

LIGO Laboratory / LIGO Scientific Collaboration

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aLIGO HAM-ISI, Installation Test Report, Phase II
Chamber-Side Testing & Initial Chamber Testing
LHO HAM6-ISI (iLIGO retrofitted)

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Distribution of this document:
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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

I. 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	S1107749
GS13	Vertical		+S1106677	+S1106663
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	D070084 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 (No shim)	Sensor reacts to Target move
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

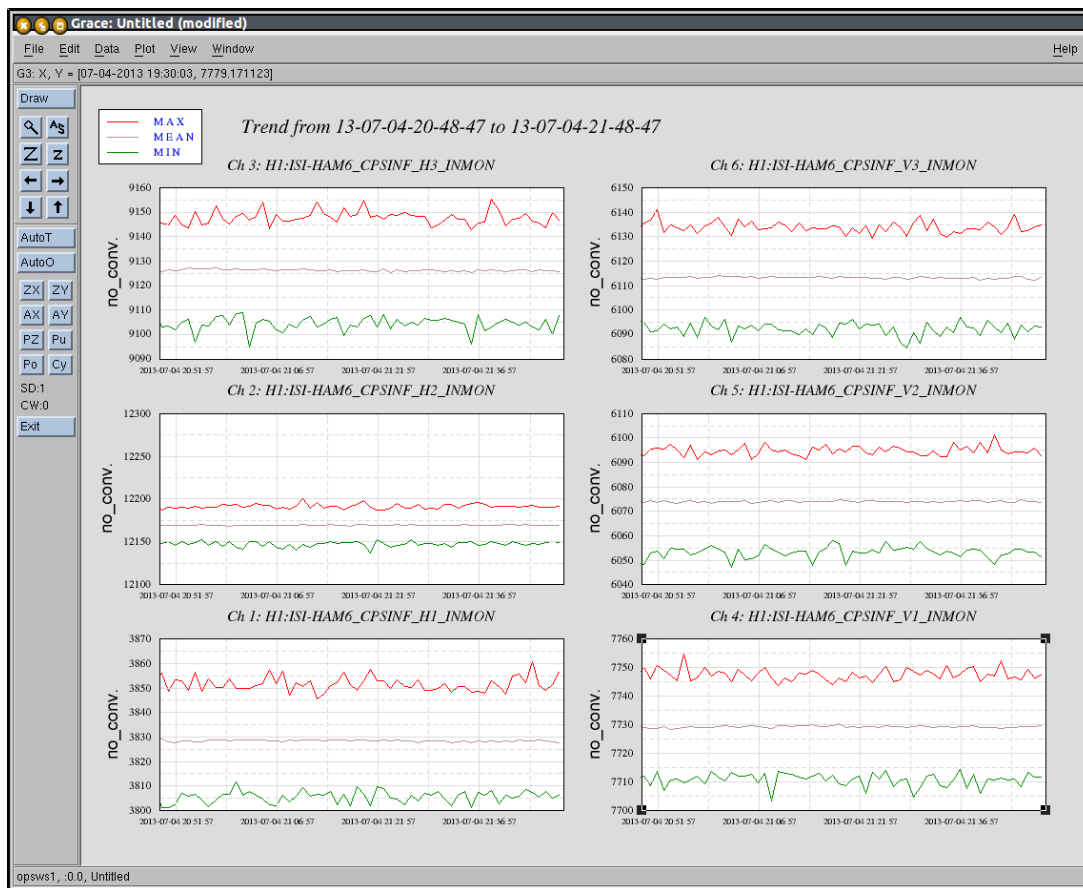


Figure – CPS readouts

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 $\pm 5V$.

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.

