Abstract for an Invited Paper
for the DPP10 Meeting of
The American Physical Society

Formation of High-Beta Plasma and Stable Confinement of Toroidal Electron Plasma in RT-1[1]

HARUHIKO SAITOH, University of Tokyo

The Ring Trap 1 (RT-1) device is a laboratory magnetosphere generated by a levitated superconducting magnet. The goals of RT-1 are to realize stable formation of ultra high-beta plasma suitable for burning advanced fusion fuels, and confinement of toroidal non-neutral plasmas including antimatter particles. RT- 1 has produced high-beta plasma in the magnetospheric configuration. The effects of coil levitation and geomagnetic field compensation [Y. Yano et al., Plasma Fusion Res. **4**, 039] resulted drastic improvements of the plasma properties, and a maximum local beta value exceeded 70%. Because plasma is generated by electron cyclotron resonance heating (ECH) in the present experiment, the plasma pressure is mainly due to hot electrons, whose bremsstrahlung was observed with an x-ray CCD camera. The pressure profiles have rather steep gradient near the superconducting coil in the strong field region. The decay rates of magnetic probe and interferometer signals have different time constants, suggesting multiple temperature components. The energy confinement time estimated from the input RF power and stored magnetic energy is on the order of 1s, which is comparable to the decay time constant of the density of hot electron component. Pure electron plasma experiments are also conducted in RT-1. Radial profiles of electrostatic potential and electron density showed that the plasma rigidly rotates in the toroidal direction in the stable confinement phase. Long time confinement of toroidal non- neutral plasma for more than 300s and inward particle diffusion to strong field regions, caused by the activation of the diocotron (Kelvin-Helmholtz) instability, have been realized [Z. Yoshida et al., Phys. Rev. Lett. **104**, 235004].

[1]Work supported by MEXT, Japan (19340170).