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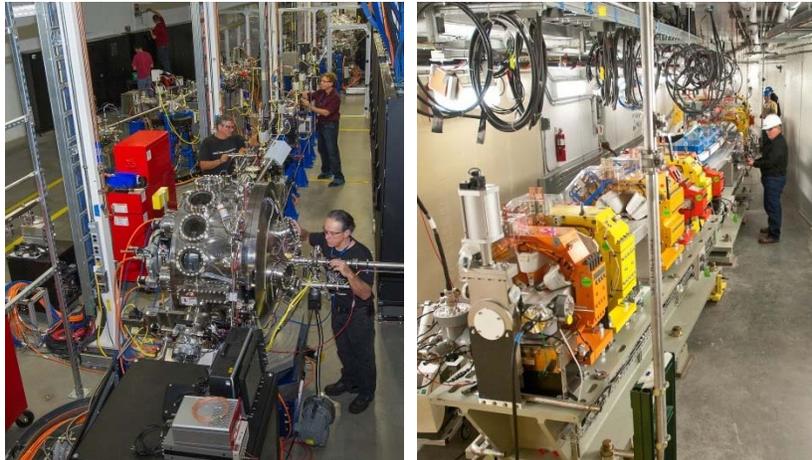
Doc No: NSLSII-18ID-PRC-001

NSLS-II PROCEDURE: BEAMLINER FXI (18-ID) RADIATION SURVEY PROCEDURE

October 25, 2017

Rev. 2

S. Chitra



 **Think Safety. Act Safely.**

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National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. NSLSII-18ID-PRC-001	Author: S. Chitra	Review Frequency: 3 yrs	Rev. 1
Title: Beamline FXI (18-ID) Radiation Survey Procedure			Effective Date: 25OCT2017

ESH Review:

10/25/2017

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:

10/25/2017

X Wah-Keat Lee

Wah-Keat Lee
FXI Lead Beamline Scientist
Signed by: Lee, Wah-Keat

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

Authorization Basis Review:

10/25/2017

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:

10/25/2017

X Lori Stiegler for

Robert Lee
ESH Manager
Signed by: Stiegler, Lori

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	29SEP2017	M. Benmerrouche	First Issue.
2	Att. A	A5	25OCT2017	A. Ackerman M. Benmerrouche	Added item 3. PBSL as Scatter Target; minor editorial changes.

ACRONYMS

ALARA	As Low as Reasonably Achievable	mrads	Millirad
ARM	Area Radiation Monitor	mrem/hr	millirem per hour
CM	Collimating Mirror	NSLS-II	National Synchrotron Light Source II
DW	Damping Wiggler	PBRs	Primary Bremsstrahlung Stop
DCM	Double Crystal Monochromator	PBSL	Pink beam Slits
ESE	End Station Enclosure	PSD	Photon Science Division
ESH	Environment, Safety and Health	PSH	Photon Shutter
FE	Front End	RCT	Radiological Control Technician
FM	Fixed Mask	RSC	Radiation Safety Components
FOE	First Optical Enclosure	SAF	Safety Approval Form
FXI	Full field X-ray Imaging	SBMS	Standards Based Management System
GB	Gas Bremsstrahlung	SBS	Secondary Bremsstrahlung Shield
ID	Insertion device	SR	Synchrotron radiation
IFB	Indistinguishable From Background	TLD	Thermo Luminescent Dosimeter
LCO	Lead Collimator	TM	Toroidal Mirror
m	Meter	WBS	White Beam Stop

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1 PURPOSE AND SCOPE

This purpose of this procedure is to perform a comprehensive commissioning radiation survey on the 18-ID beamline, as directed by PS-C-XFD-PRC-004, *NSLS-II Beamlines Radiation Safety Commissioning Plan*.

The survey scenarios are covered in the *Beamline FXI (18-ID, DW100) 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.

