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Spin Coherence Modulated Trion Transitions and Probabilistic Initialization in Charged Semiconductor Quantum Dots[1] YANWEN WU, ERIK KIM, XIAODONG XU, JUN CHENG, DUNCAN STEEL, The H. M. Randall Laboratory of Physics, University of Michigan, Ann Arbor, MI 48109, SOPHIA ECONOMOU, LU SHAM, Department of Physics, University of California, San Diego, La Jolla, California, 92093-0319, DAN GAMMON, ALAN BRACKER, The Naval Research Laboratory, Washington D.C. 20375 — The presence of symmetry breaking in a three-level Λ system consisting of two spin ground states and a charged exciton (trion) state leads to new features, where the population excited to the trion state is modulated by the spin coherence. This phenomenon is due to the unique semiconductor environment of the quantum dot (QD) system, which allows for two simultaneously orthogonal spinor axes. In addition, the polarization dependent excitations due to the double spinor axes of the system can be utilized to create a net spin from a completely mixed spin state, which is impossible to achieve through unitary operation of the spin system. This result provides an important application to the practical implementation of ultrafast spin based quantum computation in the semiconductor QD system in terms of qubit initialization.

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