Facility Advisory Committee (FAC) General Aspects Closeout

You shouldn't overspend at the moment. Frugality is important.

– Fortune from cookie given to John Galayda's table at Chef Chu's 12 October 2006

LCLS Facility Advisory Committee

12, 13 October 2006

General Observations

- Continued strong interaction between LCLS Project and FAC
  - Quality of interaction remains high
- Like the Project, the FAC is disappointed to see the CLOC stopped, but understands the necessity
  - Mitigation strategies being pursued are appropriate
  - If contingency in Conventional Facilities can be liberated perhaps a *WRISTWATCH* instead of a CLOC (see CF)
- Significant progress in integration and installation preparedness is in evidence

General Observations

- Safety
  - Take stronger credit for what has been achieved by the Project
  - Some concerns on process on procedure lapse

General Observations

- The FAC concentration on I^5 essential and beneficial
  - Strong progress in many aspects
  - Project beginning to evolve focus
  - FAC not convinced that integration/installation wholly in control
- It is always gratifying to see that the Project occasionally listens
  - Risk Registry

Schedule

- The schedule will only get tighter as time goes on
- Delays are a source of concern
- Installation schedule may not be under control
- Rigorous, meticulous, and *dogged* attention to details, schedules *inch-pebbles* is absolutely essential
- A day of float should only grudgingly be surrendered
- Too many people view float time as an available buffer
- Drive to an early finish in hopes of not having a too late finish
- *Just in time* items are disconcerting

General Comments

- Organization
  – from Baroque to Avant Garde
  - The additions and changes to the Project structure strengthen and focus
  - The Integration Management Team (IMT) is an innovative and effective solution
  - Clarity of roles and responsibilities must be strengthened before Lehman
- Communication appears generally strong, but with fluctuations
- Biggest continued risk – things falling through the cracks
  - Trading scope without full concurrence
  - Moving items off project
- As was stated last time:
  “Don’t bank on any spare contingency left over”

From a Complete Facility Standpoint:

- Schedule
  - Move to the LEFT not the RIGHT
- Scope
  - Don’t move scope without full conscious understanding
- Cost
  - Frugality is important, but estimates to complete (ETCs) must be carefully examined for completeness

Parting Points

Thanks for all of the work for the Meeting, especially Helen

Thanks for letting us observe an exciting project evolve

Controls

Tom Himel
Karen White
10/13/06

Controls Progress

Great progress has been made since the last FAC

- Overcame significant delays in cable procurement/installation
- New bottoms up cost estimated completed
- Engineering teams put in place to improve coordination and address interface issues
- PLC based PPS passed RSC

Old Comments

- Management has changed. Hamid expressed great concern about the terrible shape the controls effort is in. He does think they can support an on time injector commissioning with some temporary solutions. We agree with the latter statement and that the schedule will be very tight. Particular attention is needed for the cables in the linac which must be installed in the coming down.
  - Management transition successfully complete
  - New bottoms up cost estimate complete
  - Cable procurement and installation delays addressed

- Seems like now there is less emphasis on using COTS solutions. Increase that emphasis please. For example planned a commercial card for the timing system, but thinking of getting rights to the design and modifying it to remove unused functionality and reduce cost. We highly doubt this would be worth the engineering effort.
  - Good use of commercial solutions

Old Comments

- We think it is perfectly alright to use temporary solutions (e.g. Matlab or timing without all the bells and whistles) for the early commissioning.
  - Plans in place to use MATLAB and SLC applications for Injector commissioning (including SLC e-log)
  - Physicists writing some applications
- Perhaps different groups are using different embedded IOCs. See if it can be standardized.
  - Standardizing on in house board developed for LLRF

Controls would benefit from a full time deputy.

