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On the influence of ECRH on neoclassical and anomalous mechanisms using a dual Heavy Ion Beam probe Diagnostic in the TJ-II stellarator

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In the present paper we have investigated the influence of ECRH on neoclassical and anomalous mechanisms in the TJ-II stellarator. The results reported here were obtained by the use of a unique diagnostic which consists in two Heavy Ion Beam Probe (HIBP) systems located at two different toroidal ports separated by 900. This dual HIBP was used to study the temporal and spatial evolution of density and plasma potential profiles and Long-Range-Correlations (LRC) as proxy of zonal flows (ZFs) in the whole plasma cross-section. The unique possibilities of the dual HIBP system allow us to expand the investigation of multi-scale mechanisms from the plasma edge to the plasma core. Experiments in plasmas with combined NBI and ECR heating in the TJ-II stellarator have shown direct experimental evidence of the influence of ECRH on turbulent mechanisms, increasing both the level of broadband fluctuation and the amplitude of ZFs, and neoclassical mean radial electric fields. Whereas the influence of ECRH on the level of fluctuations takes place in a wide range of plasma densities, the ECRH induced reversal of the neoclassical radial electric field has been observed only in low-density plasmas. These findings show that multi-scale interactions are a crucial ingredient for understanding the influence of ECRH on anomalous and neoclassical transport mechanisms.

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