LIGO Advanced Detector R&D Proposal

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LIGO

LIGO Funding by NSF Task and by Year

Fiscal Year	*Construction*	*R&D*	*Operations*	*Proposed Advanced R&D*	*Total*
Thru 1994	35.9	11.2			47.1
1995	85.0	4.0			89.0
1996	70.0	2.4			72.4
1997	55.0	1.6	0.3	0.9	57.8
1998	26.2	0.8	7.3	2.7	37.0
1999			20.9	2.7	23.6
2000			21.1	2.7	23.8
2001		10 months >	[illegible]	2.6	21.7
All funds shown in 'then'-year $M					

FY1997 Assumptions

- Initiate activities requiring lead time
  - ››Test interferometer modifications
  - ››Occupy new laboratory space provided by Caltech and MIT
  - ››Recruit postdoctoral fellows and graduate students working outside the LIGO construction/commissioning program
- Initiate activities independent of final planning with collaborators
- Initiate activities independent of NSF program decisions
- Replan FY1997 activities within envelope of possible NSF support ($880K)

Revised FY1997 Plan

Table 1: FY1997 LIGO Advanced Detector R&D Plan

Task	*Equipment Costs (K$)*	*Labor (FTE)*	*Labor (K$) (Burdened)*	*Subtotals*
40 Meter Interferometer Infrared Conversion	$144K	0.5 technician, 1.0 post-doc, 0.5 staff scientist	$212K	$356K
MIT Interferometer con-figuration/suspension research	$80K	1.0 postdoc, 1.0 grad. student	$171K	$252K
Resonant Sideband Extraction	$79K	0.5 grad. student, 0.1 staff scientist	$40K	$119K
Thermal noise	$75K	0.25 postdoc, 0.5 grad. student, faculty summer	$76K	$151K
TOTAL	*$378K*	*0.5 technician, 2.25 postdoc, 0.6 staff scientist, 2 grad. student, 1 faculty summer*	*$499K*	*$878K*

Infrared Conversion of 40 Meter Interferometer

- Specify and procure 1064 nm laser, test masses, beam splitter, recycling mirror, active optical elements, support optics, control and suspension modifications
- Assume delivery and installation in FY1998
- Support for controls technician, 2 postdoctoral fellows and one staff scientist in second half of fiscal year
- Enables platform for use in the remaining advanced R&D program

Double Pendulum / Interferometer Configuration Research

- At MIT, as MIT Interferometer is reinstalled and modified, design suspension tests in MIT Interferometer
- Collaborative studies of double pendulum configurations
- Electrostatic actuator development
- Modeling of resonant sideband extraction/signal recycling configurations
- Studies of tunable output coupler/output mode cleaner techniques
- Support two postdoctoral fellows and two graduate students in second half of fiscal year

Resonant Sideband Extraction

- Florida begins signal (dual) recycling table top experiment
- LIGO begins resonant sideband extraction on a table top
- Support of a graduate student (Jim Mason) and a fraction of Seiji Kawamura
- Specify and procure laser, core optics, active optical elements

Thermal Noise

- Plan is altered from October proposal by commitment of Caltech Professor Ken Libbrecht to this research
- Revised plan is being formed and has yet to be fully reviewed by LIGO
- Proposed FY1997 activities include specifying sensitive thermal noise table top test setup and procuring initial components
- Support for a postdoctoral fellow and graduate student in second half of fiscal year

Proposal Revision and Collaboration Formation

- Aspen Workshop will provide opportunity for consolidation of collaborative research planning
- Following that, and receipt of the advice from this Committee, LIGO will submit a revised proposal to NSF for
  - ››FY1997 support
  - ››Outyear support