

# **INSTRUMENT READINESS PLAN (IRP)**

**FOR THE**

## **NSLS-II X-RAY ABSORPTION SPECTROSCOPY (XAS) ENDSTATION AT THE 17-BM (XFP) BEAMLINE**



AUGUST 2018

NSLSII-17BM-PLN-002

PREPARED BY

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FOR THE

U.S. DEPARTMENT OF ENERGY  
OFFICE OF SCIENCE BASIC ENERGY SCIENCE  
UNDER CONTRACT DE-SC0012704

# INSTRUMENT READINESS PLAN (IRP)

FOR THE

## NSLS-II X-RAY ABSORPTION SPECTROSCOPY (XAS)

## ENDSTATION AT THE 17-BM BEAMLINE (XFP)

AUGUST 2018

PREPARED BY:

 7/25/18

A. Ackerman, Instrument Readiness Coordinator

APPROVED AS A PLAN TO ACHIEVE READINESS BY:

 7/30/18

A. Broadbent, IRP Manager

CONCURRENCE BY:

 7/30/18

R. Lee, ESH Manager

APPROVED – IRP HAS BEEN FULLY IMPLEMENTED AND INSTRUMENT IS READY FOR COMMISSIONING:

 8/8/18

A. Broadbent, IRP Manager

CONCURRENCE BY:

 (for Lee) 8/8/18

R. Lee, ESH Manager

**REVISION HISTORY LOG**

<b>REVISION</b>	<b>DESCRIPTION</b>	<b>DATE</b>
1	Initial Issue	AUGUST2018

## TABLE OF CONTENTS

1.0	Introduction .....	1
1.1	Purpose and Scope .....	1
1.2	XAS Endstation .....	1
1.3	Instrument Readiness Review (IRR) .....	1
1.4	Authorization to Proceed with Commissioning .....	2
2.0	Instrument Readiness Plan .....	2
2.1	Readiness Criteria .....	2
3.0	IRP Implementation .....	2
3.1	IRP Team .....	2
3.2	Achieving Readiness – Responsibilities .....	2
3.3	Execution of the IRP .....	3
3.4	Certifying Readiness .....	3

## ATTACHMENTS

Attachment A, *Pillar I Documentation, XAS Endstation at 17-BM*

Attachment B, *Pillar II Hardware, XAS Endstation at 17-BM*

Attachment C, *Pillar III Personnel, XAS Endstation at 17-BM*

Attachment D, *Completion of IRR Pre-Start Findings*

## 1.0 INTRODUCTION

### 1.1 Purpose and Scope

The purpose of this Instrument Readiness Plan (IRP) is to establish the readiness criteria required to declare the XAS Endstation at the NSLS-II 17-BM (XFP) Beamline ready for commissioning. The scope of this IRP includes the XAS endstation instrument and was prepared in accordance with *Instrument Readiness Reviews* (NSLSII-DPT-PDN-008). Scope is limited to the chamber and associated equipment, including the new electromagnet.

This IRP will be used as a tool for planning and certifying readiness. The completion of this IRP requires that all procedures, documentation and hardware listed in the plan are completed, tested, and, where required, independently certified. In addition, Staff and Users that will be involved in commissioning shall be trained and qualified to conduct their work safely, securely and in an environmentally sound manner.

### 1.2 XAS Endstation

The XAS endstation is a population of the ES:3 location in the 17-BM FOE, downstream of two operational endstations for X-ray footprinting designated ES:1 and ES:2. The ES:3 XAS endstation will provide monochromatic X-rays (4.5-16 keV) and instrumentation for biological sciences-focused X-ray absorption spectroscopy. The equipment includes a UHV monochromator chamber from NSLS X6A containing a set of 4-jaw pink beam slits, a channel-cut Si(111) double crystal monochromator, and a motorized copper block coated with phosphor that serves as a diagnostic, all of which are water-cooled. The UHV chamber terminates in a water-cooled 0.25mm thick beryllium window. Downstream of the chamber is a motorized experimental table and stages that will house XAS experimental apparatus, including a cryostat and multi-element germanium fluorescence detector. The XAS endstation will only operate when the monochromator chamber is connected to beamline vacuum via installation of a (removable) vacuum pipe that will run through the current ES:1 and ES:2 endstations.

