

**Attachment Number B to the  
Memorandum of Understanding (LIGO-M020307-00-M)  
between the  
Hobart & William Smith Colleges LIGO Group (HWSLG)  
and the  
Laser Interferometer Gravitational Wave Observatory (LIGO) Laboratory  
February 15, 2004**

This Attachment to the Memorandum of Understanding LIGO-M020307-00-M covers the role of Hobart & William Smith Colleges LIGO Group (HWSLG) as a Member of the LIGO Scientific Collaboration (LSC) and a member of the Isolation/Suspension/Thermal Noise Development Group (ISTNDG). The period of performance for the activities in this Attachment is from February 15, 2004 to August 15, 2004. This period may be modified by agreement to a revision of this Attachment.

1. LIGO Scientific Collaboration - The LIGO Scientific Collaboration is organized as a separate organization from the LIGO Laboratory. It includes scientists from the LIGO Laboratory, and those from collaborating institutions, and has its own leadership and governance. The Collaboration will ensure equal scientific opportunity for individual participants and institutions. It will organize the research, publications, and all other scientific activities. The Collaboration will report to the Laboratory Directorate for final approval of its research program, technical work, observational physics publications, and talks announcing new observations and physics results. This will be done through regular reports to the Directorate and its PAC.
2. Charter Membership - An initial period for formation of the Charter group of institutions in the LIGO Scientific Collaboration commenced on March 1, 1997 and ended following the first full meeting of the Collaboration at which the Collaboration Council assumed its role.

Following the charter period proposals will be evaluated through the Collaboration Council. With Collaboration approval, an MOU with the LIGO Laboratory, including Attachments defining specific work, will be required for any participating institutions.

3. This document is an agreement between the Hobart & William Smith Colleges LIGO Group (HWSLG) and the LIGO Laboratory concerning the activities of HWSLG as a Collaborating Institution in the LIGO Scientific Collaboration (LSC) and in the Isolation/Suspension/Thermal Noise Development Group (ISTNDG), and as indicated in item No. 8.
4. Isolation/Suspension/Thermal Noise Development Group - The Isolation/Suspension/Thermal Noise Development Group (ISTNDG) is the scientific collaboration for defining

and developing future isolation and suspension improvements for use in advanced subsystems for the initial LIGO interferometers or in entirely new advanced interferometers. A specific Attachment will define the roles and responsibilities of groups in this development group. Members of this group will normally be authors on publications reporting the work of the group and will normally be eligible to participate in data runs and science beyond the LIGO I data run.

5. Report of Progress - HWSLG will provide a status report on its activities in support of LIGO every six months. The report will consist of: a) a summary status on research by topic as indicated item No. 8 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, b) updated List of Collaborators, and c) a plan of activities for the succeeding six-monthly period. The report will be due one month before the close of the period of performance under the Attachment in question.

6. Term of Membership - The Membership will be renewed every six months upon evidence of satisfactory performance of agreed upon duties.

The coordinates of HWSLG members are included in the Attachment Z to the Memorandum of Understanding LIGO-M020307-00-M.

7. Intellectual Property Rights - The rights to intellectual property developed under this Attachment will be subject to the National Science Foundation Grant Policy as indicated in Section 730, Intellectual Property.
8. During the period February 15, 2004 to August 15, 2004, HWSLG will include Steven Penn (faculty). HWSLG will:

a) Conduct research into the loss mechanisms in fused silica. This research will focus primarily on utilizing annealing techniques to minimize the mechanical loss in polished fused silica optics. Such methods have already been shown to lower the mechanical loss in flame-drawn samples of fused silica below the loss limit required for Advanced LIGO large optics.

b) Develop an empirical model for the loss in fused silica which includes both the frequency and surface dependence as has been observed by several researcher groups in the LSC and TAMA. These groups are collaborating on a paper to present this model.

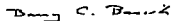
c) Participate in activities of the Coating Loss Research Group. My coating research activity will be temporarily curtailed to allow additional time for the work listed in paragraph a). I hope to rejoin those efforts when the fused silica annealing experiments wind down.

d) Participate in the Optics Working Group and Suspension Working Group activities as they relate to mechanical loss in optics and optical coatings.

9. During the period February 15, 2004 to August 15, 2004, the LIGO Laboratory will share, as requested and appropriate, LIGO data of relevance to research in Item No. 8.

10. The research effort pursuant to this Attachment B will be coordinated by Steven Penn, and David Shoemaker on behalf of HWSLG and the LIGO Laboratory, respectively.
11. Resource Sharing: The LIGO Laboratory will contribute resources, including allocation of appropriate scientific and engineering personnel, research facilities and funding in support in the effort in Item No. 8, as indicated below.
  - a) Accommodations for HWSLG investigators while on LIGO research assignment at Caltech, and or LIGO sites.
  - b) Sharing of test samples for the research efforts listed in Item No. 8.

Approved:



Digitally signed by Barry Barish  
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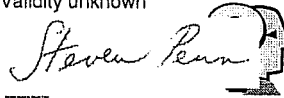
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Barry Barish  
LIGO Laboratory Director

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Date

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Steven Penn  
Principal Investigator  
LIGO Group  
Hobart & William Colleges

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Date