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UTST 球状トカマク実験における磁気リコネクションの電子加熱特性

Electron heating characteristics of magnetic reconnection in UTST spherical tokamak merging experiment

山崎 広太郎[1], 神尾 修治[1], 竹村 剛一良[1], 曹 慶紅[1], 渡辺 岳典[1], 板垣 宏知[1] , 山田 琢磨[1], 井 通暁[1], 小野 靖[1]

Kotaro YAMASAKI[1], Shuji KAMIO[1], Koichiro TAKEMURA[1], Qinghong CAO[1] , Takenori WATANABE[1], Hirotomo ITAGAKI[1], Takuma YAMADA[1] , Michiaki INOMOTO[1], Yasushi ONO[1]

東京大学[1]

the University of Tokyo[1]

Signicant electron and ion heatings of magnetic reconnection have been used to form high-beta plasma equilibrium in TS-3, TS-4, UTST (Univ. Tokyo) and MAST (Culham Lab-oratory) experiments. The merging start-up of spherical tokamak (ST) plasma has been developed in the UTST device using external poloidal eld coils[1]. The plasma current up to 310 kA has been obtained with assistance of the center solenoid (CS) coil. The electron heating occurs inside the current sheet, while ion heating does at the down stream regions. In MAST and TS-3, the merging start-up revealed a strong electron heating localized at X-point[2].

The electrostatic probe measurement at X-point reveals that the electron density increases with the toroidal current density inside the current sheet and also that electron density increase to the maximum value is followed by abrupt electron temperature increase up to 15-20 eV, simultaneously. Also, floating potential measurement inside and outside the current sheet shows that, when the current inside the current sheet decrease, floating potential globally decrease and finally form a gradient around the X-point as shown in Fig. 1. We will present the relationship between the electron heating and the current sheet dynamics and will discuss causes and mechanisms for the strong electron heating localized at the X-point using magnetic and electrostatic probe measurements.

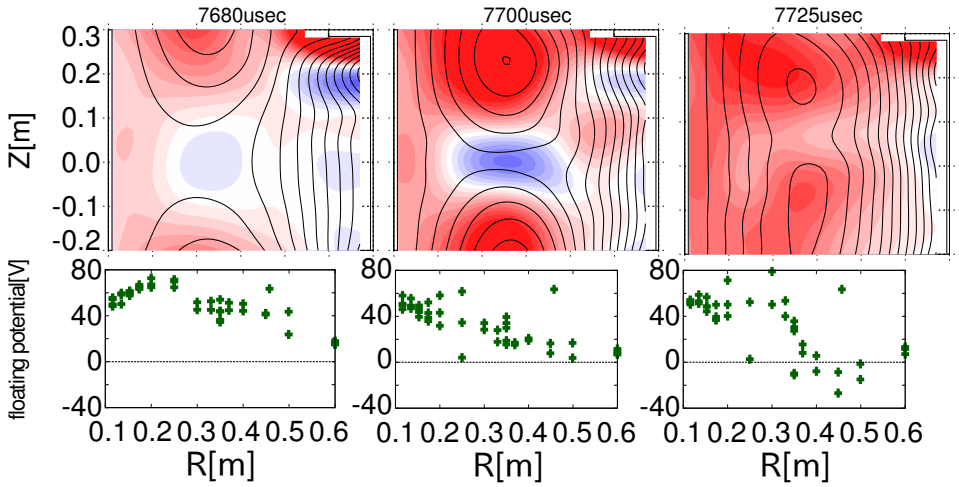

fig 1: Magnetic surface and floating potential.Color contour denotes toroidal current density.

[1]Y. Ono *et al*, Phys. Rev. Lett. 107, 185001, (2011)

[2]T. Yamada *et al*, Plasma Fusion Res. **5** (2010) S2100