2 - 9 Study of Slow Ion Beam Penetrating Low Density Plasma Target[1]

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The interaction process between ion beam and plasma is a very important aspect in Ion-Beam-Driven High Energy Density Physics and Inertial Confinement Fusion[1-4]. Considering the important role of the low energy regime in fast-ignition and target-cell burning[5-6], we present recent results about the slow ion beam interaction with plasma target.

On the 320 kV Highly Charged Ions Platform at IMP, a new experimental setup was installed for the study of ion-beam-plasma interaction. The plasma target is produced by a gas discharge device and the plasma temperature is about 2 eV, electron density varying from 2×10^{16} to 2×10^{17} cm^{-3}. The ion beam with energy of 50 keV ~ 1 MeV impacted on the plasma target, and the outgoing ions were measured using a parallel-plate and a time resolved 2D position sensitive detector[7-8].

The energy loss of the 200 keV proton beam passing through the gas target with the atomic number density varying from 1×10^{14} to 5×10^{17} cm^{-3} was measured. As shown in Fig. 1, the experimental data are very coincident with the theoretical results calculated by TRIM codes.

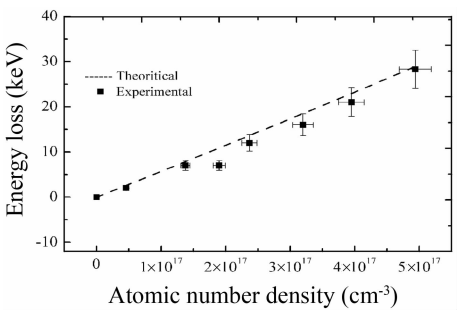

Fig. 1 Energy loss of the proton beam as a function of the gas atomic number density.

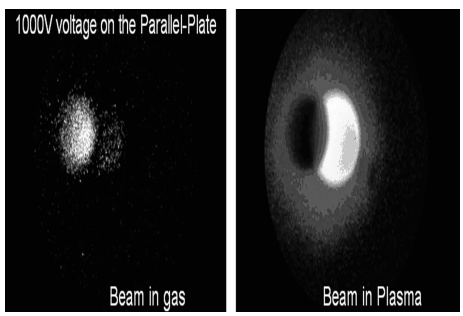

Fig. 2 Results for the proton passing through the gas (left) and the plasma target (right).

The ion beam after passing through the plasma target was measured as well. Fig. 2 shows the image on the detector in case of 200 keV proton passing through the gas and plasma target with atomic density of 7×10^{16} cm^{-3}. Due to the strong influence caused by the plasma light on the detector, it is impossible to measure the position shifting and distinguish the energy loss in the plasma. The experimental setup will be modified to eliminate the plasma light influence and the experiment will be repeated in order to more precisely measure the energy loss of ion beams in plasma and in gases.

References

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1 Supported by the Major State Basic Research Development Program of China and the National Natural Science Foundation of China.
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