Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Coherent Population Trapping of an Electron Spin in a Singly-Charged Quantum Dot[1] XIAODONG XU, BO SUN, PAUL R. BERMAN, DUNCAN G. STEEL, The Physics Department, The Univ. of Michigan, ALLAN S. BRACKER, DAN GAMMON, Naval Research Lab, LU J. SHAM, The Physics Department, The Univ. of California, San Diego — When two radiation fields drive coupled transitions in a three-level lambda system, a steady-state coherent superposition of the ground states can be formed in which the system is totally decoupled from the applied fields, a process that is sometimes referred to as coherent population trapping (CPT). Here we report the demonstration of the CPT of an electron spin in a singly-charged quantum dot. By applying a magnetic field in the Voigt geometry, we create a three-level lambda system, formed by two Zeeman sublevels of an electron spin and an intermediate trion state. As we tune the driving and probe fields to the two-photon Raman resonance, we observe a pronounced dip in the probe absorption spectrum, indicating the CPT of the electron spin. An arbitrary superposition of the electron spin states can be prepared by varying the ratio of the Rabi frequencies between the driving and probe fields. This work shows that spin based semiconductor quantum dot systems can exhibit the same interesting quantum behavior that has been found in simple atom-field systems.

[1]This work was supported in part by U.S. ARO, AFOSR, ONR, NSA/LPS, and FOCUS-NSF.

Xiaodong Xu
The Physics Department, The Univ. of Michigan

Date submitted: 29 Nov 2007 Electronic form version 1.4