

# Advanced LIGO Engineering Change Request (ECR)

**ECR Title: Modification of SUS BS RCG model to allow damping of bounce and roll modes**

**DCC No: E1400078-v2**

**Date: 02/24/2014**

**Requester:**

Jeff Kissel / Nicolas Smith / Den  
Martinov / Stefan Ballmer /  
Kiwamu Izumi

**Impacted Subsystem(s):**

SUS, CDS, ISC

**Description of Proposed Change(s):**

Modify BS SUS RCG model to wire a connection from top stage OSEMs to middle stage coil actuators.

**Reason for Change(s):**

The 17Hz bounce and 25Hz roll modes of the BS suspension cannot be damped using to top stage alone. This is due to the limited actuation coupling from the top stage to the wires between the middle stage and optic. We propose to use the middle stage actuation to damp these modes, which was shown to benefit the stability of the MICH feedback loop (elog: <https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11076>). This state should only be necessary during locking and can be disabled in science mode.

**Estimated Cost:** No materials cost. Estimate 2 days worth of one expert's time, to perform necessary infrastructure modifications. 1 day of measuring, designing, and closing the loop. Infrastructure mods can be piggy-backed with other SUS front-end code modifications to save time.

**Schedule Impact Estimate:** Can be installed opportunistically as to not impact schedule (say during maintenance period). However, to actually measure the modes, design the loops, and closing the loop will take a dedicated 0.5 to 1 day.

**Nature of Change (check all that apply):**

- Safety
- Correct Hardware
- Correct Documentation

- Improve Hardware
- Improve/Clarify Documentation
- Change Interface
- Change Software
- 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: \_\_\_\_\_
- Essential by date/event: \_\_\_\_\_
- Immediately (ASAP)

**Impacted Hardware / Software (select all that apply):**

Repair/Modify. List part & SNs: \_\_\_\_\_

Immediate impact:

`${userapps}/sus/common/models/`

BSFM\_MASTER.mdl

SIXOSEM\_F\_STAGE\_MASTER.mdl

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

# Advanced LIGO Engineering Change Request (ECR)

FOUROSEM\_STAGE\_MASTER.mdl

“Collateral Damage”

Because FOUROSEM\_STAGE\_MASTER is used by all core optic SUS,

will need to make mods to

QUAD\_MASTER.mdl

HLTS\_MASTER.mdl

HSTS\_MASTER.mdl

Because SIXOSEM\_F\_STAGE\_MASTER is used by TMTS, will need to make mods to

TMTS\_MASTER.mdl

Scrap & Replace. List part & SNs: \_\_\_\_\_

Installed units? List IFO, part & SNs: \_\_\_\_\_

Future units to be built

## **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