Attachment B

USI Screening Checklist

A) USI Screening Purpose:	**B) Description of Proposed Activity/Discovered Condition and Sponsor/Condition Owner:**
☒ **Proposed Activity** ☐ **Existing Condition**	17-BM Beamline Shielding Analysis revisited with the Addition of the XAS Experimental End Station / NSLSII-ESH-TN-281 by M. Benmerrouche – Radiation Health Physicist NSLS-II
C) USI Screening Outcome: ☒ **No potential USI** ☐ ***Potential USI***	**USI Screening Performed by/Date:** Steve Moss 07/27/18 Steve Moss / July 27, 2018 The Technical Note reanalyzes the 17-BM beamline shielding to address the introduction of the new X-ray Absorption Spectroscopy (XAS) experimental end station into the First Optical Enclosure (FOE). The analysis conducted and described within TN 281 indicates that the projected dose rates meet the shielding design criteria established within the NSLS-II Shielding Policy and confirms that the earlier 17-BM beamline radiation shielding analysis for Gas Bremsstrahlung (GB) / Synchrotron Radiation (SR) and Top-Off Analysis remains unaffected by the installation of XAS.

Qualified Screener answers the following questions; if:

- Any question is answered yes (i.e., "Y"), check "Potential USI" box in Part C, above.
- If all questions are answered no (i.e., "N"), check "No potential USI" box in Part C, above.

Does the proposed change or discovered condition impact or potentially impact:

1) The personnel protection system (PPS)?
Examples: Access doors, fencing, hutches, accelerator enclosures, software change, hardware modifications that are not, "replacement-in-kind."

☐Y or ☒N

2) ODH Monitoring System?
Examples: Hutch ODH monitors, filling station ODH monitors.

☐Y or ☒N

3) Radiation Safety Component?
Examples: Shielding, earthen berms, hutches, concrete walls, beam shutters, scatter shields, burn-through devices, exclusion zones, labyrinths, beam stops, beam masks, collimators, hutch guillotine and beam transport pipes.

☐Y or ☒N

4) Area radiation monitoring system or components?
Examples: Changing instrument position or use of a new type of instrument used for area radiation monitoring, alarms and controls.

☐Y or ☒N

5) Radiological source terms identified in the SAD?
Examples: New insertion devices, change to the maximum synchrotron energy or accelerated charge values, accelerator modifications that are not "replacement-in-kind."

☐Y or ☒N

6) Critical devices
Examples: Safety shutters, dipole magnets, top-off apertures.

☐Y or ☒N

7) PS operating organization?
Examples: Control room operators, support staff responsible for PPS, radiation monitoring or shielding configuration management.

☐Y or ☒N

8) Operational safety limits described in the Authorization Basis Documents?
Examples: Maximum current, beam energy, pulse rate.

☐Y or ☒N

Forward the completed form to the Authorization Basis Manager

NSLSII-ESH-TN-281

##/##/###
July 2018

17-BM Beamline Shielding Analysis Revisited with the Addition of the XAS Experimental End Station

M. Benmerrouche

National Synchrotron Light Source II

Brookhaven National Laboratory

Upton, N.Y. 11973

U.S. Department of Energy

Office of Science, Office of Nuclear Physics

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NSLSII-ESH-TN-281

Prepared by:

7/25/2018

X

Mo Benmerrouche
Radiation Physicist*
Signed by: Benmerrouche, Mohamed

Approved by:

7/26/2018

X

Robert Lee
ESHQ Division Manager*
Signed by: Lee, Robert J

*By approving this Technical Note, I acknowledge and authorize its release to an external website.

NSLS-II TECHNICAL NOTE BROOKHAVEN NATIONAL LABORATORY	NUMBER **NSLSII-ESH-TN-281**
AUTHOR: M. Benmerrouche	DATE 07/25/2018
17-BM beamline shielding Analysis Revisited with the Addition of the XAS Experimental End Station	

1. INTRODUCTION

The purpose of this report is to assess the radiological implications on the 17-BM beamline shielding because of introducing the new X-ray Absorption Spectroscopy (XAS) experimental end station into the First Optics Enclosure (FOE). Figure 1 shows the XAS experimental end station inside the FOE of the 17-BM beamline. The earlier 17-BM beamline radiation shielding analysis for Gas Bremsstrahlung (GB)/Synchrotron Radiation (SR) [1] and top-off analysis [2] show that the dose rates meet the shielding design criteria stated in the NSLS-II Shielding Policy and this report will show that they remain unaffected by the introduction XAS.

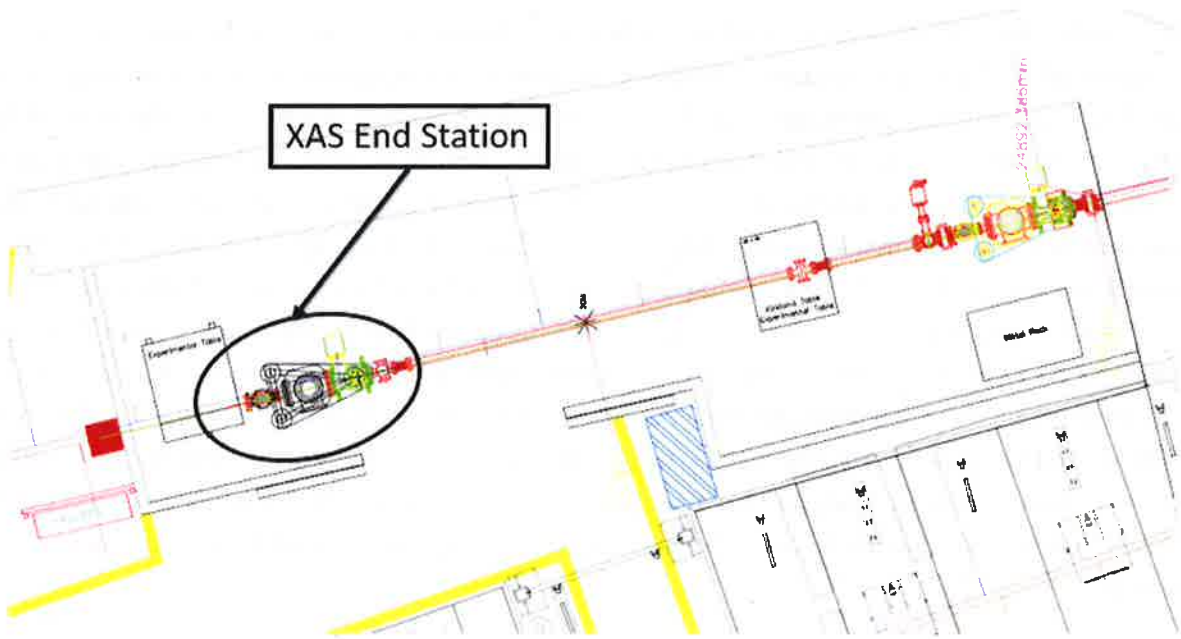

Figure 1: The layout of the 17-BM (FOE) enclosure highlighting the XAS experimental end station. Beam travels from right to left in this figure.

