

Request for Supplement

NSF Review

November 10, 2005

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ELECTRONIC
COPY

Budget Totals by Year

Category	FY 2006	FY 2007	FY 2008
Operations - LIGO Laboratory	6,917,317	8,639,366	11,669,964
Operations - Sites	11,157,309	11,511,331	11,856,671
Data Management and Analysis	5,715,679	5,286,788	5,445,391
Advanced LIGO R&D	6,035,677	5,523,138	2,960,414
Enhancements for Initial LIGO	1,162,000	1,000,000	
Education and Outreach	584,416	598,948	613,917
Next Generation R&D	427,602	440,430	453,643
Grand Total	32,000,000	33,000,000	33,000,000

Summary by Location

Description	FY 2006	FY 2007	FY 2008
<i>Subtotal Caltech</i>	12,048,302	13,127,059	15,262,619
<i>Hanford Subtotal</i>	6,244,719	6,445,451	6,635,815
<i>Livingston Subtotal</i>	5,319,006	5,481,488	5,645,933
<i>MIT Subtotal</i>	3,533,685	3,639,696	3,789,622
<i>Subtotal R&D</i>	567,288	584,307	601,836
<i>Subtotal Advanced LIGO</i>	4,287,000	3,722,000	1,064,176
Total	32,000,000	33,000,000	33,000,000

Funding Levels vs Budgeting

- Level Funding
 - FY2003 - \$33 million
 - FY2004 - \$33 million
 - FY2005 - \$32 million
 - FY2006 - \$32 million
 - FY2007 - \$33 million
 - FY2008 - \$33 million
- Budget multiple years, recognized potential problem, especially given that some activities are to be absorbed (Visitor's Program, Outreach)
- Took actions to reduce costs in FY 2005
- Deliberately budget some funds into following year to cover funding delays
- Some items delayed, for example
 - Computer Hardware
 - Advanced LIGO Tasks
 - Initial LIGO
- Absolutely no wiggle room in budget

Caltech Budgets

WBS Description		FY 2006	FY 2007	FY 2008	Category
1.1	Director's Office	1,724,884	1,783,732	1,844,688	Operations - LIGO Laboratory
1.1	Director's Office Outreach	98,000	100,940	103,968	Education and Outreach
1.1	Director's Office - Carry Forward	(4,173,998)	(2,714,540)	(31,672)	Operations - LIGO Laboratory
1.1	Enhancements for Initial LIGO	1,162,000	1,000,000		Enhancements for Initial LIGO
1.2	Business Office	2,061,672	2,046,272	2,107,661	Operations - LIGO Laboratory
1.3	Tech/Engr	3,179,661	3,275,051	3,373,303	Operations - LIGO Laboratory
1.4	Detector Group	1,530,606	1,576,524	1,623,819	Operations - LIGO Laboratory
1.5	Data Analysis	4,382,219	3,916,784	4,034,287	Data Management and Analysis
1.5.3	General Computing	1,333,460	1,370,004	1,411,104	Data Management and Analysis
1.6	40-Meter	749,798	772,292	795,461	Advanced LIGO R&D
<i>Subtotal</i>		12,048,302	13,127,059	15,262,619	

Hanford Budgets

WBS Description		FY 2006	FY 2007	FY 2008	Category
2.1	Hanford Site Office	3,512,763	3,618,145	3,726,690	Operations - Sites
2.1	Hanford Site Office - Outreach	113,975	117,395	120,916	Education and Outreach
2.2	Hanford Facilities	916,700	944,201	972,527	Operations - Sites
2.3	Hanford Vacuum Equip	211,869	218,226	224,773	Operations - Sites
2.4	Hanford Optics	38,290	39,439	40,622	Operations - Sites
2.5	Hanford General Computing	224,626	231,364	238,305	Operations - Sites
2.6	Hanford Electronics	46,786	48,189	49,635	Operations - Sites
2.7	Hanford Administration	64,889	66,837	68,842	Operations - Sites
2.8	Hanford Installation Support	200,086	413,588	425,997	Operations - Sites
2.9	Hanford Stockroom	26,735	27,537	28,363	Operations - Sites
2.10	Hanford Outreach	100,000	100,000	100,000	Education and Outreach
2.8.1	Hanford Commissioning Travel	113,623	61,922	63,779	Operations - Sites
2.11	Hanford CDS Maintenance	282,796	291,281	300,019	Operations - Sites
2.12	Hanford LDAS Maintenance	150,381	154,891	159,538	Operations - Sites
2.13	Hanford Laser Maintenance	200,000	70,000	72,100	Operations - Sites
2.14	Hanford Test Equipment	41,200	42,436	43,709	Operations - Sites
<i>Hanford Subtotal</i>		6,244,719	6,445,451	6,635,815	

