Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Ion flow measurements during the MHD relaxation processes in the HIST spherical torus device T. NISHIOKA, S. HASHIMOTO, K. ANDO, Y. KIKUCHI, N. FUKUMOTO, M. NAGATA, University of Hyogo — Plasma flow is one of the key roles in self-organization and magnetic reconnection processes of helicity-driven spherical torus (ST) and spheromak. The HIST spherical torus can form the standard ST and the flipped ST plasmas by utilizing the variation of the external toroidal field coil current. The flipped ST plasma can be generated by changing the polarity of the toroidal magnetic field during the standard ST discharge [1]. We have developed an ion Doppler spectrometer (IDS) system using a compact 16 channel photomultiplier tube (PMT) in order to measure the spatial profile of ion temperature and rotation velocity in the HIST device. The IDS system consists of a light collection system including optical fibers, 1 m-spectrometer and the PMT detector. As the results, it was observed that ion velocity was about 10 km/s in the same direction as the toroidal current and ExB direction in the standard ST discharge. The observed ion velocity agrees with Mach probe measurements. During the transition from the standard ST to the flipped ST state, the ion temperature was fluctuated and increased. The result implies an ion heating during magnetic reconnections. In addition, the toroidal direction of the ion flow was reversed. The detail physics of the observed phenomenon will be shown. [1] M. Nagata et al., Phys Rev. Lett. **90**, pp. 225001-225004 (2003).

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Date submitted: 18 Jul 2008 Electronic form version 1.4