Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Probing light-matter interactions in plasmonic nanostructures with a single quantum dot CHAD ROPP, ZACHARY CUMMINS, SANGHEE NAH, JOHN T. FOURKAS, BENJAMIN SHAPIRO, EDO WAKS, University of Maryland — Understanding and controlling the interactions between single quantum emitters and plasmonic nanostructures is important for a wide variety of applications in quantum optics and nanophotonics. Metal nanostructures provide subwavelength confinement of electromagnetic fields in the form of surface plasmon polaritons, which can enhance optical nonlinearities for improved light-matter interactions. In this talk we will present recent results on nano-manipulation of single colloidal quantum dots (QDs) for deterministic probing of light-matter interactions in plasmonic nanostructures. Single QDs are manipulated using a combination of microfluidics and engineered fluid chemistry. We achieve deterministic positioning with 50 nm accuracy and demonstrate probing of the surface plasmon mode of a silver nanowire. Spatially variant interactions are quantified by measuring the coupling rate of the QD into the wire mode as well as changes to the QD emission lifetime. The resulting interactions are resolved with nanoscale resolution and reveal features such as the evanescent field decay away from the wire surface and interference along the wire length.

Chad Ropp
University of Maryland

Date submitted: 09 Nov 2012 Electronic form version 1.4