

The only official copy of this document is the one online in the SharePoint Document Center. Before using a printed copy, verify that it is current by checking the printed document's version history log (p. ii) with that of the online version.

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-050	Author: J. Bohon	Effective Date: 21Apr2016 Review Frequency: 3 yrs	Version 1
Title: XFP Front End Mirror Door Removal and Eutectic Installation		Technical	

Reviewed by:

4/20/2016	4/20/2016	4/20/2016
X  <hr/> Robert Lee ESH Manager Signed by: Lee, Robert J	X  <hr/> Christopher Porretto Quality Assurance Manager Signed by: Porretto, Christopher J	X  <hr/> Bruce Lein Training Group Leader Signed by: Lein, Bruce
4/20/2016	4/20/2016	4/20/2016
X Michael Sullivan <hr/> Mike Sullivan Beamline Engineer Signed by: Sullivan, Michael	X  <hr/> Steve Moss Acting Conduct of Operations Manager Signed by: Moss, Steven H	X  <hr/> Charles Hetzel Vacuum Group Leader Signed by: Hetzel, Charles

USI Screening/Resolution 4/20/2016	Procedure Validation* 4/20/2016
X  <hr/> Steve Moss Authorization Basis Manager Signed by: Moss, Steven H	X Donald Abel <hr/> Donald Abel Beamline Technician Signed by: Abel, Donald *for Operations/Technical procedures only

Approved by:

4/21/2016

X 

 Paul Zschack
 Photon Science Division Director
 Signed by: Zschack, Paul

The only official copy of this document is the one online in the SharePoint Document Center. Before using a printed copy, verify that it is current by checking the printed document's version history log (p. ii) with that of the online version.

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-050	Author: J. Bohon	Effective Date: 21Apr2016 Review Frequency: 3 yrs	Version 1
Title: XFP Front End Mirror Door Removal and Eutectic Installation			Technical

VERSION HISTORY LOG

VERSION	DESCRIPTION	DATE
1	First Issue.	21Apr2016

ACRONYMS

NSLS-II National Synchrotron Light Source II

XFP X-ray Footprinting for In Vitro and In Vivo Structural Studies of Biological Macromolecules Beamline (17-BM)

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-050	Author: J. Bohon	Effective Date: 21Apr2016 Review Frequency: 3 yrs	Version 1
Title: XFP Front End Mirror Door Removal and Eutectic Installation			Technical

1 PURPOSE AND SCOPE

The purpose of this procedure is to enable safe removal and installation of the XFP front end mirror chamber door and/or mirror eutectic bath.

The scope of this procedure includes rigging, specialized bolt pattern tightening and vacuum change processes for installation and/or removal of the XFP front end mirror chamber door and also includes the preparation and handling processes required for removal or installation of the mirror eutectic bath (requiring door removal and reinstallation).

2 DEFINITIONS

None.

3 RESPONSIBILITIES

3.1 XFP Lead Beamline Scientist

3.1.1 Evaluates the need for chamber opening and/or eutectic change along with the XFP Beamline Engineer.

3.2 XFP Beamline Engineer

3.2.1 Evaluates the need for chamber opening and/or eutectic change along with the XFP Lead Beamline Scientist.

3.2.2 Evaluates the condition of all required prerequisite components and the environment for performing work.

3.2.3 Works with NSLS-II Accelerator Staff to schedule the appropriate time to perform procedure steps which require ring access.

3.2.4 Ensures the venting and pump down rates used are appropriate and acceptable.

3.3 XFP Beamline Technician

3.3.1 Performs this procedure as outlined below.

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-050	Author: J. Bohon	Effective Date: 21Apr2016 Review Frequency: 3 yrs	Version 1
Title: XFP Front End Mirror Door Removal and Eutectic Installation			Technical

3.4 Authorized Vacuum Group Personnel

3.4.1 Perform bleedup and pump down of the required vacuum section.

3.5 Vacuum Group Engineer

3.5.1 Consults with the XFP Beamline Engineer to clarify special requirements for venting, pump down and bake-out if necessary.

4 PREREQUISITES

4.1 Personnel performing this procedure shall be current in the following training:

- Overhead Crane Operator (HP-Q-010-W)
- Basic Rigging (TQ-RIG-C)
- Rigging and Crane Practical (TQ-RIG-P)

4.2 Ensure that the following equipment/supplies are available:

- Ceiling-mounted pick point, chain hoist, 2 sling straps, 2 shackles (mirror door weight = 184 lbs.; load rating of rigging hardware is at least 800 lbs.)
- Hoist rings (2) securely mounted to top edge of mirror chamber door (load rating 800 lbs.)
- Door brackets (3) for mounting door temporarily to mirror stand
- Torque wrench
- New mirror chamber door gasket

4.3 Obtain authorization from the Accelerator Coordination group to access the accelerator tunnel.

4.4 Ensure that a second technician, with current training identified in 4.1, is available to assist with mirror door removal and installation.

