STOPPING OF LOW-ENERGY HIGHLY-CHARGED IONS IN DENSE PLASMAS

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Heavy ion stopping in dense plasmas was numerically analyzed to find realistic parameters of the experiments on nonlinear interactions between the plasma targets and 10-100 keV/u beams delivered by a small electrostatic accelerator. We investigated interactions between the beams and highly-ionized hydrogen plasmas with coupling constants $\Gamma \approx 0.1$-2. To evaluate the energy loss we applied a simple particle code, in which the equations of motion were integrated for the projectile and all particles in the plasma contained in a cylinder. If the projectile charge was sufficiently high, nonlinear stopping was clearly observed even for plasmas with $\Gamma < 1$. The evaluated nonlinearity was explained comprehensively by introducing a projectile-plasma coupling constant. However we found that such a high projectile charge is not realistic for the low-energy ions at least during the passage through cold targets. Possibility of attaining high charge states needed for successful observations of the nonlinearity is discussed by considering the charge-changing processes of the projectile in target plasmas with different ionization degrees.