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Neoclassical Toroidal Viscosity Induced by Resonant Magnetic Perturbation in Tokamak Edge Plasma[1] XING-TING YAN, University of Science and Technology of China, PING ZHU, University of Science and Technology of China, University of Wisconsin-Madison, YOU-WEN SUN, Institute of Plasma Physics, Chinese Academy of Sciences — In recent experiments, non-axisymmetric magnetic field perturbations due to external perturbations or plasma instabilities have been observed to strongly affect plasma rotation through neoclassical toroidal viscosity (NTV). In this work, we have calculated the NTV torque induced by resonant magnetic perturbation (RMP) in the edge plasma of a circular-shaped limiter tokamak, using the coupling of NIMROD and NTVTOK codes newly developed for this study. The resulting NTV torque is found to be sensitive to plasma β. In particular, when β is increased by two orders of magnitude, NTV torque is almost increased by ten orders of magnitude. The amplitude of NTV torque also depends on the toroidal mode number n of the plasma response to RMP. For a same amplitude of plasma response, the ion contribution to the resulting NTV torque increases with n, whereas the electron contribution decreases with n. This suggests the significance of nonlinear toroidal coupling in the generation of NTV torque, even when the RMP has only a single toroidal mode or helicity.

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