2. GB ANALYSIS

The 17-BM beamline has a white beam mirror (WBM) in the front end which deflects the synchrotron beam vertically and passes through a vertically offset ratchet wall collimator. Under normal operation of the beamline, the primary GB will strike the WBM. As discussed in reference [1], the amount of scattered GB that enters the FOE is well collimated by the ratchet wall collimator (RCO) and the scattered radiation by any components, at any position, inside the FOE yield negligible dose rates outside of the FOE, and the forward scattered GB is significantly attenuated by the bremsstrahlung stop (BRS) located outside of the downstream wall of the FOE. Therefore, the additional scatter targets introduced by the XAS experimental end station do not affect the dose rates outside of the FOE calculated in [1].

3. SR ANALYSIS

The synchrotron beam entering the FOE is mirror reflected pink beam. The SR analysis carried in reference 1 showed that for a three-pole wiggler, white beam and an optimum scatter target the dose rates outside the FOE are negligible with the existing FOE shielding.

4. TOP OFF ANALYSIS

The earlier top-off analysis showed that when the injected beam strikes the safe end point as determined by the backward particle tracking, an intense electromagnetic shower develops inside the FE, is scattered by components in the FE, and escapes through the RCO into the FOE. When this intense forward scattered beam enters the FOE, it is further scattered by beamline components inside of the FOE and broadened in the transverse direction. The earlier analysis [2] was performed for a scatter target located approximately within one meter from the upstream face of the FOE to mimic the slits of the XFP experimental end station. The FLUKA simulation for this case showed that this forward scattered radiation is significantly attenuated by the BRS to keep the dose rates below the 100 mrem/h limit established for a fault condition in the NSLS-II Shielding Policy. In the case of the XAS experimental end station, the slits (SLT), Double Crystal Monochromator (DCM) and Diagnostic Absorber (DA), which are located near the downstream end of the FOE, become important scatter targets. It is then prudent to carry out FLUKA simulations and confirm that the dose rates remain below 100 mrem/hr with the introduction of these additional scatter targets.

4.1 DESCRIPTION OF THE FLUKA MODEL

The FLUKA model used for this study is based on the model used previously to analyze beamline shielding and top-off for the 17-BM beamline [2], supplemented by additional beamline components associated with XAS experimental end-station and include the SLT, DCM and DA.

The positions and dimensions of these additional components are given in Appendix 1. Figure 2 shows the updated FLUKA model (Top and Elevation views) of the 17-BM beamline with all components incorporated in the FLUKA simulations. All components are placed symmetrically with respect to the beam centerline in the horizontal plane. For the FLUKA model, the Z-axis represents the white beam direction centerline, the X axis is the horizontal axis normal to the beam direction, the Y axis is the vertical axis and the beam travels from left to right.

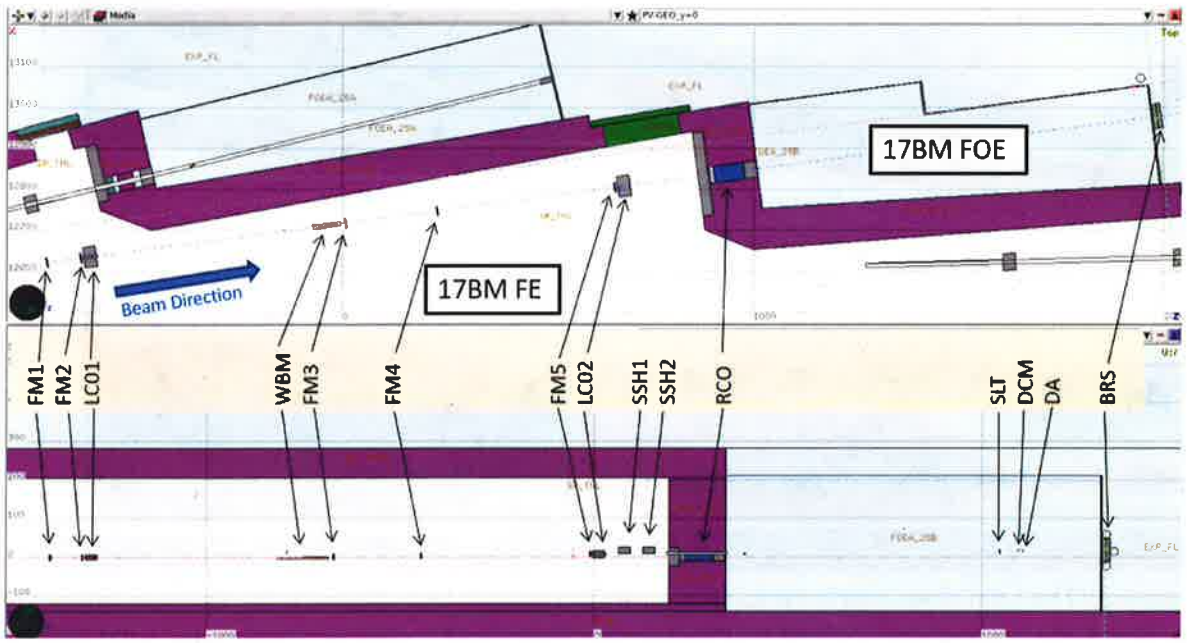

Figure 2: Plan and elevation view of the 17-BM FLUKA geometry at the white beam plane.

In all the FLUKA simulations, a pencil beam of 3 GeV electrons is assumed for the injected beam and the results are normalized to a booster to storage ring injection charge rate of 45 nC per minute.

4.2 RESULTS OF THE SIMULATIONS

Based on the backward particle tracking analysis described in [1], the electron beam is assumed lost at the safe endpoint at 2 mm from the downstream aperture edge of fixed mask 2 (FM2) either outboard or inboard. Two scenarios were considered: (i) injected beam striking the taper of FM2 aperture on the outboard side and (ii) injected beam striking the taper of FM2 aperture on the inboard side. All ambient dose equivalent rates are reported in units of mrem/h. Simulations were also performed with the WBM retracted, SLT closed, and DCM retracted out of the beam. All results are given for the top-off mode of operation where the FE safety shutters remain open during injection into the storage ring.

Figure 3 shows the total ambient dose rates distribution inside and outside the FE and FOE when the electron beam strikes the taper of FM2 aperture on the outboard side, with the SLT open and

WBM/DCM at their nominal positions (inserted). The stream of radiation that exits in the FE through the ratchet wall collimator into the FOE is further scattered by the SLT and DCM as seen in Figure 3 (Elevation View). The total ambient dose rates are well below 100 mrem/hr everywhere outside the FE and FOE walls and roof, except at a localized area on the exterior of the downstream wall of the FOE.

