Contribution ID: **45** Type: **not specified**

Phase Control of Nonlinear Breit-Wheeler Pair Creation

Thursday 21 March 2024 16:40 (20 minutes)

Some astrophysical objects (e.g., pulsars) harbor extremely intense electromagnetic fields in their immediate surroundings. These fields allow for spontaneous and proliferous electron-positron pair creation, generating what is called a lepton pair plasma. It has so far been impossible to replicate these conditions in a laboratory setup. The advances of state-of-the-art laser and accelerator facilities achieving intensities on the order of 10^{23} W/cm^2 and multi-GeV electron energies enable strong-field QED phenomena to occur. The lowest-order processes are nonlinear Compton scattering and nonlinear Breit-Wheeler pair creation, ultimately leading to electron-positron creation. Characterizing these processes is necessary if we want to bridge micro- and macro-scale phenomena in astrophysical plasmas, such as radiation emission and production of seed field fluctuations, which can later grow into instabilities and be further amplified. In this work, we present analytical predictions on how a two-colored high-intensity laser pulse, composed of a fundamental and a second harmonic, interacts with a relativistic electron beam. By controlling their relative phase, it is possible to control the transverse momentum imprinted on the leptons created during the interaction and ultimately separate positrons from electrons. This can greatly facilitate experimental detection of the out-coming pairs. The results are confirmed with fully self-consistent particle-in-cell simulations.

Available for oral presentation in a session

Yes

Primary author: PEREIRA DA COSTA DE PESSANHA BARBOSA, Bernardo Maria

Co-authors: Dr PALASTRO, John P. (LLE - Rochester); Dr RAMSEY, Dillon (LLE - Rochester); Dr WEICHMAN, Kale (LLE - Rochester); Dr VRANIC, Marija (IST - Lisbon)

Session Classification: Poster Session