

**Attachment Number D to the
Memorandum of Understanding (LIGO-M950060-A-M)
between the
Stanford Advanced Gravitational Wave Interferometry Group
and the
Laser Interferometer Gravitational Wave Observatory (LIGO) Laboratory
August 15, 2002**

This Attachment to the Memorandum of Understanding LIGO-M950060-A-M covers the role of the Stanford Advanced Gravitational Wave Interferometry Group (Stanford Group) as a Charter Member of the LIGO Scientific Collaboration (LSC) and as a member of the Advanced Detector Configurations Development Group (ADCDG). The period of performance for the activities in this Attachment is from **August 15, 2002 to February 15, 2003**. 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 Stanford Group and the LIGO Laboratory concerning the activities of the Stanford Group as a Collaborating Institution in the LIGO Scientific Collaboration (LSC) and in the Advanced Detector Configurations Development Group (ADCDG), and as indicated in Item No. 8 below.
4. Advanced Detector Configurations Development Group - The Advanced Detector Configurations Development Group (ADCDG) is the scientific collaboration for defining and

developing entirely new advanced interferometers. It is expected that this development group will pursue research in dual recycling, resonant sideband extraction, Sagnac interferometers, systems with non-transmitting optics and other advanced configurations. 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 - The Stanford Group 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 Stanford Group coordinates are included in Attachment Z to the Memorandum of Understanding LIGO-M950060-A-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 **August 15, 2002 through February 15, 2003**, Professors Robert L. Byer and Martin M. Fejer; Research Associate Sheila Rowan; Visiting Researcher Eric Gustafson; Visiting Scholar Ray Beausoleil; and Graduate Student Research Assistants A. Bullington, S. Saraf and S. Sinha will work on design studies for an all-reflective, suspended silicon test-mass delay line interferometer, testing, and modeling of thermally loaded advanced configuration interferometers. The Stanford group will:
 - a) Continue with design studies for an all-reflective, suspended silicon test-mass delay line interferometer to be installed in the Engineering Test Facility;
 - b) Fabricate gratings on silicon substrates and measure wavefront distortion with increasing absorbed power;
 - c) Continue testing of thermal distortion in optical components accomplished using a ring cavity identical to the pre-mode cleaner installed at the LIGO laboratory; This work will involve writing of a mode-matching program using MELODY's utility functions to assist the process of accurately mode matching the ring cavity
 - d) Upgrade MELODY to simulate LIGO gravity-wave sensitivity for signal-recycled configurations;

- e) Perform MELODY simulations in support of the sapphire down-select decision process;
 - f) Upgrade MELODY for the LIGO II thermal compensation design investigation; and
 - g) Continue to upgrade MELODY to meet the needs of the LSC Advanced Interferometer Configurations group as they evolve.
9. As part of the research collaboration under this agreement 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 D will be coordinated by Roger Route and Gary Sanders on behalf of Stanford Group and the LIGO Laboratory, respectively.
11. Resource Sharing:

The LIGO Laboratory will provide:

- a) Research facilities and funding in support of the effort in Item No. 8, as indicated below.
- b) Accommodations for Stanford Group investigators while on LIGO research assignment at Caltech, and/or LIGO sites.

The Stanford Group will provide:

Melody code to LIGO researchers for modeling thermal loading of interferometers.

Approved:

Barry Barish
LIGO Laboratory Director

Date

Robert L. Byer
Principal Investigator

Date