

Abstract Submitted  
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**Minimizing the Mechanical Loss in Fused Silica and Lowering the Thermal Noise in Advanced LIGO** STEVEN PENN, Hobart and William Smith Colleges, ALEXANDER AGEEV, Syracuse University, DAN BUSBY, California Institute of Technology, GREGORY HARRY, MIT, ANDRI GRETARSSON, LIGO Laboratory, KENJI NUMATA, NASA Goddard Space Flight Center, PHIL WILLEMS, California Institute of Technology — We have measured the mechanical loss in fused silica from samples spanning a wide range of geometries and resonant frequencies in order to model the known variation of the loss with frequency and surface-to-volume ratio. Our model matches the data well and agrees with earlier work on the frequency dependence of the loss. This improved understanding of the mechanical loss has contributed significantly to the design of advanced interferometric gravitational wave detectors, which require ultra-low loss materials for their test mass mirrors. Fused silica has been chosen as the test mass material for Advanced LIGO. Noise estimates for Advanced LIGO show the mirror substrate thermal noise should be well below the quantum noise of the laser. However thermal noise in the mirror coatings is predicted to contribute significantly to the total noise budget in the central frequency region of 30-500 Hz. Work on reducing the mirror coating thermal noise is ongoing.

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