

Advanced LIGO Engineering Change Request (ECR)

**ECR Title: Modernizing the EtherCAT
Slow Controls System**

DCC No: E1700370-v2

Date: 6/6/2018

Requester: Daniel Sigg

Impacted Subsystem(s):

Slow controls

Description of Proposed Change(s): We propose to upgrade the main EtherCAT slow controls system to TwinCAT 3.1. At the same time, we propose to reduce the number of the slow controls computers for the main interferometer controls from three to one, and use a model supported by Beckhoff.

Rotation stages will be moved to a separate computer.

See more details in [T1700433](#).

Reason for Change(s): Windows 7 is getting close to end of life. This is required for TC2.1.

TwinCAT 3.1 allows us to take full advantage of modern computer hardware and software: It supports multi-core processors and 64-bit operating systems. With the vacuum system already on TwinCAT 3.1, this should simplify long-term maintenance, and easily accommodate future upgrade needs.

Reducing the number of the slow controls computers will keep the costs down and reduce the communication dependencies between different EtherCAT computer systems. We would like to move from one large network ring topology to multiple smaller EtherCAT network interfaces that are working independently.

Estimated Cost: \$5000/ifo (first step) & \$17000/ifo (second step); includes spars.

Schedule Impact Estimate: ~2 days of slow controls upgrades.

Nature of Change (check all that apply):

- Hardware Safety
- Correct Hardware
- Correct Documentation

- Improve Hardware/Software
- 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 hardware safety

Urgency:

- No urgency
- Desirable by date/event: O3
- 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, D1102294, E1101144, E1201049, E1300109, D1100618, E1100455, D1101830, D1101832, D1101114

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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