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High energy, low energy spread electron bunches produced via colliding pulse injection C.G.R. GEDDES, N.H. MATLIS, S. STEINKE, LBNL, D. BRUHWILER, U. Colorado, M. CHEN, LBNL, E. CORMIER-MICHEL, Tech-X, E. ESAREY, K. NAKAMURA, G.R. PLATEAU, C.B. SCHROEDER, CS. TOTH, W.P. LEEMANS, LBNL — Injection into a high gradient laser-plasma accelerator can becontrolled by using the beat between "colliding" laser pulses to kick electrons at a specified location into a plasma wave which was operated below the threshold for self injection. The experiments used control over the laser optical mode and plasma profile to extend the acceleration distance in a gas jet target. This allowed acceleration of electrons to above 200 MeV using the 10 TW LOASIS laser. Colliding pulse injection into this high energy structure was used to control bunch quality, producing bunches with energy spreads below 1.5% FWHM and divergences of 1.5 mrad FWHM. With injection location fixed by the colliding pulses, beam energy was controlled by plasma density and by target location with respect to the collision. Dependence of injector performance on laser and plasma parameters were characterized in coordination with simulations. Separate experiments recently demonstrated 0.1 mm-mrad emittance from self injected LPAs using betatron radiation, and comparison with present divergence and energy data indicate that these bunches may also be of very low emittance.

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