

Advanced LIGO UK  
Project management meeting number 36  
Telecon, April 20th 2007  
Mark Barton, Justin Greenhalgh, Deepali Lodhia, Ian Wilmut

## 1 Participants

Justin Greenhalgh (chair)  
Mark Barton (MB)  
Tim Hayler (TMH)  
Russell Jones (RJ)  
Deepali Lodhia (DL)  
Norna Robertson (NAR)  
Joe O'Dell (JO)  
Ken Strain (KAS)  
Ian Wilmut (IW)

## 2 Comments on minutes from last meeting

There were no comments on the minutes from the previous meeting.

## 3 Actions from previous meeting

These are noted under item 13 below.

## 4 UK/US interactions

### 4.1 SUS and design meeting telecon issues

#### 4.1.1 Sus telecons:

- Lots of very useful discussion of noise prototype LASTI test plan and schedule (See M070046, M060304)
- Discussion of how to get closure on Birmingham electronics (achieved 18 April)
- Laser safety glasses

#### 4.1.2 Additional items from design telecons:

- Only one meeting since last time, due to leave etc
- Discussion of stability of suspension (only stable over a small range of tilts – larger tilts make a suspension fall over – T070073 and others refer)

### 4.2 SWG

It was planned to restart the suspensions working group meetings, on the third Friday of the month starting at 5pm UK time.

### 4.3 RODAs

For RODAs, see:

[http://www.ligo.caltech.edu/~coyne/AL/project\\_management/RODA/RODA\\_status.htm](http://www.ligo.caltech.edu/~coyne/AL/project_management/RODA/RODA_status.htm)

No change in RODA status since last meeting.

- The RODA (M060043) on sensors in the UIM and PM OSEMs was not yet signed. RJSJG had reworded the RODA per discussion last time and forwarded to Dennis Coyne. The key wording was now:

**DECISION/AGREEMENT STATEMENT:**

It has been proposed that for the ETM and ITM we will not fit sensors to the OSEMs for global control. These OSEMs are the ones on the penultimate and upper intermediate masses. However, following experience on the controls prototype, there is concern that the OSEM sensors will be required for the assembly and alignment of the suspension.

This RODA records agreement on the following decision process.

- For the N-Ptype, the sensors will be included on the global control OSEMs but we will try to avoid using them during assembly and alignment of the suspension.
- Decide whether the N-Ptype can be assembled without using the sensors in the OSEMs.
- If that is so, OSEMs will be omitted from the production SUS (this may require a change to the flexi-rigid board).
- If not, then we will need sensors in the production SUS OSEMs – but they will not need full-time low noise electronics; a simple local unit will suffice (and be much easier to use than the full-blown system). A check would need to be made on plug/wiring provision.

Experience with the controls prototype also showed that the stiffness of the wiring (pigtailes) leading to the global control OSEMs was an issue. This stiffness is mostly due to the shielding of the wiring. However, there is concern that the ESD may interfere with the OSEM drive signals if shielding is omitted.

This RODA records agreement on the following decision process.

- The Pigtails leading to the global control OSEMs in the N-Ptype will not be shielded. This is so that a check can be made as to whether the ESD interferes with those OSEM's drive signals.
- If it turns out that such interference is present, then shielding will be used for the production suspensions.

- The RODA (M060300) on lack of reaction chains in FM and BS suspensions, and on the use of LIGO-1 style OSEMs was not yet signed. Key wording was

**DECISION/AGREEMENT STATEMENT:**

It is agreed that the suspensions for the beamsplitter and folding mirror will have no reaction chains. There will be OSEMs reacting to the structure (possibly via a tablecloth or similar) at the top mass and the penultimate mass (these are triple suspensions). The OSEMs at the top mass will be the modified hybrid design developed by Birmingham University in work package 4 of the UK project. The OSEMs used at the penultimate mass will be LIGO 1 style OSEMs, like those used on the penultimate stages in the ETM and ITM suspensions.

