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Mechanical Loss Measurements of Coated Substrates for Gravitational Wave Interferometry¹ JONATHAN NEWPORT, DAVID BELYEA, RAYMOND ROBIE, GREGG HARRY, American University — Gravitational waves from sources such as binary star systems, supernovae explosions and stochastic background radiation have yet to be directly detected by experimental observations. Alongside international collaborators, the Laser Interferometer Gravitational-Wave Observatory (LIGO) is designed to realize direct detection of gravitational waves using interferometric techniques. The second generation of gravitational wave observatories, known as Advanced LIGO, are currently undergoing installation and commissioning at sites in Hanford, Washington and Livingston, Louisiana. The ultimate sensitivity of Advanced LIGO within select spectral bands is limited by thermal noise in the high-reflective coatings of the interferometer optics. The LIGO lab at American University is measuring the mechanical loss of coated substrates to predict thermal noise within these spectral bands. These predictions are used to ensure the ultimate design sensitivity of Advanced LIGO and to study coating and substrate materials for future gravitational wave detectors.

¹National Science Foundation

Jonathan Newport
American University

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