Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Self-Consistent Approach for Calculations of Exciton Binding Energy in Quantum Wells VLADIMIR SHUVAYEV, LEV DEYCH, ALEXANDER LISYANSKY, Queens College of CUNY, ILYA PONOMAREV, Naval Research Laboratory — We develop a new approach to calculations of exciton properties in QW which takes into account an renormalization of QW confining potential by electron-hole Coulomb interaction. For narrow QW this approach gives lower values for exciton binding energies than traditional variational methods, and predicts a modification of absorption spectrum in the spectral region of barrier absorption edge. The method is based on the Hartree-type variational calculations, in which effective electron-hole potential and confining potentials for the motion in the growth direction are calculated in a self-consistent way. The method is flexible enough to take into account such effects as dielectric constant and mass mismatches between well and barrier materials. The former is incorporated by including image charges in a dielectric medium with planar geometry, while the latter is taken into account in a standard way through modification of boundary conditions for electron and hole 1D wave functions along QW growth direction.

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Date submitted: 30 Nov 2004 Electronic form version 1.4