4.5 Verify that all rigging equipment has been inspected and is acceptable for use.

4.6 Personnel performing this procedure have completed a Medical Questionnaire for non-BSA Workers/Students who may enter STATIC MAGNETIC FIELDS.

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-050	Author: J. Bohon	Effective Date: 21Apr2016 Review Frequency: 3 yrs	Version 1
Title: XFP Front End Mirror Door Removal and Eutectic Installation		Technical	

5 PRECAUTIONS AND LIMITATIONS

- 5.1 Procedure shall be scheduled to be performed during a maintenance period with a duration sufficient for the task.
- 5.2 All steps in this procedure shall be performed in as clean an environment as can reasonably be achieved to reduce the likelihood of contamination of the mirror surface.
- 5.3 Do not touch the polished surface of the mirror.
- 5.4 Observe standard high vacuum procedures for maintaining a clean environment when working inside of the mirror chamber.
- 5.5 Work is performed in a high-magnetic field environment adjacent to the damping wiggler. Personnel performing the work shall complete the Medical Questionnaire for non-BSA Workers/Students who may enter STATIC MAGNETIC FIELDS.

6 PROCEDURE

6.1 XFP Mirror Chamber Door Installation and Removal

Note: Steps in this section for door installation and removal may be performed independent of those listed in section 6.2 for eutectic installation and removal.

Note: Access the mirror chamber at 17-BM via the downstream plug door.

6.1.1 Removal:

- a. Install chain hoist onto the pick point above the mirror chamber door AND verify that all lifting apparatus have been inspected and are acceptable for use.
- b. Verify that hoist rings are mounted in place on the top edge of the mirror chamber door.
- c. Attach lifting slings between the hoist rings and the chain hoist hook AND ensure that the load is securely held.

Note: The vent rate for the vacuum venting is specified by the XFP Beamline Engineer.

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-050	Author: J. Bohon	Effective Date: 21Apr2016 Review Frequency: 3 yrs	Version 1
Title: XFP Front End Mirror Door Removal and Eutectic Installation		Technical	

- d. Authorized Vaccum Group Personnel isolate AND vent the required vacuum section in accordance with PS-C-ASD-PRC-107, *NSLS-II Vacuum System Venting Procedure – LN2* .
- e. Remove all door bolts except for the 4 corner bolts.
- f. Verify that the door is fully supported by the lifting apparatus.
- g. Remove the final 4 bolts.

Caution: Always maintain control of the door and be careful not to damage the door flange.

- h. Slide the door carefully away from the chamber.
- i. Carefully lower the door onto the lower door brackets with padding between the door and the stand.
- j. Install the upper door bracket onto the central stand support to secure the door to the stand.
- k. Remove the lifting equipment to facilitate access to the chamber interior.
- l. Remove the old chamber door gasket.

6.1.2 Installation:

- a. Install chain hoist onto the pick point above the mirror chamber door AND verify that all lifting apparatus have been inspected and are acceptable for use.
- b. Verify that the hoist rings are mounted in place on the top edge of the mirror chamber door.
- c. Install new chamber door gasket.
- d. Attach lifting slings between the hoist rings and the chain hoist hook.
- e. Verify that the door is fully supported by the lifting apparatus.
- f. Remove the upper door bracket from stand.

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-050	Author: J. Bohon	Effective Date: 21Apr2016 Review Frequency: 3 yrs	Version 1
Title: XFP Front End Mirror Door Removal and Eutectic Installation		Technical	

- g. Lift the door into place, maintaining control of door, with care not to damage the door seal.
- h. Secure the 4 corner bolts.
- i. Finish installing the remaining door bolts.
 - i.1 Torque the door bolts in accordance with Attachment A, *XFP Mirror Chamber Door Bolt Tightening Protocol*.
- j. Remove the sling straps and shackles AND return the system to vacuum.

Note: The pump down rate is specified by the XFP Beamline Engineer.

 - j.1 Authorized Vacuum Group Personnel pump down the required vacuum section.
 - Pump down slowly to minimize any chance of the eutectic burping during pump down in the rough vacuum pressure region.

6.2 XFP Mirror Eutectic Installation and Removal

6.2.1 Eutectic Installation

Caution: Use extreme care when handling gallium-containing eutectic compounds in the vicinity of aluminum accelerator or front-end components, such as the storage ring vacuum chamber.

Caution: Do not use any aluminum tools or containers to work with Indalloy 60 or other gallium-containing eutectics due to corrosion of the aluminum. In particular, ensure that any needle used is stainless steel, not aluminum. Take great care not to contaminate the surface of the mirror.

Note: The steps listed below use Indalloy 60 as an example eutectic (density = 6.35 g/cm³); to use this procedure for other eutectics, adjust the mass used accordingly for the appropriate density.

Note: If small additions of eutectic are required, this may be done without moving the mirror.

