HgTe quantum wells. Energy spectrum and transport phenomena. Theory-versus-experiment.

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I plan to make a short review of the features of the energy spectrum of carriers in the quantum wells of a gapless semiconductor HgTe, in which, depending on the thickness of the well, the "normal", inverted and semimetallic spectra are realized. I will review the edge, topologically protected states, that should arise in structures with an inverted spectrum (which is realized at a quantum well thickness greater than d_c = 6.3 nm.

In more detail, I will discuss the current state of experimental results on the study of the energy spectrum, the role of edge states in kinetic effects.

For a real understanding of any experimental results the reliable knowledge of the energy spectrum is necessary. Theoretically, it has been studied quite well and in detail.

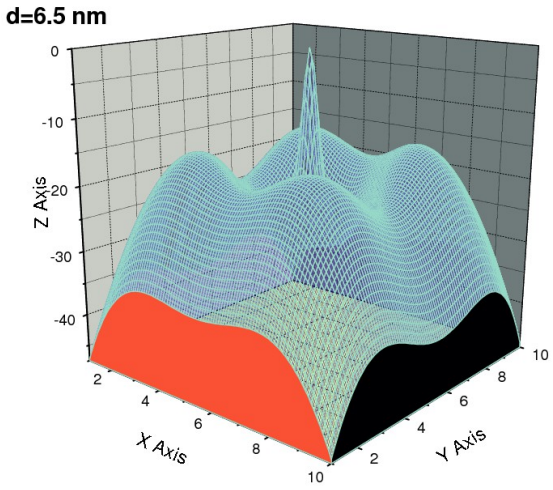

Fig.1 Isoenergy counters of the valence band calculated within 8x8 kP-model for quantum well with d slightly large d_c.

However, by the present time, quite a lot of contradictions have accumulated between theory and experiment.

Therefore, our main attention will be paid to our experimental studies of the spectrum of the valence band in structures with a well thickness close to d_c and with d> d_c [1,2,3]. It will be shown that interface inversion asymmetry leads to a large spin-orbit splitting, which radically changes the spectrum of the valence band.

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