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Laser-driven ultraintense proton beams for high energy-density physics SLAWOMIR JABLONSKI, JAN BADZIAK, PIOTR PARYS, MARCIN ROSINSKI, JERZY WOLOWSKI, Institute of Plasma Physics and Laser Microfusion, EURATOM Association, 00-908 Warsaw, Poland, ADAM SZYDLOWSKI, The Andrzej Soltan Institute for Nuclear Studies, Swierk, Poland, P. ANTICI, J. FUCHS, A. MANCIC, LULI, Ecole Polytechnique, CNRS, CEA, UPMC; Route de Saclay, 91128 Palaiseau, France — The results of studies of high-intensity proton beam generation from thin (1 – 3μm) solid targets irradiated by 0.35-ps laser pulse of energy up to 15J and intensity up to 2×10^{19} W/cm^2 are reported. It is shown that the proton beams of multi-TW power and intensity above 10^{18} W/cm^2 at the source can be produced when the laser-target interaction conditions approach the Skin-Layer Ponderomotive Acceleration requirements. The laser-protons energy conversion efficiency and proton beam parameters remarkably depend on the target structure. In particular, using a double-layer Au/PS target (plastic covered by 0.1 – 0.2μm Au front layer) results in two-fold higher conversion efficiency and proton beam intensity than in the case of a plastic target. The values of proton beam intensities attained in our experiment are the highest among the ones measured so far.

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