### 1.3 Instrument Readiness Review (IRR)

As part of the verification of readiness for commissioning, an IRR is required in accordance with *Instrument Readiness Reviews* (NSLSII-DPT-PDN-008). An independent IRR Team will use the readiness criteria developed as part of this IRP to verify that the XAS Endstation is ready for commissioning in accordance with the appropriate Commissioning Plans. Pre-start and post-start findings will be identified by the team.

## 1.4 Authorization to Proceed with Commissioning

The completion of this IRP, together with closure of any pre-start findings from the IRR, is used as the basis for the NSLS-II Director to authorize the start of commissioning of the XAS Endstation.

## 2.0 INSTRUMENT READINESS PLAN

### 2.1 Readiness Criteria

Readiness criteria are provided in Attachments A through D. The criteria were developed by the Instrument Readiness Coordinator (IRC) and Readiness Team members, using the *General Readiness Criteria* provided in Attachment A and the *Instrument Readiness Guide* provided in Attachment C of the *Instrument Readiness Reviews* (NSLSII-DPT-PDN-008).

The readiness criteria are grouped into the following categories:

- Pillar I – Documentation
- Pillar II – Hardware
- Pillar III – Personnel
- Completion of IRR Pre-Start Findings

## 3.0 IRP IMPLEMENTATION

### 3.1 IRP Team

An IRP Team will be appointed by the NSLS-II Director in accordance with *Instrument Readiness Reviews* (NSLSII-DPT-PDN-008). The IRP Team members that have responsibility for completing the IRP are listed as the Responsible Person in the Attachments.

### 3.2 Achieving Readiness – Responsibilities

The IRP Team members are responsible for ensuring that their specific readiness criteria are achieved.

The Lead Beamline Scientist is responsible for certifying that all of the readiness criteria associated with the endstation is achieved.

### **3.3 Execution of the IRP**

The IRP Team members shall execute this IRP by preparing, installing, documenting, or training (as appropriate), the specific scope of work (readiness criteria) assigned to them as listed in the Attachments. The IRP Team members shall develop, compile or assemble the documented evidence that clearly demonstrates that the readiness criteria have been met. This evidence shall be listed on the Attachments.

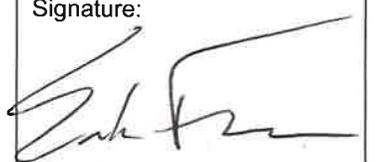
### **3.4 Certifying Readiness**

Upon completion of the readiness criteria, the IRP Team members will certify that the criteria for which they are responsible for are complete by signing and dating the Attachments in the appropriate section. The Attachments shall not be signed until the readiness criteria have been fully achieved.

For completion of the IRR pre-start findings, if identified, the IRP Manager and the ESH Manager will certify that all IRR pre-start findings relative to the endstation have been completed, and that the associated ATS Actions have been closed by signing and dating Attachment D in the appropriate section. The Independent Verifier will concur that these actions have been adequately completed and closed by signing and dating Attachment D in the appropriate section.

**ATTACHMENT A – PILLAR I DOCUMENTATION**

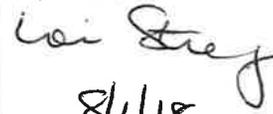
**XAS ENDSTATION AT 17-BM**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR I DOCUMENTATION (PLANNING &amp; PROCEDURES)</b>	<p><b>Functional Description</b> An overview presentation is prepared that defines the scope of the IRR and includes the following specific information:</p> <ul style="list-style-type: none"> <li>- Primary capabilities</li> <li>- Physical layout and location (includes beamline location on the experiment floor)</li> <li>- Design reviews and performance parameters</li> <li>- Source characteristics</li> <li>- Photon beam performance goals</li> <li>- Radiation Safety Committee reviews</li> <li>- Self-identified pre-start findings</li> <li>- Description and status for each item listed in this Instrument Readiness Plan</li> </ul>	<p>E. Farquhar Lead Beamline Scientist</p>	<ul style="list-style-type: none"> <li>• Develop the presentation and document described for the endstation</li> </ul>	<ul style="list-style-type: none"> <li>• Presentation</li> <li>• Functional Description Document</li> </ul>	<p>Signature:</p>  <p align="center">8/6/18</p>
	<p><b>Endstation Design</b> Endstation components are designed in accordance with NSLSII-DPT-PDN-006, <i>Engineering Design for NSLS-II Structures, Systems and Components (SSCs)</i></p>	<p>E. Farquhar Lead Beamline Scientist</p>	<ul style="list-style-type: none"> <li>• Complete the endstation traveler and any documents that address thermal management, mechanical support, configuration control, and vacuum</li> </ul>	<ul style="list-style-type: none"> <li>• Endstation Traveler</li> </ul>	<p>Signature:</p>  <p align="center">8/2/18</p>
	<p><b>Top-Off Safety System (TOSS)</b> Front End has been analyzed for Top-Off safety in accordance with PS-C-ASD-PRC-183, <i>Approval of New and Modified NSLS-II Beamline Front Ends for Top Off Safety.</i></p>	<p>R. Filler Coordinator for Top Off Safety</p>	<ul style="list-style-type: none"> <li>• Complete TOSS analysis</li> </ul>	<ul style="list-style-type: none"> <li>• TOSS Analysis Report</li> <li>• <i>Beamlines Approved for Top-Off Operations list</i></li> </ul>	<p>Signature:</p>  <p align="center">8/8/18</p>

