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Microscopic models for charge dephasing in semiconductor qubits

FÉLIX BEAUDOIN, WILLIAM A. COISH, McGill University — Charge noise is a ubiquitous source of dephasing in solid-state qubits. In typical models seeking to explain this decoherence mechanism, the charge qubit is dipole-coupled to two-level charge fluctuators distributed in the host material, at interfaces or in oxide layers. Here, we consider various microscopic mechanisms causing fluctuations in the environmental two-level systems, and study the charge qubit's coherence properties in each scenario. In light of recent experimental results reported with semiconductor qubits, we identify which noise mechanism reasonably dominates, and make testable predictions for future experiments.

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