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Controlling calibration errors in gravitational-wave detectors by precise location of calibration forces HERNAN DAVELOZA, MAHMUDA AFRIN BADHAN, Mount Holyoke College, MARIO DIAZ, UTB-TSC, KEITA KAWABE, LIGO, PABLO KONVERSKI, UTB-TSC, MICHAEL LANDRY, RICHARD SAVAGE, LIGO, UTB-TSC, CGWA COLLABORATION, LIGO, LHO COLLABORATION — To optimize the scientific benefit of interferometric GW detectors, calibration accuracies of better than 5% will be required. However, calibration forces applied to the test masses cause elastic deformation that is sensed by the interferometer detectors, inducing errors in the calibration. These errors increase with actuation frequency and can be greater than 50% at frequencies above a few kHz depending on the location of the calibration forces. They can be reduced significantly, to below 1%, by changing the position at which the forces are applied. Our finite- element modeling indicates that with the two forces located within $\pm 1mm$ of their design locations, calibration errors due to test mass elastic deformation can be kept below 1% for frequencies up to $3.5kHz$. Thus, precise control of the location of calibration forces should enable overall calibration accuracies of better than 5%.

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