Note: For step 7, instrument blocks beam to endstation. This can be done at a later date, after instrument alignment/basic commissioning at B station.

- 4.1 Authorized Beamline Staff and RCTs establish the initial conditions and record them on Attachment A, *Beamline FXI (18-ID, DW100) 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*

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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 FXI (18-ID, DW100) Comprehensive Commissioning Radiation Survey*

Attachment B, *Beamline Enclosure Diagram for 18-ID-A*

Attachment C, *Beamline Enclosure Diagram for 18-ID-B*

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 FXI (18-ID, DW100)
Comprehensive Commissioning Radiation Survey

Date: _____

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

1. Integrity of the 18-ID-A and 18-ID-B, transport pipe, RSCs and PSH with GB and SR (white and 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. Steps 1, 2 and 4

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Initial Settings:

Electron Beam Current: _____

Injection Rate: _____ BTS Injection Efficiency: _____

Straight Section Vacuum Condition: _____

CM Setting: _____

DCM Setting: _____

Mirror TM Setting: _____

Set up neutron detectors at:

1. Outside the FOE in the vicinity of CM.
2. Outside the FOE downstream wall, above the guillotine

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.

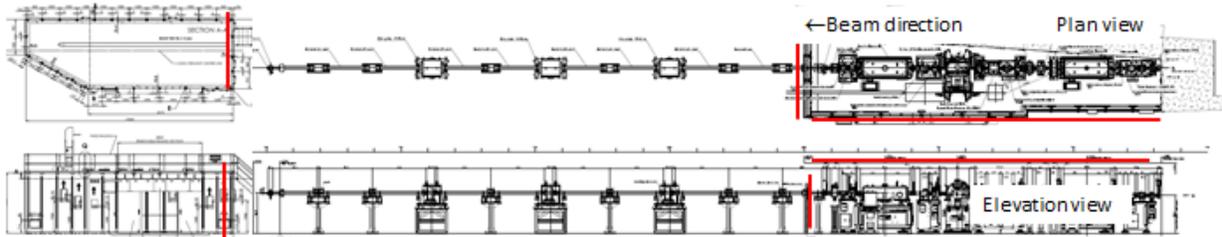
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1 WBS as Scatter target

Dump white beam on the WBS in the FOE, survey all walls and roof of 18-ID-A and inside 18-ID-B to check the integrity of the photon shutter. (See Attachment B)

Component:	FE Slits	FE PSH	CM	PBSL	DCM	TM	FOE PSH	Sample in 18-ID-B
Position:	Fully open	Open	Out	Open	In	In	Closed	Out



Straight Section Vacuum Conditions: _____

Position of CM: _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

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

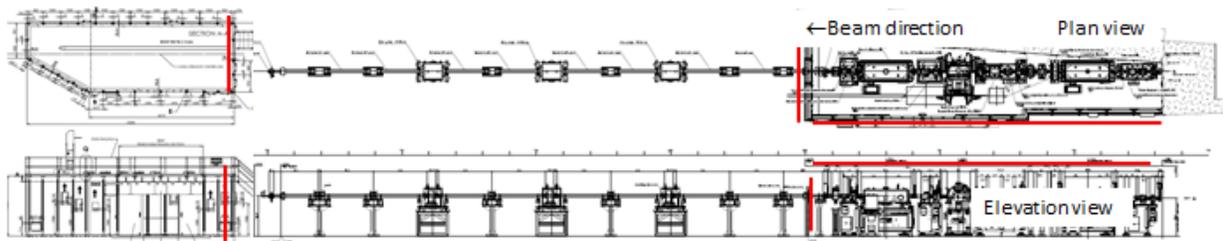
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2 CM as Scatter target

Insert WPFS. Set CM to nominal 4.4 mrad incidence angle and verify beam disappears from WPFS. With the white beam incident on CM in the FOE, survey all walls and roof of 18-ID-A and inside 18-ID-B to check the integrity of the photon shutter. (See Attachment B)

