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P4.1100 Investigation of the impact of ETGs on electron heat transport in TCV plasmas with NBI and ECH injection

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Electron Temperature Gradient (ETG) micro-turbulence modes have been recently shown to impact the electron heat transport in tokamaks in conditions when ion-scale turbulence is close to marginality and electron heating is significant [1]. Given the relevance of these mechanisms for ITER scenarios, a new study has been carried out on the TCV tokamak at the Swiss Plasma Center (Lausanne, CH), which is equipped with both ECH and NBI heating, allowing to investigate the relevance of ETG transport. An experimental characterisation of the electron threshold at mid-radius was carried out in TCV by comparing two experimental cases (EUROfusion WP MST1 TCV, 2017) with on- vs off-axis ECH power, with/without NBI heating. Each discharge features different time intervals, corresponding to NBI only, mixed NBI/ECH, ECH only phases. ECH was injected both steady and modulated, in order to gain additional information from perturbative analysis. The experimental analysis of the two discharges shows a moderate stiffness for the ECH only phases. Linear flux-tube gyrokinetic simulations have been performed with the GENE code [2], showing the possible importance of ETGs in the electron heat transport for the mixed NBI/ECH case. The numerical ETG thresholds have been found in good agreement with the theoretical dependence on Z_effTe/Ti. The results of non-linear ion-scale gyro-kinetic simulations seem to indicate that, while in the ECH only case the experimental fluxes are well matched by the simulations, in the mixed NBI/ECH case the ion-scale flux is not able to explain the experimental one, invoking the possible contribution of ETGs. The simulations have been run considering a three species (gyrokinetic) electron-deuteron-carbon (main impurity) plasma. Fast ions (gyrokinetic) have been included in the cases with NBI. References
[1] N. Bonanomi et al. 2017, 44th EPS Conf. on Plasma Physics
[2] F. Jenko et al. 2000 Phys. Plasmas 7

Presenter: MARIANI, A. (EPS 2019)

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