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Effects of finite bandwidth and delay on Bayesian quantum feedback of a qubit[1] QIN ZHANG, University of California, Riverside, RUSKO RUSKOV, Pennsylvania State University, ALEXANDER KOROTKOV, University of California, Riverside — We analyze the effect of various imperfections on the performance of the Bayesian quantum feedback loop designed to maintain quantum coherent oscillations in a solid-state "charge" qubit for an arbitrary long time. For the feedback operation the qubit state is continuously monitored using the information provided by the noisy output of a weakly coupled detector (quantum point contact or single-electron transistor); this information is taken into account using the quantum Bayesian equations. Finite signal bandwidth reduces the monitoring accuracy and affects performance of the feedback; we study this effect by Monte Carlo simulation of the quantum measurement process. We also analyze the reduction of feedback fidelity due to additional time delay in the control loop. The simulations also take into account finite quantum efficiency of the detector and possible energy asymmetry of the qubit.

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