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Progress towards observation of radiation pressure shot noise BENJAMIN ZWICKL, CHENG YANG, JACK SANKEY, ANDREW JAYICH, JACK HARRIS, Department of Physics, Yale University — Quantum mechanics sets fundamental limitations on the accuracy of interferometric displacement measurements of a mechanical oscillator. In the limit of low optical powers this uncertainty is due to the statistical uncertainty of shot noise. In the limit of high optical powers this uncertainty is due to shot noise in the radiation pressure acting on the mechanical oscillator. Although radiation pressure shot noise is predicted to be a fundamental limitation to the next generation of gravitational wave observatories, it has never been directly observed in an optomechanical system. In this work, we describe progress towards the observation of radiation pressure shot noise in a cavity optomechanical system consisting of a high finesse (70,000) cavity dispersively coupled to a 50 nm thick silicon nitride membrane.

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