Abstract Submitted
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**Giant fluorescence enhancement of fluorophores coupled to nanopatch antennas**[1] MAIKEN H. MIKKELSEN[2], ALEC ROSE, THANG B. HOANG[3], FELICIA MCGUIRE, JACK J. MOCK, CRISTIAN CIRACì, DAVID R. SMITH, Center for Metamaterials and Integrated Plasmonics, Department of Electrical and Computer Engineering, Duke University, Durham, NC 27708 — Plasmonic cavities and nanoantennas have proven to be particularly attractive candidates for modifying the excitation and decay rates of nearby emitters. Here, we demonstrate giant enhancement of fluorescence in planar nanoparticles electromagnetically coupled to a metallic film, resembling nanopatch antennas. The antennas consist of colloidally synthesized silver nanocubes deposited over a 50 nm silver film. The cubes and film are separated by a $\sim 5$ nm selfassembled polyelectrolyte spacer layer, coated with a dilute layer of fluorophores (sulfo-cy5 carboxylic acid). By varying the size of the nanocubes, we tune the plasmonic resonance throughout the excitation and emission spectra of the embedded fluorophores, demonstrating a seamless transition between fluorescence enhancement and quenching. The experimentally observed behavior agrees well with performed finite-element simulations. Using this tunable platform, design rules for optimal enhancement are revealed, allowing us to demonstrate giant fluorescence enhancements and a significantly increased spontaneous emission rate.

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