Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Density and Depth of Natural Quantum Dots in Silicon MOS Structures R.M. JOCK, S. SHANKAR[1], A.M. TYRYSHKIN, J.-H. HE, S.A. LYON, Princeton University, K. ENG[2], K. CHILDS, L. TRACY, M. LILLY, M. CARROLL, Sandia National Laboritories — Electron spins in MOS structures have shown promise as qubits for quantum information processing. Typically, characteristics such as mobility, mid-gap interface states and oxide fixed charge are considered figures of merit for the Si/SiO_2 interface, however, other properties may be important. Recently, we have shown that, by biasing the gate above threshold and then reducing V_G to 0V, we freeze electrons into natural quantum dots, where 2D electrons are confined by interface disorder. The depth of these dots is determined by the temperature and can be extracted using a Schottky-Hall-Read model. Additionally, we measure the density of confined electron states from the magnitude of the ESR signal. These measurements offer us a means to characterize the interface disorder in these MOS structures. Experiments have been performed on devices from different labs. Preliminary results from industrial quality devices fabricated at Sandia National Laboratories indicate a shallower dot depth, though a similar mobility. The shallower confinement suggests a higher quality for single-electron quantum devices.

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Date submitted: 19 Nov 2010 Electronic form version 1.4