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A Contribution to the Theory of the Interaction of Transient Radiation of a Charged Particle with Periodically Modulated Anisotropic Magnetodielectric Filling of a Waveguide

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Аннотация:

Transient radiation of a charged particle in a waveguide with modulated anisotropic magnetodielectric filling is considered. It is assumed that the particle moves with a constant velocity perpendicularly to the axis of the waveguide the filling of which is periodically modulated by the harmonic law. Wave equations for the transverse electric (TE) and transverse magnetic (TM) fields in the waveguide have been obtained. Analytical expressions have been obtained for fields in the waveguide in the first approximation by small modulation indices of waveguide filling. Energies of transient radiation of a charged particle have been calculated in the region of weak (nonresonance) interaction between the radiation and modulation waves, in particular, in the case of a rectangular waveguide. It has been shown that radiation energies at the zero harmonic in the region of weak interaction do not depend on the modulation indices and are proportional to the modulation indices in the first power at the plus and minus first harmonics. The mechanism of the appearance of Cherenkov radiation has been analyzed.