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Coupled Quantum Dot-Metal Nanoparticle Systems: Hybrid Behavior and Excitation Transport RYAN ARTUSO, University of Maryland-College Park, GARNETT BRYANT, National Institute of Standards and Technology — Transmission of information between qubits for quantum communication and quantum computing will require directed nanoscale transmission where the quality of the information can be maintained. One paradigm proposes to achieve directed nanoscale transmission by coupling qubits, for example in quantum dots, to plasmonic nanoantennas or nanoguides made from metallic nanowires and nanoparticles. We study theoretically the response of hybrid nanostructure molecules consisting of multiple semiconductor quantum dots (SQD), and metal nanoparticles (MNP) subject to an applied optical field. We consider the situation where the SQDs interact directly without an MNP and the case in which the interaction is mediated by a MNP. We find modifications to the previously predicted SQD-MNP hybrid response. We also find a new regime of behavior in which breaking the SQD-SQD identical particle symmetry causes the system to no longer reach a steady state and instead oscillate at a beating frequency. Lastly, we identify the effects that MNP size and shape, and the placement of the SQDs have on the SQD-SQD interaction.

Ryan Artuso
University of Maryland-College Park

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