

Facility Advisory Committee Closeout

- General Comments
- Conventional Facilities
- Controls Subgroup
- Photon Subgroup
- Electron Subgroup

Management

- It is good that the LCLS Project Director is considered part of the SLAC Directorate and they meet daily
- Lower level integration and priorities associated with LCLS must be communicated and emphasized by SLAC Directorate
 - That is resource needs such as Engineering/Technical

Engaging in *Boost Phase*

- Good progress since last time
- Accommodating many aspects of the gradient
 - Good staffing increase rates
 - Good incremental progress since last FAC Meeting
- Holes exist in boost phase
 - Some items are lagging
 - Many near-critical are clear within the project
 - Involvement of graduate students in select areas (lasers, x-ray systems)

Organization

- It's no longer *baroque*, ... but we suggest you fix it
 - Lasers in photon arena (cf. Electron subgroup)
 - Controls visibility (cf. Controls subgroup)
 - Explicit coordination across all instruments

Descoping

- Be very careful before accepting irreversible changes
 - A 20 meter shorter tunnel for \$500k may be very expensive savings
- The approach to descoping seems appropriate

Progress Monitoring

- Milestone density: Is it sufficient at the lowest level?
 - Level 1 = 0.9 milestones/year
 - Level 2 = 9.0 milestones/year
 - Level 3 = 33.0 milestones/year
 - Level 4 = 51.5 milestones/year
- Increase the number of milestones at lowest control levels so that engineer (or worse physicist) estimates are not used to monitor progress
- Lower level managers should use multiple aggressive milestones in updates
- Remember: contingency, not costs are centrally controlled

Risks, Trades, and Unresolved Aspects

- Rapidly moving to CD-3b
- Project *souciometer*
(project schedule anxiety)
 - Items/subsystems in fabrication/construction = !
 - Items/subsystems in detailed design = !!
 - Items/subsystems in preliminary design = !!!
 - Items/subsystems in conceptual design = !!!!

FAC Meetings

There is no monument dedicated to the memory of a committee. -- Lester J. Pourciau

- We're not a review committee
 - You don't have to "sell" us on how good you are
 - We're here because you asked us to come
 - Need to fully exploit us (something you don't hear often)
 - Just a very few summary viewgraphs on accomplishments
 - Focus on issues that cause concern, are lagging, or in design

Future meetings

- 1 ½ day is short and so must the FAC must focus
- Spend time on those items where FAC can actually have influence
- Use FAC to highlight and concentrate on issues
- Provide FAC information on all reviews, technical and otherwise, prior to the FAC meeting
- Provide FAC members access to project website to maximize ability gain understanding before meeting
- Send responses to previous meeting far enough in advance of meeting to allow review by FAC members

A Note on Presentations

- Unless you do have a medal from the King of Sweden honoring the inventor of dynamite:
 - You must not exceed **0.5 rubbia** (1 slide/minute)
 - If you want any discussion (that's why we're here) **0.25 rubbia** maximum (0.5 slide/minute)
- Use LCLS Managers as “time cops” in sessions

Accelerator systems

- MANAGEMENT

- The committee once again recognizes the excellent accelerator team supporting LCLS
- The appointment of a Laser Group leader, and hire of an additional engineer, are welcome developments. Continued growth of the group is essential.
- Access to engineering resources may be problematic
- The Laser Group focus at this time is on the photocathode system, the Committee thinks that the Group should formally report to the electron beam systems manager
- Accelerator R&D in support of LCLS in the era of BES operations of SLAC needs to be fostered

Accelerator systems

- PHOTOINJECTOR
- Laser
 - Bill White adds to the strength of the Laser Group in broad experience with laser systems operations
 - Additional hands-on PhD level experimentalist staff is needed
 - Integration of laser systems with the accelerator systems is critical
 - One team - laser and accelerator physicists work together
 - Good to see construction of the S20 laser room beginning
 - Some concerns on ability to meet pointing stability requirements and uniformity on cathode
 - Integration of beam shaping system with Thales delivered systems should be closely coordinated with Thales
 - A consultancy agreement with Thales should be explored
 - A second laser system is highly recommended, in conjunction with a new gun test facility

Accelerator systems

- PHOTOINJECTOR
 - RF gun
 - In-house fabrication to begin soon - this should retain a high priority in obtaining necessary resources
 - A new gun test facility is important for development of this critical technology
 - Full system - including laser, cathode cleaning, beam diagnostics, ...

