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Micro/macro-scale ion heating and transport process of magnetic reconnection during merging plasma startup of TS-6 spherical tokamak[1]
HIROSHI TANABE, QINGHONG CAO, HARUAKI TANAKA, MOE AKIMITSU, TARA AHMADI, RYO SOMEYA, MICHIAKI INOMOTO, YASUSHI ONO, University of Tokyo — Micro/macro-scale ion heating and its transport process of magnetic reconnection have been investigated using 96CH/320CH ultra-high resolution ion Doppler tomography diagnostics which resolve both fine structure around X-point and global heat transport process in the TS-6 merging ST (Spherical Tokamak) formation experiment. As micro-scale characteristics around X-point, ions are heated around diffusion region as well as downstream of outflow jet. In synchronization with current sheet dynamics, ion temperature initially forms peaked structure around X-point but then gets split and ejected toward downstream. In guide field reconnection, it was also observed that ion temperature profile forms poloidally tilted structure which is related to the polarity of Hall-effect. Higher temperature typically appears in the negative potential region and it becomes clearer when ion/electron mass ratio is increased. While as macro-scale characteristics, the high temperature region in the downstream is affected by global heat transport process. Under the influence of high guide field which strongly suppresses perpendicular heat conduction, ion heat flux clearly propagates on field lines and high temperature region finally forms characteristic poloidally-ring-like structure at the end of merging.

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