Status of LIGO

LSC/Virgo meeting

March 17, 2008

Jay Marx

LIGO-G080092-00-Z

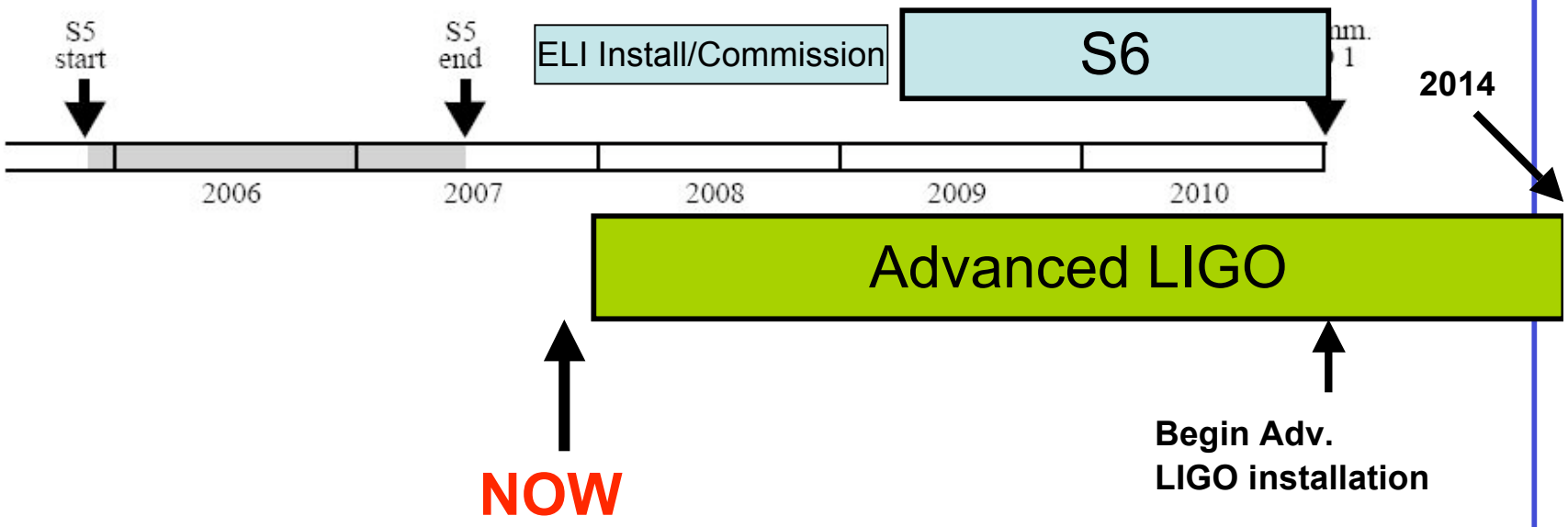
Topics

- LIGO Roadmap
  - Status of astrowatch
  - Status of e-LIGO
  - Status of Advanced LIGO
- LIGO Lab 2009-2013 operation grant
- GWIC Roadmap
- LIGO at the January AAS meeting

