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Characteristics of Multi-pulsing CHI driven ST plasmas on HIST

M. ISHIHARA, T. HANAO, K. ITO, K. MATSUMOTO, T. HIGASHI, Y. KIKUCHI, N. FUKUMOTO, M. NAGATA, University of Hyogo — The flux amplification and sustainment of the ST configurations by operating in Multi-pulsing Coaxial Helicity Injection (M-CHI) method have been demonstrated on HIST. The multi-pulsing experiment was demonstrated in the SSPX spheromak device at LLNL. In the double pulsing discharges, we have observed that the plasma current has been sustained much longer against the resistive decay as compared to the single CHI. We have measured the radial profiles of the flow velocities by using Ion Doppler Spectrometer and Mach probes. The result shows that poloidal shear flow exists between the open flux column and the most outer closed flux surface. The poloidal velocity shear at the interface may be caused by the ion diamagnetic drift, because of a steep density gradient there. The radial electric field is determined by the flow velocities and the ion pressure gradient through the radial momentum balance equation. We have investigated the contribution of $E \times B$ or the ion pressure gradient on the poloidal velocity shear by comparing the impurity ion flow obtained from the IDS with the bulk ion flow from the Mach probe. It should be noted that the diamagnetic drift velocity of the impurity is much smaller than $E \times B$ drift velocity. We will discuss characteristics of M-CHI-driven ST plasmas by varying TF coil current and the line averaged electron density.

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