Component:	FE Slits	FE PSH	CM	PBSL	DCM	TM	FOE PSH	Sample in 18-ID-B
Position:	Fully open	Open	In	Open	In	In	Closed	Out



Straight Section Vacuum Conditions: _____

Angle of CM: _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

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

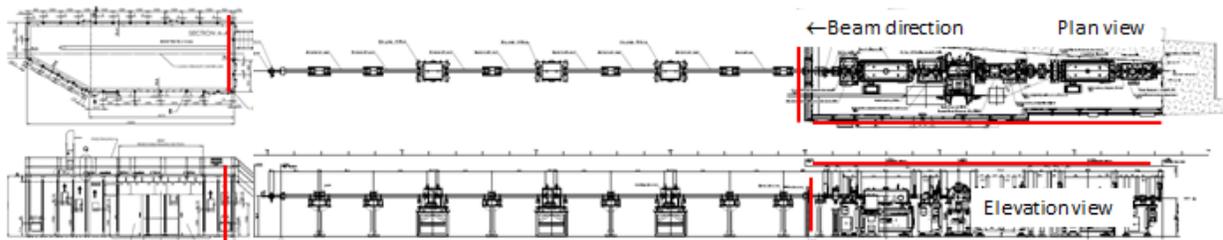
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3 PBSL as Scatter Target

With CM in its nominal position, close PBSL to block beam. Survey all walls and roof of 18-ID-A and inside 18-ID-B to check the integrity of the photon shutter. (See Attachment B)

Component:	FE Slits	FE PSH	CM	PBSL	DCM	TM	FOE PSH	Sample in 18-ID-B
Position:	Fully open	Open	In	Closed	In	In	Closed	Out



Straight Section Vacuum Conditions: _____

Angle of CM _____

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

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

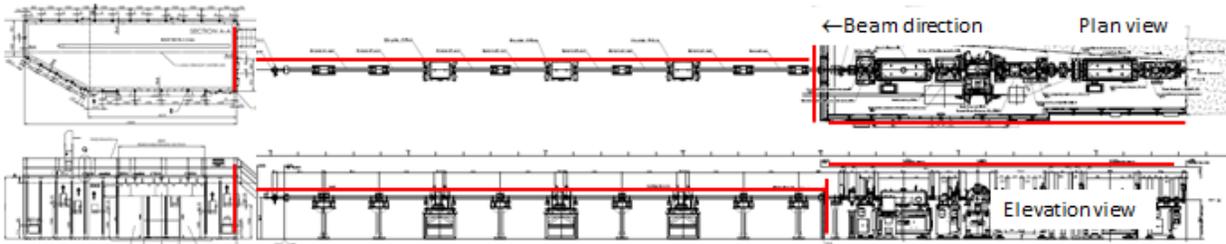
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4 DCM/TM/PSH as Scatter Targets

With PBSL open, direct beam to DCM, observe mono beam on PMFS. Retract PMFS and direct beam to TM and PSH. Survey all walls and roof of 18-ID-A and inside 18-ID-B to check the integrity of the photon shutter. (See attachment B). Perform this for DCM angles 10 degrees and 20 degrees.

Component:	FE Slits	FE PSH	CM	PBSL	DCM	TM	FOE PSH	Sample in 18-ID-B
Position:	Fully open	Open	In	Open	In	In	Closed	Out



Straight Section Vacuum Conditions: _____

Angle of CM _____

Angle of TM _____

Step	Angle of DCM	Direct Frisk	Survey Results
7.1	10 deg	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)
7.2	20 deg	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)

Direct Frisk Survey Results: IFB other (described below)

Dose Rate Survey Results: IFB other (described below)

Additional information/comments:

