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Electron number control by laser frequency detuning in three colliding pulses injection[1] LULE YU, ERIC ESAREY, CARL SCHROEDER, CAMERON GEDDES, MIN CHEN, CARLO BENEDETTI, Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA, ESTELLE CORMIER-MICHEL, DAVID BRUHWILER, Tech-X Corporation, Boulder, Colorado 80303, USA, WIM LEEMANS, Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA, LAWRENCE BERKELEY NATIONAL LABORATORY, BERKELEY, CALIFORNIA 94720, USA TEAM, TECH-X CORPORATION, BOULDER, COLORADO 80303, USA TEAM — Electron injection in laser-plasma accelerators can be achieved using colliding laser pulses [E. Esarey et al. Phys. Rev. Lett. 79, 2682 (1997)]. The background plasma electrons are heated and dephased by the slow phase velocity beat wave induced by two counterpropagating injection pulses, allowing some fraction to be trapped in the plasma wake excited by the pump pulse. It is found that the electron injection number can be controlled by tuning the frequencies of the injection pulses, which tunes the beat wave phase velocity.The optimal injection number is achieved at a negative beat wave phase velocity. With increasing laser intensities, the optimal beat wave phase velocity becomes larger and the range of the laser frequency difference for injection becomes larger. The local plasma wake suppression due to the axial electrostatic field induced by the beat wave is also studied.

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