

Current Plan - NSF-LIGO V. Cook

- LIGO I data run 2002 - 2004
 - LIGO II engineering, fabrication installation & commissioning 2004 - 2006 -
operation at 10^{-22} sensitivity - 2007.
 - current funding cycle for LIGO Lab ends 2002
(operations and Advanced R+D)
 - How do we get funding for LIGO II ?
- Budget for FY 2000 set for Physics
 - Budget cycle for FY 2001 begins Oct. 99
 - MRE request - "place holder" submitted Feb. '99.
for LIGO II funding -

SCANNED

NSF-MRE for LIGO II

LIGO is scheduled to turn on for science Jan 2002 and enter into a two year run at a strain sensitivity of $h \sim 10^{-21}$. This will represent an enormous step (more than two orders of magnitude in both sensitivity and bandwidth) beyond present searches. However, the best theoretical predictions of currently known sources indicate that further improvements of at least an order of magnitude in sensitivity may be required for direct detection of gravity waves. Even if detections have been made, improvements in sensitivity are needed to obtain statistics and to exploit the physics potential.

LIGO is actively planning for an upgrade of an order of magnitude in sensitivity, or a factor of 1000 in rate, following the initial data run. To develop the needed techniques an active advanced R&D program that involves the broader gravity wave community is underway. The LIGO Scientific Collaboration (LSC) is the organization comprising some 20 institutes that is coordinating the programs of the LIGO-user community. A recent "White Paper" produced by the LSC defines a program to 'evolve' to LIGO II by improvements in all frequency regimes, reducing the seismic noise, the thermal noise and the shot noise. This program will involve development of new higher power lasers, new optics to take the higher power which will reduce the shot noise, new test mass materials to lower the thermal noise, new suspension systems also to reduce the thermal noise, improvements to the seismic isolation system, possible new interferometer configurations, as well as improvements in the electronics and control systems.

The LSC is defining in more detail the steps to build LIGO II and is doing first cost estimates this year. However, from experience in building LIGO I and the R&D already done we can estimate the scope and timetable for these improvements.

The estimated costs to implement LIGO II are given below:

R&D	Engineering	1st Article	Fabrication	Install	Commission	TOTAL
\$5M	\$5M	\$2M	\$26M	\$5M	\$2M	\$45M

Note that this estimate is based on the following assumptions:

- It is incremental to the continuing operations budget;
- A first article of the suspension system is developed;
- Installation and commissioning are interleaved with data running with about a 50% down time beginning in 2004.

The schedule for LIGO II is to begin final design and construction in 2002 for some components and that the installation be incremental through 2005, followed by one year of commissioning and an operational LIGO II at sensitivity $h \sim 10^{-22}$ by 2007. The assumed funding profile to reach these goals is given below:

2002	2003	2004	2005	TOTAL
\$5M	\$10M	\$15M	\$15M	\$45M

This equipment project will be carried out by the LIGO Laboratory in full collaboration with the LSC. The technical steps to obtain the goals will require research and development and some challenging engineering, but do not rely on fundamental new technologies.

Plan for Advanced R&D and LIGO II Funding

- Goals: 1. Document need to increase FY2001 LIGO Advanced R&D funding by presenting convincing arguments to MPS and/or PHY management.
2. Get MRE approval for LIGO II R&D and engineering beginning in FY2002 and LIGO II construction beginning in FY2004 .

Constraints: The FY 2001 NSF budget is submitted to OMB in September 1999.

NSB process requires minimum 9 months; to allow for feedback and corrections allow 1 year.

Documentation Needed	From	By Date	To meet NSF Funding Cycle Process
LIGO II Advanced R&D, Engineering and Construction Conceptual Plan: including goals, milestones, deliverables, assignment of responsibilities, foreign participation and contributions, and budget .	LSC (reviewed and approved by LIGO Lab.)	9/1/99	NSF Panel Review by 10/1/99 to certify the Conceptual Plan in support for FY2002 budget preparation.
LIGO II R&D and Construction Information Package	LIGO Lab	1/1/00	(1/00 Start of FY2002 budget cycle) Presentation to MRE committee
LIGO II R&D and Construction Proposal To begin funding by 3/1/02	LIGO Lab	3/1/01	Review by 7/1/01 NSB presentation 10/01