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Creation of entangled exciton states in coupled quantum dots[1] CELESTINO CREATORE, RICHARD T. BRIERLEY, RICHARD T. PHILLIPS, PETER B. LITTLEWOOD[2], Cavendish Laboratory, University of Cambridge, JJ Thomson Avenus, CB3 0HE, Cambridge, UK, PAUL R. EASTHAM, School of Physics, Trinity College, Dublin 2, Ireland — Quantum state preparation through external control is fundamental to established methods in quantum information processing and in studies of dynamics. In this respect, systems such as excitons in semiconductor quantum dots (QDs) are of particular interest since they can be easily driven to a particular state through the coherent interaction with a tuned optical field such as an external laser pulse. Here we propose to use adiabatic rapid passage (ARP) to excite entangled states in an ensemble of coupled quantum systems. The ARP protocol makes use of optical pulses with both frequency and temporal modulation and it is an efficient method to achieve population inversion in quantum dot ensembles as it is robust with respect to fluctuations in coupling and detuning. We explore this problem using a generalized t-J Hamiltonian to model an interacting many-dot system described in terms of hard-core bosons. Our quantitative analysis shows that ARP can be successfully implemented to create entangled states in a realistic ensemble of inhomogeneously distributed QDs.

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