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Mechanical loss studies at Maastricht University

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For current gravitational wave interferometers, the limit in sensitivity at their most sensitive frequencies originates from the combination of thermal noise and quantum noise. The main contribution to the thermal noise arises from the Brownian motion of high reflectivity coatings on the test mass optics, composed of multiple doublets of alternating layers of low and high refractive index materials. Coating thermal noise is dominated by the loss angle of titania-doped-tantala, the high refractive index material. Possible replacement materials with lower mechanical loss for current, and future gravitational-wave detectors are currently under investigation. As part of a new coating characterization laboratory at Maastricht University, a gentle nodal suspension system has been built. We will present initial studies of the mechanical loss of different compositions of titanium dioxide doped with a few percent of germanium dioxide as part of a comprehensive study of the effect of composition and heat treatment on loss and absorption of magnetron-sputtered germania-based coatings.

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