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**aLIGO HAM-ISI, Installation Test Report, Phase II**

**Chamber-Side Testing & Initial Chamber Testing**

**LHO HAM6-ISI (iLIGO retrofitted)**

E1200510-V1

Hugo Paris,

Hugh Radkins, Jim Warner, Mitchell Robinson, Greg Grabeel

Distribution of this document:

Advanced LIGO Project

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| **California Institute of Technology**  **LIGO Project – MS 18-34**  **1200 E. California Blvd.**  **Pasadena, CA 91125**  Phone (626) 395-2129  Fax (626) 304-9834  E-mail: info@ligo.caltech.edu | **Massachusetts Institute of Technology**  **LIGO Project – NW22-295**  **185 Albany St**  **Cambridge, MA 02139**  Phone (617) 253-4824  Fax (617) 253-7014  E-mail: info@ligo.mit.edu |
| **LIGO Hanford Observatory**  **P.O. Box 1970**  **Mail Stop S9-02**  **Richland WA 99352**  Phone 509-372-8106  Fax 509-372-8137 | **LIGO Livingston Observatory**  **P.O. Box 940**  **Livingston, LA 70754**  Phone 225-686-3100  Fax 225-686-7189 |

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PHASE II Testing

The phase II of HAM-ISI testing corresponds to the tests performed after the *Assembly Validation*, and before the *Control and Commissioning* of the Units. It is divided in two parts. The present document is divided in two sections: One for each part of the Phase II testing:

**Part.1** Chamber-Side testing

**Part.2** Initial Chamber Testing

**Chamber-Side Testing** is a basic sensor check. Units can be inserted in their chamber of destination once they pass.

**Initial Chamber Testing** takes place in open chamber, with the optics off, and HEPI locked. The ISI is then connected to the electronic rack with the final in-field cables. Models are installed and running. Tests are performed with Matlab® scripts.

Optics and Suspensions can be installed right after the end of this phase of testing. No test is performed during their installation.

**Final Chamber Testing** starts once Optics and Suspensions are installed. The lockers and the CPSs usually need to be reset at this point.

Introduction

*Chamber-Side Testing*

HAM6-ISI is an iLIGO unit. It was extracted from HAM6 chamber and set on a shipping container for chamber-side testing. The ISI was locked. No payload was installed, so the springs were fully locking stage 1 against the lockers. Final electronics, and models were used to run the chamber-side testing. Tests were performed between July 1st and July 3rd 2013.

This ISI did not receive aLIGO assembly validation testing. Its mechanical validation within the iLIGO scope was considered sufficient.

**The goal of the Chamber-Side Testing** is to ensure that the sensors and their electronics (ADE boxes of the CPSs) did not alter during storage/transportation.

In this instance, we use final in field electronics and cabling, as well as final Simulink models. This phase of testing is also a way to check that those elements are properly installed, and correctly functioning.

**At the end of the Chamber-Side Testing**:

* All sensors have been checked
* Data related to the tests is available on the SVN
* The HAM-ISI is on the chamber-side, ready for the in-chamber insertion

# CHAMBER SIDE TESTING

## Inventory

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DCC Number | Part name | Configuration | Corner 1 S/N | Corner 2 S/N | Corner 3 S/N |
| D071001 | Stage 0 base | NA | iLigo | | |
| D071051 | Stage 1 base | NA | iLigo | | |
| D071050 | Optical table | NA | iLigo | | |
| D071002 | Spring Post | NA | iLigo | iLigo | iLigo |
| D071100 | Spring | NA | iLigo | iLigo | iLigo |
| D071102 | Flexure | NA | iLigo | iLigo | iLigo |
| ADE | Position sensor | Horizontal | 12043 | 12047 | 12005 |
| Vertical | 12002 | 12052 | 12023 |
| D047812 | GS-13 pod | Horizontal | 65 | 91 | 62 |
| Vertical | 81 | 28 | 16 |
| D047823 | L4C pod | Horizontal | NA | NA | NA |
| Vertical | NA | NA | NA |
| D0902749 | Actuator | Horizontal | iLigo | iLigo | iLigo |
| Vertical | iLigo | iLigo | iLigo |

