

Hanford – September 2, 2010

During the week, blend filters and isolation filters have been installed on HAM-ISI-LHO-Unit 2.

Changes in pre-filter bank

The compensator filters that take into account the new electronics of the GS13 are now located in the Pre-filter bank. Consequently, transfer functions presented in this document are comparable to those measured on HAM6. (figure 1).

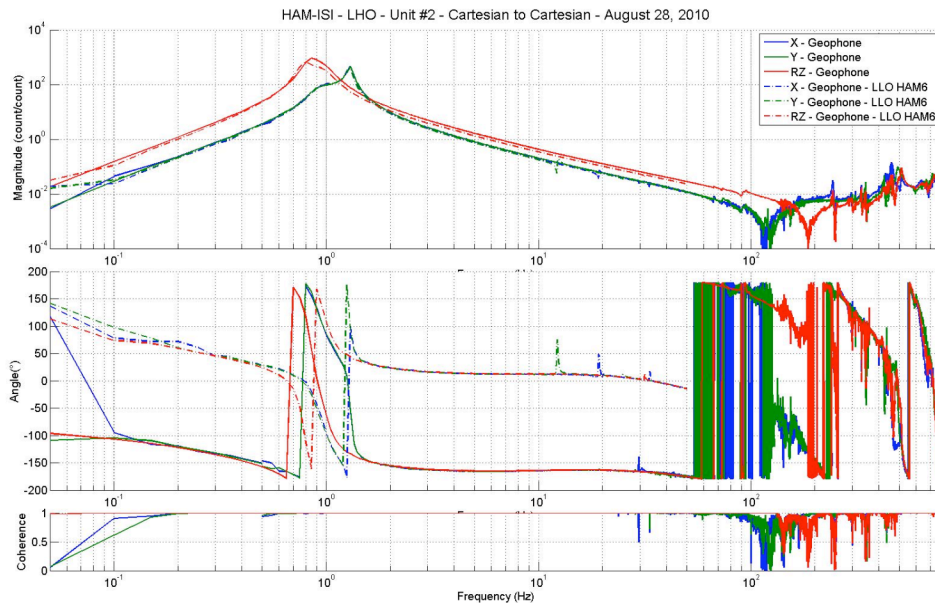


Figure 1 - Transfer functions Cartesian to Cartesian

Designing the Blend Filters

- Geophones theoretical responses are subtracted to the measured transfer functions. Next, the “new” transfer functions are normalized to unity in the frequency band [0.25; 0.45]Hz. Displacement sensors transfer functions are also normalized to unity in the frequency band [0.25; 0.45]Hz. (figure 2)
- Two complementary filters are built (figure 3). Two blend frequencies (250mHz and 1Hz) have been used during tests. “X-axis super sensor” response is presented in figure 4.
- After digitalization, filters are uploaded to the front-end via G11SIHAM.txt
- MEDM doesn’t confirm the filters update. To check the filters update, transfer functions from actuators driven in the Cartesian coordinate system to super sensors are measured (figure 5). We had time to do it.

