

Advanced LIGO Engineering Change Request (ECR)

ECR Title: Beam Diverter Lubrication and Balance

DCC No: E1400353-v1

Date: 26 August 2014

**Requester: Richard Abbott, Impacted Subsystem(s): ISC
SUS**

Description of Proposed Change(s): Addition of a tiny amount of low vapor pressure grease (Krytox) to the ruby bearing of the aLIGO Beam Diverter (D1100642). After lubrication, the diverter may require a more careful rebalancing such that the side-to-side motion does not prefer one direction or the other. The addition of approximately 10g of mass on the low mass side served to correct the imbalance on a unit at LLO (log 14230). The assembly procedure and assembly drawing for the diverter will also be updated via the DCN process.

Reason for Change(s):

It has been noticed (LLO Log 14230) that the ruby bearings on the aLIGO beam diverter (D1100642) have an unpredictable and relatively large amount of friction. This excess friction frustrates efforts to balance the side-to-side motion of the beam diverter. The bearing friction is very effectively mitigated by a tiny addition of a low vapor pressure Krytox lubricant, as was demonstrated during the LLO ETM-X vent in August 2014. Unfortunately, the resulting low bearing friction exposes the next layer of problem in that the balancing was not sufficient to permit symmetric operation of the diverter from one extreme of motion to the other. The solution to this is to rebalance the diverter once the friction has been reduced by lubrication.

Estimated Cost: \$0 in materials. Estimated 1 hour per diverter to physically make the changes.

Schedule Impact Estimate: There is no predicted impact to schedule other than freeing individuals from other tasks to participate in this mitigation.

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: before final acceptance
- 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.): D1100642, Assembly dwg., E1100686, Assembly Procedure

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Disposition of the proposed change(s):

The disposition of this proposed engineering change request is to be completed by Systems Engineering and indicated in the “Notes and Changes” metadata field in the DCC entry for this ECR. The typical dispositions are as follows:

- **Additional Information Required**: in which case the additional information requested is defined. The ECR requester then re-submits the ECR with the new information using the same DCC number for the ECR but with the next version number.
- **Rejected**: in which case the reason(s) for the rejection are to be given
- **Approved**
- **Approved with Caveat(s)**: in which case the caveat(s) are listed
- **TRB**: the ECR is referred to an ad-hoc Technical Review Board for further evaluation and recommendation. It is the System Engineer’s (or designee’s) responsibility to organize the TRB. The System Engineer (or designee) then makes a technical decision based on the TRB’s recommendation. Links to the TRB’s documentation (charge, memos, final report, etc.) are to be added to the “Related Documents” field for this ECR.
- **CCB**: a change request for approval of additional funds or schedule impact is to be submitted to the Configuration Control Board. Links to the CCB’s documentation (CR, etc.) are to be added to the “Related Documents” field for this ECR.

Concurrence by Project Management:

Acknowledgement/acceptance/approval of the disposition is to be indicated by the electronic “signature” feature in the DCC entry for this ECR, by one the following personnel:

- Systems Scientist
- Systems Engineer
- Deputy Systems Engineer