

Attachment Number B to the
Memorandum of Understanding (LIGO-M970058-00-M)
between the
Experimental Relativity Group (ERG) of the Pennsylvania State University
and the
Laser Interferometer Gravitational Wave Observatory (LIGO) Laboratory
February 15, 2000

This Attachment to the Memorandum of Understanding LIGO-M970058-00-M covers the role of ERG as a Charter 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, 2000 to August 15, 2000. 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, physics publications, and talks announcing new 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. 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 Experimental Relativity Group (ERG) of the Pennsylvania State University and the LIGO Laboratory concerning the activities of ERG 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 below.
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 ini-

tial 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 - ERG 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 below, 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 ERG members are included in Attachment Z to the Memorandum of Understanding LIGO-M970058-00-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, 2000 to August 15, 2000, the following tasks will be done:
 1. Cross Coupling Issues: Gabriela Gonzalez, Mark Beilby, and Aran Glancy will continue work on experiment measuring cross coupling issues related to mechanical configuration of a double pendulum plus vertical blades. Penn State ERG plans to have results for a simple pendulum on blades, controlled in 6 degrees of freedom, by August'00.
 2. Local Damping Systems / Performance: G. Gonzalez, M. Beilby, Robert Huber, and Laura Markowitz will design and begin an experiment to compare performance of different local damping systems (point to point vs. modal damping). Penn State ERG plans to have calculated possible differences in damping systems, and tried at least one configuration as a proof of principle, by December'00.
 3. LIGO II Suspension R&D: G. Gonzalez will visit GEO for planning diagnostics tests in GEO suspensions, as well as plan tests on sensors and local control issues of a GEO prototype.
 4. G. Gonzalez will continue maintaining the LSC Suspensions and Seismic Isolation Web page, at <http://fiji.nirvana.phys.psu.edu/~swg/>

5. G. Gonzalez will write a technical report on the thermal noise calculations from measured parameters for suspensions, starting from elastic equations of motion for the suspensions wires.
6. S. Finn will continue development of the software tool Bench, which accepts an interferometer design and returns a series of estimates of its ability to detect different sources. This tool, which has been developed in cooperation with LIGO Lab and LSC personnel, is the repository for the detector noise model "science reach" figures of merit that the members of the LSC Technical Working Groups have agreed to use in comparing interferometer designs and configurations. During this period Bench will be extended with a new characterization of detector sensitivity to a broadband source. The always current version of Bench will continue to be maintained at <http://gravity.phys.psu.edu/~lsf/Benchmarks>, also reachable from the SWG web page at <http://fiji.nirvana.phys.psu.edu/~swg/>.
9. During the period February 15, 2000 to August 15, 2000, the LIGO Laboratory will share, as requested and appropriate, LIGO data of relevance to the research focus in Item No. 8 above.
10. The research effort pursuant to this Attachment B will be coordinated by Gabriela Gonzales and Syd Meshkov on behalf of Penn State ERG 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 of the effort in Item No. 8, as indicated below. These resources will be in addition to the coordination effort and data to be made available per Item No. 9 above.
- a) Provide accommodations for Penn State ERG investigators while on LIGO research assignment at Caltech, and/or LIGO sites.

Approved:

Barry Barish
 Barry Barish
 LIGO Laboratory Director
4-19-00
 Date

Gabriela Gonzalez
 Gabriela Gonzalez
 ERG Principal Investigator
3/17/00
 Date

Lee Samuel Finn
 Lee Samuel Finn
 ERG Principal Investigator
3/17/00
 Date