

CLT simulation study of neoclassical tearing mode instability in Tokamak

Zhiwei Ma and Jiaying Huang

Institute for Fusion Theory and Simulation, School of Physics, Zhejiang University

e-mail (speaker):zwma@zju.edu.cn

Simulation study of NTM (Neoclassical tearing mode instability) in Tokamak with a large inverse aspect ratio is performed by using three-dimensional toroidal MHD code (CLT). It is found that the poloidal asymmetry of bootstrap current distribution will affect the evolution and nonlinear saturation of NTM's magnetic island, which will cause the growth rate to deviate downward from that with the cylindrical geometry. For the nonlinear saturation, the current distribution at saturation shows asymmetry and limits the saturation amplitude of the NTM. When the share of the boot current is large enough, 2/1 NTM will stimulate the growth of 3/2 NTM and cause the explosive growth of 3/2 mode, which could

lead to the overlap of adjacent magnetic islands and the stochasticity of the magnetic field that greatly downgrades the energy confinement and even causes a major disruption in the worst case. Sawtooth collapse usually generates seed magnetic islands for NTM. When the share of bootstrap current is large enough, sawtooth oscillation could stimulate the growth of 2/1 and 3/2 NTM. In turn, the presence of the NTM magnetic island affects the period and amplitude of the 1/1 sawtooth, mainly inhibits large sawtooth collapse.

