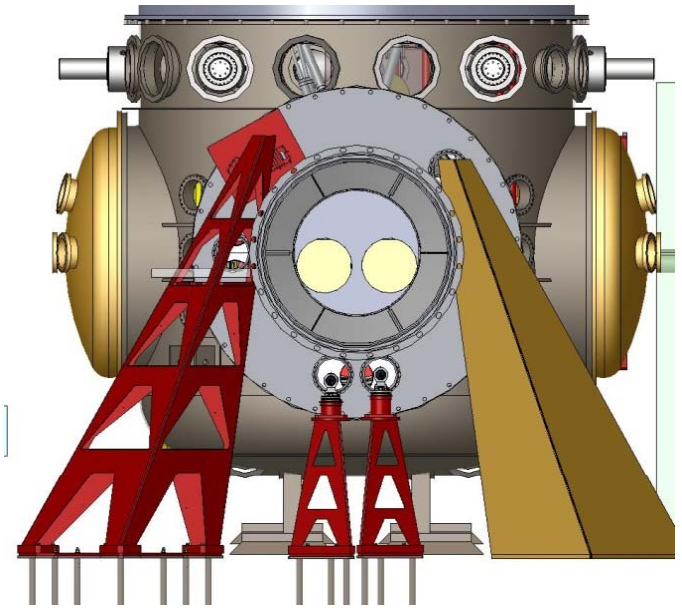
Optical Lever System (OpLev)
Eric James



OpLev Functions

- To assist in restoring alignment after invasive work
- To restore coarse alignment after loss of lock
- To tune the test mass actuators to minimize position-to-angle coupling
- Monitor the angular alignment of the HAM optical tables
- Local pitch and yaw mode damping during interferometer commissioning (not in science mode)

OpLev Requirements

- All optical levers will provide less that 1 μrad drift over one hour
- position-to-angle coupling of less than 100 nrad/μm

OpLev Design Concept

- Baseline design based on iLIGO design with incremental improvements through lessons learned.
- Beam launcher
  - » Fiber to telescope launcher with goniometer pointing.
  - » Pyramidal, folded-sheet, welded stainless steel pylons with damping material coating.
- Receiver
  - » Quadrant detector on XY translation stage.
  - » Pyramidal pylons (same as above).

OpLev Project Status

- Design phase completed
  - » Completed Final Design Review for Beam Splitter/Fold Mirror OpLevs – April 2011 ✔
  - » Completed testing first article receiver pylons – April 2011 ✔
- Procurement phase 75% complete.
  - » Transmitter pylons delivered to sites – April 2011 ✔
  - » RX pylons in production.
  - » Complete fabrication of pylons – May 2011
  - » Purchased items: 75% Ordered, 55% delivered.
  - » Procurement of some BS/FM fabricated items pending FDR.
- Assembly / Installation begun.
  - » Began assembly of OpLevs – April 2011 ✔
  - » On target for scheduled installation in coordination with installation team.

OpLev Project Status

ITEMS STILL ONGOING

- Complete fabrication of receiver pylons – May 2011.
- Complete fabrication of enclosures – September 2011.
- Procure remaining BS/FM fabricated OpLev items - in process.
- Complete assembly of all Oplevs.
- Installation in coordination with installation team.

OpLev Procurement Accomplishments

- Pylon contract ongoing – all TX pylons delivered.
- All machined parts for ITM/ETM and PR3/SR3 delivered.
- Opto-mechanical stages delivered
- Most purchased hardware ordered.
- Mapped out locations for all levers
- iLIGO lasers to be rebuilt with angle cut fibers – contract in place.

OpLev Project Plans and Organization

- Project Plans
  - On schedule for deployment for H2 Single Arm Test – Aug.2011
  - On schedule of deployment for Short Michelson Test – Jan. 2012
  - On schedule for deployment of three aLIGO IFOs – Apr. 2012
- Project Organization
  - Cognizant Engineer and Leader – Eric James
  - Cognizant Scientist – Eric Black
  - Mechanical Engineer – Ignacio Romero
  - Project Engineer – Lisa Austin
  - Electrical Engineer - Mohana Mageswaran
  - Hanford Installation Lead – Gerardo Moreno
  - Livingston Installation Lead – Chris Guido
  - Optical Design and testing – Vladimir Dergachev
  - Drafting – Jesse Terrazas – Norris Kilpatrick – Eduardo Sanchez

OpLev
Challenges, Risks, and Mitigations

- Low challenge level
- No known technical risks
- Additional vibration controls may be necessary for large receiver pylons.
- Damping materials proved adequate for prototype pylons.
- Careful coordination with installation team will be necessary.

Summary

- Contracts and Purchases coming in below estimates
- Materials arriving at sites well ahead of time required.
- No difficult assembly or installation issues.