LIGO Laboratory / LIGO Scientific Collaboration

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aLIGO BSC-ISI, Pre-integration Testing report, Phase II (before and after cartridge install)

E1100847– V1

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Distribution of this document:
Advanced LIGO Project

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Introduction

The BSC-ISI testing is performed in three phases:
1) BSC-ISI, Pre-integration Testing, Phase I (post-assembly, in the staging building)
2) BSC-ISI, Pre-integration Testing, Phase II: Final tests done before insertion in the chamber
3) BSC-ISI, Integration Phase Testing: Procedure and results related to the commissioning in the chamber.

The ISI-BSC2 was moved from the Staging building to the VEA test stand July 2013.

This document presents results of tests (Phase II) performed on the ISI-BSC2 (BS) before installation in the chamber.

All results are posted on the SVN at:
https://svn.ligo.caltech.edu/svn/seismic/BSC-ISI/H1/BS/

The following type of document can be found in the SVN:
- Excell spreadsheet (.xls)
- Data location
- Figures location
- Masses distribution scheme (ppt)

1. Phase II-A

Data for the tests on the floor in the LVEA couldn't be found. It may have been overwritten or lost when testing for ITMX was started. All of the required tests were performed once the cartridge was installed in the chamber, so the ISI has been shown to be healthy, regardless. All data in this report is from testing in the chamber.

2. Phase II-B

1. Hardware changes

1. CPS – E1100369

CPS have not been replaced since phase I testing in the staging building.

2. GS13 – E1100740

GS13 have not been replaced since phase I testing in the staging building.

3. L4C – E1100740

L4C have not been replaced since phase I testing in the staging building.

4. T240 – E1100740

T240 have not been replaced since phase I testing in the staging building.

5. Cables – E1100822

Further information can be found in E1100822.

6. Misc

No hardware changes since phase I testing in the staging building.

2. Electronic Inventory

This table reports the electronic equipment used in the LVEA.

3. Models Modifications

The model was updated and recompiled since MEDM screens were modified

4. Mass distribution

The Payload for this chamber was not recorded before closing. My recollection was that it was not visually different from other chambers.

Test result: **Passed: __** **Failed: ___** **Waived: __X__**

5. Basic functionalities just after installing the BSC-ISI in the chamber

1. Pressure sensors

All pressure sensors are working.

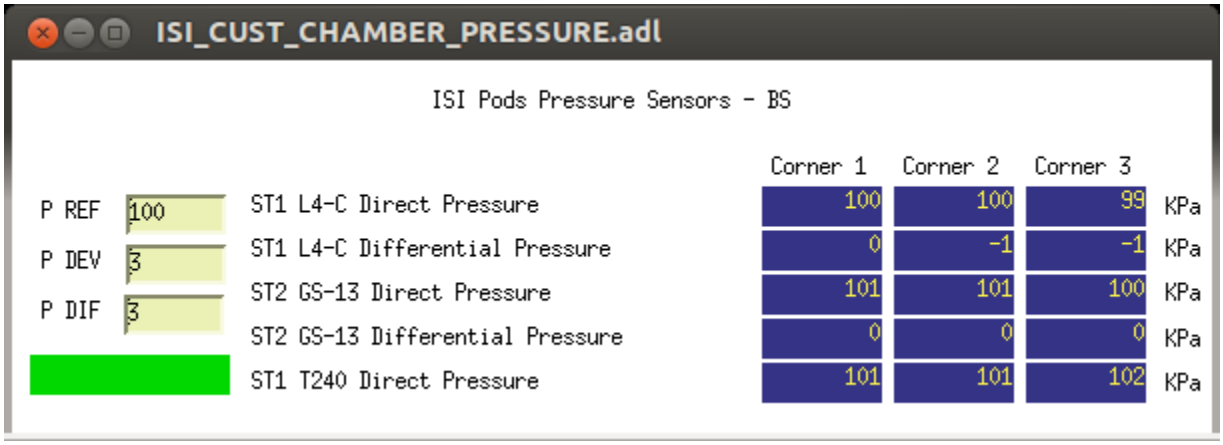

Table 1 - Geophones Pressure sensors

Test result: **Passed: _X__** **Failed: ___** **Waived: ____**

Spectra

Spectra of the instrument can be found in the SVN at:
seismic/BSC-ISI/H1/BS/Data/Spectra/Undamped/

