Gyrokinetic simulation of electrostatic microturbulence transport in ADITYA-U tokamak

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It is highly accepted in the fusion plasma community that the low-frequency drift waves (DW) are responsible for anomalous turbulent transport in tokamaks [1]. In this work, we have presented the global gyrokinetic simulations of electrostatic microturbulence for the realistic geometry and experimental profile of ADITYA-U [2] tokamak using the state-of-the-art gyrokinetic toroidal code (GTC) [3]. The collisions have been retained in the simulations and a direct comparison of simulations with the experimental observations has been done [4]. The simulations show that the linear eigenmode is dominated by the trapped electron mode (TEM) driven turbulence that propagates in the electron diamagnetic drift direction [5,6]. The ion diffusivity obtained from the nonlinear simulation matches well with the experimentally measured value of $\sim 0.2\text{m}^2$/sec. The experimentally obtained spectrogram shows the broadband from 0 to $\sim$ 50kHz, which agrees well with the spectrum of electrostatic fluctuations from the simulations. These findings assure that the TEM turbulence acts as one of the dominant channels for the microturbulence transport in ADITYA-U. The knowledge gained from the gyrokinetic simulations could be insightful to set up future ADITYA-U experiments.

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