

## LSC Six-Month Progress Report

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### a) Analysis of IO motion

We analyzed the coherence between the floor motion of the LLO corner station and the motion of various Input Optic's suspensions. We found high correlation between the motion of the input optics on HAM1 and the floor motion, and between the beam pointing of the mode cleaner's transmitted and the floor motion. These results indicate the possibility that the corner station floor motion causes arm lock loss through input optic's motions. We are planning to investigate this possibility by numerical simulation using the e2e numerical simulator.

### b) E2e

We made an e2e box to simulate MMT3 without local damping control mechanism implemented. We gave the table top motion of HAM1 estimated from the side motion of several optics on the same table and computed the motion of MMT3 optic. The power spectrum of the calculated optic's motion shows qualitative agreement with measurement.

### c) E2e and model pendulum (on campus)

On the campus of SLU, we set up a model pendulum. This model pendulum has dimensions close to the LIGO small optics. We drove the model pendulum with a mechanical oscillator, and measured the transfer function from the suspension point to the optics. We also built an e2e box to simulate this model suspension, giving the actual dimensions and other parameters such as the resonant frequencies and quality factors. The transfer function in the pendular motion showed very good agreement between the measurement and simulation, validating the e2e boxes and the model involved in the simulation.