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Heisenberg Backaction in Quantum Point Contact Qubit Detectors CAROLYN YOUNG, AASHISH CLERK, McGill University — Quantum point contacts (QPCs) are widely used for the readout of quantum electronic systems. Surprisingly, it has not been fully appreciated that charge noise fluctuations in the QPC are the source of the fundamental Heisenberg backaction associated with QPC measurement. In this talk, we derive a rigorous quantum limit on the magnitude of the QPC charge noise [1]. Without specifying the precise geometry of the detector or its coupling to the device being measured, we obtain a lower bound that depends exclusively on intrinsic QPC properties that are directly measurable in experiment. A random phase approximation treatment of charge screening is also presented which includes a description of spatial variations in the QPC charge and density of states. Finally, we discuss the implications of our results for QPC-induced dephasing in two-electron spin qubits [2].

[1] C.E. Young and A.A. Clerk, arXiv:0910.4942v1.
[2] J.R. Petta et. al., Science **309**, 2180 (2005).

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