LIGO Roadmap

S5 → Enhanced LIGO → S6 → Advanced LIGO → S7+

S5 → Astrowatch



Status of Astrowatch

See talk by Evan Goetz

H2 (2 km interferometer) Astrowatch

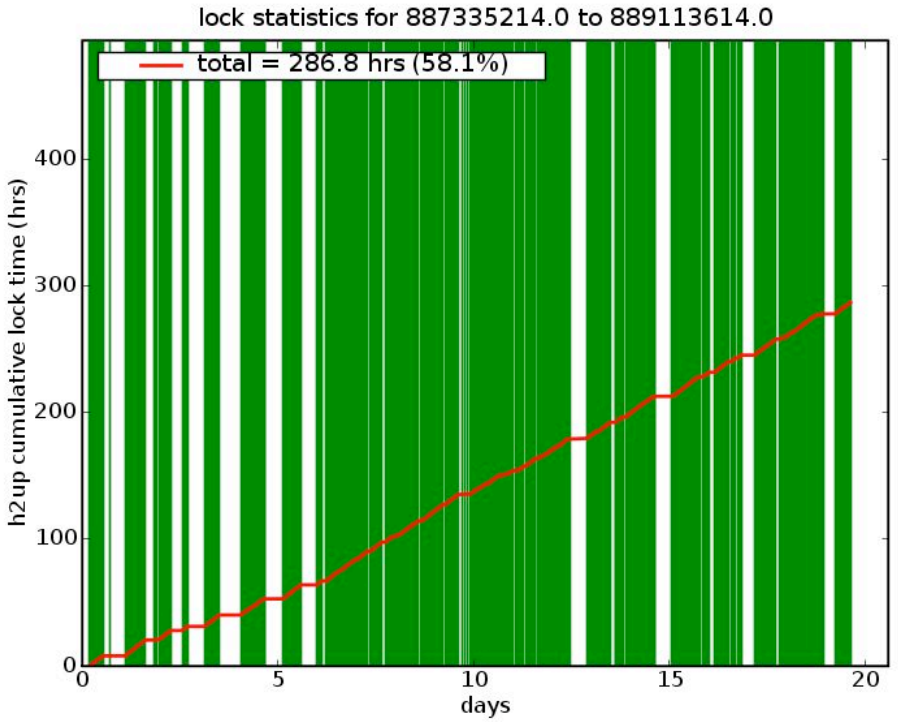
- With GEO600 (German/UK instrument, Hannover)
- Goal- Provide *best-effort single LIGO IFO* coverage during 2008-2009 gap between S5 & S6 in case there is strong near-by event
- Coverage- 1 *afternoon* and 1 *owl* shift coverage, *primarily by LSC students*
- Plan to only analyze data around time of external trigger

We need more help- great chance to learn and contribute

Note- partial support will be provided by Laboratory for those students committed to 6 month or longer service

AstroWatch with H2 at LIGO Hanford

- Began 18Feb2008
- LSC students: Berit Behnke, Evan Goetz, Pinkesh Patel, Philip Roberts, Jake Slutsky, Junyi Zhang- THANKS
- Successful start:
  - Science up time ~33%
  - Total up time ~58%
  - Saving 12-18rs of data/day

