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Isolated attosecond pulses generation with the microbunching synthesis

Monday 2 June 2025 16:00 (2 hours)

Attosecond x-ray pulses play a crucial role in the study of ultrafast phenomena involving inner and valence electrons. Especially isolated attosecond pulses with high photon energy and high peak power are of great significance in single-shot imaging in the soft x-ray region, life sciences, and attosecond pump-probe experiments. In modern accelerators, laser manipulation of electrons can be used to tailor the ultrafast properties of
free-electron laser pulses. In this paper, we propose a novel laser manipulation technique that makes use of two
many-cycle, obliquely incident laser beams with mutual delays to synthesize microbunching rotation on the scale
of infrared laser wavelengths within the electron bunch. This synthesis microbunching rotation ultimately leads to
an enhanced current contrast ratio between the main peak and the surrounding satellite peaks within the bunch.
By properly accounting for the longitudinal space-charge fields within the undulator, a tapered undulator can further suppress the side peaks in the radiation pulse and enable the selection of an isolated, hundred-attosecond, GW-level soft x-ray pulse.

Footnotes

Paper preparation format

LaTeX

Region represented

Asia

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