

**Attachment Number D to the  
Memorandum of Understanding (LIGO-M970077-00-M)  
between the  
German/British Collaboration for the Detection of Gravitational Waves  
(GEO600)  
and the  
Laser Interferometer Gravitational Wave Observatory (LIGO) Laboratory  
February 15, 2003**

This Attachment to the Memorandum of Understanding LIGO-M970077-00-M covers the role of GEO600 as a Charter Member of the LIGO Scientific Collaboration (LSC) and a member of the Advanced Detector Configurations Development Group (ADCDG). The period of performance for the activities in this Attachment is from February 15, 2003 to August 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 German/British Collaboration for the Detection of Gravitational Waves (GEO600) and the LIGO Laboratory concerning the activities of GEO600 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.

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 - GEO600 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 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.
7. For the GEO600 personnel, who will participate in the ADCDG activities in Item No. 8, see the attached GEO LSC Contribution for LSC period February 15, 2003 to August 15, 2003.
8. The GEO600 group will continue investigations of Advanced Interferometer Configurations relevant to Enhanced/Advanced LIGO interferometers, as follows:
  - a) The successful development of a tuneable signal recycling mirror will be followed by the implementation of the same type of device on GEO 600. Work at Garching will continue with the further characterization and optimization of the variable mirror, along with the possible test of the mirror in a detuned interferometer configuration.
  - b) The second phase of the 10m study of sensing and control for Advanced LIGO will be largely undertaken during the period of this MOU. The objective is to qualify the basic sensing scheme, to characterize lock acquisition and to ensure that results inform the activities planned for the 40m interferometer at Caltech. This work will be done in collaboration with the University of Florida.
  - c) In the upcoming 6 month this seed beam will be squeezed by optical parametric amplification (OPA). Noise suppression of 3-4 dB beyond the quantum noise will be demonstrated.
9. During the period February 15, 2003 to August 15, 2003, the LIGO Laboratory will share, as requested and appropriate, LIGO data of relevance to the planned research in Item No. 8.
10. The research effort pursuant to this Attachment D will be coordinated by Kenneth Strain and Gary Sanders on behalf of GEO600 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.

a) Provide accommodations for GEO600 investigators while on LIGO research assignment at Caltech, and/or at LIGO sites.

Approved:

Barry Barish  
Barry Barish  
LIGO Laboratory Director  
20 Jan 04  
Date

Karsten Danzmann  
Karsten Danzmann  
GEO600 Principal Investigator  
11.2.04  
Date

James Hough  
James Hough  
GEO600 Principal Investigator  
Date 17/02/04

Bernard Schutz  
Bernard Schutz  
GEO600 Principal Investigator  
Date 13.02.04