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT A – PILLAR I DOCUMENTATION**

**XAS ENDSTATION AT 17-BM**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR I DOCUMENTATION (PLANNING &amp; PROCEDURES)</b>	<p><b>Secondary Radiation Scatter Analysis</b> Secondary Bremsstrahlung and Synchrotron scatter is analyzed in accordance with LT-C-ESH-STD-001, <i>Guidelines for the NSLS-II Beamline Radiation Shielding Design</i>.</p>	M. Benmerrouche Radiation Physicist	<ul style="list-style-type: none"> <li>Complete GB and SR analysis</li> </ul>	<ul style="list-style-type: none"> <li>BNL Technical Note Report</li> </ul>	Signature:  8/11/2018
	<p><b>National Environmental Protection Act (NEPA) Evaluation</b> NEPA requirements evaluation completed.</p>	L. Stiegler ESH Operations Group Leader	<ul style="list-style-type: none"> <li>Complete a NEPA evaluation</li> </ul>	<ul style="list-style-type: none"> <li>NEPA evaluation report</li> </ul>	Signature:  8/1/18
	<p><b>Unreviewed Safety Issue (USI) Evaluations/ Screenings</b> Authorization basis hazard identification is managed through USI evaluation/screening.</p>	S. Moss Authorization Basis Manager	<ul style="list-style-type: none"> <li>Verify that the SAD and ASE accurately cover the hazards associated with the subject endstation, include temporary systems</li> </ul>	<ul style="list-style-type: none"> <li>SAD and ASE USI screenings/evaluations</li> <li>Applicable waivers</li> </ul> <p><i>Based on previous Beamline authorization and additional USI Screenings</i></p>	Signature:  07/27/18
	<p><b>Resolution of Open Action Tracking System (ATS) Actions</b> All action items from previous internal and external oversight groups (e.g., RSC, Design Reviews, etc.) have been closed.  Previous IRR action items are addressed.</p>	J. Zipper QA Engineer	<ul style="list-style-type: none"> <li>ATS action items for the endstation shown as closed with supporting evidence</li> </ul>	<ul style="list-style-type: none"> <li>ATS System</li> </ul>	Signature:  8/1/18

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT A – PILLAR I DOCUMENTATION**

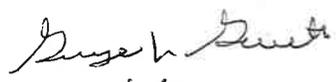
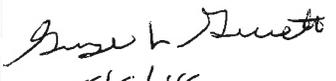
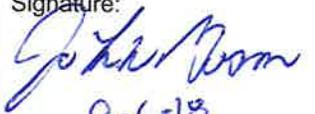
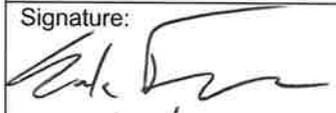
**XAS ENDSTATION AT 17-BM**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR I DOCUMENTATION (PLANNING &amp; PROCEDURES)</b>	<p><b>Procedures</b> Procedures needed for safe, secure, and environmentally sound commissioning have been developed, reviewed, validated (where applicable), and approved. Existing procedures are sufficient for new hazards introduced by this endstation, if any.</p>	K. Rubino Procedure Support	<ul style="list-style-type: none"> <li>• Develop any system specific procedures/work instructions</li> <li>• Verify that existing procedures are sufficient for any new hazards introduced</li> </ul>	<ul style="list-style-type: none"> <li>• Updated Search and Secure Sketch</li> </ul>	Signature:  7/30/18
	<p><b>Experiment Safety Review (ESR)</b> An Experiment Safety Review has been submitted, executed and approved within the BNL ESR system.</p>	E. Farquhar Lead Beamline Scientist	<ul style="list-style-type: none"> <li>• Complete submission and pursue approval of an Experiment Safety Review through use of the BNL electronic system</li> </ul>	<ul style="list-style-type: none"> <li>• Approved BNL ESR</li> </ul>	Signature:  8/8/18
	<p><b>Proposal Allocation Safety &amp; Scheduling (PASS)</b> The instrument is active within PASS with approvals to proceed with Technical Commissioning.</p>	E. Farquhar Lead Beamline Scientist	<ul style="list-style-type: none"> <li>• Assure that PASS is configured to administer the instrument</li> </ul>	<ul style="list-style-type: none"> <li>• Defined resource within PASS</li> <li>• Submitted Technical commissioning proposal</li> <li>• Submitted Safety Approval Form</li> </ul>	Signature:  7/31/18

