

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

This Attachment OPT to the Memorandum of Understanding LIGO-M050315-00-M defines the role of the Hobart and William Smith Colleges LIGO Group (HWSLG) as a Member of the LIGO Scientific Collaboration (LSC) and a member of the Optics Development Group (ODG). The period of performance for the activities in this Attachment is from August 15, 2005 to August 15, 2006.

1. Optics Development Group – The Optics Development Group (ODG) is the scientific collaboration for defining and developing improvements in optics for use in advanced subsystems for the initial LIGO interferometers or in entirely new advanced interferometers. MOU Attachments define the roles and responsibilities of groups in this development group.
2. During the period August 15, 2005 to August 15, 2006, the members of HWSLG will participate in ODG in the following areas:
 - a) *Optics Characterization* -- HWSLG will continue its studies of the mechanical loss in fused silica as a function of silica variety, surface treatment, S/V ratio, frequency, and internal stress (as altered by annealing). These studies will be conducted on flame polished rods and mechanically polished optics. The rod samples allow us to study the mechanical loss at a low resonant frequency and low S/V ratio without the losses associated with a polished surface. In comparison, the polished optic samples allow us to study the effect of the polished surface.
 - b) *Coating Characterization* – HWSLG will continue its research with the LIGO coating research group to find a suitable high refractive index, low mechanical loss material for use in the mirror coatings for Advanced LIGO. The HWS Lab provides a third measurement facility for coating samples in addition to the MIT and Glasgow facilities.
 - c) *Reduced Noise Initial LIGO Optic Suspension* – Penn will be applying to the LIGO visitors program in Fall 2005 in order to work at LASTI to help develop a nondestructive modification to the LIGO I optics suspension that will lower the thermal noise. The goal would be to make the modification as part of an interim upgrade to Initial LIGO.
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.
 - c) Purchasing of some of the samples to be used in the fused silica research described in Section 2a.
 - d) Providing Coating samples as required by the coating research group as described in Section 2b.
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 2 will be carried out within the Optics Development 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.

Approved:

Barry Barish
LIGO Laboratory Director

Steven Penn
HWSLG Principal Investigator

Peter Saulson
LSC Spokesperson

David Reitze
ODG Leader