

**Attachment Number A to the
Memorandum of Understanding (LIGO-M970084-00-M)
between the
Moscow State University Relativity Group (MSURG)
and the
Laser Interferometer Gravitational Wave Observatory (LIGO) Laboratory
August 15, 2003**

This Attachment to the Memorandum of Understanding LIGO-M970084-00-M covers the role of the Moscow State University Relativity Group (MSURG) as a Charter 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, 2003 to August 15, 2004. 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 Moscow State University Relativity Group (MSURG) and the LIGO Laboratory concerning the activities of the MSURG 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.
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 science 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.

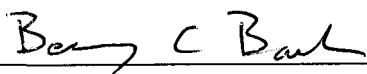
5. Report of Progress – The Moscow State University Relativity Group will provide a status report on its activities in support of LIGO every six months. The report will consist of: a) a summary status on research by topic as indicated Item No. 8 including progress against the milestones if any, significant 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 the Moscow State University Relativity Group members are included in the Attachment Z to the Memorandum of Understanding LIGO-M970084-00-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 of August 15, 2003 to **August 15, 2004**, MSURG has the following continuing goals for making contributions to LIGO I:
 - a) To formulate and analyze various models of the cosmic-ray deposition of electrical charge on the surfaces and interiors of LIGO mirrors, the charges' evolution, and the resulting charge-induced degradation of the sensitivity of LIGO I (and also of Advanced LIGO).
 - b) To continue experimental investigations of the behavior of electrical charges on model mirrors, and the charges' correlation with cosmic ray events.
 - c) To analyze possible manifestations of the parametric instability that could show up in LIGO I data.
 - d) To continue theoretical analyses and experimental development of low-noise techniques for tranquilizing (suppressing) mirror oscillations produced, e.g., by the parametric instability.

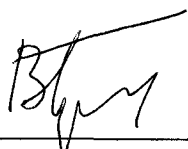
- e) To continue providing advice to LIGO management and LSC colleagues about LIGO I noise sources.
- 9. During the period August 15, 2003 to **August 15, 2004**, the LIGO Laboratory will provide, as requested and appropriate, LIGO data of relevance to the research focus in Item No. 8.
- 10. The research effort, pursuant to this Attachment A will be coordinated by Vladimir Braginsky and David Shoemaker on behalf of the Moscow State University Relativity Group, 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 MSURG investigators while on LIGO research assignment at Caltech, and/or LIGO sites.
 - b) Funding contribution for MSURG's effort in support of LIGO is provided under a subcontract between the Caltech and U.S. Civilian Research and Development Foundation for Independent States of the Former Soviet Union (CRDF). The funding authority is the National Science Foundation (NSF) Grant No. PHY-0098715.

Approved:



Barry Barish
LIGO Laboratory Director
30-March-04

Date



Vladimir Braginsky
MSURG Principal Investigator

Date 03.10.04