ACCELERATION OF IONS VIA A SHOCK COMPRESSION IN A CRITICAL DENSITY PLASMA USING A CO_2 LASER

F.S. Tsung, C. Joshi, W.B. Mori, UCLA, Los Angeles, California;
S.F. Martins, Instituto Superior Tecnico, Lisbon

Abstract

The possibility of using a CO_2 laser (10 micron wavelength) to drive a plasma density compression and achieve effective ion acceleration in gaseous targets (density $>\sim 10^{19}\mathrm{cm}^{-3}$) is explored. A parameter scan is performed with a set of particle in cell simulations in OSIRIS*, both in 2D and 3D, for various laser intensities, linear/circular polarization pulses, and plasma densities. Results show that, to generate the shock compression, plasma density must be increased above the critical value to account for the relativistic motion of the electrons. Under these conditions, 2–5 MeV ions are observed with moderate intensity (a0=3) laser pulses. Finally, configurations to generate a shock structure are suggested, that will more efficiently accelerate the particles. This scenario is also of particular relevance to fast-ignition, inertial confinement fusion, and implications to those regimes can be obtained from numerical simulations by using the appropriate density normalization.

* R.A. Fonseca *et al.*, LNCS 2329, III-342, Springer-Verlag, (2002).

Fundacao Calouste Gulbenkian and Fundacao para a Ciencia e Tecnologia under grants SFRH/BD/35749/2007.

CONTRIBUTION NOT RECEIVED