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Decay of stationary entanglement mediated by one-dimensional plasmonic nanoarrays

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Metal nanoparticles have been shown to be good mediators for entanglement generation in plasmonically-coupled quantum dot qubits. These mediators enable entanglement to be sustained over long qubit-qubit distances. We investigate the impact of the number of mediating particles on the generation of bipartite entanglement by considering both parallel and perpendicular nanoarrays with respect to the interaction axis of the qubits and the polarization of the driving field. The plasmonically-coupled qubits were investigated within the framework of cavity quantum electrodynamics. The metal nanoparticles were arranged in a collinear fashion using a periodic spacing and a particle size that allow their interactions to be treated within the dipole approximation. We employ an effective approach that enables the investigation of plasmon-mediated stationary entanglement in the coupled qubits. We show that our approach agrees with simulations. The degree of stationary entanglement was found to decay exponentially with increase in the number of mediating particles in the nanoarray.

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