Abstract Submitted
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Spectral broadening of optical transitions in InAs/GaAs coupled quantum dot pairs[1] P. KUMAR, C. CZARNOCKI, C. JENNINGS, J. CASARA, A. L. MONTEROS, N. ZAHBIHI, M. SCHEIBNER, UC Merced, CA, S. E. ECONOMOU, Virginia Tech, Blacksburg, VA, A. S. BRACKER, B. C. PURSLEY, D. GAMMON, S. G. CARTER, Naval Research Laboratory, Washington, DC — The optical transitions in InAs/GaAs coupled quantum dot (CQD) pairs are investigated experimentally. These coupled dot systems provide new means to study the interaction of quantum states with the mechanical modes of the crystal environment.[i] Here, the line width and line shape of CQD optical transitions are analyzed in detail as a function of temperature, excitation power, excitation energy, and tunnel coupling strength. A significant line broadening, up to 25 times the typical lifetime-limited linewidth of single-dot excitons, is being observed at level anti-crossings where the coherent tunnel coupling between spatially direct and indirect exciton states is considerable. The experimental observations are compared with theoretical predictions where linewidth broadening at anti-crossings is attributed to the phonon assisted transitions, and found to be strongly dependent on the energy splitting of the two exciton branches.[ii] This work focuses on understanding the linewidth broadening due to the pure dephasing, and fundamental aspects of the interaction of these systems with the local environment. i.) M. Kerfoot et al., Nature Commun. 5, 3299 (2014); ii.) J. M. Daniels et al., Phy Rev B 88, 205307 (2013)

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