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Relationship between Magnetic Helicity Injection and Magnetic Reconnection in Double-Null Startup of the UTST Spherical Tokamak TAKENORI WATANABE, SHUJI KAMIO, QINGHONG CAO, HIROTOMO ITA-GAKI, KOICHIRO TAKEMURA, KOTARO YAMASAKI, The University of Tokyo, KOJI ISHIGUCHI, The Open University of Japan, TAKUMA YAMADA, MICHI-AKI INOMOTO, YASUSHI ONO, The University of Tokyo — Magnetic helicity injection is a useful idea for explaining plasma current drive and startup of various magnetized plasmas such as Spherical Tokamaks (STs). Magnetic reconnection is directly related with the magnetic helicity injection, because it is essential to reorganization of magnetic field lines injected externally. We address how and why helicity injection is related with magnetic reconnection. An ST plasma is produced by using two pairs of external poloidal field coils in the University of Tokyo Spherical Tokamak (UTST) device. In the late phase of the formation, a single ST is connected to the coil flux, which enables magnetic helicity injection from the helicity source (the coil flux) into the helicity sink (the ST plasma). We measured the Yshaped reconnection region between the ST plasma and the poloidal coil using two dimensional pickup coil arrays in the r-z plane. magnetic reconnection of common flux into private flux causes concentration of current density along the current sheet, forming a high eigen-value area between the helicity source and the helicity sink. We made a parameter scan to study how crucial and effective the plasmoid ejection is for helicity injection and found that the plasmoid motion is a dynamic helicity injection process.

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