Sokolov-Ternov Effect in Radiation-Dominated Regime

I I Artemenko[1] and I Yu Kostyukov[1]

[1]*Nonlinear dynamics and optics devision, IAP RAS, Ulyanov St, 46, 603155, Nizhny Novgorod, Russia.*
Contact Phone: +79200604068
Contact Email: ivanartemenko1994@gmail.com

Spin dynamic is studied analytically and numerically in the regime when the radiative losses are high. To make an analytical advance we use a semiclassiacl approach when the losses are considered continuous while the the quantum formula is taken for radiation intensity. The expression for quantum χ parameter and electron's spin evolution is obtained and compared with numerical simulations from first principles. Using spin-resolved Monte Carlo simulations and energy preserving pusher for analyzing lepton dynamic in strong electromagnetic fields both theoretical solutions were tested. As expected, for classical regime *i.e.* when $\chi \ll 1$, theoretical solution is in good agreement with numerical simulations and starts deviating from the latter as parameters go into quantum regime. This could serve as a validation of the scheme used in this work. In the strong QED regime $\chi \gg 1$ the analytical and numerical results coincide only in order of magnitude.