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Heat and Particle Flux Measurement of Detached Plasma using Gas Injection in the D-module of GAMMA 10/PDX

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This research investigated the radiation cooling mechanisms and formation of detached plasma in the case of gas injection in the D-module of GAMMA 10/PDX. In the D-module of GAMMA10/PDX, a V-shaped target made of tungsten has been installed [1]. A set of Langmuir probes and calorimeters has been installed at the upper and lower plates respectively of the V-shaped target for simultaneous measurement of particle and heat flux. A pair of calorimeter and directional probe is also installed behind a small gap of the V-shaped corner for investigating the radiation cooling mechanism and the degree of the plasma detachment. In this experiments, two types of noble gas (Ar, Xe) have been injected to the D-module in order to investigate the radiation cooling. According to the increment of gas pressure, reduction of heat flux, ion saturation current has been observed as shown in Fig. 2 to Fig. 4. These results indicate radiation cooling and formation of detached plasma due to gas injection. In the noble gas injection experiments, H_2 was injected simultaneously to investigate the effect of molecular process on the detached plasma formation. Simultaneous injection of noble gas and hydrogen gas showed the most effective results on detached plasma generation. The detail of experimental results will be presented in the poster presentation.

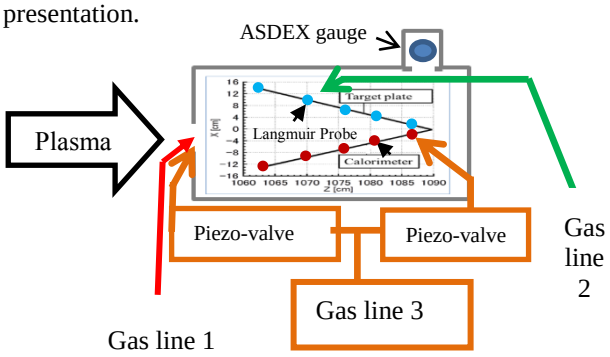

Fig. 1 Experimental setup

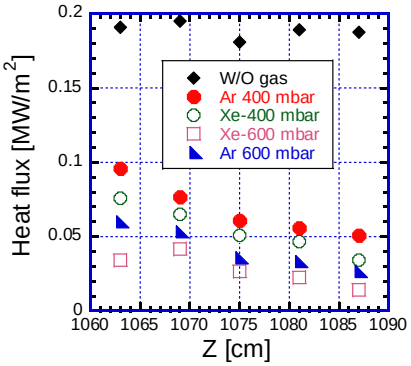

Fig. 2 Heat flux distribution on z axis.

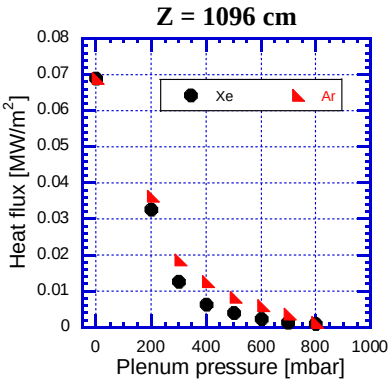

Fig.3 Heat flux as a function of plenum pressure of the injected gas.

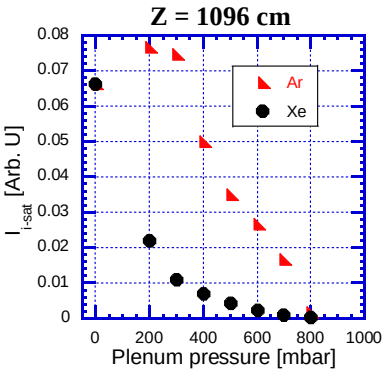

Fig.4 $I_{i\text{-}sat}$ as a function of plenum pressure of the injected gas.

[1] Y. Nakashima et al. J. Nucl. Mater. **438** (2013) S738-S741.