Abstract Submitted
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Binding energy of the trion complex in carbon nanotubes[1] AREG MELIKSETYAN, IGOR BONDAREV, North Carolina Central University — We derive an analytical expression for the binding energy of the trion complex (charged exciton) in small diameter (∼1nm) carbon nanotubes. We use the (asymptotically exact) Landau-Herring approach [1,2] that was previously implemented by one of us (Ref.[3]) to evaluate the biexciton binding energy in carbon nanotubes. Within this approach, we find the universal asymptotic relationship between the trion, biexciton and exciton binding energies in the same carbon nanotube. Particularly, the trion binding energy we obtained is estimated to be greater than the corresponding biexciton binding energy by a factor ∼1.5 for carbon nanotubes with diameters ∼1nm, which reasonably agrees with the latest non-linear optical spectroscopy measurements reported in Refs.[4] and [5] (1.46 for the (6,5) nanotube and 1.42 for the (9,7) nanotube, respectively).

[1] L.D.Landau, E.M.Lifshitz, Quantum Mechanics (Pergamon, Oxford, 1991);
[2] C.Herring, Rev. Mod. Phys. 34, 631;
[3] I.V.Bondarev, PRB 83, 153409;
[4] B.Yuma et al., PRB 87, 205412;
[5] L.Colombier et al., PRL 109, 197402.

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