Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Parametric Amplification and Detection of Nanomechanical Motion JARED HERTZBERG, Department of Physics, University of Maryland, TRISTAN ROCHELEAU, TCHEFOR NDUKUM, KEITH SCHWAB, Department of Physics, Cornell University — We have performed experiments with a 5.57 MHz nanomechanical resonator (NR) capacitively coupled to a 5 GHz superconducting microwave resonator and cooled to a temperature of 142mK. When driving with two microwave tones, a configuration appropriate for back-action evading measurements of a single motional quadrature, we find that a parametric instability appears at high drive powers. Due to the interference of the microwave tones, the capacitive frequency shift of the NR is periodically modulated at twice the mechanical frequency, resulting in a degenerate parametric amplification of the mechanical motion. In this regime, we demonstrate mechanical gains of up to 11.6dB and parametrically reduced linewidths of 2.1 Hz, resulting in a position resolution near the standard quantum limit. Although this effect is expected to limit the back-action evasion dynamics, it is useful for mechanical preamplification and noise squeezing, subjects of future work.

Jared Hertzberg
Department of Physics, University of Maryland

Date submitted: 21 Nov 2008 Electronic form version 1.4