

Gyrokinetic analysis of turbulent transport in helical systems with different magnetic shear

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Multi-machine comparisons of turbulent transport in helical systems including the Large Helical Device (LHD) and the Heliotron J (HJ) are made by gyrokinetic simulations [1-3], and they are also compared with the Cyclone base case (DIII-D). It is found that weak magnetic shear does not lead to high turbulent transport because of nonlinear interactions including zonal flow production. The importance of zonal flow originates from the fact that these plasmas are unstable against the ion-temperature gradient mode. The simulations reproduce the transition of heat transport caused by an additional NBI heating in LHD, and also reproduce the ion and electron heat transport except for the ion heat transport after the additional NBI. The simulations also show that higher toroidal ripple improves turbulent transport in HJ, and that is corresponding to the experimental observation. Comparison of these plasmas reveals that the regulation of turbulence by zonal flows is more efficient in weak magnetic shear plasmas.

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