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Monoenergetic ion acceleration and Rayleigh-Taylor instability of the composite target irradiated by the laser pulse VLADIMIR KHUDIK, S. AUSTIN YI, GENNADY SHVETS, UT-Austin — Acceleration of ions in the two-specie composite target irradiated by a circularly polarized laser pulse is studied analytically and via particle-in-cell (PIC) simulations. A self-consistent analytical model of the composite target is developed. In this model, target parameters are stationary in the center of mass of the system: heavy and light ions are completely separated from each other and form two layers, while electrons are bouncing in the potential well formed by the laser ponderomotive and electrostatic potentials. They are distributed in the direction of acceleration by the Boltzmann law and over velocities by the Maxwell-Juttner law. The laser pulse interacts directly only with electrons in a thin sheath layer, and these electrons transfer the laser pressure to the target ions. In the fluid approximation it is shown, the composite target is still susceptible to the Rayleigh-Taylor instability [1]. Using PIC simulations we found the growth rate of initially seeded perturbations as a function of their wavenumber for different composite target parameters and compare it with analytical results. Useful scaling laws between this rate and laser pulse pressure and target parameters are discussed.

[1] 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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