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Coherent excitonic resonances of natural quantum dots studied with optical 2D Fourier transform spectroscopy MARK SIEMENS, GALAN MOODY, ALAN BRISTOW, XINGCAN DAI, DENIS KARAISKAJ, STEVEN CUNDIFF, JILA, National Institute of Standards and Technology and University of Colorado, Boulder CO, ALLAN BRACKER, DANIEL GAMMON, Naval Research Laboratory, Washington DC — Electronic structure and dynamics can be captured by optical 2D-Fourier-transform spectroscopy (2DFTS), which tracks the phase of the nonlinear signal during two time delays of a multi-pulse excitation sequence. We use optical 2DFTS [1] to study the coherent response of an ensemble of interfacial "natural" GaAs quantum dots (QD) [2], found within the monolayer fluctuations of a quantum well (QW). Low temperature (∼6K) spectra show excitonic resonances from both the QD and the QW. We simultaneously extract homogenous and inhomogeneous linewidths of both QW and QD states, indicating slow dephasing and size distribution in the QDs. Additionally, variation of the population time delay and lattice temperature reveals a coupling from the QW states to the lower energy QD mediated by incoherent phonon interactions.
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