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# Advanced LIGO

Update for Virgo-LSC meeting

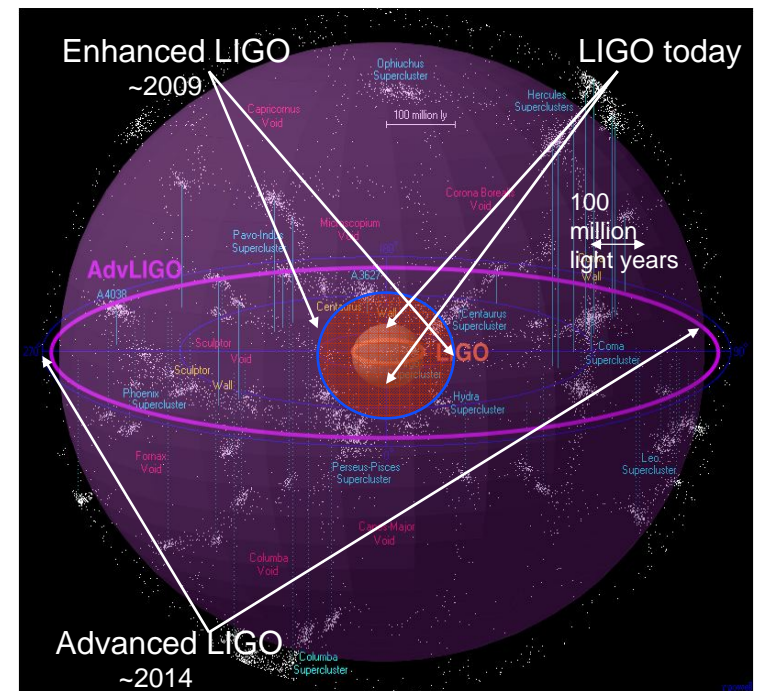
March 08

David Shoemaker



# Status of Advanced LIGO

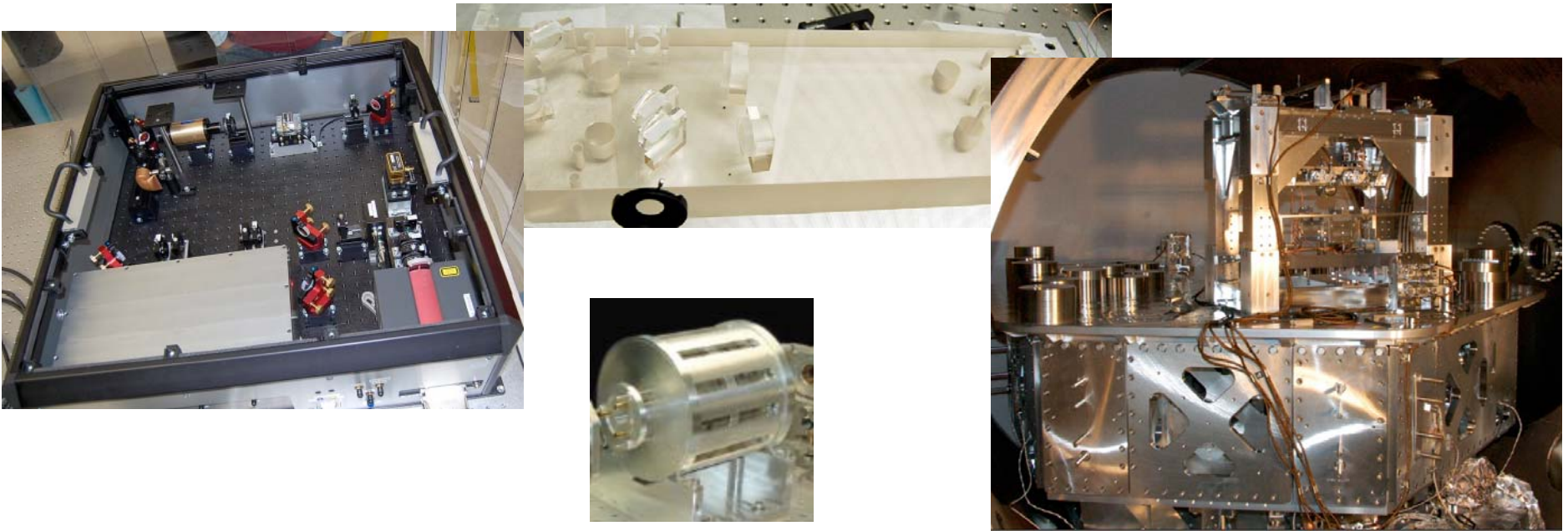
- Baseline Review in November 2007
  - » Review committee gave us (you all!) high grades
  - » “The panel is unanimous that AdLIGO is ready for a new construction start. We were extremely impressed with the thoroughness of their preparation and the soundness of the design.”
- Construction start awaits the end-March meeting of the National Science Board
  - » They received the package a few weeks ago...
- Anticipate Project Start in April 2008
  - » Expect robust funding
- Planning and hoping for continued broad LSC participation – adding value during Project, digging into post-Project tuning and testing





