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Multi-GeV electron-positron pair generation from laser-electron scattering MARIJA VRANIC, GoLP/IPFN, Instituto Superior Tecnico, Univ. de Lisboa, Portugal, ONDREJ KLIMO, GEORG KORN, STEFAN WEBER, ELI Beamlines, Fyzikalni ustav AV CR, v. v. i., Praha — Positron generation in the laboratory is of great importance, both for fundamental science and potential applications. For laboratory astrophysics, it is particularly important to produce neutral electron-positron plasma, with properties that allow studying their collective behavior. Electron-positron pairs can be generated by first emitting an energetic photon, that later decays into a pair in an intense background field (Breit-Wheeler process). Recently, several experiments demonstrated that high-frequency radiation can be generated in laser-electron beam scattering. Here we propose a new scattering configuration that can both generate electron-positron pairs, and later accelerate them to multi-GeV energies. This configuration allows obtaining an e+e- flow with a higher energy than that of the initial electron beam. We develop an analytical model that predicts the energy cutoff. We discuss the number of pairs expected, the acceleration and the overall quality of the beam. We also study the role of pulse duration and spatiotemporal synchronization for the overall number of pairs. The work is supported by OSIRIS QED-PIC simulations, and these ideas can be tested with a new generation laser system at ELI Beamlines that will provide 10 PW peak power in a 150 fs pulse duration.

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