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Steady State Toroidal Rotation in Tokamak Edge Pedestal Induced by Resonant Magnetic Perturbations[1] XINGTING YAN, University of Science and Technology of China, PING ZHU, Huazhong University of Science and Technology, University of Wisconsin-Madison, YOUWEN SUN, CAS Institute of Plasma Physics — Neoclassical toroidal viscosity (NTV) torque induced by resonant magnetic perturbation (RMP) has been found significant in tokamak edge pedestal [1]. In this work, we investigate how the edge toroidal rotation may be influenced by RMP through NTV torque, based on a coupling scheme developed between the NIMROD and the NTVTOK codes. In presence of the NTV torque alone, toroidal rotation eventually relaxes to the neoclassical offset rotation in steady state. For any radial location, multiple branches of neoclassical offset rotation may exist, particularly in the low collisionality regime and the edge pedestal region where the temperature gradient is large. The actual steady state of toroidal rotation therefore depends on the initial conditions and is potentially subject to bifurcation. In general, other toroidal momentum sources in addition to NTV torque would pull the rotation away from the neoclassical offset rotation. However, as the RMP amplitude increases, the steady state rotation should evolve towards the neoclassical offset rotation, which is qualitatively consistent with recent KSTAR experimental observations.
[1] X.-T. Yan, P. Zhu, and Y.-W. Sun, Phys. Plasmas 24, 082510 (2017).

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