Recent results on non-inductive formation of spherical torus by electron Bernstein wave heating and current drive in LATE

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The LATE device explores key issues on non-inductive start-up and formation of spherical torus by electron Bernstein (EB) wave heating and current drive. By injecting 2.45 GHz microwave from outboard side with an oblique angle to the toroidal field and locating the upper hybrid resonance (UHR) layer in the inboard side of the second electron cyclotron resonance (ECR) layer, the plasma current is ramped up with seven times the plasma cutoff density. This suggest that excitation of EB wave in the first propagation band is essential to heat the bulk plasma at the fundamental ECR.

Recently, the power supply for the toroidal coil has been refurbished to increase the maximum coil current and the same ECR condition for 5 GHz microwave as for 2.45 GHz one becomes available. The circulator for 5 GHz microwave injection system has been replaced and the microwave power injection from the klystron has been tested up to 190 kW for 70 ms. In the first experiment with 5 GHz microwave, the line-averaged electron density increased up to $\bar{n}_e \sim 1 \times 10^{12}$ cm^{-3}, which is ~2.5 times the case in the second ECR heating and current drive.

Heavy ion beam probe (HIBP) system has been developed to measure the space potential distribution. The primary Rb^+ beam with energy up to 20 keV is injected from the top port through the poloidal sweeper and the secondary beam coming to the bottom port is guided through the poloidal deflector to the energy analyzer. Preliminary result shows that the space potential is positive in the core plasma (~50 V) when Ip ~ 6 kA and $\bar{n}_e \sim 4 \times 10^{11}$ cm^{-3}.