Table – Parts inventory

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Cable Connects** | | **Cable S/N** | | |
| **Part Name** | **Configuration** | **Corner 1** | **Corner 2** | **Corner 3** |
| GS13 | Horizontal | S1104684  +S1104707 | S1107762  +S1106677 | S1107749  +S1106663 |
| GS13 | Vertical |
| Actuator | Horizontal | S1104495 | S1104487 | S1104489 |
| Vertical | S1106676 | S1104733 | S1104768 |

Table – Cables inventory

|  |  |  |
| --- | --- | --- |
| **Hardware** | **LIGO reference** | **S/N** |
| **Coil driver** | D0902744 | S1103566 |
| S1103333 |
| **Anti Image filter** | ~~D070081~~ D1100202 | S1203131 |
| **Anti aliasing filter** | D1000269 | S1203356 |
| S1203357 |
| **Interface chassis** | D1000067 | S1201746 |
| S1201747 |
| NA |

Table - Inventory electronics

NA: Not applicable.

Issues/difficulties/comments regarding this test:

No aLIGO assembly validation testing for this unit. Inventory was added to the chamber-side testing.

**Acceptance Criteria:**Inventory is complete

**Test result: Passed: X Failed: .**

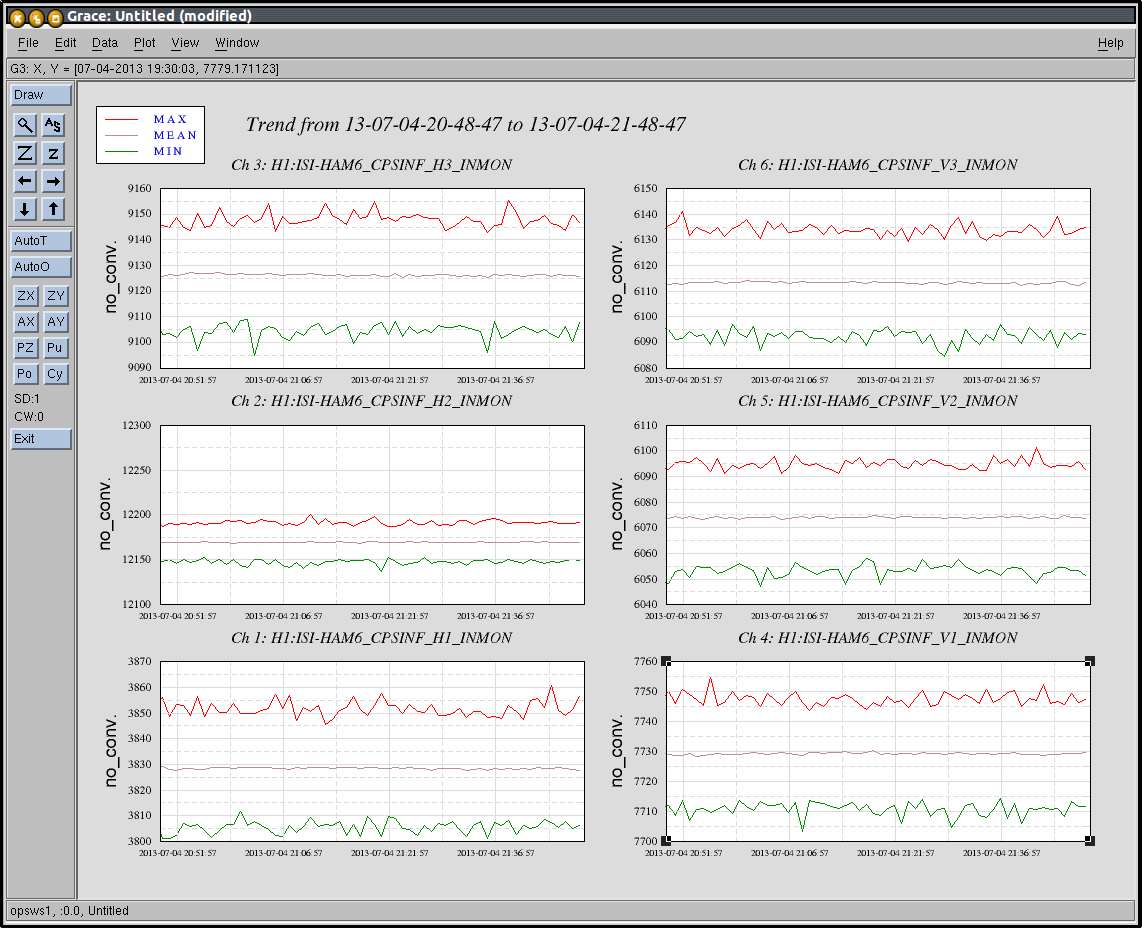
## Test 1 - CPS Check

During this step, we want to make sure that the CPSs, their cables and their electronics are functional.

