
# News from LIGO Lab

LSC/Virgo Collaboration Meeting

September 20, 2008

Jay Marx

LIGO-G080442-00-A

# Topics

- Hurricane Gustov--report
- Astrowatch update & LAAC news
- E-LIGO update
- Grant & funding for Lab operations and Advanced LIGO
- Advanced LIGO update
- Possible squeezing experiment--update
- Possible new LIGO education center at Hanford
- Open data policy--update
- International news

# Hurricane Gustov

LIGO Livingston


Path of Gustov

# Hurricane Gustov--impact on LIGO

- Observatory shutdown on August 31
- Storm hit on September 1
- Only minor damage- minor
  - Broken window
  - Fiber optics cables damaged
  - Loss of power to site due to extensive downed powerlines in area
  - Loss of power continued until September 4
  - Observatory operations restarted September 8
  - No injuries to staff and their families
- We were very fortunate. The observatory staff did a great job!

# AstroWatch with H2 at Hanford Observatory

- A5 began 18Feb2008
- Run by LSC grad students
  - Good training for students
  - Frees up most experienced labor for eLIGO work on H1
- Successfully running (stats for 18Feb-2Sep08)
  - Science mode up time ~28%
  - Total up time ~52%
  - H2 range varies 6-7.5 Mpc, depending on eLIGO activity/hardware.
- Astrowatch will continue until beginning of S6 in spring 2009
  - Need more student volunteers for January 2009 and beyond.

# LSC grad students signed up for AstroWatch A5 duty

Already served

Not yet arrived

| | |
|---|---|
| Berit Behnke (AEI) | Philip Roberts (Andrews) |
| Evan Goetz (Michigan) | Jacob Slutsky (LSU) |
| Pinkesh Patel (Caltech) | Junyi Zhang (Michigan) |
| Szymon Steplewski (WSU) | Matt West (Syracuse) |
| Adam Mullavey (ANU) | Satya Mohapatra (U. Mass. Amherst) |
| Llucia Sancho de la Jordana (U. de les Illes Balears) | Miquel Trias (U. de les Illes Balears) |
| Jericho Cain (U. Miss) | |

**Thanks students and your faculty advisors**

Need more students for Jan-Mar 2009!

Publications

Journals of the American Physical Society

**APS News**

- Issue Archives
- Features Archives
- Announcements

Physics Today

Physical Review Focus

Capitol Hill Quarterly

Other APS Publications

Reciprocal Society Newsletters

Pages For:

Physicists/Scientis Go

Home | Publications | APS News | August/September 2008 (Volume 17, Number 8) |

LIGO's Eyes on the Sky

# Astrowatch Keeps LIGO's Eyes on the Sky

**By Calla Cofield**

When LIGO announced last September that the upgrade to Enhanced LIGO would take its two largest interferometers off-line from October 2007 until early 2009, a handful of physicists winced, and recalled a similar situation in 1987. That year, all available bar detectors went off-line simultaneously and missed the 1987a supernova. Concerns were raised that LIGO might miss the gravitational wave signals from a gamma ray burst or supernova like 1987a—which it might have been able to detect—and have to wait who-knows-how-long for another one. Meanwhile, LIGO's smallest interferometer—the 2-kilometer-long H2 located at the Hanford, Washington facility—would be unable to operate during the daytime hours because of the significant seismic activity created by the construction. Plus, the operators would be occupied with the upgrade, and there wasn't funding to pay a new team.

Ph

Left to right: Matthew West, Evan

# News from the LAAC

- LIGO Lab Fellowship
  - The Observatory fellowship competition -- application deadline Oct. 01, 2008.
  - The Fellowship will provide each student with a $5000 stipend, as well as support for travel to the site, two trips to the student's home institution, and support for incremental living expenses related to being at the site.
  - This Fellowship is competitive and is open to all students in the LSC who wish to develop an expertise in instrument science, including those already in residence at an observatory.
  - Details---upload this talk and see the next slide
- Updating the student database
  - Please use the new wiki-- see www.ligo.caltech.edu/laac/

# LIGO Student Fellowship Program for AY 2008- 2009

LIGO Laboratory invites students to submit applications for participation in the LIGO Student Fellowship Program. This program provides two fellowships each year, awarded to students within the LIGO Scientific Collaboration (LSC) with a strong interest in instrumentation science. Students who are interested in committing to spend one year at either LIGO observatory to pursue a significant instrument project are encouraged to apply. The Fellowship will provide each student with a $5000 stipend, as well as support for travel to the site, two trips to the student's home institution, and support for incremental living expenses related to being at the site. This Fellowship is competitive and is open to all students in the LSC who wish to develop an expertise in instrument science, including those already in residence at an observatory.