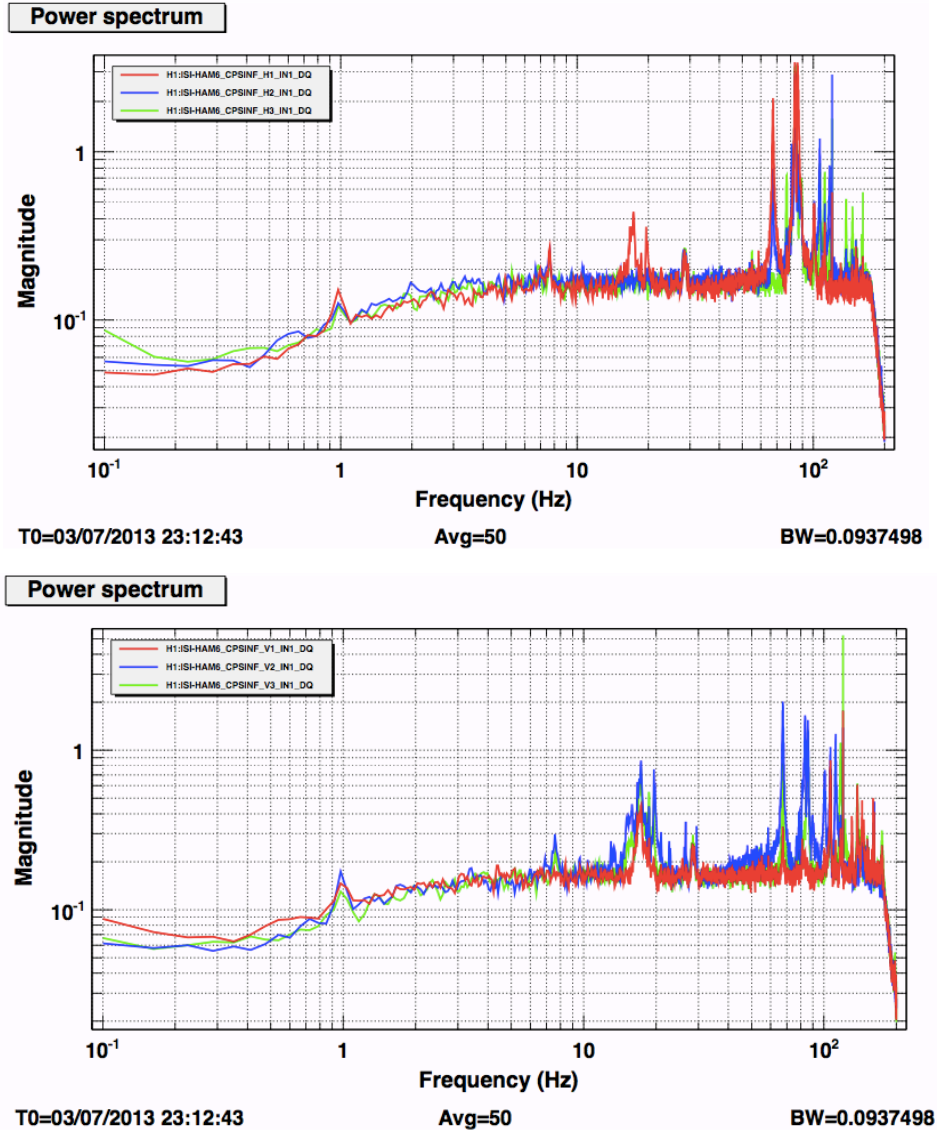


Figure – CPS Spectra

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](#)

Acceptance Criteria:

- CPS noise spectra must be below $10^{-4}V_{rms}/\sqrt{Hz}$
- 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.

