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Neoclassical toroidal viscosity due to energetic particles[1] ZHIRUI WANG, PPPL, YUEQIANG LIU, GA, NIKOLAS LOGAN, PPPL, COLIN CHRYSTAL, STEFANO MUNARETTO, GA, JONGKYU PARK, BRIAN GRIERSON, QIMING HU, JONATHAN MENARD, PPPL — The strength of neoclassical toroidal viscosity (NTV) induced by energetic particles (EPs) is investigated in DIII-D experiments. The NTV torque, which can greatly affect the plasma momentum confinement, is a result of drift kinetic non-ambipolar transport in the presence of 3D fields, where both thermal particles (most current research) and EPs can play a contributing role theoretically. A sophisticated DIII-D experiment is designed to validate the NTV torque due to trapped EPs by varying neutral beam injection angle and beam energy in the presence of the n=2 magnetic perturbations, and measuring the induced NTV from these EPs. The plasma response and NTV torque are compared between the experimental measurements and MARS-K kinetic simulation, to verify the existence and parametric dependence of EP induced NTV. This theory validation is the first step towards predicting the EP NTV for future devices such as ITER, where the NTV is expected to play an important role in the momentum balance.

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