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Multimaterial Coatings for 3rd Generation Gravitational Wave Detectors

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Thermal noise associated with the mechanical loss of highly reflective mirror coatings is a critical limiting factor to the sensitivity of interferometric gravitational-wave detectors. Several alternative coating materials have been shown to have low mechanical loss, but however, due to their high optical absorption, cannot be implemented in upgrades to these detectors.

New multimaterial coatings designs have been proposed to enable the use of these materials to reduce thermal noise without adversely affecting the absorption. At the University of Glasgow, we have been measuring the mechanical loss, both at room temperature and at cryogenic temperatures, and absorption of new silica/tantala/amorphous silicon coatings to provide the first experimental verification of the multi-material design.

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