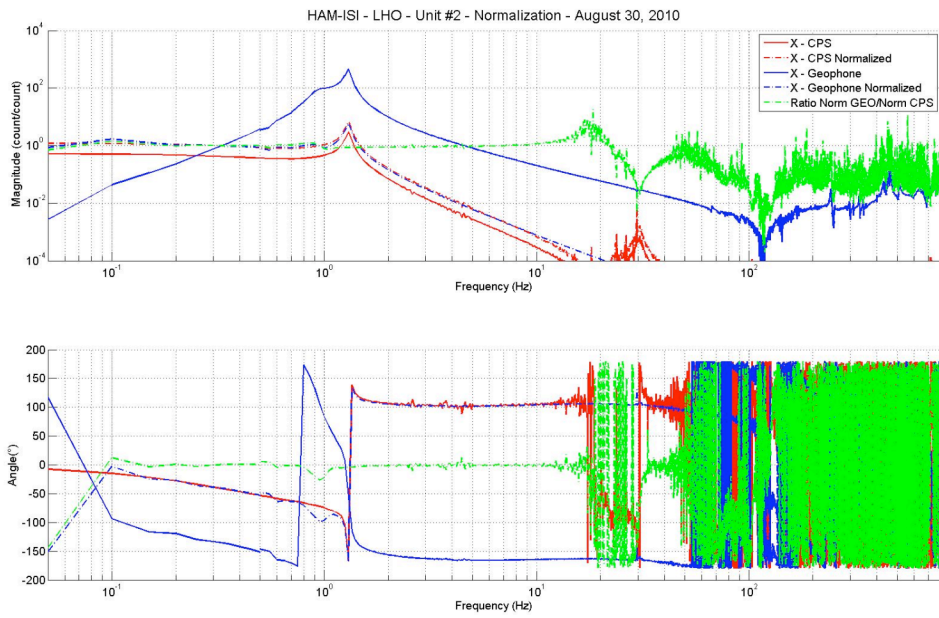


Figure 2 – Normalization

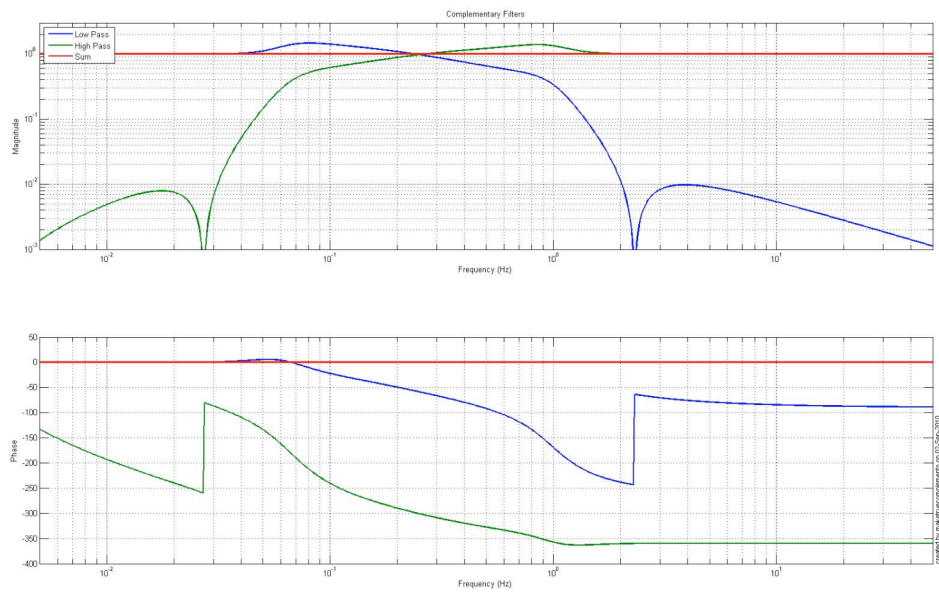


Figure 3 - Complementary filters

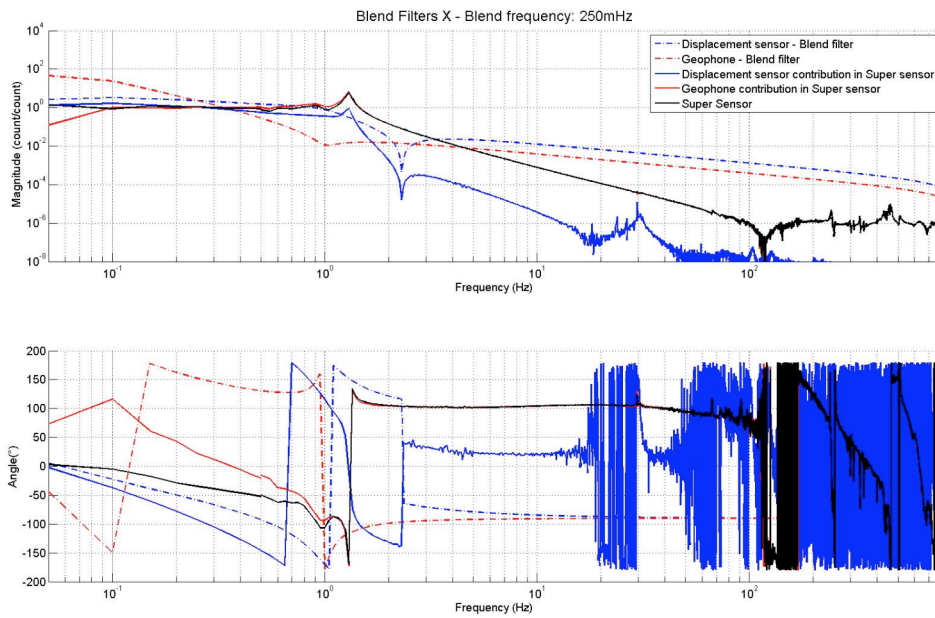


Figure 4 - Super sensor X axis

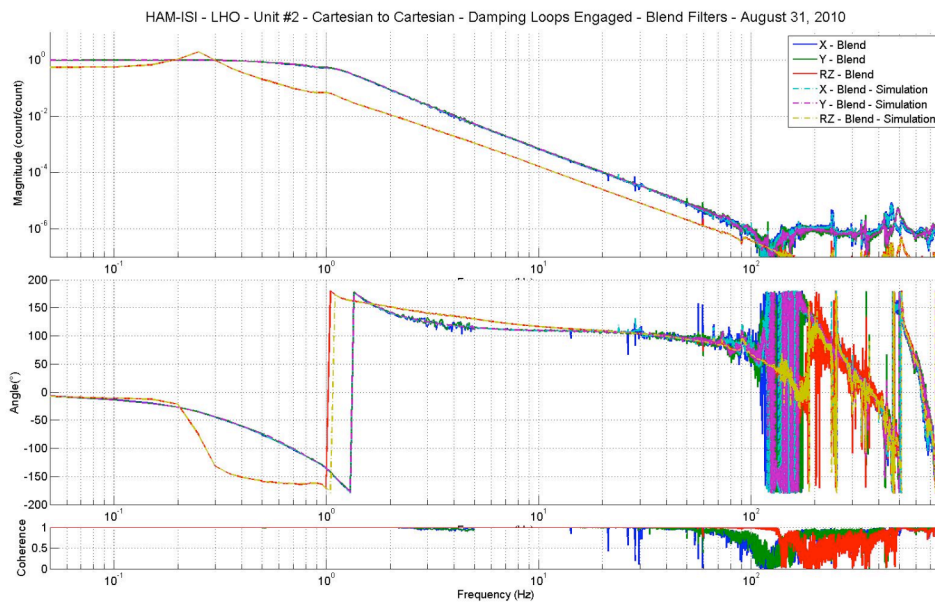


Figure 5 - Transfer functions – Cartesian drive - Super sensors – Damping Loops engaged

Designing Isolation Filters

Basic filters have been designed for this unit. Here is an example with the filter used for the x-axis and the y axis:

```
zpk([-2*pi*pair(1,55) -2*pi*3],[-2*pi*0.1 -2*pi*pair(100,70) -2*pi*100 -2*pi*100],1)
```

Gains are computed such that the unity gain frequency is 15Hz or 20Hz.

Here an example with the x-axis controller, open loop, suppression and the boost filter (dashed line).