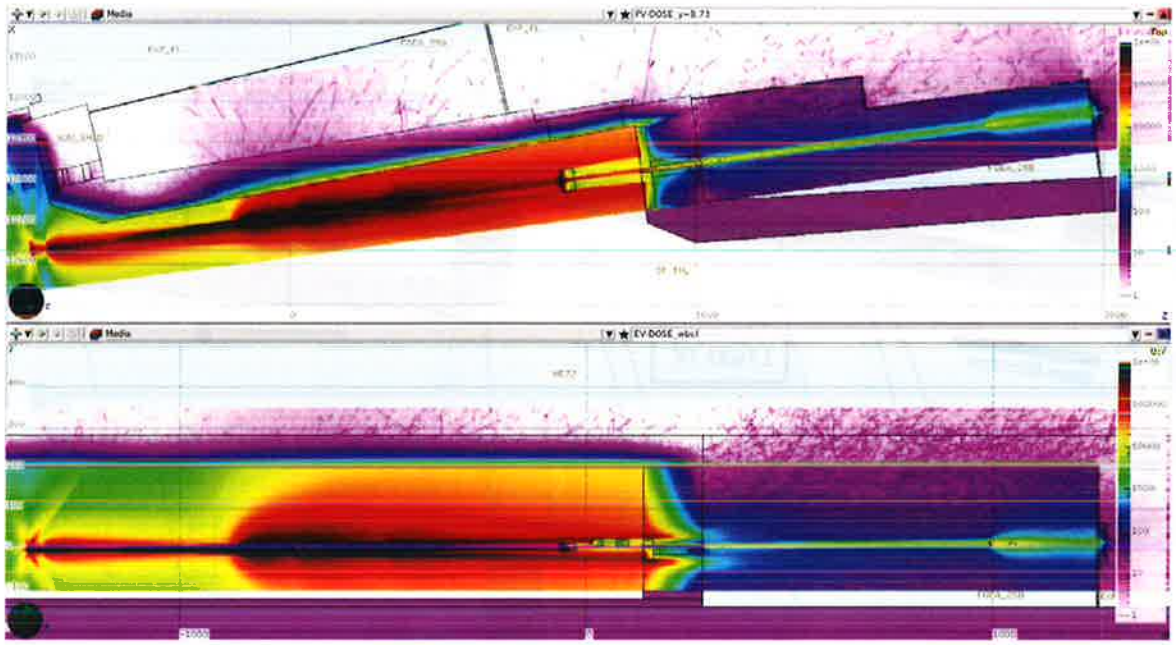

Figure 3: The total dose distributions (mrem/hr) in the front end and FOE for the case where the electron beam strikes near the tapered surface of FM2 on the outboard side, with WBM/DCM inserted. The top figure shows a plan view (y=8.73 cm) and the bottom shows the elevation view at the beam centerline.

The Bremsstrahlung Stop (BRS) located on the exterior of the downstream wall of the FOE largely attenuates the forward peaked radiation. Figure 4 shows that the total ambient doses= rates outside the BRS are below 100 mrem/h and the highest dose rates are in the forward direction on contact with the BRS as seen from Figure 4(b). The estimated maximum total ambient dose rate outside the front face of the BRS were approximately 70 mrem/h.

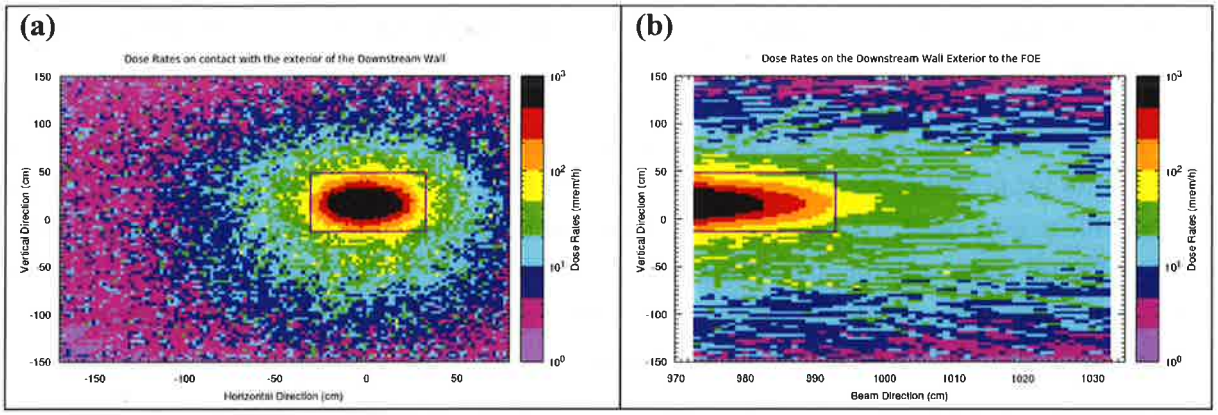

Figure 4: The total ambient dose distributions (mrem/h) at the exterior of downstream wall of the FOE (a) on contact and (b) away from the wall (along beam direction) for the case where the electron beam strikes near the tapered surface of FM2 on the outboard side, with SLT open and WBM/DCM inserted into the beam. The purple rectangle is the outline of the BRS.

The results are similar when the electron beam strikes the taper of FM2 aperture on the inboard side and the total ambient dose are shown in Figure 5. The main difference is the profile of the shower development downstream from FM2, which is more enhanced on the outboard side as illustrated in Figure 5 (plan view). The total ambient dose rates outside the FE and FOE walls and roof and BRS are below 100 mrem/h.