Livingston Budgets

WBS Description		FY 2006	FY 2007	FY 2008	Category
3.1	Livingston Site Office	2,670,722	2,750,843	2,833,368	Operations - Sites
3.1	Livingston Site Office - Outreach	114,529	117,965	121,504	Education and Outreach
3.2	Livingston Facilities	1,107,580	1,140,807	1,175,031	Operations - Sites
3.3	Livingston Vacuum Equipment	194,145	199,969	205,968	Operations - Sites
3.4	Livingston Optics	56,725	58,427	60,180	Operations - Sites
3.5	Livingston General Computing	218,386	224,937	231,685	Operations - Sites
3.6	Livingston Electronics	75,748	78,021	80,362	Operations - Sites
3.7	Livingston Administration	46,855	48,261	49,709	Operations - Sites
3.8	Livingston Installation Support	107,469	283,311	291,810	Operations - Sites
3.9	Livingston Stockroom	21,388	22,029	22,690	Operations - Sites
3.10	Livingston Outreach	77,911	80,248	82,656	Education and Outreach
3.8.1	Livingston Commissioning Travel	153,725	62,832	64,717	Operations - Sites
3.11	Livingston CDS Maintenance	229,999	236,899	244,006	Operations - Sites
3.12	Livingston LDAS Maintenance	77,868	80,204	82,610	Operations - Sites
3.13	Livingston Laser Maintenance	140,000	70,000	72,100	Operations - Sites
3.14	Livingston Test Equipment	25,956	26,735	27,537	Operations - Sites
<i>Livingston Subtotal</i>		5,319,006	5,481,488	5,645,933	

MIT and R&D Budgets

WBS Description		FY 2006	FY 2007	FY 2008	Category
4.1	MIT Project Office	514,671	530,111	559,051	Operations - LIGO Laboratory
4.2	MIT Business Office	176,130	181,414	191,355	Operations - LIGO Laboratory
4.4	MIT Detector Support	515,126	530,580	492,869	Operations - LIGO Laboratory
4.5	MIT Data/Computing	730,335	752,245	793,670	Operations - LIGO Laboratory
4.6	MIT Campus Research	658,230	677,977	715,222	Operations - LIGO Laboratory
5.1	MIT LASTI	690,370	711,081	768,859	Advanced LIGO R&D
5.1	MIT LASTI - UROP	80,000	82,400	84,872	Education and Outreach
5.6	MIT ISC	168,823	173,888	183,725	Advanced LIGO R&D
<i>MIT Subtotal</i>		<i>3,533,685</i>	<i>3,639,696</i>	<i>3,789,622</i>	
5.2	Thermal Noise Interferometer	139,686	143,877	148,193	Advanced LIGO R&D
5.11	Low Frequency Isolation	427,602	440,430	453,643	Next Generation R&D
<i>Subtotal R&D</i>		<i>567,288</i>	<i>584,307</i>	<i>601,836</i>	

Advanced LIGO Budgets

WBS Description		FY 2006	FY 2007	FY 2008	Category
5.3	Advanced Stabilized Laser	99,000	254,000		Advanced LIGO R&D
5.4	Core Optics	896,000	679,000	289,873	Advanced LIGO R&D
5.5	DAQ	126,000	175,000		Advanced LIGO R&D
5.6	Interferometer Sensing/Control	300,000	4,000		Advanced LIGO R&D
5.8	Seismic Isolation	1,028,000	1,210,000		Advanced LIGO R&D
5.10	Suspensions and Fibers	825,000	329,000	293,267	Advanced LIGO R&D
5.14	Input Optics	97,000	386,000	116,922	Advanced LIGO R&D
5.15	Gingin	40,000	40,000		Advanced LIGO R&D
5.16	Prototype-LASTI				Advanced LIGO R&D
5.17	Protototype-CIT				Advanced LIGO R&D
5.18	BSC Chamber				Advanced LIGO R&D
5.19	HAM Chamber				Advanced LIGO R&D
5.20	Quantum Sensing			-	Next Generation R&D
5.22	Adaptive Optics	557,000	368,000	364,114	Advanced LIGO R&D
5.30	Project Management	319,000	277,000		Advanced LIGO R&D
<i>Subtotal Advanced LIGO</i>		<i>4,287,000</i>	<i>3,722,000</i>	<i>1,064,176</i>	
Total		32,000,000	33,000,000	33,000,000	98,000,001

Summary of Proposed Work

- Direct continuation of on-going work under this Cooperative Agreement
 - Maintain and operate LIGO Observatories
 - Complete an initial data run – one integrated year at full sensitivity
 - Collect, archive and distribute data
 - Participate in analysis and publication
 - Continue vigorous R&D program to support Advanced LIGO
 - Education and Outreach

Justification

- LIGO Operations are at a critical phase
- Advanced LIGO Detector proposal submitted to NSF. In president's budget for FY 2008
- Planned activities straightforward continuation of existing program

Impact of Advanced LIGO

- Proposal submitted February 2003
- President's Budget
 - \$185 million over six years
 - Beginning in FY 2008
- As proposed used existing Operating funding, infrastructure, experience, skills
- Current Plan – direct staff to be charged to MREFC

Advanced LIGO Plan

- \$3.8 million in labor costs the first year
 - Net reduction - \$net reduction \$1.8 million
- \$8.1 million labor cost reduction second year

Year	No AdvLIGO Start	FY2008 start	FY2007 Start
FY2003	\$33.0 M	\$33.0 M	\$33.0 M
FY2004	\$33.0 M	\$33.0 M	\$33.0 M
FY2005	\$32.0 M	\$32.0 M	\$32.0 M
FY2006	\$32.0 M	\$32.0 M	\$32.0 M
FY2007	\$33.0 M	\$33.0 M	\$30.4 M
FY2008	\$33.0 M	\$31.2 M	\$27.1 M