Responses to LUSI Lehman Review Recommendations and Comments for CD-2 August 19-21, 2008 Revised April, 2008

	ID	XPP Recommendations	RESPONSES	POST CD-2 ACTIONS UPDATE 2 (APRIL-09)
		1. Revisit, prior to CD-2, the contingency analysis on the XPP detector in		We have reviewed and updated the complete resource-loaded schedule for
	CD2-R1.2-1	light of recent experience of comparable DOE 413 detector development projects.	The contingency analysis for the XPP detector has been revisited and we believe that the contingency is adequate for the XPP detector.	the XPP Detector contingency to include 10% contingency on all remaining XPP detector work
		 Carefully consider, prior to CD-2, the 120 Hz readout rate as a CD-4 deliverable, recognizing that scientific objectives could be achieved at a lower rate. 	The LUSI Project has decided that a 30 Hz readout rate is sufficient for CD-4; the PEP has been revised to reflect this decision.	
		 Evaluate, prior to CD-3, if the baseline XPP instrumentation is sufficient to find pump-probe to overlap efficiently, and consider adding missing capability at an early stage. 	to efficiently find pump-probe overlap.	Released a technical note to analyze the performance of a coarse timing monitor. A BCR was performed to upgrade the fast oscilloscope to 20 GHz. This change significantly enhances the XPP capability to efficiently find pump-probe overlap.
		4. Explore, prior to CD-3, engineering modular sample environments (XPP wouldn't have to <i>provide</i> the environment, just the design) and give high priority to the restoration of sample exchange to the project as funds permit.	There will be coordination with LCLS operations to develop plans for typical sample environment equipment. If the LUSI budget permits, and the Technical Configuration Control Committee agreees, LUSI could provide some sample environment equipment.	LUSI has provided LCLS with suggestions for standard sample environments. LUSI will be coordinating its contingency usage with LCLS OPS to provide a sample environment
.2	CD2-R1.2-5	5. Maintain the benefit of common optics, common controls, common detectors,, through oversight of senior LCLS/LUSI staff.	LUSI agrees and value engineering practices will be implemented to standardize as many components as possible	Re-evaluation of the diagnostics and optics component designs have been made since CD-2. We believe substantial progress in value engineering and standardization have been made.
		XPP Comments		
S	-	XPP, as the first LUSI instrument scheduled to be completed, is under		
WBS		particular pressure to balance "early science" against "efficiency". We encourage LUSI to consider:		
	CD2-C1.2-1	1. Benefits to the XPP user program of restoration of de-scoped sample environment apparatus as funds permit	An overall plan for providing standard sample environment equipment for LCLS experiments will be looked at by LCLS operations. LUSI will also consider including sample environment equipment as added scope if the project burder to them.	LUSI has provided LCLS with suggestions for standard sample environments. LUSI will be coordinating its contingency usage with LCLS OPS provided sample environment
	CD2-C1.2-2	2. Benefits to the XPP user program of restoration of de-scoped SAXS capability as funds permit	project budget allows. This will be an agenda item for the October, 2008 meeting of the XPP Team Leaders	Scope priorities were reviewed and updated, based on user input at the October meeting
	CD2-C1.2-3	3. Any other ways where minor investments can have long-term benefits in XPP efficiency	This will also be an agenda item for the October, 2008 meeting of the XPP Team Leaders	See action update to CD2-R1.2-3
		Integration of the scientific team leaders is critical to LUSI/LCLS success. We encourage LUSI to:		
	CD2-C1.2-4	1. find ways to enhance the integration of team leaders in the LUSI project	A Team Leader meeting is scheduled for October, 2008. This will be discussed. LUSI is also looking at what is done at SNS and NSLS II. LUSI will be developing an MOU/Charter for the team leaders to better define the Team Leaders roles and responsibilities. The Team Leaders will be invited to all relevant reviews, FAC and Lehman reviews	LCLS has sought information on the role of Instrument Teams at SNS and NSLS-II.
