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Title:Tuning of terahertz intrinsic oscillations in asymmetric triple-barrier resonant tunneling diodes
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Abstract:Intrinsic terahertz oscillations of the electronic current in the asymmetric triple-barrier resonant tunneling diode are investigated by means of the time-dependent Wigner-Poisson method. The current-voltage characteristics calculated for the nanodevice exhibits four separate bias voltage windows with the current oscillations, which are caused by two different mechanisms. One of these bias voltage windows, for which the electronic current oscillations stem from the negative feedback between the electronic current and the coupled quasi-bound states in the quantum wells embedded in the active region of the nanodevice, is considered in detail. It is demonstrated that the amplitude and frequency of the current oscillations in this bias voltage window depend on the coupling between the quasi-bound states formed in the quantum wells. Strength of this coupling is controlled by the thickness of the central barrier separating the quantum wells, which allows to tune the amplitude and frequency of the terahertz oscillations. Additionally, it was shown that the amplitude of the current oscillations can be tuned by shifting up or down the energy of the bottom of the wider quantum well. These properties suggest that the considered nanodevice may be of interest because of its possible application as tunable terahertz generator. © 2012 American Institute of Physics.
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