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Generation of Monoenergetic Protons by Laser Acceleration of Multi-Ion Foils with Polarization Switch[1] XI SHAO, TUNG-CHANG LIU, CHUAN-SHENG LIU, University of Maryland, College Park, BENGT ELIASSON, Ruhr-University Bochum, JYHPYNG WANG, SHIH-HUNG CHEN, National Central University — Laser radiation pressure acceleration is considered as an effective method in obtaining high energy quasi-monoenergetic ions. By irradiating a laser beam on a multi-species target made of carbon and hydrogen, the proton layer can be accelerated ahead of the carbon ion layer due to a higher charge-to-mass ratio. And the shielded Coulomb repulsion provided by the left-behind electron-carbon layer can not only further accelerate the proton layer, but also stabilize it for a long time. The acceleration time of quasi-monoenergetic protons by the combined mechanisms is extended over ten times longer compared to the case of applying single-species targets and using radiation pressure acceleration alone. 60 MeV of quasi-monoenergetic protons from a multi-species foil with input laser power of 70 TW is obtained, which is at least five times greater than the energy obtainable from pure hydrogen targets. To further increase the efficiency, we achieve an improvement of 30 percent energy enhancement by introducing a polarization switch in the laser profile. An analytical approach to interpret and optimize the results is also studied.

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