

Electron temperature fluctuation levels of quasi-coherent mode across the plasma radius

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The ECRH heated EDA regime at ASDEX Upgrade is an ELM-free regime with good energy confinement properties [1]. As a consequence of high ECRH power, the rotation profiles are hollow, similar to observations in some L-mode plasmas [2], and ELMs are replaced by a quasi-coherent mode regulating the transport and keeping the pedestal stable against large type-I ELMs. Alongside quasi-coherent modes, magnetic measurements show harmonic signature with $n = 1$ having a similar frequency to quasi-coherent mode. Peculiar to EDA H-modes is that in some core ECE channels, a mode appears with the same frequency as the quasi-coherent mode at the edge.

In this work, we explore the features of the edge quasi-coherent mode and its signature in the core. The relative temperature fluctuation levels across the pedestal are assessed via the Correlation Electron Cyclotron Emission (CECE) instrument [3] covering the region of $\rho_{\text{pol}} = [0.85-1]$. The fluctuation levels associated with the quasi-coherent mode remain constant across the pedestal but change for different electron temperatures and temperature gradients. The coupling between the quasi-coherent mode and the harmonic mode is discussed.

The radiation transport forward model supports the interpretation of the core ECE measurement, ECRad [4], with included refraction and realistic ECE geometry. We use a 2D electron temperature and density grid as input parameters, featuring an edge mode of high toroidal mode number. The synthetic ECE signal in the core is refracted by the strong edge modulation but the amplitude is of the order of magnitude lower than in the experiment. Hence, the refraction alone can not fully explain the mode in the core ECE channels.

References

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