- H1_ISI_BSC2_ASD_CT_LOC_CPS_T240_L4C_GS13_2020_07_24_4 7:9:.mat

seismic/BSC-ISI/H1/BS/Data/Figures/Spectra/Undamped/

- H1_ISI_BSC2_ASD_CT_LOC_CPS_T240_L4C_GS13_2020_07_24_4 7:9:.fig

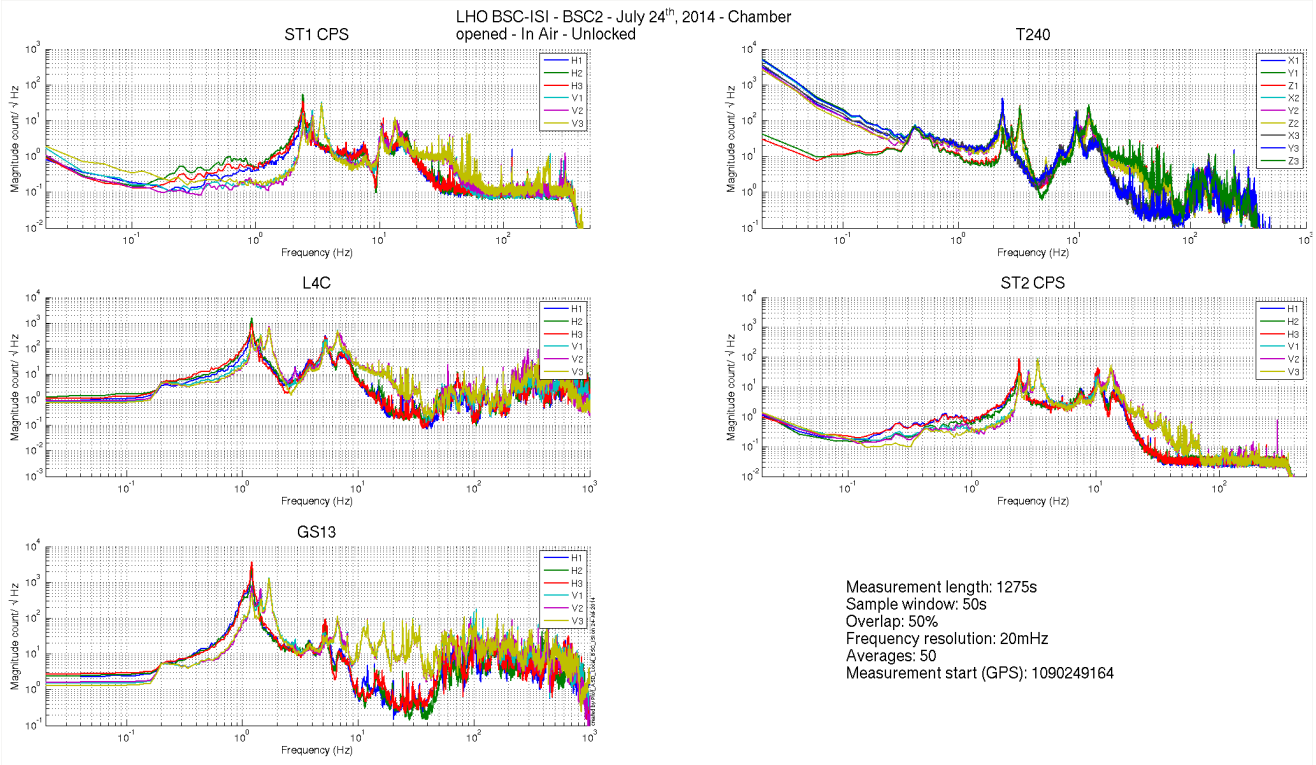

Figure 1 - Spectra inboard instruments - ISI Unlocked

Test result: **Passed: _X_** **Failed: ___** **Waived: ____**

2. Actuators-cables resistance

Not done. Can be completed outside the chamber if needed.

