The Role of MHD in the Sustainment of Electron Internal Transport Barriers and H-Mode in TCV

G. Turri, O. Sauter, S. Alberti, E. Asp, T.P Goodman, L. Porte, V.S. Udintsev, C. Zucca

Ecole Polytechnique Fédérale de Lausanne (EPFL), Centre de Recherches en Physique des Plasmas, Association Euratom-Confédération Suisse, CH-1015 Lausanne, Switzerland

Email address: Gianpaolo.Turri@epfl.ch

ABSTRACT

Advanced scenarios exhibit improved confinement properties, which make them attractive candidate for ITER. For these to be achieved, the sustainment of transport barriers and therefore high pressure gradients is inherent. Their stability properties both in the transient and steady state phases is a major issue [1], because of the relationship between high performances and proximity to a stability limit. Core MHD modes are one of the key issues in the development and sustainment of transport barriers, as they degrade the confinement properties and, in the worse case, disrupt the plasma. The understanding of the underlying physics can provide the means of finding regimes without modes. In TCV (Tokamak à Configuration Variable) H-mode and eITBs have been obtained with different schemes, usually accompanied by various types of MHD phenomenon [2, 3, 4]. From monotonic q-profiles (H-mode) to reversed ones (eITB, [3]), yielding low-shear *Quasi-Stationary ELM free H-mode* (QSEFHM) scenarios [4], infrequent sawteeth and/or NTMs and eITBs with a variety of resistive to ideal modes ascribable to the infernal stability limit [5]. Analysis of data from TCV highest performance discharges can clarify the potential threats of MHD modes in advanced scenarios. MHD core analysis of the QSEFHM [4], and of eITBs will be presented, focusing on the existence of stability windows. The resulting operational stability limits will be presented, together with considerations regarding the projections of these results to a steady-state burning plasma.

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