LIGO LABORATORY
CALTECH, MS 18-34
PASADENA, CA 91125

TEL: 626/395-2129
FAX: 626/304-9834

LIGO-M050406-00-P

Date: September 2, 2005
Refer to: LIGO-M050406-00-P
To/Mail Code: Distribution
From/Mail Code: P. Lindquist/18-34
Phone/FAX: 395-3193/304-9834

Subject: LIGO Change Control Board (CCB) Meeting Minutes—August 31, 2005

Keywords: Change Control Board, Seismic Isolation System, Beam Splitter Chamber, Advanced LIGO, Prototype

References: CR-050009—Advanced LIGO, SEI, In-Vacuum Components, BSC Chamber Prototype

Participants:

B. Barish (tel.)	D. Coyne	J. Giaime (tel.)	A. Lazzarini
P. Lindquist	K. Mason (tel.)	F. Raab (tel.)	P. Saulson (tel.)
D. Shoemaker (tel.)	S. Whitcomb	C. Wilkinson (tel.)	J. Worden (tel.)

Agenda:

The LIGO Change Control Board met on Wednesday, August 31, 2005. The following change request was discussed:

CR Number	Description	Submitted By	Date
CR-050009	Advanced LIGO, SEI, In-Vacuum Components, BSC Chamber Prototype	K. Mason	August 24, 2005

CR-050007 Advanced LIGO, SEI, In-Vacuum Components, BSC Chamber Prototype

The Seismic Isolation Critical Review Committee issued a final report (LIGO-M050035-01-M) recommending that we proceed with the fabrication and testing of the ASI version of the BSC seismic isolation prototype at LASTI. This change request is to authorize the remaining funds allocated for this task to begin fabrication.

There is currently budget set aside in a fabrication account to cover these expenses. The estimate is based on vendor quotes and is an estimate-to-complete. There will be potentially multiple contracts. Most drawing information is final and the contracts will be build-to-print. The next step will be to request competitive bids. LIGO will act as the system integrator with Ken Mason in charge of the fabrication effort (originally this was to be farmed out to ASI, but their costs kept increasing). LIGO is light on electronics and test support and mechanical integration personnel. The estimate does not include additional labor resources that might be required. Nor does the estimate include the

effort that may be required to reduce the 10 Hz motion either by active control or mechanical stiffening.

Ultimately the preferred approach could be for LIGO to be doing final cleaning and assembly in house. However, facilities to handle the large parts will not be available for this prototype. Therefore, LIGO will be looking for a contractor to do the cleaning.

The estimate does include the identification of a need for a 24 percent contingency. This is not included in the budget requested.

The proposed schedule is not generous. Three months are allocated for testing both in and out of the vacuum. The schedule is deemed possible if resources are available.

This change request is approved.

Note: some information attached to this change request includes sensitive procurement information, and the attachments will not be distributed. The complete request including the attachments are filed in the LIGO Document Control Center.

PEL:pel

Attachments: CR-050009—Advanced LIGO, SEI, In-Vacuum Components, BSC Chamber Prototype

Distribution:

D. Coyne	R. DeSalvo	P. Fritschel	J. Giaime
E. Jasnow	E. Katsavounidis	F. Kaufman	A. Lazzarini
P. Lindquist	N. Mavalvala	F. Raab	P. Saulson
D. Shoemaker	A. Sibley	L. Wallace	A. Weinstein
R. Weiss	C. Wilkinson	M. Zucker	K. Mason

cc:

B. Barish
S. Whitcomb
Document Control Center

LIGO CHANGE REQUEST

Change Request No: CR-050009 **Date: August 24, 2005**

WBS Element and Title: Advanced LIGO, SEI, In-Vacuum Components, BSC Chamber Prototype

Originator: K. Mason **Telephone: 617-258-8295** **CCB Sponsor: D.Coyne**

Technical Change Description: Re-allocate Budget for BSC Seismic Prototype

A final report has been issued by the Seismic Isolation Critical Review Committee (LIGO-M050035-01-M) recommending we proceed with the fabrication and testing of the ASI version of the BSC seismic isolation prototype at LASTI. This request is to release the remaining funds allocated for this task to begin fabrication. *[Note: The funds were never actually unallocated; this request is to authorize use for fabrication of the prototype.]*

The July 31, 2005 LIGO financial report (pg. 34) shows a balance of $858K remaining for LIGO.BSCCH-5.18 from the "re-aligned budget". The Estimate To Complete (ETC), given in the attached spreadsheet, totals $838K. This estimate is based on travel, materials, supplies and subcontract costs (all labor is to be supplied by the LIGO operations budget). The estimate includes non-binding quotes on preliminary piece part drawings for the machined components.