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

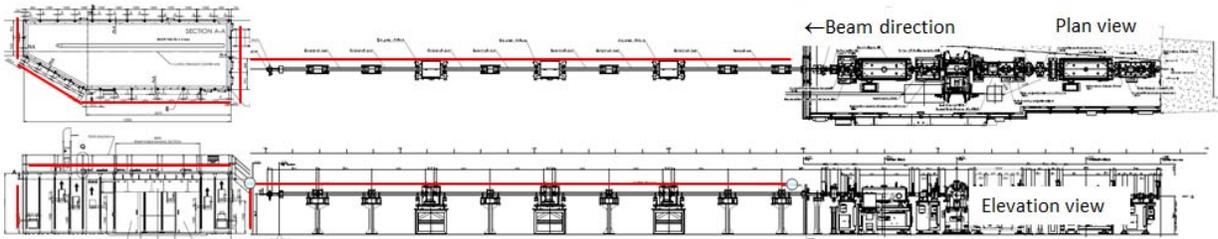
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5 Generic Sample inside the 18-ID-B as Scatter Target

With the CM, DCM and TM in nominal positions and the FOE photon shutter open, deflect the monochromatic beam on to a generic sample in 18-ID-B. Survey the beam transport pipe and all walls and roof of 18-ID-B. Perform this for DCM angles 10 degrees and 20 degrees. (See Attachment C)

Component:	FE Slits	FE PSH	CM	PBSL	DCM	TM	FOE PSH	Sample in 18-ID-B
Position:	Fully open	Open	In	Open	In	In	Open	In



Straight Section Vacuum Conditions: _____

Angle of the CM: _____

Angle of the TM: _____

Step	Angle of DCM	Direct Frisk	Survey Results
8.1	10 deg	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)
8.2	20 deg	<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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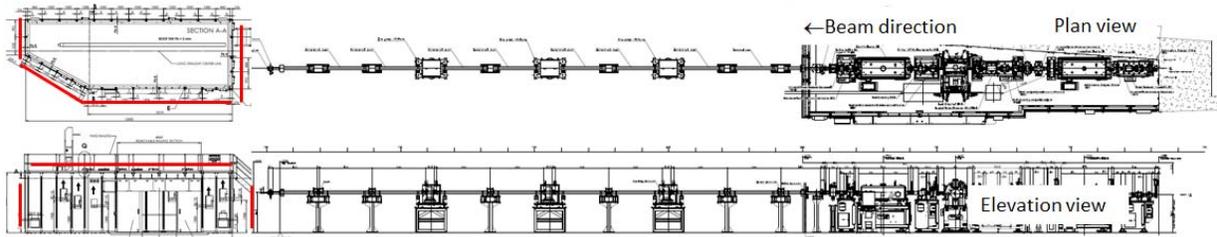
6 Beam Stop inside 18-ID-B as Scatter Target

With the CM and TM in nominal positions, deflect the monochromatic beam on to the beam stop in the 18-ID-B. Survey all walls and roof of 18-ID-B. Perform this for DCM angles 10 degrees and 20 degrees. (See Attachment C)

Component:	FE Slits	FE PSH	CM	PBSL	DCM	TM	FOE PSH	Sample in 18-ID-B
Position:	Fully open	Open	In	Open	In	In	Open	In

Note:

Some instruments block the beam from reaching the beam stop in the endstation. This step shall be carried out as soon as the instruments are aligned and beam is deliverable to the beam stop.



Straight Section Vacuum Conditions: _____

Angle of the CM _____

Angle of the TM _____

Step	Angle of DCM	Direct Frisk	Survey Results
9.1	10 deg	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)	<input type="checkbox"/> IFB <input type="checkbox"/> other (described below)
9.2	20 deg	<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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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: _____

