Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Back-action Evading Measurements of a Nanomechanical Resonator TCHEFOR NDUKUM, TRISTAN ROCHELEAU, Cornell University, KEITH SCHWAB, California Institute of Technology — By driving a 5GHz superconducting, co-planar waveguide (CPW) resonator coupled to a radio-frequency nanomechanical resonator with both red and blue-detuned, phase coherent microwave signals, we have demonstrated amplifier noise back-action evading (BAE) detection of one quadrature of nanomechanical motion. With this quantum non-demolition (QND) scheme we have shown precise measurements of a single motional quadrature with additive measurement noise of 4 times the zero point amplitude, and a reduction in sensitivity to injected measurement noise of a factor of 43 in comparison to a single tone, non-BAE measurement. By increasing the CPW frequency to 7.5GHz, quadrupling the coupling strength and improving the (internal) quality factor of the CPW, we expect to be able to demonstrate sensitivity to one quadrature with additive measurement noise below the zero-point level, a necessary ingredient to produce and measure squeezed states of motion.

Tristan Rocheleau
Cornell University

Date submitted: 20 Nov 2009 Electronic form version 1.4