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Plasmoid formation in the elongated current sheet during transient CHI on HIST MASAYOSHI NAGATA, AKIHIRO FUJITA, TAKAHIRO MATSUI, YUSUKE KIKUCHI, NAOYUKI FUKUMOTO, University of Hyogo, TAKASHI KANKI, Japan Coast Guard Academy — The Transient-Coaxial Helicity Injection (T-CHI) is a promising candidate for the non-inductive plasma start-up on Spherical Torus (ST). The problem of the flux closure in the T-CHI is important and related to understand the physics of fast magnetic reconnection. The recent MHD simulation (F. Ebrahimi and R. Raman, Phys. Rev. Lett. 114, 205003 (2015)) on T-CHI for NSTX predicts the formation and breakup of an elongated Sweet-Parker (S-P) current sheet and a transient to plasmoid instability. According to this simulation, the reconnection rate based on the plasmoid instability is faster than that by S-P model and becomes nearly independent of the Lundquist number S . In this meeting, we will present that the formation of multiple X-points and plasmoids has been observed in T-CHI start-up plasmas on HIST. The stronger external guide (toroidal) magnetic field makes plasma less compressible, leading to slower reconnection time and longer current sheet. The experimental observation shows that $2/3$ plasmoids are generated in the elongated current sheet with the narrow width comparable to the ion skin depth or the ion sound gyro-radius. The small plasmoids develop to a large-scale flux structure due to a current inward diffusion during the decay phase.

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