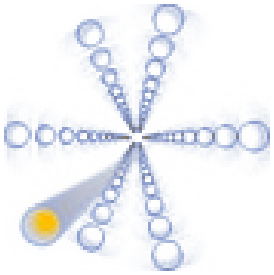

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Orientation Dependence of Electron-Positron Pair Production in Single Crystals

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One of the important problems in today's astrophysics and gamma–astronomy is the construction of detectors for high energy photons (more than 1GeV) with the high angle resolution. In this energy range the dominating effect in interaction of photons with matter is e-e+ pair production.The high angle resolution may be achieved using single crystals as an effective converter of photons into electron-positron pairs,
In this report the cross section of pair production in single crystal is analysed for the ultrarelativistic case. It is shown that this cross section sufficiently increases when the photon is propagating through the crystal under small angles (~ mec2/ħω_γ) to the crystallographic axises due to coherent interaction with many atoms simultaneously. This effect can not be considered within the frameworks of a perturbation theory, when the lepton wave functions are the exact wave functions in the continuos potential of the crystallographic lattice. However, if to take into account the possibility for one or the both of leptons to be born in the channeling regime, when their transverse motion is bound to certain axis or plane of atoms, the wave functions of leptons have to be calculated precisely as the decision of Schrödinger equation with averaged channeling potential. It is shown that this mode leads to additional sufficient increase of pair production when photon is propagating through the crystall under the angles less than the crytical Lindhard angle. The angular maximum half-width coincides by an order of magnitude with the the crytical Lindhard angle.

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