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Analytic model of a laser-accelerated composite plasma target and its stability VLADIMIR KHUDIK, GENNADY SHVETS, Institute for Fusion Studies, The University of Texas at Austin, Austin, TX 78712 USA — A self-consistent analytical model of monoenergetic acceleration of a one and two-species ultrathin target irradiated by a circularly polarized laser pulse is developed. In the accelerated reference frame, the bulk plasma in the target is neutral and its parameters are assumed to be stationary. It is found that the structure of the target depends strongly on the temperatures of electrons and ions, which are both strongly influenced by the laser pulse pedestal. When the electron temperature is large [1], the hot electrons bounce back and forth inside the potential well formed by ponderomotive and electrostatic potentials while the heavy and light ions are forced-balanced by the electrostatic and non-inertial fields forming two separated layers. In the opposite limiting case when the ion temperature is large, the hot ions are trapped in the potential well formed by the ion-sheath's electric and non-inertial potentials while the cold electrons are forced-balanced by the electrostatic and ponderomotive fields. Using PIC simulations we have determined which scenario is realized in practice depending on the initial target structure and laser intensity. Target stability with respect to Rayleigh-Taylor instability will also be discussed [2].
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[1] V. Khudik, S. A. Yi, C. Siemon, and G. Shvets , AIP Conf. Proc. 1507, 803 (2012); doi: 10.1063/1.4773801, [2] T.P. Yu, A. Pukhov, G. Shvets, M. Chen, T. H. Ratliff, S. A. Yi, and V. Khudik, Phys. Plasmas, 18, 043110 (2011).

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