Test result: **Passed: __** **Failed: ___** **Waived: _X__**

- **Offsets CPS Unlocked vs locked**

	Table locked		Table unlocked		Difference locked - unlocked	
Sensors	**Offset (Mean)**	**Std deviation**	**Offset (Mean)**	**Std deviation**	**Offset (Mean)**	**mil**
ST1 - H1	240	7	58	28	182	**.21**
ST1 - H2	153	6	-68	18	221	**.26**
ST1 - H3	-36	5	-93	26	57	**.07**
ST1 - V1	-710	6	-979	24	269	**.32**
ST1 - V2	661	10	880	23	219	**.25**
ST1 - V3	-16	12	-42	23	26	**.03**
ST2 - H1	302	143	161	40	141	**.041**
ST2 - H2	-631	129	-684	51	53	**.015**
ST2 - H3	-243	119	-206	33	37	**.011**
ST2 - V1	-1532	123	-1539	64	7	**.002**
ST2 - V2	-579	123	-559	60	20	**.006**
ST2 - V3	-221	76	-118	66	103	.03

Table 2 - Locked vs Unlocked Position

Test result: **Passed: _X__** **Failed: ___** **Waived: ____**

i. Offset local drive

Skipped due to time.

Test result: **Passed: ____** **Failed: ___** **Waived: _X___**

ii. Offset Cartesian drive

Skipped due to time.

Test result: **Passed: ____** **Failed: ___** **Waived: _X___**

iii. Range of motion

The range of motion of the table is measured by pushing on the table in a direction collinear to the CPS. The Static tests results can be found on the SVN at:
https://svn.ligo.caltech.edu/svn/seismic/BSC-ISI/H1/BS/Data/Static_Tests/H1_ISI_BSC2_Range_Of_Motion_20130419.mat

Sensor readout (counts)	Negative drive	no drive	Positive drive	Amplitude count	mil
ST1 - H1	-15516	36	16493	**32008**	**38**
ST1 - H2	-15211	-43	16907	**32118**	**38**
ST1 - H3	-16688	-161	15523	**32211**	**38**
ST1 - V1	-14177	-993	12175	**26352**	**31**
ST1 - V2	-12396	850	14099	**26495**	**31**
ST1 - V3	-13327	-159	13004	**26331**	**31**
ST2 - H1	-9618	238	10079	**19697**	**5.9**
ST2 - H2	-10400	-696	9003	**19403**	**5.8**
ST2 - H3	-9958	-200	9547	**19505**	**5.8**
ST2 - V1	-13200	-1581	10005	**23205**	**6.9**
ST2 - V2	-12259	-663	10919	**23178**	**6.9**
ST2 - V3	-11931	-222	11467	23399	6.9

Table 3 - Range of motion - Actuator drive in the LVEA

Test result: **Passed: _X_** **Failed: ___** **Waived: ____**

iv. Linearity test

Measurements data can be found in the SVN at:
SeiSVN/seismic/BSC-ISI/H1/BS/Data/Linearity_Test/H1_ISI_BSC2_Linearity_test_20130417.mat

