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Title:Optical Absorption and Electromagnetically Induced Transparency in Semiconductor Quantum well Driven by Intense Terahertz Field
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Abstract:An approach for solving the excitonic absorption in a semiconductor quantum well driven by an intense terahertz field is presented. The formalism relies on the stationary single-photon Schro¨dinger equation in the full quantum mechanical framework. The optical absorption dynamics in both weak and strong couplings are discussed and compared. The excitonic absorption spectra show the Autler-Townes doublets for the resonance terahertz field, a replica peak for the non-resonance terahertz field, and the electromagnetically induced transparency phenomenon for modulating the decay rate of the second electron state in the weak coupling. In particular, the electromagnetically induced transparency phenomenon window range is discussed. In the strong coupling region, the multi-order energy level resonance splitting due to the strong optical field is found. There are three (non-resonance terahertz field) or four (resonance terahertz field) peaks in the optical absorption spectra. This work provides a simple and convenient approach to deal with the optical absorption in the exciton system.
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Inspec controlled terms:absorption coefficients - excitons - Schrodinger equation - semiconductor quantum wells - Stark effect - transparency
Uncontrolled terms:optical absorption - electromagnetically induced transparency - semiconductor quantum well - excitonic absorption - stationary single-photon Schrodinger equation - full quantum mechanical framework - Autler-Townes doublets - nonresonance terahertz field - decay rate - second electron state - multiorder energy level resonance splitting
Inspec classification codes:A7820D Optical constants and parameters (condensed matter) - A7820J Electro-optical effects (condensed matter) - A7865 Optical properties of thin films and low-dimensional structures - A7135 Excitons and related phenomena - A7170E Spin-orbit coupling, Zeeman, Stark and strain splitting (condensed matter)
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