Abstract Submitted
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**Resilient neutral exciton qubits in self-assembled quantum dot molecules**[1] J.E. ROLON, S.E. ULLOA, Ohio University — We investigate the optical coherent manipulation of neutral indirect excitonic qubits in self-assembled quantum dot molecules (QDMs) [1]. Our studies include initialization with near unity fidelity, state shelving and rotations. A numerical Lindblad master equation approach, as well as analytical Feshbach self-consistent projection, allows us to extract the effective qubit dynamics and decoherence times. Near resonant excitation and electric field pulses drive vacuum-indirect transitions mediated by virtual levels outside the qubit subspace. Subsequent adiabatic pulses drive the initial state into a level anticrossing, where the qubit is controllably rotated by the internal dynamics of the system. The qubit subspace is surprisingly well isolated from external driving fields and is resilient to spontaneous exciton recombination. With low excitation power the dynamics is nearly coherent over hundreds of nanoseconds, while high excitation power produces virtual transitions mediated by biexciton states reducing somewhat the coherent time scales, but well within appropriate limits for quantum information processing. This opens the possibility of using indirect neutral exciton states as operating qubits, or auxiliary qubits within more complex quantum computation schemes in QDMs. [1] J.E. Rolon and S.E. Ulloa, Phys. Rev. B 79, 245309 (2009).

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