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Photon-Mediated Magnetic Cooling of a Micromechanical Oscillator JOONHO JANG, RAFFI BUDAKIAN, Physics Department, University of Illinois at Urbana-Champaign — In recent years, a number of techniques have been developed to cool a mode of a micromechanical oscillator to the ground state. In this talk, I will present a new scheme for cooling a micromechanical oscillator involving the interaction of a micron-size superconductor, attached to the cantilever, with an external magnetic field. When the cantilever is placed inside an optical cavity, the absorption of photons by the superconductor gives rise to a retarded force that modifies the damping of the oscillator. Initial measurements using $NbSe_2$, show approximately a factor of 25 reduction in the mode temperature from 5 K to 200 mK. By optimizing the cavity finesse, the magnetic field configuration, and the superconductor quasiparticle lifetime, a further reduction of $10^3 10^4$ in the cantilever mode temperature could be realized.

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