The Program is intended to encourage the long-term presence at an Observatory needed for a student to gain experience and to successfully complete a significant instrumentation project. Identification of a mentor at an Observatory, and a project that is significant to LIGO and of interest to the Observatory staff, is, therefore, an important aspect of a successful application. Observatory contacts this year are Dr. Brian O 坦eilly at LIGO Livingston Observatory and Dr. Mike Landry at LIGO Hanford Observatory. Students and/or their advisors are invited to coordinate with the appropriate Observatory contact for assistance with preparation of the proposal. The observatory contact can help identify a possible on-site mentor, indicate whether the project being proposed fits into the needs or capabilities at an observatory, and provide information on possible projects that are of interest to the observatory staff.

**Proposals submission details**: * Brief curriculum vitae: Under two pages. * Research proposal: A plan for the research project to be carried out at the Observatory with a description of the project, its significance to LIGO, why it is desirable to carry out this project at an Observatory, the resources needed to carry out the project, and an indication of others who would be involved in the project (e.g. mentors, collaborators, etc.). The proposal should be no more than three pages in length. * Recommendation letter: A letter of recommendation, preferably from the student痴 thesis advisor, that includes a commitment of support for the student during the year at the Observatory. * Application due date: **October 01, 2008**, to be submitted electronically to Nergis Mavalvala (nergis@ligo.mit.edu) Proposals will be evaluated by a committee consisting of members of the LIGO Academic Advisory Council and a representative from each Observatory. Results will be announced shortly after October 01, 2008.