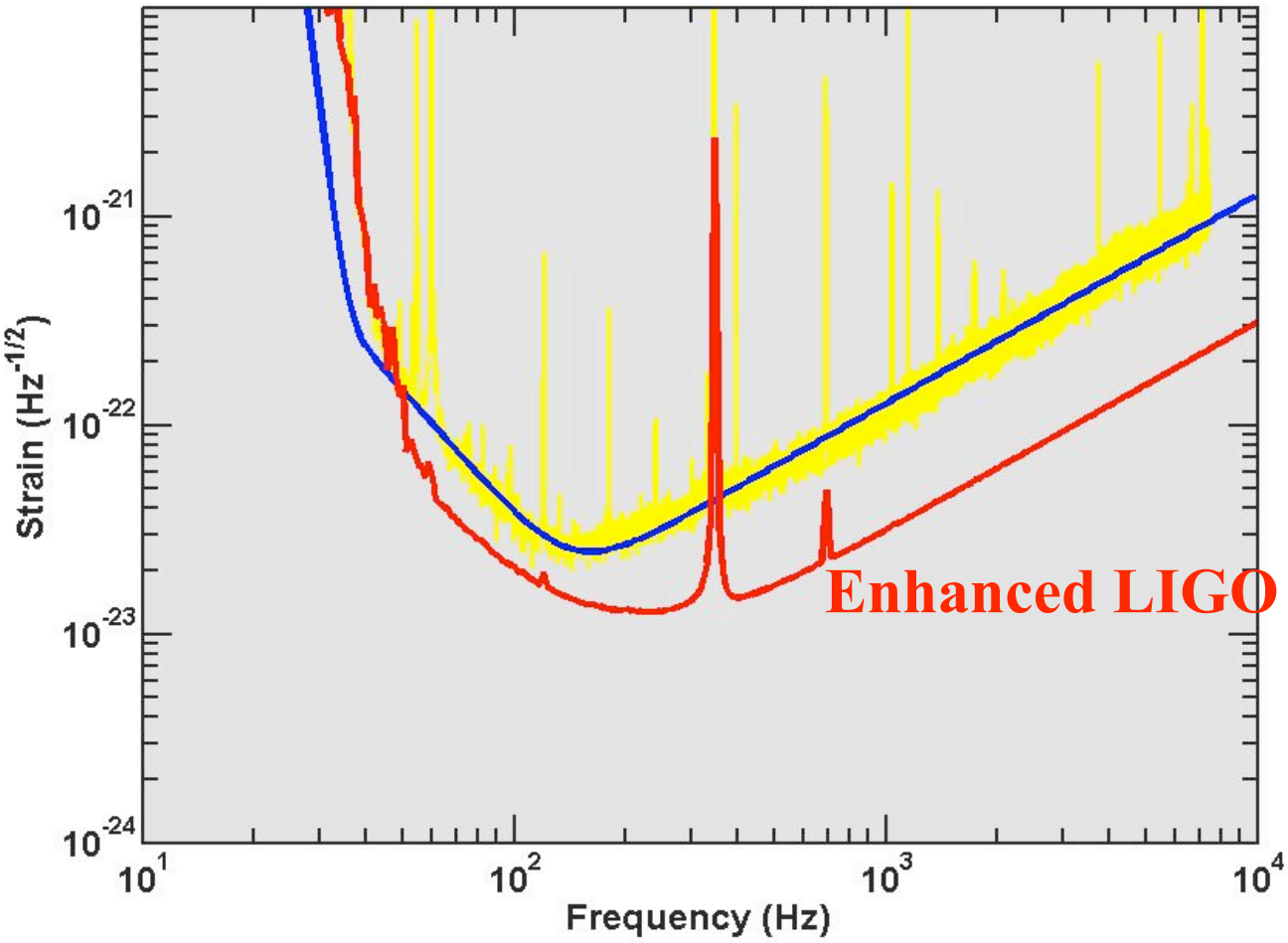


Status of Enhanced LIGO

See talk by Rana Adhikari

Enhanced LIGO

Goal- ~x2 improvement in sensitivity

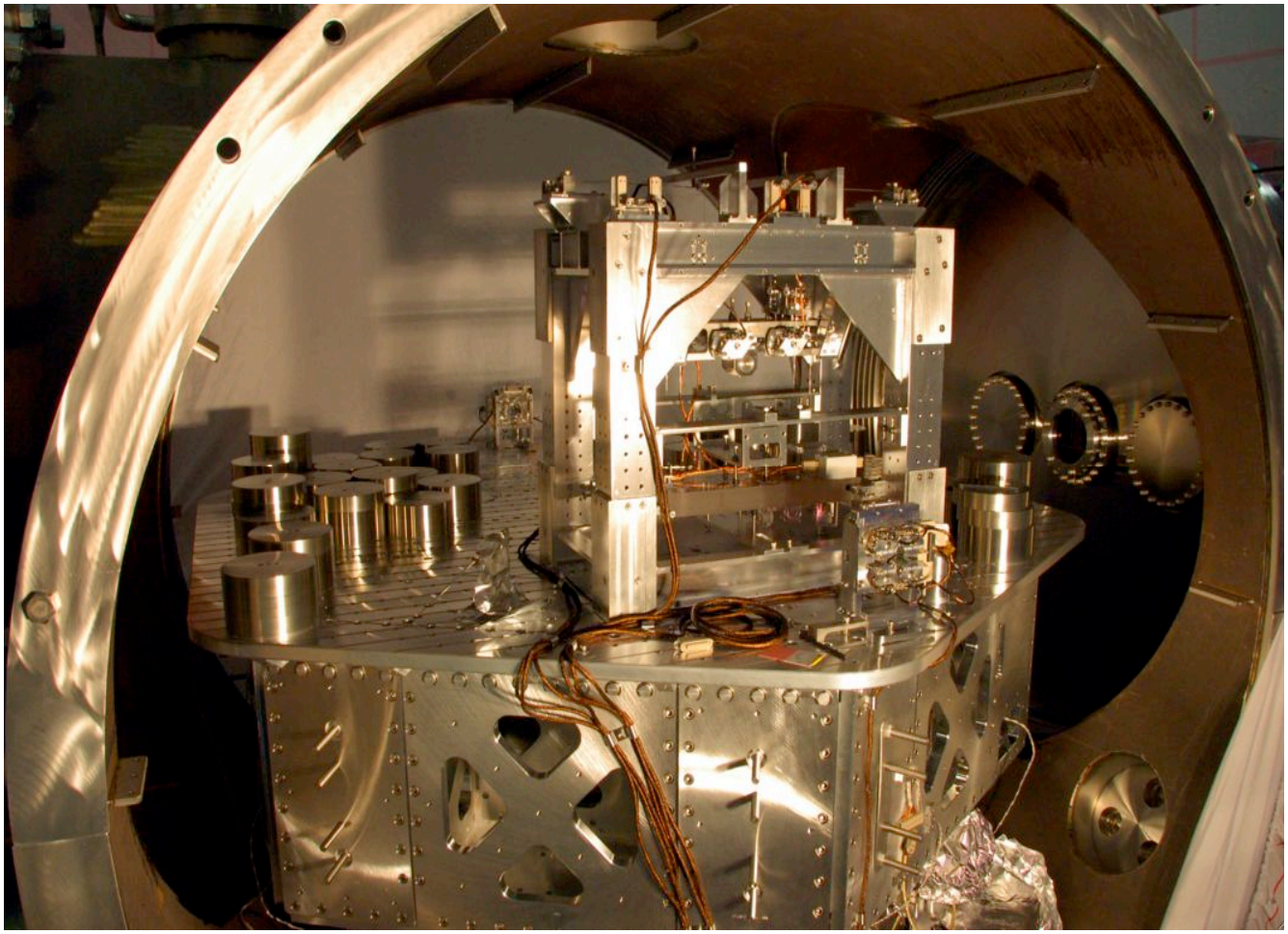


Enhanced LIGO update

- Hardware fabrication is > 90% complete
- Installation >75% complete
- News
  - ETM SmCo magnet swap
    - approved by directorate following review
  - The OMC was cleaned (which fixed it, T > 95%), rebaked (it survived), integrated with its suspension, and installed in HAM6
  - L1 is also now locking again (on the old RF readout, for now).
- Looking ahead-- the plan
  - August '08 - Jan '09 (+?)--Tag-team commissioning (LLO and LHO)
  - **February '09 (if all goes very well) begin S6 !**

Some Enhanced LIGO Photos

