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Singlet-triplet donor-quantum-dot qubit in silicon PATRICK HARVEY-COLLARD, Université de Sherbrooke, GREGORY A. TEN EYCK, JOEL R. WENDT, TAMMY PLUYM, Sandia National Laboratories, MICHAEL P. LILLY, Center for Integrated Nanotechnologies, Sandia National Laboratories, MALCOLM S. CARROLL, Sandia National Laboratories, MICHEL PIORO-LADRIÈRE, Université de Sherbrooke — Electron spins bound to phosphorus (P) donors in silicon (Si) are promising qubits due to their high fidelities, but donor-donor coupling is challenging. We propose an alternative two-electron singlet-triplet quantum-dot (QD) and donor (D) hybrid qubit. A QD is formed at a MOS 28-Si interface and is tunnel-coupled to implanted P. The proposed two-axis system is defined by the exchange and contact hyperfine interactions. We demonstrate that a few electron QD can be formed and tuned to interact with a donor. We investigate the spin filling of the QD-D system through charge-sensed (CS) magnetospectroscopy and identify spin-up loading consistent with a singlet-triplet splitting of $\sim$100 μeV near a QD-D anti-crossing. We also demonstrate an enhanced CS readout contrast and time window due to the restricted relaxation path of the D through the QD. This work was performed, in part, at the Center for Integrated Nanotechnologies, an Office of Science User Facility operated for the U.S. Department of Energy (DOE) Office of Science. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. DOE's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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