Abstract Submitted
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Cooling by evanescent-wave heat transfer in a parallel plane geometry[1] RICHARD OTTENS, University of Florida, V. QUETSCHKE, University of Texas at Brownsville, G. MUELLER, D.H. REITZE, D.B. TANNER, University of Florida, LIGO COLLABORATION — To increase their reach into the universe, future gravitational-wave interferometers may operate at cryogenic temperatures. Novel methods will be needed to cool the test masses without introducing displacement noise. Evanescent-wave heat transfer is the process by which near-field radiation effects are used to transfer heat from one body to another. These evanescent waves allow a thermal transmission across a small vacuum gap. With decreasing gap size, the heat transfer rises exponentially above the far-field blackbody radiation limit. Although this process was first theoretically explained in the early 1970's by Polder and Van Hove, experimental testing of this theory has been limited. We experimentally demonstrate evanescent heat transfer in a bulk geometry between two parallel plates of sapphire. Our experiments are in good agreement with theoretical predictions. We discuss possible ways to apply our method to future gravitational-wave interferometers.

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