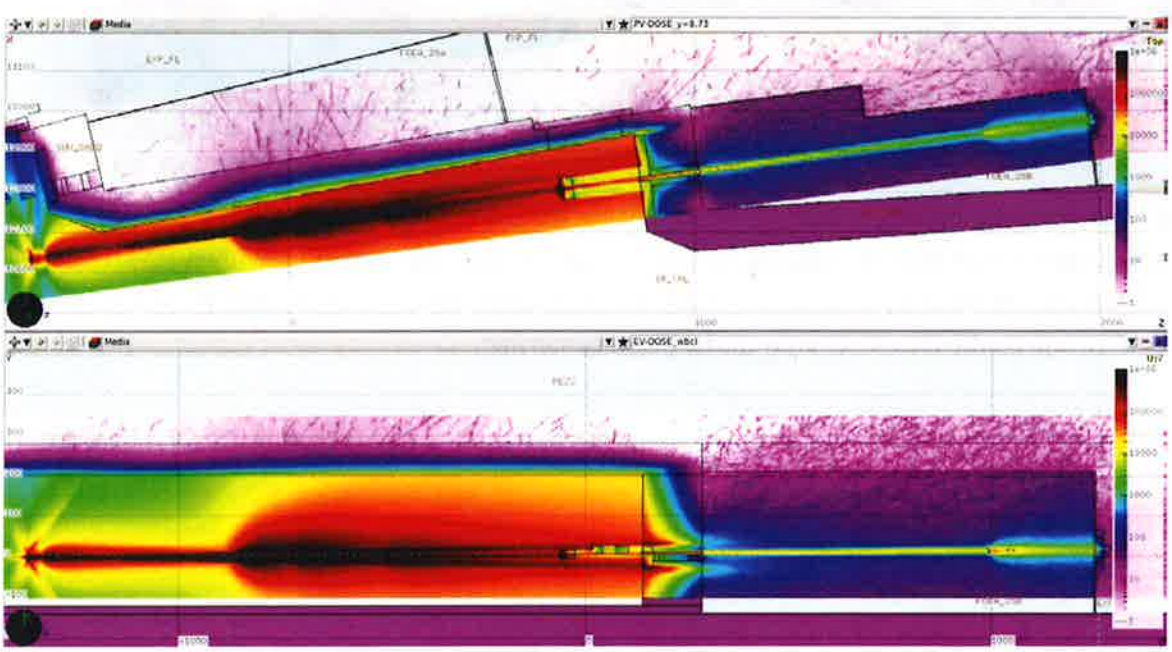

Figure 5: The total dose distributions (mrem/h) in the front end and FOE for the case where the electron beam strikes near the tapered surface of FM2 on the inboard side, with WBM/DCM

inserted. The top figure shows a plan view (y=8.73 cm) and the bottom shows the elevation view at the beam centerline.

In Figure 6, the total ambient dose rates are given when the WBM is retracted, for the case when the electron beam strikes near the tapered surface of FM2 on the outboard side. The results are comparable to previous two cases. Figure 7 shows the total ambient dose rates outside the surface of the BRS are below 100 mrem/h. Other configurations where the DCM is retraced with the slits fully closed were also simulated and the results are comparable to the ones shown above for the configurations with and without the WBM inserted.

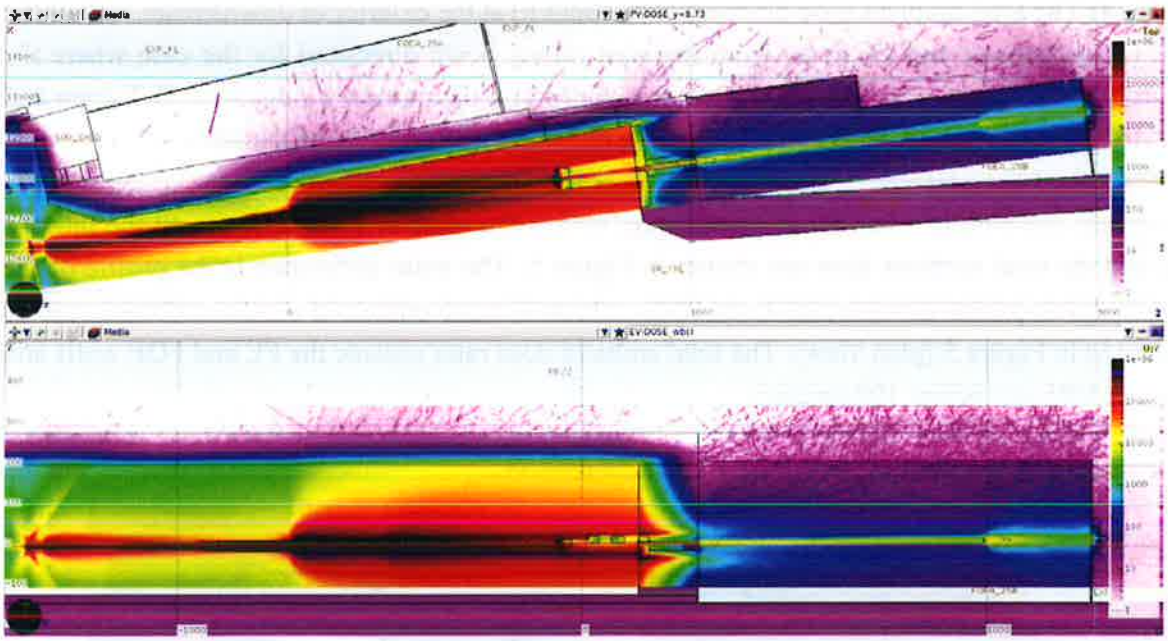

Figure 6: The total dose distributions (mrem/hr) in the front end and FOE for the case where the electron beam strikes near the tapered surface of FM2 on the outboard side, with WBM retracted, SLT open and DCM at its nominal position. The top figure shows a plan view (y=8.73 cm) and the bottom shows the elevation view at the beam centerline.

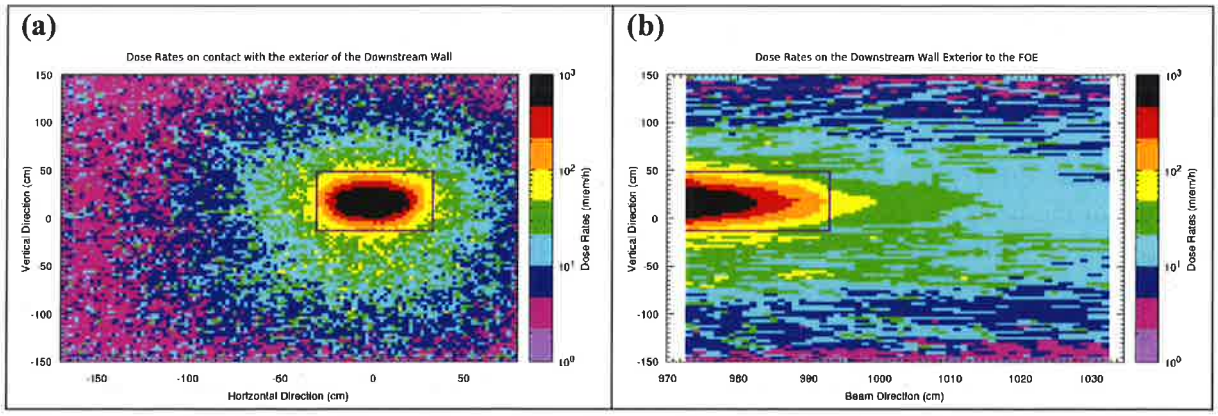

Figure 7: The total ambient dose distributions (mrem/h) at the exterior of downstream wall of the FOE (a) on contact and (b) away from the wall (along beam direction) for the case where the electron beam strikes near the tapered surface of FM2 on the outboard side, with WBM retracted, SLT open and DCM at its nominal position. The purple rectangle is the outline of the BRS.

5. SUMMARY AND CONCLUSIONS

The analysis described in Sections 2, 3 and 4 of this report indicates that dose rates meet the shielding design criteria established in the NSLS-II Shielding Policy and confirms that the earlier 17-BM beamline radiation shielding analysis for Gas Bremsstrahlung (GB)/Synchrotron Radiation (SR) [1] and top-off analysis [2] remain unaffected by the introduction of XAS.

6. REFERENCES

[1] M. Benmerrouche, "*17-BM XFP Beamline Radiation Shielding Analysis,*" NSLS II Technical Note 218, June 21, 2016.