**ACTION 36.01 RJSJG** to pursue the two RODAs at the SUS meetings.

## 4.4 Reviews

### 4.4.1 Noise prototype PDR #3

No change from the previous meeting. Although no formal outcome had yet been published, work was more or less complete on the basis of a successful outcome.

## 4.5 Visits and trips etc.

Brett Shapiro had visited RAL for a week during early April and made a very useful contribution to the assembly of the dirty nose prototype.

SMA had visited RAL to make measurements on the structure for the wiring loom.

Iain Martin and Calum Torrie were planning to return to RAL for more measurements as soon as the full “dirty” structure was available. (Provisionally set for 30/31 May).

SMA and DL were planning to visit RAL for a general laser safety course on the morning of 26<sup>th</sup> April.

RAJ and MB were planning to visit RAL to review the parts set for the laser machine; this would probably take place in w/b 7 May.

NAR was planning to visit Glasgow for the last two weeks in May and make a side trip to RAL on May 24<sup>th</sup>.

## 5 PAG/OsC issues

RJSG had submitted updated spend profiles to PPARC and had been asked to update them again once the revised grant profile was published to Glasgow.

The next OsC will be on Friday 28<sup>th</sup> Sept in Glasgow.

**ACTION 36.02** RJSG to trigger next PAG meeting

## 6 Finance

No new reports.

## 7 Changes

A change to the BS conceptual design was still under consideration.

Other areas potentially to be treated as changes and/or risks:

- Delay to the BS/FM conceptual design. Work currently in hand may need to be redone – this should be entered as a risk in the risk log.
- Problems at structure manufacturer – now big enough to constitute a change, and worth noting as a risk to be managed during procurement (eg TMH’s strategy). Should be noted in the change log.
- Time taken to assemble – a risk log entry should note that we are likely to go over budget here.
- Time taken for testing – as above.
- The whole OJEU process to be considered as a risk-management issue. What is the best procurement route to minimise both risk and delay? (Details of how to split the procurement, eg can we start the blades early etc)

**ACTION 36.03** RJSG to make entries in the change and risk logs as noted, and to chase up the BS/FM decision process in one month.

Scope document updated to version B, signed by David Shoemaker and Carol Wilkinson, now with Dennis Coyne.

## 8 Web sites etc

[http://www.eng-external.rl.ac.uk/advligo/papers\\_public/ALUK\\_Homepage.htm](http://www.eng-external.rl.ac.uk/advligo/papers_public/ALUK_Homepage.htm).

Most recent updates:

- RAL June 2006 with PDR documents; ALUK March 2006.
- Glasgow: Last update 16<sup>th</sup> June 2006 with PDR #3 documents from Glasgow
- Birmingham update 16<sup>th</sup> June 2006 with PDR #3 documents

It was agreed to give all three websites an update, since the new DCC had been delayed.

**ACTION 35.05 STANDS: SMA, IW and MB** to update the websites.

## 9 Project schedules etc

RJSG had produced a schedule for the LASTI activities, M070046, to complement the LASTI test plan (in draft) and the milestone list (M060304).

## 10 Activity/plans and document summaries

### 10.1 Glasgow

#### 10.1.1 Activities in previous month

- Alastair has been variously away at a conference and distracted by other tasks, so not much further R&D on pulling and welding has occurred. However a number of good quality ribbons have been pulled and passed to Alan for characterization.
- Russell and Alan have been working on improving the profiler.
- Calum and Alan have been working on the design of the bounce/proof test rig.
- Orders placed for mechanical components required for ribbon characterisation set-ups (Proof/Bounce tester, Profiler).
- Mark has done a first detailed plan for the LASTI Ribbon Lab taking account laser safety, cleanliness, ergonomics etc. (See appendix)
- The prisms were finished except for the grooves, which our supplier were initially reluctant to quote on.
- Russell convinced them to try a test groove in a spare prism and had the result profiled by Liam. Indeed the result was not very satisfactory – there was a large chip in the back face of the prism (relative to the tool motion).
- Russell, Mark and Calum visited the supplier to discuss a way forward. It was decided to rethink the sharp edge on the top of the prism. A second test where the top edge was ground down slightly before the groove was cut was much more satisfactory. The bottom of the groove was a little too round, but a fresh cutting wheel should fix that. We are awaiting costing for a slightly larger test run on in-process spares.
- Russell developed a plan for packing and shipping the ERM, and Russell and Mark adapted a cover letter by Justin.
- Mark has researched the location and editing of the web site files and has done a preliminary update. However more stuff will go up in the next week or so.