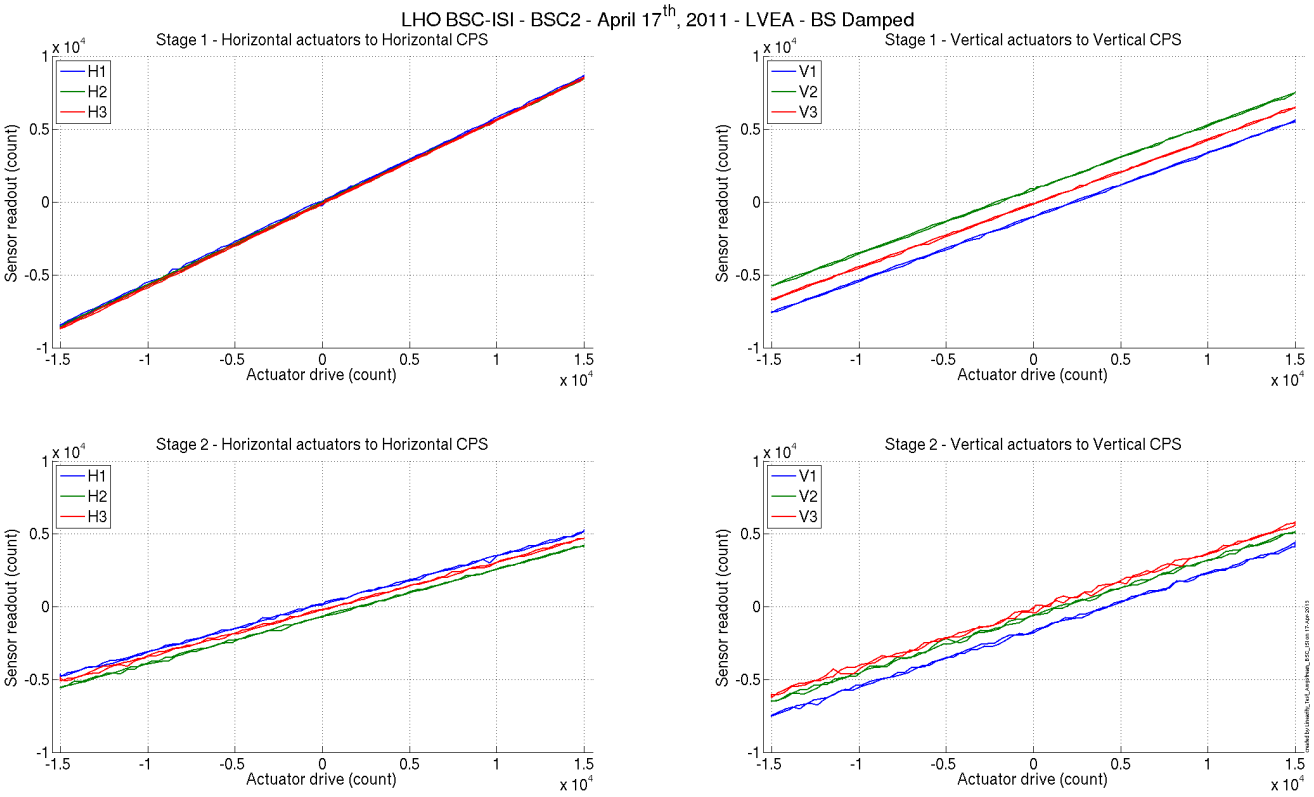

Figure 2. Linearity Test

Test result: **Passed: _X_** **Failed: ___** **Waived: __**

6. Transfer functions and Comparison with measurements done in the staging building.

1. At the end station

Measurements data can be found in the SVN at:
SeiSVN/seismic/BSC-ISI/H1/BS/Data/Transfer_Functions/Measurements/Undamped:

- H1_ISI_BSC2_Data_L2L_10mHz_100mHz_ST1_ST2_20130418-205201.mat
- H1_ISI_BSC2_Data_L2L_100mHz_700mHz_ST1_ST2_20130418-161906.mat
- H1_ISI_BSC2_Data_L2L_700mHz_10Hz_ST1_ST2_20130418-223504.mat
- H1_ISI_BSC2_Data_L2L_10Hz_100Hz_ST1_ST2_20130418-134213.mat
- H1_ISI_BSC2_Data_L2L_100Hz_500Hz_ST1_ST2_20130418-122201.mat
- H1_ISI_BSC2_Data_L2L_500Hz_1000Hz_ST1_ST2_20130418-111719.mat

Once the data are processed, they can be found in the SVN at:
/seismic/BSC-ISI/H1/BS/Data/Transfer_Functions/Simulations/Undamped/
- H1_ISI_BS_TF_L2L_Raw_2013_04_18.mat

The transfer functions can be found in the SVN at:

seismic/BSC-ISI/H1/BS/Data/Figures/Transfer_Functions/Measurements/Undamped/

- H1_ISI_BS_TF_L2L_Raw_from_ST1_ACT_to_ST1_CPS_2013_04_18.fig
- H1_ISI_BS_TF_L2L_Raw_from_ST1_ACT_to_ST1_L4C_2013_04_18.fig
- H1_ISI_BS_TF_L2L_Raw_from_ST1_ACT_to_ST1_T240_2013_04_18.fig
- H1_ISI_BS_TF_L2L_Raw_from_ST1_ACT_to_ST2_CPS_2013_04_18.fig
- H1_ISI_BS_TF_L2L_Raw_from_ST1_ACT_to_ST2_GS13_2013_04_18.fig
- H1_ISI_BS_TF_L2L_Raw_from_ST2_ACT_to_ST1_L4C_2013_04_18.fig
- H1_ISI_BS_TF_L2L_Raw_from_ST2_ACT_to_ST1_T240_2013_04_18.fig
- H1_ISI_BS_TF_L2L_Raw_from_ST2_ACT_to_ST2_CPS_2013_04_18.fig
- H1_ISI_BS_TF_L2L_Raw_from_ST2_ACT_to_ST2_GS13_2013_04_18.fig

