Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Transient Absorption Spectroscopy for the Detection of Multi-exciton States in Semiconductor Quantum Dots[1] AMANDA NEUKIRCH, OLEG PREZHDO, University of Rochester — It has been shown that excitations of quantum dots at photon energies well above the band gap can produce a superposition of single exciton (SE) and multiple exciton (ME) states. The resulting electron hole dynamics can then be monitored using transient absorption (TA) spectroscopy. We have modeled the TA signal that can be expected when $Pb_{68}Se_{68}$ and $Si_{29}H_{24}$ are excited, and subsequently probed with attosecond laser pulses. In the proposed experiment a pump pulse serves to excite the sample. The energy of the probe pulse is chosen such that any detected absorption is attributable to the presence of a ME state. Oscillations in the absorption spectrum indicate the existence of a coherent superposition. The period of the oscillation depends on the energy difference between the superimposed states. We explore how dephasing of this signal is affected by the temperature of the system, as well as the number of states involved. We predict what can and cannot be measured experimentally and propose specific attosecond experimental scenarios.

[1]This work was supported by NSF grant number CHE-1050405.

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Date submitted: 03 Nov 2011 Electronic form version 1.4