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Full counting statistics for a quantum nanoelectromechanical system STEVEN BENNETT, AASHISH CLERK, McGill University — Experiments on nanoelectromechanical systems often involve the effects of a mechanical oscillator on the current noise of a mesoscopic conductor. Coupling to the oscillator induces correlations between tunneling electrons in the conductor, leading to signatures in the shot noise. To better characterize such correlations it is useful to consider full counting statistics (FCS), which describe the complete probability distribution of tunneled charge. We study theoretically the FCS in a tunnel junction coupled to a nanomechanical oscillator. This system has been realized in experiment using an atomic point contact where one electrode is free to vibrate [1], and it has been predicted that the oscillator dynamics leads to large signatures in the shot noise that cannot be explained classically [2]. Thus motivated, we investigate the FCS using a reduced density matrix tracking the oscillator and the number of tunneled electrons, for which we obtain an equation of Caldeira-Leggett form with additional terms due to tunneling.

[1]N. E. Flowers-Jacobs, D. R. Schmidt, and K. W. Lehnert (submitted).
[2]A. A. Clerk and S. M. Girvin, *Phys. Rev. B* **70**, 121303(R) (2004).

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