		CXI Recommendations		
	CD2-R1.3-1	1. A KB mirror manipulator should be designed for the 1.0 micron system and it should be reviewed. This should be done before CD-4.	This is what is in the LUSI plans. The plans for the mechanical support design contract were reviewed during the advanced procurement technical review for the mirror system on October 8, 2008	
	CD2-R1.3-2		design contract were reviewed during the advanced procurement technical	Information on materials damage will be gathered in the early phases of LCLS operations.
	CD2-R1.3-2	and it should be reviewed. This should be done before CD-4. 2. Plans for calculations and simulations for the KB mirrors that incorporate lessons-learned from mirrors put in the front-end should be treated more	design contract were reviewed during the advanced procurement technical review for the mirror system on October 8, 2008 LUSI is using the same assumptions as LCLS in their damage calculations, which are based on the comparison of limited results from FLASH with computer simulations. The LUSI group has informal collaborations with the LLNL group to perform early damage experiments at LCLS and compare with the LLNL damage models. The error bars in the calculations are large and only experiments can truly verify the radiation resistance of materials.	
	CD2-R1.3-2 CD2-R1.3-3	and it should be reviewed. This should be done before CD-4. 2. Plans for calculations and simulations for the KB mirrors that incorporate lessons-learned from mirrors put in the front-end should be treated more formally. 3. A single individual should take the KB mirror systems as their responsibility and be the contact point with the vendor and for possible	design contract were reviewed during the advanced procurement technical review for the mirror system on October 8, 2008 LUSI is using the same assumptions as LCLS in their damage calculations, which are based on the comparison of limited results from FLASH with computer simulations. The LUSI group has informal collaborations with the LLNL group to perform early damage experiments at LCLS and compare with the LLNL damage models. The error bars in the calculations are large and only experiments can truly verify the radiation resistance of materials. LUSI cannot be formally be involved in experiments. This is part of the job definition of the CXI Instrument Scientist and he has been and will continue to be the point of contact for both of these aspects. The density of particles delivered to the beam by the particle injector is sample dependent and therefore no numbers can be given as a specification. Also, the reproducibility of samples is dependent on the samples and is a research project of its own and no specification can be given. We have schemes to characterize the target beam such as charge	
	CD2-R1.3-2 CD2-R1.3-3 CD2-R1.3-4	and it should be reviewed. This should be done before CD-4. 2. Plans for calculations and simulations for the KB mirrors that incorporate lessons-learned from mirrors put in the front-end should be treated more formally. 3. A single individual should take the KB mirror systems as their responsibility and be the contact point with the vendor and for possible radiation damage related simulations. Quantify the specifications of the target injector such as the sample density	design contract were reviewed during the advanced procurement technical review for the mirror system on October 8, 2008 LUSI is using the same assumptions as LCLS in their damage calculations, which are based on the comparison of limited results from FLASH with computer simulations. The LUSI group has informal collaborations with the LLNL group to perform early damage experiments at LCLS and compare with the LLNL damage models. The error bars in the calculations are large and only experiments can truly verify the radiation resistance of materials. LUSI cannot be formally be involved in experiments. This is part of the job definition of the CXI Instrument Scientist and he has been and will continue to be the point of contact for both of these aspects. The density of particles delivered to the beam by the particle injector is sample dependent and therefore no numbers can be given as a specification. Also, the reproducibility of samples is dependent on the samples and is a research project of its own and no specification can be given. We have schemes to characterize the target beam such as charge detectors and a particle beam viewer based on dusting the samples. Those are included in the scope of the project. Other schemes will be developed as	LCLS operations. A new particle beam characterization scheme has been developed with collaborators. It simple involved scattering of a green laser off the particle in the beam. This makes the particle beam visible and allows some measu of the density of the particle beam. This can be easily implemented in CXI

