Reduction of ELM intensity on DIII-D by on-demand triggering with high frequency pellet injection and implications for ITER

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Abstract. The injection of small deuterium pellets at high repetition rates up to 12x the natural edge localized mode (ELM) frequency has been used to trigger high-frequency ELMs in otherwise low natural ELM frequency H-mode deuterium discharges in the DIII-D tokamak [J.L. Luxon and L.G. Davis, Fusion Technol. **8**, 441 (1985)]. The resulting pellet triggered ELMs result in up to 12x lower energy and particle fluxes to the divertor than the natural ELMs. The plasma global energy confinement and density are not strongly affected by the pellet perturbations. The plasma core impurity density is strongly reduced with the application of the pellets. These experiments were performed with pellets injected from the low field side pellet in plasmas designed to match the ITER baseline configuration in shape and normalized β operation with input heating power just above the H-mode power threshold. Nonlinear MHD simulations of the injected pellets show that destabilization of ballooning modes by a local pressure perturbation is responsible for the pellet ELM triggering. This strongly reduced ELM intensity shows promise for exploitation in ITER to control ELM size while maintaining high plasma purity and performance.

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