PHOTON SCIENCE at STANFORD LINEAR ACCELERATOR CENTER

LUSI LCLS Ultrafast Science Instruments

DESIGN REVIEW REPORT	Report No. TR-391-003-16-0

The Design Review Report Shall include at a minimum:

- The title of the item or system;
- A description of the item;
- Design Review Report Number;
- The type of design review;
- The date of the review;
- The names of the presenters
- The names, institutions and department of the reviewers
- The names of all the attendees (attach sign-in sheet)
- Completed Design Checklist.
- Findings/List of Action Items – these are items that require formal action and closure in writing for the review to be approved. See SLAC Document AP-391-000-59 for LUSI Design Review Guidelines.
- Concerns – these are comments that require action by the design/engineering team, but a response is not required to approve the review
- Observations – these are general comments and require no response

TYPE OF REVIEW: Preliminary Design Review

WBS: 1.5 Diagnostics Common Optics

Title of the Review	Intensity Position Monitor Preliminary Design Review	
Presented By:	Yiping Feng, Tim Montagne	
Report Prepared By:	Scott DeBarger	**Date:**19 Jan 2009
Reviewers/Lab :	Scott DeBarger (SLAC) Rob Duarte (LBL) Jim Peck (SLAC) Bill White (SLAC),	
Distribution:		
Attachments:	☐Review Slides ☐Design Checklist ☐Calculations ☐Other	

Purpose/Goal of the Review:

- Assess the completeness of physics and engineering requirements for the Intensity Position Monitor.
- Review the preliminary design of the Intensity Position Monitor and evaluate how well it meets the requirements
- Review the interfaces that have been identified and how well they have been communicated to the relevant parties (includes controls and software interfaces, safety review committees, instrument design teams)
- Assess plans for fabrication, assembly, testing and inspection, and maintenance
- Review the cost estimate and schedule.
- Identify high-risk elements and evaluate plans to mitigate the risk.

Comment on whether the component design is ready to proceed to final design

Introduction and outcome summary of the review:
The presented design for the Intensity Position Monitor appears to satisfy the stated need to measure X-ray beam intensity and position to a high level of precision over a large of incident beam intensities.

The mechanical design is economical in its use of space while permitting appropriate *in situ* disassembly for servicing of in-vacuum components.

The review committee feels that the presented preliminary design is sound and should be advanced to the Final Design Review level.

Findings/Action Items:
Exact conductor counts and connector styles for the vacuum feedthroughs were not specified. This needs to be done before the feedthroughs are procured.

Concerns:
The presented detector array was shown, in simulations, to accurately measure to variations in beam position in X or Y. It is unclear that the same is true of variations at an arbitrary angle. A study of response to beam motion at a 45 degree angle should be performed.

Observations:
<u>General</u>
The presented specification calls for wavefront distortion to be minimized "to the extent possible." Quantifying the allowable wavefront distortion based on the operational requirements of the device will permit the design team to ascertain their success in meeting this requirement.

The foil material will subjected to cyclic thermal loading as each light pulse strikes the foil. Fatigue of the foil material over the anticipated life of the instrument should be investigated.

The details of the manner in which the Be screen will be held need to be developed.

The device has been designed to be economical of beamline space and to permit installation in multiple locations. The specific installation locations should be checked to ensure that bolts can be loaded into the vacuum flanges for the specific combination of devices at that location.

The Intensity Position Monitor is expected to be installed in locations where there are additional beamlines in close proximity to the installed device. If components from these beamlines are close in X to the Intensity Position Monitor, access for service of the in-vacuum components may be compromised.

The difficulty of removal of the diode actuator will affect operations to service the diode. As presented the diode actuator is offset from the path of the photons through the instrument. Moving the diode actuator onto the photon path may ease removal of the actuator. Removal of the entire top of the vacuum chamber may also be a design option worth exploring.

A general plan for prototyping and testing was presented. Consideration should be given to adding tests of the first articles with the LCLS photon beam (possibly in the FEE, Hutch 3, or XTOD areas).

Procurement of beryllium material for the scattering foil may be a long lead item. Procurement of the material should be pursued aggressively.

Response to Findings/Action Items:

Exact conductor counts and connector styles for the vacuum feedthroughs were not specified. This needs to be done before the feedthroughs are procured.
Response: Based on conversations with the controls group, a standard 16 pin D connector will be used for the vacuum feedtrhoughs. This will be sufficient for all the signal and grounding signals.