

Memorandum of Understanding
between the
Syracuse University Experimental Relativity Group(SUERG)
and the
Laser Interferometer Gravitational Wave Observatory (LIGO) Project
August 1, 1995

The purpose of this Memorandum of Understanding is to establish and define a collaborative relationship between the Syracuse University Experimental Relativity Group(SUERG) and the Laser Interferometer Gravitational Wave Observatory (LIGO) Project. Both parties to 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 Syracuse University Experimental Relativity Group(SUERG) consists of Prof. Peter R. Saulson plus, typically, one postdoctoral fellow and two or three graduate students. SUERG's LIGO-related research, during the remainder of the 1990s, will focus primarily on issues related to thermal noise in interferometric gravitational wave detectors. This work will be funded primarily by research grants from the National Science Foundation (PHY-9113902) and by Syracuse University set-up funds.
2. The Laser Interferometer Gravitational-Wave Observatory (LIGO) Project 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 Agreement¹ 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 approach beginning with one three-interferometer detector system and evolving to a nine-interferometer configuration to enable simultaneous use by several gravitational-wave observation systems.
3. In entering into this Memorandum of Understanding, the LIGO Project will carry out its responsibilities following the requirements of the Cooperative Agreement¹.

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.

4. The LIGO Project 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. An annual Attachment will define specific activities to be carried out during the following year.
7. SUERG will study fundamental and technical dissipation mechanisms in pendulum wires and flexures, and in their attachments to test masses.
8. SUERG will develop and utilize a new method for measuring the dissipation in test masses.
9. SUERG will apply the new method to characterize the loss mechanisms in the former 40-meter interferometer test masses, in order to test the hypothesis that thermal noise was limiting the noise spectrum of the interferometer before the 1994 replacement of the test masses.
10. SUERG will investigate fundamental loss mechanisms in fused silica, and will attempt to identify ways to minimize the dissipation to enable test masses of the lowest possible thermal noise to be constructed.
11. SUERG will study construction methods for pendulums, in a search for ways to minimize excess dissipation.
12. SUERG will search for other materials that might exhibit lower thermal noise than fused silica, as candidates for interferometer test masses.
13. SUERG will investigate novel interferometer geometries, if they appear to offer lower thermal noise than interferometer designs that require the excellent optical properties of fused silica.
14. SUERG will communicate to the LIGO Project its research results and its interpretation of the implications for LIGO.
15. The LIGO Project will communicate its research results related to test mass design, suspension design, and thermal noise. It will make available to SUERG all LIGO reports and internal memos relevant to the above-mentioned issues.
16. SUERG and LIGO will work together in organizing international collaborative research and exchange of ideas in the areas of pendulum design, test mass design, and thermal noise.

Approved:

Barry Barish
Barry Barish
LIGO Principal Investigator

Peter R. Saulson
Peter R. Saulson
SUERG Principal Investigator

Aug 2, 1995
Date

August 16, 1995
Date