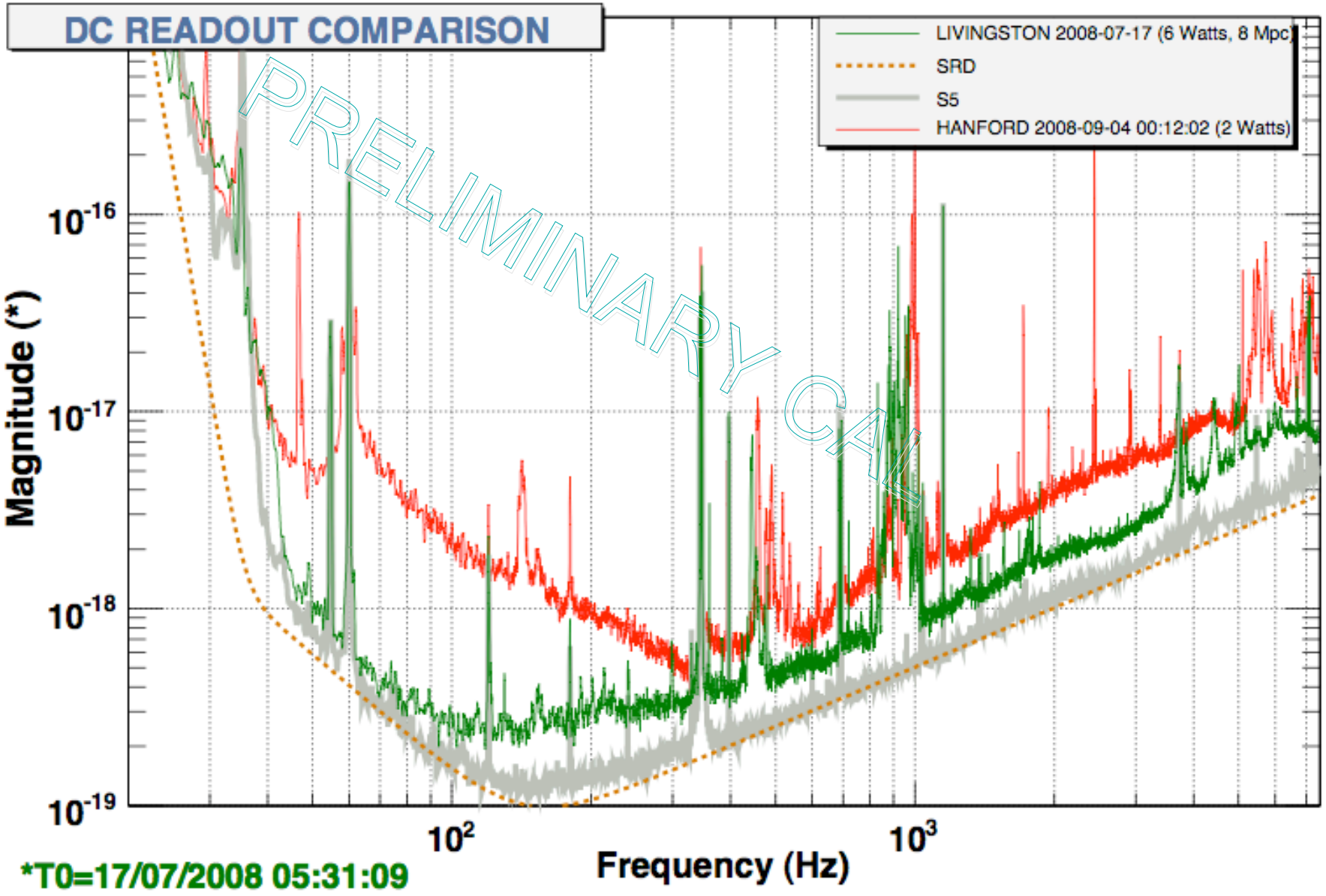
# *Enhanced LIGO (ELI) Status 9/08*

- Hardware (mostly) COMPLETE
  - AEI/LZH 35W lasers, locked & stabilized (**AdL** laser front end)
  - UF **AdL** high-power IO upgrades (Faraday, EOM)
  - 35W CO2 laser thermal compensation
  - **AdL** Active HAM seismic isolation
  - **AdL** Output Mode Cleaners
  - **AdL** OMC Double Suspensions
  - **AdL** DC Readout detectors, electronics, software, PCIX front ends

**Lots of AdL hardware!**

- Other improvements over S5 configuration
  - Silica bumpers ("earthquake stops") to stop contact charging
  - SmCo drive magnets to stop domain-flip upconversion
  - Stray light baffles+ to kill multipath phase noise
- Left to do;
  - Increase power (+ corresponding thermal compensation)
  - Finish L1 EOM & PSL integration
  - Install H1 ETM baffles
  - Take out 50:50 split for old RF readout
  - REDUCE NOISE, INCREASE DUTY FACTOR

# L1 *AND* H1 on DC Readout



# *E-LIGO--The Plan*

- September 2008: Synchronize H1 & L1 hardware & software
- October-January ‘09: Tag-team commissioning push
  - Power up, noise reduction, duty factor
  - Two expert teams, identical hardware, complementary test plans
- Feb ‘09 (*success-oriented*); Begin to prepare for S6

# NSF funding for operations and Adv. LIGO

- In April 2008 the NSF NSB approved full funding for Advanced LIGO ($205M) and $150M for LIGO Lab operations for FY2009-FY2013
  - New operations grant starts Oct 1, 2008 (in ~ 1 week)
- Since April have negotiated with NSF for a more optimum funding profile ($ vs. time) for both Advanced LIGO and operations--- success.
- Bottomline-- funding for both Adv. LIGO and for LIGO Lab operations for next 5 years is in good shape