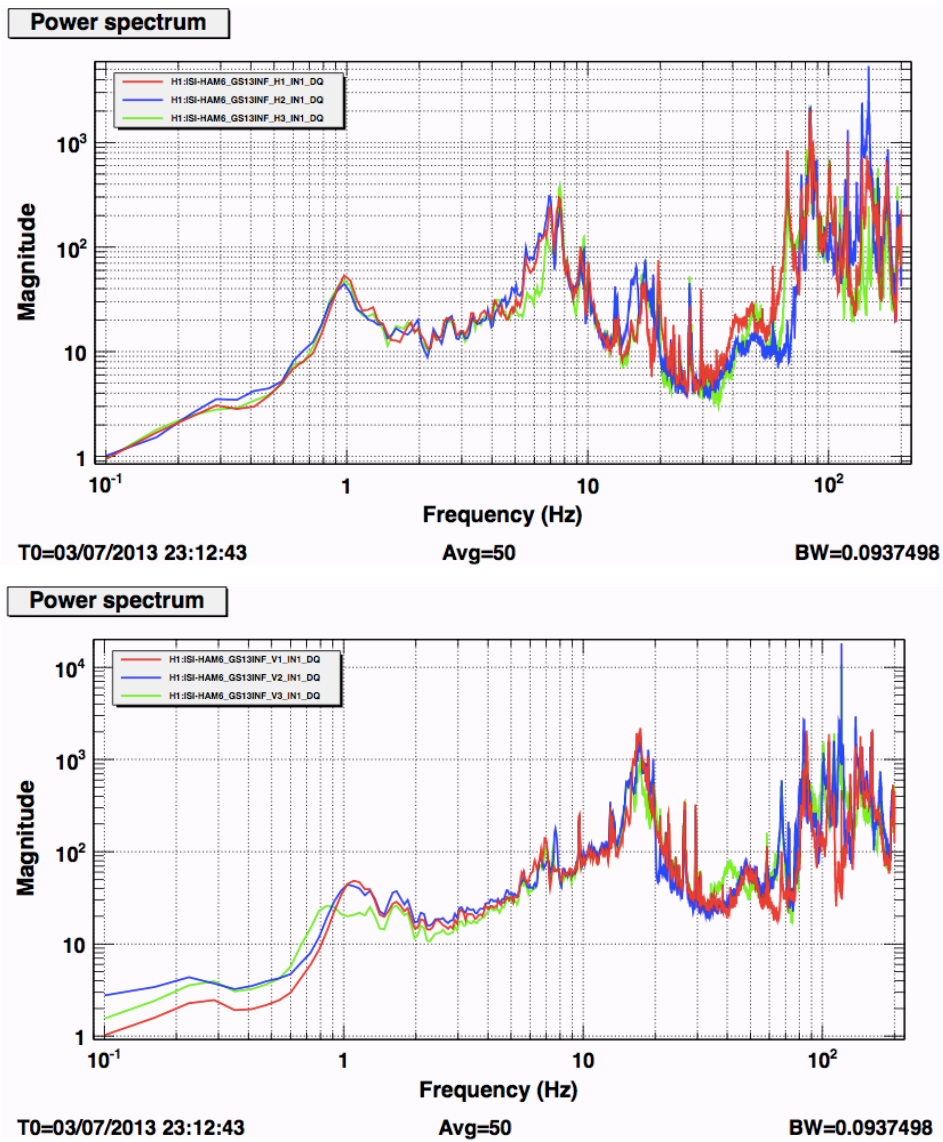


Figure – GS13 Spectra

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](#)
- Huddle tests prior to install can be found in [LHO aLog #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**

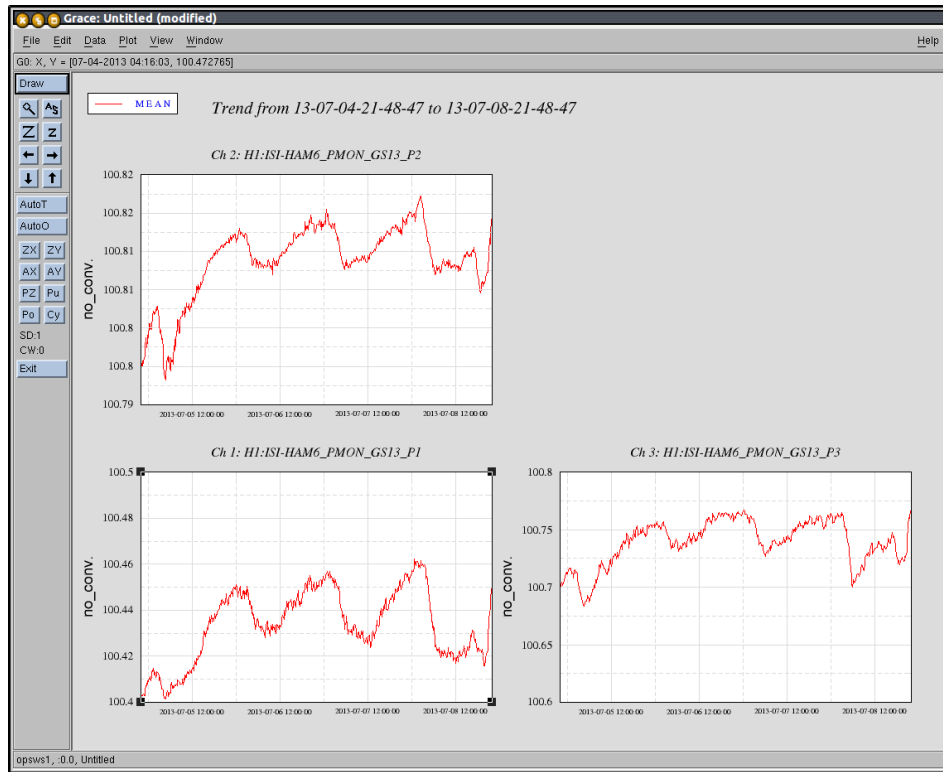


Figure – GS13 Pressure Readouts over 4 days

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.