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Title:Theoretical study of density-dependent intraexcitonic transitions in optically excited quantum wells

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Abstract:We present a theoretical study of the terahertz-pulse-induced intraexcitonic dynamics of optically created excitons in quantum wells, providing an explanation of the density dependence of the 1s2p intraexcitonic transitions observed experimentally. We find that two types of many-body interactions, the phase space filling and the exchange interaction, are responsible for the observed red-shift of the resonance frequency. In addition to calculating the density renormalized exciton energy levels, which offer indirect information regarding the density-dependent 1s2p transitions, we developed a mean-field approach to examine the intraexcitonic transition process directly. The resulting dynamic equation provides a useful tool to gain insight into the intraexcitonic transitions in semiconductor nanostructures. © 2011 IOP Publishing Ltd.