# Effect of B-field Dependent Particle Drifts on ELM Behavior in the DIII-D Boundary Plasma*

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The interaction of transient particle and energy pulses with the plasma facing components (PFCs) during edge localized modes (ELMs) is a critical issue for the viability of future high power tokamaks. Projections for ITER indicate that the divertor target lifetime could be limited to ~$10^4$ unmitigated Type-I ELMs (~ several hundred full performance pulses) [1]. Finding operating regimes with good H-mode confinement and tolerable sized ELMs involves both ELM instability physics in the pedestal and the behavior of the transient pulses from ELMs in the boundary plasma.

Toroidal magnetic field dependent particle drifts play a role in the ELM behavior in the SOL and divertor, and understanding this dependence will provide valuable information toward finding tolerable ELM regimes. Matched, lower single null, ELMing H-mode discharges were produced in DIII-D with the ion Bx$\nabla$B drift toward and away from the divertor. ELM behavior in the pedestal and boundary plasmas was measured with multiple diagnostics having fast data acquisition (≥20 kHz). In the case with ion Bx$\nabla$B drift toward the divertor, the fast measurements showed strong density dependence of many ELM effects in the pedestal and boundary plasma [2]. The matched discharges with ion Bx$\nabla$B drift toward and away from the divertor show strong dependence of the delay in inner vs outer divertor ELM $D_\alpha$ emission on drift direction and a weaker dependence of the ratio of the peak heat flux to the inner vs outer targets, in addition to strong density dependence. These and other experimental observations will be presented as functions of ion Bx$\nabla$B drift direction and density.

Time dependent modeling of the boundary plasma evolution during an ELM with the UEDGE code including a six-species fluid carbon model and the effect of B-field induced particle drifts [3] shows features similar to those seen in the matched discharges. Delays in the ELM perturbation at the inner vs. outer divertor targets are similar to the measured delays. Qualitative agreement of the target heat flux broadening during ELMs is obtained between measurements and simulations. Details of the UEDGE modeling and comparisons with data from matched discharges with ion Bx$\nabla$B drift toward and away from the divertor will be presented.

[1] G. Federici et al., J. Nucl. Mater. **313-316** (2003)11.
[2] M.E. Fenstermacher et al., Plasma Phys Control. Fusion **45** (2003) 1597.
[3] T.D. Rognlien et al., J. Nucl. Mater. **313-316** (2003) 1000.

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