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Optomechanics with microwave light

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Recently, superconducting circuits resonant at microwave frequencies have revolutionized the measurement of astrophysical detectors [1] and superconducting qubits [2]. In this talk, I will describe how we extend this technique to measuring and manipulating nanomechanical oscillators. By strongly coupling the motion of a nanomechanical oscillator to the resonance of the microwave circuit we create structures where the dominant dissipative force acting on the oscillator is the radiation pressure of microwave "light" [3]. These devices are ultrasensitive force detectors and they allow us to cool the oscillator towards its motional ground state.

[1] P. K. Day *et al.*, Nature **425**, 817 (2003).
[2] A. Wallraff *et al.*, Nature **431**, 162 (2004).
[3] J. D. Teufel, J. W. Harlow, C. A. Regal and K. W. Lehnert, Phys. Rev. Lett., **101**, 197203 (2008).