

Abstract Submitted
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Indeterminate form 0/0 and tunneling in double quantum wells¹

IGOR FILIKHIN, BRANISLAV VLAHOVIC, North Carolina Central University
— We study single electron tunneling between localized and delocalized states in double InAs/GaAs quantum wells (DQWs). Spectral distribution of localized (or delocalized) states demonstrates high sensitivity on inter-dot distance. The tunneling goes consecutively from the higher energy levels to the ground state when the inter-dot distance decreases. The spectrum is presented by set of quasi-doublets and may be described by three parts: localized states, delocalized states, and states with different probability for localization in each QW of DQW. For the last states, the ratio $W/\Delta E$ of the wave functions overlapping integral W and the electron energy difference ΔE of isolated left and right QWs is a weight coefficient in the expansion of wave function on the basis of the wave functions of isolated QWs. In case of weakly coupled QWs in DQW the indeterminate form 0/0 takes a place for the electron wave function. It is found that a small violation of the DQW shape symmetry drastically affects tunneling. This effect also appears as a numerical instability calculations for small variations of input parameters of numerical procedure.

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Igor Filikhin
North Carolina Central University

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