Contribution ID: **1165** Type: **not specified**

P3.118 Effects of divertor leg length on detached plasma formation in linear plasma device

Wednesday, 19 September 2018 11:00 (2 hours)

Steady-state fusion reactors and DEMO reactors will have much higher heat flux from the core than that from ITER, which itself exhibits heat flux that is several times larger than that available in the current fusion reactors. The detached plasma is effective for reducing heat load. However, since the generation of detached plasma requires to introduce a large quantity of gas, there is concern about the backflow of neutral particles. The long-leg divertor which is one possible solution for that has been proposed, but the relationship between the divertor-leg length and the backflow suppression / the detached plasma generation is not clear. Recently, advanced divertor aiming at additional heat removal by improving the magnetic field structure has been studied. Even in these diverters, because detached plasma is used for heat remove, it is necessary to clarify the relationship between the divertor-leg length and the neutral backflow / detachment plasma. Therefore, we conducted fundamental experiments to investigate the variation of characteristics about the backflow and the detached plasma by leg length and the magnetic field. We had reported the characteristics of the neutral backflow under the curved divergent magnetic field [1]. In a recent work, we experimentally examined the relationship between the leg length and the backflow / the detached plasma generation. The experiments had been performed by a linear divertor simulator, known as the Test plasma Produced by Directed current discharge for the Sheet plasma IV (TPD-Sheet IV) [1,2]. The orifices as a divertor-leg with different length were installed in front of the target region, respectively. The plasma parameters such as the electron temperature and electron density were measured by a Langmuir probe.

[1] T. Takimoto et al., Fusion Eng. Des., 124 (2017) 235–238.
[2] A. Tonegawa et al., J. Nucl. Mater., 313-316 (2003) 1046.

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Session Classification: P3