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Laser-wakefield driven generation of subcycle pulses[1] EVANGELOS SIMINOS, University of Gothenburg, ILLIA THIELE, Chalmers University of Technology — A scheme for the generation of intense, isolated, carrier-envelope-phase (CEP)-tunable, subcycle-pulses by laser-driven wakes in plasmas is proposed. It relies on the interaction of a low-intensity, CEP-stable, long-wavelength seed pulse with a wake driven by an intense, not necessarily CEP-stable pump laser pulse. We show through 3D particle-in-cell (PIC) simulations that a seed pulse with wavelength longer than the plasma skin depth, c/ω_{pe}, can extract energy from the leading density spike of the wake. As a result of localized amplification, an intense subcycle pulse is formed. Through a parametric study with 2D PIC simulations we show that the subcycle pulse is CEP-tunable by varying either the CEP of the seed pulse or the delay between the seed and pump pulses. Moreover, we show that we can control the subcycle pulse intensity, mean frequency and spectral range by varying the plasma density and pump laser intensity. In particular, relativistic intensity subcycle pulses can be obtained in the mid-IR regime, which are hard to obtain by conventional methods. Such pulses could be used to probe slow processes (e.g. rovibrational spectra) with subcycle resolution or to excite transient nonlinear effects at non-ionizing wavelengths.

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