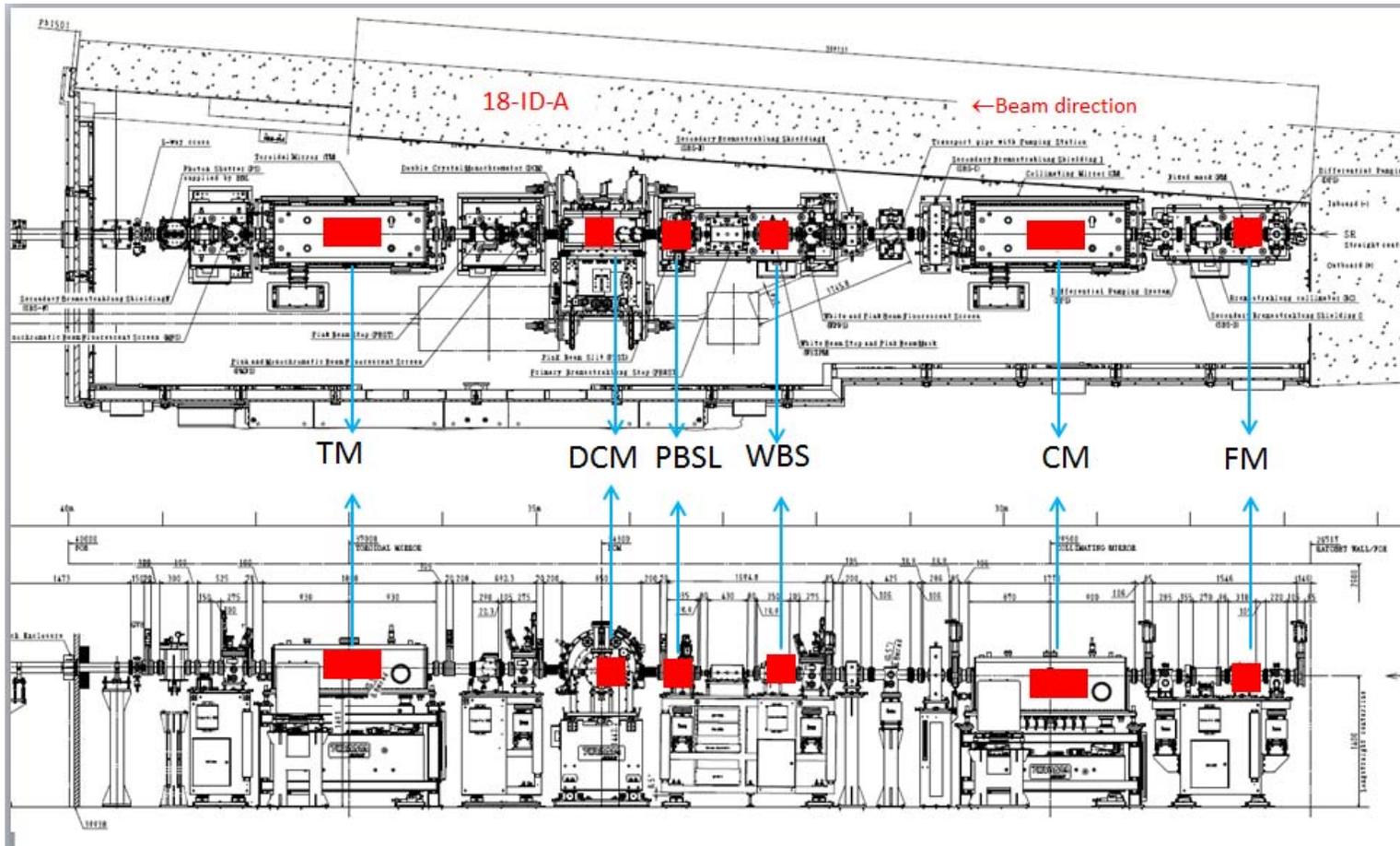
- Survey duration: _____
- Result: _____
- Exposure rate: _____

d) Meter location: _____

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

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Attachment B – Beamline Enclosure Diagram for 18-ID-A



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Attachment C – Beamline Enclosure Diagram for 18-ID-B

