

**Attachment OPS to the
Memorandum of Understanding (LIGO- M050270-00-M)
between the
Pennsylvania State University Relativity Group (PSURG)
and the
Laser Interferometer Gravitational Wave Observatory (LIGO)
August 15, 2005**

This Attachment OPS to the Memorandum of Understanding LIGO-M050270-00-M defines the role of the Pennsylvania State University Relativity Group (PSURG) as a Member of the LIGO Scientific Collaboration (LSC) in the areas of detector commissioning, detector characterization, and operations in support of the initial LIGO interferometers. The period of performance for the activities in this Attachment is from August 15, 2005 to August 15, 2006.

1. Together, the LIGO Laboratory and the LIGO Scientific Collaboration (LSC) are responsible for implementing and exploiting the initial LIGO detector through its science data runs. LSC groups are encouraged to contribute to the commissioning, characterization, and operation of the LIGO detectors, as members of working groups established by the LIGO Laboratory and the LSC.
2. During the period August 15, 2005 to August 15, 2006, the members of PSURG Group will participate in the initial LIGO detector research program in the following areas:

a) Detector characterization

1. Spectral Line Cataloguing: Thorne will lead the Spectral Line Catalogue sub-group. This sub-group is tasked with providing updated catalogues of the spectral line features in S4 and subsequent data. This work will assist with line source identification and potential amelioration.
2. S5 Line-Finding Analysis: Finn, Desai and Thorne will use the near-realtime analysis pipeline for automated daily reporting of spectral line features during the S5 run.
3. S5 stationarity: Finn and Desai will use lineamp, medNoiseChar, and other tools to identify epochs where the S5 noise and calibration can be considered to be approximately stationary. Results will be documented in a technical document and posted on the web on a daily basis for use by the collaboration.
4. S5 Vetoes: Finn and Desai will identify potential channels in S5 to be used for vetoes, and tune their parameters for greatest veto effectiveness. They will also provide daily summaries of results of Block-Normal processing on various auxiliary channels.

5. Test for non-gaussianity: Summerscales will apply the Poisson test for detecting data segments with nonzero higher order moments caused by nonlinear correlations to recent science runs.

6. Detector investigations: Rakhmanov, who will be sited at LHO, will assist the PSU group and the LHO staff in diagnosing detector artifacts discovered through the analysis of detector data, and will recommend data diagnostics, to be implemented by PSURG, based on knowledge of the detector and its operation.

b) Computing infrastructure

1. Virtual Organization Administration: Ramsunder, assisted by Holmes, McNabb and Nucciarone, will administer and support the LIGO virtual organization within the OSG. This support will include maintaining the LIGO VOMS server, the LIGO computing account applications page, and the support center for outside OSG users.
 2. MATLAB based data analysis: Thorne, Finn, and McNabb will support MatApps.
 3. Einstein@Home: Ramsunder will with the Einstein@Home project to continue PSU's support of an Einstein@Home mirror at PSU.
 4. Grid infrastructure: Rakhmanov will work with Zweizig to support the DMT in the OSG environment.
3. Resource Sharing: The LIGO Laboratory will contribute resources including allocation of appropriate scientific and engineering personnel, research facilities and funding in support of the effort in Item No. 2, as indicated below.
 - a) Research accommodations for PSURG group members while on LIGO research assignment at any LIGO Laboratory site,
 - b) Access to LIGO data through established LSC channels in support of this work.
 4. Coordination and Reporting – PSURG Group will perform this research within the structures established by the LIGO Laboratory and the LSC where appropriate. In particular activities described in Item 2a) will be carried out in coordination with the Detector Characterization Working Group, and Item 2b) will be carried out in coordination with the Data Analysis Software Working Group of the LSC. Coordination will include keeping the Group leaders informed of activities and plans, reporting to the group at meetings and telecons, and through technical documents submitted to the LIGO Document Control Center.

In addition, an annual report will be submitted with the update to this Attachment, giving a summary status on research by topic as indicated in Item No. 2, including progress against the milestones if any, significant accomplishments such as new insights/discoveries or publications, issues of concern if any, and an indication of invested time. This Attachment will be updated at least annually with a plan of activities for the succeeding on-year period.

These documents will be due one month before the close of the period of performance under this Attachment.

5. All computer code delivered to the LSC under this Attachment must be developed in consultation with the LSC Data Analysis Software Working Group (DASWG) and archived, documented and reviewed as determined by that group.

Approved:

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Lee Samuel Finn
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Peter Saulson
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