

**Attachment Number D to the
Memorandum of Understanding (LIGO-M990031-00-M)
between the
National Astronomical Observatory of Japan TAMA Group (NAOJ-TAMA)
and the
Laser Interferometer Gravitational Wave Observatory (LIGO) Laboratory
August 15, 2004**

This Attachment to the Memorandum of Understanding LIGO-M990031-00-M covers the role of the National Astronomical Observatory of Japan TAMA Group (NAOJ-TAMA) as a 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, 2004 to February 15, 2005. 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 National Astronomical Observatory of Japan TAMA Group (NAOJ-TAMA) and the LIGO Laboratory concerning the activities of NAOJ-TAMA as a Collaborating Institution in the LIGO Scientific Collaboration (LSC) and in the Advanced Detector Configurations Development Group (ADCDG). These activities are 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, sys-

tems 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 - NAOJ-TAMA 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 (Attachment Z), 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 commitments in Item No. 8.

The coordinates of NAOJ-TAMA members are included in the Attachment Z to the Memorandum of Understanding LIGO-M990031-00-M.

7. In order to preserve the intellectual property rights of NAOJ-TAMA and Caltech, the NAOJ-TAMA Principal Investigator will inform Caltech at once of any inventions coming from joint actions, which might lead to intellectual property rights.
8. During the period August 15, 2004 to February 15, 2005, the NAOJ-TAMA group will perform the following tasks:
 - a) Masa-Katsu Fujimoto, Seiji Kawamura, Shuichi Sato, Kentaro Somiya, Fumiko Kawazoe, and Keiko Kokeyama will work on the suspended-mirror RSE interferometer using a new signal extraction method, which makes the signal extraction matrix completely diagonal. This is a backup method for the planned signal extraction for the Advanced LIGO RSE interferometer.
 - b) Masa-Katsu Fujimoto, Seiji Kawamura, Kentaro Somiya, and Shihori Sakata will also work on a table-top experiment to demonstrate the DC readout scheme, which is an essential technology for the Advanced LIGO RSE interferometer.
 - c) In addition, Seiji Kawamura and Kentaro Somiya will work on the 40m RSE prototype at Caltech by making some occasional visits as well as by doing simulations on the related issues.
9. The main portion of the NAOJ-TAMA research above will take place at the National Astronomical Observatory of Japan. Reciprocal exchange visits on the part of NAOJ-TAMA and the LIGO Laboratory staff are planned.
10. The research effort pursuant to this Attachment D will be coordinated by Seiji Kawamura and David Shoemaker, on behalf of NAOJ-TAMA 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 NAOJ-TAMA investigators while on LIGO research assignment at Caltech, and/or LIGO sites.

Approved:

Barry C. Barish 2004.10.28
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Barry Barish
LIGO Laboratory Director

2004.11.8
Yoshihide Kozai

Yoshihide Kozai
NAOJ-TAMA Principal Investigator