In addition to this base ETC, we estimate that a contingency of 24% ($201K) may be required (though this is not part of this budgetary request since all contingency funds are held by the project office). Several unknowns still exist which may require use of the contingency. They include:

a) The electronics cost estimate was based on a very preliminary -based design. The plan now is to use a PCI-bus based system (not VME) and the hardware costs will be lower.
b) This cost does not include any costs for crossbeam and support structure stiffening measures (structural or active control), which have been discussed but are not part of the baseline design.
c) The increase in estimated labor costs for installation and commissioning in the production phase are not included. In fact no operations personnel labor is included at all. Moreover, the critical review committee's report suggests augmenting the team with some additional labor, which is not reflected in these costs.
d) The plan for cleaning the parts is a bit immature. Costs are based on non-binding ROMs from vendors.
e) Cost of materials such as aluminum and steel are rising due to increased energy costs.
f) The scope of the effort is through assembly, functional testing and installation but does not include integrated testing with the suspension or "commissioning" within LASTI. These costs are considered R&D costs beyond the scope of the fabricated capital equipment item account.

Budget Impact: None (seeking management authorization to spend allocated funds).

Schedule Impact:

Attached is an updated schedule, which includes the impact of the Critical Design Review.

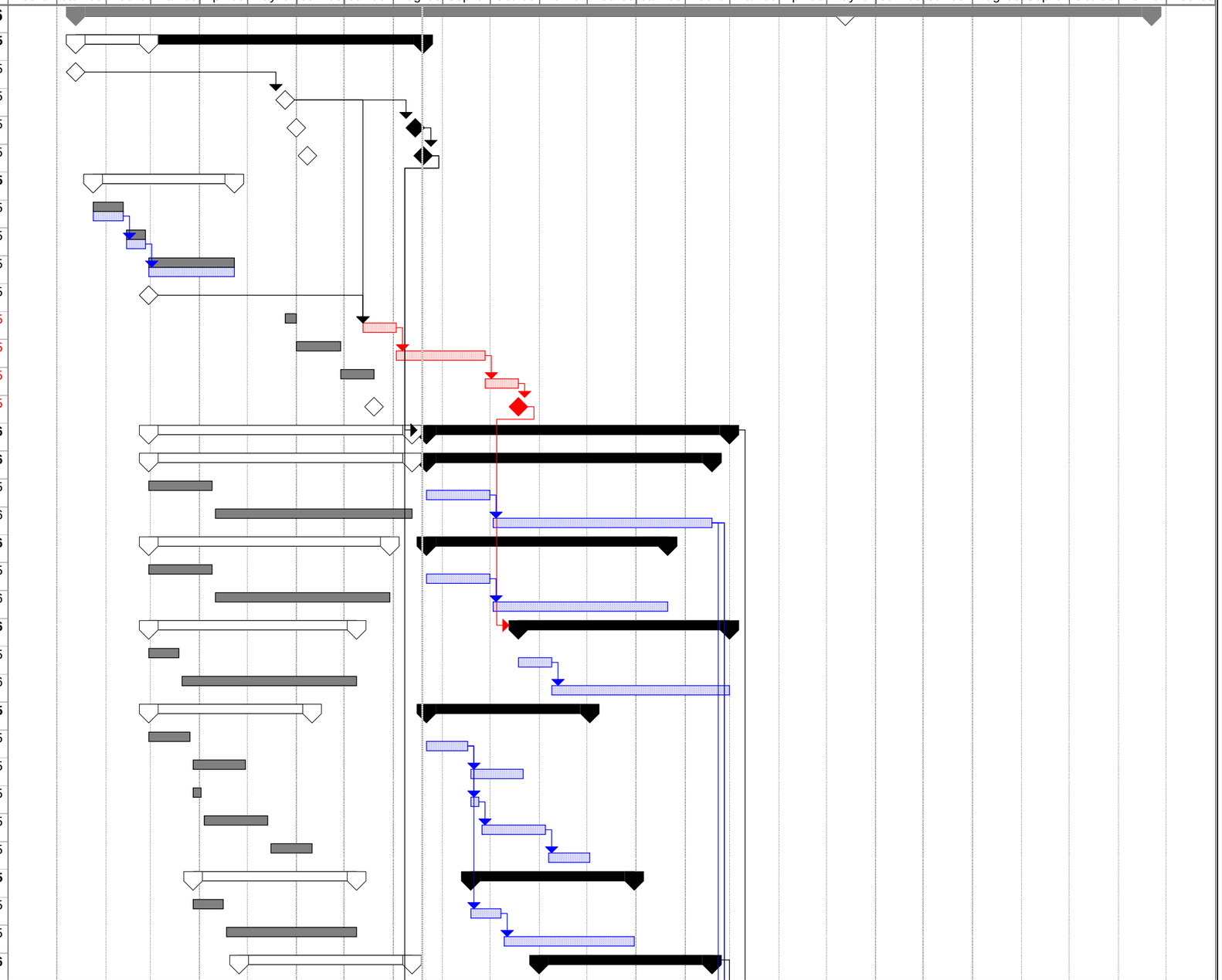
Concurrence Signatures:

