Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Optically-Detected Electron Spin Resonance of Self-Assembled InAs Quantum Dots JOHN S. COLTON, AARON MITCHELL JONES, STEVE BROWN, SCOTT THALMAN, DALLAS SMITH, Brigham Young University, ALLAN BRACKER, Naval Research Laboratory — Optically-detected magnetic resonance (ODMR) of electron spins has been performed on self-assembled InAs quantum dots. A cw probe laser was used to monitor the Kerr rotation of a subset of the dots (those resonant with the laser) as microwaves induce transitions between spin states, separated by ∼12 GHz at ∼1.8 T. At high powers (optical and microwave), the ODMR response seems to be a jumble of peaks superimposed on each other. At low powers, however, individual peaks can be resolved. And, at the lowest power a single ODMR peak is evident. The g-factor and T_2^* value obtained from the lowest power ODMR peak position and width were $|g| = 0.485$ and $T_2^* = 3$ ns. This lifetime is consistent with hyperfine effects rather than inter-dot inhomogeneity being the limiting factor. By way of comparison, measurements from time-resolved Kerr rotation indicated a T_2^* of 1 ns at small fields, which decreased to less than 0.5 ns at 2 T due to inhomogeneities in the g-factor. Both of these observations are consistent with the hypothesis that at the lowest powers, we are seeing a response from a very small number of homogeneous quantum dots, possibly even an individual quantum dot.

John Colton
Brigham Young University

Date submitted: 20 Nov 2009 Electronic form version 1.4