Advanced LIGO Engineering Change Request (ECR)

ECR Title: ECR: **CM Board Modifications (ALS)**	**DCC No: E12xxxxx-vx** **Date: 10/12/2012**

Requester:

Daniel Sigg

Impacted Subsystem(s):

ISC

Description of Proposed Change(s):

As a result of the one arm test a number of changes need to be propagated to all other ALS end station boards. The common mode boards are described in a wiki. The modifications affect the transfer functions for the laser locking and the cavity locking. It adds low pass filtering to suppress PZT resonances and it fixes a gain in the slow controls readback. As a consequence the previously identical ALS boards are now split into two types: LL (laser locking) and ALS (cavity locking). The actual boards are D040180-E. The changes are described in E1200907-v1.

Reason for Change(s):

The transfer functions of the ALS common mode boards had to be modified to reflect reality.

Estimated Cost: total $5k (parts and labor)

Schedule Impact Estimate:

None.

Nature of Change (check all that apply):
- [ ] **Safety**
- [x] **Correct Hardware**
- [ ] **Correct Documentation**
- [x] **Improve Hardware**
- [ ] **Improve/clarify Documentation**
- [ ] **Change Interface**
- [ ] **Change Requirement**

Importance:
- [ ] **Desirable for ease of use, maintenance, safety**
- [ ] **Desirable for improved performance, reliability**
- [x] **Essential for performance, reliability**
- [x] **Essential for function**
- [ ] **Essential for safety**

Urgency:
- [ ] **no urgency**
- [x] **desirable by date/event: _Feb 2013____**
- [ ] **Essential by date/event: _____**
- [ ] **Immediately (ASAP)**

Impacted Hardware (select all that apply):
- [ ] **Repair/modify. List part & SNs:** _____
- [ ] **Scrap & Replace. List part & SNs:** _____
- [ ] **Installed units? List IFO, part & SNs:** _____
- [ ] **Future units to be built**

Impacted Documentation (list all dwgs, design reports, test reports, specifications, etc.):

D040180-E, E1200907, T1200477

Advanced LIGO Engineering Change Request (ECR)

Disposition (to be completed by Systems Engineering):

☐ **TRB**

☐ **CCB**

☐ **Approved**

☐ **Additional information required. Define:**

[Requester re-submits with new information with the same DCC E-number for the ECR but the next version number.]

Concurrence by Project Management: (Acknowledged Electronically in DCC)

Project Systems Engineer: Dennis Coyne	**Project Systems Scientist**: Peter Fritschel

Advanced LIGO Engineering Change Request (ECR)

ECR Title: ECR:

Eliminating the ALS Wavefront Sensors

DCC No: E12xxxxx-vx

Date: 9/28/2012

Requester:	**Impacted Subsystem(s):**
Daniel Sigg	ISC

Description of Proposed Change(s):

Eliminate the WFS in the end stations. Eliminate the WFS heads, the table feedthroughs, the demodulators, the whitening chassis, the ASC demodulator concentrator, the legacy WFS PD interface, the legacy PD concentrator, the associated cabling, the associated channels in the EtherCAT chassis and the associated channels in the front-end computer.

Reason for Change(s):

The ALS wavefront sensors were of little value during the One Arm Test and we propose to eliminate them.

Estimated Cost: $0k

Schedule Impact Estimate:

None.

Nature of Change (check all that apply):
- ☐ Safety
- ☒ Correct Hardware
- ☒ Correct Documentation
- ☐ Improve Hardware
- ☐ Improve/clarify Documentation
- ☐ Change Interface
- ☐ Change Requirement

Importance:
- ☒ Desirable for ease of use, maintenance, safety
- ☐ Desirable for improved performance, reliability
- ☐ Essential for performance, reliability
- ☐ Essential for function
- ☐ Essential for safety

Urgency:
- ☐ no urgency
- ☐ desirable by date/event: _Feb 2013____
- ☐ Essential by date/event: _____
- ☐ Immediately (ASAP)

Impacted Hardware (select all that apply):
- ☐ Repair/modify. List part & SNs: _____
- ☒ Scrap & Replace. List part & SNs:___TBD_____
- ☐ Installed units? List IFO, part & SNs: _____
- ☐ Future units to be built

Impacted Documentation (list all dwgs, design reports, test reports, specifications, etc.):

D1002803, D1001423, D1100670, E1100591, D1100682, D1100683

Advanced LIGO Engineering Change Request (ECR)

Disposition (to be completed by Systems Engineering):

☐ **TRB**
☐ **CCB**
☐ **Approved**

☐ **Additional information required. Define:**

[Requester re-submits with new information with the same DCC E-number for the ECR but the next version number.]

