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P4.2022 Generating bright gamma-ray pulses via ultra-intense laser colliding with a flying plasma layer

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See full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P4.2022.pdf

With the forthcoming laser intensities (I≥10^23 W/cm^2), synchrotron radiation in a laser-plasma interaction has attracted particular interest because it can lead to an extremely bright source of γ-rays. Here, a scheme to generate a bright γ-ray pulse with high efficiency is proposed and numerically demonstrated. Using a circularly polarized (CP) laser pulse impinged on a thin foil, a relativistic flying plasma layer is formed. With another counterpropagating CP pulse colliding with the flying layer, it is found that the electrons are efficiently accelerated in the longitudinal direction by the space-charge field. The energetic electrons interact with the counterpropagating CP pulse, producing ultra-brilliant (~10^24photons/s/mm^2/mrad^2/0.1%BW) highly dense (~270nc) femtosecond (~5 fs) γ-ray pulses. At a moderate laser intensity of 4x10^22 W/cm^2, the fraction of laser energy transferred into the γ-ray pulse is as high as 10%, which is comparable to that previously predicted for an order of magnitude higher in laser intensity. The enhanced γ-photon emission might pave the way for its potential applications in the near future.

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