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Overview of recent progress on non-inductive start-up experiment in LATE

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LATE (Low Aspect ratio Torus Experiment) is a small device with the toroidal magnetic field up to 0.16 T at $R = 0.25$ m. It has no center solenoid and the plasma current is initiated and maintained by ECH/ECCD alone. There are three launchers for 2.45 GHz microwave and one launcher for 5 GHz microwave, each of which is installed on the radial port and injects microwave in the left-handed circular polarization to excite electron Bernstein wave (EBW) via O-X-B process. Overdense ST plasmas with 6 ~ 7 times the plasma cutoff density and plasma current of ~ 10 kA are formed when the fundamental ECR layer is located near the plasma core and EBW is excited in the 1st frequency band.

When EBW at the 2nd frequency band of 5 GHz is excited in the ST plasma produced by EBW at the 1st frequency band of 2.45 GHz, plasma current is driven strongly while the bulk electron parameters such as density are nearly the same. It is suggested that the injected EBW at the 2nd frequency band is absorbed mainly by high energy tail electrons in the low field side at Doppler shifted ECR and drives the plasma current while EBW at the 1st frequency band heats the bulk electrons.

Intermittent events of plasma ejection through LCFS occur in the highly overdense plasma produced by 2.45 GHz microwave. The central density decreases about 20 % and strong magnetic activity appears during the events of ~ 100 μ sec. Multiple magnetic probe signals show that a current channel escapes to the upper wall and TAE like oscillations are excited. Heavy ion beam probe measurement shows that space potential near the plasma core increases about 50V during the ejection event and recovers at once.

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