

**Title: aLIGO Installation Acceptance Document for H1 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 H1 PSL and all of the equipment within and attached plus associated electronics racks.

<b>Interferometer</b> [ <i>L1 or H1</i> ]:	<b>H1</b>
<b>Building(s)/Room(s):</b> [ <i>e.g. corner/LVEA</i> ]	<b>LVEA, H1 PSL Laser Area Enclosure (LAE) Corner Station, Laser Diode Room (LDR)</b>
<b>Vacuum Chamber(s):</b>	<b>NA</b>
<b>Electronics Rack Designation(s):</b>	<a href="#">H1-PSL-C1</a> <a href="#">H1-PSL-R1</a> <a href="#">H1-PSL-R2</a>
<b>Optics Table(s)/Enclosure(s) Designation(s), and other equipment/assemblies related to this installation:</b>	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.

<b>Baseline or initial Installation Procedure(s):</b> <i>[enter linked DCC document #(s); found under <a href="#">E1200023</a>]</i>	<a href="#">T0900568</a> , aLIGO PSL Installation Plan <a href="#">E1000679</a> , aLIGO PSL Table Legs Installation Procedure Section “Installation of PSL table components” in <a href="#">T1000097</a> , Input Optics Installation Plan
<b>As-Built/Installed Procedure(s),</b> 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 # <a href="#">1983</a> : PSL floor installation completed elog # <a href="#">2006</a> : PSL optical table legs installation completed



**ALIGO INSTALLATION INSTANCE  
ACCEPTANCE DOCUMENT**

**Title: aLIGO Installation Acceptance Document for H1 PSL**

<p>tooling, etc., and/or</p> <p>c) Enter a list of hyperlinked electronic log entries detailing the experience in applying the baseline installation procedure</p>	<p>elog #<a href="#">2040</a>: PSL optics table installation completed</p> <p>elog #<a href="#">2086</a>: PSL Laser Area Enclosure (LAE) construction starts</p> <p>elog #<a href="#">2655</a>: PSL enclosure QA inspection</p> <p>DCC #<a href="#">L1200277</a>: PSL LAE completed &amp; ready, certification report from Gerbig</p> <p>elog #<a href="#">2379</a>: 35W laser under test</p> <p>elog #<a href="#">2378</a>: 200W laser under test</p> <p>elog #<a href="#">2796</a>: PSL achieved 204W, starting characterizing measurements</p> <p>elog #<a href="#">3060</a>: punchlist of items after completion of PSL installation</p> <p>elog #<a href="#">1457</a>: PSL dust monitor plots signifying that a dust monitor has been installed</p> <p>elog #<a href="#">3294</a>: started IO installation on the PSL/IO optics table</p> <p>elog #<a href="#">8606</a>: power control stage installed</p> <p>elog #<a href="#">8731</a>: power control stage tested</p> <p>elog #<a href="#">4673</a>&amp; #<a href="#">4688</a> :(essentially) completed IO installation onto the PSL/IO optics table</p> <p>elog #<a href="#">7169</a>: PEM sensors installed in PSL room</p> <p>elog #<a href="#">9306</a> : PSL rotation stage installed</p>
<p><b>Baseline or initial Alignment Procedure(s):</b> <i>[enter linked DCC document #(s); found under <a href="#">E1100734</a>]</i></p>	<p>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:</p> <p><a href="#">T0900646</a>, LIGO 35W MOPA laser - user guide</p> <p><a href="#">T0900641</a>, User Manual 200W laser</p> <p><a href="#">T0900133</a>, aLIGO PSL Diagnostic Breadboard Instruction Manual</p>
<p><b>As-Built/Aligned Procedure(s)</b>, either:</p> <p>a) Enter hyperlinked DCC number for revised or red-lined baseline alignment procedure, and/or</p> <p>b) Enter hyperlinked DCC number for separate document with alignment notes on deviations, changes in procedure, changes in tooling, etc., and/or</p> <p>c) Enter a list of hyperlinked electronic log entries detailing the experience in applying the baseline alignment procedure</p>	<p>NA</p>



