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Entanglement of Two, Three, and Four Quantum Dots in Hybrid Quantum Dot/Plasmonic Systems MATTHEW OTTEN, Department of Physics, Cornell University, Ithaca, NY and Mathematics and Computer Science Division, Argonne National Laboratory, Argonne, IL, RAMAN SHAH, NORBERT SCHERER, Department of Chemistry and The James Franck Institute, The University of Chicago, Chicago, IL, MISUN MIN, Mathematics and Computer Science Division, Argonne National Laboratory, Argonne, IL, MATTHEW PELTON, Department of Physics, University of Maryland, Baltimore County, Baltimore, MD, STEPHEN GRAY, Center for Nanoscale Materials, Argonne National Laboratory, Argonne, IL — We use cavity quantum electrodynamics to study systems composed of two, three, and four two-state quantum dots in proximity to a plasmonic system such as a metal nanoparticle or an array of metal nanoparticles. We find that significant essential (all dot) entanglement, as measured by concurrence, in the two and four quantum dot cases is possible. At present the three quantum dot case lacks an easily applied measure of entanglement, but multiple bipartite entanglements are demonstrated. Moreover, we show that one can induce entanglement in two and three quantum dot systems starting from the ground state by use of pulsed excitations. These results represent a promising advance for the eventual use of quantum dots, coupled to one another through a dissipative structure such as a plasmonic system, in quantum computation.

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