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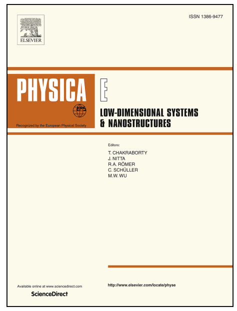

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Abstract

Field-induced transient current in one-dimensional nanostructures has been studied by a model of an electron confined in a 1D attractive Gaussian potential subjected both to electrodes at the terminals and to an ultrashort pulsed oscillatory electric field with the central frequency ω and the FWHM pulse width Γ. The time-propagation of the electron wave packet has been simulated by integrating the time-dependent Schrödinger equation directly relying on the second-order symplectic integrator method. The transient current has been calculated as the flux of the probability density of the escaping wave packet emitted from the downstream side of the confining potential. When a static bias-field E_0 is suddenly applied, the resultant transient current shows an oscillatory decay behavior with time followed by a minimum structure before converging to a nearly constant value. The ω-dependence of the integrated transient current induced by the pulsed electric field has shown an asymmetric resonance line-shape for large Γ while it shows a fringe pattern on the spectral line profile for small Γ. These observations have been rationalized on the basis of the energy-level structure and lifetime of the quasibound states in the bias-field modified confining potential obtained by the complex-scaling Fourier grid Hamiltonian method.

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