### 10.1.2 Plans for coming month

- Ship ERM.
- Order grooves in prisms.
- Finish commissioning of laser welding setup; try welding.
- Discuss LASTI ribbon lab layout with US, especially w.r.t cleanliness.
- Continue design work on ribbon processing and characterization tooling.
- Russell, Mark, Calum visit RAL to stocktake, label and organize LASTI CO<sub>2</sub> lab items.

### 10.1.3 New and modified documents

T050257-01 - Quad Pendulum Controls Prototype - Identification of Modes. (Update)

### 10.1.4 Progress against schedule

The ERM has slipped a bit further. Russell will visit the supplier on Tuesday 24/4 to see it going into its box, and it should ship the next day. However the latest word is that the first PM should still ship around the time of our earlier guesstimate of the beginning of June, with the second around 3 weeks later in late June.

## 10.2 RAL (WP 1 and 3)

### 10.2.1 Activities in the previous month

- Due to the Easter holidays and illness less progress has been made than usual (55% effort only)
- Noise prototype initial assembly complete (dirty)
  - There have been minimal problems, with all systems going together quickly and easily.
  - To date the quad is fully assembled and suspended with both chains at the same height and most of the interfaces checked.
  - OSEMS have been trial fitted in all locations, and no problems were encountered.
- Daresbury have had all but the last 10% of the components for cleaning (excluding weldments) these will be sent shortly.
- 90% of the fiber welding tooling has been procured and is ready for checking by Glasgow.
- Feedback received for ear bonding jig, 2<sup>nd</sup> iteration is underway.
- The BS structures were presented to the design group a few months ago. The following course of action was decided and is being implemented as follows:
  - One “Meccano” beam splitter designed, and procured, and being assembled
  - One face plate beam splitter designed and out for manufacture
  - One set of stays to be prototyped and tested
- Given the problems encountered with the upper structure welding some preliminary thought has been given to alternative methods of manufacture for the weldments. One possibility was a SS structure, a preliminary FE analysis was done for this showing SS would be as good if a practical design could be realized.
- Lower structure assembly tooling set to CIT for trial runs
- Lower structure and tooling sent to Glasgow for fiber weld tests.
- Folding mirror design being progressed
- A lot of work was done on the quad stability range trying to understand if things were working as they should. All seems well.

- Scope document updated to version B, signed by David Shoemaker and Carol Wilkinson, now with Dennis Coyne.
- Mini schedule produced for activities at LASTI, very useful discussions ongoing with LASTI team.
- Laser safety glasses identified and will be bought.
- Attended LSC.

### 10.2.2 Plans for the coming month

- Receive dirty sleeve and perhaps clean upper structure and sleeve (if we are lucky)
- Ensure that all the items for the quad will at LASTI when required.
- Complete the procurement of the laser welding tooling (computer and a few bolts and things)
- Complete the design of the ear bonding jig .
- Migrate PDR-3 documentation to new DCC as soon as it is running.
- Get a good baseline design of the FM
- Ship the LASER tooling to LASTI
- Ship the Quad to LASTI (as much as we can)

### 10.2.3 New and modified documents

The review process has obviously resulted in the production of a lot of documents. These are presently available from [www.eng-external.rl.ac.uk/advligo/](http://www.eng-external.rl.ac.uk/advligo/) review as these documents migrate to the DCC they will be listed here as complete. (note; awaiting new automated DCC first)

Since listing all drawings is going to be tedious and fairly unhelpful we will list DCNs for sets of drawings. These will allow “system” level access to drawings.

