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Design of a metallic SET gated by lateral Schottky gates for measurements of electric-field-dependent ionization of donors LUYAN SUN, K. R. BROWN, B. E. KANE, Laboratory for Physical Sciences, University of Maryland — Spins associated with donors in silicon are ideally suited as qubits for a solid state quantum computer due to their long coherence times and potential scalability. One method for spin measurement incorporates electric-field-dependent ionization of two-electron systems to distinguish singlet and triplet spin states. Therefore the electric field at donor sites needs to be known accurately. The electric field can be applied via a heavily doped back gate, but sharp density profiles are difficult to obtain both with ion implantation (due to straggle) and with molecular beam epitaxy. To resolve this issue, we have fabricated lateral PtSi Schottky gate devices. Schottky gates should make the transition from conducting layer to intrinsic Si far more abrupt. They can also tune the Fermi level in the substrate, so that we can populate donors in the substrate by applying an appropriate bias and shining an LED. By studying the Coulomb blockade peak spacing of an $Al/AlO_x/Al$ SET while sweeping a nearby Schottky gate, we can identify the flat band condition. We will present preliminary data for the filling and emptying of Si/SiO_2 interface states and for the determination of electric field below the SET island from such devices.

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