# Advanced LIGO technical progress: Enhanced LIGO

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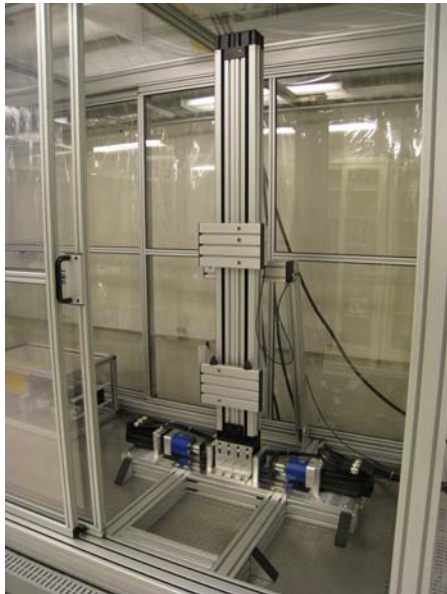
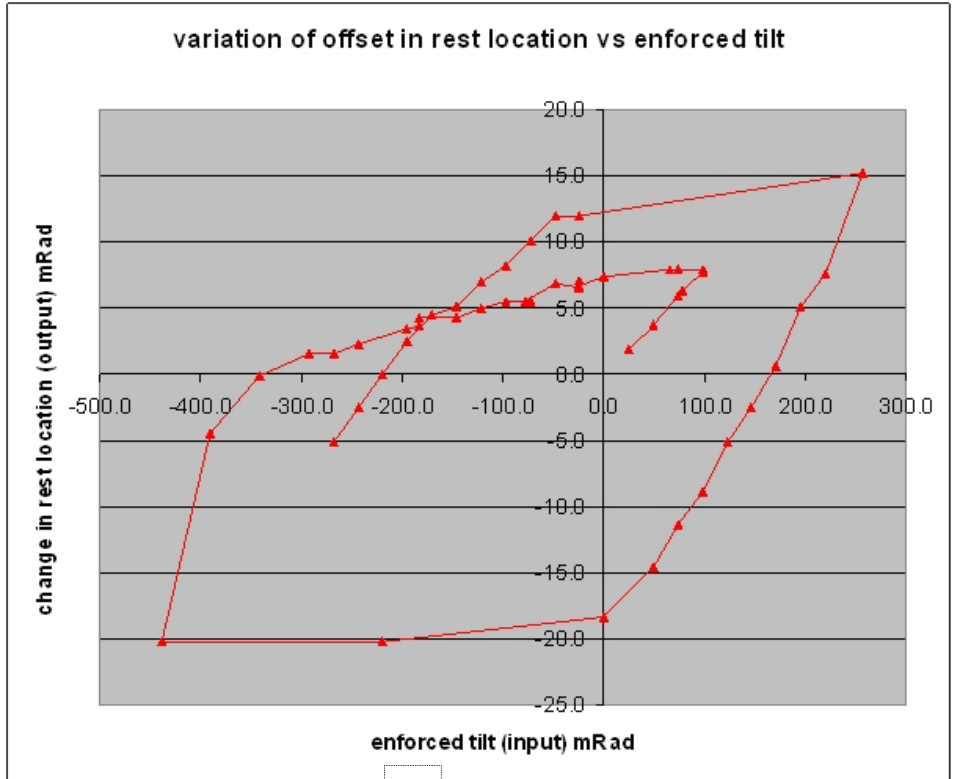
- The beautiful eLIGO progress you will hear about later this morning is *directly* relevant to Advanced LIGO
  - » Remarkable depth and breadth of prototype testing *in situ*
  - » Training and experience for all as well

