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(N)TM Onset by Central EC Power Deposition in FTU and TCV Tokamaks

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The onset of both the conventional and neoclassical tearing modes (N)TMs remains an important issue for the fusion plasma operations. The understanding of the (N)TM onset driven by on-axis EC action, far from the mode locations, is a field still not well understood for the MHD instability control. Comparison of the responses from different devices with comparable size and operation parameters can give clear information about the main mechanisms leading to the mode destabilization. In L-mode the effects of central electron cyclotron heating (ECH) and current drive (ECCD) on the presence of (N)TMs have been investigated in TCV without explicit triggers as sawteeth and in FTU with the presence of latent MHD activity. In TCV two possible concomitant driving mechanisms for these instabilities, due to the on-axis EC power, have been associated to the change of plasma current density profile and of mode stability parameter upstream of the resonant location $q=m/n$ and to the change in sign of the local difference between the toroidal plasma and the (N)TM velocity due to the EC torque, allowing the destabilizing action of the ion polarization current. In FTU the former mechanism has been related to both the mode onset and the amplification of a mode that was present in a marginally stable state. A scaling for the onset / amplification of (N)TM will be given and discussed taking into account geometrical and operational parameters. Investigation of the plasma current density evolution will be done using the current diffusion equation in transport codes as JETTO and ASTRA in order to calculate the stability parameter changes and compare this dynamics in FTU and TCV.

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