Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Strong exciton-plasmon coupling in double walled semiconducting carbon nanotubes.[1] ADRIAN POPESCU, IGOR BONDAREV, North Carolina Central University — We demonstrate theoretically the strong near-field exciton-plasmon coupling in a double walled semiconducting carbon nanotube (CN) system, in which the exciton residing on one tubule interacts with the near field of an interband plasmon resonance of the other concentric tubule. Because of the peculiar quasi-one-dimensional character of small-diameter CNs, both excitons and interband plasmons can coexist in the same energy range of about 1 eV in these structures[1]. Since the peak positions of the exciton and plasmon resonances are determined by the respective CN chirality indexes[2], the double walled CN combinations can be selected appropriately to have the overlapping exciton and plasmon resonances. We describe the details of the exciton-plasmon interactions in such systems, derive analytic solutions for the coupled exciton-plasmon quasiparticle dispersion, and calculate the fractions of excitons and plasmons to form hybridized quasiparticle states. We also discuss the possibility for the exciton Bose-Einstein condensation in these structures, using the analysis reported earlier for single wall CNs[3]. – [1]I.V.Bondarev, K.Tatur, L.M.Woods, PRB 80, 085407 (2009); [2]I.V.Bondarev, PRB 85, 035448 (2012); [3]I.V.Bondarev, A.V.Meliksetyan, PRB 89, 045414 (2014).

[1]NSF-ECCS-1306871 (A.P.), DOE-DE-SC0007117 (I.B.)

Igor Bondarev
North Carolina Central University

Date submitted: 06 Nov 2016 Electronic form version 1.4