Concurrence by Project Management: (Acknowledged Electronically in DCC)

Project Systems Engineer: Dennis Coyne	**Project Systems Scientist**: Peter Fritschel

Advanced LIGO Engineering Change Request (ECR)

ECR Title: ECR: **Frequency Counter for PLL error signal**	**DCC No: E12xxxxx-vx** **Date: 9/17/2012**

Requester:	**Impacted Subsystem(s):**
Daniel Sigg	ISC

Description of Proposed Change(s):

Add frequency counter capability to the PLL error signal. Since the timing system already has a frequency counter, this request only covers an additional preamplifier in the PLL error signal. The design of the preamplifier can be found here.

Reason for Change(s):

When the ALS laser frequency is far away from the fiber reference, we typically use a local spectrum analyzer to roughly adjust the NPRO temperature before trying to engage the PLL. To automate this process for day-by-day operations, we like to replace the local spectrum analyzer with a remote-readout frequency counter.

Estimated Cost: 8 units at a cost of $1.5k each, total $12k

Schedule Impact Estimate:

None.

Nature of Change (check all that apply):
- ☐ Safety
- ☐ Correct Hardware
- ☐ Correct Documentation
- ☒ Improve Hardware
- ☐ Improve/clarify Documentation
- ☐ Change Interface
- ☐ Change Requirement

Importance:
- ☐ Desirable for ease of use, maintenance, safety
- ☐ Desirable for improved performance, reliability
- ☒ Essential for performance, reliability
- ☐ Essential for function
- ☐ Essential for safety

Urgency:
- ☐ no urgency
- ☐ desirable by date/event: _Feb 2013____
- ☐ Essential by date/event: _____
- ☐ Immediately (ASAP)

Impacted Hardware (select all that apply):
- ☐ Repair/modify. List part & SNs: _____
- ☐ Scrap & Replace. List part & SNs:_____
- ☐ Installed units? List IFO, part & SNs: _____
- ☐ Future units to be built

Impacted Documentation (list all dwgs, design reports, test reports, specifications, etc.):

D1002803, D1001423, D1100670, E1200146

Advanced LIGO Engineering Change Request (ECR)

Disposition (to be completed by Systems Engineering):

☐ **TRB**
☐ **CCB**
☐ **Approved**

☐ **Additional information required. Define:**

[Requester re-submits with new information with the same DCC E-number for the ECR but the next version number.]

Concurrence by Project Management: (Acknowledged Electronically in DCC)

Project Systems Engineer: Dennis Coyne	**Project Systems Scientist**: Peter Fritschel

Advanced LIGO Engineering Change Request (ECR)

ECR Title: ECR: Fiber Polarization Correction	DCC No: E12xxxxx-vx Date: 10/2/2012

Requester: Daniel Sigg	Impacted Subsystem(s): ISC

Description of Proposed Change(s):

Add a motorized polarization controller at the launch point of the fibers (MSR).
Add a polarizer and a sampler to each fiber exit port in the end stations.

Reason for Change(s):

We observed during OAT that the polarization of the fiber beam on ISCBT10R changed slowly over time. This required us to manually adjust a halfwave plate. Worse, we had no diagnostics to indicate the problem. Adding a polarizer and measuring both the passed-through and the rejected beam will remedy this problem. Adding a motorized polarization controller further allows us to correct for polarization drift automatically.

Estimated Cost:

MPC1-2-2-2-FC-UPC-R (3 dual channel units): 34,500
Optics (polarizer, sampler, mounts): $4,800

Total: $39,300

Schedule Impact Estimate:

None.

