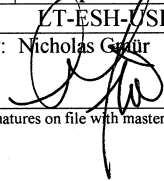
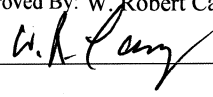
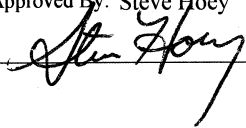


The only official copy of this file is the one on-line in the Photon Sciences website. Before using a printed copy, verify that it is the most current version by checking the document issue date on the PS website.

Brookhaven National Laboratory/ Photon Sciences Directorate

Subject:	NSLS-II USI #2 – Linac Radiation Interlock Testing and Radiation Monitor Calibration Frequencies		
Number:	LT-ESH-USI-002	Version:	1
Effective:	08Dec2011	Pages 1 - 6	
Prepared By:	Nicholas Gmür	Approved By:	W. Robert Casey
			
		Approved By:	Steve Hoey
			

*Approval signatures on file with master copy.

VERSION	DESCRIPTION OF ANY CHANGES	DATE	PREPARER	APPROVED BY
1	Original document	08Dec2011	Nicholas Gmür	See signatures above

NSLS-II Unreviewed Safety Issue #2

**NSLS-II Linac Radiation Interlock Testing
And
Radiation Monitor Calibration Frequencies**

EMS, FUA and SAD/ASE Checklist for Photon Sources Directorate Reviews

(Photon Sources Directorate ES&H personnel and the Environmental Compliance Representative can assist in completing this form)

Review Committee: Laboratory ESH Committee

Date: 08Dec2011

Project Name (and # if any): NSLS-II USI #2

This checklist identifies issues associated with this project that may impact the Directorate Environmental Management System, Occupational Health & Safety Management System, Facility Use Agreements, Safety Assessment Documents & Accelerator Safety Envelopes, and NEPA documents. This checklist will be completed during a review process, if needed, and form part of the documentation of that review.

SIGNIFICANT ENVIRONMENTAL ASPECTS ASSOCIATED WITH THIS PROJECT:

Check off any environmental aspects that are associated with this project ([Photon Sciences Directorate Environmental Management System aspects matrices](#) show the significant aspects).

For criteria, go to the SBMS Subject Area titled [Identification of Environmental Aspects and Impacts](#)

<input type="checkbox"/>	Industrial Waste Generation	<input type="checkbox"/>	Work with Engineered Nanomaterials	<input type="checkbox"/>	Power Consumption	<input type="checkbox"/>	Historical Contamination (groundwater, soil)
<input type="checkbox"/>	Hazardous Waste Generation	<input type="checkbox"/>	Atmospheric Emissions	<input type="checkbox"/>	Engineered Nanomaterials	<input type="checkbox"/>	Soil Activation
<input type="checkbox"/>	Radioactive Waste Generation	<input type="checkbox"/>	Liquid Effluents	<input type="checkbox"/>	Historical Monuments/Cultural Resources	<input type="checkbox"/>	Transuranic Waste Generation
<input type="checkbox"/>	Mixed Waste Generation	<input type="checkbox"/>	Storage or Use of Chemicals or Radioactive Materials*	<input type="checkbox"/>	Sensitive/Endangered Species and Sensitive Habitats (including Pine Barrens)	<input type="checkbox"/>	Other Regulatory Requirements - recycling
<input type="checkbox"/>	Medical Waste Generation	<input type="checkbox"/>	Water Consumption	<input type="checkbox"/>	Environmental Noise	<input type="checkbox"/>	NONE

*Art 12 registered area, spill potential, transportation of hazmat or rad, backflow devices, PCBs.

Any environmental aspects new to the Photon Sciences Directorate: Y or N? Any aspects associated with new activities: Y or N? If yes, describe below and issue a memo to the appropriate Photon Sciences Directorate ESH Manager:

APPLICABLE REGULATORY REQUIREMENTS:

Check off any BNL [Subject Areas](#) that are applicable to this process:

Note: PI's should consider subscribing to the Subject Area Subscription Service as a means of staying informed of changes to the Subject Area requirements.

