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Reconstruction of many-body excitation configurations via nonlinear absorption in semiconductor quantum wells RYAN P. SMITH, ANDREW FUNK, JILA, University of Colorado, HANNO STEINER, Philipps-University, Marburg, Germany, JARED K. WAHLSTRAND, JILA, University of Colorado, MARTIN SCHAEFER, MACKILLO KIRA, STEPHAN KOCH, Philipps-University, Marburg, Germany, STEVEN CUNDIFF, JILA, University of Colorado, PHILIPPS-UNIVERSITY, MARBURG, GERMANY COLLABORATION — Detailed electronic many-body configurations are determined by analyzing quantitatively measured time-resolved nonlinear absorption spectra of resonantly excited GaAs quantum wells with a fully consistent microscopic theory. The measured reflection and transmission probabilities across a broad spectrum allowed a model of the sample structure to be fixed using a transfer matrix calculation. Quantitative comparison of co-linear and co-circular polarization pump-probe excitation schemes reveal consequences of spin selection rules on scattering. An observed strong transient probe gain is attributed to the optically induced coherent polarization under low dephasing conditions. Radiative and internal sources of dephasing are quantified. Unexpectedly, it is found that true exciton populations do not significantly contribute to spectral broadening whereas the strong resonance blue shifts are dominated by the excited carrier densities.

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