Abstract Submitted
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Adiabatic rapid passage in single InGaAs quantum dots: Towards a method of "incoherent control" PETER BRERETON[1], MEGAN STANLEY, ALEXANDRA GRAHAM, BARBARA VAN HATTEM, PIERRE CORFDIR, AMOP Group, University of Cambridge, ISOBEL HOUGHTON, Bristol University, YANWEN WU, University of Texas Austin, MARK HOPKINSON, University of Sheffield, RICHARD PHILLIPS, AMOP Group, University of Cambridge — Adiabatic rapid passage (ARP) using frequency-swept optical pulses was shown to invert an InGaAs quantum dot from the ground state to the neutral exciton state [1,2]. As in atomic systems, ARP couples the confined electronic states of a quantum dot to a pulse that is chirped to sweep through resonance. If the sweep rate is slow with respect to the instantaneous Rabi frequency but faster than any decay rates, the dressed state of the system will adiabatically switch from one bare state to the other. Damping of the ARP inversion suggests confirmation of theoretical predictions of the effect of phonon-assisted dephasing [3]. ARP allows a train of chirped pulses to control the population state of a quantum dot without the need for locking the relative phase of the pulses. Each pulse pair will effectively drive the state vector through a 2π rotation on the Bloch sphere, regardless of the relative phase. Initial work toward this method of 'incoherent control' is presented, showing an enhancement of the photocurrent under excitation with two chirped pulses separated by greater than the electron tunneling time. [1] Y. Wu, et al, PRL 106, 067401 (2011). [2] C.-M. Simon, et al PRL, 106, 166801 (2011). [3] A. Debnath, et al PRB, 86, 161304 (2012).

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