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Multi-laser QED cascades in 2D and 3D geometry[1] MARIJA VRANIC, THOMAS GRISMAYER, GoLP/IPFN, Instituto Superior Tecnico, Universidade de Lisboa, 1049-001 Lisbon, Portugal, RICARDO A. FONSECA, DCTI/ISCTE - Instituto Universitario de Lisboa, 1649-026 Lisboa, Portugal, LUIS O. SILVA, GoLP/IPFN, Instituto Superior Tecnico, Universidade de Lisboa, 1049-001 Lisbon, Portugal — Studying the plasma dynamics in the presence of extreme laser fields requires taking into account physics beyond classical electrodynamics. Pair production seeded by an electron has a lowest threshold among the first quantum mechanisms that appear as the intensity increases, which makes it relevant for the future experiments planned at ELI [1] and other facilities. We have included the two-step pair production process (non linear Compton scattering + Breit-Wheeler) in a massively parallel PIC code (Osiris 2.0 framework) via a Monte Carlo module. With this approach, we take self-consistently into account the interaction of the intense fields with the generated pair plasma. We have also developed a macroparticle merging algorithm that reduces the number of macroparticles in the simulations, while conserving local particle distributions [2]. This algorithm is crucial for simulating scenarios where a large number of pairs are being created, such as QED cascades. We present 2D and 3D PIC-QED study of pair cascades induced with multiple laser pulses. The polarization dependence is discussed, together with the properties of the emitted radiation and experimental signatures.

[1] http://www.eli-laser.eu/
[2] M. Vranic et al., CPC 191, 65-73 (2015)

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