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Self-consistent PIC modeling of pair production with intense lasers pulses THOMAS GRISMAYER, RICARDO FONSECA, GoLP/Instituto de Plasmas e Fusao Nuclear-Laboratorio Associado, Instituto Superior Tecnico, 1049-001 Lisboa, MATTIAS MARKLUND, Department of Applied Physics Chalmers University of Technology SE-412 96 Göteborg, Sweden, LUIS SILVA, GoLP/Instituto de Plasmas e Fusao Nuclear-Laboratorio Associado, Instituto Superior Tecnico, 1049-001 Lisboa — The availability of powerful lights sources offers in principle new possibilities for investigation of various quantum processes. Peak intensities up to 10^{22} W/cm^2 are already available in some laser facilities and even greater intensity should be attainable with the development of the ELI project. Among various quantum phenomena, electron-positron pair production, at the focus of an intense laser, is currently a topic of considerable interest. As is typical for particle scattering experiments, many different processes may contribute to the final yields of pairs. Out of the possible mechanisms, pair production seeded by an electron is likely to be the most dominant at lower intensities. In this work, we include the two-step process (non linear Compton scattering + Breit-Wheeler) in a massively parallel PIC code (using the Osiris 2.0 framework) via a Monte Carlo module, focusing on implementing in a self-consistent manner and multi-dimensions the interaction of the intense fields with the pair plasma dynamics. As an illustration we have investigated the pair cascades initiated by a single electron in counter-propagating lasers pulses for ELI parameters. The numerical results are also compared with analytical results.

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