INSTRUMENT READINESS PLAN (IRP)

FOR THE

NSLS–II 8-BM (TES) BEAMLINE AND FRONT END

AUGUST 2016

PS-C-XFD-PLN-030

PREPARED BY

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FOR THE

U.S. DEPARTMENT OF ENERGY
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UNDER CONTRACT DE–SC0012704

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NATIONAL LABORATORY

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PREPARED BY:

7/22/16

A. Ackerman, Instrument Readiness Coordinator

APPROVED AS A PLAN TO ACHIEVE READINESS BY:

7/22/2016

J. Adams, IRR Technical Authority (Beamline)

T. Shaftan for F. Willeke 7/22/2016

F. Willeke, IRR Technical Authority (FE)

CONCURRENCE BY:

Robert Lee 7-22-16

R. Lee, ESH Manager

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

8/8/2016

J. Adams, IRR Technical Authority (Beamline)

2016/08/08

F. Willeke, IRR Technical Authority (FE)

CONCURRENCE BY:

Robert Lee 8-8-16

R. Lee, ESH Manager

VERSION HISTORY LOG

VERSION	DESCRIPTION	DATE
1	Initial Issue	August 2016

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ATTACHMENTS

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 NSLS-II 8-BM (Tender Energy Spectroscopy and Imagining [TES]) Beamline and Front End and ready for commissioning. The scope of this IRP includes the 8-BM Beamline, Front End and End Station Diagnostics, and was prepared in accordance with the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001). Experimental equipment that is installed and operational in the End Station will be included in the scope of this plan.

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 8-BM Beamline

The TES beamline is the first NSLS-II beamline to wholly use a Bending Magnet as source for X-ray radiation, which is collected at 3.25 millradians inboard of the upstream accelerator straight section. In addition to the standard equipment and hardware used in three-pole wiggler front ends, the TES beamline has two mirrors in the 8-BM front end that in combination deflect the photon beam 25 mm downward and parallel to the 8-BM white beam. The TES/8-BM front end and beamline are designed to optimize performance of x-ray absorption spectroscopy (XAS) and X-ray fluorescence imaging capabilities over an energy range of 1.2-5 keV, with a full operational range of 1-8 keV, and at spatial resolutions from the mm to µm scale. Performance is accomplished with compound focusing, coupled with specialized monochromator crystals and geometry, and tunable vertical collimation and harmonic rejection. This beamline was developed for study of heterogeneous and structured materials in a wide rnge of scientific disciplines, and under various *in-situ* and/or *operando* sample conditions. The credited controls include shielding and personnel protection system (PPS) interlocks in accordance with the NSLS-II Accelerator Safety Envelope (ASE) (PS-C-ESH-ROASE-001).

1.3 Instrument Readiness Review (IRR)

As part of the verification of readiness for commissioning, an IRR is required in accordance with the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001). An independent IRR Team will use the readiness criteria developed as part of this IRP to verify that the 8-BM Beamline and Front End are 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 8-BM Beamline and Front End.

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 Review Procedure* (PS-C-ESH-PRC-001).

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 Readiness Team

A Readiness Team will be appointed by the NSLS-II Director in accordance with the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001). The Readiness Team members that have responsibility for completing the IRP are listed as the Responsible Person in the Attachments.

3.2 Achieving Readiness – Responsibilities

The Readiness 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 Beamline is achieved.

The Mechanical Engineering Group Leader is responsible for certifying that all of the readiness criteria associated with the subject Front End is achieved.

3.3 Execution of the IRP

The Readiness 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 Readiness 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 Readiness Team members will certify that the criteria for which they are responsible for are complete by signing 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 IRR Technical Authorities and the ESH Manager will certify that all IRR pre-start findings relative to the 8-BM Beamline and Front End have been completed, and that the associated ATS Actions have been closed by signing Attachment D in the appropriate section. The Independent Verifier will concur that these actions have been adequately completed and closed by signing Attachment D in the appropriate section.

