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Displacement Calibration Techniques for the LIGO Detectors
EVAN GOETZ[1], University of Michigan, LIGO SCIENTIFIC COLLABORATION
— Calibration of the gravitational wave data channels of the Laser Interferometer Gravitational Wave Observatory (LIGO) is critical to determining the sensitivity of the detectors to spacetime perturbations produced by distant astronomical bodies. These detectors are designed to measure relative displacement fluctuations at the level of 10^{-19} m/$\sqrt{\text{Hz}}$ at 100 Hz. This calibration requires mirror displacement actuation that can be performed without disrupting the servo lock. For LIGO, the actuation for the length sensing and control servo uses voice-coils surrounding magnets glued to the suspended mirrors. This actuation has been calibrated using three techniques: simple Michelson, frequency modulation, and radiation pressure. These methods, which span a wide range of actuation strengths, will be described and compared.

[1]for the LIGO Scientific Collaboration.

Evan Goetz
University of Michigan

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