<input type="checkbox"/>	Drinking Water	<input type="checkbox"/>	Radioactive Waste Management
<input type="checkbox"/>	Environmental Monitoring	<input type="checkbox"/>	Regulated Medical Waste Management
<input type="checkbox"/>	Hazardous Waste Management	<input type="checkbox"/>	Spill Response
<input type="checkbox"/>	Liquid Effluents	<input type="checkbox"/>	Storage and Transfer of Hazardous & Non-hazardous Materials
<input type="checkbox"/>	Mixed Waste Management	<input type="checkbox"/>	Transfer of Hazardous or Radioactive Materials On-Site
<input type="checkbox"/>	National Environmental Policy Act (NEPA) and Cultural Resource Evaluation	<input type="checkbox"/>	Transport of Hazardous or Radioactive Materials Off-Site
<input type="checkbox"/>	Non-Radioactive Airborne Emissions	<input type="checkbox"/>	Underground Injection Control
<input type="checkbox"/>	PCB Management	<input type="checkbox"/>	Regulated Industrial Waste Management
<input type="checkbox"/>	Pollution Prevention and Waste Minimization	<input type="checkbox"/>	Working with Nanomaterials ES&H
<input type="checkbox"/>	Radioactive Airborne Emissions	<input type="checkbox"/>	None

Facility Use Agreement (FUA)

Answer “Yes” or “No” for each category below.

Category	Applicable		Elements and Details
	Yes	No	
Radiological Source Terms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See FUA Table 4.1.1 for details.
Chemical, Toxic, Biological & Hazardous Source Terms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	See FUA Table 4.1.2 for details.
Physical Source Terms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	See FUA Table 4.1.3 for details.

If yes, do any terms require an update to the FUA: Y or N? If yes, describe below and issue a memo to the appropriate Photon Sciences Directorate ESH Manager: **Note: The FUA for building 740 will be written once construction has been completed. Radiological information would be included at that time.**

Safety Assessment Document (SAD)/Accelerator Safety Envelope (ASE)

Does this project include components that exceed or are not included in the safety boundaries described in the SAD or the ASE: Y or N? If yes, describe below and issue a memo to the appropriate Photon Sciences Directorate ESH Manager: **Activities that may increase the level of a known hazard or may introduce a new type of hazard not examined in a Safety Assessment Document, and therefore may impact the items below must be evaluated through the PSD USI determination process:**

- **Radiation monitoring for personnel protection**

Job/Facility Risk Assessments (JRA/FRA)

Does this project include components that exceed or are not included in the jobs, hazards, controls or risks described in the JRA/FRAs: Y or N? If yes, describe below and issue a memo to the appropriate Photon Sciences Directorate ESH Manager:

NSLS-II Unreviewed Safety Issue #2

NSLS-II Linac Radiation Interlock Testing And Radiation Monitor Calibration Frequencies

Introduction

This document is prepared as an addendum to the existing National Synchrotron Light Source II (NSLS-II) Linac Commissioning Safety Assessment Document (LCSAD); dated May 11, 2011. It discusses referring to the BNL Standards Based Management System (SBMS) and Radiological Control Manual (RCM) requirements for radiation interlock testing and monitor calibration frequencies instead of listing very specific time intervals which the LCSAD currently does. This change is analyzed as an Un-reviewed Safety Issue (USI) as defined in DOE Order 420.2C, *Accelerator Safety*.

Executive Summary

A NSLS-II Linac is being constructed as part of the injection system for the new NSLS-II Storage Ring. The LCSAD currently lists the required testing and calibration time intervals in months for radiation interlocks and for radiation monitors, respectively. The Brookhaven National Laboratory (BNL) Radiological Control Division (RCD) Health Physicist has recommended that the LCSAD be changed, eliminating the specific testing and calibration time intervals, and stating instead that the requirements stated in the BNL SBMS and RCM will be followed. This would maintain the necessary controls required during Linac commissioning and would make the LCSAD a simpler document by referring to SBMS.