Nature of Change (check all that apply):
- [ ] Safety
- [ ] Correct Hardware
- [ ] Correct Documentation
- [x] Improve Hardware
- [ ] Improve/clarify Documentation
- [ ] Change Interface
- [ ] Change Requirement

Importance:
- [ ] Desirable for ease of use, maintenance, safety
- [ ] Desirable for improved performance, reliability
- [x] Essential for performance, reliability
- [ ] Essential for function
- [ ] Essential for safety

Urgency:
- [ ] no urgency
- [ ] desirable by date/event: _Feb 2013____
- [ ] Essential by date/event: _____
- [ ] Immediately (ASAP)

Impacted Hardware (select all that apply):
- [ ] Repair/modify. List part & SNs: _____
- [ ] Scrap & Replace. List part & SNs:_____
- [ ] Installed units? List IFO, part & SNs: _____
- [ ] Future units to be built

Impacted Documentation (list all dwgs, design reports, test reports, specifications, etc.):

D1100607, MSR drawing

Advanced LIGO Engineering Change Request (ECR)

Disposition (to be completed by Systems Engineering):

☐ **TRB**
☐ **CCB**
☐ **Approved**

☐ **Additional information required. Define:**

[Requester re-submits with new information with the same DCC E-number for the ECR but the next version number.]

Concurrence by Project Management: (Acknowledged Electronically in DCC)

Project Systems Engineer: Dennis Coyne	**Project Systems Scientist**: Peter Fritschel

Advanced LIGO Engineering Change Request (ECR)

ECR Title: ECR: **DC Photodiodes for laser power measurement**	**DCC No: E12xxxxx-vx** **Date: 10/2/2012**

Requester:

Daniel Sigg

Impacted Subsystem(s):

ISC

Description of Proposed Change(s):

Add DC photodiodes to the ISC/ALS system to aid the slow controls logic. We propose to add DC photodiodes (Thorlabs SM05PD1A or SM1PD1A) to: (1) the beam leaving the fiber in the correct polarization, (2) the corresponding rejected beam, (3) the IR beam of the ALS laser, (4) the PSL beam reaching ISCHT1L, (5) the green beam after the SHG, (6) and the green beam of coming back from each arm. We also propose to add 1-2 spare readout channels to each ISC table. This requires a total of 4 new auxiliary concentrators (D1201345, D1201349 and D1201352) with either 2 or 3 dual DC photodiode amplifiers (D1200543).

Reason for Change(s):

A computer controlled auto-locker is at a disadvantage when it has not enough basic information. To have well defined state transitions and error conditions we need to record the laser power at the ALS laser (IR), the output of the fiber for both polarization states, the PSL beam reaching ISCHT1L, the beam after the SHG as well as both green beams returned from the arms.

Estimated Cost:

10 photodiodes/ifo (plus feedthroughs, cabling & mounting): $2500
4 concentrators/ifo (plus EtherCAT terminals): $4000
Total (3 ifos): $19500

Schedule Impact Estimate:

None.

Nature of Change (check all that apply):
- ☐ Safety
- ☐ Correct Hardware
- ☐ Correct Documentation
- ☒ Improve Hardware
- ☐ Improve/clarify Documentation
- ☐ Change Interface
- ☐ Change Requirement

Importance:
- ☐ Desirable for ease of use, maintenance, safety
- ☐ Desirable for improved performance, reliability
- ☒ Essential for performance, reliability
- ☐ Essential for function
- ☐ Essential for safety

Urgency:
- ☐ no urgency
- ☐ desirable by date/event: _Feb 2013____
- ☐ Essential by date/event: _____
- ☐ Immediately (ASAP)

Impacted Hardware (select all that apply):
- ☐ Repair/modify. List part & SNs: _____
- ☐ Scrap & Replace. List part & SNs:_____
- ☐ Installed units? List IFO, part & SNs: _____
- ☐ Future units to be built

Impacted Documentation (list all dwgs, design reports, test reports, specifications, etc.):

D1100683, T1100472, D1002803, D1001423, D1100670, D1100170, D1101904, D1200196, D1200666, D1101126

Advanced LIGO Engineering Change Request (ECR)

Disposition (to be completed by Systems Engineering):
☐ **TRB**
☐ **CCB**
☐ **Approved**

☐ **Additional information required. Define:**

[Requester re-submits with new information with the same DCC E-number for the ECR but the next version number.]

Concurrence by Project Management: (Acknowledged Electronically in DCC)

Project Systems Engineer: Dennis Coyne	**Project Systems Scientist**: Peter Fritschel