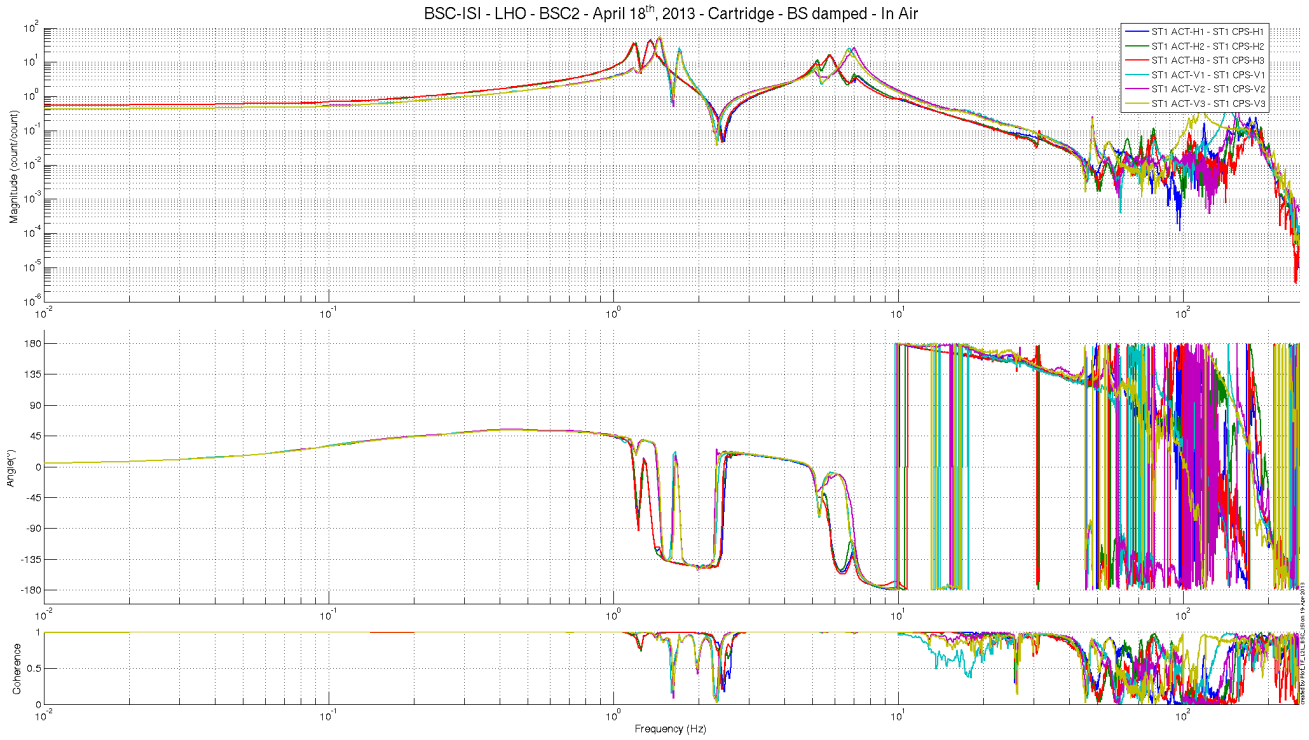

Figure 3 - TF ST1 ACT to ST1 CPS

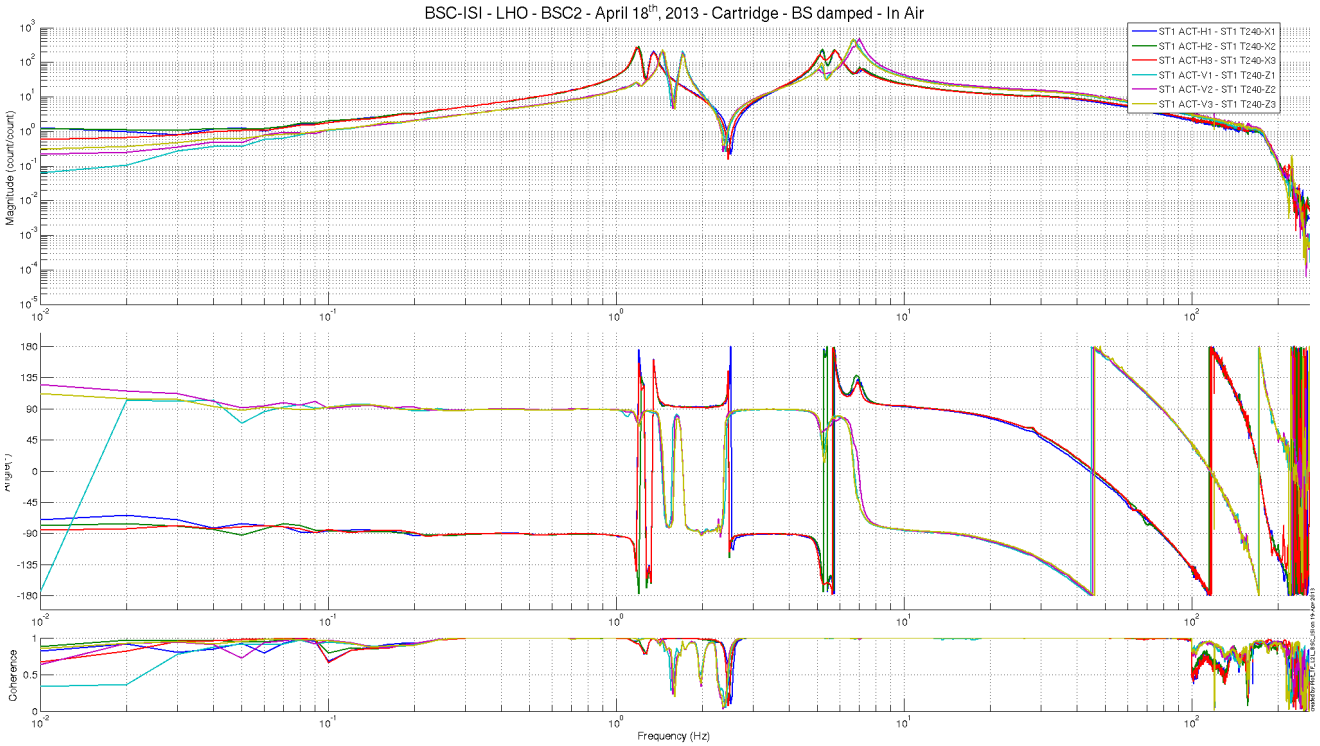

Figure 2 - TF ST1 ACT to ST1 T240

