This document covers the technical content for acceptance review of a subset of the Advanced LIGO (aLIGO) installation. See document [M1300468](https://dcc.ligo.org/LIGO-M1300468) for an overview of the aLIGO acceptance process. Acceptance by Systems Engineering is to be indicated in the metadata for this document in the LIGO Document Control Center (DCC).

# Installation Instance/Subset Definition

*Insert a brief description of the subset of the aLIGO equipment which is covered under this installation acceptance document. Complete the entries in the following table. If elements of the table are not applicable, enter “not applicable”.*

This installation covers the BSC chamber LBSC4 and all of the equipment within and attached plus associated electronics racks.

|  |  |
| --- | --- |
| **Interferometer** [*L1 or H1*]: | **L1** |
| **Building**(s)/**Room**(s): [*e.g. corner/LVEA*] | **LVEA** |
| **Vacuum Chamber**(s): | **LBSC5 (Y ARM)** |
| **Electronics Rack Designation**(s): | L1-VDC-YC1, L1-VDC-YC2, L1-SEI-YC1, L1-SUS-YC1, L1-SUS-YC2, L1-SUS-YR1, L1-ISC-YC1, L1-ISC-YR1, L1-TCS-YC1Note that the Capacitive Position Sensor readout boxes which sit on the cable trays do not have an official designation. |
| **Optics Table(s)/Enclosure(s) Designation**(s), and other equipment/assemblies related to this installation: | [ETMY Cryo-Pump Baffle](https://dcc.ligo.org/LIGO-D1003228) , [Optical Lever and Photon Calibrator](https://dcc.ligo.org/LIGO-D1000375) , [ISCTEY Table](https://dcc.ligo.org/LIGO-D1100607) , STS-2 Ground Seismometer. |

# Procedures

If there are any caveats or explanatory notes regarding the procedure documentation cited in the table below, then add these notes to the table entries.

|  |  |
| --- | --- |
| **Baseline or initial Installation Procedure**(s): *[enter linked DCC document #(s); found under* [*E1200023*](https://dcc.ligo.org/LIGO-E1200023)*]* |  We used <https://dcc.ligo.org/E1200344-v4> for our install procedure. Redlined versions are attached to this document in the DCC> |
| **As-Built/Installed Procedure**(s), either:1. Enter hyperlinked DCC number for revised or red-lined baseline install procedure, and/or
2. Enter hyperlinked DCC number for separate document with installation notes on deviations, changes in procedure, changes in tooling, etc., and/or
3. Enter a list of hyperlinked electronic log entries detailing the experience in applying the baseline installation procedure
 | No as-built notes were recorded in document E1200269. However some as-built notes (“red lines”) were recorded in the file name BSC5INSTALL.pdf which is filed as an “other file” with [E1200344](https://dcc.ligo.org/LIGO-E1200344)-v4, the BSC Cartridge installation procedure.This test lift which included a cartridge weight measurement occurred 20 Feb 2014 and was recorded in LLO alog [#11051](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11051)The installation took place on 21 Feb 2014 and was recorded in LLO alog [#11061](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11061) |
| **Baseline or initial Alignment Procedure**(s):*[enter linked DCC document #(s); found under* [*E1100734*](https://dcc.ligo.org/LIGO-E1100734)*]* | [E1200957-v4](https://dcc.ligo.org/LIGO-E1200957-v4) is the initial procedure. |
| **As-Built/Aligned Procedure**(s), either:1. Enter hyperlinked DCC number for revised or red-lined baseline alignment procedure, and/or
2. Enter hyperlinked DCC number for separate document with alignment notes on deviations, changes in procedure, changes in tooling, etc., and/or
3. Enter a list of hyperlinked electronic log entries detailing the experience in applying the baseline alignment procedure
 | [E1200956-v5](https://dcc.ligo.org/LIGO-E1200956-v5) is the as-built alignment procedure, with embedded notes.The LBSC5 cartridge alignment was recorded in LLO alog [#10390](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=10390)The CMBy installation was recorded in LLO alog [#8220](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=8220)B&K Hammering in LLO alog [#8194](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=8194).The in-chamber ETMY alignment was recorded in LLO alog [#11533](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11533). TMSy alignment was recorded in LLO alog [#10882](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=10882)With a final alignment check in LLO alog [#11769](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11769).The ETMy ACB installation is recorded in LLO alog [#11572](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11572). The alignment was not recorded in the LLO alog except for a comment in the aforementioned entry that it is within tolerance.OptLev install and alignment in LLO alog entries [#11717](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11717) and [#11844](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11844) |

