

**Attachment OPS to the**  
**Memorandum of Understanding (LIGO-M050315-00-M)**  
**between the**  
**Hobart and William Smith Colleges Group (HWSLG)**  
**and the**  
**Laser Interferometer Gravitational Wave Observatory (LIGO)**  
**August 15, 2005**

This Attachment OPS to the Memorandum of Understanding LIGO-M050315-00-M defines the role of the Hobart and William Smith Colleges Group (HWSLG) 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 HWSLG will participate in the initial LIGO detector research program in the following area:

*Detector Characterization* – HWSLG plans to complete development of the bicoherence monitor, BicoMon. This monitor is used to detect bilinear coupling, such as up-conversion, non-Gaussianity, and frequency/phase noise. Although work on the monitor has languished during the past year due to heavy teaching commitments, the work should be able to be completed this year while Penn is on research leave.

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 HWSLG members while on LIGO research assignment at any LIGO Laboratory site,
  - b) Access to LIGO data in support through established LSC channels in support of this work.
4. Coordination and Reporting – HWSLG 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 within the Detector Characterization 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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Barry Barish  
LIGO Laboratory Director

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Steven Penn  
HWSLG Principal Investigator

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Peter Saulson  
LSC Spokesperson

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Keith Riles  
LSC Detector Characterization Leader