**...but in addition....**

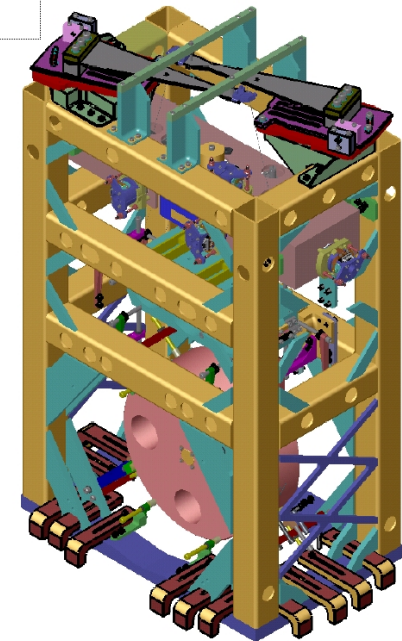


# Test Mass Suspensions

- Nearing moment for Test Mass suspension fabrication (UK funds)
- UK Electronics undergoing rigorous testing, review
- Quad alignment hysteresis observed, understood; still looking at any consequences



- Final prototype to be installed
- Silica Fiber pulling, welding system installed at LASTI
- All parts for the BeamSplitter prototype are out for manufacture
- Prototype fabrication of the Large Triple Suspension for the HAM Chamber is underway





# Seismic Isolation

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- The Test Mass (BSC) isolator prototype is coupled to the Test Mass (Quad) suspension prototype
- Looked for influence of resonances of Quad on isolator, looks acceptable
- Preparing to install Isolator and Suspension together in the LASTI vacuum system – important step in integration, coordinated test

