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SFQEDtoolkit: a high-performance library for the accurate modelling of strong-field QED effects in relativistic laboratory astrophysics codes

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Strong-field QED (SFQED) effects are central in determining the dynamics of particles and plasma in extreme electromagnetic fields such as those generated with multipetawatt lasers or present in the vicinity of compact astrophysical objects such as pulsars and magnetars. SFQEDtoolkit is a fully open source library designed to allow for a straightforward implementation of SFQED effects in existing particle-in-cell (PIC) and Monte Carlo codes. Through advanced function approximation techniques, high-energy photon emission and electron-positron pair creation probabilities and energy distributions are accurately and efficiently calculated within the locally-constant-field approximation (LCFA) as well as with advanced models beyond the LCFA [Phys. Rev. A **99**, 022125 (2019)]. SFQEDtoolkit is designed to provide users with high-performance and high-accuracy, simultaneously. Moreover, its implementation in existing codes is kept as easy as possible, and neat examples showing its usage are provided. In the near future, SFQEDtoolkit will be enriched to model the full angular distribution of the generated particles, i.e., beyond the commonly employed collinear emission approximation, as well as to describe spin and polarization dependent SFQED effects.