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Investigation of radiation pressure shot-noise in a microwave circuit optomechanical system JENNIFER HARLOW, JILA, University of Colorado and NIST, JOHN TEUFEL, RAYMOND SIMMONDS, NIST, KONRAD LEHNERT, JILA, University of Colorado and NIST — We examine the possibility of measuring the radiation pressure shot-noise of microwave light. When the motion of a nanomechanical oscillator is coupled to the microwave energy stored in a resonant circuit, the oscillator experiences a radiation pressure force. That force must have a random component associated with the quantum nature of the microwave field, a mechanical manifestation of the microwave photon. The variance of this random component increases with increasing circuit excitation power. Until recently, reaching powers where radiation pressure shot-noise would dominate over other random forces was unfeasible due to relatively weak optomechanical coupling and technical power limitations of microwave circuits. However, the recent advent of a mechanical oscillator coupled strongly to a microwave circuit [1] will enable exploration of this regime. We discuss the most favorable circuit parameters and measurement strategy for studying radiation pressure shot-noise.

[1] J. D. Teufel, et al, Circuit cavity electromechanics in the strong coupling regime, arXiv:1011.3067v1.

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