

Advanced LIGO Project Update

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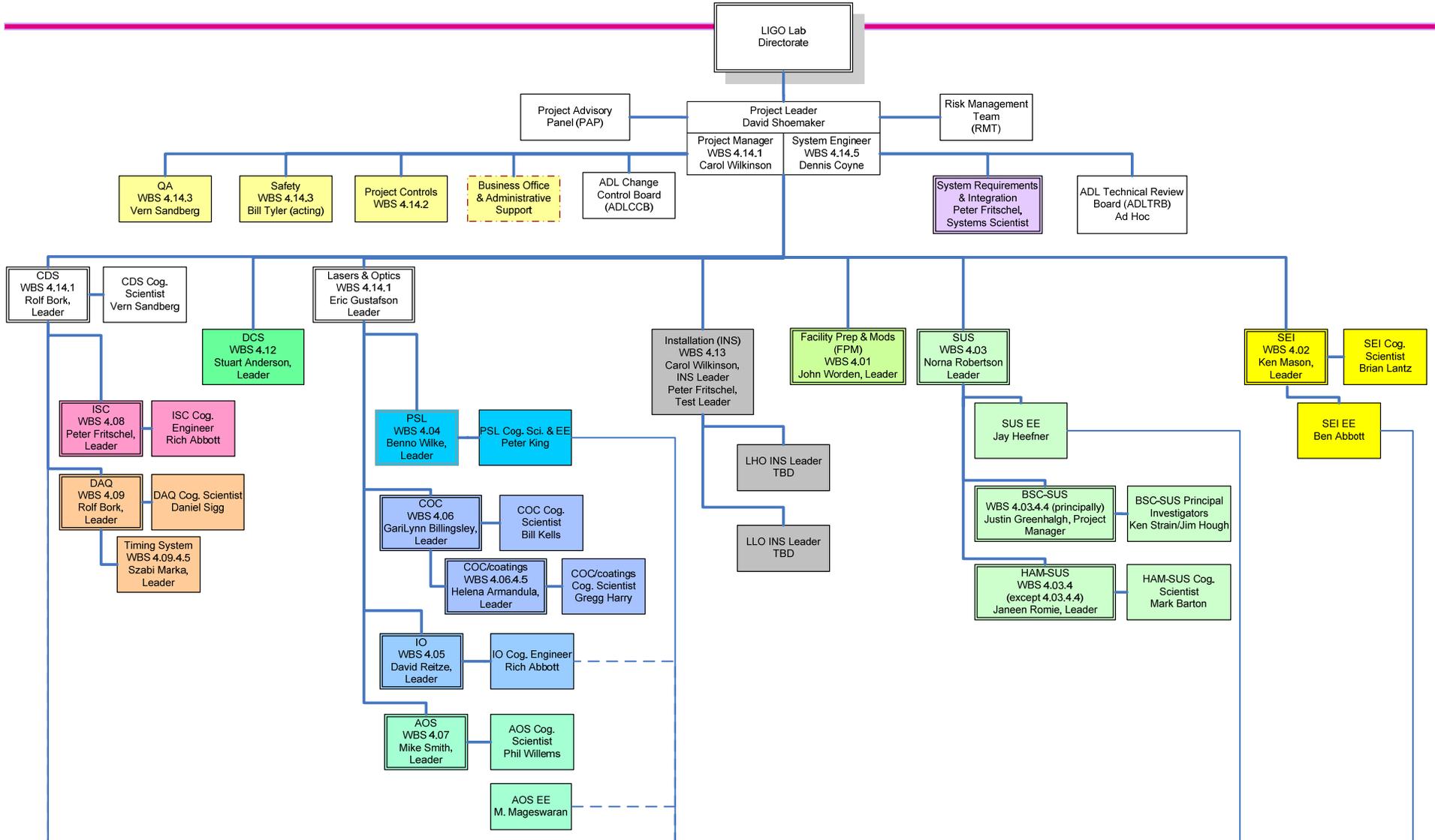
31 Jan 08

- Project starting soon
- Pace will pick up considerably
- Want to give a sense of all activities to all those involved in Advanced LIGO
- Anticipate that there will be 'news' on a monthly rhythm during the Project – start now with an update
- Today's will be quick – no need to fill an hour!