Commenta (except for KB mirrors): No comment needed CD2-C1.32 The virsuiting science appears to be only 4 years away. No comment needed CD2-C1.32 The injector will be ready for some experiments. No comment needed CD2-C1.33 The injector will be ready for some experiments. No comment needed CD2-C1.34 The reference laser is inj good shape. No comment needed CD2-C1.35 The wavefront sensor is guite important. The Diagnostics and Common- Optics comment on the wavefront sensor. No comment needed CD2-C1.35 The wavefront sensor is guite important. The Diagnostics and Common- Optics comment on the wavefront sensor. No comment needed CD2-C1.35 The wavefront sensor is guite important. The Diagnostics and Common- Optics comment on the wavefront sensor. No comment needed CD2-C1.36 Twe appears solution to form has been demonstrated by the quoted vendor, J-TEC. This is conforting. However, a demonstrated by the quoted vendor, J-TEC. This is conforting. However, a minuplator system for the mirrors designed for use at the LCLS was not demonstrated, and is a concern. No comment needed CD2-C1.34 S. Using information obtained on mirrors in the front-end is a reasonable way for the CXI team to address possible beam-induced degradation of the mirrors. However, the involvement of LLNL in simulations appears somewhat informal. The involvement and using information tobtained an m			CXI Comments		
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Strengthen and broaden outreach to and input from the User Community in the developing on MOU/Charter for the team leaders to better define the		CD2-R1.4-2	Consider including environmental control of the split-and-delay optical	Not needed for CD-2, but will be considered by the XCS team	
Team Leaders roles and responsibilities.			Strengthen and broaden outreach to and input from the User Community in beamline design and in conceiving XCS experimental programs.	be developing an MOU/Charter for the team leaders to better define the	
CD2-R1.44 Recommend proceeding to CD2. No comment needed		CD2-R1.4-4	Recommend proceeding to CD2.		

	CD2-C1.4-1	XCS Comments Development of local expertise in Split-Delay optics should be a high priority for LCLS	This is a high priority for LCLS. The LCLS Directorate is exploring ways to make this happen.		
	CD2-C1.4-2	The effect of pulse-to-pulse intensity fluctuations on the measured intensity autocorrelation needs more consideration, although it does not appear to be a serious issue	The pulse to pulse variation are not of concern to conduct successful XPCS experiments. All the variations will be turned into Intensity fluctuations using various optical components (which in any case are required to conduct the experiment.) This includes, slits (i.e mitigating spatial fluctuations), monochromator (i.e. mitigating wavelength fluctuations and angular fluctuations). The use of a transmissive diagnostics right before the sample allows to precisely record the incident intensity, which will be further used for proper normalization of the experimental data (and to correct the data). More consideration will be given to the pulses to pulse intensity fluctuation		
4		The performance of the common optical elements is absolutely critical to the success of the XCS instrument.	No comment needed		
WBS 1.4	CD2 C1 4 4	More attention to coherence preservation is important, especially in surface specifications of all optical elements along the beam path.	The coherence preservation is important and is considered in the design and/or choice of every component of the XCS instrument. This is not reflected in the WBS 1.4 but rather in the Diagnostics and common optics section. The LUSI scientist have been developing simulations in order to properly account for these effect, thus allowing us to provide more accurate specifications for optical components to be purchased, while preserving at best the coherence properties of the x-ray beam. More attention will be given to coherence preservation		
		Comments from previous reviews should be addressed more carefully. More stakeholder input beyond the team leaders is highly desirable in design	These comments have been addressed		
	CD2-C1.4-6	decisions and in conceiving XCS experiments. This could be accomplished by increasing the number of Team Leaders, and by holding regularly scheduled Team Leader meetings to discuss beamline and experimental design details. It would valuable for the XCS beamline scientist to develop collaborations with XCS researchers and carry out experiment at other facilities.	A Team Leader meeting for XCS is scheduled for October, 2008. Go-forward plans will be discussed at this meeting. We will be looking at SNS/SING and NSLS II for ideas for implementing this recommendation.		
		Additional scientific and engineering personnel would be highly desirable to develop and oversee the key common optics components.	No comment needed		
		We applaud the plan to utilize common designs where possible to maximize savings.	No comment needed		
		It would be valuable for the XCS beamline scientist to develop collaborations with XCS researchers and carry out experiment at other facilities.	LUSI agrees. This will depend on funding out side of the LUSI project.		
