Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Current Sheet Dynamics in TS-4 Tokamak Reconnection Experiment YASUSHI ONO, TOMOKI HAYASHI, HEIZO IMANAKA, RYOTA IMAZAWA, University of Tokyo — The current sheet dynamics have been studied in the TS-4 tokamak mergting / reconnection experiment, revealing quasi-steady, transient and intermittent reconnections. Reconnection speed of two tokamak plasmas was varied by acceleration and separation coil currents. When the inflow flux was set larger than the outflow flux, rapid growth of current sheet was followed by its various dynamics, such as sheet deformation, sheet ejection and island structures of the sheet. In the high-q tokamak merging, the sheet resistivity was almost classical due to the sheet thickness larger than ion gyroradius. Large inflow flux and low current-sheet dissipation caused plasma pileup around the sheet, indicating rapid growth of the current sheet. When the flux pileup exceeded a critical limit, the sheet was ejected mechanically from the squeezed X-point area. The reconnection (outflow) speed was slow during the flux pileup and was fast during the ejection, indicating that intermittent reconnection similar to the solar flare increased the averaged reconnection speed. Right after the ejection, the current sheet was often transformed into several current islands, suggesting that the island size comparable with ion gyrodasius increased the sheet resistivity as well as the reconnection speed. These transient effects caused the fast reconnection as well as the high-power reconnection heating in the merging tokamak experiment.

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Date submitted: 20 Jul 2007 Electronic form version 1.4