Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Quantum confined stark effect in non-identical InAs/GaAs coupled quantum dots: Dependence on vertical electrical field[1] MUHAMMAD USMAN, GERHARD KLIMECK, NCN Purdue University West Lafayette IN — InAs/GaAs coupled quantum dot (QDs) have gained much attention for optical and quantum computing applications. Due to strain, originating from assembly of lattice- mismatched semiconductors, quantum dot tend to grow in the vertical direction. These stacked QDs are strongly coupled through strain field, which is atomistically inhomogeneous and penetrates deep into GaAs buffer layer surrounding the dots. Piezoelectric field must be taken into account to properly model the experimentally observed symmetry breaking and a global shift in the energy spectra of the system. Vertical electrical field applied in the growth direction results in the red shift of emission spectra due to the quantum confined stark effect. Previous studies are based on kp method that ignore the crystal symmetry, optical anisotropy and piezoelectricity effects. In this work, we apply a twenty band $sp^3d^5s^*$ atomistic tight binding model to study the experimentally observed red shift of emission spectra resulting from an applied electrical field. We quantitatively compare the results for coupled QDs with the results for single QD.

[1]nanoHUB.org computational resources are used.

Muhammad Usman
NCN Purdue University West Lafayette IN

Date submitted: 29 Nov 2008 Electronic form version 1.4