LIGO Laboratory

Date:	23 June 2008	Refer to:	L080066-00-0
Subject:	Notes on Adv LIGO first article builds for BSC suspensions		
To:	Dennis, Coyne, David Shoemaker, Carol Wilkinson		
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1. Introduction

This document summarises the outcome of a discussion between Norna Robertson, Justin Greenhalgh and Ken Strain concerning the current position regarding aspects of the assembly of first articles for the suspensions which the UK are delivering to Advanced LIGO, namely the ETM/ITM and BS/FM suspensions.

2. Background

The discussion was initiated by a request from Dwight Carter to Justin to update the list of proposed UK milestones for BSC production. This prompted a reconsideration of several issues to reflect the current position. It is noted that not only the milestones, but also the schedule and the US costbook require updating when the outcome of these discussions is agreed.

The issues to address include

a) Training of US personnel by UK personnel for ETM/ITM and BS/FM suspensions
b) First Articles
c) Number of suspensions which the UK will assist in assembly
d) Timing of all of the above

3. Training and First Articles

Here we specifically address training on building the metal version of these suspensions. This area is funded in the UK's Advanced LIGO capital budget and in particular involves staff from RAL. As such there is a finite lifetime for the funding which ends in October 2009 (although we note that the UK has asked for an extension beyond that date for installation support[1]). Support for training/advice on monolithic work could continue beyond that date under the rolling grant at Glasgow.

3.1 Quad training

RAL has already provided training both at RAL on the copy of the noise prototype quad situated there, and on trips to LASTI. They propose that the final quad training session on a metal assembly be done in October 2008 at one of the sites on what has been termed the

[1] *The extension is very modest is scope allowing for just ~1 staff month of effort, plus T&S.*

first article. It is a first article in the sense that all parts are to the final design which is being used for manufacture of productions items. However the actual parts will be a combination of existing parts taken from the noise prototype currently at RAL and new parts where there has been a revision in the design. RAL will carry out a dirty assembly of this “training quad” and then the parts will be delivered to the US and cleaned to class B standard (which is not to the standard for installation in LIGO). We believe that training on a cleaned item gives necessary experience of handling under those conditions. However to carry out a full clean to LIGO installation requirements is not necessary for a training exercise and in addition would be time consuming and more costly (e.g. helicoils would need to be removed and reinserted). There is no intention of using this article in Advanced LIGO. One advantage of this scheme is that it leaves LIGO with a complete suspension that can be used for future training or test purposes.

This procedure is not what is described in the current US costbook or schedule, but is proposed as a good compromise given the current situation. It was expected when the costbook was assembled that the first article would be the first item of the actual production run. However a delivery of such a first article from the company carrying out the production in advance of producing the remaining parts would have significantly increased the cost of production, and the UK team has decided that this is not acceptable. It is expected that the parts for the final quad production items will not be delivered to the US until February or March of next year since they require to be checked at RAL, and then they require cleaning and baking. So if we do not carry out the training exercise above, the first opportunity for such training would be the assembly of a production item which could not start until after March 2009 at the earliest.

b) BS/FM training
The RAL team is currently assembling a prototype BS suspension at RAL. The intention is that the US would send a team over to the UK to get trained on building this assembly in its “dirty” state. The schedule for this is not yet in place but such a training exercise is unlikely to occur before October 2008. A further training opportunity could be possible on the first of the production items at one of the sites in summer 2009.

4. Production Assembly

In the current US costbook the UK are listed as assembling 2 suspensions at each site “as a technology transfer to the LIGO LAB” (see for example activity SU-A03477A). Such technology transfer has been/will be carried out by the training exercises described above. UK labour which was earmarked for assembly and training will then have been expended. The UK hope to be able to have staff from RAL on standby when the production items are assembled, but do not have the resources to offer more support. This has implications for the US funding for assembly which need to be addressed.

5. Timing of Training Exercises and Production Assemblies.

Timing of future training activities has already been indicated in the above sections. To summarise:

5.1 Training on a semi-clean “training quad” ETM/ITM: October 2008, at LLO or LHO
5.2 Training on a dirty BS/FM prototype: date to be determined but not likely to be before October 2008, at RAL
5.3 Possible second training session for the BS/FM on a production item: summer 2009

Timing of arrival of parts for production items at the sites (as currently foreseen):

5.4 ETM/ITMs – Spring 2009
5.5 BS/FMs – Summer 2009

6. Conclusions

We believe the above proposed plan of action is a good compromise in the light of developments since the original plans were drawn up. As noted earlier, the milestones, schedule and US costbook will require updating in the light of this revised plan.