# ALIGO INSTALLATION INSTANCE ACCEPTANCE DOCUMENT

## Title: aLIGO Installation Acceptance Document for H1 PSL

### 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](#).

N.B.: All documentation regarding the H1 PSL installation can be found referenced or linked to [E1200039](#), aLIGO PSL #1 Acceptance

Applicable Building/Room Top-Level Drawing(s):	<a href="#">D1002633</a> , Ante-room Plan, H1 Laser Area Enclosure <a href="#">D1002634</a> , Ante-room Elevations, H1 Laser Area Enclosure <a href="#">T1000028</a> , aLIGO Laser Area Enclosure Concept <a href="#">T070195</a> , aLIGO PSL Laser Diode Room
Top-Level Chamber Assembly Drawing(s):	NA
Electronics Rack Drawing(s):	<a href="#">S1301858</a> , H1-PSL-C1 <a href="#">S1301880</a> , H1-PSL-R1 <a href="#">S1301881</a> , H1-PSL-R2 <a href="#">D1101778</a> , aLIGO PSL Laser Diode Rack
Optics Table Drawing(s):	<a href="#">D1300348</a> , As Built PSL Table Layout for Advanced LIGO H1 <a href="#">D1003076</a> , L1 and H1 PSL/IO optical table and Laser Area Enclosure layout drawing



# ALIGO INSTALLATION INSTANCE ACCEPTANCE DOCUMENT

## Title: aLIGO Installation Acceptance Document for H1 PSL

### 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
<a href="#">S1301858</a>	H1-PSL-C1	NA
<a href="#">S1301880</a>	H1-PSL-R1	NA
<a href="#">S1301881</a>	H1-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	<a href="#">E1300129</a>
	Front-End Laser Diodes	NA	<a href="#">E1100540</a>
	LAE	NA	<a href="#">T1200171</a> (acoustic isolation test of H2 enclosure, not H1) elog # <a href="#">7168</a> , How to run HEPA fans and AC in the LAE Environmental testing/characterization



**ALIGO INSTALLATION INSTANCE  
ACCEPTANCE DOCUMENT**

**Title: aLIGO Installation Acceptance Document for H1 PSL**

			(temperature, humidity, particulate levels, magnetic fields, etc.) – not measured
	Optics table legs	Pre-aLIGO testing, <a href="#">iLIGO ilog 9/12/2010</a>	<a href="#">H1 test results</a> , which are brief and rely on:  <a href="#">H2 test results</a>  <a href="#">L1 test results</a>
IO	IO components on the PSL/IO optics table	All IO testing for components & assemblies on the PSL/IO optics table are collected at <a href="#">T1300365</a>	
	EOM	<a href="#">E1300758</a>	
	IO Power Control	No documentation on testing of the rotation stage  test of the liquid cooled beam dump design (not specifically the H1 unit) is documented in <a href="#">E1300444</a>	eelog # <a href="#">8731</a> : PSL rotation stage functional and ready to go eelog # <a href="#">12820</a> : PSL rotation stage calibrated eelog # <a href="#">13254</a> : IMC locked, PSL at 56 mW eelog # <a href="#">13554</a> : IMC power increased to 10 W  <b>No documentation found on the high power testing of the PSL beam dump.</b> Added to punchlist.
	PSL Beam Jitter	NA (must be performed installed)	<a href="#">T1300378</a>
	PSL Mode Matching	NA (must be performed installed)	<a href="#">T1300379</a>

**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:	<b>All items are installed.</b>
---	---------------------------------

**ALIGO INSTALLATION INSTANCE  
ACCEPTANCE DOCUMENT****Title: aLIGO Installation Acceptance Document for H1 PSL****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=\\*](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
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	Hardware installed.	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