Technical and Engineering Support:	Date:
Detector Support:	Date:
Data and General Computing:	Date:
Hanford Observatory:	Date:
Livingston Observatory:	Date:
Project Controls Manager:	Date:

CCB Approval/Disposition:

CCB Chairman:	Date:

ID	Task Name	Duration	Start	Finish
0	**BSC LASTI ISI Prototype**	**484 days**	**1/13/05**	**11/21/06**
1	**Critical Review**	**157 days**	**1/13/05**	**8/19/05**
2	cost/schedule review	0 days	1/13/05	1/13/05
3	ETF results review	0 days	5/25/05	5/25/05
4	recommendation	0 days	8/15/05	8/15/05
5	decision	0 days	8/19/05	8/19/05
6	**LASTI MGSE Design and Fab**	**65 days**	**1/24/05**	**4/22/05**
7	Lasti MGSE Design	15 days	1/24/05	2/11/05
8	Bid and Issue P.O.	10 days	2/14/05	2/25/05
9	Fabrication	40 days	2/28/05	4/22/05
10	**ASI Drawing Package Complete**	0 days	2/28/05	2/28/05
11	Issue/negotiate ASI blade re-design task	3 wks	7/13/05	8/2/05
12	ASI blade re-design	8 wks	8/3/05	9/27/05
13	LIGO Lab revises drawings	3 wks	9/28/05	10/18/05
14	revised drawing package complete	0 days	10/18/05	10/18/05
15	**Fab/ Procure Structure Parts**	**137 days**	**8/22/05**	**2/28/06**
16	**Large Machined Components**	**130 days**	**8/22/05**	**2/17/06**
17	Bid and Issue PO	6 wks	8/22/05	9/30/05
18	Fabrication	20 wks	10/3/05	2/17/06
19	**Small Machined Components**	**110 days**	**8/22/05**	**1/20/06**
20	Bid and Issue PO	6 wks	8/22/05	9/30/05
21	Fabrication	80 days	10/3/05	1/20/06
22	**Springs and Rod Flexures**	**95 days**	**10/19/05**	**2/28/06**
23	Issue P.O.	3 wks	10/19/05	11/8/05
24	Fabrication	80 days	11/9/05	2/28/06
25	**Pod Assemblies**	**75 days**	**8/22/05**	**12/2/05**
26	Issue P.O. (machined parts)	20 days	8/22/05	9/16/05
27	Fabrication	25 days	9/19/05	10/21/05
28	Issue P.O. (Norcal)	5 days	9/19/05	9/23/05
29	Fabrication	30 days	9/26/05	11/4/05
30	Pod Assembly	20 days	11/7/05	12/2/05
31	**SS Counterweight Masses**	**75 days**	**9/19/05**	**12/30/05**
32	Issue PO (machined parts)	3 wks	9/19/05	10/7/05
33	fabrication	12 wks	10/10/05	12/30/05
34	**Tooling/ Fixturing**	**79 days**	**11/1/05**	**2/17/06**



