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The Influence of Transition Radiation Upon Electron-Positron Pair Ionization Loss

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The problem of ionization energy loss of high-energy electron-positron pair in thin layer of substance is considered. It is assumed that the thin layer is situated in vacuum in the direction of the pair motion on some distance from the substance in which the pair is created. It is shown that in this case the approximation of parallel electron and positron velocities, which is usually used for calculation of pair ionization loss in homogeneous boundless medium, may not be strictly valid and the existence of non-zero angle of pair divergence is taken into account. It is shown that transition radiation, generated during the pair emission from the substance, in which it is created, leads to manifestation of interference effects in pair ionization loss in thin layer on much larger distances (from the pair creation point) than in the case of 'classical' Chudakov effect in boundless medium [1]. Moreover, at sufficiently small angles of pair divergence such effects can be manifested for arbitrary distances between the layer and the substance. In this case with the increase of this distance the pair ionization loss does not reach the value of the sum of independent electron and positron losses but remains suppressed comparing to this value.
The present work is the generalization of the problems about pairs ionization loss in thin films from [2-4], which have been considered under conditions when the influence of transition radiation or non-parallelism of electron and positron trajectories upon ionization loss were negligible.

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