Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Wavelength-dependent super-resolution imaging of dye molecules coupled to plasmonic nanotriangles. ESTHER WERTZ, Rensselaer Polytechnic Institute, BENJAMIN ISAACOFF, JULIE BITEEN, University of Michigan —

The emission properties of fluorescent molecules are strongly affected by nearby plasmonic nanoparticles which act as optical nanoantennas. By studying the changes in the single-molecule emission properties, we can learn about the interactions of the fluorophore with its environment. Here, we probe the effects of the excitation and emission wavelengths on the emission patterns from dye molecules coupled to plasmonic nanotriangles, using single-molecule super-resolution imaging. This technique allows the localization of an emitter with a precision much greater than the diffraction limit, by fitting the emission profile to the microscope point-spread function. In order to compare the relative effects of excitation versus emission enhancement, we successively vary laser excitation wavelength, dye emission and absorbance spectra, and local surface plasmon resonance frequency. We demonstrate that the emission pattern is dramatically changed when coupling occurs, and that the emission wavelength of the dye is strongly shifted towards the resonance of the particle it is coupled to. Finally, we show and that large coupling between the dye and gold nanotriangle happens even in the absence of strong intensity enhancement, illustrating the power of super-resolution techniques to investigate light-matter interactions at the nanoscale.

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Date submitted: 11 Nov 2016

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