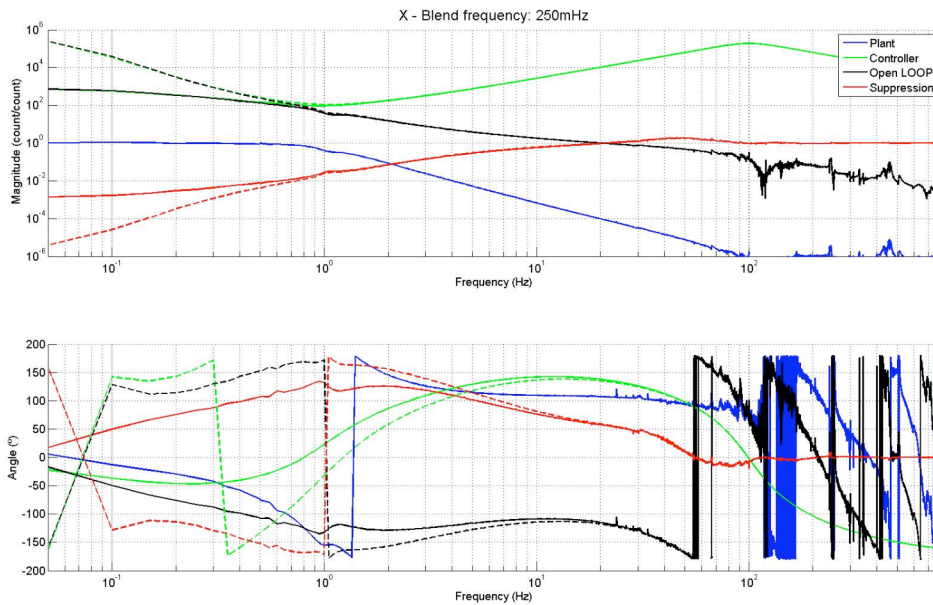


Figure 6 - x-axis controller

Powespectrum measurements

Powerspectrum presented have been measured with the fans turned on. Consequently, the contribution of the “air flow disturbance” is important. Results are presented for a 250mHz blend frequency.

