Attachment LAS to the

Memorandum of Understanding (LIGO-M 0970077 -00-M)

between the

German/British Collaboration for the Detection of Gravitational Waves (GEO600)

and the

Laser Interferometer Gravitational Wave Observatory (LIGO)

August 15, 2006

This Attachment LAS to the Memorandum of Understanding LIGO-M 0970077 -00-M defines the role of the **German/British Collaboration for the Detection of Gravitational Waves** as a Member of the LIGO Scientific Collaboration (LSC) and a member of the Lasers Development Group (LDG). The period of performance for the activities in this Attachment is from August 15, 2006 to August 15, 2007.

1. Lasers Development Group - The Lasers Development Group (LDG) is the scientific collaboration for defining and developing future high power lasers for use in advanced subsystems for the initial LIGO interferometers or in entirely new advanced interferometers. MOU Attachments define the roles and responsibilities of groups in this development group.

2. During the period August 15, 2006 to August 15, 2007, the members of **GEO600** will participate in in LDG in the following areas:

a) Laser Development

The GEO group is taking the leading role in the Advanced LIGO pre-stabilized laser system (PSL) development. This includes overseeing the laser development at the Laser Zentrum Hannover (LZH) as well as the development of the power and frequency stabilization feed-back control loops and spatial control of the laser beam. The GEO group will not only provide the manpower but as well the money needed to buy equipment for the laser development and fabrication.
In addition the GEO group will work in the LDG on techniques towards pre-stabilized laser systems for third generation detectors. Specifically we will work on injection-locking studies and high-sensitivity power-fluctuations measurements with photodiodes and other techniques to allow measurements at the 1E-9/sqrt(Hz) level.
The GEO group is responsible for the operation and maintenance of the PSL of the one of the LSC interferometers (GEO600).

(i) Work on the development of the Advanced LIGO laser system will continue at the LZH. During this MOU period the free-running noise and the spatial beam profile of a 200W laboratory prototype system will be measured. Based on the results an AdvLIGO pre-modecleaner will be designed. Stabilization experiments of this system will continue toward a pre-stabilized laser system that comes close to the requirements for AdvLIGO. Based on the results of the 200W laser characterization PSL systems simulation will start with the goal to define requirements for sensors, actuators and the filters for the final control loop design.

(ii) The GEO group will provide the laser for Enhanced LIGO. During this MOU period we will work with LZH and LIGO to bring the amplifier from the brass board to the engineering prototype and to the reference system level. After a final check the first laser will be delivered to LIGO.

(iii) One of the main challenges for the AdLIGO PSL will be the power stabilization. Experiments will continue to analyze and reduce the excess noise sources between in-loop and out-of-loop measurements.

b) Other Contributions

Not Applicable

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

c) Not Applicable

4. Coordination and Reporting -

GEO600 will perform this 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 Lasers Development Working Group of the LSC. Coordination will include 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 on-year period. These documents will be due one month before the close of the period of performance under this Attachment.

5. 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.

Approved:

Jay Marx

LIGO Laboratory Director

2007.05.17 21:00:18 +02'00'

Karsten Danzmann

Principal Investigator(s)

GEO Project

Peter Saulson

LSC Spokesperson