Enhanced LIGO output bench



Status of Advanced LIGO

See talk by David Shoemaker

Advanced LIGO--politics and funding

- Successful Construction Readiness Review held in November 2007

- Next week NSF National Science Board should approve start of Advanced LIGO construction for $32.75M in FY08 and $205.11M total construction cost

- The formal project start will occur in a matter of weeks
- Then the real challenge begins!
  - we have to do what we said we could do!!!!!!

Advanced LIGO technical progress

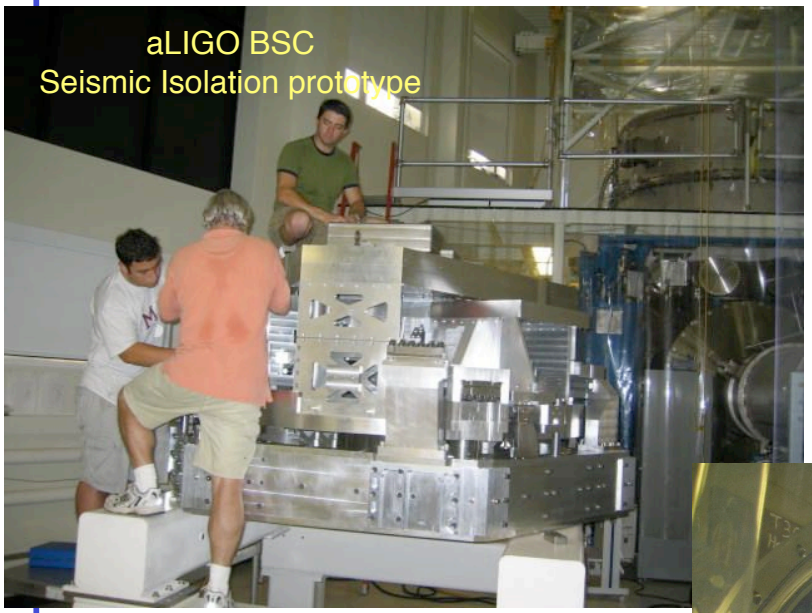
- The eLIGO progress is *directly* relevant to Advanced LIGO--provides
  - Depth and breadth of prototype testing *in situ*
  - Training and experience for AdL staff

