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Coherent control of multipartite excitonic entanglement in quantum dot arrays JUAN E. ROLON, JOAQUIN E. DRUT, University of North Carolina at Chapel Hill — We propose a coherent control scheme for multipartite entanglement of exciton states in optically driven quantum dot arrays (QDAs) coupled by charge tunneling and resonant energy transfer (RET) processes. An adiabatic manipulation of the entanglement dynamics is devised by pulse shaping and time-dependent electric field sweeps. By varying the inter-dot distance and number of quantum dots (QDs) comprising the QDA, the excitonic qubit manifolds are obtained by a Feshbach projection over the resulting multilevel exciton configurations. We identify regimes in which the dynamics is confined to decoherence-free excitonic qubit manifolds taking into account spontaneous recombination and non-Markovian effects introduced by a phonon bath. We present results for entanglement monotones and measures such as the entanglement of formation and entanglement entropy for different QDA geometries and carrier injection conditions. Our results indicate that in spite of the effects of phonon-assisted relaxation, entanglement can be optimized and transferred between QDs by the controlled interplay of system geometry, pulse shaping, RET and carrier tunneling.

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