

Status of non-inductive startup via the electrostatic helicity injection in Versatile Experiment Spherical Torus

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The electrostatic helicity injection is one of the powerful methods for non-inductive start-up of spherical torus. By using this methods, it is possible to expand startup capability of Versatile Experiment Spherical Torus (VEST). The injector (electron gun) has been installed in the lower chamber of VEST and experimental attempts to drive plasma current via the electrostatic helicity injection during plasma startup are underway.

By using single power configuration that can provide voltages for both injector operation and helicity injection [1], gradual rising plasma current of ~ 10kA has been achieved successfully based on injection current of 1.5kA and the injection voltage of 500V. The measured time evolution of plasma current density distribution using magnetic diagnostic system of VEST and the fast camera images show the formation of current sheet clearly. The experiments with two power system also conducted to control injector operation and helicity injection respectively. Plasma currents up to ~30kA have been achieved based on the peak injection current of 1.0 kA and the peak injection voltage of 1.5 kV. The large current multiplication is also confirmed, further experiment and more accurate diagnostic is ongoing to confirm the possibility of relaxation into tokamak-like plasma with closed flux surface.

References:

- [1] JongYoon, Park, et al. "Design and development of the helicity injection system in Versatile Experiment Spherical Torus." Submitted to Fusion Engineering and Design