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Initial Plasma Experiment in the Levitated Ring Trap RT-1

H. Saitoh¹, Z. Yoshida¹, Y. Ogawa², J. Morikawa¹, S. Watanabe¹, Y. Yano¹, and J. Suzuki¹

¹*Department of Advanced Energy, Graduate School of Frontier Sciences, The University of Tokyo, Kashiwa 277-8561, Japan*

²*High Temperature Plasma Center, The University of Tokyo, Kashiwa 277-8561, Japan*

Studies on toroidal flowing plasma have started in a superconductor levitated coil device, Ring Trap 1 (RT-1) [1]. RT-1 generates a magnetosphere-like dipole magnetic field configuration that enables various kinds of experiments related to flowing plasmas. The main purpose of the Ring Trap Experiment is to explore a new high- β relaxation state of plasmas predicted by two-fluid relaxation theory of flowing plasmas [2]. Magnetic surface configuration of RT-1 also enables stable pure-magnetic trap of non-neutral plasmas [3], which is potentially suitable for the confinement of charged particles including anti-matters. As an initial experiment, hydrogen plasma is produced by electron cyclotron heating using 8.2GHz microwave generated by a klystron with the maximum power of 100kW for 1s pulse operation. The high- T_c superconductor (Bi-2223) ring with a total coil current of 250kAT is magnetically levitated in a vacuum chamber using a PID feedback control system. The field strength in the trap region is 0.03T to 0.3T. Diagnostics for the RT-1 experiment includes spectroscopy, soft X-ray pulse-height analysis with Si (Li) detector, magnetic probes, and Langmuir probes for edge plasma measurement. The initial experimental results in RT-1 will be presented in the meeting.

1. Z. Yoshida *et al.*, Plasma Fusion Res. **1**, 008 (2006).
2. Z. Yoshida and S. M. Mahajan, Phys. Rev. Lett. **88**, 095001 (2002).
3. Z. Yoshida, *et al.*, in *Nonneutral Plasma Physics III, IV*.