Document	Status
<b>New Documents</b>	
M070041-00-K Advanced LIGO UK Project Management Meeting Number 36, Telecon, Mar 15th, 2007	Submitted to DCC (not yet available)
M07000046 LASTI schedule	Not submitted to DCC
<b>Older Documents</b>	
DCN for UK scope document M030162-B E070049-00-K	Submitted to DCC (not yet available)
OSEM active range and SUS assembly issues G040061-00-K	Submitted to DCC (not yet available)
Alignment and adjustment issues G050100-00-K	Submitted to DCC (not yet available)
RODA on lack of sensors on PU and UIM in ETM/ITM M060043-00-K	Submitted to DCC (not yet available)
Integrated ALUK schedule M060088-00-K	Submitted to DCC (not yet available)
RODA on no reaction chains for BS and FM M060300-00-K	Submitted to DCC (not yet available)
Cost of OSEMs for UK and US M070018-00-K	Submitted to DCC (not yet available)
Range of OSEMs for Advanced LIGO T040113-00-K	Submitted to DCC (not yet available)
mechanics calculations for earthquake stops T060054-00-K	Submitted to DCC (not yet available)
mechanics calculations for earthquake stops T060055-	Submitted to DCC (not yet available)

00-K	
mechanics calculations for earthquake stops T060056-00-K	Submitted to DCC (not yet available)
Effects of earthquake and shock loads on quad suspensions T060100-00-K	Submitted to DCC (not yet available)
Transmissibility of beamsplitter and folding mirror blades T060295-00-K	Submitted to DCC (not yet available)
DCN for Noise prototype top stage E060238	Submitted to DCC (not yet available)
DCN for Noise prototype tablecloth E060239	Submitted to DCC (not yet available)
DCN for Noise prototype UI mass E060247	On DCC
DCN for Noise prototype Top mass E060248	On DCC
M060036 PMC Mar 2006	Not yet on the DCC
M060043 RODA on sensors in Noise	Not yet on the DCC
M060007 PMC Jan 2006	Not yet on the DCC
E050317 Compliance matrix	still in draft
All documents from PDR-3	Awaiting new DCC

#### 10.2.4 Progress against schedule

The RAL schedule will be updated as soon as the UK/LASTI schedule discussions reach a stable state.

### 10.3 Birmingham

#### 10.3.1 Activities over the previous month

##### Mechanical

- IRLED Burn-in process completed for all 2000 units (\*no\* failures)
- IRLED screening underway (identified sufficient quantity for NP)
- Ship 10 completed 'dirty' OSEM OMC units to Caltech
- Assembly of 20 Clean NP OSEMs for LASTI is underway
- Parts have been cleaned and are now being baked
- Updated OSEM drawings given experience gained with 1st batch
- DCN update from release A to B
- Obtained quotes for fabrication of parts
- Placed orders for next batch of 70 OSEM units
- Procurement Status:-
  - Received shipment of ESD in vacuum co-ax cable
  - Received shipment of OSEM pigtail cable (incomplete)
  - Received shipment of micro-D connector backshells

##### Electronics

- UIM Coil Drive and Monitor Circuit design has been completed and has been approved by Jay Heefner
- The manufacturing data files are being generated and discussed with the contractor with a view to laying out the board, manufacturing the board and populating it
- Three boards are to be manufactured initially, two of which are for delivery to the USA (one four channel board plus a spare)

- The Top Coil driver board will be very similar to the UIM board but with an extra output drive stage, which minimises the extra work required

### 10.3.2 Plans for the coming month

#### Mechanical

- Attend laser safety session at RAL (26th April)
- Ship 20 completed 'clean' OSEMs to LASTI
- Manufacture mock harness for evaluation on the 'dirty' Quad at RAL
- Completion of procurements, awaiting shipment of:-
  - Tubular braid
  - Shipping containers ('pink' tubs)
  - Kester solder
  - Submit OSEM assembly specification (Janeen & Bob)
  - Submit OSEM test specification (Janeen & Bob)

#### Electronics

- Complete and check all the manufacturing information for the UIM Coil Drive
- Set manufacture in motion
- Design Top coil drive circuits
- Prepare to manufacture them
- Continue testing of satellite box as time allows, and discuss the production of further satellite boxes

### 10.3.3 New and modified documents

- None this month

### 10.3.4 Progress against schedule

Now that the electronics design has been agreed it will be possible to update progress against a revised schedule.

