

High-quality particle and radiation sources from laser peeler regime

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Abstract

Laser-based particle acceleration is a promising candidate for next-generation accelerators and radiation sources. However, currently, the laser-accelerated ion beams and radiations have limitations in peak energy, flux, energy spread, etc. In this talk, I shall report a novel method to overcome these limitations by irradiating the edge of a microtape with available femtosecond lasers, called laser peeler regime [1-4]. As the laser pulse sweeps along the tape, it excites a strong surface plasma wave, which accelerates tens of pC electrons to superponderomotive energies [1,5]. While acceleration, these electrons undergo transverse betatron oscillations, leading to emission of hard x-rays. On the other hand, when these high space charge electrons are injected into the accelerating region, protons are accelerated and bunched simultaneously, leading to a monoenergetic proton spectrum. Our 3D PIC simulations demonstrate that a monoenergetic proton beam with peak energy > 100 MeV and energy spread about 1% can be stably achieved [1], whilst emitting bright x-rays [4].

References:

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