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Refer to: LIGO-L1500019-v1

From: Brian O'Reilly
To: David Shoemaker; Installation Acceptance Review Team (B. O'Reilly (chair), S. Aston, M. Levine, N. Robertson, K. Thorne, C. Torrie)

CC: D. Coyne, F. Raab, M. Landry,

Re: LHO Installation Acceptance Review Report

Executive Summary:

The LHO Installation Acceptance Review Committee met on eleven occasions by teleconference to consider acceptance materials and status. The review was guided by the charge (<https://dcc.ligo.org/LIGO-L1400017>), with particular emphasis on the formulation of punchlist items for remaining work.

Here we recommend that the LHO installation be formally accepted, with the understanding that:

- i) Punchlist items be addressed
- ii) Either the aLIGO Project or LIGO Lab Operations assign staff and monitor progress and completion of those items.

Details of the Review:

- 1) The main product of the review is a punch list of items, which may be found at <https://dcc.ligo.org/LIGO-E1400459>. As of writing we are at version 10 of this document. In total 42 items were deemed important enough to include in the list, 22 of these were closed while following up with installation personnel, 2 were designated to be finished by operations and 18 remain open. These 18 are still being actively worked on and many should be resolved before final system acceptance.
- 2) We also produced an acceptance document for each chamber, for the PSL, the Vacuum equipment and the Data Acquisition system. These documents follow the template form of <https://dcc.ligo.org/LIGO-F1300019> and are collected at <https://dcc.ligo.org/LIGO-E1400154>.
- 3) We found no deficiencies in documentation or installed components that warranted holding up the review. We did find a dearth of detailed information related to Vacuum Equipment modifications and installed components and recommend that some effort be expended to collect this information prior to full system acceptance.

Response to Charge:

- 1) All instances of the installation are considered by this review to be ready for acceptance.
- 2) Most installed equipment and software has completed stand-alone testing. Indeed the LHO instrument has just achieved a 2-hour lock. There are a very limited number of cases where testing has not been completed. In none of these instances is the item to be tested unique and/or sufficiently complex to cause concern that this testing is critical for the instrument to behave properly. For example we do not have modal testing results for the H1 Cryo-pump Manifold Baffles, but we do have good data from L1 for this system. Other deficiencies are noted in the punch list. Some of these, such as the aforementioned baffles, are closed and considered "missed opportunities".
- 3) The interferometer equipment is installed and operational. As mentioned before the H1 instrument is now well into the integrated testing phase. Deficiencies in the installation are captured in the punch list.
- 4) We have no concerns about the plans for, or the progress of, integrated testing.
- 5) We have no concerns about the ability of Operations to assume responsibility for the detector. Many experienced personnel have transitioned from aLIGO to Operations and are well qualified to maintain the hardware and software.
- 6) We have no concerns about the readiness of Project, Operations and non-Project staff and visitors to work together.

We were pleased to find a great deal of conformity in the installations at both the L1 and H1 detectors. We encourage Operations to continue to enforce these standards as we move towards observations.

The review committee appreciates the effort by many in the LIGO lab, especially those at LHO, in preparing documents and responding to queries and input. We congratulate LHO and the aLIGO staff on a successful installation.