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT B – PILLAR II HARDWARE**

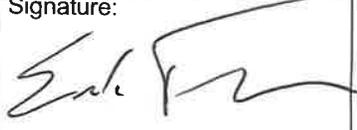
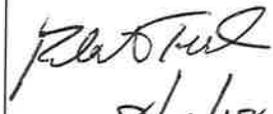
**XAS ENDSTATION AT 17-BM**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR II SAFETY CRITICAL HARDWARE (INSTALLATION)</b>	<p><b>Personnel Protection System (PPS) Interlocks: Installed and Certified</b> Hardware/Software installed in accordance with PS-C-XFD-SPC-PPS-001, <i>Beamline Personnel Protection System (BLPPS) and Front End Personnel Protection System (FEPPS) Design Description.</i></p>	G. Ganetis Electrical Engineering Group Leader	<ul style="list-style-type: none"> <li>• Generate system schematics and logic diagrams</li> <li>• Install PPS components</li> <li>• Certify PPS</li> </ul>	<ul style="list-style-type: none"> <li>• Overall PPS Checklist</li> <li>• Executed Beamline Radiological Interlock Test Checklist</li> </ul>	Signature:   8/6/18
	<p><b>Electrical Power</b> SBMS electrical power distribution requirements are satisfied. SBMS Electrical Equipment Inspection (EEI) requirements are satisfied.</p>	G. Ganetis Electrical Engineering Group Leader	<ul style="list-style-type: none"> <li>• Generate and approve one-line drawings</li> <li>• Complete system electrical inspection</li> <li>• Complete needed EEI inspections</li> </ul>	<ul style="list-style-type: none"> <li>• Approved AC Power one-line drawings</li> <li>• EEI database entries</li> </ul>	Signature:   8/6/18
	<p><b>Utilities</b> Permanent facility and beamline utility systems are installed and tested (i.e., Compressed Air, DI Water, Gaseous Nitrogen, Process Chilled Water) in accordance with design, labeling, and attachment requirements.</p>	J. Gosman Mechanical Utilities Group Leader	<ul style="list-style-type: none"> <li>• Generate system schematics</li> <li>• Perform pressure test</li> <li>• Assure SBMS and NSLS-II labeling and hardware attachment requirements are met</li> </ul>	<ul style="list-style-type: none"> <li>• Approved system schematics</li> <li>• System pressure testing reports</li> </ul>	Signature:   8-6-18
E. Farquhar Lead Beamline Scientist		Signature:   7/31/18			

