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A Self-Consistent Scheme for Optical Response of large Hybrid Networks of Semiconductor Quantum Dots and Plasmonic Metal Nanoparticles BERNARDO BARBIELLINI, L. HAYATI, C. LANE, A. BANSIL, H. MOSALLAEI, Northeastern Univ. — We discuss a self-consistent scheme for treating the optical response of large, hybrid networks of semiconducting quantum dots (SQDs) and plasmonic metallic nanoparticles (MNPs). Our method is efficient and scalable and becomes exact in the limiting case of weakly interacting SQDs. The self-consistent equations obtained for the steady state are analogous to the Heisenberg equations of motion for the density matrix of a SQD placed in an effective electric field computed within the discrete dipole approximation (DDA). Illustrative applications of the theory to square and honeycomb SQD, MNP and hybrid SDQ/MNP lattices as well as SQD-MNP dimers are presented. Our results demonstrate that hybrid SQD-MNP lattices can provide flexible platforms for light manipulation with tunable resonant characteristics.

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