Gamma ray emission from wakefield accelerated electrons wiggling in laser filed

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Hard x-ray emission from fs laser produced plasmas have a number of interesting applications in the dynamic probing of matter and in medical/biological imaging. Betatron radiation is a highly collimated laser-driven hard x-ray source with fs duration which generated by electron transversely oscillation during acceleration in underdense plasmas. However, yield and photon energy of this source is always limited by controdictory between parameters during electron acceleration.

Several methods were proposed by our team for the sake of improving quality of betatron X-ray sources [1-3]. However, till now all popular methods are based on a single laser pulse, which is in charge of electron acceleration and wiggling simultaneously. The efficiency of betatron oscillation is limited in a comparably low level.

In order to overcome the radiation spectra peak limited to tens of keV, we present a new method for high energy radiation emission via the accelerated electrons wiggling in an additional laser field whose intensity is one order magnitude higher than the self generation transverse field of the bubble, resulting the equivalent wiggler strength parameter *K* to increase about twenty times. Fitting with synchrotron radiation, we acquired the brightness for the case of laser wiggler field, which was 1.2×10^{23} ph/s/mrad^2/mm^2/0.1%BW at 1 MeV. Such a high brilliant and ultra-fast gamma ray source could be applied to time-resolved probing of the dense plasma and material, and the production of medical radioisotopes [4].

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