Turbulence measurements with the Correlation Electron Cyclotron Emission (CECE) diagnostic in TCV

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The correlation ECE (CECE) diagnostic in TCV has been substantially upgraded. In particular a new upper lateral, steerable line of sight [1] has been installed, and it is shared with a reflectometer: this allows the design of discharges where electron temperature and density fluctuations are measured simultaneously in the same plasma volumes. Moreover the intermediate frequency section of the radiometer has been expanded with six frequency tunable YIG filters. This grants extreme flexibility in the choice of the measurement locations.

This upgraded system has been used for the study of electron temperature fluctuations over the $0.2 < \rho_\psi < 0.9$ range in discharges with triangularity $\delta$ varying between -0.6 and 0.6 but comparable collisionality profiles. The results show that the relative fluctuations amplitude $\delta T_e/T_e$ increases with the normalized minor radius and with triangularity changing from negative to positive. In particular it was observed that the difference in relative fluctuations amplitude between positive and negative triangularity persists also for $\rho_\psi < 0.5$ where the effects of shaping are no longer present [2].

Further studies will be performed on the effects of various parameters on turbulence properties: in particular the electron cyclotron resonance heating (ECRH) and the neutral beam injector (NBI) systems of TCV will be exploited to study the effect of varying $T_e/T_i$ ratio on fluctuations spectra and relative amplitude over a large fraction of the radial profile.

These experiments will be accompanied by local, linear gyrokinetic simulations run with the GENE code to verify the presence of transitions between different turbulence regimes when varying these parameters.

References