



**Attachment OPT to the
Memorandum of Understanding LIGO-M970077-00
between the German/British Collaboration (GEO 600) for the
Detection of Gravitational Waves (GEO600)
and the
Laser Interferometer Gravitational Wave Observatory (LIGO)
For The Period
August 15, 2007 - August 14, 2008**

This Attachment OPT to the Memorandum of Understanding LIGO-M970077-00 defines the role of the German/British Collaboration (GEO 600) for the Detection of Gravitational Waves (GEO600) as a Member of the LIGO Scientific Collaboration (LSC), and a member of the Optics Development Group (LDG). The period of performance for the activities in this Attachment is from August 15, 2007 - August 14, 2008.

1. Collaboration

The Optics Development Group (ODG) is the scientific collaboration for defining and developing instruments in optics for use in advanced subsystems for the initial LIGO interferometers, or in entirely new advanced interferometers.

MOU Attachment OPT defines the roles and responsibilities of groups in this development group.

2. Participation

During the period August 15, 2007 - August 14, 2008, the members of GEO600 will participate in ODG in the following areas:

a. Optics Characterization

Coating Losses for Advanced LIGO and beyond

a.1.) Measurements of multi-layer coatings applied to fused silica substrates
(Murray, Rowan, Hough & I. MacLaren)

Reduction of the mechanical loss associated with the addition of coatings to substrates and associated thermal noise remains an important research area for Advanced LIGO and is vital for the success of any future detectors that aim to have sensitivities better than Advanced LIGO.

We thus propose to continue to work with our LSC colleagues- Stanford University, Syracuse University, MIT, and Hobart and William Smith Colleges, on studies

of the excess mechanical losses associated with adding dielectric coatings to test mass substrates as part on the ongoing LSC coating research program.

a.2.) Mechanical loss associated with coatings for diffractive optics
(Cumming, Heptonstall, Rowan & Hough)

We propose to investigate the mechanical loss associated with the fabrication of diffractive optics in collaboration with colleagues in Hanover and Jena. We will have coatings added to blank silica disks and the disks on which there is etched a diffraction grating and then will study the mechanical dissipation of these to assess the mechanical loss associated with a coated diffractive optic.

a.3.) Coating loss measurements using thin cantilever substrates
(Martin, Reid, Rowan & Hough)

We propose to carry out measurements of the mechanical loss factors of uncoated and coated silicon cantilever samples to assess the temperature dependence of the mechanical loss of a number of ion-beam-sputtered coating materials.

In particular we will first study a single layer of undoped tantalum pentoxide to compare the behaviour of any low temperature dissipation peak with that in the doped tantalum pentoxide we studied previously. This experiment should help us probe what physical effect is responsible for the observed reduction in room temperature mechanical loss associated with titania doping the tantala.

b. Other Contributions

Studies of the use of non-Gaussian beams
(Miller, Strain & Robertson)

Experimental tests and theoretical development of the optics for mesa beam interferometry are carried out at Caltech. We will continue to provide input to this through the effort of John Miller (visiting Caltech). This work is supervised from Glasgow (Strain, Robertson) and Caltech (DeSalvo, Robertson).

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 GEO600 group members while on LIGO research assignment at any LIGO Laboratory site.

Not Applicable

b. Access to LIGO data through established LSC channels in support of this work.

Not Applicable

4. Coordination and Reporting

GEO600 will perform 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.

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

5. Computer Code

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.



Jay Marx
LIGO Laboratory Director



Karsten Danzmann
**Principal Investigator(s)
GEO600**



David Reitze
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