# Advanced LIGO- status

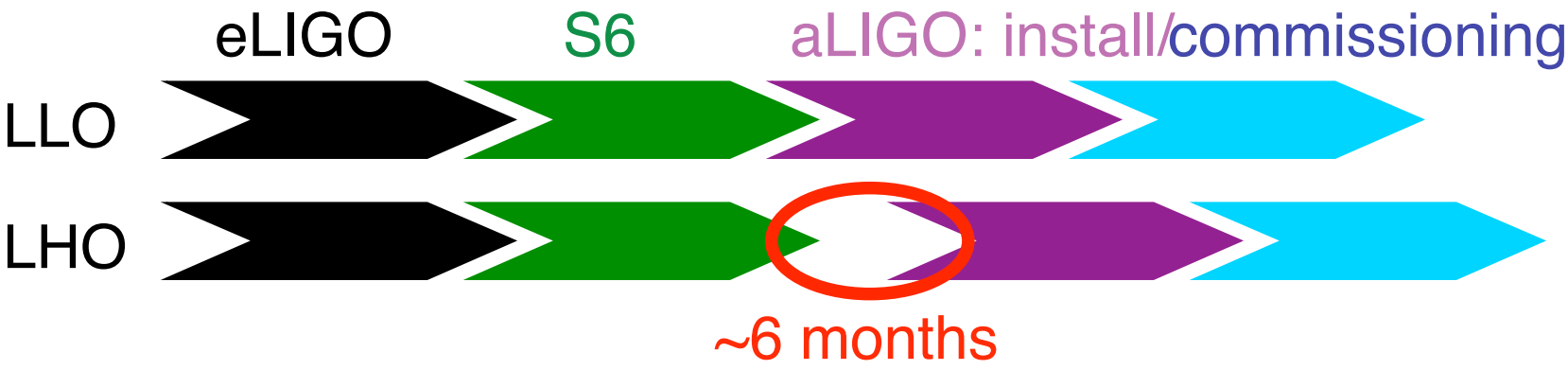
Details-David Shoemaker's talk

- Project started in April!
  - Funding, schedule as anticipated
- Now ~6 months into Project activities
  - Project established and in operation
  - Staffing effectively complete
  - Major subcontracts set up, procurements underway
  - Observatory staging buildings in preparation
  - Still wrapping up development, no show stoppers
- Reminder of key schedule dates:
  - First observatory shutdown (early dates) Feb '11, second Oct '11
  - Interferometer Acceptance (early dates): June '13, Jan '14, April '14

# H1 Squeezing Experiment
## Motivation

- High power operation in future detectors is one of biggest remaining technical risks for Advanced LIGO
- Successful squeezing could have a big positive impact on Advanced LIGO performance
  - Squeezing allows for lower laser power to achieve hf sensitivity goal
  - Or better hf sensitivity at full power
- Daniel Sigg et al have proposed that LIGO Lab undertake experiment at Hanford H1
  - Demonstrate low frequency, low noise squeezing on IFO
  - Essential step towards development of squeezer for AdL IFOs

# H1 Squeezing Experiment Time Line




- Complete proposal to LIGO lab: August 2008
  - Internal review (Fred Raab, chair) in progress
  - Approval (hopefully): September/October 2008
- Construction
  - Build breadboard by fall 2009
  - Testing and characterization by mid 2010 → send to LHO
- Experiment on H1: Feb 2011 to Sep 2011
- Wiki: http://baikal.mit.edu/sqwiki/H1Squeezer
  - Email list: http://mm.ligo.caltech.edu/mailman/listinfo/squeezer

# LIGO open data policy- update

- Part of the NSB approval resolution for Advanced LIGO:

WHEREAS, the NSF management shall report back to the National Science Board within 12 months of this award what efforts have been undertaken and what provisions have been implemented to make the data obtained under this award available and useable to the broader research community;

- This is a directive to the NSF (not LIGO or the LSC at this point)
- But we need to be proactive--devise an approach we want to live with and convince NSF to support it
- Directorate chartered group (Rai Weiss, Barry Barish, Peter Saulson, Dave Reitze, Stan Whitcomb, Albert Lazzarini, Jay Marx) to develop an approach and white paper.
- **Will be discussed with LSC-- Albert's talk today, then with LSC Excomm and Council**
- NSF will "review" our approach with outside reviewers in ~late January 2009 as part of developing their response to NSB directive.
  - Our opportunity to convince NSF to do it our way

# Possible science education center at Hanford

- Building on successful SEC at Livingston, have interested NSF in funding a center at Hanford (the LIGO Exploration Center- LExC)
- In August the NSF Deputy Director discussed the idea with the National Science Board.
- LIGO Lab was invited to submit a proposal for the design, construction and outfitting of the LExC
- Proposal will be submitted in November 2008
  - Then expert review including site visit to Hanford, perhaps January 2009
- With good review we are very hopeful that LExC will happen

# International update

- GWIC Roadmap-status
  - Looks at where the field should go over next several decades and facilities and capabilities needed; ground, space, theory, NR, technology.
  - Platform for field to advocate for its needs and articulate the promise and goals to other scientists
  - Good progress-- draft report near complete
  - Will ask a set of colleagues from inside and outside our field to critique
  - Then to full GWIC--- goal-- before Xmas

# ASPERA Workshop


- September 30--Speakers on priorities in astroparticle physics from:
  - Europe, DOE, NSF, Japan, China, Canada, Russia, India
- Worldwide Coordination in GW antennas J. Marx
- Towards a worldwide coordination in Astrophysics--- Round table with all speakers

# Summary--news headlines

- LIGO dodged a bullet- hurricane Gustov
- Astrowatch going well
- e-LIGO making good progress towards S6
- Advanced LIGO project is off and running
- Funding for Advanced LIGO and LIGO Lab operations for next 5 years is in excellent shape
- Virgo viewport failure- a heads-up for LIGO
- Important new “opportunities” for LIGO
  - Proactive defining a realistic open data policy
  - Squeezing experiment towards mitigating Adv. LIGO high power risk
  - LIGO Exploration Center at Hanford