Accelerator systems

- GTF
 - GTF resources in FY06 may be better directed toward the LCLS injector test and commissioning phase
 - A new location for a gun test facility should be found

Accelerator systems

- LINAC
 - CSR measurement and bunch length feedback systems are essential to successful operation of the facility
 - The level of conceptualization, planning and execution of this critical diagnostic are inadequate for this stage of the LCLS Project
 - A remediation plan should be initiated immediately and include experience from other facilities
 - Additional mechanical engineering resources are needed in several areas to meet the installation schedule
 - An additional LLRF systems review should be held within ~month

Accelerator systems

- FEL PHYSICS
 - Good studies of trajectory tolerances
 - Good studies of tolerances to understand FEL output sensitivity
 - Temperature stability in the undulator hall now $\pm 0.5^\circ\text{C}$

Accelerator systems

- **UNDULATOR**

- Good progress with undulator systems
- Vacuum chamber fabrication is critical: concerns
 - Weld permeability
 - Al coating adhesion during forming
 - Surface roughness
- Details of quadrupole support need to be developed
- The committee would like to see proposals for fast beam loss monitoring systems for undulator protection

- **ALIGNMENT**

- The various alignment proposals (BBA, stretched wire, scanning wire, HLS, photon-beam based) need to be re-examined in the context of an overall alignment strategy
 - The committee would like to see a scheme for using these redundant systems

FAC Conventional Facilities Subcommittee Report

H. Carter, A. Chargin, G. Kugler, K. Schuh

Conventional Facilities Subcommittee Report: Charge for this Review

- Consider responses to last (the April 2005 FAC) Review
- Consider the planned/proposed scope changes to accommodate the conventional facilities costs

Conventional Facilities Subcommittee Report: Responses to Last Review

- The subcommittee was pleased to see that our recommendations from the April 2005 FAC Report have been satisfactorily addressed.

- Areas of Priority were:

- Undulator tunnel design for stability and long term creep
- Undulator tunnel temperature stability
- LCLS Construction Safety Program: Program established
- Construction Management: award of contract for CM/GC as soon as possible (resolved)
- Jacobs Design Management turnover issue (under control but still an LCLS management concern)

Workable CF solutions were not apparent

Conventional Facilities Subcommittee Report: Responses to last review (cont.)

- April 2005 General Comments topics were:
 - Conventional Facilities Project Start
 - Interaction with DOE/EPA
 - w/re UBC1997 as relevant code (resolved) and
 - Existing FONSI [Finding of no significant impact] determination (resolution in progress)
 - Contingency and Schedule: contingency appeared adequate and schedule aggressive but doable
 - HVAC and Vibration
 - Far Hall Layout: finalize design (accomplished)

Conventional Facilities Subcommittee Report: Planned/proposed scope changes to accomodate the conventional facilities costs

CF Descoping Plan:

- Conventional Facilities Spreadsheet developed addressing ~60 items in the following areas
 - Tunneling
 - Architectural, Structural, General
 - Mechanical
 - Electrical
- All cost savings are based on Title II numbers
- Total savings by adopting (LCLS/SLAC mgmt.) approved items ~\$11M

Conventional Facilities Subcommittee Report: Findings

- Require Turner to resolve contract issues before each contract closeout
- Incentives based on BOD need to be explicitly defined
- The LCLS ES&H Plan has a few problems that need to be resolved
- Contingency and schedule: Title I cost estimates for CF now appear to be low based upon later estimates and actual bids.
- Descoping is planned to accommodate escalating CF costs. The proposed descoping plan is commendable and appropriate in order to increase contingency

Conventional Facilities Subcommittee Report: Recommendations

- Require Turner to resolve contract issues before each contract closeout
- Incentives based on BOD need to be explicitly defined
- Complete FONSI review for continued validity with CF design changes. Revise and resubmit for approval if necessary.
- Rewrite ES&H Plan. Do a flow through test of the document when finished
- Review cost data