# Drawings

*Enter hyperlinked DCC document number(s) for each drawing in the table below. If elements of the table are not applicable, enter “not applicable”. All chamber-level, assembly drawings can be found listed at* [*E1200562*](https://dcc.ligo.org/LIGO-E1200562) *and found linked under* [*D0901491*](https://dcc.ligo.org/LIGO-D0901491)*.*

|  |  |
| --- | --- |
| Applicable Building/Room Top-Level Drawing(s): | [D0901464](https://dcc.ligo.org/LIGO-D0901464) aLIGO Systems Layout LLO Y-End Station  |
| Top-Level Chamber Assembly Drawing(s):  | [D0900506](https://dcc.ligo.org/LIGO-D0900506) aLIGO Systems, LBSC5-L1 Top Level Chamber Assembly |
| Electronics Rack Drawing(s): | All drawings for the racks can be found by navigating through [G1001032](https://dcc.ligo.org/LIGO-G1001032).  |
| ETM Optical Lever Drawing(s): | [G1000702](https://dcc.ligo.org/LIGO-G1000702) Floor Occupancy, Optical Levers, LLO Y-End Station. |
| Cryopump Manifold Baffle Dwg(s): | [D1003228](https://dcc.ligo.org/LIGO-D1003228) Manifold\_Cryo\_Baffle\_Assembly, ETMY |
| PCAL Video CAM Periscope | [D1200174](https://dcc.ligo.org/LIGO-D1200174): aLIGO, PCAL-VIDEO CAM, PERISCOPE |
| Photon Calibrator Transmission Pier Assembly | [D1000676](https://dcc.ligo.org/LIGO-D1000676): aLIGO AOS Photon Calibrator Transmission Pier Assembly |
| ISCTEY | ISC Table containing ALS optics etc. The drawing is [D1100607](https://dcc.ligo.org/LIGO-D1100607), an annotated version will be attached as a related file. |

# Serial Number Records

*Serial numbers are used to track a subset of the parts, particularly active elements (see* [*M1000051*](https://dcc.ligo.org/LIGO-M1000051)*) and electronics (with S-numbered documents; see* [*T0900520*](https://dcc.ligo.org/T0900520)*). Enter the hyperlinked DCC document number(s), and name(s) for the highest level assembly(ies) covered by this installation acceptance document in the table below. Also enter the hyperlink to the ICS entry for the instance of this assembly in the Inventory Control System (ICS). If elements of the table are not applicable, enter “not applicable”. If elements of the table are not available/missing, then enter “not available”.*

|  |  |  |
| --- | --- | --- |
| Assembly DCC D-Number  | Assembly Name | ICS entry |
| D0900471 | aLIGO Systems, LBSC4-L1 Top Level Chamber Assembly | <https://ics-redux.ligo-la.caltech.edu/JIRA/browse/ASSY-D0900471-NA>  |
| D1000513 | HEPI | N/A (assembly and install done in 2004, before ICS) |

# Testing

*All post-installation, stand-alone, in situ, checkout/testing (phases 2 and 3 per* [*M1000211*](https://dcc.ligo.org/LIGO-M1000211)*) must be completed, be successful and be documented:*

* *phase 2: pre-installed, post-storage, test results for the assembly (testable item)*
* *phase 3: stand-alone, in situ test results for the assembly (testable item)*

*Note that integrated testing (phase 4 testing per* [*M1000211*](https://dcc.ligo.org/LIGO-M1000211)*) is covered under the system acceptance review, not this installation acceptance review. In the table below, enter hyperlinked DCC document number(s) for all of the relevant testing for the major subassemblies/subsystems covered within this installation instance/subset. If elements of the table are not applicable, enter “not applicable”. If elements of the table are not available/missing, then enter “not available”.*

