Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Lifting of Spin Blockade by Charged Impurities in Si-MOS Double Quantum Dot Devices[1] CAMERON KING, University of Wisconsin, Madison, JOSHUA SCHOENFIELD, University of California, Los Angeles, M. J. CALDERÓN, Instituto de Ciencia de Materiales de Madrid, ICMM-CSIC, BELITA KOILLER, ANDRÉ SARAIVA, Instituto de Física, Universidade Federal do Rio de Janiero, XUEDONG HU, State University of New York, Buffalo, HONG-WEN JIANG, University of California, Los Angeles, MARK FRIESEN, S. N. COPPERSMITH, University of Wisconsin, Madison — Fabricating quantum dots in silicon metal-oxide-semiconductor (MOS) for quantum information processing applications is attractive because of the long spin coherence times in silicon and the potential for leveraging the massive investments that have been made for scaling of the technology for classical electronics. One obstacle that has impeded the development of electrically gated MOS singlet-triplet qubits is the lack of observed spin blockade, where the tunneling of a second electron into a dot is fast when the two-electron state is a singlet and slow when the two-electron state is a triplet, even in samples with large singlet-triplet energy splittings. We show that this is a commonly exhibited problem in MOS double quantum dots, and present evidence that the cause is stray positive charges in the oxide layer inducing accidental dots near the devices active region that allow spin blockade lifting.

[1]This work was supported by ARO (W911NF-12-1-0607), NSF (IIA-1132804), the Department of Defense under Contract No. H98230-15-C 0453, ARO (W911NF-14-1-0346), NSF (OISE-1132804), ONR (N00014-15-1-0029), and ARO (W911NF-12-R-0012).

Cameron King
University of Wisconsin, Madison

Date submitted: 11 Nov 2016 Electronic form version 1.4