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Subject: Large Facilities Projects Monthly Report (End of September 2008)

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Subject: LIGO End of September 2008 Highlights (LIGO Cooperative Agreement NSF PHY-0107417)

Reference: LIGO-M080357-00-P

General

A new five-year cooperative agreement for LIGO Operations (NSF PHY-0757058) is being finalized and will begin with an effective start date of October 1, 2008. We are in the process of switching from the current cooperative agreement (NSF PHY-0107417). LIGO has requested, and the NSF has granted, a six month no-cost extension to the current cooperative agreement. All day-to-day operations will be switched to the new cooperative agreement effective October 1. However, the no-cost extension will provide time for an orderly transition. Unobligated funds will be used to complete tasks that were planned as part of and are within the scope of the current cooperative agreement. Examples include hardware to support unfinished R&D effort for Advanced LIGO and the procurement of cluster computers needed for analyzing enhanced LIGO data. We typically delay the purchase of computers as long as possible to achieve the best performance/price ratio.

LSC

The third LSC-Virgo meeting of the year was held in Amsterdam during September, with 194 attending. In addition to progress updates on the LIGO, Virgo, and GEO detectors, as well as reports on instrument science and analyses, the LSC-Virgo community heard presentations on developing an open data policy and on establishing collaborations with electromagnetic astronomers and particle astrophysicists for burst searches. The LSC Executive Committee and Virgo Steering Committee held a joint meeting to consider two questions: (i) how to develop external collaborations with astronomers and particle astrophysicists and (ii) how an open data policy would affect Virgo. The LSC Council also engaged in an enlightening discussion about the merits of an open data policy followed by a spirited debate on how we should go about developing external collaborations.

Following the main conference, a meeting of the chairs of LSC and Virgo data analysis, calibration, detector characterization, data analysis software and computer groups was held at Nikhef to address a number of issues, including progress on S5/VSR1 analyses and papers, preparations for S6 and VSR2, and LIGO-

Virgo integration. The purpose of the meeting was to analyze how each group functions, to understand the internal and external stresses that may compromise work efficiency, to identify bottlenecks in generating observational results and develop methods to overcome them, and to develop methods and insights for improving how the group functions. All participants felt the meeting was worthwhile and beneficial.

The LIGO Astrowatch program was featured in the August-September APS Newsletter: "Astrowatch Keeps LIGO's Eyes on the Sky," http://www.aps.org/publications/apsnews/200808/ligo.cfm?cs_LoginTime=171834. The article pointed out the key role that LSC graduate students played in getting the program started and keeping it going.

A newly designed and much upgraded LSC web page, www.ligo.org, was unveiled in September.

Publications

Published or accepted for publication:

- The S4 burst paper "First joint search for gravitational-wave bursts in LIGO and GEO600 data" has been accepted in Classical and Quantum Gravity.

Submitted or on the arXiv:

- The Pulsar group early S5 all-sky observational paper "All-sky LIGO Search for Periodic Gravitational Waves in the Early S5 Data" has been posted to the ArXiv: <http://lanl.arxiv.org/abs/0810.0283> and is intended for submission to the Physical Review Letters.

Education and Outreach

Livingston Observatory (LIGO Science Education Center)

Student learning:

- The Science Education Center hosted six school visits this month with a total attendance of 170.
- Dillard University International physics students (5)
- Homeschool (19)
- Special needs 4th grade (21)
- Two private schools
 - 5th grade (31)
 - 9th-10th (15)
- High School, 12th grade (79)

Teacher Training programs:

- We conducted two off-site Docent training (Cohort 2) programs at SUBR. The focus of the training was the use of "snacks" as a method of teaching LIGO Science concepts and modeling the LIGO exhibits.
- Successful Docent (Cohort 1) participation in school visit -- four docents helped with the program.

Public Outreach:

- Conducted two public tours for a total of 28 visitors. We conducted our first public tour on Saturday,

September 27th.

- Met with Scott Higgins of Pro-media to discuss filming a LIGO Scientist as part of the Science Education Program for pre-visit packets and for the SEC web-site.

Hanford Observatory

For the fourth consecutive year, the Hanford Observatory participated in the Idaho National Laboratory (INL) Science, Engineering, and Safety Expo in Idaho Falls. Three thousand regional middle school students attended the first two days of the Expo; the final day was family day. Roughly 30 agencies, universities, INL groups and community science interests participated as exhibitors. Following the 2007 Expo, LIGO appeared on page 6 of FTC NewsLink (<http://www.federallabs.org/pdf/OctoberNovember2007-NewsLink.pdf>).

Enhanced LIGO

The Hanford and Livingston four-kilometer interferometers have both returned to operational shakedown after the vents and installation activities reported last month. Progress continues toward reducing strain noise, improving robustness, and gradually scaling up laser power to take full advantage of the completed hardware.

Advanced LIGO

This is a summary of activities conducted under Operations Support for the LIGO Laboratory, along with contributions from other collaborating institutions with the NSF or international support, for Advanced LIGO Development. It complements the Advanced LIGO Project Activities summary in the Advanced LIGO Project Monthly Report.

Seismic Isolation

Test Mass Seismic Isolation system: Further tuning of the control laws is underway.

Auxiliary Chamber Isolation system: We began the HAM internal seismic isolation Preliminary Design Review at the end of the month, with a mature design and complete documentation. Given the positive experience with the prototypes installed at the observatories, it is anticipated that we will 1) be able to re-use the prototypes as part of Advanced LIGO, and 2) be able to carry out the Final Design Phase in roughly one month (mostly a matter of documentation).

Suspensions

We are characterizing the Output Mode Cleaner suspensions for enhanced LIGO. Work continues on the design of the triple suspensions to be used as part of the recently-adopted stable recycling cavity geometry.

Pre-Stabilized Laser

We continue to characterize the system at Hannover, Germany, where it is continuously running at the specified power of 180 Watts. More experience was gained with the 35 W front end lasers installed in enhanced LIGO. We have started the Preliminary Design Review with a very good package of results and documentation.

Input Optics

The University of Florida group, with LIGO Laboratory support, continued aligning and tuning the enhanced LIGO elements, and continued the detailed design of the input optics for Advanced LIGO. Testing of components in the beam of the prototype Advanced LIGO Laser at Hannover has shown that the components performed as anticipated with the planned input power (140 W in this case and at this point in the optical circuit).

Core Optics

The polishing pathfinder effort at Tinsley is approaching its closeout review scheduled for the first week of October, and preliminary data are very encouraging. Interactions with potential polishing and coating vendors continues. The modeling effort is helping to better specify the surface in a way that is compatible with the vendors' needs.

Auxiliary Optics

Continued work on the Preliminary Design phase of the stray light control subsystem. We continue to tune and commission the Thermal Compensation System for enhanced LIGO.

Interferometer Sensing and Controls

We continued commissioning the DC readout as realized for enhanced LIGO and preparing for a demonstration of sensing topologies in the Caltech 40-meter facility.

Data Acquisition System

The DAQ Preliminary Design Review is nearing completion. The committee judged the package to be largely suitable for a Final Design Review, due to both the maturity of the design and the unique fact that the electronics are expected to evolve on a time scale that is short compared to the duration of the Advanced LIGO Project. This indicates that a non-traditional review process consisting of periodic meetings of an advisory committee, with procurements guided by an assessment of schedule pressure and technical readiness, may be best. The approach to be used is in discussion as the month closes.

System Engineering and Integration

These activities are now part of the Advanced LIGO Project and reported there.