ATTACHMENT A – PILLAR I DOCUMENTATION

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR I DOCUMENTATION (PLANNING & PROCEDURES)	**Functional Description** An overview presentation is prepared that defines the scope of the IRR and includes the following FE and Beamline specific information: – Primary capabilities – Physical layout and location (includes Beamline location on the experiment floor) – Design reviews and performance parameters – Source characteristics – Photon beam performance goals – Radiation Safety Committee reviews – Self-identified pre-start findings – Description and status for each item listed in this Instrument Readiness Plan	P. Northrup Lead Beamline Scientist	• Develop the presentation described for the Beamline	• Presentation • Functional Description Document	Signature: Paul Northrup
		G. Fries Accelerator Division Liaison Engineer	• Develop the presentation described for the FE	• Presentation	Signature: G. Fries
	Beamline & FE Design Beamline components are designed in accordance with PS-QAP-0412, *Design Reviews* and PS-C-QAS-PRC-010, *Engineering Design by Others*.	P. Northrup Lead Beamline Scientist	• Complete Engineering Design Reviews for the Beamline and FE that address thermal management, mechanical support, configuration control, and vacuum	Beamline: • Internal and contractor supplied design review documents and reports	Signature: Paul Northrup
		S. Sharma Mechanical Engineering Group Leader		FE: • Requirements, Specifications, and Interface report (RSI) • Internal design review documents	Signature: S. Sharma

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

ATTACHMENT A – PILLAR I DOCUMENTATION

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR I DOCUMENTATION (PLANNING & PROCEDURES)	**Radiation Safety Components Design** Radiation Safety Components for the Beamline and FE designed in accordance with NSLS-II requirements, PS-QAP-0412, *Design Reviews* and PS-C-QAS-PRC-010, *Engineering Design by Others*.	P. Northrup Lead Beamline Scientist	• Complete requirements analysis and design of radiation safety components for the Beamline	• Internal design review documents and reports • RSC Report	Signature: Paul Northrup
		S. Sharma Mechanical Engineering Group Leader	• Complete requirements analysis and design of radiation safety components for the FE	• Internal design review documents • RSC Report	Signature: S. Sharma
	Top-Off Safety System (TOSS) FE has been analyzed for Top-Off Safety in accordance with PS-C-ASD-PRC-183, *Approval of New and Modified NSLS-II Beamline Front Ends for Top Off Safety.*	R. Fliller Coordinator for Top Off Safety	• Complete TOSS analysis	• TOSS Analysis Report • Updated FE layout drawings • Updated *Beamlines Approved for Top-Off Operations* list	Signature:
	Ray Traces Bremsstrahlung and Synchrotron Ray Traces generated in accordance with PS-C-XFD-PRC-008, *Synchrotron and Bremsstrahlung Ray Trace Procedure*.	P. Northrup Lead Beamline Scientist	• Prepare the Ray Traces for the Beamline	• Primary Bremsstrahlung Ray Traces • Maximum Synchrotron Ray Traces	Signature: Paul Northrup
		S. Sharma Mechanical Engineering Group Leader	• Prepare the Ray Traces for the FE	• Primary Bremsstrahlung Ray Traces • Maximum Synchrotron Ray Traces	Signature: S. Sharma

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ATTACHMENT A – PILLAR I DOCUMENTATION