[2] M. Benmerrouche, R. Fliller, and Y. Li, "*17-BM (XFP) Top-Off Radiation Safety Analysis,*" PS-C-ASD-TOS-RPT-004, April 22, 2016.

APPENDIX 1

17BM-XAS Beamline Data for FLUKA Simulations – Mike Sullivan (June 11, 2018)

The XAS addition to the 17-BM XFP beamline consists of a new monochromator, connected to the rest of the beamline by UHV vacuum pipe, with a typical pressure of $1x10^{-8}$ Torr. There is a 4-blade set of Oxford Instruments water-cooled pink beam slits located at 31965 mm for vertical blade center and 32100 mm for center of horizontal defining blades that have a design maximum aperture of 50mm x 50mm.

The monochromator contains an upward reflecting channel cut Si (111) channel cut crystal, which will supply monochromatic light to a spectroscopy end-station. Downstream of the channel cut crystal is a pink beam diagnostic absorber located at 32580 mm. A 250 μm thick Be exit window at 32694 mm separates beamline vacuum from atmosphere.

The first crystal of the monochromator, which intercepts synchrotron pink beam reflected from the mirror, is located 32450 mm from the 3PW source. The second crystal is offset 3mm vertically from the first crystal. The expected angular range of the first crystal, used to define the monochromatic energy, is expected to be 7° – 27°. A motorized water-cooled diagnostic absorber, located 130mm downstream of the crystal, fabricated from copper, prevents white (or pink) beam from propagating further down the beamline to the XAS end station.

All other components of the 17-BM XFP beamline, as tabulated and discussed in NSLS-II Technical Note #218 ("17-BM XFP Beamline Radiation Shielding Analysis") remain unchanged.

Mirror	14000 mm
Oxford slits vertical blade center	z = 31965 mm
Horizontal blade center	z = 32100 mm
Maximum designed clear aperture	Horz.36mm x Vert.16mm
a) Slit blades,	tungsten
b) Slit blade thickness	3mm
c) Absorber,	OFHC copper
d) Absorber thickness	8mm
Tungsten Blade	x = 55 mm, y = 50mm, z =3mm
Copper block	x = 55mm, y = 50mm, z =8 mm
U/S tungsten blade 1 to U/S tungsten blade 2:	20 mm
Monochromator 1st crystal center	z = 32450 mm
Diagnostic absorber (DA)	z = 32580 mm (Upstream Edge)
Copper block	x = 88.9 mm, y = 25.4 mm, z =19.05 mm

Attachment B

USI Screening Checklist

A) USI Screening Purpose: ☒ **Proposed Activity** ☐ **Existing Condition**	**B) Description of Proposed Activity/Discovered Condition and Sponsor/Condition Owner:** 17-BM XAS End Station Traveler / E. Farquhar
C) USI Screening Outcome: ☒ **No potential USI** ☐ ***Potential USI***	**USI Screening Performed by/Date:** Steve Moss 07/26/18 Steve Moss / July 26, 2018 The traveler is being used for the installation and testing of end station equipment previously installed and operated at NSLS or another facility, that is now being installed at NSLS-II. The traveler goes beyond the typical installation/test traveler that instructs/documents installation qualification. It also: (1) confirms that the re-purposing of the equipment was reviewed and approved for its intended use; (2) collects upgraded information from subject matter experts (SMEs) that is deemed necessary for the equipment's safe operation at NSLS-II; and, (3) confirms that any new upgrades have been incorporated.

Qualified Screener answers the following questions; if:

- Any question is answered yes (i.e., "Y"), check "Potential USI" box in Part C, above.
- If all questions are answered no (i.e., "N"), check "No potential USI" box in Part C, above.

Does the proposed change or discovered condition impact or potentially impact:

1) The personnel protection system (PPS)?
   Examples: Access doors, fencing, hutches, accelerator enclosures, software change, hardware modifications that are not, "replacement-in-kind."

   ☐Y or ☒N

2) ODH Monitoring System?
   Examples: Hutch ODH monitors, filling station ODH monitors.

   ☐Y or ☒N

3) Radiation Safety Component?
   Examples: Shielding, earthen berms, hutches, concrete walls, beam shutters, scatter shields, burn-through devices, exclusion zones, labyrinths, beam stops, beam masks, collimators, hutch guillotine and beam transport pipes.

   ☐Y or ☒N

4) Area radiation monitoring system or components?
   Examples: Changing instrument position or use of a new type of instrument used for area radiation monitoring, alarms and controls.

☐Y or ☒N

5) Radiological source terms identified in the SAD?
Examples: New insertion devices, change to the maximum synchrotron energy or accelerated charge values, accelerator modifications that are not "replacement-in-kind."

☐Y or ☒N

6) Critical devices
Examples: Safety shutters, dipole magnets, top-off apertures.

☐Y or ☒N

7) PS operating organization?
Examples: Control room operators, support staff responsible for PPS, radiation monitoring or shielding configuration management.

☐Y or ☒N

8) Operational safety limits described in the Authorization Basis Documents?
Examples: Maximum current, beam energy, pulse rate.

☐Y or ☒N

Forward the completed form to the Authorization Basis Manager

NSLS-II

NATIONAL SYNCHROTRON LIGHT SOURCE II

17BM XAS **END STATION EQUIPMENT INSTALL/TEST**

Rev Date: 10/02/2017
Author: Joseph Zipper
Approved: 10/02/2017

Title	Name	Approval Date
NPB Portfolio Manager	Andrew Broadbent	10/02/2017
Deputy Director for Construction	Erik Johnson	10/02/2017
ESH Manager	Robert Lee	10/02/2017
Quality Assurance Engineer	Joseph Zipper	10/02/2017

Serial No	Part No	Part Rev	ECN	Rev	ECN	Rev

Deviation & Waiver: _____

OP	Description	Name/Life #	Date	DR
10	TRAVELER INFORMATION This traveler shall be used for the installation and testing of end station equipment previously installed and operated at NSLS or another facility, that is now being installed at NSLSII. This traveler goes beyond the typical installation/test traveler that instructs/documents installation qualification. It will also: 1) confirm that the re-purposing of this equipment was reviewed and approved for its intended use 2) collect upgrade information from subject matter experts (SME) that they deem nesessary for the equipment's safe operation at NSLSII, and 3) confirm that any new upgrades have been implemented.			

COMPLETE OP#20 THRU OP#130 BEFORE INSTALLATION

20	A. In the space provided at the top of this traveler write in the relevant beamline.	Erik Farquhar Y5735	11/6/17	

B. In the space below record the name/descripton of the end station equipment, and its intended use.

NAME/DESCRIPTION: XAS Mono + Endstation

INTENDED USE: ~~Produce~~ Provide monochromatic x-rays, detectors, and sample environments for biological XAS at 17-BM

OP	Description	Name/Life #	Date	DR
30	EQUIPMENT RE-PURPOSING REVIEW - This operation shall be signed off by the Lead Beamline Scientist when all concurrences have been obtained.			