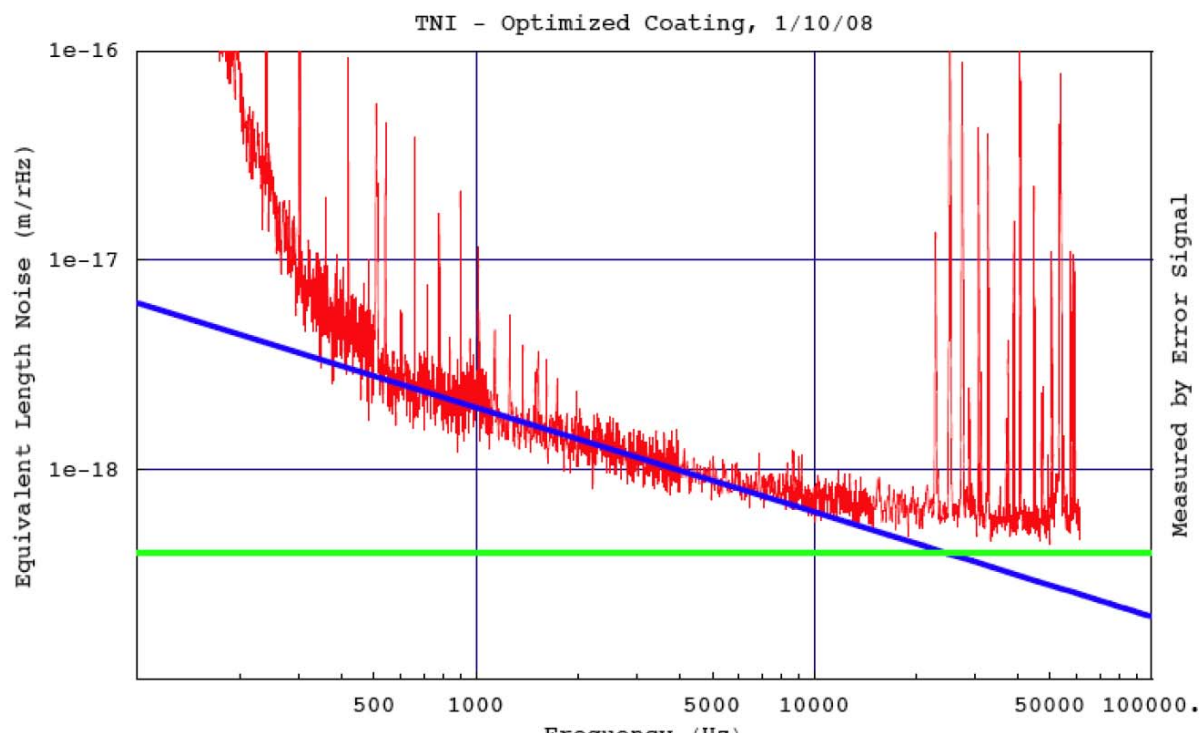




# Core Optics – Test Masses

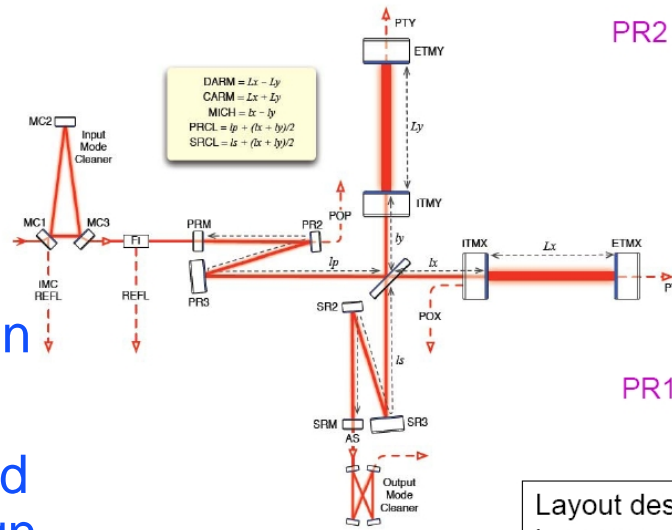
- A challenge to develop the requirements
- A challenge to meet the requirements
- Preliminary design and glass Procurement Readiness Reviews are nearly complete; Will be ready to order blanks
- A novel post-polishing technique – ion milling – now in testing, with potential to exceed the requirements

- Coatings critical to AdL performance; optimized 'standard' coating to be fabricated, directly measured soon
  - » direct measurement of similar recipe suggests success
- Ongoing program in Lab, LSC in coatings – implement when timely

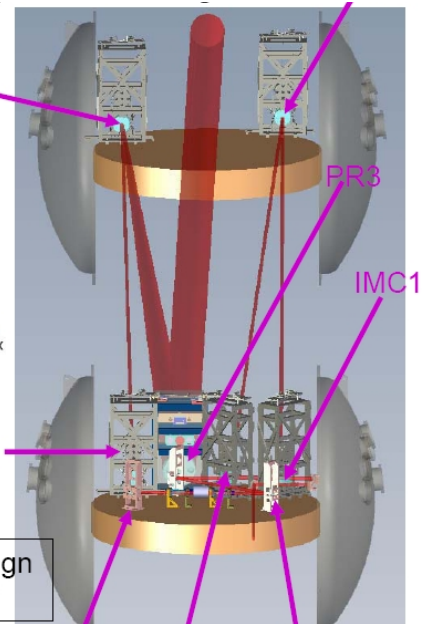




# ISC and Systems



17 March 08



G080070-00

Steering Mirror

IMC3

IMMT

4

- Stable recycling cavities chosen

- » Very significant step forward in the definition of the design to build

- » Enables the Conceptual Design and Requirements (and reviews thereof)

