SEMINAR

nuclear physics

23/06/2021, 10:00 a.m.

Online seminar

Theoretical studies on a radiating electron in high-intensity laser pulse

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The present high-power laser systems have reached an output of 10 PW [1] and 10^{22} W/cm^2 [2]. One of the elementary processes tested at such laser facilities is electromagnetic radiation processes of a highly energetic electron, i.e., nonlinear Compton scattering (NCS)/radiation reaction (RR). This nonlinearity is the same as multi-photon absorption in nonlinear optics, an electron absorbs laser photons in a single QED process and it emits a single photon. The QED correction of radiation (the quantumness) provides a modification of the radiation spectrum from the classical model. Thus, the dependence of NCS for its nonlinearity and quantumness in the uncharted domain is a large interest in experiments.

We will discuss a theoretical model of polarization-dependent NCS to understand that regime, based on Ref. [3,4] with locally constant field approximation. The information of a polarization mode of an emitted photon provides a finer resolution of the collision process. We will see it by emission probability rates (decay rates). We will also discuss the conceptual design of its experiment at the ELI-NP laser facility [5].

[1] F. Lureau, *et al.*, "High-energy hybrid femtosecond laser system demonstrating 2x10 PW capability" High Power Laser Science and Engineering **8**, e43 (2020).
[2] H. Kiriyama, *et al.*, "High-contrast high-intensity repetitive petawatt laser," Opt. Lett. **43**, 2595 (2018).
[3] I. V. Sokolov, *et al.*, "Emission and its back-reaction accompanying electron motion in relativistically strong and QED-strong pulsed laser fields," Phys. Rev. E **81**, 036412 (2012).
[4] B. King, and S. Tang, "Nonlinear Compton scattering of polarized photons in plane-wave backgrounds," Phys. Rev. A **102**, 022809 (2019).
[5] K. Seto, *et al.*, "Experimental design of radiation reaction by 1 PW laser pulse and linear accelerator electron bunch," High Energy Density Physics **38**, 100919 (2021).

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