TURBULENCE SIMLATIONS FOR STELLARATOR PLASMA TRANSPORT

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Abstract. In magnetic fusion researches, it is one of the critical issues to understand the physics in the plasma turbulent transport which influences the confinement performances of the plasmas. In recent years, due to the rapid progress of the high-performance computers, the plasma transport phenomena can be accurately predicted by the first-principle simulations based on the gyrokinetics. In the stellarator systems such as Large Helical Device (LHD) [Takeiri et al.2017], which is a promising device for the long-time plasma discharges, the gyrokinetic simulations demand extremely heavy computational cost compared with the tokamak cases. In order to establish the predictable turbulence simulations in the stellarator plasma transport, the local flux-tube gyrokinetic code GKV [Watanabe et al. 2006] has been developed and extended. Using the code, the turbulent transport in the stellarators for the hydrogen isotope plasmas [Nakata et al. 2017] and the multi-species plasmas [Nunami et al. 2020] have been studied. Furthermore, based on the simulation results, we have developed a reduced model for the turbulent transport of the stellarator plasmas [Toda et al. 2019].

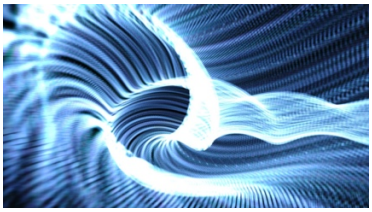

Figure 1: The potential fluctuation obtained by GKV simulation for the LHD plasma.

References

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