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Hybrid Laser Wakefield and Direct Laser Plasma Accelerator in the Plasma Bubble Regime XI ZHANG, VLADIMIR KHUDIK, Department of Physics and Institute for Fusion Studies, The University of Texas at Austin, ALEXANDER PUKHOV, Institut für Theoretische Physik I Heinrich-Heine-Universität Düsseldorf, GENNADY SHVETS, Department of Physics and Institute for Fusion Studies, The University of Texas at Austin — The concept of hybrid laser wakefield and direct laser plasma accelerator in plasma bubble regime was recently [1] proposed. The advantage of this approach is two-fold: (a) electrons' energy gains from the laser and from the wake add up, and (b) dephasing is slowed down. Using 2D VLPL simulations, we will demonstrate that two conditions must be met by the electrons injected into the hybrid accelerator: (1) strong spatial overlap with the laser field, and (2) large initial transverse energy. The firstcondition is met by employing two laser pulses: one to produce a plasma bubble, and the second time-delayed pulse to interact with the injected electrons. We will show that there are two approaches to meeting the second condition: self-injection using an engineered density bump [1] and ionization-injection. The criteria for direct laser acceleration of ionization-injected electrons will be discussed. Combinations of laser pulses with different wavelengths will also be considered. This work is supported by the US DOE grant DE-SC0007889 and the AFOSR grant FA9550-14-1-0045.

[1] X. Zhang, V. N. Khudik and G. Shvets, Phys. Rev. Lett. , 184801 (2015).

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