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Recent Progress in TS-4 and UTST ST Merging Experiments YASUSHI ONO, Univ. Tokyo, TS AND UTST TEAM — For the past ten years, we have been investigating the merging startup of spherical tokamak in TS-4 and UTST experiments. Cause and mechanism for magnetic reconnection heating were directly measured for the first time by use of new two dimensional ion and electron measurements. Two ST plasmas were merged together in the axial direction for high-power reconnection heating/ startup without center-solenoid (CS) coil. A new finding is that ions and electrons were heated in the down-stream area and in the current sheet, respectively. The 2-D line-integrated data of spectral lines were measured by polychromators with ICCD cameras, and were transformed into local ion temperature data using the tomography reconstruction. The electron temperature was measured by a scanning electrostatic probe array. While the electron temperature outside the sheet was uniformly 5-6eV, it clearly peaked around the current sheet. While electrons were quickly hearted inside current sheet by its ohmic heating power, ions were heated in the downstream area by shock or viscosity damping of the reconnection outflow. The ion heating power $\sim$4MW was an order of magnitude larger than the electron heating power $\sim$0.2MW. This heating mechanism is consistent with the squared B scaling (B: poloidal field) of reconnection heating energy. We started the multiple merging experiment for CS-less rampup and current drive of ST and for new double axis divertor for its high MHD activities.

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