  - Now in budget, to be posted soon

New Comments

- Schedule still very tight for some systems for January test run
  - Some diagnostics will not be installed initially, but added later
  - BPMs electronics high risk of being late
    - Boards just sent for fabrication
    - Still need stability and calibration tests
  - Toroid electronics high risk of being late
  - Timing and BPM software design still in early phase

New Comments

- New LCLS MPS design still in early phase; need to evaluate if hardware will be fast enough – a lot of work remains to complete this system in ~1 year
- Initially, emittance and bunch length measurements done in MATLAB – not available to Correlation Plots (SLC) – is this a problem?
- Should plan for revision control for MATLAB applications written by physicists

New Comments

- Timing system needs technical leader (Hamid is acting)

Accelerator sub-group

Max Cornacchia
Joerg Rossbach
Wim Leemans
Patrick O'Shea
John Corlett

LCLS FAC October 2006

General comments

Excellent presentations from a world-class team

Much thought and planning has gone into the project

Discussions in unstructured meetings very useful in addition to polished presentations

Injector installation schedule

- **Schedule not well defined**
- **Delays impact commissioning schedule**
  - **Priority in shops?**

Recommendations:

- **Develop schedule - uniform voice, need consistent plan agreed across project**
- **SLAC management should provide clear priority to LCLS components in shops**
- **Consider other "vendors" for well-defined components/systems**
  - **May be other engineering groups at SLAC, or other institutions**
  - **e.g. single-beam dump, laser heater, …**
    - **Important to have sound plan in hand for Lehman review**

Commissioning schedule

- **Sound plan, well thought through**
- **Delays in commissioning may ultimately impact Level-3 deliverable**
  - **First light from undulator August 2008**

Photocathode laser system

Excellent laser group and hardware

Complex system that will fail

System needs spares

Second system advantageous

Pointing stability needs to be demonstrated

Spatial shaping not yet demonstrated within spec

Temporal shaping being commissioned

Excellent communication between laser and accelerator physics groups

Fall-back positions developed

Recommendation:

Define critical components and plan for spares to maintain operational up-time

Photocathode gun

First gun under RF power test

Second gun in fabrication

Recommendation:

Consider less aggressive conditioning goals to minimize risk of damage to gun

110 MV/m may be acceptable

Complete second gun as soon as possible

Continue to pursue dedicated gun test facility & gun R&D

GTL

Displacements up to 1.5 mm measured in some accelerating sections

Corrected in injector structures

May impact performance if whole linac is similarly misaligned

Recommendation:

Assess status and impact of displacements in all accelerating sections

Emittance growth at different beam energies

Cooling water system complex design, contract for installation not yet assigned

Critical system, maintain attention to this

Linac

Delays in components may result in spool pieces installed

Typically hours - one shift to install

Recommendation:

Gain understanding with SLAC management that access to install missing items will be given

Undulators Subgroup Summary

FAC

October 12-13 - 2006

K. Robinson, J. Pflüger

Serial production in Argonne

– Well in progress and in schedule
– Gives very good overall impression
– Good Work!

Magnetic measurements at SLAC

- MMF has been occupied and is operational
- There is impressive progress since April06!
- Detailed measurement plans are being made
- Serial measurements are about to start
- The proposed time schedule to measure 33 segments by Sep07 is ambitious but doable but leaves a time buffer of about six months to relief too high time pressure

Undulator Vacuum Chamber I

- A lot of good and fundamental investigations were presented:
  Non-magnetic stainless steel, welds, polished stainless steel sheets, Al sputter coating of thin long chambers…
- But everything comes very late and very close to the critical path!
- High risk of delays!
- The old U-shaped concept, which was promised in April to be prototyped by July06 was completely abandoned. (Plan A)
- Presently the new “Four Welds” concept followed (PlanB):
  only a 42” prototype, not a full scale exists so far. Full scale Prototype is promised for the end of this year
- There is still a high risk for failure. Drop dead date for decision Feb07

Undulator Vacuum Chamber II

- Alternatives are: Al extrusions or Al clam shells
  Plan C made in Argonne
  Plan D Vacuum chambers made by SLAC
- SLAC has started some preliminary work on this but no concept or design (Robb Pope).
- Strong Recommendation of the FA C:
  1. **Plan B should be pursued with full strength.**
  2. **As an alternative, the concept following Plan C/D, has to be worked out so that in case the Plan B prototype fails, additional delays are avoided.**