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-050	Author: J. Bohon	Effective Date: 21Apr2016 Review Frequency: 3 yrs	Version 1
Title: XFP Front End Mirror Door Removal and Eutectic Installation		Technical	

- a. Fill the funnel with eutectic (to bring bath to full required mass if possible; example: for Indalloy 60 >4 kg) AND cap the ends.
- b. Solidify eutectic in funnel (at 3-5 C) in an upright position overnight.
 - b.1 Maintain the temperature to ensure that the eutectic stays solid, in accordance with the manufacturer's specifications.
- c. With the mirror system in place and mirror installed, move mirror to zero pitch and to the lower limits of vertical travel.
- d. Remove the chamber door in accordance with step 6.1.1 AND remove the bobber hole cover.

Caution: Leave the top cap on or use perforated cellophane and a rubber band to avoid potential contamination due to eutectic outgassing during subsequent pump-down.

- e. Remove the lower cap from the funnel AND set the eutectic funnel on the bobber hole.

Note: Reverse the gasket to achieve a leaktight seal when using the gasket for the second time.

- f. Using a previously used door gasket, install the chamber door in accordance with step 6.1.2 AND pump down slowly (to avoid contamination due to eutectic outgassing) to at least a rough vacuum.

Note: Previous experience indicates that 1 kg will take about two hours to melt and flow under the mirror. The increase in volume is expected to significantly extend this, and it is recommended to wait overnight.

- g. Wait for the eutectic to melt and flow under the mirror.

Note: The vent rate for the vacuum venting is specified by the XFP Beamline Engineer.

- h. Authorized Vacuum Group Personnel isolate AND vent the required vacuum section in accordance with PS-C-ASD-PRC-107, *NSLS-II Vacuum System Venting Procedure – LN2*.

Note: Take care to catch any drips from the funnel as you remove it.

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-050	Author: J. Bohon	Effective Date: 21Apr2016 Review Frequency: 3 yrs	Version 1
Title: XFP Front End Mirror Door Removal and Eutectic Installation		Technical	

- i. Remove the door in accordance with step 6.1.1 AND remove the funnel.
- j. If necessary, repeat the above steps (a, b, d-i) to nearly fill the mirror bath (>630 mL).
- k. Move the mirror to the initial position.
- l. Inspect eutectic bath to ensure that the eutectic is completely contained within the bathtub.
- m. Using a syringe and needle, add the remaining eutectic through the bobber hole while observing the level of eutectic in the hole to avoid overfilling.
- n. Reinstall the bobber hole cover.
- o. Install the chamber door in accordance with step 6.1.2

Note: The pump down rate is defined by the XPF Beamline Engineer.

- p. Authorized Vacuum Group Personnel return the system to operational vacuum state.

6.2.2 Eutectic Removal

- a. IF it is required to remove the eutectic, THEN remove with a syringe and a needle through the bobber hole.

7 REFERENCES

7.1 PS-C-ASD-PRC-107, *NSLS-II Vacuum System Venting Procedure – LN2*

8 ATTACHMENTS

Attachment A, *XFP Mirror Chamber Door Bolt Tightening Protocol*

9 DOCUMENTATION

None.

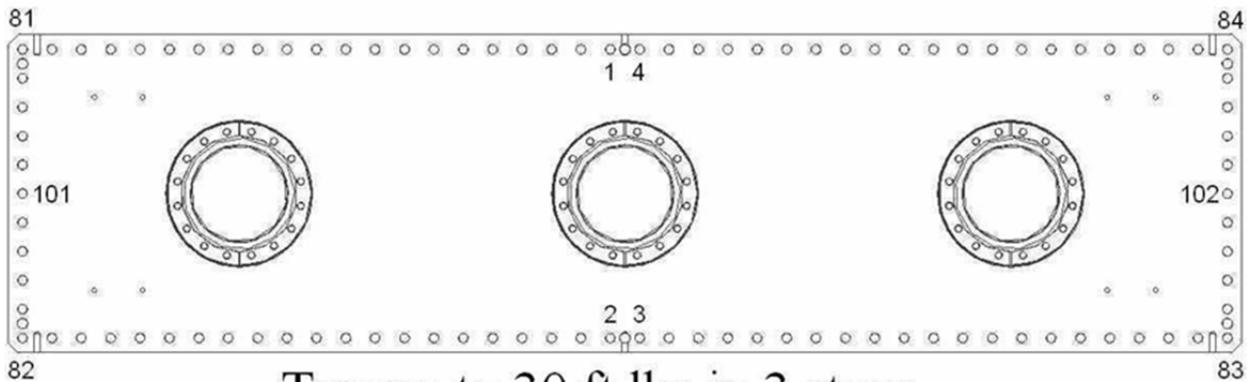
The only official copy of this document is the one online in the SharePoint Document Center. Before using a printed copy, verify that it is current by checking the printed document's version history log (p. ii) with that of the online version.

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-050	Author: J. Bohon	Effective Date: 21Apr2016 Review Frequency: 3 yrs	Version 1
Title: XFP Front End Mirror Door Removal and Eutectic Installation			Technical

Attachment A

XFP Mirror Chamber Door Bolt Tightening Protocol

Bolts are tightened in three steps, following the pattern shown (total of 306 tightening steps).



Torque to 30 ft lbs in 3 steps

CHAMBER DOOR WEIGHT: 184 lbs.

– END –