Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Back action evading quantum limited measurements of a nanomechanical resonator TCHEFOR NDUKUM, TRISTAN ROCHELEAU, Department of Physics, Cornell University, JARED HERTZBERG, Department of Physics, University of Maryland, KEITH SCHWAB, Department of Physics, Cornell University — 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 demonstrate amplifier noise back action evading(BAE) detection of one quadrature of nanomechanical motion. With this method we show 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. We have also found a parametric instability which limits the coupling strength possible in our device, which will be described elsewhere. With straightforward improvements to the microwave resonator, 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
Department of Physics, Cornell University

Date submitted: 17 Dec 2008 Electronic form version 1.4