The undersigned have inspected the end station equipment and agree to the following:

- It is fit for the intended purpose
- It will be used in a manner in which it was intended
- There is no additional radiation safety risk
- There are no additional vacuum/pressure vessel risks

Concurrence:

11/21/17 Lead Beamline Scientist: _____

PORTFOLIO Program Manager: _____

Project Manager: _____

Beamline Engineer: Michael R Sullivan

ESH Manager: _____

OP	Description	Name/Life #	Date	DR
40	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by the Electrical Engineering Group Leader	JOHN ESCALLIER	10/6/17	

Inspect the equipment for electrical safety hazards, and complete the following:

___ The equipment is safe as is and there are no upgrades required.

✓ The following upgrades are required:

ION PUMPS INSTALLED + BONDED

BOND RACK ENCLOSURE

ALL ELECTRONICS IN RACK NEED EEI PRIOR TO INSTALL

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#40" on the attachment.

OP	Description	Name/Life #	Date	DR
50	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by a Pressure Safety SME	Geffny 22039	11/6/2017	

Inspect the equipment for pressure safety hazards, and complete the following:

___ The equipment is safe as is and there are no upgrades required.

X The following upgrades are required:

√ Develope a plan/system to control the hazard of table motion entropy staff
√ Post maximum load rating for electronics racks
consider adding elbow protection for chromometer burst disk
√ Ensure piping/tubing is labled properly

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#50" on the attachment.

OP	Description	Name/Life #	Date	DR
60	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by a Vacuum Engineer	K Tnal/18710	5/24/18	

Inspect the equipment for vacuum equipment performance, and complete the following:

✓ The equipment is acceptable as is and there are no upgrades required.

___ The following upgrades are required:

_____

_____

_____

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#60" on the attachment.

OP	Description	Name/Life #	Date	DR
70	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by a Radiation Safety SME	25263 Mo Zimmerrinde	11/06/2017	

Inspect the equipment for radiation safety hazards, and complete the following:

✓ The equipment is safe as is and there are no upgrades required.

___ The following upgrades are required:

_____

_____

_____

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#70" on the attachment.

OP	Description	Name/Life #	Date	DR
80	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by the Beamline Engineering Group Leader	S. Hulbert/17250	6 Nov 2017	

Inspect the equipment for mechanical safety hazards, and complete the following:

✓ The equipment is safe as is and there are no upgrades required.

___ The following upgrades are required:

_____

_____

_____

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#80" on the attachment.

OP	Description	Name/Life #	Date	DR
90	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by ESH Staff	Lori Stiegler 19497	11/6/17	

Inspect the equipment for safety hazards, and complete the following:

___ The equipment is safe as is and there are no upgrades required.

✓ The following upgrades are required:

Re evaluate PDS Search buttons + pattern
Update Beryllium inventory
Evaluate LN2 vent / potential for ODH alarms
Cover the moving parts / pink beam absorber motion

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#90" on the attachment.

OP	Description	Name/Life #	Date	DR
100	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by an EPS Controls Engineer	H. Bassam 25677	11/6/17	

Inspect the equipment for EPS upgrades, and complete the following:

✓ The equipment is acceptable as is and there are no upgrades required.

___ The following upgrades are required:

_____

_____

_____

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#100" on the attachment.

OP	Description	Name/Life #	Date	DR
110	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by a Mechanical Utilities Engineer	O'BRIEN 24021	11/16/17	

Inspect the equipment for mechanical utillity upgrades, and complete the following:

___ The equipment is acceptable as is and there are no upgrades required.

X The following upgrades are required:

PRESSURE TEST REPORT REQUIRED.
HOSES USED SHOULD BE RATED
AT OR ABOVE 225 PSIG. (~~150 PSIG~~ IS ACCEPTABLE) (WD) 7/11/18

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#110" on the attachment.

OP	Description	Name/Life #	Date	DR
120	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by the Survey Group	HUBBARD 20503	11/18/17	

Inspect the equipment for survey/alignment upgrades, and complete the following:

✓ The equipment is acceptable as is and there are no upgrades required.

___ The following upgrades are required:

_____

_____

_____

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#120" on the attachment.

OP	Description	Name/Life #	Date	DR
130	END STATION DRAWING A. On the space provided on page 1 for part number record the released drawing number for this end station equipment. B. Verify that the drawing includes envelope dimensions, location from source, critical interfaces, performance specifications, and upgrade information from the SME's. For clarity purposes the drawing may also include a photo of the equipment but its not required.			

COMPLETE OP#140 THRU OP#250 AFTER INSTALLATION & UPGRADE

140	Follow the ESH and PPE requirements for the area. Wear safety glasses, safety shoes and gloves for physical installation as applicable	D. abel X9000	7/11/18	
150	Verify measuring and test equipment used for this procedure contains a valid calibration label in accordance with NSLS-II Calibration Procedure PS-QAP-0901, where applicable. The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported in accordance with NSLS-II Discrepancy Reporting Procedure PS-QAP-0002.	D. abel X9000	7/11/18	
160	Verify installation of the end station components per its released drawing.			
170	Verify windows and viewports (overpressure, Be) are installed and compliant with NSLSII requirements	D. abel X9000	7/11/18	
180	Verify access to the end station and adjacent equipment is acceptable and unimpeded.	D. abel X9000	7/18/18	

OP	Description	Name/Life #	Date	DR
190	MAGNETIC FIELD SAFETY VERIFICATION - This operation shall be completed by BNL Safety and Health Services Division Personnel	N/A Y5735 E. FARQUHAR	7/17/18	
	A. Measure location of 5 Gauss Line.			
	B. In the space provided below make recomendations on shielding, barricades, and/or signage.			
	C. Confirm recomendations have been installed and are acceptable.			
200	FOR END STATION EQUIPMENT WITH CRYOGENICS	D. abel X9000	7/11/18	
	A. Verify cyro lines are securely supported			
	B. Veriy over pressure relief device is installed.			
210	VACUUM TESTING	R.T. 18710	5/21/18	
	A. Perform vacuum testing as per traveler BL-VA-001.			
	B. Attach completed BL-VA-001 travelers to this traveler.			

OP	Description	Name/Life #	Date	DR
220	UPGRADE INSTALLATION VERIFICATION - This operation shall be signed off by the Lead Beamline Scientist once all signoffs are obtained from the SME's.			

SME's shall sign-off below that requested upgrades have been installed and are acceptable. If no upgrades were requested then write "N/A".

