

Operational diagrams for MHD instabilities limiting plasma performances in JET D-T Scenarios with ILW

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One of the major aims of nowadays JET experimental campaigns is the execution of D-T experiments with a metallic tokamak (ILW, ITER-like wall) wall [1-2]. At present, experiments are devoted to develop scenarios capable of sustaining high performances for >5s. Two scenarios are considered with this aim: the Baseline H-mode Scenario, and the Hybrid Scenario.

High performances and duration can be limited by the onset of MHD modes or by the influx of high Z impurities in the plasma core [3,4,5]. MHD modes can foster the accumulation of impurities [4] and, on the other hand, an excess of impurities in the core plasma degrades the current density profile providing the conditions to lower the thresholds for triggering MHD instabilities. Then, to identify the conditions under which NTMs are the main cause limiting the plasma performances, the statistical analysis of the MHD onset conditions has been undertaken distinguishing between the trigger causes (e.g., Sawteeth) and the presence or not of impurities in the plasma. The latter condition has been found effective in indicating that cases of n=2 onsets (not Sawtooth triggered) at low β_N in the Hybrid scenario are mainly due to plasma profiles already degraded by impurity influx.

The analysis here presented takes into account all pulses performed in Hybrid scenario during the 2015-2016 JET campaign (~250 pulses), and a selected list of ~90 pulses for the Baseline scenario.

References:

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