High Harmonic Generation and QED Effects Induced by Relativistic Oscillating Mirror

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The laser-plasma interactions are dominated by the QED regime since intensities of the forthcoming laser facilities are approaching $10^{23\text{-}24}$ W/cm^2. Here we present the high brightness γ-photon emission and e^+e^- pair creation accompanied with the high harmonic generation. Relativistic oscillating mirror reflects the incident intense laser field and generates the focused attosecond pulse with enhanced intensity. A large number of high energy photons are emitted by the collisions between the radiation trapped electrons and the high harmonic pulses. The corresponding photons are counter-propagating through the strong laser field which provides a large cross section for pair creation. Relativistic positron bunches are generated and further accelerated in the reflected laser field. The peak intensity of the γ-ray reaches 0.74 PW with the brilliance of 2×10^{24} s^{-1}mm^{-2} mrad^{-2} (0.1%BW)$^{-1}$ (at 58 MeV). A GeV positron beam is obtained with density of 4×10^{21} cm^{-3} and a particle number of 5.6×10^9.

This work was supported by the project ELITAS (CZ.02.1.01/0.0/0.0/16_013/0001793) and by the project High Field Initiative (CZ.02.1.01/0.0/0.0/15_003/0000449) both from European Regional Development Fund.

References:

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