New Experimental Results Obtained using Microwave Reflectometry in HL-2A Tokamak

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Abstract

A modulated time delay microwave reflectometry with scanning frequency from 26.5-60 GHz and a step Doppler reflectometry have been developed on HL-2A. The plasma density profiles and the plasma poloidal rotation profiles have been obtained. Some new experimental results about particle transport and plasma rotation have been observed.

The particle transport study with the microwave reflectometry is based on the pulsed Molecular Beam Injection (MBI), which is a good particle perturbation source with deeper penetration and better location than the general gas puffing. The perturbation experiments show that the particle source injected by pulsed MBI is located at r/a=0.6~0.75, where the obvious minimum phases can be observed. The maximum amplitude of the first harmonic shifts inward, indicating the presence of an inward convective component. The particle diffusion coefficient and convection velocity during an Ohmic discharge are calculated using analysis code.

The plasma rotation profiles have been measured using Doppler reflectometry with scanning frequency, which is very important to understand the mechanism of the confinement improvement. In purely Ohmic discharge a change of the E × B flow velocity profiles has been observed in the region for $28 < r < 30$ cm if the line average density exceeds 2.2×10^{19} m^{3}. The plasma density profile gradient change is measured in the same region, too.