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Quantum resonances in small-angular positrons and electrons reflection

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The physical reason of predicted phenomena, similar to the band structure of transverse energy levels, is connected with the Bloch form of the wave functions of electrons (positrons) near the crystallographic planes, which appears both in the case of planar channeling of relativistic electrons (positrons) and in reflection by a crystal surface. Calculations show that positions of maxima in reflection of relativistic electrons and positrons by a crystal surface specifically depend on the angle of incidence with respect to the crystal surface and relativistic factor of electrons/positrons. These maxima form the Darwin tables similar to that in ultra-cold neutron diffraction. Calculations show that if the particle energy is fixed, the reflection coefficient value specifically depends on incidence angle. Increase of the electrons energy leads to decrease of the distance between the Darwin tables. In contrary, with increase of the angle of incidence of electrons to the crystal surface, the distance between the Darwin tables increases as well. Our results demonstrate that the effect of small-angular positrons and electrons reflection can be experimentally observe.

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