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新古典最適化配位における新古典粘性とフローの配位依存性
Configuration dependence of neoclassical viscosity and flows in neoclassical-optimized devices

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In the research of optimized configuration of helical devices, one of the main subjects is the reduction of neoclassical radial flux and / or parallel bootstrap current. There are several concepts of neoclassical-optimized configurations such as quasi-helical symmetric, quasi-isodynamic, and quasi-axisymmetric configurations. These optimized configurations are related to a certain type of symmetry of the magnetic configuration [1]. From neoclassical transport theory, it is known that the neoclassical viscosity in the direction of quasi-symmetry is suppressed. It is also known that the neoclassical transport is determined by the combination of neoclassical toroidal, poloidal, and parallel viscosities. Therefore, the configuration dependence of the neoclassical viscosities determines the degree of neoclassical optimization.

Furthermore, it is anticipated that the equilibrium flow in optimized configurations (ambipolar $E \times B$ + bootstrap + Pfirsch-Schlüter flow) will possess a large shear to suppress the turbulent transport such as ITG mode [2]. Therefore, understanding the configuration dependence of neoclassical viscosity and flow is also important for further optimization for turbulent suppression.

In this presentation, we utilize a global 3D neoclassical transport code FORTEC-3D [3] to study the configuration dependence of neoclassical viscosities in several types of neoclassical optimized helical configurations which are existing or under development such as CFQS [4] and W7-X[5]. Flow shear in these devices are also discussed.

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