Langmuir probes on the divertor plates

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1. Purpose / Application

Purpose of the diagnostic is to investigate divertor plasma parameters and fluctuation characteristics of ion flux near the divertor plates.

2. Name of analysis (Kaiseki) data

"DivIis_tor_sum": Summation of ion saturation current signals measured with toroidal divertor probe arrays with low frequency
"DivIis_tor_iso": Profile of DivIis_tor_sum
"DivIis_tor_F#R": Fast ion saturation current signals on #R divertor plate
"DivIis_tor_F#L": Fast ion saturation current signals on #L divertor plate
(# is section number of 2, 4, 6 ,7 ,8 , 9 or 10)

3. General Description

3.1 Divertor probe arrays

- Consist of total 400 Langmuir probes embedded on 20 divertor plates
- 20 electrodes are aligned on each divertor plate every 6 mm
- Probe tips are made of graphite having a dome shape with a radius of 1 mm
- 14 probe arrays are positioned near the midplane on the closed helical divertor plates at 2I, 4I, 6I, 7I, 8I, 9I, and 10I (see Fig. 1)
- 1 probe array is positioned near the midplane on an open divertor plate at 3I
- the other 5 probe arrays are positioned with different poloidal angles at 9I and 1O

3.2 Operation

3.2.1. Single probe characteristics mode

- Single probe characteristics can be obtained by sweeping the applied voltage on the probe electrode - electron density, electron temperature, floating potential, and space potential can be estimated
- Sweeping frequency is normally 250 Hz

3.2.2. Ion saturation current fluctuation mode

- Ion saturation current fluctuation can be obtained with fixed negative voltage - sampling frequency is 250 kHz

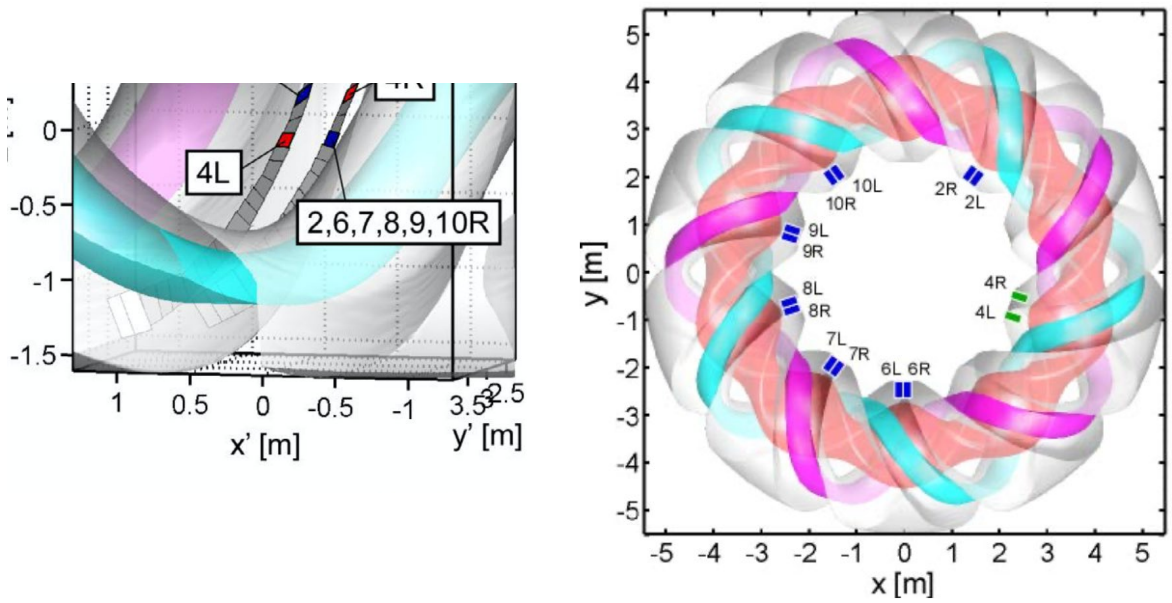

Figure 1 (Left) divertor plate with a Langmuir probe array. (Right) Divertor probe arrays embedded near the midplane on the closed helical divertor plates.

4. Others

Single probe characteristics and/or ion saturation current fluctuations are acquired in all discharges.

Several probe tips are broken due to the insulation breakdown because of carbon deposition.

References

[1] H. Tanaka, et al., Nucl. Mater. Energy 12 (2017) 241.

[2] S. Masuzaki, et al., Nucl. Fusion 42 (2002) 750.