

Date:	15 <sup>th</sup> April 2008
Refer to:	T080087-00-R
Subject:	LASTI Review March 2008 Report from the LASTI Technical Advisory Committee (TAC)
To:	David Shoemaker
From:	Members of the committee: Rich Abbott, Dennis Coyne, Riccardo DeSalvo, Brian Lantz, Fred Raab, Norna Robertson (chair) and Alan Weinstein

## 1. Introduction

The LASTI TAC met with the LASTI leader Rich Mittleman on 19<sup>th</sup> March 2008 during the recent LSC-Virgo meeting at Caltech. Rich gave a plenary presentation on recent work at LASTI at the main meeting on Monday 17<sup>th</sup> and gave a follow-up presentation at this meeting covering future planning, including the task list and an outline timeline (presentation reference: G080244-00-R).

## 2. General Observations

The LASTI TAC commends the LASTI team for the progress made there, and recognises that the work being undertaken is important for mitigating risk in the installation and commissioning of Advanced LIGO. We welcome the news that the separation of the HAM chamber containing the ponderomotive experiment from those chambers being used for the LASTI program is almost complete, with the septum plate now installed. We are also pleased to hear that the problem with large temperature fluctuations which were plaguing the LASTI facility appears to be resolved.

The main thrust of the current program at LASTI is the work on the quadruple pendulum and BSC-ISI system. The first installation of the combined quad+ISI is due to take place in April (with the quad in its all-metal state). The immediate upcoming work is commissioning the ISI with the quad load, and then a reinstallation with the quad in its monolithic silica configuration. This will be followed by cavity tests starting this summer. Major tasks in the future will be testing of the TCS system and installation of the HAM-ISI.

After the review Rich provided the committee with a more detailed listing of the LASTI task list, which is included here as an appendix. He also provided a list of LASTI manpower.

### 3. Comments

#### 3.1 Important (baseline) work versus wish-list items

We would like to see the task list for LASTI separated into those tasks which are key items to mitigate risk in Advanced LIGO, and thus should take precedence in the program, from those which may be interesting but are not baseline.

#### 3.2 Timeline for the baseline items

We would like to see a schedule/timeline which includes details of the external milestones/deadlines from the various groups involved (SUS, SEI, SYS...)

We suggest that for the fleshing out of this timeline, it would be useful to consider a range bounded by an early and a late date. Milestones for delivery of needed results to Adv LIGO should be achievable using the late dates, but deliveries to or actions at LASTI should attempt to achieve the early dates. The spread between early and late dates should be able to accommodate reasonable estimates of what can go wrong. As guide based on previous LIGO R and D experience we offer the following examples: delivery delays would need a month of margin in a schedule or a lot of good options for work-arounds; a prototype test of a fully modelled system typically finds some problems that need about 3 months to identify, understand and design and implement a way out of; a more exploratory test of something not very well understood (e.g. SPI) should have a margin of 6-9 months.

3.3 When the overall task lists are presented it would be helpful to have them accompanied with an annotated “map” of the LASTI lab showing where and when the work is performed. For example as major changes happen a set of “snapshots” of the LASTI spatial configuration would be helpful, e.g. where would the quad-triple cavity be set up, where would the HAM ISI installation be done, where would an SPI test take place.

#### 3.4 Status on what is R and what is D.

In future updates it would be helpful to understand which current and upcoming tasks are still in the research mode and which are into development.

#### 3.5 Manpower needs to carry out 'baseline' compared to availability

In future updates it would be helpful to receive information on the available manpower compared to the manpower needs for the baseline work so that the committee can offer advice, and /or help to lobby for more support. In addition we would like to receive information on how much and when manpower is needed from groups external to LASTI (e.g. SUS, SEI, CDS).

#### 3.6 In future updates please include specific information on CDS work

#### 3.7 Specific items which arose during the meeting

3.7.1 There was a discussion about testing loading scenarios on the ISI to investigate off-centre loading. We propose this testing is done.

3.7.2 We note that it would be useful to take a video of pulling fibres for training purposes.

3.3.3 UK quad electronics: we note that the first version of these electronics is due to be installed in early April and subsequently tested. There will be a second set - “the pre-production” version produced by our UK colleagues, and we propose this second set is also tested at LASTI as and when it becomes available.

#### **4. Actions**

Items 3.1, 3.2, and 3.3.

We propose that Rich contacts the appropriate people to gather the list of deadlines for the important (baseline) tasks and then works with them to flesh out a timeline which aims to meet these requirements. We note that this will require significant input from the groups involved. When the data is gathered we propose that Rich includes information on the LASTI spatial configurations with the updated timeline and task list.

**Appendix: LASTI task list information from Rich Mittleman.****Lasti Main Plan**

- 1) **Get Quad/ISI Running**
  - a. **Commission ISI**
    - i. **HEPI?**
  - b. **Install and test Monolithic Construction**
    - i. **Finish welding and pulling development**
- 2) **Cavity Tests (Starting this summer)**
  - a. **Get Locking Working again**
  - b. **Test ESD**
  - c. **Test Control Strategies**
  - d. **Test Violin Damper**
  - e. **Test Ring Heater**
  - f. **Install ETM(?) Baffles**
- 3) **Convert to ITM and TCS (Middle 2009?)**
- 4) **Install HAM-ISI**

**In Laundry List Format****Lasti Task List****Definite plans to do this**

The details aren't fleshed out, but we plan to do it

Sounds interesting, no plans yet

**SEI****fully commission BSC-ISI**

Implement Control Loops and Test performance

Test Installation and in vacuum performance

**Test Load scenarios**

Currently the Quad is centered on the optics table; we should test off center loading

Balance and performance

Install and test a SPI

Install and Commission HAM-ISI

Reduced Sensor Controls (what happens if an in vacuum sensor dies)

**SUS****Get Noise prototype working**

Fix current hysteresis problem

Verify damping, modal frequencies and couplings on metal version

Convert to glass monolithic version

Test assembly alignment and installation procedures and tooling

**Test Electro Static Drive (ESD)**

Optic Modes and Damping (Parametric excitation) is included here

**Fiber Pulling and Welding**

Finish Installation

Develop and refine fiber pulling and welding methods

There is still a lot of development work to be done

Clearly this is with a lot of help from Glasgow.

Test Ring Heater (thermal and optical)

Violin Mode Damping

Non Gaussian noise in violin mode studies bond studies

Charging/discharging of the test mass studies

RM Suspension in HAM

Reconfigure to ITM suspension

First article modecleaner,

**Other**

Baffle Installation and Fit Check

Complete end to end test of Adv LIGO TCS system including SEI/SUS thermal interactions

**Beta Testing of CDS Advanced LIGO Controls Infrastructure**

**Lock a triple/quad cavity and test hierarchical control schemes**

**Finish splitting LASTI into two separate vacuum systems**

**Continue to support the squeezing experiment in the mid-y HAM chamber**