Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Reservoir engineering in microwave cavity optomechanics FLORENT LECOCQ, JEREMY CLARK, JOSE AUMENTADO, RAYMOND SIMMONDS, JOHN TEUFEL, NIST Boulder — Microwave cavity optomechanics is an architecture in which a freely suspended membrane modulates the frequency of a superconducting microwave resonant circuit. The resulting parametric interactions influence both the mechanical degree of freedom and the microwave light emerging from the cavity. Even at cryogenic temperatures, the mechanical oscillator resonating at 10 MHz is typically dominated by its thermal reservoir, washing out any quantum behavior. However, in the presence of coherent drives to the cavity, the bare mechanical properties can be overwhelmed by the strong opto-mechanical interactions from the light field. By choosing wisely the frequency and amplitude of the drives, one can engineer the environment seen by the mechanical oscillator, a technique known as "reservoir engineering". From an experimentalist point of view, I will discuss how using two-tone driving schemes, we exploit correlations in the vacuum noise to: (1) eliminate the backaction imparted on the mechanical quadrature being measured, a technique so-called Back-Action Evasion, or (2) strongly couple the mechanical mode to a squeezed microwave bath.

Florent Lecocq
NIST Boulder

Date submitted: 14 Nov 2014 Electronic form version 1.4