Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Coherent Manipulation of a Silicon Spin-Charge Hybrid Qubit DOHUN KIM, ZHAN SHI, CHRISTIE B. SIMMONS, DANIEL R. WARD, JON R. PRANCE, TECK SENG KOH, JOHN KING GAMBLE, DONALD E. SAVAGE, MAX G. LAGALLY, MARK FRIESEN, SUSAN N. COPPERSMITH, MARK A. ERIKSSON, University of Wisconsin — The recently proposed quantum dot hybrid qubit enables fast, coherent quantum operations [1, 2]. We demonstrate rotations of a hybrid qubit in a three-electron Si/SiGe double quantum dot about two axes of the Bloch sphere (X and Z). We perform Larmor oscillations (x-rotations on the Bloch sphere) between the 0 and 1 hybrid states, demonstrating a T2* time of 2.1 ns at the charge degeneracy point [3,4]. Using tailored pulse gating sequences, we perform fast (>10GHz) phase (z-axis) rotations of the hybrid qubit states. We measure a lower bound of the coherence time T_2* of 10 ns and high figure of merit >150. This work was supported in part by ARO (W911NF-12-0607) and the United States Department of Defense. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressly or implied, of the US Government.

[1] Z. Shi, et al., Phys. Rev. Lett. 108, 140503 (2012).
[2] Teck Seng Koh, et al, Phys. Rev. Lett. 109, 250503 (2012)
[3] Z. Shi, et al., Phys. Rev. B 88, 075416 (2013)
[4] Z. Shi, et al., e-print: http://arxiv.org/abs/1308.0588

Dohun Kim
University of Wisconsin

Date submitted: 11 Nov 2013 Electronic form version 1.4