ID	Task Name	Duration	Start	Finish
35	Structure MGSE Design	25 days	11/7/05	12/12/05
36	Bid and Issue P.O.	10 days	12/12/05	12/26/05
37	Fabrication	40 days	12/26/05	2/17/06
38	Hardware Selection	5 days	11/1/05	11/8/05
39	Issue P.O.	14 days	11/8/05	11/28/05
40	Fabrication	50 days	11/28/05	2/3/06
41	**Controls (Electronics, Software)**	**205 days**	**8/22/05**	**6/2/06**
42	**In-Vacuum Cables, Harnesses**	**80 days**	**8/22/05**	**12/9/05**
43	Request Quote, Issue PO	3 wks	8/22/05	9/9/05
44	Fabrication	13 wks	9/12/05	12/9/05
45	**Design**	**190 days**	**8/22/05**	**5/12/06**
46	define requirements, concept	4 wks	8/22/05	9/16/05
47	ETF analog electronics design critique	2 wks	9/19/05	9/30/05
48	review	2 wks	10/3/05	10/14/05
49	**actuator driver**	**110 days**	**10/17/05**	**3/17/06**
50	design mods, small act driver design	10 wks	10/17/05	12/23/05
51	review	2 wks	12/26/05	1/6/06
52	proto fab	6 wks	1/9/06	2/17/06
53	proto test	2 wks	2/20/06	3/3/06
54	evaluate/mod/review	2 wks	3/6/06	3/17/06
55	**signal conditioning design**	**110 days**	**10/17/05**	**3/17/06**
56	bd design	12 wks	10/17/05	1/6/06
57	proto fab	6 wks	1/9/06	2/17/06
58	proto test	2 wks	2/20/06	3/3/06
59	evaluate/review	2 wks	3/6/06	3/17/06
60	**Exo-vacuum Cabling**	**10 days**	**1/9/06**	**1/20/06**
61	design, spec	2 wks	1/9/06	1/20/06
62	**Electronics Diagnostic Interface Tester**	**130 days**	**10/17/05**	**4/14/06**
63	design	12 wks	10/17/05	1/6/06
64	proto fab	6 wks	1/9/06	2/17/06
65	proto test	4 wks	2/20/06	3/17/06
66	evaluate/review/modify	4 wks	3/20/06	4/14/06
67	**Software**	**190 days**	**8/22/05**	**5/12/06**
68	real-time software development	16 wks	8/22/05	12/9/05
69	MEDM screen design	8 wks	12/12/05	2/3/06

ID	Task Name	Duration	Start	Finish
70	test-stand implementation	4 wks	4/17/06	5/12/06
71	**Fabrication/Procurement**	**165 days**	**10/17/05**	**6/2/06**
72	**actuator driver**	**55 days**	**3/20/06**	**6/2/06**
73	fab	8 wks	3/20/06	5/12/06
74	test	3 wks	5/15/06	6/2/06
75	**signal conditioning**	**35 days**	**3/20/06**	**5/5/06**
76	fab	4 wks	3/20/06	4/14/06
77	test	3 wks	4/17/06	5/5/06
78	**COTS VME module selection**	**95 days**	**10/17/05**	**2/24/06**
79	request quotes, place POs	3 wks	10/17/05	11/4/05
80	procure	16 wks	11/7/05	2/24/06
81	**Exo-Vacuum Cabling**	**70 days**	**1/23/06**	**4/28/06**
82	request quotes, place POs	2 wks	1/23/06	2/3/06
83	fab	12 wks	2/6/06	4/28/06
84	**Assembly & Modal Test**	**127 days**	**1/23/06**	**7/18/06**
85	Assembly Area Preparation	20 days	1/23/06	2/17/06
86	Part Inspection	5 days	2/20/06	2/24/06
87	"Dirty" Assembly (per E040507)	25 days	3/1/06	4/4/06
88	Modal Testing	10 days	4/5/06	4/18/06
89	Disassembly (per E040507)	15 days	4/19/06	5/9/06
90	Ship, Clean Small Parts	28 days	5/10/06	6/16/06
91	Ship, Clean Large Parts	28 days	5/10/06	6/16/06
92	Clean Assembly (per E040507)	22 days	6/19/06	7/18/06
93	**Installation & Test @LASTI**	**137 days**	**5/15/06**	**11/21/06**
94	Instrumentation Test	4 wks	5/15/06	6/9/06
95	Electronics Install & C/O (diagnostic interface)	3 wks	6/12/06	6/30/06
96	Pre-installation Functional Test	10 days	7/19/06	8/1/06
97	System Ident. & Characterization in air	3 wks	8/2/06	8/22/06
98	Preliminary Control	3 wks	8/23/06	9/12/06
99	Stand-alone SEI ISI installation	2 wks	9/13/06	9/26/06
100	Stand-alone SEI testing	6 wks	9/27/06	11/7/06
101	SUS/UK Quad Assembled & Ready at LASTI	0 days	9/26/06	9/26/06
102	Cartridge Installation (assembled with quad SUS)	10 days	11/8/06	11/21/06