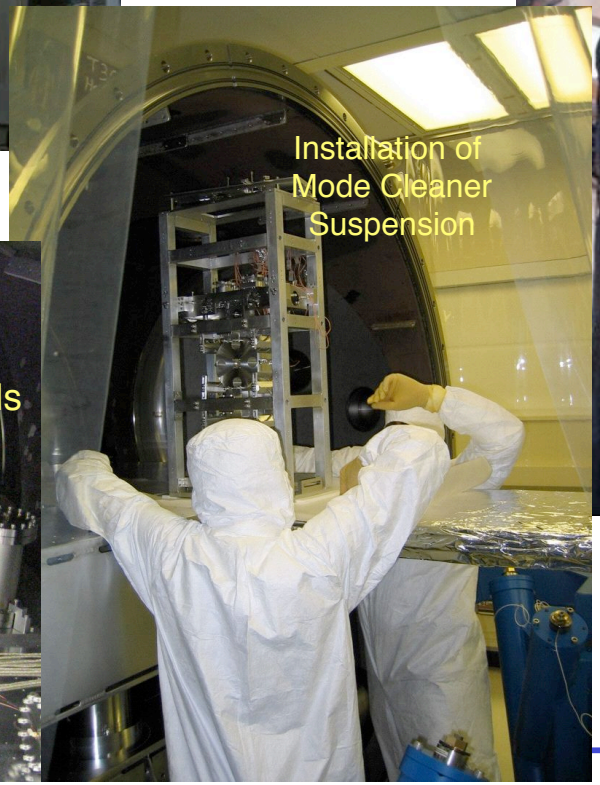
- Lots of technical progress--consistent with construction start; e.g.
  - Lasers and Optics – high power laser head running; core optics in final design; optimized coating tested; AOS layout ripening
  - Test Mass Suspensions – testing of quad suspension, start of actual production fabrication
  - Test Mass Seismic Isolation – successful testing with suspension, start of installation in vacuum

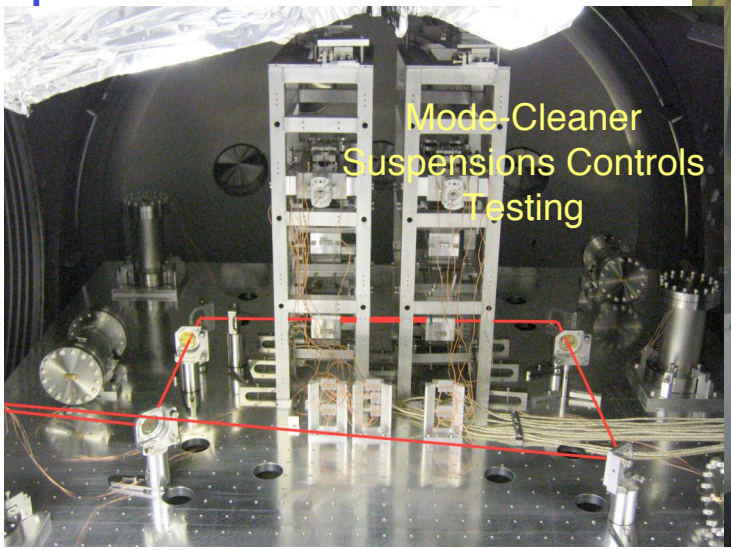
What's coming- big picture

- Project start--then in short term--
  - Move of staff from operations to project
  - 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
- 2008-2011--Fabrication and assemble components
- Early 2011--Break into the vacuum system for installation
- ….and start tuning the interferometer in 2013

