SWG meeting summary

November '03 LSC Meeting, LHO
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LIGO G030647-00-Z

Facility Reviews

- Dave Ottaway: LASTI Review presentation.
  - LASTI experimental plans have been greatly revised, so that the BSC payload can be supported by a 'stock' Adv LIGO BSC SEI system.
  - Test of modecleaner / PSL frequency servo
  - Test of FP length noise using one or two quad pendulums on BSC together with a triple-mounted mirror in a HAM. 2×10^{-19} m/$\sqrt{\text{Hz}}$ should be possible around 100 Hz with low laser power. A high-frequency high-power measurement is also planned.
- Eric Black: TNI Review presentation.
  - much progress since last review; coating thermal noise of about 10^{-18} m/$\sqrt{\text{Hz}}$ seen at several kHz, falling with f adn fading into readout noise, which is at 10^{-19} m/$\sqrt{\text{Hz}}$.

Acoustic and vibration coupling studies

- R Schofield: Systematic effort to reduce acoustic noise coupling into detector signals in LHO's LVEA.
  - Had been causing both excess noise and coherent noise (and glitches) between detectors.
  - Glitch timing studies and loudspeaker excitation used to track noise entry points, dominated by the AS external optical path. Sound - vibration - clipping identified as leading culprit.
  - Sound sources identified as HVAC for low frequencies and electronics fan noise for high frequencies.
  - remediation: reduce noise by damping ducts and moving racks, increasing some optics sizes to reduce clipping, and massive sound-blocking enclosures around tables to reduce transmission.
  - outcome: measurements indicate that effect is now at the 10^{-19} m/$\sqrt{\text{Hz}}$ level.
- R. Mittleman (for Ito and Mason): New periscope tower.
  - cylindrical shell, lightweighted on top, and low-mass mirror mount, increase resonance frequency above 500 Hz and reduce acoustic & vibration pickup.

LASTI EPI work

- Cleanup of magnetic external pre-isolation (MEPI) work.
  - HAM-mounted MEPI, using modal damping with geophones, together with displacement sensor correction from an STS-2 on the slab, reduced noise in target band (1–3 Hz) by about 30.
- Active pier-stiffening experiment: Apply a force against a 10 kg reaction mass based on pier-top-mounted geophone signal. This can raise the lowest pier flex resonance.
- Hydraulic EPI (HEPI) system now installed and running on the LASTI HAM.
  - As expected, resonant structures in the HAM plant are largely damped by HEPI, simplifying servo controller design.
  - Local displacement sensor servos closed, and sensor correction inputs are implemented.

Oscillator noise

- A. Gretarsson: Searching for excess noise in suspensions.
  - Technique to look for burst-like excitations in resonances, such as violin-string modes, and to distinguish between thermal excitation and gaussian readout noise.
  - Signal is demodulated at the resonant frequency, and the average position on a plane of quadratures, as well as changes in the average 'energy innovation,' or motion on the plane, can be studied for various averaging times.