- » Many subsystems contributed to decision– Systems Layout, Input Optics, Suspensions, Auxiliary Optics, Modeling group

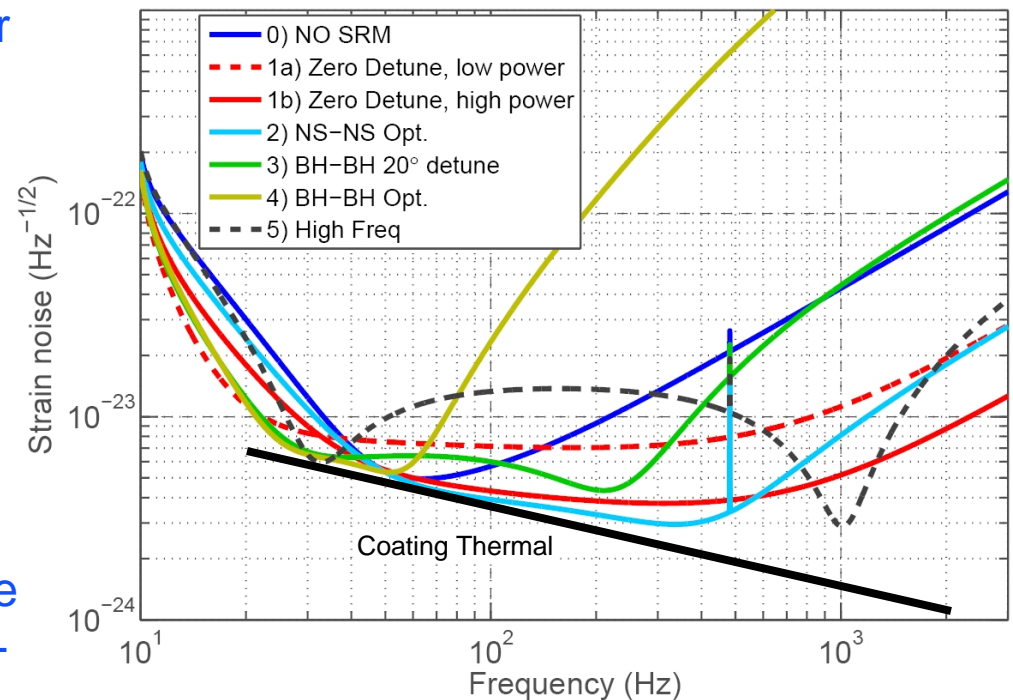
- » Many subsystems impacted by the decision...but we planned on that, looks fine

- Lot of progress on design issues, length and alignment control Sensitivity curves developed – worth discussion...



# Advanced LIGO Sensitivity

- Study of interferometer modes for design of sensing and control
- Coating thermal noise dominates over broad range
  - » Have some development time, and ideas, yet in coatings
- Non-detuned signal recycling cavity leads to broad high-sensitivity curve
  - » 169 Mpc, compared to 171 for curve optimized for NSNS
- Also leads to easier control systems, fewer competing noise terms
- Should probably start to use this curve as the point of departure for most AdL search planning
  - » Low-power version likely for early commissioning work – and very good for BHBH inspirals