		The design of the XCS instrument is quite mature. The development of the instrument could be accelerated if additional funding is made available.	LUSI agrees. LUSI management will continue to explore ways to make this happen with the current funding profile.	LUSI has plans to accelerate XCS.	
		Diagnostics and Common Optics Recommendations			
WBS 1.5	CD2-R1.5-1	1. Deployment of the large offset monochromator is required for practical experimental operations of the CXS beamline. X-ray optics experts including reviewers from outside the laboratory should review detailed physics specifications for the Large Offset Monochromator.	Not needed for CD-2, but this will be done as part of the established LCLS/LUSI engineering control processes. In addition, an advance procurement review will be held to review the requirements prior to placing the purchase order.	Advance procurement review of the XCS Large offset monochromator is planned for April 2009	
	CD2-R1.5-2	2. In addition, the angular stability requirements for the Large Offset Monochromator may not be obtainable at a reasonable cost with the current monochromator placement. Project management should consider reserving an alternative position near the far experiment hall for this component.		LUSI Project Management and LCLS will reserve an alternative position for the monochromator near the Far Experimental Hall.	
	CD2-R1.5-3	3. Surface roughness and microstructure of commercial Be CRLs may adversely affect beam coherence. Within the next 12 months, preliminary R&D on the commercial lenses should be a priority for the project.	Research has been done in this area. The report "Design and Microfabrication of Novel X-ray Optics II" edited by Anatoly A Snigrev and Derrick Mancini was published in the Proceedings of SPIE, Vol. 5539. The article "Beryllium parabolic refractive x-ray lenses" (B. Lengeler, et al) in that report commented on the high quality of Be lenses manufactured in Aachen as demonstrated in the excellent preservation of the lateral coherence by the parabolic refractive lenses.		
	CD2-R1.5-4	4. Recommend that Diagnostics and Common Optics proceed to CD-2.	No comment needed		
	CD2-C1.5-1	Diagnostics and Common Optics Comments	No comment needed		
	CD2-C1.5-2	2. Physics specifications are in development for the Large Offset Monochromator. Details of the engineering specifications, cost and device performance will depend critically on the choice of monochromator crystals and cut.	The monochromator is planned as a design/build contract. The physics specifications will be evaluated as a part of a focused pre-procurement technical review. The physics specifications will allow for the use of a range of crystals. The engineering design will allow for the use of different crystals. The final crystal decision will be made by the instrument scientist.		

		Controls and Data Acquisition Recommendations		
	CD2-R1.6-1	We recommend regularly scheduled meetings between the beamline scientists, diagnostics physicists and control system design engineers.	LUSI agrees and the project will schedule regular meetings including the beamline scientists, diagnostics physicists and control system design	Regularly scheduled meetings are occurring for the Cornell detector and supports. Other meetings are still on an "as-needed" basis. We will start
	CD2-R1.6-2		engineers. No comment needed	regular XPP meetings after the FIDR.
1.6		Controls and Data Acquisition Comments		
	CD2-C1.6-1	1. The design is technically sound. For the CD-2, the project's scope, attendant cost and schedule are all satisfactory for this subsection.	No comment needed	
	CD2-C1.6-2	2. The committee is pleased to see the following: The LUSI control and data system design team included expertise from	No comment needed	
WBS	CD2-C1.6-3	The project team is taking advantage of established designs from existing	No comment needed	
3	CD2-C1.6-4	120-Hz data feedback loop is prepared for beamline applications	No comment needed	
	CD2-C1.6-5	Data system concept and architecture are well developed. The test of interfaces between LUSI DAQ system and readout electronics for LUSI detectors got a good start.	No comment needed	
	CD2-C1.6-6	 Since beam diagnostics information for each experimental data set is critical on a pulse by pulse basis, it is very important to have a strong technical link between beamline scientists, diagnostics physicists and control system design engineers. 	LUSI agrees. See recommendation 1.	
