

SWG Summary, LHO LSC

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LHO LSC
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Concerns

- Seismic noise at LLO significantly greater than at LHO
 - » 1-3 Hz – devilish coincidence with stack resonances
 - » May be getting worse with time (years)
 - » Requires both short term (electronic) changes, and
 - » Long-term solution: probably additional external isolation
 - » Tiger Team!
- Discussion of lower cutoff for Advanced LIGO
 - » Presently at 10 Hz
 - » Drives many tough parameters -- masses, size, -- to limits of practicability
 - » 10→13 Hz: very small impact (<1%) on NS-NS inspiral
 - » But loses some area in sensitivity curve. Systems question.
- Coating mechanical losses
 - » Significant impact on fused silica ‘seeing’ in worst case
 - Sapphire stiffer, less impact
 - » May be significantly less for some coating formulation
 - » Coating R&D underway
- Braginsky’s latest: exchange of energy between internal substrate modes optical modes – requires a detailed look

...and nice stuff

- Thorne et alia's Flat Top optical beams to reduce thermoelastic noise
 - » Still a bit shocking from the optical point of view!
- GEO – fused silica suspensions installed in GEO 600
 - » And GEO Quad Adv LIGO prototype together at MIT
- ETF Isolation prototype fabrication ready to start
- Yamamoto: experimental confirmation -- it matters where the loss is
 - » Objects on the back surface of a mirror may not increase the thermal noise
- Numata: beautiful Q measurements of large substrate modes
 - » Complemented by Syracuse measurements on rods
 - » Suggestion of tendency of lower losses at lower frequencies
- Violin Qs and dilution factors fit together
 - » Measure temperature dependence of frequency, Young's modulus – get the ratio of energy in gravitational field to energy in fiber elasticity, order ~100
 - » Directly measured 'diluted' violin Q at 1500 Hz of $4.2e8$!!!