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Strategies for Thermal Noise Reduction in Future Gravitational Wave Detectors

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Strategies for thermal noise reduction in future gravitational wave detectors. Interferometric gravitational wave detectors utilize kilometer-scale Michelson interferometers as a means of measuring minute length changes caused by gravitational waves from astrophysical sources. Thermal noise refers to the thermal vibrations of the mirror surface, substrate, and suspension system which tend to mask the desired gravitational wave signal. These effects are expected to be the limiting source of noise in much of the sensitive frequency range of the Advanced gravitational wave interferometers that are currently under construction. Development of new technologies will be required to further reduce thermal noise in the future. This talk will explore several possible avenues currently being investigated. These include the use of novel optical coatings based on crystalline materials, new materials for the mirror substrate and suspension system, and the use of cryogenics.