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR I DOCUMENTATION (PLANNING & PROCEDURES)	**Secondary Radiation Scatter Analysis** Secondary Bremsstrahlung and Synchrotron scatter is analyzed in accordance with LT-C-ESH-STD-001, *Guidelines for the NSLS-II Beamline Radiation Shielding Design.*	M. Benmerrouche Health Physics	• Complete FLUKA analysis • Complete STAC8 analysis	• BNL Technical Note Report	Signature:
	National Environmental Protection Act (NEPA) Evaluation NEPA requirements evaluation completed.	L. Stiegler ESH Operations Group Leader	• Complete a NEPA evaluation	• NEPA Evaluation Report	Signature:
	Unreviewed Safety Issue (USI) Evaluations/ Screenings Authorization basis hazard identification is managed through USI evaluation/screening.	S. Moss Authorization Basis Manager	• Verify that the SAD and ASE accurately cover the hazards associated with the subject Beamline and FE, including temporary systems	• SAD and ASE USI screenings/evaluations • Applicable waivers	Signature: 08/04/16
	Resolution of Open Action Tracking System (ATS) Actions Instrument specific action items from previous internal and external oversight groups (e.g., RSC, Design Reviews, etc.) are addressed. Previous IRR action items are addressed.	J. Zipper QA Engineer	• ATS action items for the instrument are satisfied. • ATS action items from previous IRRs are evaluated for impact to the instrument	• ATS System	Signature: 8/3/16
		J. Hawkes QA Engineer	• ATS action items for the FE shown as closed with supporting evidence	• ATS System	Signature: 8/4/16

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ATTACHMENT A – PILLAR I DOCUMENTATION

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR I DOCUMENTATION (PLANNING & PROCEDURES)	**Procedures** Procedures needed for safe, secure, and environmentally sound commissioning have been developed, reviewed, validated (where applicable), and approved. Existing procedures are verified as sufficient for new hazards introduced by this Beamline and FE, if any.	K. Rubino Procedure Support	• Develop any system specific procedures • Verify that existing procedure are sufficient for any new hazards introduced	• 8-BM Radiological Interlock Test Procedure (PS-C-XFD-PRC-062) • Search and Secure Sketch • Front End Mirrors Vacuum Bleed Up and Bakeout	Signature: K. Rubino
	Commissioning Plans Commissioning plans have been generated for the Beamline and FE to address the task sequence required for technical commissioning (safe photon transport).	P. Northrup Lead Beamline Scientist	• Prepare a Beamline Commissioning Plan to define technical objectives and operational readiness requirements	• Approved Beamline Commissioning Plan	Signature: Paul Northrup
		T. Shaftan Accelerator Coordination Group Leader	• Verify that NSLS-II Insertion Device and Front End Commissioning Sequence (PS-C-ASD-PRC-166) adequately covers commissioning for the FE	• NSLS-II Insertion Device and Front End Commissioning Sequence (PS-C-ASD-PRC-166)	Signature:

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ATTACHMENT A – PILLAR I DOCUMENTATION

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR I DOCUMENTATION (PLANNING & PROCEDURES)	**Radiation Survey Plans** A survey plan has been generated for the Beamline in accordance with PS-C-XFD-PRC-004, *NSLS-II Beamlines Radiation Safety Commissioning Plan* and the existing NSLS-II Insertion Devices and Front End Radiation Survey Plan (PS-C-ESH-PRC-061) has been reviewed and updated as necessary for the FE.	M. Benmerrouche Radiation Physicist	• Prepare the Radiation Survey Plan for the Beamline	• Approved Beamline Radiation Survey Plan	Signature: 
		M. Benmerrouche Radiation Physicist	• Verify that the NSLS-II Insertion Devices and Front End Radiation Survey Plan (PS-C-ESH-PRC-061) adequately covers commissioning for the FE	• NSLS-II Insertion Devices and Front End Radiation Survey Plan (PS-C-ESH-PRC-061)	Signature: 
	Proposal Allocation Safety & Scheduling (PASS) The instrument is active within PASS with approvals to proceed with Technical Commissioning.	P. Northrup Lead Beamline Scientist	• Assure that PASS is configured to administer the instrument	• Defined resource within PASS • Submitted Technical commissioning proposal • Submitted Safety Approval Form	Signature: 

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ATTACHMENT B – PILLAR II HARDWARE

