

Pedestal and ELM characteristics with different first wall materials and nitrogen seeding in ASDEX Upgrade

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In magnetically confined fusion the focus of the experiments shifts more and more towards ITER and corresponding reactor relevant machine requirements and plasma operation. Examples are the change from a carbon to a tungsten wall in ASDEX Upgrade or the installation of the metal wall (ITER like wall) in JET, as well as ELM mitigation and radiative cooling. Operational scenarios involving radiative divertor cooling with impurity seeding or mitigation of edge localised modes (ELMs) with magnetic perturbations (MP) applied by external coils are intensively studied. In this contribution we discuss the pedestal and ELM characteristics with and without these additional actuators.

In scenarios with radiative divertor cooling, achieved with nitrogen seeding, a large reduction in ELM size is observed. Detailed studies reveal that although these ELMs are different from usual type-I ELMs they exhibit fundamental similarities. The usual ELM is composed of two separated phases, during seeding one of these phases remains the same while the other is suppressed [1]. Mitigation of ELMs at AUG is also obtained with strong deuterium gas puffing, with and without MPs. In both cases the mitigation occurs above a certain density threshold which, however, is reduced by the presence of MPs [2].

The inter-ELM pedestal properties in different scenarios, such as carbon or tungsten wall, gas puffing and nitrogen seeding, will be presented. In an AUG scenario with different wall materials, but otherwise similar settings, the pedestal pressure remains unchanged. However, temperature and density do change, with a higher density in the case with metal wall. Regardless of the applied scenario, a strong correlation was found between the electron temperature at the pedestal top and its gradient in the pedestal [3]. The implications for the understanding of pedestal physics will be discussed.

References

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- [2] RATHGEBER, S. K., Edge kinetic data in regimes with type-I and mitigated ELM, submitted to NF.
- [3] SCHNEIDER, P. A. et al., *Nuclear Fusion* **53** (2013) 73039.