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Reduced sensitivity to charge noise in semiconductor spin qubits via symmetric operation

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Gated semiconductor quantum dots controlled with the exchange interaction are attractive candidates for quantum information processing because of their long coherence time and electrical controllability. Exchange is conventionally modulated by detuning the chemical potentials of neighboring dots over a fixed tunnel barrier, an approach whose precision is limited by charge noise. In this talk we demonstrate a "symmetric" mode of operation which substantially reduces the sensitivity of exchange operations to gate fluctuations. The method involves biasing a double-dot symmetrically between the charge-state anti-crossings, where the derivative of the exchange energy with respect to gate voltages is minimized. Exchange remains highly tunable by adjusting the tunnel coupling. We propose a metric, insensitivity, to quantify the techniques improvement and find that it increases by at least a factor of five between operating regimes. We also demonstrate a substantial increase in the number of Rabi fringes observed.