Bets for chamber delays are: Kem 10c, Joachim 5c

Beam Protection System

- Last FAC’s recommendation followed
- Designwork started
- Effort is appreciated

BPM’s in Undulator section

- Good working concept
- In schedule
- Good results

Quadrupoles

- Hysteresis effect to be avoided
- Needs special Quad designs with special material
- Not yet ordered: Time is getting tough

Undulator K-Tuning

- Field Integrals change beyond tolerance limits on changing K by horizontal translation movement. Changes are small: I_1<40Gcm $I_2 \approx 5 kGcm^2$
- Compensation by applying corrections recommended. Would avoid individualization of segments and ease householding of possible undulator exchanges

X-Ray Subgroup Summary
Facilities Advisory Committee
October 13, 2006

Josef Feldhaus
Paul Fuoss
Tom Rabedeau
Thomas Tschentscher

Discussions

- **LUSI - Wednesday**
  - **Budget - full project budgeted at $90M, budget guidance said no more than $60M**
  - **Reduce support for Correlation Spectroscopy and Pump-Probe infrastructure**
  - **Further support reductions to all experiments will probably be required**
  - **Splitter monochromator replaces flipper mirrors and allows simultaneous operation of three experiments**
  - **Lehman review will be held in January**
- **LCLS - Thursday**
  - **XTOD update - no surprises**
  - **XES update - no surprises**
  - **Mirror physics requirements**
  - **Commissioning diagnostics**
- **Relationship between LCLS and LUSI**

Positive Developments

- **Physics requirements documents are being prepared**
- **Baseline components and systems are steadily moving through the approval process**
- **Replacement of flipper mirrors by splitter monochromators is very positive**

New Concerns

- **Budget is continually squeezed and items descoped**
- **Mirror design is still in an early stage and needs to be advanced rapidly**
- **Coordination between LCLS and LUSI is complicated and informal**

Current Recommendations

- **Mirrors are crucial in the current concept**
  - Mechanical and optical design concepts efforts can move ahead semi-independently
  - Mirrors are at the state of the art. Set up a panel of independent experts to provide early input into physics requirements and design.
- **Obtain expert advice on design and fabrication of thin monochromator crystals**
- **Define critical paths for commissioning and for the experimental program**
- **FAC should provide advice that spans LCLS and LUSI.**
  - Projects should bring problems at an early stage to the FAC.
- **Further down scoping of x-ray instrumentation will negatively impact the scientific output of LCLS**

Linac Coherent Light Source Facility Advisory Committee Conventional Facilities Subgroup

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

Outline

- Findings
- Comments (to be included in final report)
- Recommendations

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Conventional Facility Subgroup Findings

- The earned value for CF is approximately 30%
- The CF bids are in and are ~50% over baseline
- The CF design has been stable for several months and 80% of the bid packages are awarded
- The project is holding 15% contingency for contracts post award
- Due to the cost increases as bid, the project has removed the CLOC from the CF scope

Gus Kugler
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Conventional Facility Subgroup Findings

- Project staff is preparing detailed analyses for contingency required on post award contracts.
- Detailed risk registry exists for CF

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Conventional Facility Subgroup Findings

- The CF organization has been strengthened with the addition of the APD and staffing
- Procurement/contract administration has been strengthened with the addition of dedicated personnel
- An Integrated Management Team (IMT) has been created to address configuration management and interface control

Conventional Facility Subgroup Findings

- The LCLS construction safety record at this point in the project is excellent
- The LCLS has a documented process for authorizing work; however, the program is not being fully implemented to the level of detail required
- A documentation control system has been implemented; however, the mechanism for notification and distribution of approved field changes (redlines) to users requiring the information is not fully developed

Conventional Facility Subgroup Comments: Response to Recommendations from last FAC

- In general, CF has addressed the concerns and recommendations from the April 2006 FAC meeting

Recommendations:

- Reevaluate the contingency held for post award CF contracts
- Prepare options for CLOC alternatives
- Fully execute the planned safety program
- Summarize risk registry numerically at the bottom line for CF as a whole
- Fully develop a system for redlined drawing changes and their timely distribution

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