|  |  |  |
| --- | --- | --- |
| Subsystem | Testable Item | DCC document numbers |
| Phase 2 | Phase 3 |
| SEI | BSC-ISI | [LIGO-E1100859](https://dcc.ligo.org/LIGO-E1100859) |
| SEI | HEPI | N/A | [E1300931](https://dcc.ligo.org/LIGO-E1300931) |
| SUS | BSC3 Suspension (under Test Results) | [E1400131](https://dcc.ligo.org/LIGO-E1400131) | [E1400131](https://dcc.ligo.org/LIGO-E1400131) |
| AOS/SLC/Viewports | Leak and pressure testing. | [E1200445](https://dcc.ligo.org/LIGO-E1200445) Leak and pressure testing was completed, refer to above link. All viewports were tagged at time of inspection and testing.  | Visual inspection in-situ not completed, refer to bug list.  |
| AOS/OpLev | OpLev Impulse Hammer Modal Testing at CIT. | [T1100152](https://dcc.ligo.org/LIGO-T1100152) | Not Completed. |
| AOS/CMB | Impulse Hammer Modal Testing |  | [8194](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=8194) |
| AOS/TCS/RHy | Collection, refer to links. | N/R | [T1300495](https://dcc.ligo.org/LIGO-T1300495) and [G1400018](https://dcc.ligo.org/LIGO-G1400018)Install Recorded in LLO aLOG [#9388](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=9388) |
| TMSy | Transfer FunctionsB&K Hammer Test | Phase 3a in [#11798](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11798)Phase 3a in [#11489](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11489) | Phase 3b in [#11798](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=11798) |
| AOS/ACB | Photodiode continuity testing. In-situ operation. |  [E1300376](https://dcc.ligo.org/LIGO-E1300376)Not envisioned at start. Diodes used for alignment of beam thus confirmed working. |
| AOS/ACB | Impulse Hammer Modal Testing | One instance of testing completed, refer to LHO e-log entry [8656](https://alog.ligo-wa.caltech.edu/aLOG/index.php?callRep=8656). |
| ESD | ESD install/testing for the quads | ([E1300848](https://dcc.ligo.org/LIGO-E1300848)) | [#12193](https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=12193) for LBSC5 |

# Installation Completeness

*If/as applicable, provide a hyperlink reference to a list of remaining tasks to be completed before the installation is finished (i.e. a ‘punch’ list).*

|  |  |
| --- | --- |
| Installation tasks remaining to be completed: | **All items are installed.** |
| ICS Assembly Record needs to be updated | There are some issues with ICS which are affecting this task. Some TCS and SLC records have been added but do not appear. Still need to add viewports, Oplev periscope and perhaps misc. other items to the ICS records.  |

# Installation/Integration Issues and ECRs

*If/as applicable, provide a hyperlinked list of integration issues and Engineering Change Requests (ECRs) encountered during installation and which are relevant to the installation subset/instance covered by this acceptance document. See* [*M1300323*](https://dcc.ligo.org/LIGO-M1300323) *for a description of the Integration Issue and ECR Tracker.*

