Attachment Number 1 to the Memorandum of Understanding (LIGO-M960071-00-M) between the University of Florida Physics Department LIGO Group (UFLG) and the Laser Interferometer Gravitational Wave Observatory (LIGO) Project

October 1, 1996

This Attachment to the Memorandum of Understanding LIGO-L960071-00-M describes the activities of the University of Florida Physics Department LIGO Group (UFLG) in developing the input/output optics (IOO) for the initial LIGO. The period of performance for the activities in this Attachment is from October 1, 1996 to February 28, 1998. This period may be modified by agreement to a revision of this Attachment.

1. Goal - The aim is to develop the IOO subsystem of the interferometer for the initial LIGO detectors. The IOO serves as the interface optics between the laser and the interferometer, providing mode-cleaning, mode matching to the core optics, frequency modulation of the carrier, and additional frequency and power stabilization of the laser. UFLG will design the IOO subsystems for the three interferometers (one each for the 4 km and 2 km interferometers at the Washington site and one for the 4 km interferometer at the Louisiana site). Deliverables include the Design Requirements, Conceptual Design (October 1996), Preliminary Design (June 1997), and Final Design (February 1998).

2. Management and Technical Representatives - The UFLG is headed by Guenakh Mitselmakher with David Tanner as co-Principal Investigator. The technical work described in this Attachment will be carried out under the direct supervision of David Tanner and David Reitze. The Technical Representative from UFLG for this attachment is David Reitze. The Technical Representative from LIGO is Jordan Camp, reporting to Stan Whitcomb.

3. Statement of Work and Deliverables - The work will be primarily carried out at the University of Florida Physics Department and associated facilities. Some testing of design concepts will be performed at Caltech. The following tasks are to be carried out:

   a. Specification of the design requirements for the IOO subsystem of the LIGO interferometers consistent with the LIGO Science Requirements. This includes a description of the functions and components (RF modulation, mode cleaning optics, mode matching telescope, and frequency and intensity stabilization sensing) and performance requirements and characteristics of the components (power throughput, frequency and intensity stability, alignment and mode-matching tolerances), and interfaces to other Detector subsystems.

b. A conceptual design for the IOO subsystem which describes the conceptual optical layouts (Pockel cells, Faraday isolators, mode-cleaner geometry and beam parameters, mode matching telescope geometry and parameters), optics parameters, modulation methods, and control systems which will achieve performance at the design requirement level.

c. A preliminary design which provides information on designs and all components and parameters in the IOO.

d. A final design which provides complete and detailed information for IOO implementation and all optical, mechanical, and electrical IOO components and interfaces.

4. Reporting - Schedule and cost status reports will be prepared monthly. Each of the IOO scheduled activities in the LIGO detector schedule will be reported on. Any changes, anticipated changes and/or delays in the schedule will be highlighted and the possible consequences discussed.

   The UFLG will conduct local weekly meetings and will meet at least once a month with representatives of the LIGO detector group (either directly or through teleconferencing) to discuss technical issues and to assess progress relative to the Schedule.

   Technical progress will be reported to the cognizant LIGO task leader via e-mail weekly.

5. Costs - The costs of the project are denumerated in the Budget. The LIGO Project will provide these funds through a subcontract with the University of Florida.

6. Intellectual Property Rights - The rights to intellectual property developed under this Attachment will be subject to the National Science Foundation Grant Polict as indicated in Section 750, Intangible Property.

Approved:

Barry Barish

Barry Barish
LIGO Principal Investigator

10/2/96

Date

G. Mitselmakher

Guenakh Mitselmakher
UFLG Principal Investigator

Oct 4, 1996

Date

T. Walk FOR

Karen Holbrook
Vice President for Research,

OCT 7, 1996

Date