

Retrieving self-generated magnetic fields of ultrarelativistic laser plasma via ejected electron polarization

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Spin is an intrinsic property of electrons. In general, radiative spin flips could take place when the electrons emit high-energy photons inside strong magnetic fields, which gives rise to the net spin polarization of plasma electrons. To examine the dynamics of radiative spin-polarized plasma, we extended the kinetic Particle-in-cell (PIC) code to incorporate the quantum electrodynamical effects of spin-dependent photon emission and radiative spin flips. Through analyses and simulations, we demonstrate that the spin polarization of ejected electrons could serve as a tool to retrieve the structure and magnitude of the self-generated plasma magnetic fields. This would be beneficial for the high-intensity laser plasma interaction.