Abstract Submitted
for the 4CF09 Meeting of
The American Physical Society

Using Carbon Nanotubes for Nanometer-Scale Energy Transfer Microscopy[1] JESSICA JOHNSTON, EYAL SHAFRAN, BEN MANGUM, CHUN MU, JORDAN GERTON, University of Utah, Department of Physics and Astronomy — We investigate optical energy transfer between fluorophores and carbon nanotubes (CNTs). CNTs are grown on Si-oxide wafers by chemical vapor deposition (CVD), lifted off substrates by atomic force microscope (AFM) tips via Van der Waals forces, then shortened by electrical pulses. The tip-attached CNTs are scanned over fluorescent CdSe-ZnS quantum dots (QDs) with sub-nm precision while recording the fluorescence rate. A novel photon counting technique enables us to produce 3D maps of the QD-CNT coupling, revealing nanoscale lateral and vertical features. All CNTs tested (>50) strongly quenched the QD fluorescence, apparently independent of chirality. In some data, a delay in the recovery of QD fluorescence following CNT-QD contact was observed, suggesting possible charge transfer in this system. In the future, we will perform time-resolved studies to quantify the rate of energy and charge transfer processes and study the possible differences in fluorescence quenching and nanotube-QD energy transfer when comparing single-walled (SW) versus multi-walled (MW) CNTs, attempting to grow substrates consisting primarily of SW or MWCNTs and characterizing the structure of tip-attached CNTs using optical spectroscopy.

[1]NSF Grant # DBI-0845193

Jessica Johnston
University of Utah, Department of Physics and Astronomy

Date submitted: 29 Sep 2009 Electronic form version 1.4