The Features of the Electron Heat Transport during High Power ECRH & SMBI on HL-2A

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With the high power ECRH and supersonic molecular beam injection (SMBI), the electron heat transport has been investigated on HL-2A. This paper will show the features of the electron transport, especially the new non-local phenomena triggered by SMBI, in which the electron transport barrier is formed at the position just outside the q = 1 surface and the globe confinement is improved.

Electron heat transport has been analyzed with two methods during high power ECRH. The diffusion coefficient both χ^{hp} and χ^{pb} increase with ECRH power and decreases with the electron density. The dependence of the χ_e on the input power and the electron density in HL-2A shows a great agreement with the L-mode scaling. The ratio χ^{hp} / χ^{pb} is about 2.8 in Ohmic discharges, it decreases to 1.7 with high power ECRH. So the heat diffusive process in ECRH discharges is more dominant than that in Ohmic discharges. Medium profile stiffness has been observed in HL-2A plasma, the threshold of critical gradient length is about 12.5. The plasma rotation in these discharges has also been observed with the Doppler microwave reflectometry.

The non-local transport phenomena induced by SMBI lasts much longer than that induced by pellet injection in other similar size tokomak; both the bolometer radiation and the Ha emission decrease when the non-local effect appears. The existence of a threshold on plasma density has been observed. The density limit in ECRH regime is apparently higher than that in the Ohmic regime. After the appearance of the non-local effect, it can be found that the region outside r ~ 20 cm is cooled by it, while the core T_e increases. The core T_e rise is about 18 %. This suggests that the injection of SMBI triggers internal transport barriers, which weakens the inward propagation of the cold pulse and the outward heat diffusion.