

Abstract Submitted
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Stable electron bunches with low absolute momentum spread using plasma down ramp injection in a laser wakefield accelerator¹ C.G.R. GEDDES, K. NAKAMURA, C. TOTH, E. ESAREY, C.B. SCHROEDER, W.P. LEEMANS, LBNL, E. CORMIER-MICHEL, UNR, J. CARY, D. BRUHWILER, Tech-X — Control of particle trapping in a laser wakefield accelerator using plasma density gradients produced stable electron bunches at momenta near 1 MeV/c and with 170 keV/c FWHM momentum spread, 20 keV/c RMS central momentum variation, and repeatable charge and pointing. A 10 TW laser pulse was focused near the downstream edge of a mm-long hydrogen gas jet so that plasma density near focus decreased in the laser propagation direction. Particle simulations indicate the gradient slowed wake phase velocity resulting in stable trapping. Simulations and transition radiation experiments indicate the bunches are ultrafast. Simulations further show that the bunches can be post accelerated in plasma wakes, potentially producing stable multi-GeV beams with greatly reduced momentum spread.

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