Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Electron Spin Resonance in Si/SiGe Heterostructures at 350 mK[1]

JIANHUA HE, A.M. TYRYSHKIN, S.A. LYON, Princeton University, D.E. SAVAGE, M.A. ERIKSSON, University of Wisconsin-Madison — Si/SiGe heterostructures are one of the promising matrices for electron spins as qubits in a silicon-based quantum computer. Many electron spin resonance (ESR) measurements have been done to characterize 2D electron spins embedded in such structures at temperatures above 2 K. Here we report the first CW and pulsed ESR experiments in Si/SiGe heterostructures in a ^{3}He system at 350 mK. Electron beam lithography was used to pattern a large area (16 mm^2) of a CVD grown modulation doped Si/SiGe quantum well (QW) into an array of ∼100 nm quantum dots (300 nm pitch) which has been wet etched about half-way through the doped layer. In the dark, only one signal is observed, which shows a Curie-like temperature dependence indicative of isolated spins. After brief illumination, two more signals appear: a line having the same g-factor as an unpatterned QW sample (g=2.0003) and another line which disappears upon annealing to 20 K. The first of these lines (g=2.0003) shows a Pauli temperature dependence consistent with many-electron quantum dots, and a T_2 relaxation time of about 150 ns at 350 mK. The origin of these ESR signals and their relaxation mechanisms will be discussed.

[1]Supported by LPS/ARO

Jianhua He

Date submitted: 21 Nov 2008 Electronic form version 1.4