

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 ($I \geq 10^{23}$ W/cm²), 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 impinging 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 ($\sim 10^{24}$ photons/s/mm²/mrad²/0.1%BW) highly dense (~ 270 nc) femtosecond (~ 5 fs) γ -ray pulses. At a moderate laser intensity of 4×10^{22} W/cm², 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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