

Attachment Number A to the
Memorandum of Understanding (LIGO-M010217-00-M)
between the
Goddard Gravitational Wave Astrophysics Group (GGWAG)
and the
Laser Interferometer Gravitational-Wave Observatory (LIGO) Laboratory
August 15, 2001

This Attachment A to the Memorandum of Understanding LIGO-M010217-00-M covers the role of the Goddard Gravitational Wave Astrophysics Group (GGWAG) as a Member of the LIGO Scientific Collaboration (LSC) and a member of the LIGO I Development Group (LIDG). The period of performance for the activities in this Attachment is from August 15, 2001 to February 15, 2002. This period may be modified by agreement to a revision of this Attachment.

1. LIGO Scientific Collaboration - The LIGO Scientific Collaboration (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 semi-annual 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 and approved, as appropriate, 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 Goddard Gravitational Wave Astrophysics Group (GGWAG) and the LIGO Laboratory concerning the activities of GGWAG as a Collaborating Institution in the LIGO Scientific Collaboration (LSC) and in the LIGO I Development Group (LIDG), and as indicated in Item No. 8 below.
4. LIGO I Development Group - The LIGO I Development Group is the scientific collaboration for implementing and exploiting the initial LIGO detector and physics through the initial sci-

ence data run. Only groups who establish a specific Attachment approved by the LIGO Laboratory, which defines a sufficient contribution and participation in LIGO I development, implementation or data analysis will be part of this initial LIGO data run and science. Participation in future data runs and science that follow LIGO I will be possible for other groups, with guidelines to be determined by the LIGO Scientific Collaboration. It is anticipated that LIGO I data will only be made available through formal collaboration within the LIGO I Development Group during the first two years following its collection.

The general guideline for institutional membership in the LIGO I Development Group is that the contribution per collaborator of any new group to the design, construction, and implementation of the initial LIGO detector and to the first data run be comparable to that of the LIGO Laboratory scientists.

5. Report of Progress - GGWAG 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 GGWAG members are included in the Attachment Z to the Memorandum of Understanding LIGO-M010217-00-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 August 15, 2001 to February 15, 2002, the members of GGWAG will include Research Scientists Jordan Camp, Joan Centrella, and Tod Strohmayer, Postdoc John Baker and possibly one graduate student. The following are GGWAG's research plans and goals for the period in question:

a) Astrophysics of Gravitational Wave Sources

T. Strohmayer will investigate fast chirp transform (FCT) search strategies for transient (burst) GW signals in correlation with astrophysical triggers from compact objects such as X-ray bursts and accretion outbursts. Strohmayer will also begin studying search strategies for coherent GW signals from rotating neutron stars in LMXB.

b) Searches for Gravitational Radiation from Galactic Compact Objects

T. Strohmayer will carry out a search for transient (burst) GW signals in correlation with

astrophysical triggers from compact objects such as X-ray bursts, accretion outbursts, etc. Strohmayer will also carry out a study of coherent searches for GW signals from rotating neutron stars in LMXBs.

c) Catalogs of Gravitational Waveforms

J. Centrella and J. Baker will compile catalogs of computed gravitational waveforms. These will include binary neutron star and black hole coalescence, rotational instabilities, and gravitational collapse. These will be made available online, and will complement the existing Zwerger-Mueller catalog of waveforms from axisymmetric collapse. The catalogs will be updated as new models and results become available.

d) Analysis of Model Calculations and Astrophysical Scenarios

J. Centrella and J. Baker will apply time-frequency and other analysis techniques to the waveforms in the catalogs mentioned in item c) above. Beginning with the source models, noise and other detector characteristics will be added. Given assumed signals from the detectors (inverse problem), scenarios for astrophysical upper limits will be built. This work will be carried out in collaboration with the Bursts Upper Limits Group in the LSC.

e) Detector Characterization

J. Camp will continue work on characterization of the detector noise with particular emphasis on frequency noise. This will include the prestabilized laser noise, as well as frequency noise associated with the suspended cavities, both in and out of the LIGO signal band. Both Gaussian and non-Gaussian noise will be investigated. This work will take place in the Binary Inspiral and Burst Upper Limit groups.

9. During the period August 15, 2001 to February 15, 2002, the LIGO Laboratory will provide, as requested and necessary, LIGO data of relevance to the research in Item No. 8 above.
10. The research effort pursuant to this Attachment A will be coordinated by Joan Centrella and Albert Lazzarini on behalf of GGWAG 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) Accommodations for GGWAG investigators while on LIGO research assignment at Caltech, and /or LIGO sites.