- Topics for today –
 - Who is working on Advanced LIGO?
 - How is Advanced LIGO organized?
 - What's the status with respect to funding?
 - What's going on in the subsystem development?
 - What's the overall Project flow?
 - Challenges

- AEI – Lasers, pre-stabilized laser system
 - ALUK – Quad test mass suspensions
 - ACIGA – Wavefront sensors, Optics steering mirrors, Seismic Platform Interferometer, high power stability
 - Columbia – Timing system
 - Stanford – Seismic Isolation, materials
 - University of Florida – Input Optics
 - LIGO Hanford – Electronics, Facilities, ...
 - LIGO Livingston – Suspensions, Seismic isolation, ...
 - LIGO MIT – Interferometer sensing/control, Seismic isolation, ...
 - LIGO Caltech – lots of stuff.
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- About 150 persons presently active, about 100 of these in the Lab

Organization



What is the status of NSF funding?

- Advanced LIGO is in the planned activities of the NSF with a start this fiscal year; Congress has funded the NSF
- All signs are that the National Science Board will give the official Project Start for Advanced LIGO in late March 2008
- All signs are that the funding will be enough for a robust start of the project on about April 1, 2008 – \$20-30M for *this year*
 - » Core Optics, HEPI (seismic pre-isolator), Facilities, UK Suspensions are first activities, and management
- NSF very supportive of Advanced LIGO – lots of excitement in the Foundation for what AdL can do and the future of the field
- Jay Marx playing important role here – talking with people, providing context, etc.

- Lasers – 35w laser from AEI/LZH in the US for installation in Enhanced LIGO (ELI); rooms at LHO/LLO prepared to house pump diodes.
- Input Optics – installing Faraday Isolator at LLO for ELI
- Core Optics – trials with polishers with novel approaches; measurements of optimized coating thermal noise
- Quad suspensions – tests of combined resonant frequencies when mounted on seismic isolation, fabrication any day now
- HAM suspensions – design of the recycling mirror (big diameter, small headroom); Output Mode Cleaner packed up for ELI
- Seismic isolation – installation of HAM isolator at LLO; tests of BSC isolator with Quad, preparations for installation at LASTI
- Auxiliary optics – ELI thermal compensation; suspended baffle designs; overall layout
- Interferometer sensing and control – choice of a stable or barely stable recycling cavity, next week; Output Mode Cleaner for ELI
- CDS – timing design; lots of support/prototyping in data acq and control; integrating community input on control room tools

- Still a fair amount of Development to be done
 - » Testing of prototypes – Enhanced LIGO to the rescue!
 - » Re-designs, fixturing, modeling
 - » Reviews and documentation -- non-negligible work
- Project supports activities after the Final Design Review
 - » All prototypes fabricated, with test results sufficient to proceed with fabrication
- In most cases, subsystems broken down into bite-sized pieces
 - » A continuous flow of reviews and transfers of support and activity from Development to the Project
- Development mostly complete by end of this year; ends in 2009
- Dennis/Peter/David chasing this to conclusion while Carol concentrates on the Project itself

- Lasts ~3.6 years
- The two major assembly sites at LLO and LHO will share equally in the assembly for all three IFO's
 - » Assembled equipment will be shipped from LLO to LHO
- Other assembly sites include MIT, CIT, Univ. of Florida, Columbia Univ., etc.
- Equipment will be stored 'ready to install' at the sites
- Assembly continues after LLO shuts down and even after LHO shuts down.
- Each subsystem ends when all its equipment is ready for installation

