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Ion acceleration by relativistic laser pulses from semitransparent targets A.V. BRANTOV, E.A. GOVRAS, V. YU. BYCHENKOV, Lebedev Physics Institute, Moscow, Russia, W. ROZMUS, Univ. of Alberta, Edmonton, AB, Canada — A new, maximum proton energy, E_p, scaling law with the laser pulse energy, E_L, has been derived from the results of 3D particle-in-cell (PIC) simulations. According to numerical modeling, protons are accelerated during interactions of the femtosecond relativistic laser pulses with the plain semi-transparent targets of optimum thickness [Esirkepov, *et al.* Phys. Rev. Lett. **96**, 105001 (2006)]. The scaling, $E_p \sim E_L^{0.7}$, has been obtained for the wide range of laser energies, different spot sizes, and laser pulse durations. Our results show that the proper selection of foil target optimum thicknesses, results in a very promising increase of the ion energy with the laser intensity even in the range of parameters below the radiation pressure (light sail) regime. The proposed analytical model is consistent with numerical simulations.

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