Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Control and measurement of an optomechanical system using a superconducting qubit FLORENT LECOCQ, JOHN TEUFEL, MICHAEL ALLMAN, KATARINA CICAK, FABIO DA SILVA, ADAM SIROIS, JED WHITTAKER, JOSE AUMENTADO, RAYMOND SIMMONDS, NIST - Boulder — In cavity optomechanics one can use photons to manipulate and measure the mechanical motion of a macroscopic object. With these techniques, ground state cooling of a mechanical resonator [1] and coherent transfer between a state of light and mechanical motion have been demonstrated [2]. So far these experiments have been using Gaussian resources, and therefore are limited to the observation of Gaussian states. I will discuss recent experiments that use an artificial atom as a non-linear resource for cavity optomechanics. The device consists of a superconducting phase qubit coupled to a lumped element microwave cavity, whose capacitance is formed by a mechanically compliant vacuum-gap capacitor. The motion of the mechanical resonator is encoded in the intra-cavity microwave field. The cavity can thus mediate an interaction between the qubit and the mechanical resonator, enabling preparation and readout of non-classical states of motion. In this talk I will show how we use the qubit to measure of the time evolution of the photon distribution in the microwave cavity, allowing us to infer the phonon distribution in the mechanical resonator. [1] Teufel et al, Nature 475, 359 (2011) [2] Palomaki et al, Nature 495, 210 (2013)

Florent Lecocq
NIST - Boulder

Date submitted: 15 Nov 2013 Electronic form version 1.4