Installation and Testing

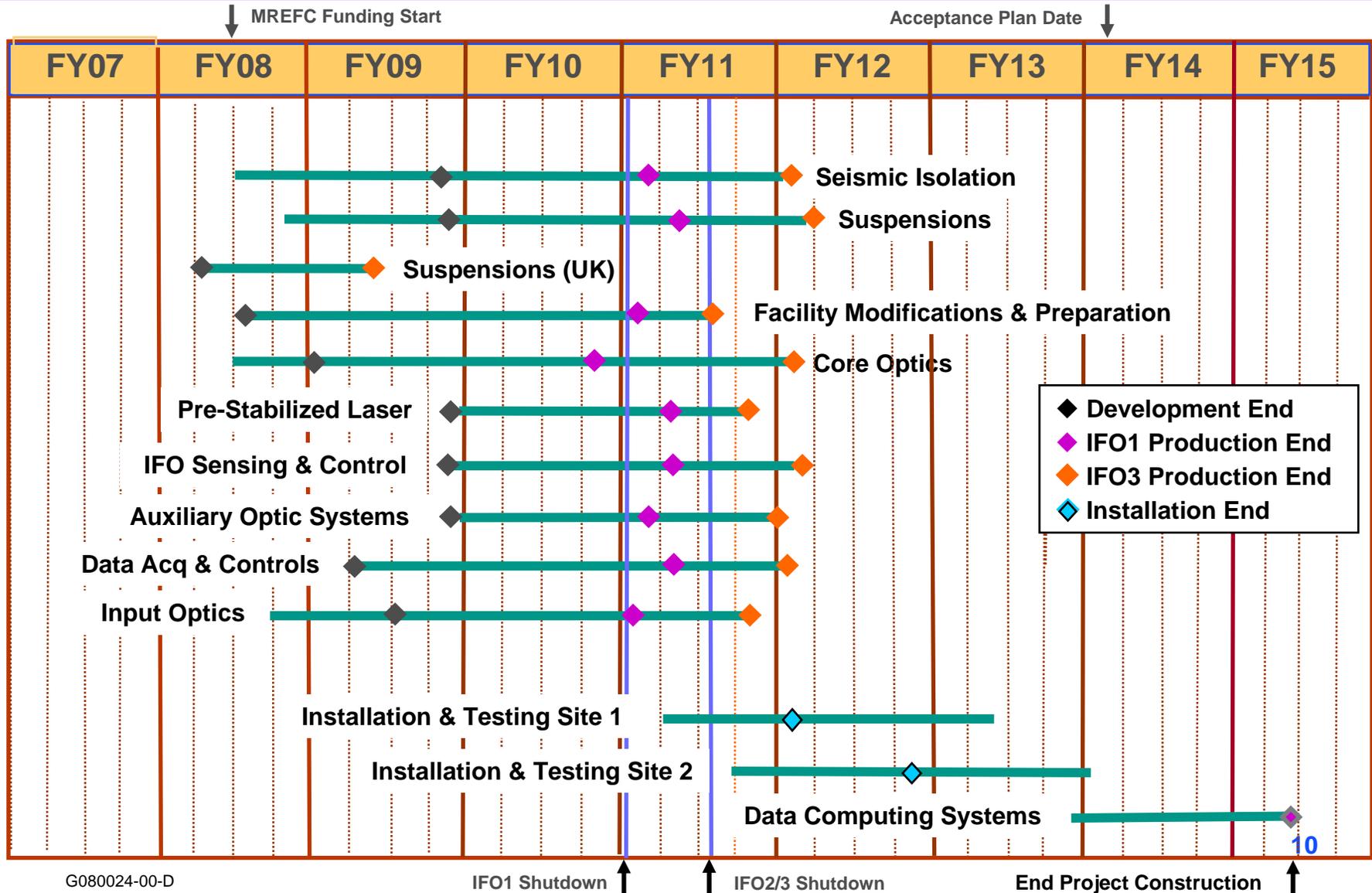
(Carol's slide)

- Lasts 3 to 4 years (11 months schedule contingency)
- Installation is staggered to allow teams and lessons to migrate from first site to second site
- Integration and testing run in parallel with installation tasks
- Installation/integration/test complete (from the formal Project standpoint) when all IFO's have demonstrated full lock and been accepted.
- Effort becomes one of Operations commissioning – lots of students, postdocs, folks from LSC all welcome
- Data analysis and storage computers are installed just-in-time at the end of the project.

Commissioning to design sensitivity
continues under operations funding.

Advanced LIGO Subsystem Summary Cartoon

(Showing Development and Project Production Milestones)



- Keeping up with the plan: Development
 - » R&D has typically a more tortured path than hoped for...but finding problems is what R&D is about.
 - » We need to move briskly now – sometimes making some decisions on less than perfect knowledge
 - » It may seem that there is a lot of time spent preparing for reviews in the next months....
- Keeping up with the plan: the Project
 - » Should be more linear than the R&D, easier to keep a schedule; certainly we need to respond more quickly to surprises
 - » If you feel that we have misjudged what's needed in people or time or whatever, please speak up!
 - » If you see a process (technical or bureaucratic) that needs fixing (or dynamiting), please speak up!
 - »and please speak up early – much easier to fix things then.

- Commissioning of enhanced LIGO
 - » Want to get a good understanding of AdL components used
 - » Want, nay NEED S6 to be a real success!
 - » ...but need to move on to AdL activities in a timely way
 - » All efforts to characterize AdL elements needs a set of goals – have to think about when to stop, priorities, etc.
- Communication
 - » We are spread all over the globe
 - » Working on better virtual meeting tools (is video a good idea? Webex? Better sound needed, most certainly)
 - » Should we have periodic in-person team meetings? At LSC meetings?
 - » ...it will continue to be a struggle to keep synchronized
 - » Don't want to drown in meetings (was today's needed?)
 - » Brainstorming on this welcome

- I think we should feel confident about Advanced LIGO –
 - » We know a great deal about Advanced LIGO hardware compared to the case for Initial LIGO
 - » Our plans count on the Advanced LIGO team working very effectively together – even if in different time zones – and we have been doing this very well
- But...I need your help to lead this project – please tell me what's not working or ideas for improvements. I'll try to make something happen!

Thanks.