

Measurements of the radial ion flow velocity profile using the multi-channel Mach probe in the boundary plasma of the W7-X stellarator

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Ion flow velocity measurement in the edge and scraper-off layer (SOL) is important to understand the edge physics in fusion devices for the aims of impurity control and advanced confinement. During the Wendelstein 7-X (W7-X) experimental campaign OP1.2a [1, 2], the multi-channel (MC) Mach probe mounted on the multi-purpose manipulator (MPM) [3] has been used to measure the radial profiles of ion flow velocity as well as the electron density and temperature profile. This MC-Mach probe consists of two polar and two radial arrays of directional Langmuir pins (28 pins in total) serving for different aims, of which the polar arrays could obtain a polar distribution of ion saturation current while the radial arrays are used to study the dynamic process of radially propagated event. Besides, a sweeping voltage from -200V to 200V is applied to one of the Mach probe pins, by which the electron density and temperature profile could be obtained. In this paper, the first measurement of radial ion flow velocity profile using the MC-Mach probe in the boundary plasma of W7-X with island divertor will be presented. The impacts of magnetic topology on the edge ion flow will be discussed.

Reference

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