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Title:Electric instability in multibarrier heterostructures: features of the RF impedance
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Abstract:By mathematical simulation of the electric conduction in multibarrier heterostructures, static voltage-current characteristics (VCCs) whose S-shape is indicative of the corresponding electric instability have been obtained. In order to analyze the dynamic parameters of this instability, an analytical model of the instability under investigation has been constructed with the use of the known approximations of semiconductor physics. The static version of the analytical model also provides an S-shaped VCC that is close to the corresponding results of the numerical simulation. With this closeness considered as a confirmation of the validity of the developed analytical model, the small-signal version of this model is generalized to the case of a harmonic electrical disturbance. A clear physical interpretation of the instability under consideration in terms of a positive feedback in a unit cell of the multibarrier heterostructures under study is proposed. The resulting formula for the frequency dependence of the small-signal impedance shows that the dynamic impedance is negative up to terahertz frequencies.
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