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Modeling Thermal Noise From Crystalline Coatings For Gravitational-Wave Detectors NICHOLAS DEMOS, GEOFFREY LOVELACE, Cal State Univ- Fullerton, LSC COLLABORATION — In 2015, Advanced LIGO made the first direct detection of gravitational waves. The sensitivity of current and future ground-based gravitational-wave detectors is limited by thermal noise in each detectors test mass substrate and coating. This noise can be modeled using the fluctuation-dissipation theorem, which relates thermal noise to an auxiliary elastic problem. I will present results from a new code that numerically models thermal noise for different crystalline mirror coatings. The thermal noise in crystalline mirror coatings could be significantly lower but is challenging to model analytically. The code uses a finite element method with adaptive mesh refinement to model the auxiliary elastic problem which is then related to thermal noise. Specifically, I will show results for a crystal coating on an amorphous substrate of varying sizes and elastic properties. This and future work will help develop the next generation of ground-based gravitational-wave detectors.

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