Abstract Submitted
for the APR13 Meeting of
The American Physical Society

Two-body problem in graphene ROMAN YA. KEZERASHVILI, OLEG L. BERMAN, New York City College of Technology, City University of New York, KLAUS ZIEGLER, Institut für Physik, Universität Augsburg — The description of excitons in graphene as a bound electron and hole using two dimensional Dirac equation is presented. We introduce a transformation to decouple the center-of-mass motion and the relative motion and analyze the two body problem with action-at-a-distance inter-particle Coulomb potential in a gapped graphene sheet. Then turn to a problem of two Dirac particles in two-layer graphene sheets separated by a dielectric, assuming that exciton in this system is formed by the electron located in the one graphene sheet and the hole located in the other. Assuming that interaction potential and both relative and center-of-mass kinetic energies are small compared to the gap energy, the analytical solution for the wave functions and energy spectrum of the exciton are found. The advantage of the consideration of exciton formed by an electron and a hole from two different graphene layers, separated by an insulating slab, is that the dielectric slab creates the barrier for the electron-hole recombination which increases the life-time of the exciton compared to the exciton formed by an electron and a hole in a single graphene layer.

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Date submitted: 14 Jan 2013 Electronic form version 1.4