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Non-equilibrium Charge Fluctuations as a Source of Inelastic Back-action in Quantum Point Contact Qubit Detectors CAROLYN YOUNG, AASHISH CLERK, McGill University — Many recent experiments make use of a quantum point contact (QPC) as a qubit readout (e.g., of a double quantum dot (DQD) qubit). It has long been realized that QPC current fluctuations can give rise to inelastic back-action effects on the DQD [1] [2]. In contrast, the role of QPC charge fluctuations in generating inelastic back-action has not been fully studied, despite the fact that this is a more fundamental mechanism. We provide a full theoretical study of charge-noise induced inelastic back-action effects in a QPC plus DQD system, showing that these effects should be appreciable in typical experimental setups. We also discuss a novel contribution to the charge noise associated with the physics of Friedel oscillations. Finally, we discuss how the effects of charge noise back-action can be distinguished from current noise back-action in experiment.

[1] S. Gustavsson et al., Phys. Rev. Lett., 99, 206804 (2007).

[2] R. Aguado and L.P. Kouwenhoven, Phys. Rev. Lett., 84, 091987 (2000).

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