CONFIGURATION DEPENDENCE OF THE NEOCLASSICAL VISCOSITY IN TJ-II

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Plasma rotation in tokamaks and quasisymmetric stellarators is a topic of great interest in connection with stability, confinement, and access to H-mode [1]. The magnetic pumping effect due to the in-out variations of $|B|$ in axisymmetric configurations is expected to keep the poloidal velocities down to low levels. Perfect toroidal symmetry, in turn, precludes the calculation of toroidal mass flows within the standard Neoclassical theory. Nevertheless, the discreteness of TF coils in tokamaks devices causes finite levels of toroidal ripple, specially in the edge, which will be enlarged when magnetic perturbations are used for ELM control. ITER in particular will depart measurably from perfect axisymmetry and has renewed the interest in NC effects in 3D magnetic topologies (see Ref. [2] and citing articles).

TJ-II is a medium-size L=4 flexible heliac [3]. The variation of $|B|$ on flux surfaces lacks any continuous symmetry and flows are therefore expected to be small and dominated by NC mechanisms. Its flexibility makes it an ideal device for studying the dependence of transport on the magnetic configuration. The latter may be modified both on a shot-to-shot basis and continuously. A new experimental method has been proposed [4] in order to measure the NC viscosity of stellarators. It has first been applied to TJ-II: the experimental results are to be compared with the calculations shown here.

We follow Ref. [5] in order to calculate the NC viscosities from the monoenergetic transport coefficients calculated by DKES. The discussion is made in terms of the three monoenergetic viscosity coefficients. Similar studies have been previously made for other devices such as Heliotron-J, HSX, LHD, QPS and NCSX (see, e.g., Ref. [6] and references therein). We calculate the NC viscosity for configurations of constant volume and varying toroidal mirror and rotational transform: small dependence on the configuration if observed for the set of configurations usually explored at TJ-II; comparison with the experiment is underway.