Electrical Engineering Group Leader: [signature] 7/17/18

Pressure Safety SME: N/A [signature] 7/11/2018

Vacuum Engineer: [signature]

Radiation Safety SME: N/A

Beamline Engineering Group Leader: N/A

ESH Staff: [signature] 7/16/18

EPS Controls Engineer: N/A

Mechanical Utilities Engineer: [signature]

Survey Group: N/A

230	SURVEY GROUP A. Survey and align all components per released drawings. B. Attach survey report to this traveler.			
240	Motion Testing with Motion Control System: A. Verify the motion of all motorized axes of the end station components listed above. Also verify the function of travel limits, over-travel limits, encoders, and home switches where applicable. B. Document results and attach test report.			
250	Verify All Traveler Operations Complete			
260	REVISION HISTORY (This step is informational and does not require signoff) Rev - Description - Date C First Release			

Moss, Steven H

From: Farquhar, Erik
Sent: Tuesday, July 17, 2018 1:53 PM
To: Moss, Steven H
Subject: RE: XAS End Station Traveler
Attachments: 17BM-XAS-ES-traveler-17July18.pdf

Dear Steve,
Here is the latest issue of my "17-BM XAS Endstation Traveler" newsletter. We now have SME signoff on installation verification. Once the drawing is released, I can get sign off on several other sections quite quickly. The finish line is in sight.

Erik

From: Moss, Steven H
Sent: Monday, July 9, 2018 5:20 AM
To: Farquhar, Erik <efarquhar@bnl.gov>
Subject: RE: XAS End Station Traveler

Dear Dr. Farquhar,
Thanks for remembering to include me on the update. I love to see it when a project plan comes together in implementation.
Please keep me on your subscription list.
Stevie

From: Farquhar, Erik
Sent: Friday, July 06, 2018 3:27 PM
To: Moss, Steven H
Subject: RE: XAS End Station Traveler

Hi Steve,
I thought I would pass an updated version to you of the 17-BM XAS endstation traveler, since you requested to be kept in the loop. The changes from previous are that I got signoff on all of the "installation review" steps and have subsequently also completed the vacuum steps.

If you'd like any other documentation, let me know.

Erik

From: Farquhar, Erik
Sent: Tuesday, May 22, 2018 11:08 AM
To: Moss, Steven H
Subject: RE: End Station Traveler

Here you go.
I am trying to fill in the unsigned lines for OP #20-#130 later this week.

Erik

From: Moss, Steven H
Sent: Tuesday, May 22, 2018 11:06 AM
To: Farquhar, Erik
Subject: FW: End Station Traveler

Dear Dr. Farquhar,

Could you please help me out with a copy of the document referenced below?

Thanks,
Stevie, ABM

From: Zipper, Joseph
Sent: Tuesday, May 22, 2018 8:33 AM
To: Moss, Steven H
Subject: RE: End Station Traveler

Erik Farquhar

From: Moss, Steven H
Sent: Tuesday, May 22, 2018 5:50 AM
To: Zipper, Joseph
Cc: Moss, Steven H
Subject: RE: End Station Traveler

Dear Mr. Zipper,

The version received is unmarked. Who must I see or speak to in order to get a copy of the latest current or completed version, with sign-offs to date?
Stevie

From: Zipper, Joseph
Sent: Monday, May 21, 2018 2:00 PM
To: Moss, Steven H
Subject: End Station Traveler

Hi Steve,

As requested, I have attached the End Station traveler for your review.

Thanks,

Joe

Attachment B

USI Screening Checklist

A) USI Screening Purpose: ☒ **Proposed Activity** ☐ **Existing Condition**	**B) Description of Proposed Activity/Discovered Condition and Sponsor/Condition Owner:** 17-BM XAS End Station Equipment Install/Test Traveler, Doc. No. BL-ES-001, Rev. C (Partial) / E. Farquhar
C) USI Screening Outcome: ☒ **No potential USI** ☐ ***Potential USI***	**USI Screening Performed by/Date:** Steve Moss / May 23, 2018 Steve Moss 05/23/18

Qualified Screener answers the following questions; if:

- Any question is answered yes (i.e., "Y"), check "Potential USI" box in Part C, above.
- If all questions are answered no (i.e., "N"), check "No potential USI" box in Part C, above.

Does the proposed change or discovered condition impact or potentially impact:

1) The personnel protection system (PPS)?
Examples: Access doors, fencing, hutches, accelerator enclosures, software change, hardware modifications that are not, "replacement-in-kind."

☐Y or ☒N

2) ODH Monitoring System?
Examples: Hutch ODH monitors, filling station ODH monitors.

☐Y or ☒N

3) Radiation Safety Component?
Examples: Shielding, earthen berms, hutches, concrete walls, beam shutters, scatter shields, burn-through devices, exclusion zones, labyrinths, beam stops, beam masks, collimators, hutch guillotine and beam transport pipes.

☐Y or ☒N

4) Area radiation monitoring system or components?
Examples: Changing instrument position or use of a new type of instrument used for area radiation monitoring, alarms and controls.

☐Y or ☒N

5) Radiological source terms identified in the SAD?
Examples: New insertion devices, change to the maximum synchrotron energy or accelerated charge values, accelerator modifications that are not "replacement-in-kind."

☐Y or ☒N

6) Critical devices
Examples: Safety shutters, dipole magnets, top-off apertures.

☐Y or ☒N

7) PS operating organization?
Examples: Control room operators, support staff responsible for PPS, radiation monitoring or shielding configuration management.

☐Y or ☒N

8) Operational safety limits described in the Authorization Basis Documents?
Examples: Maximum current, beam energy, pulse rate.

☐Y or ☒N

Forward the completed form to the Authorization Basis Manager

17BM XAS END STATION EQUIPMENT INSTALL/TEST

Rev Date: 10/02/2017
Author: Joseph Zipper
Approved: 10/02/2017

Title	Name	Approval Date
NPB Portfolio Manager	Andrew Broadbent	10/02/2017
Deputy Director for Construction	Erik Johnson	10/02/2017
ESH Manager	Robert Lee	10/02/2017
Quality Assurance Engineer	Joseph Zipper	10/02/2017

Serial No	Part No	Part Rev	ECN	Rev	ECN	Rev

Deviation & Waiver: _____

OP	Description	Name/Life #	Date	DR
10	TRAVELER INFORMATION This traveler shall be used for the installation and testing of end station equipment previously installed and operated at NSLS or another facility, that is now being installed at NSLSII. This traveler goes beyond the typical installation/test traveler that instructs/documents installation qualification. It will also: 1) confirm that the re-purposing of this equipment was reviewed and approved for its intended use 2) collect upgrade information from subject matter experts (SME) that they deem nesessary for the equipment's safe operation at NSLSII, and 3) confirm that any new upgrades have been implemented.			

COMPLETE OP#20 THRU OP#130 BEFORE INSTALLATION

20	A. In the space provided at the top of this traveler write in the relevant beamline. B. In the space below record the name/descripton of the end station equipment, and its intended use. NAME/DESCRIPTION: XAS Mono + ENDSTATION INTENDED USE: ~~Produce~~ Provide monochromatic x-rays, detectors, and sample environments for biological XAS at 17-BM	Erik Farquhar Y5735	11/6/17	

[ ]

OP	Description	Name/Life #	Date	DR
30	EQUIPMENT RE-PURPOSING REVIEW - This operation shall be signed off by the Lead Beamline Scientist when all concurrences have been obtained.			

