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Ion and Electron Heating Characteristics of Magnetic Reconnection in TS-3, TS-4 and MAST Merging Experiments[1] HIROSHI TANABE, TAKUMA YAMADA, AKIHIRO KUWAHATA, HIROTAKA OKA, MASANOBU ANNOURA, KAZUTAKE KADOWAKI, MICHIAKI INOMOTO, YASUSHI ONO, Graduate School of Frontier Sciences, University of Tokyo, SETTHIVOINE YOU, Aeronautics and Astronautics, University of Washington, MIKHAIL GRYAZNEVICH, EURATOM/CCFE Fusion Association, Culhum Science Center — Characteristics of ion and electron heating during magnetic reconnection were investigated by use of 2D tomographic Doppler spectroscopy and 2D electrostatic probe measurement in TS-3 and TS-4 merging experiments. The magnetic reconnection heats electrons around X point and ions at the downstream, indicating that ion and electron heating are caused by outflow damping and sheet current dissipation, respectively. The different temperature profile of ions and electrons relax with the ion-electron relaxation time $\tau_{E_{e-i}}$. The MAST merging experiment has a long confinement time ∼100msec and $\tau_{E_{e-i}}$ ∼20msec is two or three times longer than ion heating time <10msec. The current sheet first increases Te quickly up to ∼300eV around X-point and then slowly does up to 500eV ∼20msec after the reconnection. The heating efficiency depends on guide field for electrons and not for ions. The most sensitive parameter for ion heating is reconnecting magnetic field $B_{//}$ due to the outflow heating mechanism. The TS-3 and TS-4 results agree with the ion temperature increment scaled with $B_{//}^2$. We are now installing another 2D Doppler measurement for the MAST merging experiment and will study the reconnection heating in the high field regime $B_{//} > 0.1$T.

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