|  |  |
| --- | --- |
| Tracker #*[hyperlinked]* | Title/description |
| [#823](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=823) closed | LBSC5 (ETMY) Issue Tracker |
| [#3](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=3) closed | Unintentional ground connection at GS-13 pods |
| [#26](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=26) closed | LLO End Station Rack layout missing ISC rack |
| [#27](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=27) closed | Improve robustness of electrical connections for TCS UHV Temperature Sensing |
| [#30](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=30) closed | Change Locating Dimensions of Pcal Transmitter and Oplev/Pcal Receiver Installations in all End VEAs |
| [#31](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=31) closed | ECR: Modifications to Photon Calibrator Periscope Structures |
| [#34](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=34) closed | ECR: Add PEM, timing chassis to end-station TCS Remote racks |
| [#35](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=35) closed | ECR: Add Beckhoff, Dolphin equipment to end-station DAQ racks |
| [#44](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=44) closed | Removal of ETM HWS secondary beam |
| [#49](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=49) closed | Changes to TMS post LLO initial build |
| [#55](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=55) closed | Modifications to Photon Calibrator Periscope Structures (duplicate of #31) |
| [#61](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=61) closed | ECR - Pcal Periscope Mirror Alignment Pin |
| [#63](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=63) closed | ECR: Dog Clamps for SLC suspended baffles |
| [#67](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=67) closed | ECR – Manifold/Cryopump Baffle Suspension Flexure has inadequate strength |
| [#78](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=78) closed | SUS Electronics Missing/Incomplete/Out-of-date Drawings |
| [#80](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=80)  | Possibility of damage to ESD pattern on ERMs and CPs due to arcing |
| [#81](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=81) | add vacuum hardware to TM chambers for future instruments without venting |
| [#92](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=92) closed | ports misidentified on End 2 EtherCAT chassis |
| [#97](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=97) | Add direct wire connection between RT and EtherCAT systems |
| [#101](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=101) closed | Pinhole transmission in ETM08 and ETM09 |
| [#105](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=105) closed | Remake Manifold Cryopump Turnbuckle Handle |
| [#111](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=111) closed | Modify Manifold Cryopump Copper Plate (D1100821) to add grooves for o-ring bumper stops. |
| [#115](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=115) | TOP driver for Quad suspension: DC current range mismatch |
| [#118](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=118) closed | ECR: HEPI medm screen update |
| [#182](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=182) closed | ECR: BSC-ISI and HEPI MEDM (Duplicate of #500) |
| [#183](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=183) closed | Change the CPS biases from the local basis to the calibrated cartesian basis (Duplicate of #205) |
| [#186](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=186) closed | ECR: Topology Changes to SUS models as a result of ISC Informed Interaction |
| [#191](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=191) closed | Droopy Quad top mass blades |
| [#205](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=205) closed | ECR: Add Cartesian bias monitoring and offsets to the ISI models |
| #[207](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=207) closed | ECR: Model and screens update to allow sensor correction to the ISI using Ground seismometers (STS-2) |
| [#215](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=215) closed | Purchase additional F1 Mirrors (D1102335) from higher quality vendor. Strip, resurface and recoat mirrors in-house or ship back to vendor.**LLO TMSx was already assembled and did not receive new mirrors (BO’R)** |
| [#236](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=236) | Addition by welding of Pcal Receiver Mounting Blocks to six Oplev/Pcal Receiver Pylon Weldments. |
| [#253](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=253) closed | ECR – minor rework/modifications to the Manifold Cryopump Baffle Assembly |
| [#261](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=261) closed | Issues arising from LLO TMSx primary optic being too thin |
| [#283](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=283) | CPS Circuit Modification to eliminate a high frequency oscillation |
| [#327](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=327) | Odd High-frequency behavior from all SUS Top2Top Transfer Functions |
| [#355](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=355) closed | ECR: Modify HAM-ISI and BSC-ISI simulink control filters to monitor gain for ODC |
| [#359](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=359) closed | Modifications to TMS tablecloth and cable routing during TMSx build at both LLO and LHO |
| [#375](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=375) closed | ECR: Migrate the ISI Checker Script functions to the frontend code |
| [#385](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=385) closed | ECR: create science frame channels for the SEI models |
| [#445](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=445) closed | ECR: Update the SAFE level for the BSC and HEPI model watchdog |
| [#459](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=459) closed | Add XTerm window pop-up for BSC-ISI and HAM-ISI transition command buttons (Duplicate of #650) |
| [#482](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=482) | ECR: ODC changes in SUS, SEI, HPI and PSL |
| [#487](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=487) closed | ECR: Remove ISI IPC links which come from SUS offload |
| [#489](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=489) closed | Duplicate cable number in end station wiring diagram |
| [#500](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=500) closed | ECR: HEPI MEDM Update |
| [#524](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=524) closed | 27 out of 30 Silicon Photodiodes have suffered bond wire failure |
| [#530](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=530) closed | ECR: update to the HEPI master model and related MEDM screens |
| [#551](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=551) closed | ECR: HEPI script update  |
| [#556](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=556) | TCS End Station EtherCAT chassis design modifications |
| [#557](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=557) | Lack of Baffle Photo-diode Readback |
| [#562](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=562) closed | Readbacks for arm cavity baffle photodiodes (Duplicate of #557)  |
| [#589](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=589) | Alignment drift of the ALS return beam in the end station |
| [#614](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=614) closed | ETM HR coating for green out of spec |
| [#629](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=629) | CPS Racks Grounding Schemes |
| [#630](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=630) | CPS cross talk |
| [#650](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=650) | ECR: ISI model update - Jan 2014 |
| [#652](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=652) closed | Acquisition of green arm transmitted power |
| [#662](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=662) | Use of GE FANUC RFM cards on end-station SEI, SUS front-ends |
| [#664](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=664) | 5V regulator failing on Timing Comparators |
| [#668](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=668) | DC Switch Breaker Box Install in Pier Pod and TCS ISS Power cords. |
| [#696](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=696) | Adding auto-alignment for ALS |
| [#713](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=713) | AA/AI placement in End Station Remote rack |
| [#716](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=716) | Add a relay switch for ALS laser noise eater |
| [#721](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=721) | ECR: Replace the custom cartesian-bias-ramping code with cdsFiltCtrl2 parts |
| [#722](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=722) | ECR: Adding Independent ASC IPC Paths for Dither Alignment to Most SUS |
| [#724](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=724) closed | Updating documentation on ITM and ETM coating specifications |
| [#746](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=746) | ECR: store suspension mis/alignment values separately in EPICS database |
| [#751](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=751) | Op Lev Cover for lead bricks |
| [#759](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=759) closed | Add BLRMS for OpLevs on suspensions |
| [#761](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=761) | In Situ, Visual Inspections of All Viewport Windows |
| [#762](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=762) | Increase drive range for the ETM UIM actuators |
| [#776](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=776) closed | Syncing the CPS Timing to the GPS (Duplicate of #630) |
| [#777](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=777) | Low signal strength for green PFDs |
| [#788](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=788) | mechanical problems with the Optical Levers (OptLev) at both sites |
| [#822](https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=822) | LBSC4 (ETMX) Issue Tracker |