

§62. Optimization of Sabot for Target Injection Accuracy - Development of Sabot Remover of Target Injector for IFE -

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A target for First Ignition for Inertial Fusion Energy is protected from thermal radiation by a container sabot. The target is separated from the sabot before entering to the reactor chamber. We have been developed magnetic sabot-remover applying Lorentz force generated by permanent magnet array (PMA)¹⁻⁶⁾. The force acts on only sabot for removal it. In order to improve injection accuracy, improvement of machining accuracy of sabot and introduction of sabot rotation are carried out⁵⁾.

Fig. 1 shows the experimental injector system. A poly-styrene form target ($4.0 \pm 0.05\text{mm}\phi$, 0.8mg) was inserted in an aluminum sabot ($9.35\text{mm}\phi \times 40\text{mm}$, 5.07g) with machining accuracy of $50\text{ }\mu\text{m}$. A solenoid valve releases 10^6 Pa N_2 gas to accelerate the sabot up to 40 m/s with the target. Forty donut shape permanent magnets (OD30mm, ID14mm, 5mmt) of PMA are set outside of the barrel. The sabot passing through the PMA is selectively decelerated down to 20 m/s . Fig. 2 shows injection accuracy of $\sim 13\text{ mrad}$ measured at the end of vacuum chamber.

Fig. 3 shows preliminary testing sabot rotation apparatus. The pieces of neodymium magnets (232mT) are spirally set on the vertically fixed transparent acrylic barrel. A free fallen sabot passed through it was rotated at the angular velocity of $30\pi\text{ rad/s}$. Its slip was estimated $s=0.95$. The slip can be decreased by rearrangement of neodymium magnets. We are introducing the tested rotating magnetic field to newly designed target injector.

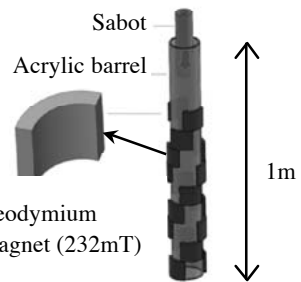


Fig. 3 Preliminary tested sabot rotation apparatus.

We are constructing the new injector system shown in Fig. 4. The effect of sabot rotation for target injection accuracy will be evaluated

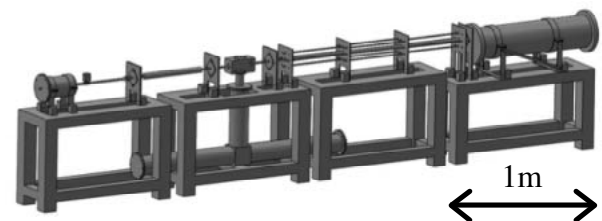


Fig. 4 Newly designed target injector

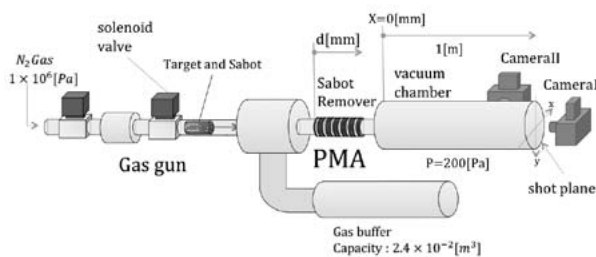


Fig.1 Experimental injector system

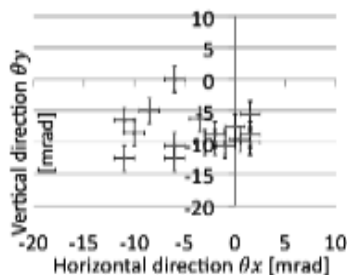


Fig. 2 Target injection accuracy

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