

Title: Study of instabilities in tokamak plasmas using radiation diagnostics

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Abstract: The thesis focuses on the characterisation of sawtooth instability and its effect on selected edge plasma processes at COMPASS. It is shown that sawtooth crash precedes the vast majority of L-H transitions, lower occurrence of ELMs and transitions to ELM-free H-mode. The sawtooth instability also affects H-L transitions, as their increased occurrence is observed in the middle of the sawtooth cycle. In the thesis, optimised tomography of the electromagnetic emission at COMPASS and JET is also applied to study instabilities in tokamak plasmas. The performance of fast tomographic methods with potential for real-time plasma control purposes is also studied. As the magnetic field configuration plays a vital role in plasma stability and tomographic reconstructions, the thesis also includes simulations of magnetic fields. These simulations were applied to optimise the design of coils for COMPASS-U.

Keywords: tokamak, tomography, sawtooth instability, electromagnetic emission