Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Exciton Emission under Strong Exciton-Plasmon Coupling in Carbon Nanotubes[1] IGOR BONDAREV, North Carolina Central University, LILIA WOODS, KEVIN TATUR, University of South Florida — We study theoretically the interactions of excitonic states with surface electromagnetic modes of small-diameter (∼1nm) semiconducting single-walled carbon nanotubes (CNs). We show that these interactions can result in strong exciton-interband-surface-plasmon coupling in individual CNs. This results in the exciton emission line (Rabi) splitting ∼0.1eV as the exciton energy is tuned to the nearest interband plasmon resonance of the CN [1]. The exciton-plasmon coupling strength we predict for individual CNs is close to that previously reported for hybrid plasmonic nanostructures artificially fabricated of organic semiconductors on metallic films [2]. The quantum confined Stark effect with an electrostatic field applied perpendicular to the CN axis can be used to control the exciton-plasmon coupling, and the exciton emission accordingly [3]. We expect this effect to open up paths to new tunable optoelectronic device applications of small-diameter semiconducting CNs.

[1] I.V.Bondarev, K.Tatur, L.M.Woods, Optics Commun. 282, 661 (2009). [2] J.Bellessa, et al., Phys. Rev. Lett. 93, 036404 (2004). [3] I.V.Bondarev, L.M.Woods, K.Tatur, Phys. Rev. B 80, 085407 (2009).

[1]NSF support acknowledged (ECS-0631347, HRD-0833184).

Igor Bondarev
North Carolina Central University

Date submitted: 12 Nov 2009 Electronic form version 1.4