		ES&H Recommendations		
	CD2-R1.1-5	1. Approve CD-2 for the LUSI project.	No comment needed	
	CD2-R1.1-4	Cost and Schedule Recommendations	No comment needed	
		Cost and Schedule Comments 1. The LUSI project plan for staffing and procurements conforms to the		
	CD2-C1.1-5	program funding profile and assumes a Continuing Resolution through	The project has started to evaluate the effect of funding scenarios on the proposed baseline. As of Sept. 29, 2008, our CD-2 baseline plan is accurate.	This effort continues. Additional complexities have been added since CD-2 due to the receipt of earlier total funding for the LUSI project.
	CD2-C1.1-6	2. The level of detail and basis behind the cost estimate are very good for the	No comment needed	
	CD2-C1.1-7	The material escalation rate of 2.3% is considered low. Although majority of vendor/catalog quotes are recent, the Project should continue to monitor market conditions and adjust as necessary	The LUSI project will continue to monitor market conditions and adjust escalation rates as necessary.	Due to the current economic conditions, LUSI would like to make early procurements. We are moving ahead as quickly as possible with the PEP- planned procurements and are also looking at ways to accelerate other procurements.
	CD2-C1.1-8	project (CD-2)	No comment needed	
	CD2-C1.1-9	5. Preliminary scope contingency consisting of the 0.1 micron K-B mirror system has been identified - estimated at ~\$1M 6. The project has yet to require the Control Account Managers to prepare	No comment needed	
1.1	CD2-C1.1-10	3. The project in spectra regime ine Control Account managers to prepare variance analysis reports. It is important that each Control Account Manager take "ownership" of their Control Accounts. Implementing variance analysis even before a performance measurement baseline is approved would assist this process.	o	Formal variance reporting is in process.
ŝ		Project Management Recommendations		
WBS	CD2-R1.1-1	1. Clarify CD-4 deliverables and coordinate structure of CD-3/CD-4	The project is clarifying CD-4 deliverables and has decided on a single CD-3 and CD-4. These changes are included in the PEP.	Action Complete
	CD2-R1.1-2	 Enhance participation of instrument team leaders in LUSI project execution 	Team leader meetings for all three instruments are scheduled for October, 2008, Go-forward plans will be discussed at these meetings. We will be looking at SNS/SING and NSLS II for ideas for implementing this recommendation. LUSI will be developing an MOU/Charter for the team leaders to better define the Team Leaders roles and responsibilities. In addition, the Team Leaders will be invited to all design reviews, FAC and Lehman reviews.	Team Leader meetings for all three instruments were conducted in October, Concurrence on the current instrument scope was received. Scope adds and subtracts were discussed. LUSI is working with the LCLS XFD Division to define the Team Leader roles as we move into operation. We are also cooperating on involving the expanded user community in future instrument decisions.
	CD2-R1.1-3	3. Approve CD-2 for LUSI project	No comment needed	
	CD2-C1.1-1	Project Management Comments	The project has clarified CD-4 deliverables. Hand-off to LCLS operations will follow the same procedures developed for the LCLS-AMO instrument. LUSI is working with LCLS Photon Operations to develop these procedures.	This effort is continuing. LUSI/LCLS coordination meetings occur every two weeks.
	CD2-C1.1-2	 Structure of CD-3 and CD-4 milestones may limit flexibility of project to respond to science needs 	The CD-3 and CD-4 milestones have been redefined. There is now only one CD-3 and one CD-4. Appropriate Level 2 milestones for instrument early science and advance procurrements are used to increase the flexibility of the project to respond to science needs.	Action Complete - although LUSI is evaluating additional L2 milestones to properly track advanced progress allowed by the ARRA funding
	CD2-C1.1-3	 Scope contingency [up or down] should be well documented and socialized with all LUSI stakeholders 	LUSI will prepare the scope contingency and it will be discussed at the Team Leader meetings in October	Scope contingency items were discussed at the October meetings. LUSI has started incorporating some of the scope adds identified as a result of these meetings.
	CD2-C1.1-4		Responses to the design review comments have been documented. Appropriate mixtures of engineering and physics participation will be included in future reviews.	We have conducted a number of design reviews since CD-2. There is formal documentation for these.