

Abstract Submitted
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Tiltmeter Characterization for Seismic Attenuation Systems in Advanced LIGO AMANDA O'TOOLE, Student, LIGO COLLABORATION — In order to detect weak gravitational waves, the two detectors making up the Laser Interferometer Gravitational Wave Observatory need to have sensitivity to $1e-22$ meters. Our tiltmeter focuses specifically on reducing seismic noise by differentiating between horizontal ground motion and tilt. The sensitivity goal for this balance tiltmeter is $3e-10$ radians/sqrt(Hertz) at 10 mHz. Previous tests on the system yielded hysteresis and noise measurements, but more recent advancements include detailed characterization of the knife-edge on which the tiltmeter arm balances as well as improvements to the software control program. After cracks were found in old knife-edge blades, a new cutting scheme was implemented and the new blades photographed. The resulting unbroken test blades were polished and coated with diamond-like carbon to determine whether physical (PVD) or chemical vapor deposition (CVD) was the better choice. In the end, PVD was decided on due to high surface tension in CVD. The final knife-edge is currently being polished and coated. In addition to knife-edge development, new control code was written in order to manage the working point position, viscous damping, and an offset-dependent anti-spring. Further tests advance the tiltmeter sensitivity past its current value of $2e-9$ radians/sqrt(Hz) at 1 Hertz, and an interferometric position readout system and vacuum chamber testing are only two of many future advances.

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