13th INTERNATIONAL STELLARATOR WORKSHOP

Influence of resonances on ELM-like events at TJ-II

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MHD instabilities coupled together to ELM-like transport events have been observed in TJ-II stellarator [1]. During the last experimental campaign some specific experiments have been carried out in order to investigate the onset conditions for the occurrence of these phenomena in ECRH heated discharges.

ELM-like events are short, periodic perturbations of the plasma edge primarily observed in the H_α signals. Each individual event is accompanied by an outwards flux of energy and particles. During the crash, the temperature at the plasma edge decreases on a time scale of less than 100 μs, with a corresponding rise of the H_α emission. A cold pulse is propagated towards the plasma centre with vanishing amplitude; correspondingly there is a heat pulse propagating outwards and finally observed by the edge diagnostics. The amplitude and repetition frequency of these perturbations are clearly correlated with the electron pressure gradient, increasing with this magnitude.

Generally, the ELM-like transport event is triggered by MHD activity of short duration (about 50 ms) characterised by a quasi-coherent magnetic oscillation (f =15-30 kHz) observed in the Mirnov coils. This signal has been correlated with the ECE channels at the oscillating frequency thus pointing to the radial localisation; that position coincides with low order rational surfaces in the computed rotational transform profile. Up to now, the rotational transform values of 3/2 and 5/3 have been identified.

We have performed a magnetic configuration scan where discharges with similar electron pressure profiles have been compared. It has been observed that the MHD activity together with the edge perturbations (ELM-like events) disappear when the rotational transform is sufficiently increased to exclude the presence of any low order resonances from the confined plasma region. These experimental findings illustrate how the ELM-like transport events are triggered by the magnetic perturbation associated to a resonance. The ELM-like modes as a localised instability driven by a pressure gradient could be related to a resistive ballooning instability.

[1] I. García-Cortés, E. de la Luna, F. Castejón, J.A. Jiménez, et al. Nuclear Fusion, **40** (2000) 1867.

Topic: 2,3 Poster is preferred: No
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