# Active control of Edge Localized Modes by Resonant Magnetic Perturbations

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The next generation of fusion machines like ITER and DEMO will need a reliable method for controlling the periodic transient expulsion of a considerable amount of energy onto the plasma facing components caused by instabilities at the plasma edge. The good plasma confinement in these tokamak devices will result in a steepened pressure profile at the plasma edge. When the pressure gradient exceeds a critical value so-called edge localized modes (ELMs) are destabilised. These modes feature a periodic fast collapse of the edge pressure, a sudden loss of the confinement and a subsequent release of heat and particles onto plasma facing components. The associated transient heat loads might cause excess erosion and lead to a strong reduction of the plasma facing components lifetime.

Active control of edge localized modes (ELMs) by resonant magnetic perturbation fields offers an attractive method for next-generation tokamaks, e.g. ITER. D-III D has shown that type-I ELMs are completely suppressed when $n = 3$ magnetic perturbations are applied [1]. On JET, when a low $n$ (1, 2) field with amplitude of a few Gauss at the plasma edge ($\Psi > 0.95$) is applied during the stationary phase of a type-I ELMy H-mode plasma, the ELM frequency rises by a factor of ~ 4-5 and follows the applied perturbation field strength [2,3]. This allows for ELM control in a wide range of plasma parameters. The frequency of the mitigated ELMs is proportional to the input heating power similarly to type-I ELMs, but the controlled ELMs have a higher frequency and are smaller in amplitude.

In this paper, an overview of the influence on the plasma confinement and key physics issues related to ELM control with magnetic perturbation fields is given from the experimentalist's point of view.

The work was supported by EURATOM and carried out under EFDA.

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