Impact of ECCD on Alfvén Eigenmodes in the TJ-II stellarator.

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The impact of Electron Cyclotron Current Drive (ECCD) on NBI-driven modes has been investigated in the TJ–II low shear stellarator. Experimental results show that a small amount of EC driven current may modify dramatically the spectrum of observed modes (Fig. 1). Applying 240 kW of on-axis ECRH power in counter-ECCD configuration ($N_{||} = +0.2$) provokes ~ 0.5 kA reduction in plasma current. This mild reduction of current is accompanied by a strong change in the behaviour of alfvénic magnetic fluctuations [1]. Changes in rotational transform profile (ι), having a strong influence on the Shear Alfvén Spectrum (SAS) of the device, are the main candidate to explain the observations.

The high sensitivity of the SAS structure on $\iota(\rho)$ suggests that the interpretation of the results should be made considering all the relevant contributions to the plasma current (NBCD, ECCD and to a lesser extent, the boostrap current I_{boot}). For modelling purposes, the STELLGAP and AE3D codes are used to calculate the spectrum and spatial structure of possible gap modes in several shots with different values of the total current. No experimental information on the current profile is available and therefore, the input VMEC magnetic equilibrium, which should be consistent with the plasma current profile, will be obtained using a rough approximation to the unknown NBCD profile and a rigorous theoretical calculation of the ECCD profile (TRAVIS) and the bootstrap current profile.

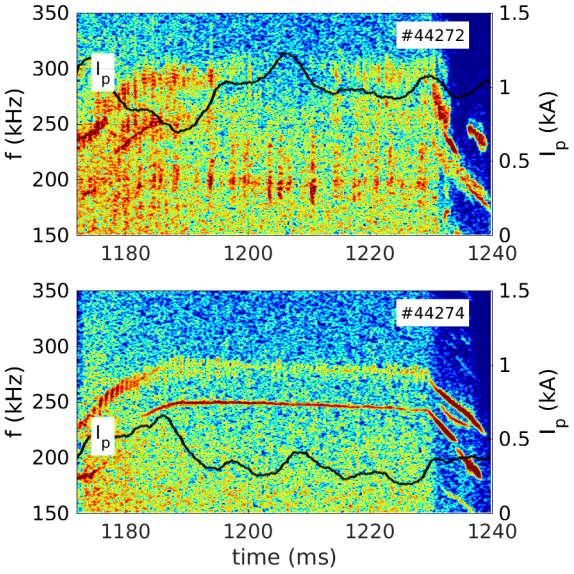

Figure 1: *Spectrogram of magnetic fluctuations with (bottom) and without ECCD (top).*

References

[1] S. Yamamoto et al., 21th International Stellarator-Heliotron Workshop, Kyoto, Japan (2017).