## 10.4 Strathclyde

The sensor for the violin-mode dampers was soon to be tested with 1/3 length ribbons.

## 11 Visits etc and absences planned for the coming months

	April	May	June	July
General				
RJSG		Leave w/b 7th		
AV				
TMH		LASTI?		

JO	Leave 6 - 13	LASTI		
IW	Leave 2 - 13	LASTI; 1 week's leave late in May		
SMA				
CAC				
KAS		Germany 1-11 May		
RAJ	Poss. RAL			
AH				
MB				
IM				

## 12 AOB

NAR agreed to advertise the location of the SUS page on the Advanced LIGO wiki.

## 13 Summary of actions

### 13.1 Complete or superseded by events:

**ACTION 35.01 RJSG** Verify at LSC, then reword the RODA on OSEM sensors to reflect the decision process. Done.

**ACTION 35.02 RJSG** to pursue the FM/BS reaction chain RODA at the LSC. Could not do – DCC not there.

**ACTION 35.03 AV, IW and Glasgow** to produce updated spend profiles by 24<sup>th</sup> March. Done.

**ACTION 35.04: RJSG** to check with Dennis Coyne at the DCC on the situation with horizontal wedges. Could not do – DCC not there.

**ACTION 35.06 RJSG** would check at the LSC why the plan to omit shielding from the suspended OSEM pigtailed (RODA M060043 refers) had been abandoned. Done as far as possible – see update to sensors RODA

### 13.2 Outstanding

**ACTION 35.05: SMA, IW and MB** to update the websites.

**ACTION 35.07 SMA** to check exactly what the wiring problems had been on the C-Ptype ESD and formulate a correction strategy. This was in hand but not yet complete.

### 13.3 New

**ACTION 36.01 RJSG** to pursue the two RODAs at the SUS and meetings.

**ACTION 36.02 RJSG** to trigger next PAG meeting

**ACTION 36.03 RJSG** to make entries in the change and risk logs as noted, and to chase up the BS/FM decision process in one month.

## 14 Next meeting

PMC Friday May 18<sup>th</sup> 2007, 2pm, telecon.

Justin Greenhalgh with progress reports from the other authors.  
20 April 2007

## 15 Summary for LIGO newsletter

ALUK held its latest Project Management Committee on 20<sup>th</sup> April 2007 (See LIGO-M070059-00-K).

A brief activity summary follows:

- **RAL:** The dirty noise prototype has been fully assembled and suspended. Most UHV cleaning done, but delayed by shipping damage to some parts (now fixed). The “long pole” remains the structure – delivery of the first “sleeve” is expected imminently. Most parts for the second laser welding machine were now at RAL. The first test beam splitter structure has arrived and is awaiting assembly. The second test structure (faceplate design) is being manufactured. A lot of attention has been focussed on planning for LASTI assembly and test.
- **Glasgow:** ERM is now finished and ready to ship; details of shipping being finalised. Work in hand with manufacturer on finalising prism design. Plan drafted for laser area at LASTI. Ribbon characterisation hardware ordered.
- **Birmingham/Strathclyde:** 10 OSEMs sent to LASTI (OMC); 20 more in assembly (quad noise prototype); 70 more on order (remainder of BHam commitment + extras). Satellite boxes production/test continues. Coil driver electronics design agreed and in manufacture for UIM; top stage and PU to follow shortly. Wiring harness design agreed and being mocked up to try on dirty noise prototype. 2 000 IRLEDs have all passed burn in test and screening test (to match output) is underway; enough already matched for noise prototype. The violin-mode damping sensors will be testing on 1/3 length fibres shortly.

