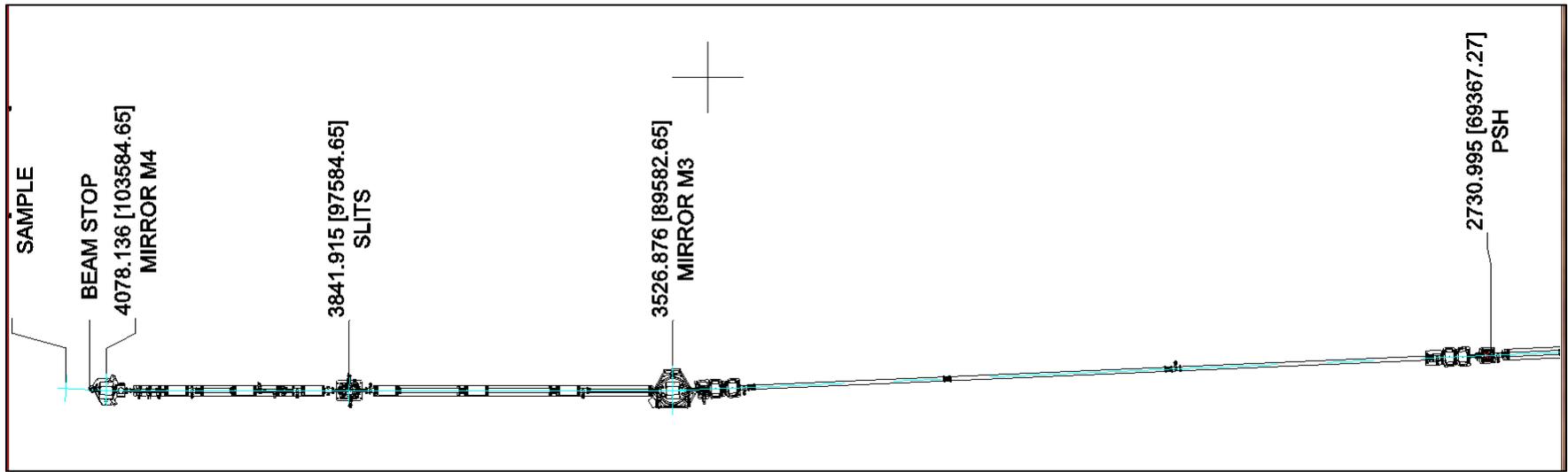
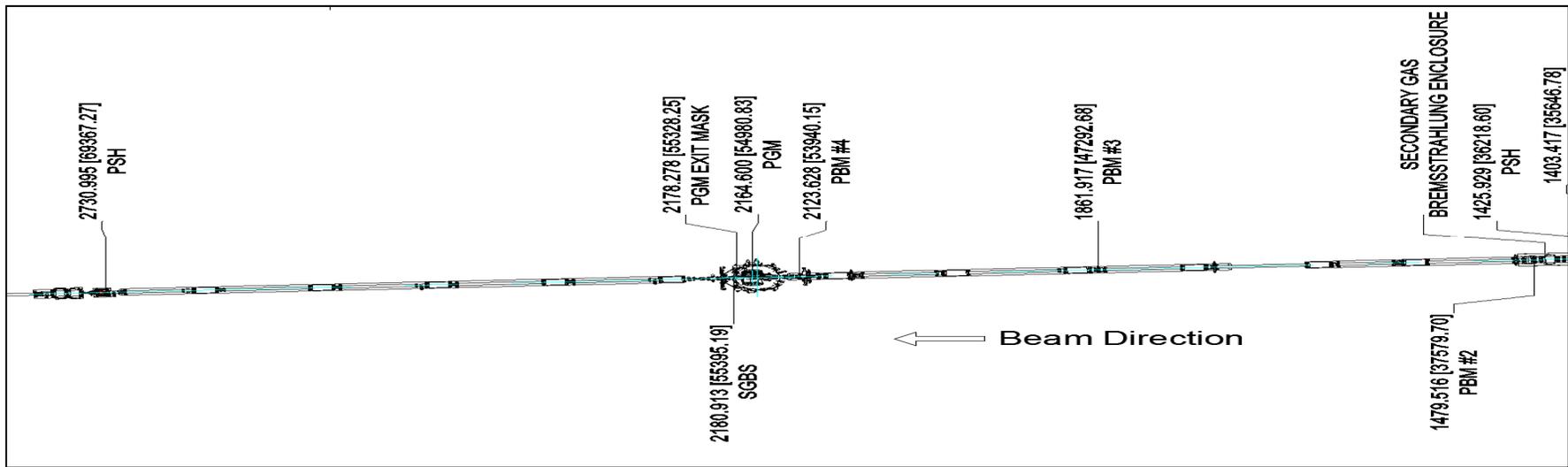
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Attachment B – Beamline Enclosure Diagram, 02-ID-A (FOE)



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Attachment C – Beamline Components outside the FOE



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Attachment D – Beamline Endstation