Advanced LIGO Prototyping - Suspensions & Seismic-- LASTI Facility @ MIT







Funding for LIGO Lab
New grant for FY2009-FY2013

- Current operations grant runs out 9/30/08
- Proposal for new grant covering FY2009-FY2013 submitted in September '08 and reviewed in November '08
  - Received excellent grades
- Next week NSF NSB is expected to approve funding the grant at ~94% of our request
  - This is still a healthy funding level
  - Will provide for all key planned operations, staffing R&D and outreach programs

LIGO session at January 2008 AAS meeting

My impression

- Speakers did excellent job
- Well attended
  - Perhaps 100 people, only a handful from our field
  - Almost everyone stayed for all talks
    - People came because they were interested, not just to sample the wares
- Many questions indicate engaged audience--
  - Almost all sincere attempts to better understand what was said and the implications (vs skepticism)
  - Lots of people hung around after session to talk to speakers
- Bottom line- very successful exposure of our science to the astronomy/astrophysics community

GWIC Global Roadmap for the field

- **Charge**---
  - Develop global roadmap for field with 30-year horizon.
  - Consider ground and space based capabilities, theory and NR, and possible impact of new technologies and approaches
  - A perspective to optimize the global science in the field should form the basis for this roadmap
  - Take account known national and regional planned projects.
  - Identify relevant science opportunities and the facilities needed to address them.
  - Roadmap should address what should happen & when to reach goals in a timely manner, key decision points, strategies, etc.

- **Membership**
  - Benoit Mours, Cliff Will, David McClelland, Flavio Vetrano, Jay Marx (chair), Karsten Danzmann, Kazuaki Kuroda, Sheila Rowan, Stan Whitcomb, Stefano Vitale, Sterl Phinney

GWIC Roadmap

- Goal-
  - excite and influence other scientists & funders about great opportunities in our field, and potential impact and synergy with other sciences
  - Show we have a realistic and coherent science-driven plan (e.g. we have our heads screwed on right)
- Progress-
  - Active subgroups focusing on science opportunities, ground & spaced-based developments, impacts of other fields
  - Meeting arranged with representatives of funding agencies
    - NSF, INFN, CNRS, STFC, so far
  - Meetings arranged with "wise people" from inside and outside our field
- Seeking community input

  e-mail: gwicpoll.ligo.caltech.edu

Message from this talk

- We are going excellent science that is being noticed
  - e.g. AAS meeting, GRB020107, Crab Pulsar spindown limit
- The future looks very bright
  - Enhanced LIGO schedule pointing to S6 in 2009
  - Advanced LIGO construction will begin in a few weeks

We have a lot to celebrate at the dinner tonight

Backup slides

Cybersecurity comments

- Cybersecurity Policy was updated to reflect coordination efforts with NSF and LDG Tier IIs
  - posted on LIGO's website
- Begun search for full time professional cybersecurity officer
  - job announcement posted
  - search committee being formed (chaired by Kent Blackburn)
- Most important-- Cybersecurity is a community effort-- involving everyone
  - intelligent uses of passwords and access controls
  - keeping virus protection rules up-to-date
  - avoid phishing emails and websites
  - communicate concerns with cybersecurity team and sysadmins

NSF funding prospects for FY2009 educated (?) speculation

- FY09 President's budget request
  - Big increases for NSF research
  - For projects-- Total MREFC- $147.5M ($73M below FY08)
    - Reflects NSF view of Adv. LIGO and other MREFC projects-- Only ALMA, ICECUBE & Adv. LIGO ($51.43M).
    - Three other projects paused- the Alaska Region Research Vessel (ARRV), the National Ecological Observatory Network (NEON), or the Ocean Observatories Initiative (OOI)
- FY09 will probably be difficult- Bush's budget dead on arrival
  - Expect Continuing Resolution (CR) at FY08 funding levels until new president decides on FY09 budget priorities--lasts thru April '09 and perhaps whole year
  - Large increase for NSF in Bush budget makes a tempting target
- LIGO Lab prospects if CR
  - Need FY09$<FY08$ due to staff on Adv. LIGO--ok in CR
  - ADL ~$51M part of MREFC budget line < FY08 so that's good