Controls

Tom Himel

Karen White

Controls

- Excellent progress
 - Many issues addressed
 - Strong technical team
 - Good use of standards
 - SLC aware IOC functional

Issues

- Database – late start may impact reach
- SLC Integration – need to set SLC devices from EPICS side
- PPS – need approval for PLC technology
- MPS – late start* BPMs – tight schedule
- Management – going well – need to plan for transition to new leader
- Process – ensure reviews are documented

*Bob & Tom have a nickel riding on this one



Future

- Would like to see network layout and cyber security plans for next time

X-Ray Subgroup Summary
Facilities Advisory Committee
October 28, 2005

Josef Feldhaus

Paul Fuoss

Tom Rabedeau

Roger Falcone

Thomas Tschentscher

Pete Siddons (resigned)

Discussions

- LCLS/LUSI Experiments - John Arthur
 - Much progress in communicating with experimental groups
 - Hutch layouts and assignments have been finalized
 - Shorten tunnel to save 0.5M
 - No flipper mirrors
- XTOD Layout and Diagnostic Systems - Donn McMahon
 - The team is fully staffed
 - Modeled beam transport system
 - Presented conceptual slit design
 - Presented new FEE layout with expanded space
 - Solid attenuator
- Gas Attenuator - Stewart Shen
- X-Ray GB Separation Periscope - Michael Pivovarovoff
 - Preserving beam brightness and full coherence isn't possible with current technology
 - Deformation of mirrors in gravity needs to be studied
 - Science driven requirements need to be developed
- X-Ray Diagnostics - Rich Bionta
 - Preliminary data from damage studies from VUV-FEL
 - Cryogenic bolometer probably won't survive FEL beam
- X-Ray Detectors - Stefan Moeller
 - MOU's have been signed for PIXEL detector and BNL SSD detector
 - MOU almost done for streak camera
- Experimental Area Conventional Facilities - Stefan Moeller
 - Detailed layouts of both halls seem good
 - X-ray experimental systems is gaining staff

Concerns from April

- Per shot beam characterization.
 - Each pulse needs to be characterized nondestructively if single shot experiments are being performed.
 - May cause large computational and/or network demands
- Diagnostics to detect low-gain FEL beam
- Mirror optics
 - Coherence preservation
 - Angular stability
 - Degradation from high energy photons and particles
 - Degradation from high peak fluxes
 - Overall layout
- Layout of optics and experiments in FEE and NEH
 - Is space being used efficiently (FEE)?
 - Experiment in NEHH#1 pressures FEE
 - Poor coordination between affected parties (recent hire may improve this)
- Design of FEH hutch layout
 - Straight through beam capability
- Concepts rapidly changing

New Concerns

- Descoping process
 - Movement of the FEH upstream.
 - Removal of flipper mirror
 - Willingness to make irreversible decisions in the process
 - Not clear that all of the dependencies are being considered
- Improve the link between physics requirements to engineering design
- Coordination of design information flow from scientists to designers
 - Basically all information goes through John Arthur who is overcommitted

Prior Recommendations

- Efforts of the x-ray group should focus on problems which are unique to LCLS
- Hutch layout
 - All hutch and assembly areas should have same height
 - Favor “Stephenson” staggered hutch arrangement
 - Ensure that on-axis hutch has provision for “white” beam
- Optics (mirror) design
 - Preserve option for straight through beam operation
 - Deal with personnel protection issues now, don’t assume they will become easier later (PLC for PPS maybe a problem)
 - Investigate long-term damage to mirror and impact on coherence preservation
 - Include stability and alignment issues in design
 - Generate holistic design that preserves future flexibility
- DESIGN a revised beam transport, optics and hutch layout
 - publicize it
 - get buy-in from experimental groups
 - make decision

New Recommendations

- Don't move FEH to save 500K
 - There may be design considerations that lead to it moving
- Include flipper mirrors
 - There is no need to build all three hutches in FEH if flipper mirrors are not included in the plan
- Improve reliability and efficiency link between the science driven requirements and the engineering product.
- Engineer for cost effectiveness.
- **Focus NOW on mirror system performance requirements and how to achieve them!**