LIGO

HAM SAS Test Plan at LASTI

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Overview

1. The LASTI Seismic Environment
2. The Seismic Requirements
3. Testing SAS
    1. Installation and fit check
    2. Seismic isolation performance
    3. DC Stability and check of control band noise enhancement
    4. Interaction Tests
4. Discussion

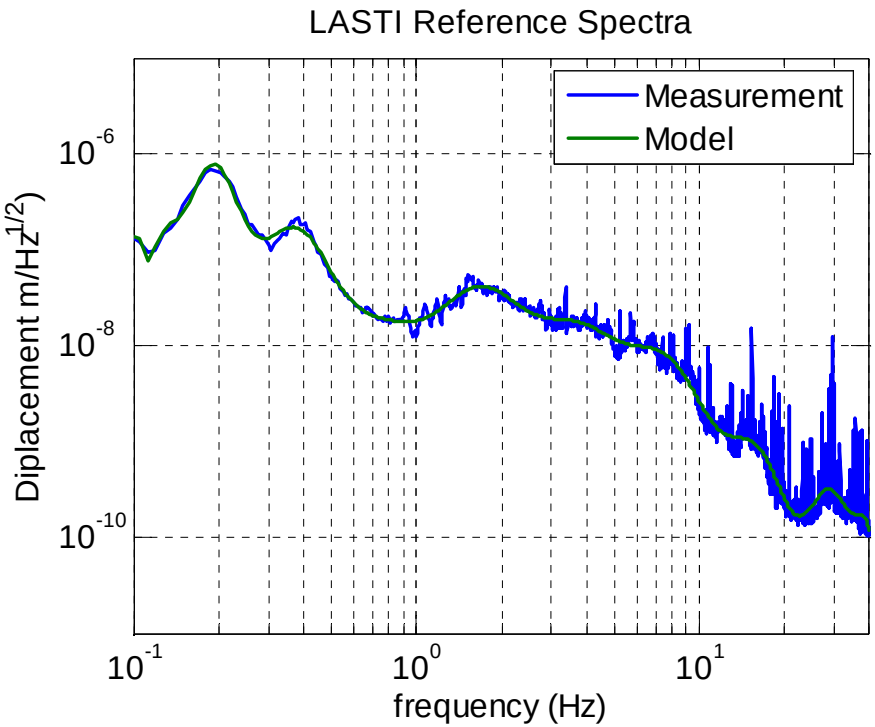
HAM Seismic Requirements 1

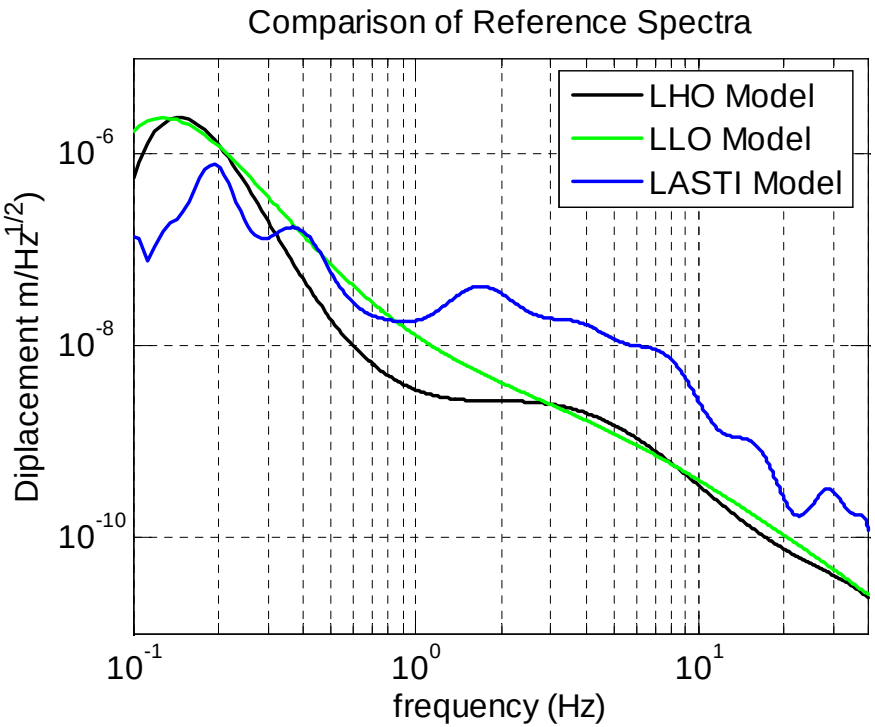
- Based on LIGO-E990303-03-D – HAM Req. may relax
- Vacuum Compatibility
- Seismic Payload
- Optical Platform Interface Requirements
- Operational mode and start-up
- Isolation performance

