APPLICABILITY OF THE PIECEWISE-LINEAR APPROXIMATION OF THE POTENTIAL PROFILE OF UNDOPED MQW HETEROSTUCTURES

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The piecewise-constant approximation of the potential profile (PP) for the quantum-size effects investigation in MQW heterostructures under the conditions of absence of the external electric field is frequently used. To take into account the bias piecewise-linear functions are used [1]. Other authors [2] persist in the non-applicability of such an approximation and propose the self-consistent computing of Schrodinger and Poisson's equations. At the same time the first group of authors as well as the second achieved results which are in good accordance with experimental works and not contradict present-day theory of the solid-state physics of MQW. However rigorous criterions of the applicability of the piecewise-linear approximation (PLA) PP MQW have not been formulated yet.

The aims of this work are the elaboration of criterions of the piecewise-linear PP applicability and detection of conditions which lead to the necessity of the self-consistent computation. For that the comparing of self-consistent results and PLA results was realized.

The 6 QW structure have been chosen for the investigation [3] within which the varying of the QW layers' composition and thickness were carried out and the influence of the optical confinement layers was considered. The computations were realized in the effective mass approximation, on the assumption of the abruptly thin heteroboundary region and the absence of the internal QW layers' deformations. The bias was missing.

In the frame of the work it was shown that the main factor which limits the PLA usage is the big thickness of both the separate layers and the structure as a whole. At a big layers' thickness the PLA usage gives the wrong representation of the wave function shape and the state spectrum. At a sizeable structure thickness the usage of the PLA also gives the wrong information about the QW arrangement that leads to incorrect results concerning the QW interaction. These mistakes especially appear for the case of equal QWs.

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3. *Lysak V. V., Kawaguchi H., Katayama T. et al.* // Meeting on Creation of Ultrahigh-Speed Optical Buffer Memory with Shift Register: Yamagata University, Yonezawa, Japan, 2003. P. 49-52.