

Abstract Submitted
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Enhancement of the Transformer Ratio in a Plasma Wakefield Accelerator Using an Additional Long Laser Pulse¹ XI ZHANG, VLADIMIR KHUDIK, The University of Texas at Austin and Cornell University, TIANHONG WANG, GENNADY SHVETS, Cornell University — Direct laser acceleration (DLA) in both the plasma bubble accelerating regime and the plasma bubble decelerating regime has been recently proposed [1,2,3]. Here we introduce the DLA into the beam-driven plasma wakefield acceleration (PWFA), and report the increase of the transformer ratio through DLA. Instead of interacting with the witness beam directly, the long laser pulse interacts with the driving electron beam and accelerates it through the mechanism of DLA in the plasma bubble decelerating regime. The energy of the driving electron beam is maintained for much longer time compared with the standard PWFA. Therefore, the witness beam gains much more energy without losing its beam quality. Due to the long pump depletion length of the laser pulse, the above PWFA scheme is extended from the single stage to the multi-stage and verified through self-consistent 2D PIC simulations. [1] X. Zhang, V. N. Khudik and G. Shvets, Phys. Rev. Lett. , 184801 (2015). [2] X. Zhang, V. N. Khudik, A. Pukhov and G. Shvets, Plasma Phys. Control. Fusion 58 034011 (2016) [3] V. N. Khudik, X. Zhang and G. Shvets, arXiv: 1610.0945 (2015).

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