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Optically-controlled plasmonic gate to modify the dielectric environment of semiconductor quantum dots MATT SEATON, YANWEN WU, Univ of South Carolina, NAVAL RESEARCH LABORATORY COLLABORATION, TAMPERE UNIVERSITY OF TECHNOLOGY COLLABORATION —
The detailed coupling between single quantum emitters and nearby plasmonic modes is an open area of research in the field of plasmonics. A lot of research is being done to study direct coupling effects between these two systems. In this talk I will instead focus on experimental aspects which indirectly affect their interaction. In a system of semiconductor InGaAs quantum dots very weakly coupled to a silver plasmonic structure, we observe effects similar to the quantum-confined Stark effect. This suggests the presence of a local dc electrical field generated by the launching of surface plasmon polaritons (SPPs) along the silver/GaAs interface. To understand this effect, we consider the electric field interaction between the SPPs and free carriers in the dielectric from the above band-gap optical excitation, as well as free charge carrier effects in the silver including phenomena such as an enhanced photon drag effect or plasmonic drag.

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