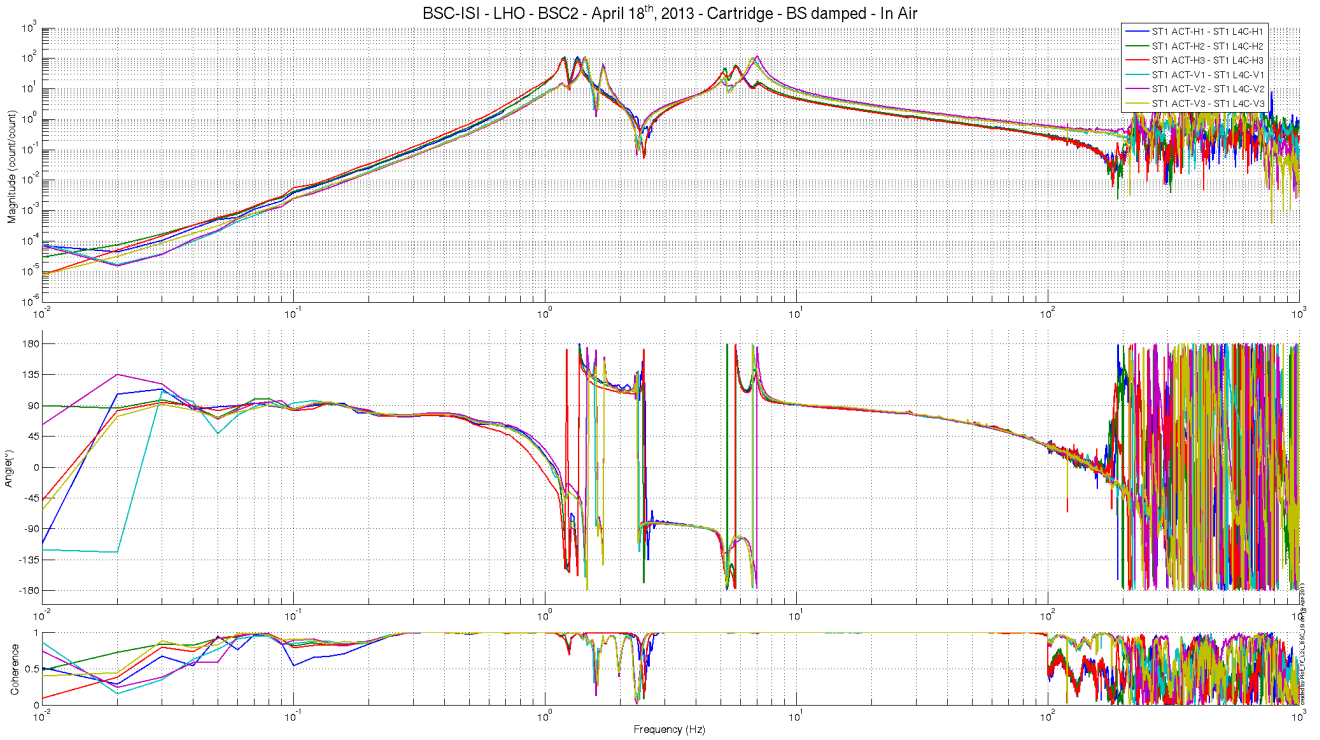

Figure 3 - TF ST1 ACT to ST1 L4C

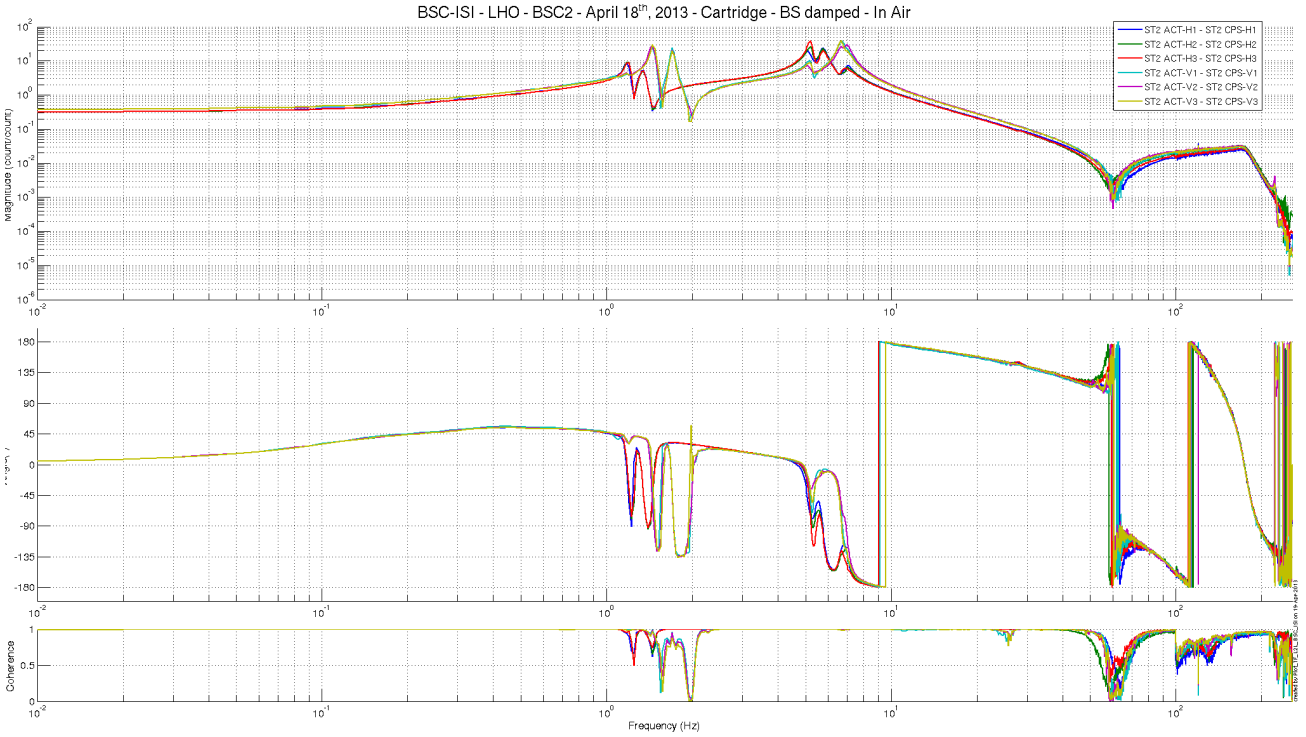

Figure 4 - TF ST2 ACT to ST2 CPS