HAM Requirements (2) -Actuation

- Course positioning: +/- 1mm – small accelerations
- Tidal correction: +/- 90 um – time constant of 10 minutes
- Microseism correction: +/- 10 um – time constant of 0.1 s
- Internal resonances: All un-damped resonances must be greater than 100 Hz
- Field emission: Must not compromise SUS performance
- Drift and thermal expansion: Shall not exceed 0.1 mm in translation and 100 urad over 30 days
- Power and Signal Transmission:
  - » Route must be provided for signal and power transmission to the optical table.
  - » Must not compromise seismic performance

LASTI Seismic Environment





- Data taken at 1.30 am for LASTI
- 20th order log polynomial fit

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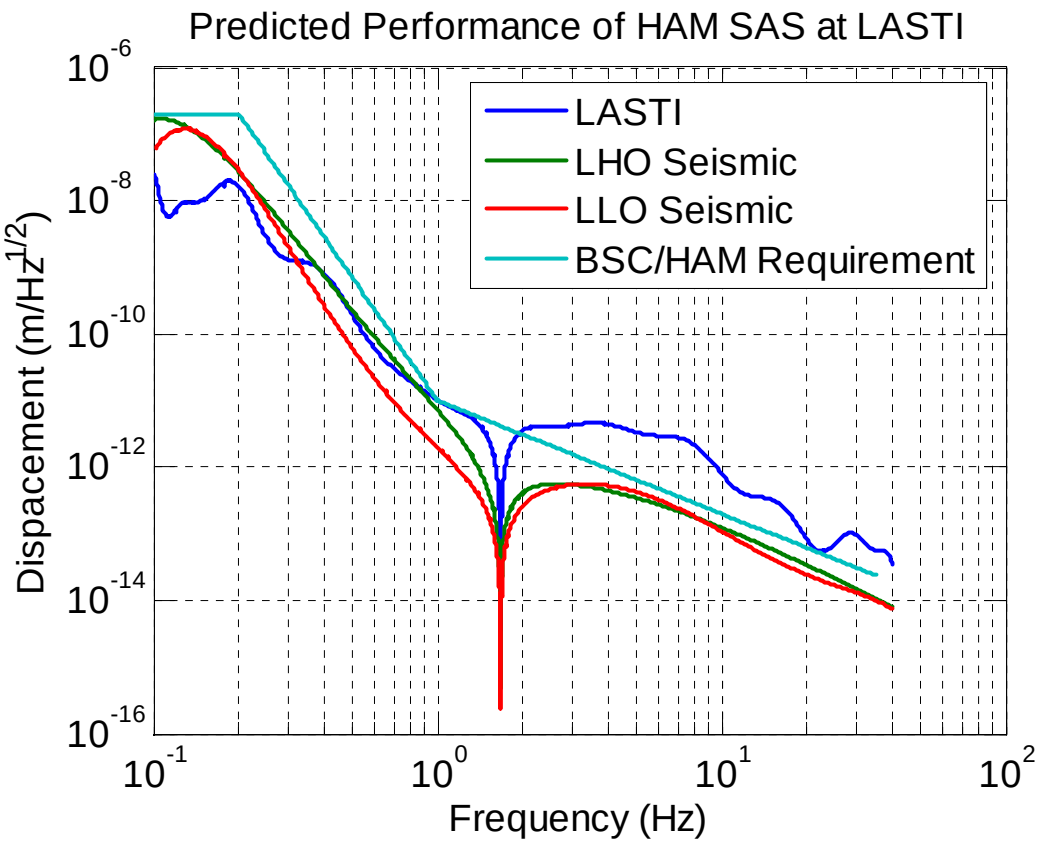
Installation and Fit Check

- HAM SAS to be used installed in the Yend HAM of LASTI
- Yend HAM space is tight
- Will test cartridge style installation
- Installation fixturing will be tested
- Will be installed on scissor tables
- Ability to test vacuum compatibility looks unlikely because of significant water load in unbaked LASTI vacuum – Further calculations required though

Isolation Performance



- Predicted horizontal performance shown
- Have 6 in-vacuum geophones available for test
- 4 Low-frequency vacuum out of loop in vacuum geophones to be provided
- Will use on floor ST2 to obtain transfer function to validate performance
- Need to check that DC stability does not compromise this performance
- Base on TF by V. Sannibale

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DC Position and Angular Stability

- Do not have any guaranteed DC stability references
- Best bet is to lock the system to DC position sensors and check in loop performance
- Check that the DC stabilization loops do not significantly compromise the stability in the LIGO control band
- Optical levers could be used to measure the long term angular stability

SAS Cross Coupling

- In Advanced LIGO it is looking more likely that the Modecleaner and the Power Recycling Cavity mirrors will be mounted on common tables
- Control of heavy optics ~ (45 Kg for RM) will create angular and displacement inter-connection between the PRC and the MC
- Will test this an the ease of installing test-masses on to HAM tables by installing two mode cleaner optics and confirming cross coupling – A RM mirror would be better
- This will also test the ease of installation of suspended optics on SAS.