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ヘリオトロンJにおける電子内部輸送障壁形成時の熱輸送特性
Thermal Transport Characteristics of Heliotron J Plasma with Electron Internal Transport Barrier Formation

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The role of rational surface and magnetic island on electron internal transport barrier (e-ITB) formation has been recognised both at LHD[1] and TJ-II[2]. Heliotron J can contribute to the ITB physics research in terms of the role of rational surfaces controlling the presence of low order rationals in the rotational transform profile owing to its wide range of controllability of magnetic configuration[3].

In Heliotron J, an electron e-ITB formation has been observed with on-axis electron cyclotron heating (ECH)[4]. A heat transport analysis shows significant improvement of an electron thermal diffusivity in the core region in plasma with an e-ITB over that without the e-ITB. Eexperiments also be performed changing the rotation transform around the rational surface $n/m = 4/7$ in order to study its influence on the transition by introducting bootstrap current. In these experiments, e-ITB formations appear as a sudden increase in the central electron temperature at a certain value of the plasma current at 240 msec (figure 1(a)). The flattening of T_e is shown around $r/a = 0.3$ at the timing of e-ITB formation, which might be caused by a magnetic island (figure 1(b)). The rotational transform increases due to the plasma current and might reach to the 4/7 rational surface. The other experiments show the lower limit density to form e-ITB with the plasma current is higher ($1.3\times10^{19}\ m^{-3}$) than that without plasma current ($0.6\times10^{19}\ m^{-3}$), which suggests the existence of the rational surface contributes to the e-ITB formation at higher plasma density. It is possible that the existence of the rational surface triggers the e-ITB formation. Detailed research is proceeded to understand the mechanism of e-ITB formation especially in terms of the existence of rational surface and magnetic island.

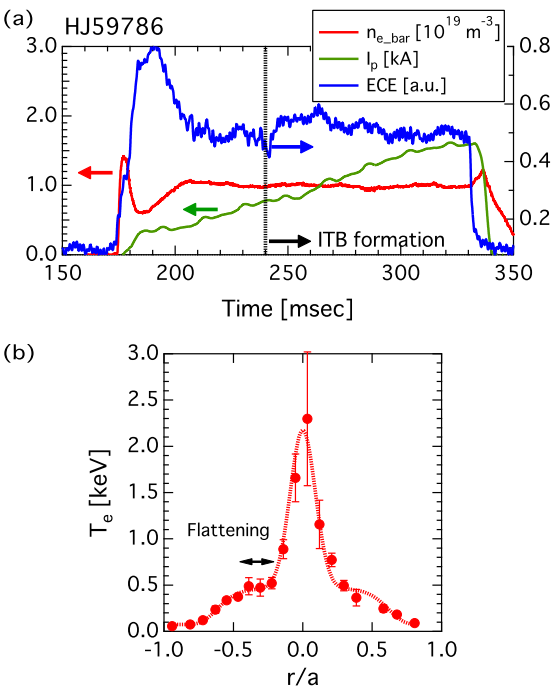

Figure 1: (a) Time evolution of central electron temperature (ECE) and line-averaged density and (b) typical T_e profile of e-ITB in the same magnetic configuration.

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