LIGO-M080224-00

Attachment SUS 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, 2008 - August 14, 2009

This Attachment SUS 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 Isolation/Suspension/Thermal Noise Development Group (ISTNDG). The period of performance for the activities in this Attachment is from August 15, 2008 - August 14, 2009.

1. Collaboration

The Isolation/Suspension/Thermal Noise Development Group (ISTNDG) 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 SUS defines the roles and responsibilities of workgroups in this development group.

2. Participation

During the period August 15, 2008 - August 14, 2009, the members of GEO600 will participate in in ISTNDG in the following areas:

a. Coating Losses

See under Optics Characterization in Attachment OPT.

b. Suspension Design for Advanced LIGO

References to WP1-WP4 below are to work packages of the UK Advanced LIGO Project. See the Advanced LIGO UK (Glasgow) website: http://www.physics.gla.ac.uk/igr/advligo/
[Personnel for items b.1. - b.3.: K A Strain, R Jones, K Tokmakov, M van Veggel, G Hammond, S Rowan, J Hough]

b.1.) WP1 Project management
(RAL + Glasgow/GEO600 + UK Advanced LIGO Project Team)

Continue oversight of all of the work packages within the UK Advanced LIGO Project. Manage the continuing OJEU procurement process.

b.2.) WP2 Main Suspension Science

Continue scientific input to the suspensions for Advanced LIGO. This work will now concentrate on refinements to the designs currently under test at LASTI, in particular the prism material and ear design will be reviewed. In parallel provide for procurement of the production masses, ears, and prisms.

b.3.) WP3 Main Suspension Systems: development of the final mechanical designs for the main suspension systems

(RAL + Glasgow/GEO600 + UK Advanced LIGO Project Team)

Continue to support LASTI in the testing of the prototypes, and also assemble a production prototype quad suspension to ensure correct fit and function of final production parts. Complete procurement of the final suspensions.

[Personnel for items b.4. - b.6.: S M Aston, M Cruise, R Cutler, A Freise, D Hoyland, N Lockerbie, D Lodhia, A Page, C C Speake, A Vecchio + ALUK Project Team and US/SUS]

b.4.) WP4 Electronics for Advanced LIGO

Our work is fully defined by the scope and schedule of the ALUK project, within the larger Advanced LIGO project.

- Final production of the OSEMs is underway and these will be delivered to the US throughout the next 12 month period.
- A pre-production cycle for the Coil Drive Electronics will be carried out and we aim to deliver “Test Stand” units to the US. Work towards the optimization of the performance will continue.
- Testing and production of the Coil Drive Electronics and Electro-Static Drive units will be conducted and units delivered to the US.

b.5.) WP4 Violin mode damping of silica ribbons for Advanced LIGO

Four units are scheduled to be delivered to LASTI over the coming months and the need for dampers will be determined.

b.6.) Compact interferometric sensor for Advanced LIGO

We will continue to develop the compact interferometric sensor and consider potential applications in LIGO where the high sensitivity and larger working range it offers would be advantageous.

c. Other Contributions

c.1.) Investigations of charge mitigation techniques

[S Reid, I Martin, S Rowan, J Hough & W Cunningham]

We propose to develop the current deposition technique for SnO coatings in order to produce more uniform coatings in an attempt to minimise the degradation in the breaking stress of conductive silica fibres. We will contact coating vendors regarding the possibility of acquiring commercial coatings (SnO, SnO2 or ITO) to assess

their suitability for Advanced LIGO.

c.2.) Improved suspension techniques development for bulk mechanical loss measurements

[E Chalkley, P Murray, A Cumming, J Faller, J Hough & S Rowan]

Modifications will be applied our current nodal support set up to compensate for the differential expansion between the test mass and the clamping structure.

c.3.) Measurements of silicon ribbon flexures

[S Reid, I Martin, W Cunningham, S Rowan & J Hough]

We will continue our studies of the mechanical loss of silicon cantilevers (which is both of intrinsic interest regarding their possible use as suspension elements in future detectors as well as of immediate relevance for their use as substrates for the study of the temperature mechanical loss factors of dielectric coating materials).

c.4.) Silicate bonding

[M van Veggel, S Reid, I Martin, P Murray, W Cunningham, J Scott, S Rowan & J Hough]

Investigations of the dependence of the thickness of the silicate bonds on volume and chemistry of bonding solution used will continue. Silica (Suprasil 311 and 3001) and silicon test masses of diameter 65 mm and lengths 50 mm and 70 mm will be fabricated and bonded to investigate the level of excess mechanical dissipation resulting from the bond material. New bonded silicon samples, optimised for thermal conductivity studies, will be sent to the University of Florence to investigate the dependence of the thermal conductivity of silicate bonds on volume and chemistry of bonding solution also. Bending and shear strength tests will be carried out on silica silica bonds in addition to developing a test bed for carrying out bending tests at low temperature on silicon-silicon samples.

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. n particular, activities described in Item 2 will be carried out within the Isolation/Suspension/Thermal Noise Development 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
LSC Spokesperson