The UK situation

Crisis but looking more encouraging

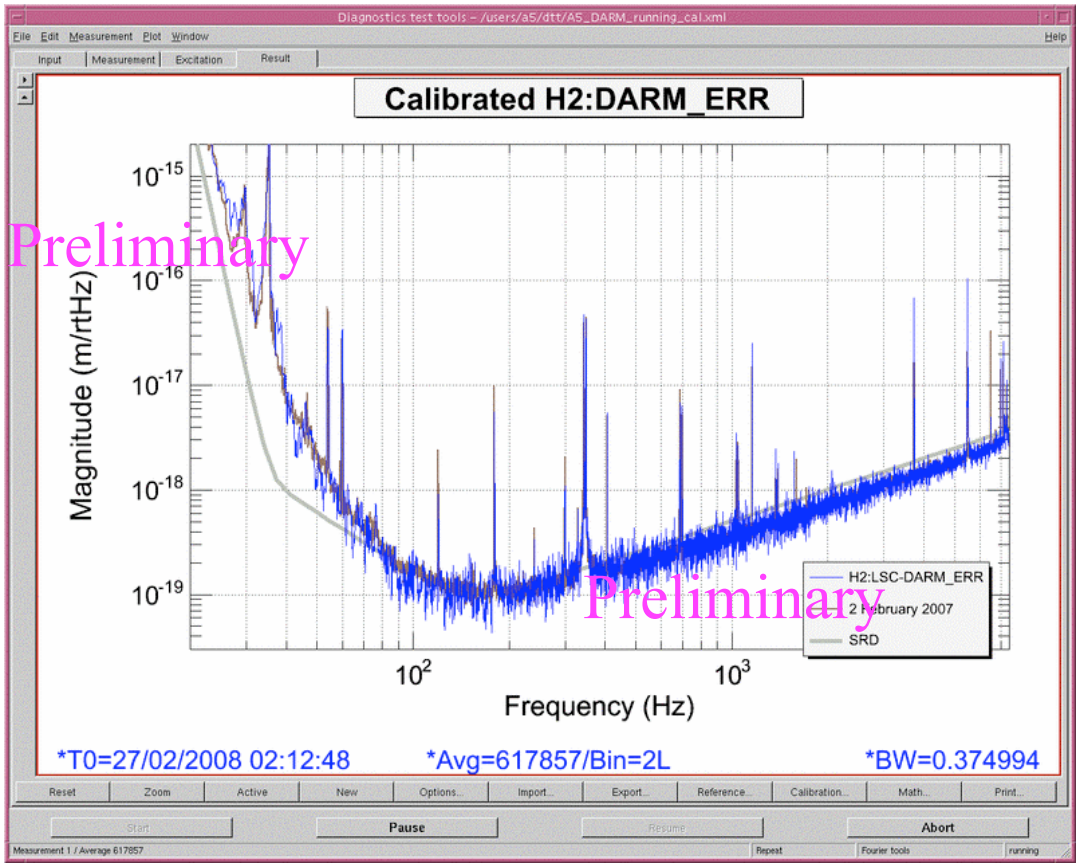
- Science and Technology Facilities Council Programmatic Review

The Science and Technology Facilities Council (STFC) has today (3rd March 2008) released the advice it has received from its Science Board and subcommittees who have over the past few months been conducting a review of all approved STFC programmes.

Among activities which the Science Board rate as **most important for the future are the search for gravitational waves**, the exploitation of the Large Hadron Collider (LHC) at CERN (which is coming on line this year), the new Diamond Light Source, and the second target station at the ISIS neutron spallation source.

- But there is a several week comment period; still time for priorities to change

H2 performance looks good



Compared to H1 performance during of ~5.7 Mpc on Inspiral Range Monitor