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ABOVE-BARRIER REFLECTION AND DEGENERATE STATES OF ENERGY BAND SPECTRUM IN PLANAR CHANNELING OF ELECTRONS AND POSITRONS IN CRYSTALS

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The motion of a charged particle in a one-dimensional periodic potential of the Kronig-Penney type is considered. The energy band structure, Bloch wave functions in coordinate and momentum representation are investigated in detail. Two sharply distinguished groups of states, i.e. below-barrier and above-barrier, are extracted and the role of both of them in the channeling of positively and negatively charged particles is explained. It is shown that only using a dispersion equation form one is able to obtain information on the symmetry properties of the Bloch wave functions at the edges of energy bands. An estimate of the corresponding regions of the edge coherence in the Brillouin zone is given. In the above-barrier case a nontrivial effect is found of parity interchange violation of the Bloch wave functions at the edges of energy bands, connected with the nullification of the reflection coefficient either from the single barrier or well. An oscillatory behavior of both allowed and forbidden band widths is revealed. The analytical results for different values of the parameters are illustrated by computer calculations. The behavior of Bloch wave reflection coefficients from potential barriers and wells for the nearest above barrier energy band as a function of quasi-momentum in the Brillouin zone is investigated for different energies of channeled electrons and positrons. The variation of above-barrier reflection coefficients for the whole energy spectrum at transition from one energy band to another
for each fixed energy value of incident particles is also studied.

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