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Analysis of thermal noise of newly proposed design and material for the Advanced LIGO suspensions

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For the suspensions of Advanced LIGO, a new model of low noise, flex joint is being investigated. In order to optimize the design of the joint we need a theoretical prediction of the thermal noise, depending on the shape and on the material of the suspension. The analytical formula is found for the thermal noise spectrum but it depends on the mechanical properties of the material that are investigated experimentally with stress-strain measurements here. Due to their superior mechanical properties and low loss factor, two materials, the MoRuB alloy and Monocrystalline Silica, are tested for this application.