Parametric study of ion acceleration in electrostatic shock waves

ELISABETTA BOELLA, FREDERICO FIÚZA, ANNE STOCKEM, RICARDO FONSECA, LUIS SILVA, GoLP/Instituto de Plasmas e Fusão Nuclear - Laboratorio Associado, Instituto Superior Tecnico, Lisbon, Portugal — In past years, a considerable effort has been devoted to investigate the acceleration of ions by means of laser-plasma interactions. Recently, a new mechanism has been proposed to accelerate ions efficiently in laser-driven electrostatic shock waves. As experiments and numerical simulations demonstrated [1, 2], shocks with low Mach number can be generated in near critical density plasmas; such shocks are able to accelerate ions having an energy spectrum suitable for medical applications. We have developed a reduced electrostatic code [3] that captures all the relevant 1D physics of shock formation and particle acceleration; the code has been benchmarked with full-PIC OSIRIS calculations. In the poster, we will present results from a detailed parameter scan for different plasma temperature and density profiles inducing the shock formation; moreover, the optimal conditions for the generation of high energy and high quality ions beams will be illustrated.