

## **Memorandum of Understanding**

**between the**

**Eddy-Current Subgroup (ECSG) in the Center for Nondestructive Evaluation  
of the Iowa State University**

**and the**

**Laser Interferometer Gravitational-Wave Observatory (LIGO) Laboratory**

**August 15, 2000**

The purpose of this Memorandum of Understanding is to establish and define a collaborative relationship between the Eddy-Current Subgroup (ECSG) in the Center for Nondestructive Evaluation of the Iowa State University and the LIGO Laboratory. Both parties of this agreement share the goals of observing gravitational radiation and subsequently using gravitational radiation as an astrophysical probe. This agreement is intended to further these joint goals.

1. The Center for Nondestructive Evaluation (CNDE) of the Iowa State University has several components working on physics-based modeling of nondestructive inspections applied to complex engineering systems, using methodologies based on electromagnetism, elasticity, and penetrating radiation. The Eddy-Current Subgroup (ECSG) in the CNDE, a subgroup of the NDE modeling team, is headed by Norio Nakagawa. The ECSG is interested, and has been actively participating, in a LIGO-related project (NSF-PHY-9800976, "Numerical Green's Function Computation and its Application to Thermal Noise Estimator for Laser Interferometric Gravitational Wave Receivers"). Through collaboration with the LIGO Laboratory, the ECSG aims to advance the future LIGO detector designs and sensitivities, by way of providing the LIGO Laboratory with modeling capabilities for simulating thermal noise properties and characteristics of the projected optical systems. The ECSG has expertise in the areas of analytical and computational electromagnetism and elasticity, with background in general field theory.
2. The Laser Interferometer Gravitational-Wave Observatory (LIGO) Laboratory is aimed at opening the field of gravitational-wave astrophysics through the direct detection of gravitational waves. LIGO detectors will use laser interferometry to measure the distortions of the space between free masses induced by passing gravitational waves. The design, construction, and operation of LIGO is being carried out by scientists, engineers, and staff at the California Institute of Technology (Caltech) and the Massachusetts Institute of Technology (MIT).

Caltech has prime responsibility for the project under the terms of a Cooperative Agreement<sup>1</sup> with the National Science Foundation (NSF). LIGO will become a national facility for gravitational-wave research, providing opportunities for the broader scientific community to participate in detector development, observations and data analysis. LIGO welcomes the participation of outside scientists at any of these levels. LIGO is being constructed in a phased

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1. Cooperative Agreement No. PHY-9210038 between the National Science Foundation, Washington, D.C. 20550 and the California Institute of Technology, Pasadena, CA 91125, dated May 1992.

approach beginning with one three-interferometer detector system and evolving to a multiple interferometer configuration to enable simultaneous use by several gravitational-wave observation systems.

3. In entering into this Memorandum of Understanding, the LIGO Laboratory will carry out its responsibilities following the requirements of the Cooperative Agreement<sup>1</sup>.
4. The LIGO Laboratory is responsible for obtaining NSF approval of all collaborative Memoranda of Understanding with international partners, or involving NSF costs exceeding \$100,000. All Memoranda of Understanding will be provided to NSF for their information.
5. 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 the other institution may be allowed for travel requested by that institution.
6. This Memorandum of Understanding will remain in force until the parties mutually agree to terminate it. A semi-annual Attachment will define specific activities to be carried out during the following year.

Approved:

Barry Barish  
Barry Barish  
LIGO Laboratory Director

Norio Nakagawa  
Norio Nakagawa  
ECSG Principal Investigator  
Iowa State University

Jul 28, 2000  
Date

Aug 8, 2000  
Date