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Optical Response of Strongly Coupled Quantum Dot-Metal Nanoparticle Systems: Double Peaked Fano Structure and Bistability RYAN ARTUSO, University of Maryland College Park, GARNETT BRYANT, NIST, Gaithersburg — We study the optical response of a semiconductor quantum dot (SQD) coupled with a metal nanoparticle (MNP). In particular, we explore the relationship between the size of the constituents and the response of the system. We identify, three distinct regimes of behavior in the strong field limit that each exhibit novel properties. In the first regime, we find that the energy absorption spectrum displays an asymmetrical Fano shape (as previously predicted). It occurs when there is interference between the applied field and the induced field produced by the SQD at the MNP. When the coupling is increased by increasing the size of the SQD, we find a double peaked Fano structure in the response. This second peak occurs when the induced field becomes stronger than the external field. As the coupling is further increased by increasing the sizes of both the SQD and the MNP, we find a regime of bistability. This originates when the self-interaction of the SQD becomes significant. We explore these three regimes in detail and set bounds on each.

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