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Effect of Disorder on Spectral Diffusion in GaAs Quantum Wells Studied Using Two-Dimensional Coherent Spectroscopy ROHAN SINGH, JILA, University of Colorado and NIST, Boulder, GALAN MOODY, NIST, Boulder, MARK E. SIEMENS, University of Denver, Denver, HEBIN LI, Florida International University, Miami, STEVEN T. CUNDIFF, JILA, University of Colorado and NIST, Boulder — Disorder exists in even the highest quality semiconductor quantum wells (QWs) due to well-width fluctuations. A consequence of this disorder is inhomogeneity in the energies of excitonic resonances. Once an ensemble of excitons is excited, spatial migration of the excitons results in redistribution of exciton energies, known as spectral diffusion. Spectral diffusion in QWs is typically modeled in the strong-redistribution approximation, which means that the exciton energy redistribution is assumed to be independent of the initial exciton energy. In the present work, we study spectral diffusion in GaAs QWs using two-dimensional coherent spectroscopy (2DCS). 2DCS is an extension of the three-pulse transient four-wave mixing technique where the signal is unfolded onto two (emission and absorption) energy axes. The redistribution of exciton energies can be directly measured using 2DCS. We find that the disorder localized and delocalized excitons exhibit different spectral diffusion characteristics, and the distinction is more prominent at low sample temperatures ($<$ 25 K). Our results show that the strong-redistribution approximation is not sufficient to explain spectral diffusion of excitons in QWs, especially at low temperatures.

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