

NOTES ON INVERSE COMPTON SCATTERING

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We examine how the kinematic conditions of the inverse Compton scattering of photons by relativistic electrons, as well as the polarizations of the colliding particles, affect the differential cross section of the process as a function of the angle of the scattered photon. It is found that the cross section is significantly influenced by the helicities of the electron and photon. In the case, where the initial photon momentum is transverse to the electron momentum, it was found that, in the ultrarelativistic limit, there is a surprising almost twofold increase in the cross section compared to the case of the head-on collision. In both cases the scattered photon moves in the direction of the electron beam. The increase in the photon energy is almost the same as in the head-on collision [1]

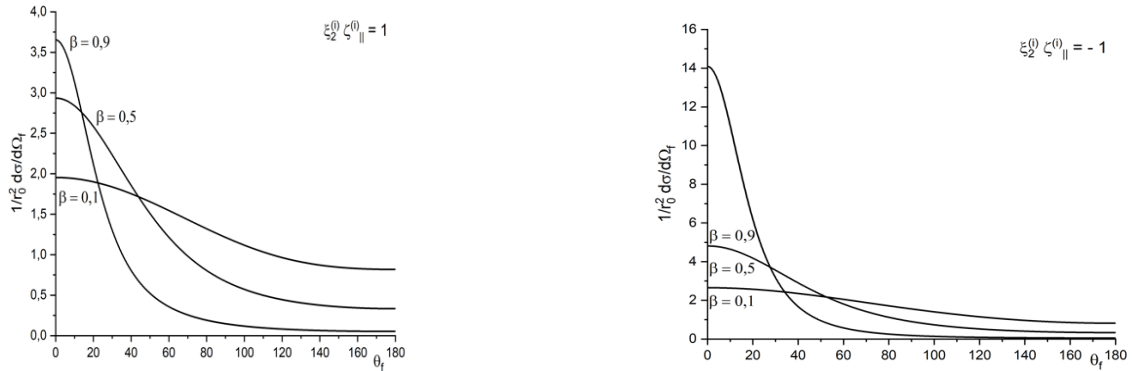


Fig. 1. Differential cross section of the head-on Compton photon-electron collision versus the photon scattering angle for several values of the parameter $\beta=v/c$. The incident photon energy is $\omega_i = 150$ keV. Left panel: helicities of particles are of the same sign; right panel: signs are opposite.

As an example, in Fig. 1, the cross sections are displayed for the cases, where the electron and photon helicities are either the same (left panel) or have opposite signs (right panel). The photon energy is 150 keV and the collision is head-on. In the figures, the parameter $\beta = v/c < 1$ is the ratio of the electron speed to the speed of light. For large β , the difference in the values of the cross section at the peak is nearly quadrupled.

References

- [1]. Bornikov K. A., Volobuev I. P., Popov Yu. V. *Moscow University Physics Bulletin* **78**(4) 453–459 (2023).