|  |  |  |  |
| --- | --- | --- | --- |
| Corner | Direction | Voltage | Sensor reacts to Target move |
| (No shim) |
| 1 | H | NR | X |
| V | NR | X |
| 2 | H | NR | X |
| V | NR | X |
| 3 | H | NR | X |
| V | NR | X |

**Table – CPS Check**

NR: Not Recorded



**Figure – CPS readouts**

Issues/difficulties/comments regarding this test:

Voltage not recorded but readouts within expected range after target setup.

**Acceptance Criteria:**

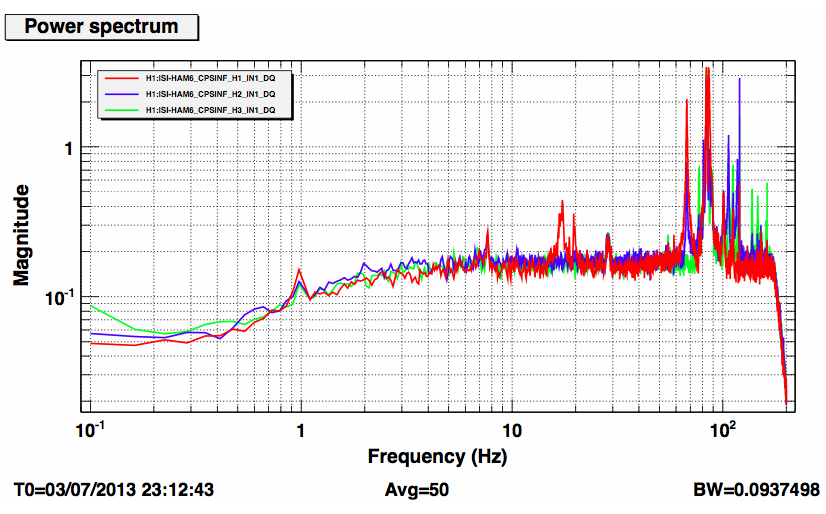
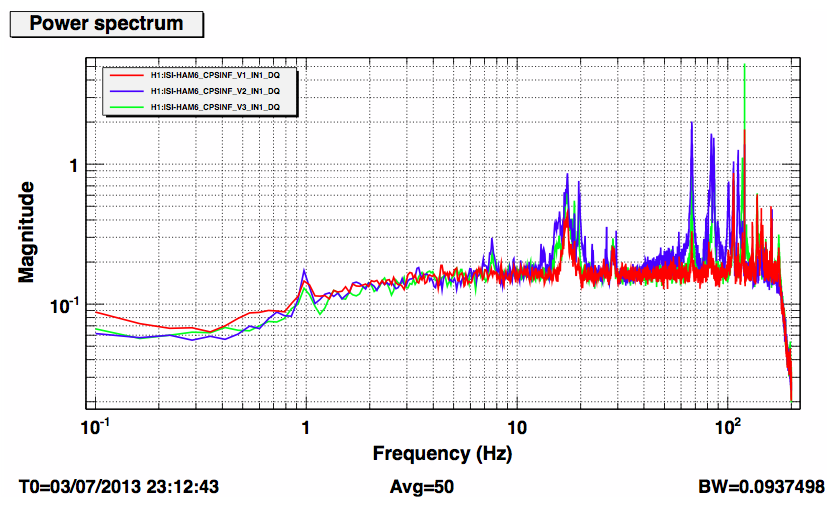
* All CPS were tested
* All CPS react to shim insertion/moving target
* The voltages recorded with no shim are within +/‑5V.

**Test result: Passed: X Failed: .**

## Test 2.1 – CPS spectra

During this step, we want measure the noise spectra of the CPSs and make sure that it is not too high.

Final in-filed electronics are used. The ISI is locked without payload. The springs are locking stage 1 against its lockers.

