Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Spin coherence and relaxation of natural quantum dots at the Si/SiO_2 interface[1] S. SHANKAR, A. M. TYRYSHKIN, JIANHUA HE, S. A. LYON, Princeton University — While electron spins confined in quantum dots in silicon heterostructures are good candidates to make qubits, little is known about the coherence of electrons at the Si/SiO_2 interface. We perform pulsed electron spin resonance on a Metal-Oxide-Silicon transistor and report the spin relaxation (T_1) and coherence (T_2) times for mobile two-dimensional electrons as well as electrons isolated in natural quantum dots at the Si/SiO_2 interface. Mobile electrons have short T_1 and T_2 of around 0.3 μs at 5 K. Upon confining electrons into isolated dots with a few meV binding energy, T_1 rises dramatically as temperature is decreased, reaching 1.1 ms at 350 mK. Simultaneously, T_2 rises and saturates at 10 μs below 1 K. The long T_1 is consistent with a reduced efficiency of Rashba fluctuations in causing spin relaxation in a quantum dot. However T_2 is not controlled by T_1 below 1 K, but is instead caused by an unknown extrinsic mechanism.

[1]Supported by NSA/LPS and ARO

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Date submitted: 19 Nov 2009 Electronic form version 1.4