Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Study of Local Plasma Heating during Magnetic Reconnection by Tomographic Ion Doppler Spectroscopy in TS-3, TS-4 and MAST HIROSHI TANABE, AKIHIRO KUWAHATA, Univ. Tokyo, TAKUMA YAMADA, Kyusyu Univ., TAKENORI WATANABE, KEII GI, MASANOBU ANNOURA, KAZUTAKE KADOWAKI, YASUHIRO KAMINOU, HIDEYA KOIKE, KENTO NISHIDA, MICHIAKI INOMOTO, Univ. Tokyo, SETTHIVOINE YOU, Univ. Washington, BRENDAN CROWLEY, NEIL CONWAY, RORY SCANNEL, CCFE, MIKHAIL GRYAZNEVICH, Tokamak Solutions, YASUSHI ONO, Univ. Tokyo —
For the past decade, local plasma heating during magnetic reconnection has been investigated in TS-3 and TS-4 by use of 2D Doppler tomography and in-situ probe diagnostics. Our merging experiments revealed significant ion heating in the outflow region and electron heating around X point. The reconnection heating energy scales with the square of reconnecting field B_{rec} and reaches $\sim$200eV at maximum with B_{rec} $\sim$0.1T. As a promising CS-less spherical tokamak startup technique, the reconnection/merging startup in MAST achieved the maximum ions and electron temperatures over 1keV. The high-resolution Thomson scattering with 130 chords reveals direct electron heating at the X-point and electron density pile-up in the downstream. The 32 chords Doppler tomography system was installed on the midplane of MAST for the purpose of measuring the radial profile of ion temperature. The measured triple peaks of ion temperature indicate the ion heating in the downstream as well as that in the current sheet with and without the assist of centre solenoid coil.

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Date submitted: 12 Jul 2013 Electronic form version 1.4