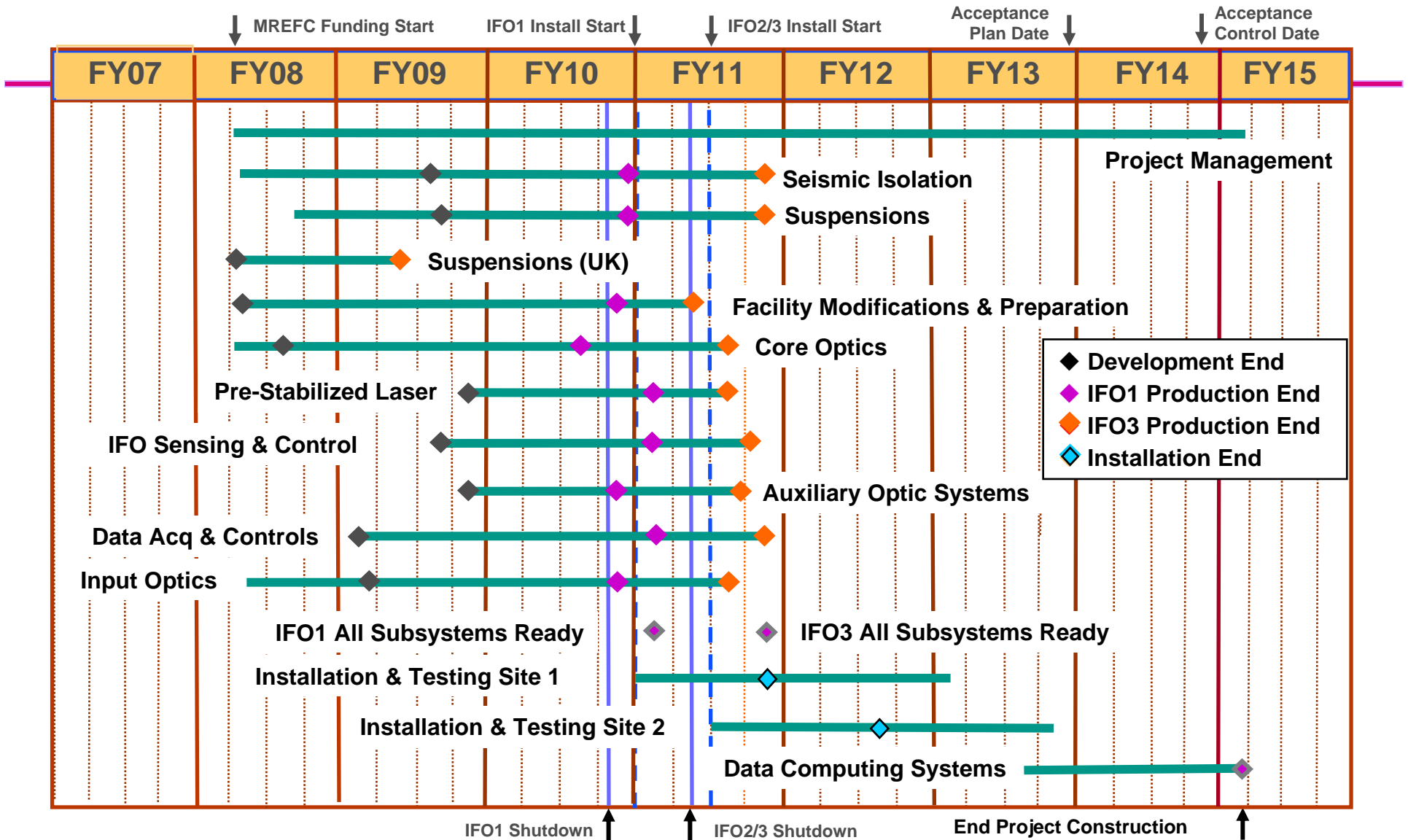






# Advanced LIGO Subsystem Summary

(Showing Development and Project Production Early Milestones)





# What's next

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- Project start!
  - » Preparation of the clean spaces for assembly/storage at Observatories
  - » Start on Seismic Pre-isolator fabrication
  - » Ordering of Core Optics blanks
- Wrap up development over coming year
- Fabrication and assemble components 2008-2011
- Charge into the vacuum system in early 2011
- ....and start tuning the interferometer in 2013.