# DYNAMIC CONTROL OF THE CURRENT DENSITY PROFILE AND MHD INSTABILITIES BY ECH/ECCD IN TOKAMAKS

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The deposition of EC waves in the restricted plasma volume defined by the print of the mm-wave beam on the electron cyclotron resonant surface and by the local optical length is the key to active control of MHD instabilities by means of ECH/ECCD in tokamaks. If the absorbing volume is located on a generic magnetic flux surface the generated heat (or current) is rapidly spread all over the surface, and the resulting change in the axisymmetric current density profile can affect the instability parameter ! Õ.If the volume is on a rational-q flux surface an ECCD helical current perturbation might develop and interact with the plasma-driven instability. The TM evolution, usually described by the Rutherford equation, is the result of the balance between stabilizing and destabilizing terms, including the one determined by ECH/ECCD. This makes Electron Cyclotron a powerful tool for studying TM dynamics, and for stabilizing the mode when necessary.
The paper describes experimental work performed in this field on FTU tokamak, and it deals in particular with the implementation of a system for automatic detection of TM onset, and an appropriate stabilizing reaction with ECH/ECCD. The system is composed by a particular arrangement of the 140 GHz, 2 MW ECH launcher set-up, and a DSP-based (Digital Signal Processor) unit for the analysis of ECE and Mirnov data, and for the control of gyrotron power supplies. The detection/reaction system, successfully tested in the experiments described in the paper, is very fast since no mirror motion is foreseen. This might be a possible scheme for a fast reaction to ÒearlywarningÓNTM suppression in fusion devices, in which the application of ECCD, localized on the O-point radial position, is performed as soon as the seed island is detected and much before it reaches saturation. ITER perspectives are discussed.