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Coherent Interband and Intersubband Dynamics in Terahertz-Driven GaAs Quantum Wells

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Abstract: We theoretically investigate the optical absorption spectra and charge density by subjecting a GaAs quantum well to both an intense terahertz (THz)-frequency driving field and an optical pulse within the theory of density matrix. In presence of a strong THz field, the optical transitions in quantum well subbands are altered by the THz field. The alteration has a direct impact on the optical absorption and the charge density. The excitonic peak splitting and THz optical sideband in the absorption spectra show up when changing the THz field intensity and/or frequency. The Autler-Towns splitting is a result from the THz nonlinear dynamics of confined excitons. On the other hand, the carrier charge density is created as wave packets formed by coherent superposition of several eigenstates. The charge density exhibits quantum beats for short pulses and/or wider wells and is modulated by the THz field.

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