ALIGO INSTALLATION INSTANCE ACCEPTANCE DOCUMENT

Title: aLIGO Installation Acceptance Document for L1 PSL

This document covers the technical content for acceptance review of a subset of the Advanced LIGO (aLIGO) installation. See document 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).

1 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 HAM chamber LHAM2 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, Laser Area Enclosure (LAE)** **Corner Station, Laser Diode Room (LDR)**
Vacuum Chamber(s):	**NA**
Electronics Rack Designation(s):	L1-PSL-C1 L1-PSL-R1 L1-PSL-R2
Optics Table(s)/Enclosure(s) Designation(s), and **other equipment/assemblies related to this installation**:	PSL Enclosure IO Components on the PSL Optics Table

2 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]*	T0900568, aLIGO PSL Installation Plan E1000679, aLIGO PSL Table Legs Installation Procedure Section "Installation of PSL table components" in T1000097, Input Optics Installation Plan
As-Built/Installed Procedure(s), either: a) Enter hyperlinked DCC number for revised or red-lined baseline install procedure, and/or b) Enter hyperlinked DCC number for separate document with installation notes on deviations, changes in procedure, changes in	No as-built notes were recorded in any of the installation procedures. elog #329: PSL floor installation starts elog #357: PSL optics table installation completed elog #419: PSL Laser Area Enclosure (LAE)

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tooling, etc., and/or c) Enter a list of hyperlinked electronic log entries detailing the experience in applying the baseline installation procedure	construction starts elog #526: PSL enclosure QA inspection elog #756: PSL LAE completed & ready elog #774: PSL electronics ready & 35W laser under test elog #906: 200W laser under test elog #910: PMC, FSS, DBB all under test elog #990: All PSL parts installed on the PSL Optics Table elog #1163: PSL achieved 188W, starting characterizing measurements elog #1297: PSL dust monitor installed elog #1320: started IO installation on the PSL/IO optics table elog #1336: power control stage installed elog #1345: power control stage tested elog #1356: (essentially) completed IO installation onto the PSL/IO optics table elog #3233: PEM sensors installed in PSL room
Baseline or initial Alignment Procedure(s): *[enter linked DCC document #(s); found under E1100734]*	There is no separate, stand-alone alignment procedure for the PSL, or the IO components on the PSL/IO optics table. However alignment is covered in the following documents: T0900646, LIGO 35W MOPA laser - user guide T0900641, User Manual 200W laser T0900133, aLIGO PSL Diagnostic Breadboard Instruction Manual
As-Built/Aligned Procedure(s), either: a) Enter hyperlinked DCC number for revised or red-lined baseline alignment procedure, and/or b) Enter hyperlinked DCC number for separate document with alignment notes on deviations, changes in procedure, changes in tooling, etc., and/or c) Enter a list of hyperlinked electronic log entries detailing the experience in applying the baseline alignment procedure	NA

3 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 and found linked under D0901491.

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N.B.: All documentation regarding the L1 PSL installation can be found referenced or linked to E1200039, aLIGO PSL #1 Acceptance

Applicable Building/Room Top-Level Drawing(s):	D1002787, Ante-room Plan, L1 Laser Area Enclosure D1002789, Ante-room Elevations, L1 Laser Area Enclosure T1000028, aLIGO Laser Area Enclosure Concept T070195, aLIGO PSL Laser Diode Room
Top-Level Chamber Assembly Drawing(s):	NA
Electronics Rack Drawing(s):	D1201118, L1-PSL-C1 D1201120, L1-PSL-R1 D1201121, L1-PSL-R2
Optics Table Drawing(s):	D1300347, As Built PSL Table Layout for Advanced LIGO L1 D1003076, L1 and H1 PSL/IO optical table and Laser Area Enclosure layout drawing

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4 Serial Number Records

Serial numbers are used to track a subset of the parts, particularly active elements (see M1000051) and electronics (with S-numbered documents; see 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".

N.B.: There are no PSL assemblies entered into the ICS system. Most of the PSL parts entered into the ICS are for the ISS outer loop photodiode array assembly. The PSL optics table parts were all entered as D1300462, PSL-T-Misc Parts instead of individually by part number.

Assembly DCC D-Number	Assembly Name	ICS entry
S1202977	L1-PSL-C1	NA
S1202978	L1-PSL-R1	NA
S1202979	L1-PSL-R2	NA

5 Testing

All post-installation, stand-alone, in situ, checkout/testing (phases 2 and 3 per 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) 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
PSL	PSL	After shipment only visual inspections were done before installation	E1100716
	Front-End Laser Diodes	NA	E1100539
	LAE	NA	T1200171 (acoustic isolation test of H2 enclosure, not L1) elog #4450, How to run HEPA fans and AC in the LAE Environmental testing/characterization

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			(temperature, humidity, particulate levels, magnetic fields, etc.) – not measured
	Optics table legs	NA	T1200172
IO	IO components on the PSL/IO optics table	All IO testing for components & assemblies on the PSL/IO optics table are collected at T1300365	
	EOM	E1300758	
	IO Power Control	No documentation on testing of the rotation stage test of the liquid cooled beam dump design (not specifically the L1 unit) is documented in E1300444	Functional test of power control stage in elog #1345 Functional test of the liquid cooled beam dump at 100W reported in elog #3091
	PSL Beam Jitter	NA (must be performed installed)	T1300368
	PSL Mode Matching	NA (must be performed installed)	T1300369

6 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.**

7 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 for a description of the Integration Issue and ECR Tracker. The format of the url for the issue tracker is as follows.

*https://services.ligo-wa.caltech.edu/integrationissues/show_bug.cgi?id=**

*id	status	resolution	Title/description
10	Closed	Fixed	Throughput of PMC degrades over time
15	Closed	Fixed	PSL cooling water flow causes frequency noise in acoustic

			band
23	Closed	Fixed	ECR: change the IO_MB_M2 beam splitter on the PSL table to increase power for ALS
40	Closed	Fixed	Need housing, power, network for rotation stage Beckhoff modules
41	Accepted	Pending	Add PSL environmental sensors, EtherCat chassis to L1
56	Closed	Fixed	There is no systems wiring diagram for the PSL.
88	Closed	Fixed	Remove some PSL quick-connect water fittings to reduce vibrations caused by water turbulence
93	Closed	Fixed	open lid of PMC tank E1300284-v1
139	Closed	Works	PSL tripped due to Beckhoff remote client 'glitching'
194	Accepted	Pending	addition of a light shield to the IO/PSL periscope & differences in the periscopes
482	Accepted	Pending	ECR: ODC changes in SUS, SEI, HPI and PSL
484	Accepted	Pending	ECR: Adding h1psl0 to the Dolphin network
491	Assigned		ECR - PSL channels in the science frame
590	Accepted	Pending	IO PDs monitoring power at the EOM and at the periscope
619	Assigned		Implementation of interface for PSL temperature box and replacement of reference cavity heater power supply
644	Accepted	Pending	checking electronics modules without visible over-current protection