Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Plasmon-Enhanced Single-Molecule Fluorescence for Sub-Diffraction-Limited Imaging ESTHER WERTZ, JESSICA DONEHUE, JULIE BITEEN, University of Michigan — Super-resolution microscopy is a powerful tool for noninvasively imaging biological structures below the standard diffraction limit of light. One such technique, single-molecule fluorescence (SMF) imaging, achieves this resolution gain based on localizing isolated fluorophores. The accuracy of such localizations increases as the number of photons collected from each fluorophore increases. The ability to engineer the fluorescence quantum yield, radiative decay rate, and photostability of emitters will therefore greatly enhance the image resolution. In this work, we control SMF by coupling emission to plasmon resonances in metallic nanoparticles. These localized surface plasmons are confined charge density oscillations, and the local enhanced electromagnetic field they generate can be used to reduce the radiative lifetime and improve fluorophore brightness and photostability. We explore the effects of particle plasmons on the fluorescence properties of single dye molecules through wide-field single-molecule microscopy and fluorescence lifetime imaging microscopy experiments. All measurements are made both in the presence and absence of gold plasmonic structures. We observe up to ten-fold enhancements in photostability upon coupling to nanostructured gold, indicating that plasmon-enhanced imaging is a promising means to increase the resolution of single-molecule microscopy. We will extend our current experiments on dyes and quantum dots to fluorescent proteins.

Esther Wertz
University of Michigan

Date submitted: 09 Nov 2011 Electronic form version 1.4