Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Tunnel coupling tuning of a QD-donor S-T qubit R. M. JOCK, M. RUDOLPH, Sandia National Laboratories, P. HARVEY-COLLARD, Universit de Sherbrooke, T. JACOBSON, J. WENDT, T. PLUYM, J. DOMINGUEZ, R. MANGINELL, M.P. LILLY, M.S. CARROLL , Sandia National Laboratories
— Coherent coupling between an electrostatic quantum dot (QD) and an implanted 31P donor has been recently demonstrated in a singlet-triplet qubit design [arXiv1512.01606]. Controlling the tunnel coupling between the QD and donor is a key design challenge. We demonstrate the ability to voltage-tune the tunnel coupling between a QD and a donor in a new, implanted, MOS-QD design. The tunnel coupling is extracted from the frequency dependence of coherent singlet-triplet oscillations on detuning. By tailoring the electrostatic tuning of the QD, we observe a near-order-of-magnitude change in QD-donor tunnel coupling. Independent control of the QD-lead tunnel rates is also demonstrated. This new MOS foundry compatible QD-donor design shows promise for substantially relaxing fabrication requirements for donor based qubits. 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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Date submitted: 09 Nov 2016 Electronic form version 1.4