

**Memorandum of Understanding****between the****Australian Consortium for Interferometric Gravitational Astronomy (ACIGA)****and the****Laser Interferometer Gravitational Wave Observatory (LIGO)**

The purpose of this Memorandum of Understanding is to define the roles, responsibilities and rights of the Australian Consortium for Interferometric Gravitational Astronomy (ACIGA) to participate as an international partner with the Laser Interferometer Gravity Wave Observatory (LIGO) in Advanced LIGO development, installation and commissioning. Both parties share the goals of developing and upgrading the existing LIGO observatories, using them to observe gravitational radiation, and subsequently using gravitational radiation as an astrophysical probe. This agreement outlines ACIGA's proposed contribution to the Advanced LIGO Project in exchange for access to data from the LIGO Observatories and participation in LIGO management.

1. The Laser Interferometer Gravity-wave Observatory (LIGO) comprises two related organizations, the LIGO Laboratory and the LIGO Scientific Collaboration.

The LIGO Laboratory is a U. S. national facility for gravitational wave research, providing opportunities for the broader scientific community to participate in detector development, observations, and data analysis. The LIGO Lab comprises designated groups of scientists, engineers, and staff at the California Institute of Technology (Caltech), the Massachusetts Institute of Technology (MIT), and the two LIGO Observatories. Caltech and MIT share prime responsibility for the operation of the LIGO Laboratory and for the design and construction of upgrades, under the terms of a Cooperative Agreement between Caltech and the U.S. National Science Foundation (NSF).

The LIGO Scientific Collaboration (LSC) is an international consortium of academic and research organizations that contribute to data analysis, the scientific operation of the LIGO observatories and research and development in support of upgrades to the LIGO observatories. It includes scientists from the LIGO Laboratory, and those from collaborating institutions, and has its own internal leadership and governance. The Collaboration ensures equal scientific opportunity for individual participants and institutions. It organizes the research, publications, and all other scientific activities. The organization of the LSC and its governance are defined in its Charter.

2. The Australian Consortium for Interferometric Gravitational Astronomy (ACIGA) consists of the following organizations:

The Australian National University	Principal Investigator: Professor David McClelland
The University of Western Australia	Principal Investigator Professor David Blair
The University of Adelaide University	Principal Investigator: Professor Jesper Munch
Monash University	Principal Investigator: Dr. Anthony Lun
The University of Melbourne	Principal Investigator: Dr. Andrew Melatos

ACIGA is itself a member of the LIGO Scientific Collaboration. ACIGA's objectives are: to undertake research and development aimed at improving the performance of present laser interferometer gravitational wave detectors through advanced designs to ultimate limits set by mechanics, quantum mechanics, lasers and optics; to transfer this R&D into practical designs for inclusion in existing and future detectors; and to participate to the fullest extent in gravitational wave detection and astronomy. ACIGA operates 3 main experimental facilities - the Gingin Research Facility in Western Australia, the Gravitational Wave Research Facility at The Australian National University (ANU) and a laser development facility at The University of Adelaide - and a data analysis cluster, ADAC, at The ANU. ACIGA's research activities are funded primarily by the Australian Research Council along with contributions from the participating universities.

3. The LIGO program is being implemented in a phased approach, starting with an initial, three-interferometer detector already in operation. Upon completion of initial observations, these detectors will be replaced by a set of three detectors with increased sensitivity and flexibility, called Advanced LIGO. Advanced LIGO is being pursued as an international collaboration. Lead funding for Advanced LIGO will be provided by the U.S. National Science Foundation and lead responsibility for Advanced LIGO design and implementation will be provided by the LIGO Laboratory, under a Cooperative Agreement with the NSF. International partners in Advanced LIGO participate in the development, construction and operation of Advanced LIGO, through in-kind contributions provided through project-to-project agreements. In return, international partners are granted data rights and roles in the governance of Advanced LIGO commensurate with their contributions.
4. In entering into this Memorandum of Understanding, the LIGO Laboratory will be responsible to ensure that all aspects of the activities under this MOU are consistent with the requirements of the Cooperative Agreement with the NSF. In particular, the LIGO Laboratory is responsible for obtaining NSF approval of certain collaborative Memoranda of Understanding, under the terms of its Cooperative Agreement with the NSF. All Memoranda of Understanding are provided to NSF for their information. Similarly, ACIGA will be responsible to ensure that all aspects of the activities under this MOU are consistent with the requirements under its agreement with ARC.
5. As an international partner in Advanced LIGO, ACIGA will provide expertise, support, and equipment in the spirit of the LIEF proposal "Australian Partnership in Advanced LIGO" (submitted May 2005) and any subsequent revisions. Principal elements of this proposal

include delivery of output optics for integration into the Advanced LIGO detector, providing a testbed for high optical power testing, and establishing a tier 2 data analysis center to participate in the grid-based LIGO data analysis. The exact scope of work will be negotiated between LIGO and ACIGA during the design phase, as interfaces are defined, performance requirements are formalized, and delivery schedules are base-lined. All equipment supplied by ACIGA will be consistent with negotiated parameters, including interfaces, technical performance, and schedule. Property arrangements for the transfer of all equipment provided by ACIGA must be consistent with the expected operational life of Advanced LIGO. The LIGO Lab will ensure that all equipment provided by ACIGA will be not be used other than for its intended purpose without the express consent of ACIGA.

6. As an international partner in Advanced LIGO, the LIGO Laboratory will give ACIGA a commensurate role in the management of the development, design, construction and operation of Advanced LIGO through established structures. In particular:
  - Individual members of ACIGA will have equal opportunities to serve as subsystem leaders, subsystem scientists and other Advanced LIGO project roles to those of LIGO Laboratory staff.
  - ACIGA will be allocated membership(s) on the LIGO Lab Executive Committee, the principal management body of the LIGO Laboratory, commensurate with their project responsibilities. This will ensure that ACIGA will be fully informed of and can exert influence on design and construction status, commissioning activities, and observation planning.
  - ACIGA will have representation on the LIGO Change Control Board and will participate in all consideration of changes in budget, schedule, scope or technical performance affecting Advanced LIGO.
  - ACIGA representatives will be invited for all major meetings affecting Advanced LIGO, including the LIGO Program Advisory Committee, and periodic NSF reviews of LIGO.
  - The LIGO Laboratory management will recommend that ACIGA will be granted a seat on the LIGO Oversight Committee, the principal body providing institutional oversight for LIGO.
7. As an international partner in Advanced LIGO, ACIGA will also be afforded full rights to the analysis, publication and dissemination of LIGO results through its participation in the LSC. These rights, and the corresponding responsibilities, are documented in the LSC Charter and By-laws, and include a commensurate role in the governance of the LSC.
8. Each party to this agreement continues to be responsible for all support of its staff including travel costs associated with the activities under this agreement. Exceptional support of travel by another institution may be allowed for travel requested by that institute.
9. This Memorandum of Understanding will remain in force through the design, fabrication and operation of Advanced LIGO, or until the parties mutually agree to terminate it.

**Approved:**

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Barry Barish  
LIGO Laboratory Director

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Date

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Peter Saulson  
LIGO Scientific Collaboration Spokesperson

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Date

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David McClelland  
Chairperson, Australian Consortium for  
Interferometric Gravitational Astronomy

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Date