Particle production effects in laser-matter interactions at ultra-high intensities

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Plasma electrons accelerated in the field of ultra-intense laser pulse may easily reach energies allowing for electron-positron pair production, as a result of direct or indirect quantum electrodynamic interaction with nuclei or other electrons in the medium. This effect was indeed observed in [1,2]. Recently there has been increased interest in this phenomenon, due to recent experimental results [3], where copious laser-induced positron production was reported. Electron energies achieved at very high intensities may allow for production of even more massive particles, such as muons. Some new efforts to quantify the production of positrons and other particles as a result of laser interaction with matter for various configurations of laser and plasma parameters are reported. The effect of plasma flow on the distribution of the produced particles is studied, and its possible relevance for the development of particle cascades [4,5] is analyzed.

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