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Effects of Equilibrium Toroidal Flow on Locked Mode and Plasma Response in a Tokamak[1] PING ZHU, University of Science and Technology of China, University of Wisconsin-Madison, WENLONG HUANG, XINGTING YAN, University of Science and Technology of China — It is widely believed that plasma flow plays significant roles in regulating the processes of mode locking and plasma response in a tokamak in presence of external resonant magnetic perturbations (RMPs). Recently a common analytic relation for both locked mode and plasma response has been developed based on the steady-state solution to the coupled dynamic system of magnetic island evolution and torque balance. The analytic relation predicts the size of the magnetic island of a locked mode or a static nonlinear plasma response for a given RMP amplitude, and rigorously proves a screening effect of the equilibrium toroidal flow. To test the theory, we solve for the locked mode and the nonlinear plasma response in presence of RMP for a circular-shaped limiter tokamak equilibrium with constant toroidal flow, using the initial-value, full MHD simulation code NIMROD. The comparison between the simulation results and the theory prediction, in terms of the quantitative screening effects of equilibrium toroidal flow, will be reported and discussed.

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Ping Zhu
University of Science and Technology of China

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