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Exploration of high field reconnection heating in merging spherical tokamak formation experiments[1] HIROSHI TANABE, University of Tokyo, MIKHAIL GRYAZNEVICH, Tokamak Energy Ltd., QINGHONG CAO, HARUAKI TANAKA, TARA AHMADI, MOE AKIMITSU, YUNHAN CAI, RYO SOMEYA, CHIO-ZONG CHENG, MICHIAKI INOMOTO, YASUSHI ONO, University of Tokyo — Here we present recent progress of our exploration of high field reconnection heating in the ST40 and TS-6 merging spherical tokamak formation experiments. Ion heating in keV regime as in the MAST spherical tokamak has successfully been reproduced in ST40 and supporting heating/transport physics has now been investigated in TS-6. From the formation of first plasma in 2018 in both projects, ST40 demonstrated successful application scenario (connection of merging startup plasma to steady state) in 2019 and TS-6 enables full-2D ion temperature profile measurement with gyro-scale spatial resolution using 96CH/320CH ion Doppler tomography. Based on outflow heating mechanism ($\Delta T_i \propto B_{rec}^2$), magnetic reconnection forms high temperature region in the downstream of outflow jet and forms fine structure. Blob-like structure in the diffusion region is ejected toward downstream and forms clear hot spots after merging, while the hot spots on the closed flux surface formed by reconnected field lines are transported on the field line direction with the weight of $\kappa_{\parallel}^i/\kappa_{\perp}^i = 2(\omega_{ci}\tau_{ii})^2 >> 1$ under the influence of high guide field and finally forms poloidally ring-like structure.

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