

O2.201 Efficient generation of atto-pulses and positrons at the interaction of ultra-intense laser radiation with the shaped targets

Tuesday, 9 July 2019 17:30 (15 minutes)

See the full abstract here <http://ocs.ciemat.es/EPS2019ABS/pdf/O2.201.pdf>

Recently we have proposed an efficient scheme of generation of short dense electron bunches and atto-pulses during the interaction at large angles of incidence of a laser pulse with a limited foil target [1]. Later [2], the generation of high-intensity atto-pulses has been investigated also in a hollow cone-like target. We found the source and direction of the coherent radiation that ensures the existence of atto-pulses. Since the laser pulse reflected from plasma inherently contains low-order harmonics, a second reflection from a fresh plasma surface leads to the increase of spectral intensity. In [3], we have made an extensive study of multiple reflections of a short pulse between two solid density plasma walls at oblique incidence, with the help of PIC simulations. It is shown that even in the weakly relativistic regime the intensity of high harmonics can be amplified by three orders of magnitude with help of this method. Increasing the photon energy from the x-ray to gamma-ray regime makes probing of extremely small space-time domains accessible. In [4] we proposed the mechanism for generating attosecond gamma photon and positron bunches with small divergence using laser intensities below 10^{23}W/cm^2 which will become reachable at the ELI. In contrast with previous works, in our scheme a single laser pulse is sufficient instead of two counterpropagating pulses. Numerical simulations are used to formulate the conditions for confined radiation and to characterize the generated photon and positron bunches. The threshold intensity for the generation of a significant number of positrons is shown to be in the order 10^{22}Wcm^{-2} , when optimal target properties, as presented in [5], are considered. With the help of a modified particle-in-cell code, the detailed angular-energy distribution of positrons is presented, which is in good agreement with our analytical model.

References

1. A. Andreev, K. Platonov Optics and Spectroscopy 114, 788(2013)
2. Z. Lech, A. Andreev, Phys Rev E 93, 013207 (2016)
3. Z. Lech, A. Andreev Journal of the Optical Society of America B 35, A51 (2018)
4. Z. Lech, A. Andreev Phys. Rev. E 99, 013202 (2019)
5. Z. Lech, A. Andreev Plasma Physics and Controlled Fusion (2019)

pppo

Presenter: ANDREEV, A. (EPS 2019)

Session Classification: BPIF

Track Classification: BPIF