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Scaling Studies of Laser Proton Acceleration by Radiation Pressure Sail T.C. LIU, G. DUDINKOVA, CHUAN S. LIU, X. SHAO, R.Z. SAGDEEV, Physics Department, University of Maryland — We present scaling studies of proton acceleration by short pulse, intense lasers in the region of radiation pressure acceleration of ultra thin foil. By defining the monoenergetic proton as having energy spread less than 10 percent in 2D PIC simulation, we studied the proton monoenergy profile as a function of the laser power and peak intensity, thin foil thickness and target density ratio to critical density. We found that the energy of monoenergetic proton scales linearly with the square root of laser power after fixing the target density ratio to critical density. The Rayleigh-Taylor (R-T) instability plays significant role in increasing the energy spread of accelerated protons. But, there are parameter regimes for instability remediation or suppression. Parameters of interest are for lasers in sub-Peta Watt range and producing quasi energetic protons to 250 Mev and carbon ion to 1 Gev. The simulation results are able to provide experimentalists with suggestion for optimal scaling for laser acceleration of thin foils for instability avoidance and optimal ion acceleration. Possible medical applications of the technology in proton cancer therapy is also discussed.

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