

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Coherent coupling and energy transfer enhancement via multi-exciton levels in semiconductor nanocrystals AMEENAH AL-AHMADI, Department of Physics, Umm Al-Qura University, SA, SERGIO ULLOA, Department of Physics and Astronomy, Ohio University, Athens, OH — The theory of coherent energy transfer (ET) in nanocrystal (NC) systems [1] is generalized for multiexciton levels. The relevant excitonic states in an isolated NC can be described by an effective four-level system, consisting of the ground level, two degenerate single exciton levels, and the biexciton level. We study the dynamics of a single donor-acceptor pair via the equation of motion for the density matrix of the system and consider analytical limits as well as numerical solutions. We show that the enhancement of the ET efficiency introduced by the biexciton levels is limited due to the coherent coupling of the exciton-biexciton levels in the donor-acceptor pair. The saturation of the ET rate in the donor-acceptor pair suggests a new mechanism to control the dipole-dipole coupling strength in NC systems, and we present here its dependence on structure parameters.

[1] A. N. Al-Ahmadi and S. E. Ulloa, Phys. Rev. B **70**, 201302(R) (2004).

Ameenah Al-Ahmadi
Department of Physics, Umm Al-Qura University, SA

Date submitted: 29 Nov 2007

Electronic form version 1.4