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Investigation of QED effects in thin foil targets

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We have investigated the generation of dense electron-positron pairs and intense photonray bursts in the laser plasma interaction using quantum electrodynamics (QED) effects included in particle-in-cell (PIC) simulations. Linearly polarized laser pulses were used to irradiate a thin foil (1 μm) with an intensity of 4*1023 W/cm2. A scan of targets with varying Z (Al, Cu and Au) is investigated for the QED effects. Abundant electronpositron pair production is possible at laser intensity of 1023 W/cm2 at wavelength of 1 μm. We studied the various pair production processes in all the targets. The number of pairs created for Al and Cu targets is 1014 and 1013 respectively. But in case of Au, due to high electron density there is no pair production. We also calculated how the electron energy changes with respect to these targets, and also how pair production is changing with respect to varying target densities. The results indicate that target Z plays a very important role in the pair production process, which will be explained in this paper.

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