**Figure – CPS Spectra**

**Data in the SVN at:**

**/SeiSVN/seismic/HAM-ISI/H1/HAM3/Data/Spectra/Chamber\_Side/**

2013\_07\_02\_Sensor\_Checkout .xml

2013\_07\_02\_Sensor\_Checkout .pdf

Issues/difficulties/comments regarding this test:

Measurements performed with DTT  
Results presented in the [LHO aLog #6983](https://alog.ligo-wa.caltech.edu/aLOG/index.php?callRep=6983)

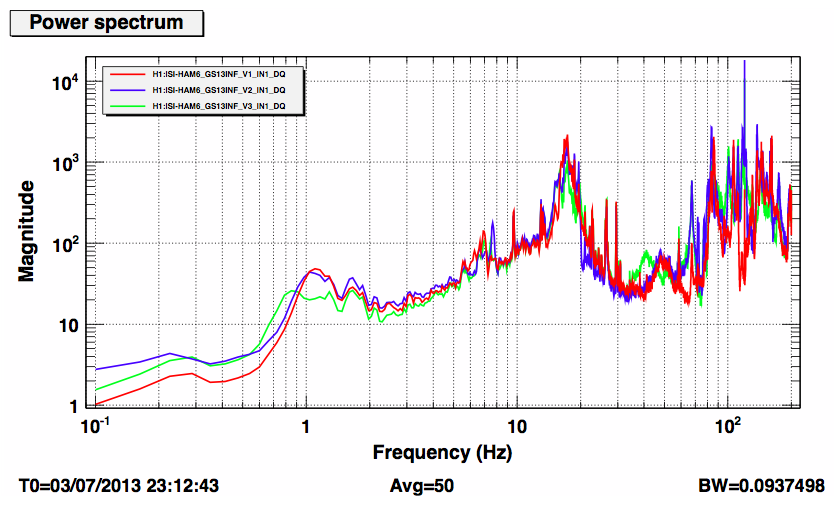
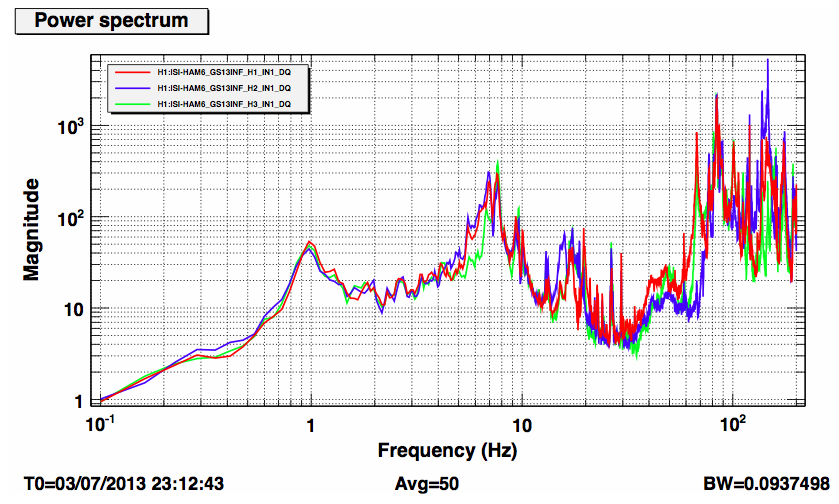
**Acceptance Criteria:**

* CPS noise spectra must be below 10-4Vrms/√Hz
* Plots of Spectra are saved under the SVN

**Test result: Passed: X Failed: .**

## Test 2.2 – GS13 Spectra

During this test we want to take spectra of the GS13s to make sure that they are still functional.



**Figure – GS13 Spectra**

**Data in the SVN at:**

**/SeiSVN/seismic/HAM-ISI/H1/HAM3/Data/Spectra/Chamber\_Side/**

2013\_07\_02\_Sensor\_Checkout .xml

2013\_07\_02\_Sensor\_Checkout .pdf

Issues/difficulties/comments regarding this test:

- Measurements performed with DTT  
- Results presented in the [LHO aLog #6983](https://alog.ligo-wa.caltech.edu/aLOG/index.php?callRep=6983)

