Abstract Submitted
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Quantifying Excitonic Coupling in Disordered Semiconductor Quantum Wells[1] ZHENG SUN, THOMAS JARVIS, XIAOQIN LI[2], Physics department, University of Texas-Austin, MIKHAIL EREMENTCHOUK, MICHAEL LEUENBERGER, NanoScience Technology Center and Department of Physics, University of Central Florida — Monolayer fluctuations in the thickness of a quantum well lead to the formation of different types of excitons (bound electron-hole pairs) clearly resolvable in an optical spectrum. Coherent coupling between these spectrally resolved exciton resonances may modify the statistics of photon emission or affect energy transfer processes. We study a prototypical disordered GaAs quantum well sample using the newly developed electronic two-dimensional Fourier transform spectroscopy. Our experiments permit for the first time a quantitative measurement of the coupling strength between exciton resonances. Our theoretical modeling suggests that strong coherent coupling may only be observed when the Coulomb correlation length is greater than both the disorder correlation and confinement lengths. This rule should be applicable to other disordered systems, e.g. molecular aggregates, where coherent coupling critically affects charge transfer processes.

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