Nonlinear Compton Scattering in Focused Laser Pulses

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In nonlinear Compton scattering (NCS) electron can absorb quanta from the external field and emit energetic photons [1]. The aspects of the emission spectrum in less idealized field configurations compared to monochromatic planewaves has been a subject of extensive and ongoing study. In particular, the incorporation of the phase envelope, carrier phase and polarization effects and also ensuing interference and spin effects in the emission spectrum have been analyzed to great extent within Furry picture [2]. The treatment of the transverse focusing typically seen in (Super)Gaussian pulses is on the other hand more intricate. Unlike in the case of purely temporal pulse profiles, for which scattering amplitudes can be constructed from Volkov solutions, Dirac equation admits no known solution for Gaussian-type backgrounds therefore the use of approximation methods becomes necessary [3–5]. In this talk, I will present basic aspects of WKB method and semiclassical Volkov solutions, from which the amplitudes of first order nonlinear QED processes in a given space-time dependent background can be constructed [6,7]. Based on these solutions, I will present the initial results on the NCS emission spectra for Gaussian and Super-Gaussian pulse profiles.

References

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