Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

**Inductive cooling in quantum magnetomechanics.**[1] ERICK ROMERO-SANCHEZ, University of Queensland, JASON TWAMLEY, Macquarie University, WARWICK P. BOWEN, University of Queensland, MICHAEL R. VANNER, University of Oxford — Coupling to light or microwave fields allows quantum control of the motion of a mechanical oscillator, and offers prospects for precision sensing, quantum information systems, and tests of fundamental physics. In cavity electromechanics ground state cooling has been achieved using resolved sideband cooling. Here we present an alternative approach based on a magnetomechanical system that inductively couples an $LC$ resonator to a mechanical oscillator. The experimental setup consists of a micro cantilever with a pyramidal magnetic tip attached at the end of the beam. The sharp end of the magnetic tip is positioned close to the planar microfabricated inductor of the $LC$ resonator. The displacement in the position of the end of the cantilever generates a change in flux through the coil inducing an electromotive force in the circuit. The current in the $LC$ resonator generates a magnetic field, and then a force between the tip and the coil. When they are strongly coupled and the mechanical resonance frequency $\omega_m$ exceeds the electrical decay rate of the resonator $\gamma_e$, resolved sideband cooling can be used to cool the mechanics. We present estimations for the coupling rates and the experimental parameters required for these experiments.

[1]E. Romero acknowledges to CONACyT

Erick Romero-Sanchez
University of Queensland

Date submitted: 08 Nov 2015 Electronic form version 1.4