The safety impact of using SBMS and the RCM is outlined below. It is concluded that this change can be used without impacting the safety basis of commissioning the NSLS-II Linac. The NSLS-II Linac Commissioning Accelerator Safety Envelope (LCASE) has already incorporated this change as part of a November 14, 2011 review by the Laboratory ESH Committee review.

Discussion

A Linac is being constructed for NSLS-II. It will form the first part of a two-part injection system (includes a Booster) for the new NSLS-II electron Storage Ring. NSLS-II LCSAD (dated May 11, 2011) document has been prepared and has been approved by the Department of Energy Brookhaven Office.

Once the Linac has been constructed, it must undergo a period of commissioning to assure that it meets its technical specifications and is ready to inject bunches of electrons into the NSLS-II Booster whose own commissioning will follow that of the Linac. The commissioning effort requires that the Personal Protection System (radiation safety interlocks) be tested, and that the radiation monitors be calibrated.

Section 4.15.3.2.1 of the LCSAD states:

The [radiation interlock] certification must be repeated following any work on the system which might compromise protective function or at time intervals not to exceed 6 months since the previous test. With the consent of the Manager of the BNL Radiological Control Division, the time interval between tests may be extended to 8 months if the Linac operating schedule did not permit testing within the previous 6 month schedule (SBMS Electrical Safety subject area, Section 6 Interlock Safety for Personnel, sub-section D4) . Failure analyses of PPS systems has demonstrated a failure rate of less than 1 in 10^6 for 6 and 12 month testing periods, therefore an extension to 8 months would fall into this low failure rate (Sys-Tech Solutions, Evaluation of Safety Interlock Integrity – National Synchrotron Light Source II, Brookhaven National Laboratory, April 29, 2010, Rev. B).

And, Section 4.15.3.2.2 of the LCSAD states:

The response of the interlocked radiation detectors must be confirmed by qualified personnel using approved calibration procedures. In addition, these area monitors must be calibrated before initial use and at regular 12 month intervals. This program must be documented.

The above two Credited Controls are restated in LCSAD section 5.4.

On November 30, 2011, a discussion took place between the RCD Health Physicist and members of the NSLS-II ESH staff. The Health Physicist pointed out the following:

- a) The RCM requires that the radiation interlocks for accelerators operating fulltime be tested every 12 months (see quote below).
- b) The RCM requires that radiation monitors be tested every 12 months (see quote below).
- c) Therefore, if the RCM states these requirements, there is no need for a SAD or an ASE to repeat these requirements. They should instead state that the requirements specified by the RCM will be followed.
- d) The additional benefit to this is that if the RCM requirements change, the SAD and ASE remain current.
- e) The Health Physicist recommended that the NSLS-II SAD and ASE wording be changed accordingly. NSLS-II personnel agreed.

RCM Appendix 3A:

4. Area Interlock Requirements for High Radiation Areas >5 rem/hr:
 - b. An interlock system shall not be used to provide protection unless it has been tested within the interval specified below....

- For the accelerators, accumulators and beamlines that have an annual running period and a shutdown period, a rigorous functional test of all components shall take place within an interval of 12 months.

NOTE: Exemptions from these testing requirements may be requested from the Manager, Radiological Control Division.

RCM Section 516 Area Monitoring

A. Guidance

1. The calibration frequency of instruments used should be annually or according to the manufacturer's suggested schedule.

Conclusion

Use of SBMS and the RCM for radiation interlock testing and radiation monitor calibration interval requirements during Linac commissioning presents no impact to the Linac facility safety basis (LCSAD). These changes have already been incorporated into the LCASE.