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Generation of High Brightness Electron Beams via Ionization Induced Injection by Transverse Colliding Lasers in a Beam-Driven Plasma Wakefield Accelerator F. LI, X.L. XU, W. LU, Tsinghua University, Beijing 100084, China, W.B. MORI, C. JOSHI, University of California Los Angeles, Los Angeles, California 90095, USA — The production of ultra-bright electron bunches using ionization injection triggered by two transversely colliding laser pulses inside a beam-driven plasma wake is examined via three-dimensional (3D) particle-in-cell (PIC) simulations. The relatively low intensity lasers are polarized along the wake axis and overlap with the wake for a very short time. The result is that the residual momentum of the ionized electrons in the transverse plane of the wake is reduced and the injection is localized along the propagation axis of the wake. This minimizes both the initial "thermal" emittance and the emittance growth due to transverse phase mixing. Simulations show that ultra-short ($\sim$8 fs) high-current (0.4 kA) electron bunches with a normalized emittance of 8.5 and 6 nm in the two planes respectively and a brightness greater than $1.7 \times 10^{19} \mathrm{A} \cdot \mathrm{rad}^{-2} \cdot \mathrm{m}^{-2}$ can be obtained for realistic parameters.

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