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Modeling of the Effects of Beam Fluctuations from LIGO's Mode Cleaner NAFIS JAMAL, Stanford University, SANICHIRO YOSHIDA, Southeastern Louisiana University — LIGO's mode cleaner (MC) is a triangular laser cavity that forms the Input Optics (IO) along with the subsequent mode matching telescopes (MMT). The output beam from the MC travels through the MMT chain to the core optics, the heart of LIGO, which consists of the power recycling mirror, beam splitter and the two arm cavities. If the incoming beam to the core optics is flawed, LIGO's sensitivity becomes degraded. In my research, we model the MC's effect on the laser beam and the performance of the core optics. To appropriately model the MC, seismic perturbations as well as stabilizing control forces must be simulated. Using the LIGO's End-to-End simulator, we model the MC's length sensing control (LSC) to adjust the overall optical path length to resonance. To complement the LSC, we model the Alignment Sensing Control (ASC) system to correct the angular misalignment of the MC mirrors, minimizing the beam pointing angle (by a factor of 3) as well as maximizing power coupled in the cavity (from >99% to >99.9%). We will analyze how the beam pointing and amplitude fluctuations at the MC's output affect LIGO's overall performance.

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