Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Simulation comparison of EHO state and broadband MHD phase in near-zero torque QH-mode on DIII-D[1] JIANGUO CHEN, PKU, XUEQIAO XU, LLNL, KEITH BURRELL, XI CHEN, GA — A DIII-D QH-mode discharge (#163518), with NBI torque reduced to near zero, exhibits a spontaneous transition from coherent edge-harmonic oscillation (EHO) phase to broadband MHD turbulence state with improved pedestal conditions recently. Simulations are carried out to study the features and the mechanism of both EHO state and broadband MHD phase in QH-mode by using the 6-field two-fluid model in BOUT++ framework. The double null equilibriums and plasma profiles from the DIII-D low-torque QH-mode discharge #163518 at t=2350ms (EHO state) and t=3130ms (broadband MHD state) are adopted in the simulations. The linear simulation results demonstrate that the ExB shear flow is the main driving factor of the low-n MHD instabilities and can destabilize the low-n modes which are dominant during this QH-mode discharge. In nonlinear simulation, the intermediate-n (6˜12) modes are excited first in the early linear stage and then the low-n modes develop by inverse cascade. The toroidal mode n=1 becomes dominant in the nonlinear saturated phase. The analysis of heat and particle fluxes and frequency spectra in nonlinear simulations is also presented.

[1]Prepared by LLNL under Contract DE-AC52-07NA27344. Work supported by US DOE under DE-FC02-04ER54698, the CSC (No. 2011606060047), the ITER-China Program (2013GB111000, 2013GB112006), and the NSFC (11261140326, 11375053).

Jianguo Chen
PKU

Date submitted: 14 Jul 2017 Electronic form version 1.4