Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Kinetic Ballooning Modes with bootstrap current in High-beta Pedestal Plasma[1] PENGFEI LI, PKU, XUEQIAO XU, LLNL, CHENHAO MA, None — We present the Linear and nonlinear simulation results of kinetic ballooning modes (KBM) in edge pedestal plasmas based on the gyro-Landau-fluid (GLF) model under the BOUT++ framework. The linear growth rate spectrum of KBMs shows the stabilizing effect of the bootstrap current, both the growth rate and the unstable region of the instabilities decrease, and the spectra shift to the low toroidal mode number. The toroidal resonance can drive the KBM unstable under the ideal peeling-ballooning mode threshold and the Landau damping can destabilize the KBM for low-β and have stabilizing effect on the KBM for high-β In the nonlinear simulation, the energy loss with bootstrap current is higher than those without bootstrap current, because with bootstrap current local magnetic shear decreases and the fluctuation level increases, resulting in a large energy flux. The saturated fluctuation level increases with β, while the fraction of the bootstrap current has weak impact on the saturated level. The turbulence in low β is mainly the ballooning dominant turbulence while the turbulence in high β is mainly the peeling dominant.

[1]*This work was performed for USDOE by LLNL under DE-AC52-07NA27344 and also was supported by National Key RD Program of China under Grant No. 2017YFE0301100, 2017YFE0301101.

Pengfei Li
PKU

Date submitted: 01 Jul 2020 Electronic form version 1.4