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Toroidal modelling of core plasma flow damping induced by RMP fields in ASDEX Upgrade NENG ZHANG, Southwestern Institute of Physics, YUEQIANG LIU, General Atomics, PAOLO PIOVESAN, Consorzio RFX, DELIANG YU, SHUO WANG, GUANGQI DONG, GUANGZHOU HAO, GUOLIANG XIA, Southwestern Institute of Physics — Resistive plasma response to the n=1 RMP field is systematically investigated for a high-beta hybrid discharge in ASDEX Upgrade. Both linear and quasi-linear response are modelled using the MARS-F and MARS-Q codes, respectively. Linear response computations show a large internal kink response when the plasma central safety factor q_0 is just above 1. This internal kink response induces core neoclassical toroidal viscous (NTV) torque, which is significantly enhanced by the precessional drift resonance of thermal particles in the super-banana regime. Quasi-linear simulation results reveal a core plasma flow damping by about 25%, agreeing well with experimental observations, with the NTV torque playing the dominant role. Sensitivity studies indicate that the internal kink response and the resulting core flow damping critically depend on the plasma equilibrium pressure, the initial flow speed, the coil phasing and the proximity of q_0 to 1. No appreciable flow damping is found for a low β_N plasma. A relatively slower initial toroidal flow results in a stronger core flow damping, due to the enhanced NTV torque. Weaker flow damping is achieved as q_0 is assumed to be farther away from 1. Finally, a systematic coil phasing scan finds the strongest (weakest) flow damping occurring at the coil phasing of approximately 20 (200) degrees, again quantitatively agreeing with experiments.

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