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Laser-driven proton acceleration in thin micro-structured foils[1]
JIRI LIMPOUCH, ONDREJ KLIMO, JAN PSIKAL, RICHARD LISKA, JAN PROSKA, LUCIE STOLCOVA, JIRI VYSKOCIL, Czech Technical University in Prague, Czech Republic, DANIELE MARGARONE, GEORG KORN, DANIEL KRAMER, TOMAS MOCEK, JAN PROKUPEK, Institute of Physics AS CR, Prague, Czech Republic, TAE MOON JEONG, I. JONG KIM, HYUNG TAEK KIM, K.H. NAM, IL WOO CHOI, SEONG KU LEE, JAE HEE SUNG, TAE JUN YU, APRI GIST Gwangju, Rep. of Korea — Proton acceleration enhancement by microstructures on the front side of a thin foil was studied both theoretically and experimentally. Microstructures of characteristic width comparable to the laser wavelength improve the absorption of high-contrast ultrashort intense laser pulses, hot electron temperature and number is enhanced and subsequently, the efficiency of ion acceleration in the TNSA regime is increased. We have proposed, prepared and tested targets with a monolayer of microspheres on the surface of 1-μm-thick plastic foil. These targets were irradiated by 100 TW laser beam reaching intensities up to 5×10^{19} W/cm^2. The cut-off proton energy was increased by 60% for the optimal spheres' diameter of 535 nm compared to the pure planar foil. The total number of protons with energies higher than 1 MeV was increased approximately 5 times. Experimental results are interpreted by means of 2.5-dimensional Particle-In-Cell code.

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