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Super Resolution Measurements of the Near-Field Coupling of the Polarized Modes of Gold Nanorods to Fluorescent Emitters BENJAMIN ISAACOFF, JESSICA DONEHUE, JULIE BITEEN, Univ of Michigan - Ann Arbor — The localized surface plasmon resonances of metal nanoparticles result in complex light-matter interactions that depend strongly on the nanoparticle geometry. In this work, we use single-molecule super-resolution imaging and single-particle spectroscopy to study the polarization dependent response of gold nanorods (GNRs), which support two orthogonal plasmon modes. Furthermore, we measure the emission intensity and polarization of single fluorescent molecules coupled to the GNR as a function of excitation polarization and spectral overlap with the GNR modes. Based on such differential excitation, we demonstrate polarization control of plasmon-enhanced fluorescence from single molecules coupled to single nanoparticles. These experiments are compared with broadband finite-difference time domain (FDTD) simulations studying the role of fluorophore position and orientation, revealing the underlying mechanisms of this coupling. These super-resolution measurements and the associated simulations demonstrate how polarization can be used to actively control nanoparticle plasmonics and opens the door to a new framework for controlling and optimizing nanoparticle-fluorophore interactions.

Benjamin Isaacoff
Univ of Michigan - Ann Arbor

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