

Unified description of electromagnetic processes in strong laser fields and channeling in crystals at high energies

Khokonov M Kh[®] and Lomanosov V S

Kabardino-Balkarian State University, Chernyshevskogo Street 173, Nalchik,
Kabardino-Balkaria 360004, Russia

® khokon6@mail.ru

To-day, the interaction of ultrahigh-intensity electromagnetic fields with charged particles is of growing interest [1]. There are two ways for studying the effects of strong fields in the laboratory. These are strong laser fields and electrostatic fields in oriented crystals (OC) [2]. In the present research the spectral characteristics of x-ray and gamma radiation of ultra-relativistic electrons and positrons under the channeling conditions in OC and under the influence of the intense laser wave are analysed in terms of two Lorentz-invariant parameters by means of the method developed recently in [3]. Quantum effects in radiation as well as nonlinear effects of higher harmonic generation are considered. Significant differences between lasers and OC are revealed, due to the fact that in the latter case the non-dipole parameter of the radiation depends on energy.

[1] Popruzhenko S V and Fedotov A M 2023 *Phys.-Usp.* **66** 460–493

[2] Di Piazza A *et al* 2020 *Phys. Rev. Lett.* **124** 044801

[3] Khokonov M Kh 2023 *Phys. Lett. B* **846** 138208