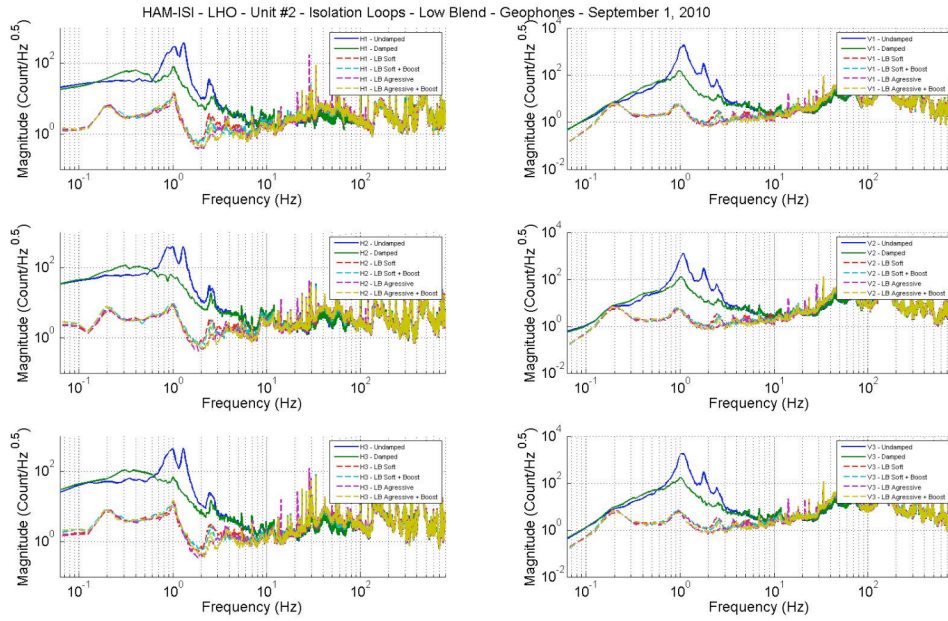


Figure 7 - Geophones Power Spectrum - Local coordinates - No normalization

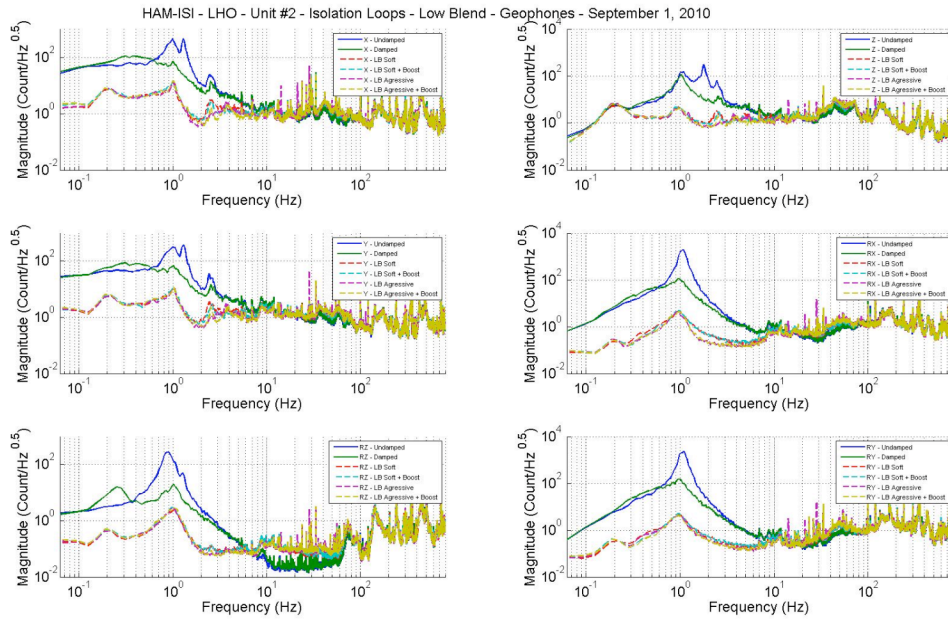


Figure 8 - Geophones Power Spectrum - Cartesian coordinates - No normalization

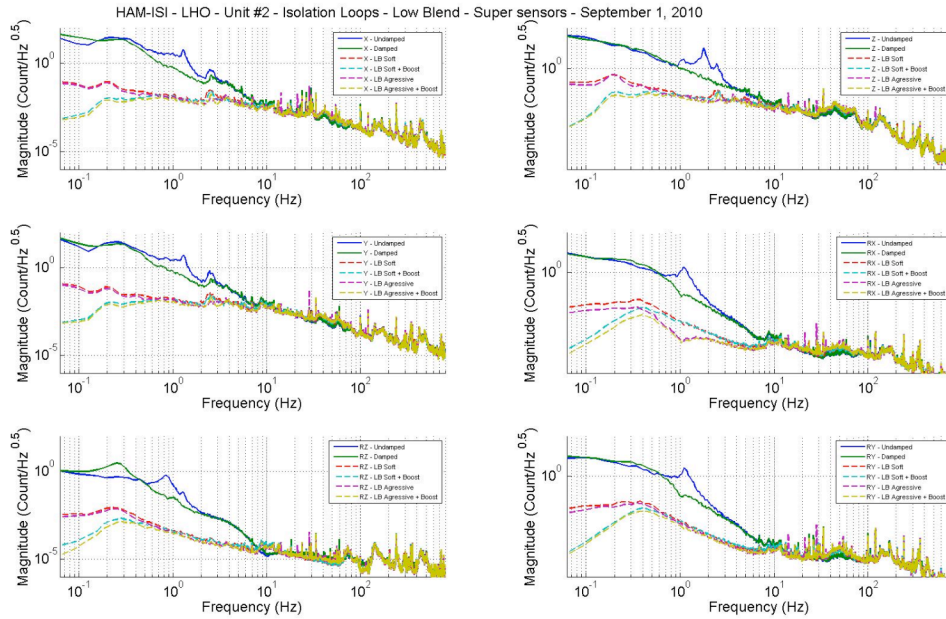


Figure 9 - Power spectrum - Super sensors

MEDM :

- **G1ISI_HAM_Blend_all**.adl MEDM screen was not linked to **G1ISIHAM_HAM_GEO**direction.adl and **G1ISIHAM_HAM_DISP**direction.adl. Some MEDM screens are located in the isiham folder and some are located in g1isiham folder. The “root name” of medm screen is either **G1ISI_HAM** or **G1ISIHAM_HAM**.
- Buttons of the isolation filters bank and blend filters bank don't turn green when filters are engaged
- Functions have been written to start/stop damping loops, start/stop isolation loops, and switch blend frequency.