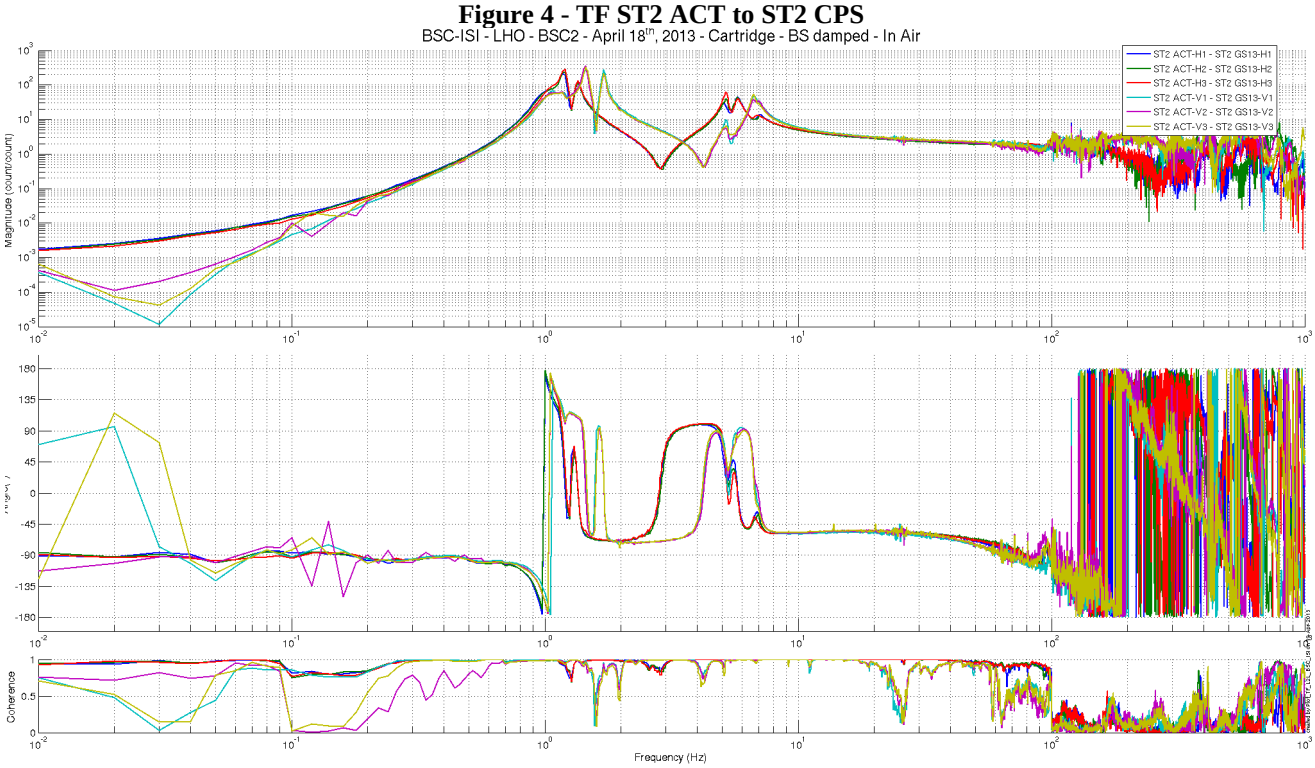

Figure 5 - TF ST2 ACT to ST2 GS13

Test result: **Passed: _X_** **Failed: ___** **Waived: ____**

7. Conclusion Phase II-B

Tests performed during Phase II-B don't show any major anomalies on ISI-BSC2.

Test result: **Passed: _X_** **Failed: ___** **Waived: ___**