Development of a multi-channel retarding field analyzer for the SOL physics on EAST and W7-X

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Steady-state operation of ITER and future power plants needs a detailed understanding of plasma-wall interaction (PWI) physics. Previous experiments in both tokamak and stellarator have shown that the magnetic topology plays an essential role in the particle and heat transport in the scrape-off layer (SOL), which is one of important PWI issues.

Wendelstein 7X (W7-X), the world largest stellarator, that started operation in 2015 [1], is aiming to demonstrate a high performance steady-state plasma operation with a natural 3-dimensional (3D) island divertor configuration. To investigate the interplay between magnetic topology and particle and heat transport in the SOL, a multi-channel retarding field analyzer (RFA) has been developed for measurements of the edge plasma temperature and density profiles in the upcoming W7-X experimental campaign, and it has been tested on EAST tokamak [2] in 2016.

In this paper, a detail physical design of the multi-channel RFA will be introduced, and the first measurements of the SOL profiles using the multi-channel RFA on EAST will be presented.

References