

Amendment No. 2
to the
Memorandum of Understanding
between the
VIRGO Collaboration
and the
Laser Interferometer Gravitational Wave Observatory (LIGO) Project
May 2005

The purpose of this Amendment No. 2 to the Memorandum of Understanding (MOU) LIGO-M970123-00-M is to establish and define a collaborative relationship between the VIRGO Collaboration and the Laser Interferometer Gravitational Wave Observatory (LIGO) Project. VIRGO and LIGO detectors use laser interferometry to measure the distortions of the space between free masses induced by passing gravitational waves. Both parties to this MOU Amendment No. 2 share the joint goals of opening the field of gravitational-wave astrophysics, through the direct detection of gravitational waves, and later through their use as astrophysical probes by coincidence analysis from all the detectors. This MOU Amendment No. 2 is intended to further these joint goals.

This MOU Amendment No. 2 is an update of the MOU LIGO-M970123-00-M between the VIRGO and LIGO Projects, established in November 1997 and all the agreements done under it or under Amendment No. 1 remain valid.

1. CNRS and INFN signed an agreement concerning the realization of an antenna, VIRGO, for the detection of gravitational waves on 27 June 1994 in Pisa. VIRGO consists of a three kilometer Fabry-Perot interferometric antenna aimed at the detection of gravitational waves in the frequency range 10-10000 Hz. The construction and scientific exploitation of the VIRGO antenna is under the responsibility of the VIRGO Collaboration, which has been defined in its present form in December 2000, and is formed by about 200 physicists and technicians, from 11 laboratories of CNRS and INFN. The VIRGO Collaboration is represented by its Spokesperson. In December 2000, CNRS and INFN jointly founded the European Gravitational Observatory (EGO), with the purpose, among others, of supporting the VIRGO Collaboration in the operation of the antenna, in its exploitation and its upgrade, as well as promoting an open co-operation in R&D. The relationship between VIRGO Collaboration and EGO Consortium is defined in the Memorandum of Agreement between the VIRGO Collaboration and EGO Consortium, EGO-COU-47-2002. The VIRGO antenna is located at the site of EGO in Cascina, Italy. The operation of VIRGO and EGO is supervised by the EGO Council.

2. The LIGO Project includes the LIGO Laboratory and the LIGO Scientific Collaboration (LSC). The LSC Charter establishes the functions, organizational structure and responsibilities of the LSC as well as its role in the research of the LIGO Laboratory, and the release of scientific results. The LIGO Leadership includes the Laboratory Directorship and the LSC Spokesperson.

The LSC is composed of approximately 520 individuals from about 35 institutions worldwide, including scientists and engineering personnel from the LIGO Laboratory. For the purposes of this MOU Amendment No. 2, LIGO membership includes scientists and engineers from the GEO 600 project. These scientists and engineers have the same rights and privileges as any other LSC members with regard to the provisions of this MOU Amendment No. 2.

LIGO was built under a Cooperative Agreement between the National Science Foundation (NSF) and Caltech signed in May 1992 (No. PHY 9210038). LIGO is a system of three interferometric Fabry-Perot antennas, two of them 4 kilometers long and the third one 2 kilometers long, aimed at the simultaneous detection of gravitational waves in the frequency range 40-6000 Hz. LIGO has been built in Hanford, Washington and in Livingston Parish, Louisiana (USA) and began observations in the year 2002. The design and construction of LIGO was carried out by California Institute of Technology (Caltech) and the Massachusetts Institute of Technology (MIT). Caltech operates LIGO for the NSF under a Cooperative Agreement and MIT joins in this effort under subcontract to Caltech. The LIGO Oversight Committee supervises the realization of LIGO.

The agreement LIGO-M040357-00-M (dated November 5, 2004) between LIGO and GEO states, "All such agreements to share data with external projects will be made jointly by LIGO/LSC and GEO leadership, with the goal that, wherever it makes scientific sense, provisions for sharing data will treat data from LIGO and GEO equivalently." Thus, this agreement applies equally to data from any of the three LIGO interferometers and to data from the GEO 600 interferometer.

The German/British Collaboration for the Detection of Gravitational Waves (GEO) has built a detector of arm length 600m (GEO600) near Hannover in Germany, with the purposes of joining in a worldwide search for gravitational radiation from astronomical sources and of developing advanced interferometric and suspension technologies for later gravitational wave detectors. The design, construction and operation of the GEO600 system is being carried out by scientists and technologists at the University of Hannover, the University of Glasgow, and the Max Planck Institute for Gravitational Physics (Albert Einstein Institute) in Hannover and Golm. Data acquisition and analysis are managed by the Albert Einstein Institute (AEI), Cardiff University, and Birmingham University. The project is funded in Germany by the State Government of Niedersachsen, the Max Planck Gesellschaft (MPG), and the Bundesministerium fuer Bildung und Forschung (BMBF) in Germany, and by the Particle Physics and Astronomy Research Council (PPARC) in the UK.

3. The Spokesperson of the VIRGO Collaboration and the Principal Investigator of LIGO will serve as liaison between the VIRGO Collaboration and EGO on one side and LIGO, on the other side. In this capacity, they will identify issues that need to be considered by both the VIRGO Collaboration and EGO on one side and LIGO, on the other side, will facilitate the study of these issues, will see that the results of these studies are communicated to both the VIRGO Collaboration, EGO and LIGO in a timely and effective manner and shall help implement the goal of optimizing scientific opportunity.
4. Both parties to this agreement, the VIRGO Collaboration and LIGO, need to develop large and specific efforts in many fields as diverse as active and passive seismic isolation, optical metrology and manufacturing, vacuum technology, materials science (mechanical damping, dislocations, hysteresis), computing, etc. Joint developments and sharing of technologies will improve the efficiency and quicken the achievement of the common goals.
5. As VIRGO, LIGO and GEO are approaching a time when their observatories will be able to carry out observations with sensitivity sufficiently matched for scientific interest, the VIRGO Collaboration, the LIGO Project and GEO will agree on Observatory operating modes, schedules, joint data protocols, joint and cooperative data analysis and data sharing.
6. The VIRGO Collaboration and the LIGO Project will share hosting of scientific meetings and shall invite each other to major meetings and reviews, agree to exchange documents and distribution lists, and agree to exchange team members in a helpful and collaborative manner.
7. Each party to this MOU continues to be responsible for obtaining all resources, and for all support of its staff including travel costs associated with the activities under this MOU Amendment No. 2. Exceptional support of travel by the other institution may be allowed for travel requested by that party.
8. In order to preserve the intellectual property rights of their respective institutions and sponsors, the VIRGO Collaboration Spokesperson, LIGO Principal Investigator and the GEO Principal Investigator for Data Analysis will promptly inform their respective institutions and sponsors of any invention resulting from joint actions which might lead to intellectual property rights.
9. The LIGO Laboratory is responsible for obtaining NSF approval of collaborative Memoranda of Understanding where required. All Memoranda of Understanding will be provided to NSF for their information.
10. This Memorandum of Understanding will remain in force until the parties mutually agree to terminate it. Attachments will define specific activities to be carried out.

Approved:

Barry C Barish
Barry Barish
LIGO Director and LIGO Principal Investigator
23 June 05
Date

Peter N. Saulson
Peter Saulson
LSC Spokesperson
23 June 2005
Date

Bernard Schutz
Bernard Schutz
GEO 600 Principal Investigator for Data Analysis
04.07.2005
Date

Benoit Mours
Benoit Mours
VIRGO Collaboration Spokesperson
23 June 2005
Date

Approved by the EGO Council on