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To: Brian Lantz <blantz@stanford.edu>  
Cc: Jeff Kissel <jkissel@ligo.mit.edu>  
Re: BSC-ISI performance limits

April 30, 2015 2:57 PM

I talked this through with Kiwamu and Jeff a bit. My couple of comments:

1. Above 1 hz, I don't get much feedback from the Kiwamu's and Sheila's of the LHO world. At this point the performance of the IFO is limited by other things in that area, so it's unclear. At this point, the local performance is limited by GS13s in the 1-10 hz region, and maybe feedforward. Lower CPS noise would help some too, but we've mostly handled that by rolling off CPS blends more aggressively. Jeff argued that this is also the region where SUS is more important.
2. Below 1hz, when SEI makes things any worse, we hear immediately and Sheila shows up to the Friday SEI meeting. I think they would like to see low frequency improvements. Especially in the range 30-100 mhz, around our blend filter gain peaking. So, BRS? Tilt free seismometers?
3. I didn't see anywhere in the T1500120 mention of the Z/RZ coupling. It's kind of fallen off the radar, and there are nearer term blend changes Jeff and I have discussed for some improvement. But this limits our ability to blend lower than 750mhz on RZ. It also forces us to blend higher in Z, which we've compensated for by doing broadband sensor correction on HEPI Z. But, I think we could get some improvements in the .5-1 hz region if we could blend lower in RZ.
4. Our duty cycle is very good, except for wind, which BRS helps with, but blend configurations need more investigating. Chambers almost never trip anymore, except for earthquakes, or people running into HEPI. And totally uncontrollable/unknowable things like cables unplugging themselves in chassis.
5. We aren't gain limited at low frequency. Unclear if higher UGF's are really necessary.

If I come up with anything clever, I'll send it along. I have some crazy/bad ideas, but I don't know what the forum would be to suggest them.

On 4/30/2015 11:19 AM, Brian Lantz wrote:

Jim,  
Soon I will have the opportunity to pitch for improvements to the SEI/SUS systems for LIGO A+ Consider a 5 year time-scale (as opposed to the quick-quick scale you usually see), and then ...

Since you keep making the BSC-ISI and HAM-ISI better, you are best placed to answer the question

1) what is keeping us from making it better? or, alternately -

-what would we have to change to get it to be better? (e.g. lower noise GS-13, lower noise stg2 CPS, smack-down of the 8 Hz amplification, 50 deg less phase loss at 100 Hz)

2) would "making it better" at 10 Hz help the current IFO in any way?

Then,

Please take a look at the 4 pages of text in [T1500120](#) and see if you have other suggestions.

Other questions which would be interesting:

3) What areas would 'better' be? Low frequency isolation, 0.4 Hz? 1-6 Hz? 6-30 Hz? etc

4) should we be thinking about the ASD of typical motion, or something else (e.g. low freq alignment, getting the duty cycle up ~99%, )

5) how can we better integrate SEI with SUS for an all-new SUS?

some thoughts soon are better than complete and perfect thoughts in a week. The discussion is next Thursday.

Thanks!  
-Brian

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