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT B – PILLAR II HARDWARE**

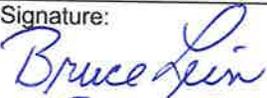
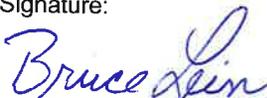
**XAS ENDSTATION AT 17-BM**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR II OTHER HARDWARE (INSTALLATION)</b>	<p><b>Other Components, Optics, and Diagnostics</b> Components that are not radiation safety components are installed and tested in accordance with the Travelers. Diagnostic equipment needed to begin technical commissioning is installed and tested.</p>	E. Farquhar Lead Beamline Scientist	<ul style="list-style-type: none"> <li>• Generate and execute Traveler</li> <li>• Complete acceptance inspections</li> </ul>	<ul style="list-style-type: none"> <li>• Completed Traveler</li> <li>• Acceptance inspection documentation, as needed</li> </ul>	Signature:  8/2/18
	<p><b>Equipment Protection System (EPS) Interlocks</b> Hardware/Software installed and tested in accordance with the Traveler.</p>	G. Bischof Controls Engineer	<ul style="list-style-type: none"> <li>• Generate and execute Traveler</li> <li>• Verify EPICS integration</li> <li>• Generate Test Report</li> </ul>	<ul style="list-style-type: none"> <li>• Test Report</li> <li>• Completed Traveler</li> </ul>	Signature:  8/1/18
	<p><b>Controls</b> Hardware/Software installed and tested in accordance with NSLS-II requirements.</p>	Z. Yin Controls Engineer	<ul style="list-style-type: none"> <li>• Test system performance</li> <li>• Complete integral testing</li> </ul>	<ul style="list-style-type: none"> <li>• Performance and integral testing documentation</li> </ul>	Signature:  8/3/18
	<p><b>Vacuum</b> Vacuum hardware has been installed and tested in accordance with the Traveler and has the capability of achieving full vacuum needed during commissioning.</p>	R. Todd Vacuum Engineer	<ul style="list-style-type: none"> <li>• Generate and execute Top Level Traveler</li> <li>• Identify overpressure devices</li> <li>• Test system performance</li> </ul>	<ul style="list-style-type: none"> <li>• Completed Top Level Traveler</li> <li>• Test Report</li> </ul>	Signature (Beamline):  8/3/18

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT C – PILLAR III PERSONNEL**

**XAS ENDSTATION AT 17-BM**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>PILLAR III PERSONNEL</b>	<b>Lead Beamline Scientist (LBS) / Cognizant Space Manager (CSM)</b> LBS and CSM personnel are assigned and Trained/Qualified.	B. Lein Training Group Leader	<ul style="list-style-type: none"> <li>Assign JTA for LBS and CSM</li> </ul>	<ul style="list-style-type: none"> <li>BTMS record</li> </ul>	Signature:  8-1-18
	<b>Authorized Beamline Staff</b> Sufficient personnel to begin commissioning are assigned and Trained/Qualified.	B. Lein Training Group Leader	<ul style="list-style-type: none"> <li>Assign JTA</li> </ul>	<ul style="list-style-type: none"> <li>BTMS record</li> <li>Sufficient Staff Documentation</li> </ul>	Signature:  8-1-18
	<b>Support Staff</b> Other, non-beamline dedicated personnel needed to begin commissioning (e.g., Beamline Engineers and Controls Personnel) are assigned and Trained/Qualified for the Beamline and FE/ID.	B. Lein Training Group Leader	<ul style="list-style-type: none"> <li>Assign JTA</li> </ul>	<ul style="list-style-type: none"> <li>BTMS record</li> </ul>	Signature:  8-1-18
	<b>Lead Operators &amp; FLOCOS (Accelerator Division)</b> Trained/Qualified to: <ul style="list-style-type: none"> <li>Execute the Beamline Enable procedure</li> <li>Perform roles assigned in any Beamline-specific procedures</li> <li>Perform tasks related to FE and ID Commissioning</li> </ul>	B. Lein Training Group Leader	<ul style="list-style-type: none"> <li>Train Operators</li> </ul>	<ul style="list-style-type: none"> <li>BTMS record</li> </ul>	Signature:  8-1-18

<b>* READINESS CERTIFICATION</b>	<b>E. Farquhar</b> Lead Beamline Scientist	Signature:  8/8/18
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\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT D – COMPLETION OF IRR PRE-START FINDINGS  
XAS ENDSTATION AT 17-BM**

READINESS CRITERIA		RESPONSIBLE PERSON	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<b>IRR PRE-START FINDINGS</b>	<b>No Pre-Start Findings Identified</b>	R. Lee ESH Manager	• IRR Preliminary Report	Signature:
	No pre-start findings associated with the XAS Endstation have been identified by the IRR Team and therefore the following lines do not require sign-off.	E. Cheswick Independent Verifier		Signature:
	<b>Pre-Start Actions Complete</b>	A. Broadbent IRP Manager	• Pertinent closure evidence	Signature:
	<b>Pre-Start Actions Verified</b>	R. Lee ESH Manager	• Pertinent closure evidence	Signature:
	<b>Pre-Start Actions Independently Verified</b>	E. Cheswick Independent Verifier	• Pertinent closure evidence	Signature:

\*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.