

Abstract Submitted
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Laser-driven shock acceleration of monoenergetic ion beams ELISABETTA BOELLA, FREDERICO FIUZA, RICARDO A. FONSECA, LUIS O. SILVA, GoLP/IPFN - LA - Instituto Superior Tecnico, DAN HABERBERGER, SERGEI TOCHITSKY, CHAO GONG, WARREN B. MORI, CHAN JOSHI, UCLA — Ion acceleration from laser-plasma interactions is a promising approach for compact and bright ion sources. However, the conditions for optimization of the beam quality and energy are not yet fully understood. We show that the use of tailored critical-density targets, with a steep density ramp at the front and an exponential ramp at the back, which can be obtained in realistic experimental conditions, enables the generation of high quality and high energy ion beams accelerated by a laser-driven electrostatic shock. The laser deposits most of its energy in a localized region at critical density, heating the electrons and generating an electrostatic shock. The shock can then reflect most of the ions from the back of the target to high energies before competing accelerating fields (like TNSA) develop significantly, leading to high quality beams. Our PIC simulation results illustrate the possibility of generating high quality proton beams with energies in the required range for medical applications (100-300 MeV) with moderate laser intensities ($a_0 \sim 10$).

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