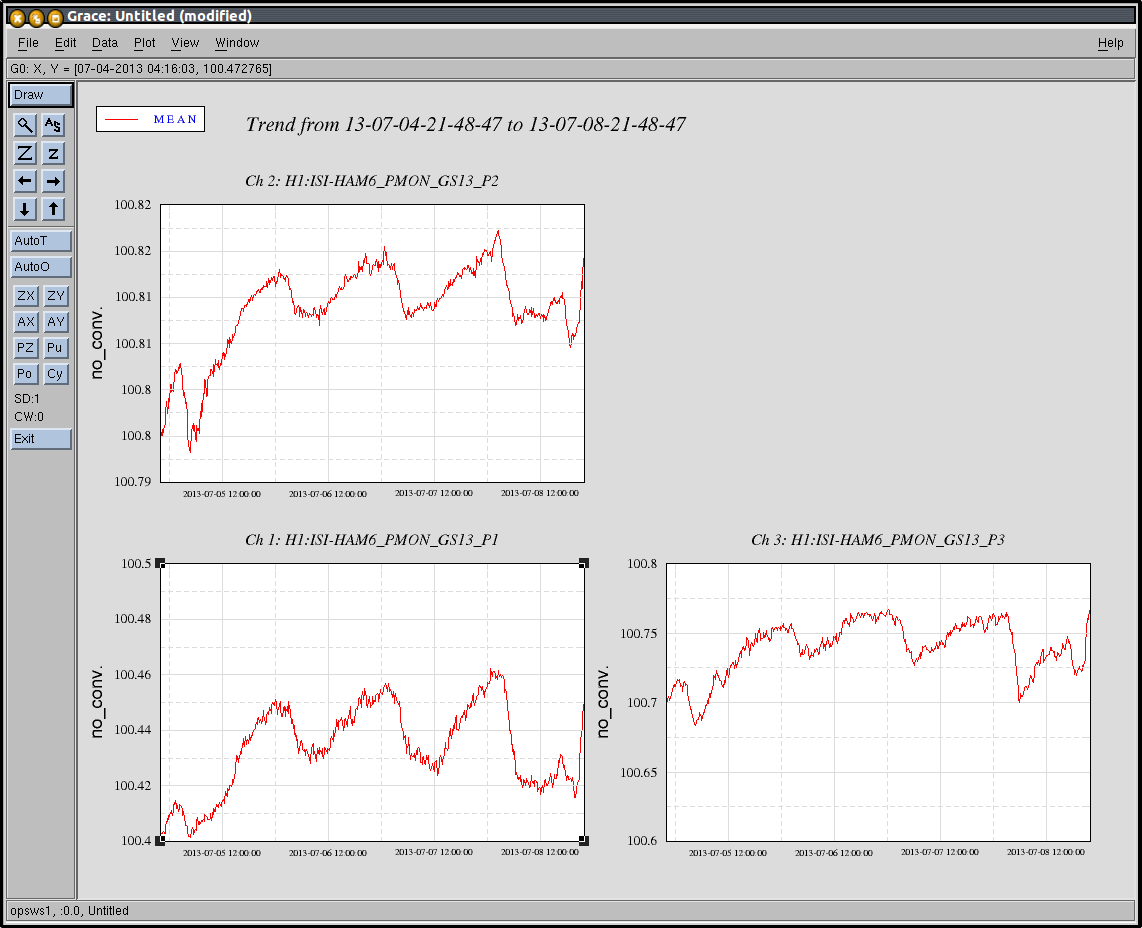
- Huddle tests prior to install can be found in LHO [aLog #4058](https://alog.ligo-wa.caltech.edu/aLOG/index.php?callRep=4058).

**Acceptance Criteria:**

* GS13s spectra match between corners.
* GS13s responses must not drop in low frequency
* Plots of power spectra are saved under the SVN

**Test result: Passed: X Failed: .**

## Test 2.3 – GS13 Pressure Readouts



**Figure – GS13 Pressure Readouts over 4 days**

**Acceptance criteria:**

- The pressure on *GS13\_P* channels must be 102KPa +/-8 KPa (25000 counts +/- 3000 counts)

- *GS13\_P* must vary the same way in each corner and *GS13\_DIFF* must be constant (channels follow comparable trend)

**Test result: Passed: X Failed: .**

Conclusion

*Chamber-Side Testing*

The tests presented here were performed between July 1st and July 3rd 2013.

All sensors appeared to be functional. Serial numbers were recorded.

HAM6-ISI was left ready for in-chamber insertion.

In-Chamber insertion was performed on July 11th 2013. Initial In-Chamber Testing will follow.