The undersigned have inspected the end station equipment and agree to the following:

- It is fit for the intended purpose
- It will be used in a manner in which it was intended
- There is no additional radiation safety risk
- There are no additional vacuum/pressure vessel risks

Concurrence:

11/01/17 Lead Beamline Scientist: _____
PORTFOLIO
Program Manager: _____
Project Manager: _____
Beamline Engineer: Michael R Sullivan
ESH Manager: _____

40	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by the Electrical Engineering Group Leader	JOHN ESCALLIER	11/6/17	

Inspect the equipment for electrical safety hazards, and complete the following:

___ The equipment is safe as is and there are no upgrades required.

✓ The following upgrades are required:

ION PUMPS INSTALLED + BONDED

BOND RACK ENCLOSURE

ALL ELECTRONICS IN RACK NEED EEI PRIOR TO INSTALL

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#40" on the attachment.

OP	Description	Name/Life #	Date	DR
50	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by a Pressure Safety SME			

Inspect the equipment for pressure safety hazards, and complete the following:

___ The equipment is safe as is and there are no upgrades required.

X The following upgrades are required:

Develope a plan/system to control the hazard of table motion entraping staff
Post maximum load rating for electronics racks
consider adding elbow protection for chamber burst disk
Ensure piping/tubing is labled properly

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#50" on the attachment.

OP	Description	Name/Life #	Date	DR
60	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by a Vacuum Engineer			

Inspect the equipment for vacuum equipment performance, and complete the following:

___ The equipment is acceptable as is and there are no upgrades required.

___ The following upgrades are required:

_____

_____

_____

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#60" on the attachment.

OP	Description	Name/Life #	Date	DR
70	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by a Radiation Safety SME Inspect the equipment for radiation safety hazards, and complete the following: ✓ The equipment is safe as is and there are no upgrades required. ___ The following upgrades are required: _____ _____ _____ Note: If there is not enough space provided here please write "See attachment" and reference 'OP#70" on the attachment	25263 M. Zimmerman	11/06/2017	
80	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by the Beamline Engineering Group Leader Inspect the equipment for mechanical safety hazards, and complete the following: ✓ The equipment is safe as is and there are no upgrades required. ___ The following upgrades are required: _____ _____ _____ Note: If there is not enough space provided here please write "See attachment" and reference 'OP#80" on the attachment.	S. Hulbert/17280	6 NOV 2017	

OP	Description	Name/Life #	Date	DR
90	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by ESH Staff	Lori Stiegler 19497	11/6/17	

Inspect the equipment for safety hazards, and complete the following:

___ The equipment is safe as is and there are no upgrades required.

✓ The following upgrades are required:

Re evaluate RDS Search buttons + pattern
Update Beryllium inventory
Evaluate LN2 vent / potential for ODH alarms
Cover the moving parts / pink beam absorber motion

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#90" on the attachment.

OP	Description	Name/Life #	Date	DR
100	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by an EPS Controls Engineer	H. Bassan 25677	11/6/17	

Inspect the equipment for EPS upgrades, and complete the following:

✓ The equipment is acceptable as is and there are no upgrades required.

___ The following upgrades are required:

_____

_____

_____

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#100" on the attachment.

OP	Description	Name/Life #	Date	DR
110	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by a Mechanical Utilities Engineer	O'BRIEN 24021	11/16/17	

Inspect the equipment for mechanical utillity upgrades, and complete the following:

___ The equipment is acceptable as is and there are no upgrades required.

X The following upgrades are required:

PRESSURE TEST REPORT REQUIRED.
HOSES USED SHOULD BE RATED
AT OR ABOVE 225 PSIG.

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#110" on the attachment.

120	EQUIPMENT UPGRADE INFORMATION - This operation shall be completed by the Survey Group			

Inspect the equipment for survey/alignment upgrades, and complete the following:

___ The equipment is acceptable as is and there are no upgrades required.

___ The following upgrades are required:

_____

_____

_____

Note: If there is not enough space provided here please write "See attachment" and reference 'OP#120" on the attachment.

OP	Description	Name/Life #	Date	DR
130	END STATION DRAWING A. On the space provided on page 1 for part number record the released drawing number for this end station equipment. B. Verify that the drawing includes envelope dimensions, location from source, critical interfaces, performance specifications, and upgrade information from the SME's. For clarity purposes the drawing may also include a photo of the equipment but its not required.			

COMPLETE OP#140 THRU OP#250 AFTER INSTALLATION & UPGRADE

140	Follow the ESH and PPE requirements for the area. Wear safety glasses, safety shoes and gloves for physical installation as applicable			
150	Verify measuring and test equipment used for this procedure contains a valid calibration label in accordance with NSLS-II Calibration Procedure PS-QAP-0901, where applicable. The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported in accordance with NSLS-II Discrepancy Reporting Procedure PS-QAP-0002.			
160	Verify installation of the end station components per its released drawing.			
170	Verify windows and viewports (overpressure, Be) are installed and compliant with NSLSII requirements			
180	Verify access to the end station and adjacent equipment is acceptable and unimpeded.			

OP	Description	Name/Life #	Date	DR
190	MAGNETIC FIELD SAFETY VERIFICATION - This operation shall be completed by BNL Safety and Health Services Division Personnel			
	A. Measure location of 5 Gauss Line.			
	B. In the space provided below make recomendations on shielding, barricades, and/or signage.			
	_____			
	_____			
	_____			
	_____			
	C. Confirm recomendations have been installed and are acceptable			
200	FOR END STATION EQUIPMENT WITH CRYOGENICS			
	A. Verify cyro lines are securely supported			
	B. Veriy over pressure relief device is installed.			
210	VACUUM TESTING			
	A. Perform vacuum testing as per traveler BL-VA-001.			
	B. Attach completed BL-VA-001 travelers to this traveler.			

OP	Description	Name/Life #	Date	DR
220	UPGRADE INSTALLATION VERIFICATION - This operation shall be signed off by the Lead Beamline Scientist once all signoffs are obtained from the SME's.			

SME's shall sign-off below that requested upgrades have been installed and are acceptable. If no upgrades were requested then write "N/A".

Electrical Engineering Group Leader: _____

Pressure Safety SME: _____

Vacuum Engineer: _____

Radiation Safety SME: _____

Beamline Engineering Group Leader: _____

ESH Staff: _____

EPS Controls Engineer: _____

Mechanical Utilities Engineer: _____

Survey Group: _____

230	SURVEY GROUP A. Survey and align all components per released drawings. B. Attach survey report to this traveler.			
240	Motion Testing with Motion Control System: A. Verify the motion of all motorized axes of the end station components listed above. Also verify the function of travel limits, over-travel limits, encoders, and home switches where applicable. B. Document results and attach test report.			
250	Verify All Traveler Operations Complete			
260	REVISION HISTORY (This step is informational and does not require signoff) Rev - Description - Date C First Release			