Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Effect of Helical Perturbation on Exciton Binding Energy in Semiconducting Carbon Nanotubes BENJAMIN TAYO, SLAVA ROTKIN, Dept. of Phys., Lehigh University — Exciton binding energy in the presence of an external DNA-induced helical potential is studied. Exciton energies are obtained by solving the Bethe-Salpeter equation within the tight-binding approximation. The quasi-particle wavefunctions and energies which enter the Bethe-Salpeter equation are "dressed" by the one-electron helical potential. This external potential, produced by helical DNA-wrapping, is modelled by applying a perturbation operator of the Coulomb interaction which breaks both translational and rotational symmetry. This lowering of symmetry induced by DNA-wrapping has far-reaching effects: the DNA changes the band gap of the nanotube thus modulating its electronic and optical properties. For instance, the helical perturbation uplifts the degeneracy on the angular momentum quantum number m. The role of these effects for an exciton is elucidated.

Benjamin Tayo
Dept. of Phys., Lehigh University

Date submitted: 20 Nov 2008 Electronic form version 1.4