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Generation of electrons bunched at X-ray wavelength from plasma-based acceleration XINLU XU, SLAC - Natl Accelerator Lab, FEI LI, FRANK TSUNG, KYLE MILLER, UCLA, MARK HOGNA, VITALY YAKIMENKO, SLAC - Natl Accelerator Lab, CHAN JOSHI, WARREN MORI, UCLA
— We show using particle-in-cell simulations and theoretical analysis that a high-quality electron beam whose density is modulated at angstrom scale can be generated directly in density downramp injection in plasma-based acceleration. When two counter-propagating linearly polarized frequency degenerate laser pulses interfere inside a plasma downramp, a plasma density modulation at the one-half the optical wavelength is created driven by the ponderomotive force of the standing wave pattern and the restoring force of the plasma ions. The density modulation can turn on and off the injection of electrons at the modulation wavelength when an intense driver excites a wake across the downramp. Due to the unique longitudinal mapping between the electrons' initial positions and their final trapped positions inside the wake, an electron beam with density modulation at the X-ray wavelength can be generated in this scheme. Such a high quality, modulated beam can produce fully coherent, stable, hundreds of GW X-rays by going through a resonant undulator.

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