Contribution ID: **3380** Type: **not specified**

P4.1003 Simulations of Segmented Rail Probes for COMPASS Upgrade

Thursday, 11 July 2019 14:00 (2 hours)

See full abstract here
http://ocs.ciemat.es/EPS2019ABS/pdf/P4.1003.pdf

Tokamak COMPASS Upgrade will be a high-field high-density fusion experiment aimed also at investigation of advanced divertor scenarios. One of proposed diagnostic systems is based on time-proven technique of Langmuir probe measurements. However, to operate these probes in the harsh environment of such machine, specific precautions must be taken.
The first is the elimination of the protruding electrode, which would be easily sputtered or melted away by high particle and heat flux. Probes adapted in such fashion are commonly known as flush mounted probes. However, this is not sufficient, since the inclination angle of the magnetic field lines will be very low and the sheath expansion would significantly affect the collected current. This can be counteracted by extending the probe along the field line, forming a stripe, or a rail. Probes of such design were a part of diagnostic setup at Alcator C-mod [1].
In this contribution, a study aimed at exploration of operational range of a newly constructed probe array will be presented. The probe in question will be simulated by a particle-in-cell model SPICE2 [2], which enables us to observe not only stationary heat or particle fluxes deposited on the probe, but also to artificially obtain the IV curve measured by the probe.
It has been found out that the sheath expansion affects especially the leading edge part of the probe, where the extra collected current is focused majority of the current is being collected near the leading edge, covering the extent of only a few Larmor radii. While it can cause overheating of the edge and possible melting, which can be mitigated by shaping of the leading edge, the flux focus can also be used as an advantage. Dividing the probe into several segments can improve the quality of the measured data as the analysis of artificial current-voltage curve indicates, especially with respect to ion saturation current and electron temperature measurements.
References
[1] A. Q. Kuang et al., Nuclear Materials and Energy 12, 12311235 (2017) [2] M. Komm et al., Nuclear Fusion 57, 126047 (2017)

Presenter: PODOLNIK, A. (EPS 2019)

Session Classification: Poster P4

Track Classification: MCF