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Spin polarization of electrons by ultra-intense lasers DARIO DEL SORBO, University of York, DANIEL SEIPT, Cockcroft Institute/Lancaster University, TOM G. BLACKBURN, Chalmers University of Technology, ALEXANDER G. R. THOMAS, Cockcroft Institute/Lancaster University, CHRISTOPHER D. MURPHY, University of York, JOHN G. KIRK, Max Planck Institut für Kernphysik, CHRISTOPHER RIDGERS, University of York — At the intensities accessible by the soon to be completed Extreme Light Infrastructure, laser-matter interactions are predicted to reach a new regime characterized by the interplay of relativistic plasma kinetics and non-linear QED processes. In order to understand the dynamics of this QED-plasmas, it is necessary to have an accurate description of the micro-dynamics of particles undergoing QED processes in the strong background field of the laser. Standard treatments average over the spin degree of freedom. However, Sokolov and Ternov demonstrated that ultra-relativistic electrons and positrons spin polarize up to 92.4%, in a strong magnetic field, after a characteristic time. We show that electron spin-polarization can also occur in the electromagnetic fields of next-generation lasers. In particular, we study the case of electrons orbiting in a rotating electric field – a configuration that may be realized at the magnetic node of two colliding, circularly-polarised laser pulses. The spin-polarization of the electrons by high-intensity lasers can occur very rapidly, we predict on the femtosecond time scale [1]. [1] Del Sorbo, arXiv preprint arXiv:1702.03203 (2017).

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