The influence of plasma rotation on tearing mode excitation in TEXTOR

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For fusion reactors, based on the principle of magnetic confinement, it is crucial to understand the interplay between plasma rotation and MHD instabilities. For ITER e.g. a fast enough plasma rotation is needed in order to avoid disruptions caused by resistive wall modes (RWM). The influence of plasma rotation on tearing mode excitation, also referred to as mode penetration, in the TEXTOR tokamak was investigated.

Although tearing modes have a different topology than resistive wall modes, the process of RWM locking and tearing mode excitation can be treated with the same philosophy. The reason for investigating tearing modes rather than RWM's is the fact that in TEXTOR tearing modes can be excited in a controllable and reproducible way.

A set of helical perturbation coils, called the Dynamic Ergodic Divertor (DED), is installed at TEXTOR. These coils can be used to set up a (rotating) perturbation field. This very controllable and fully known perturbation field was used in a set of dedicated experiments to investigate how the plasma rotation changes as a function of the perturbation level and how the threshold for mode excitation depends on the plasma rotation. The experimental observations were compared with theoretical predictions.