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INSTRUMENT READINESS REVIEW (IRR) FOR DIAGNOSTIC/R&D BEAMLINE (CELL 22) AND THREE POLE WIGGLER TAILORED REVIEW PLAN



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

Instrument Readiness Review (IRR)
for
Diagnostic/R&D Beamline (Cell 22) and Three Pole Wiggler

Tailored Review Plan

JANUARY 27, 2017

PREPARED BY:

2/3/2017

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3/31/2017

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John Hill
NSLS-II Director
Signed by: Hill, John

By approving this plan I acknowledge the requirements set forth herein and agree with its implementation.

REVISION HISTORY

REVISION	DESCRIPTION	LIST OF REVIEWERS	DATE
1	First Issue	M. Bebon W. Cheng R. Lee T. Shaftan D. Siddons O. Singh	27JAN2016

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ACRONYMS

3PW	Three Pole Wiggler
ARR	Accelerator Readiness Review
ATS	Action Tracking System
ESH	Environment, Safety & Health
IRP	Instrument Readiness Plan
IRR	Instrument Readiness Review
NSLS-II	National Synchrotron Light Source II
R&D	Research & Development
RSC	Radiation Safety Committee
SME	Subject Matter Expert

1.0 INTRODUCTION

Processes for performing Accelerator Readiness Reviews (ARRs) and Instrument Readiness Reviews (IRRs) have been established and exercised for transitioning the NSLS-II from construction and installation to readiness for Routine Operation for the accelerators and for commissioning of the beamlines. These processes include the NSLS-II procedure for performing IRRs (PS-C-ESH-PRC-001) and the Accelerator Safety Subject Area requirements for Accelerator Readiness Reviews. The purpose of this document is to outline the processes needed to manage the IRR for the Cell 22 three pole wiggler (3PW) Diagnostic/R&D Beamline.

The wiggler source for this instrument is identical to the devices operating at Cell 17 and Cell 11. At Cell 22, however, there are no standard front end components. Light from the wiggler is directed to several optical tables within the storage ring enclosure and is terminated within that enclosure; there is no ratchet wall penetration. This presents a unique circumstance for the configuration and operation of this beamline. With no User program and no equipment on the experiment floor side of the accelerator enclosure, risk to personnel is reduced from that presented through operation of a more standard beamline. Safe operation of this instrument can be accomplished with minimal change to the existing shielding configuration and with no impact to the PPS configuration. The standard set of readiness criteria can be modified to focus on analysis and control of radiation scatter that can penetrate the storage ring enclosure to areas that personnel can access, conventional safety items, and on assurance that adequate staffing is identified.

2.0 REVIEW PROCESS TAILORING AUTHORITY

The *NSLS-II Process Description: Review Process for Facility Additions and Modifications* (PS-C-CMD-PLN-001) provides the basis for tailoring the review process for an NSLS-II facility addition or modification project and identifies the NSLS-II Director as the approval authority. The process description allows the Cognizant Scientist or Engineer, or the Project Manager, to propose a tailored review process to the NSLS-II Director for approval. Once approved, the tailored review process is documented and used for the project or the remaining activities under the project.

3.0 TAILORED REVIEW READINESS SCOPE

Scope for Pinhole Diagnostic Beamline:

The Cell 22, 3PW diagnostic beamline will utilize the 3PW radiation to measure emittance and energy spread. The whole diagnostic beamline resides inside the storage ring tunnel.

A 0.5 mm thick diamond window separates the storage ring vacuum and beamline vacuum, with aperture of 1mm x 5mm (HxV). The window is water cooled and has been installed since 2014. A low vacuum extension pipe has been installed to the optical table with a 75 micron diamond window at the end. A glidcop mask is installed upstream to protect the diamond window flanges. A pinhole assembly from tungsten bars will be installed with varies pinhole sizes. The whole pinhole assembly is mounted on the motion stage and it can be fully retracted to allow the full x-ray fan passing through for the R&D beamline. The imaging system consists of an x-ray scintillator, lens and CCD camera, which will be installed at the upstream optical table. An aluminum filter with varying thickness is located upstream of the imaging system to adjust the x-ray photon intensity and energy. Proper shielding around the imaging system will minimize the radiation damage to the equipment.

Scope for R&D Beamline:

The detector development R&D program will be performed on the second, larger optical table mounted downstream of the diagnostics endstation. It will be used whenever the diagnostic equipment is removed from the beam path. The initial setup will consist of a motorized X-Y slit to control the beam profile at the experiment, followed by a fluorescent screen, which will be monitored by a TV camera. Subsequent developments will add an air-cooled monochromator and a large X-Y translation stage for manipulating the device under test. Provision will be made to install a large vertical plate at the upstream end of the table in order to provide a shadowed area around the detector. The concern is that the radiation levels in the area around the table are too high for measurements to work. The shield will be installed if initial tests show that the area is too harsh for the tests to be meaningful without it. No further shielding around the optical table is anticipated.

4.0 TAILORED REVIEW READINESS PROCESS

As described in the *NSLS-II Process Description: Review Process for Facility Additions and Modifications* this Tailored Review Plan has been prepared for determination of NSLS-II readiness for the Cell 22 3PW Diagnostic/R&D Beamline.

Analysis of the risks indicates that readiness to begin technical commissioning at Cell 22 is best managed through development of an Instrument Readiness Plan (IRP). The IRP will provide specifics for the items listed below.

- Gas Bremsstrahlung and Maximum Synchrotron fan ray traces to identify needed Radiation Safety Components
- A Configuration Control Plan for required Radiation Safety Component changes
- A Radiation Survey Plan to define the tasks required to assure control of radiation scatter in areas accessible to personnel
- A Commissioning Plan to define the tasks required for safe start-up operation of the three pole wiggler
- Design review for:
 - Vacuum window assembly
 - Water cooled mask assembly
- Walkthrough inspection to focus on installation; mechanical assembly, electrical power distribution, utilities (water/air)
- Beamline Staffing Plan

5.0 REVIEW TEAM CHARGE

NSLS-II ESH Staff will manage the review and coordinate with the NSLS-II Radiation Safety Committee (RSC) and ESH Subject Matter Experts (SMEs) to assure a comprehensive IRR. The Review Team will be charged to interview personnel, review documents and inspect installed equipment. The Review Team will verify systems readiness and identify findings to be managed within the NSLS-II Family Action Tracking System (ATS). A final, written report will be generated to document review specifics and findings.

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