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II SAFETY CRITICAL HARDWARE (INSTALLATION)	**Radiation Safety Components: Installation** Radiation Safety Components, including Top Off components are installed in accordance with the Traveler.	P. Northrup Lead Beamline Scientist	• Generate and execute Traveler	Beamline: • Completed Traveler	Signature: Paul Northrup
		G. Dacos Mechanical Engineer	• Generate and execute Top Level Traveler	FE: • Completed Traveler	Signature: George G. Dacos
		L. Doom Accelerator Coordination	• Generate and execute Top-Off Traveler	• Completed Traveler	Signature: Lewis Doom
	Radiation Safety Components: Configuration Control A Radiation Safety Component Checklist template is generated in accordance with PS-C-ESH-PRC-025, *NSLS-II Radiation Safety Component Inspection Procedure.*	P. Northrup Lead Beamline Scientist	• Develop Radiation Safety Component Checklist	• Approved beamline specific Radiation Safety Component Checklist	Signature: Paul Northrup
		L. Doom Accelerator Coordination Group Engineer	• Verify that the existing Radiation Safety Component checklist includes the subject FE	• Approved Storage Ring Radiation Safety Component Checklist Template	Signature: Lewis Doom

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ATTACHMENT B – PILLAR II HARDWARE

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II SAFETY CRITICAL HARDWARE (INSTALLATION)	**Personnel Protection System (PPS) Interlocks: Installed and Certified** Hardware/Software installed in accordance with PS-C-XFD-SPC-PPS-001, *Beamline Personnel Protection System (BLPPS) and Front End Personnel Protection System (FEPPS) Design Description.*	G. Ganetis Electrical Engineering Group Leader	• Generate system schematics and logic diagrams • Install PPS components • Certify PPS	• Overall PPS Checklist • Executed Beamline Radiological Interlock Certification Checklist	Signature: 
	Hutch Structures Hutch structures installed with adequate provision for life safety issues (egress and fall protection) in accordance with NXG-C-XFD-SOW-HU-001, "*NSLS-II NxtGen Lead/Steel Beamline Shielding Enclosures ('Hutches') Statement of Work*" and NXG-C-XFD-SPC-HU-001, "*NSLS-II NxtGen Lead/Steel Beamline Shielding.*"	E. Haas Beamline Engineer	• Generate and execute Traveler for inspection	• Completed Traveler	Signature: 
	Electrical Power SBMS electrical power distribution requirements are satisfied. SBMS Electrical Equipment Inspection (EEI) requirements are satisfied.	A. Boerner Electrical Distribution Engineer	• Generate and approve one-line drawings • Complete system electrical inspection • Complete needed EEI inspections	• Approved AC Power one–line drawings • EEI database entries	Signature: 

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ATTACHMENT B – PILLAR II HARDWARE

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II SAFETY CRITICAL HARDWARE (INSTALLATION)	**Utilities** Permanent utility systems are installed and tested (i.e., Compressed Air, DI Water, Gaseous Nitrogen, Process Chilled Water) in accordance with design drawings.	J. Gosman Mechanical Utilities Group Leader	• Generate system schematics • Perform pressure test	• Approved system schematics • System pressure testing reports	Signature: 

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ATTACHMENT B – PILLAR II HARDWARE

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II OTHER HARDWARE (INSTALLATION)	**Other FE Components, Photon Transport Components, Optics, and Diagnostics** FE and photon transport 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. Northrup Lead Beamline Scientist	• Generate and execute Traveler • Complete acceptance inspections	Beamline: • Completed Traveler • Acceptance inspection documentation, as needed	Signature:
		G. Dacos Mechanical Engineer	• Generate Traveler and drawing • Execute Traveler • Perform pressure test	FE: • Completed Traveler • System pressure testing reports	Signature:
	Equipment Protection System (EPS) Interlocks Hardware/Software installed and tested in accordance with the Traveler.	R. Kadyrov Controls Infrastructure Group Leader	• Generate and execute Traveler • Verify EPICS integration • Test system performance	Beamline: • Test Report • Completed Traveler	Signature:
		G. Ganetis Electrical Engineering Group Leader	• Verify EPICS integration • Test system performance	FE: • Test Report	Signature:

