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Optical Conductivity of Impurity-Doped Parabolic Quantum Wells in an Applied Electric Field

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Abstract: The optical conductivity of impurity-doped parabolic quantum wells in an applied electric field is investigated with the memory-function approach, and the analytic expression for the optical conductivity is derived. With characteristic parameters pertaining to GaAs/$Ga_{1-x}Al_xAs$ parabolic quantum wells, the numerical results are presented. It is shown that, the smaller the well width, the larger the peak intensity of the optical conductivity, and the more asymmetric the shape of the optical conductivity; the optical conductivity is more sensitive to the electric field, the electric field enhances the optical conductivity; when the dimension of the quantum well increases, the optical conductivity increases until it reaches a maximum value, and then decreases.

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Key words: optical conductivity, parabolic quantum wells, impurity