Exciton Emission under Strong Exciton-Plasmon Coupling in Carbon Nanotubes\textsuperscript{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 (\(\sim 1\text{nm}\)) 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 \(\sim 0.1\text{eV}\) as the exciton energy is tuned to the nearest interband plasmon resonance of the CN \cite{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 \cite{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 \cite{3}. We expect this effect to open up paths to new tunable optoelectronic device applications of small-diameter semiconducting CNs.

\textsuperscript{1} NSF support acknowledged (ECS-0631347, HRD-0833184).