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

ATTACHMENT B – PILLAR II HARDWARE

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II OTHER HARDWARE (INSTALLATION)	**Controls** Hardware/Software installed and tested in accordance with NSLS-II requirements.	C. De Silva Controls Group Engineer	• Test system performance • Complete integral testing	Beamline: • Performance and integral testing checklist	Signature:
		D. Padrazo Deputy Instrumentation Group Leader	• Test system performance • Complete integral testing	FE: • Performance and integral testing checklist	Signature:
	Vacuum Vacuum hardware has been installed and tested in accordance with the Traveler and has the capability of achieving full vacuum needed during commissioning.	R. Todd Vacuum Engineer	• Generate and execute Top Level Traveler • Identify overpressure devices • Test system performance	Beamline: • Completed Top Level Traveler • Test Report	Signature:
		C. Hetzel Vacuum Group Leader	• Generate and execute Top Level Traveler • Identify overpressure devices • Test system performance	FE: • Completed Top Level Traveler • Test Report	Signature:

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ATTACHMENT C – PILLAR III PERSONNEL

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR III PERSONNEL	**Lead Beamline Scientist (LBS) / Cognizant Space Manager (CSM)** LBS and CSM personnel are assigned and Trained/Qualified.	B. Lein Training Group Leader	• Assign JTA for LBS and CSM	• BTMS record	Signature: Bruce Lein
	Authorized Beamline Staff Sufficient personnel to begin commissioning are assigned and Trained/Qualified.	B. Lein Training Group Leader	• Assign JTA	• BTMS record	Signature: Bruce Lein
	Support Staff 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	• Assign JTA	• BTMS record	Signature: Bruce Lein
	Lead Operators, Scientific Operators & FLOCOS (Accelerator Division) Trained/Qualified to: – Execute the Beamline Enable procedure – Perform roles assigned in any Beamline-specific procedures – Perform tasks related to FE commissioning	B. Lein Training Group Leader	• Train Operators	• BTMS record	Signature: Bruce Lein

* READINESS CERTIFICATION	**Paul Northrup - Lead Beamline Scientist**	**Signature:** Paul Northrup
* READINESS CERTIFICATION	**S. Sharma - Mechanical Engineering Group Leader**	**Signature:**

*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

8-BM BEAMLINE AND FRONT END

	READINESS CRITERIA	RESPONSIBLE PERSON	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
IRR PRE–START FINDINGS	**Actions Complete** All actions associated with the 8-BM Beamline and FE IRR pre-start findings are completed and the ATS Actions are closed.	J. Adams IRR Technical Authority (Beamline)	• ATS	Signature:
		F. Willeke IRR Technical Authority (FE)	• ATS	Signature:
	Actions Closed All actions associated with the 8-BM Beamline IRR pre-start findings have been verified complete and the ATS Condition is closed. (ATS Condition No. _____)	R. Lee ESH Manager	Beamline: • ATS	Signature:
	All actions associated with the 8-BM FE IRR pre-start findings have been verified complete and the ATS Condition is closed. (ATS Condition No. _____)		FE: • ATS	Signature:
	Actions Verified Actions associated with the 8-BM Beamline IRR pre-start findings have been satisfactorily completed.	E. Cheswick Independent Verifier	Beamline: • ATS	Signature:
	Actions associated with the 8-BM FE IRR pre-start findings have been satisfactorily completed.		FE: • ATS	Signature:
	No Pre-Start Findings Identified No pre-start findings have been identified by the Review Team and therefore the previous lines do not require sign-off.	R. Lee ESH Manager	• IRR Preliminary Report	Signature:
		E. Cheswick Independent Verifier	• IRR Preliminary Report	Signature:

– END –

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