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Investigation of Neutral Particles in the SMBI Experiments Using a Laval Nozzle in GAMMA 10

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The proper control of gas fueling is very important to obtain good performance plasma. A gas fueling by supersonic molecular beam injection (SMBI) has been performed at the central-cell in GAMMA 10 as shown in Fig. 1. The results of SMBI experiment with plenum pressure from 0.3 MPa to 2.0 MPa were obtained using a laval nozzle. The line density in the central-cell (NLcc) of the plasma were increased during SMBI (Fig.2). $H\alpha$ intensity was measured by $H\alpha$ detectors at different position along z-axis. The $H\alpha$ line intensity was increased by SMBI (Fig.3). The neutral particle behavior was investigated based on 2-dimensional image captured by a high speed camera which is installed at the central-cell (Fig.4). The distribution of the emission intensity were also investigated by the image captured by the camera as an index of the neutral transport. It was found that the full width at half maximum (FWHM) value with the laval nozzle (20 cm) was lower than that of straight nozzle (28 cm) which had been performed previously [1]. This indicates that the effect of the laval nozzle reduces the diffusion of injected hydrogen molecules.

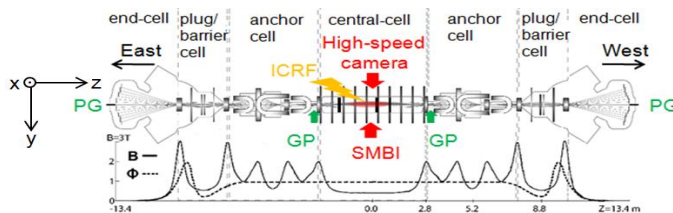


Fig. 1 Overview of GAMMA 10 experimental set-up.

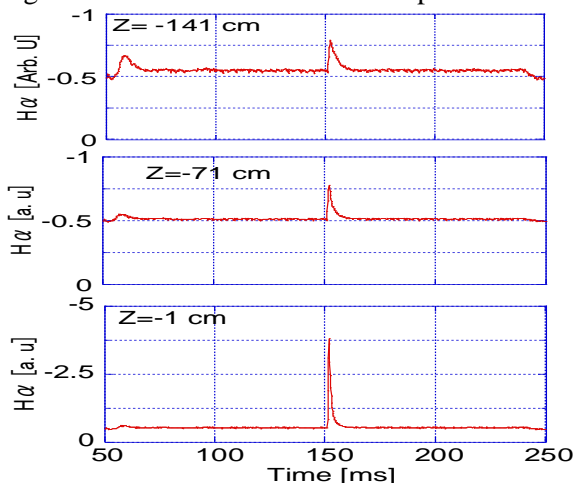


Fig. 3 Variation of $H\alpha$ with time in the central-cell.

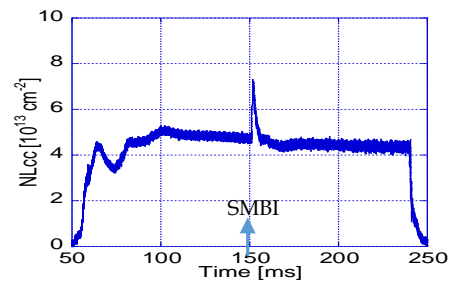


Fig. 2 Time responses of line density in central cell.

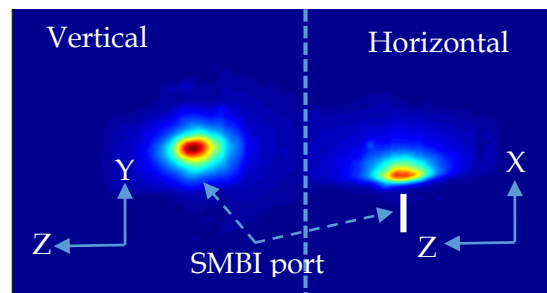


Fig. 4 2-D image by the high-speed camera.