ELM Energy Scaling in DIII–D*

A.W. Leonard. T.H. Osborne, and M.A. Mahdavi

General Atomics, P.O. Box 85608, San Diego, California 92186-5608

The energy released by ELMs into the divetor may result in unacceptable target plate erosion in future large tokamaks. Because ELMs result from the relaxation of edge pedestal gradients, the scaling of ELM energy in DIII–D is explored as a function of edge pedestal characteristics. In order to study mechanisms that may determine ELM size, the spatial profile of energy lost from the pedestal is measured with the DIII–D Thomson scattering diagnostic. For discharges with regular ELMs and nearly constant conditions the Thomson data is ordered in time with respect to the nearest ELM. Fitting the evolution of the edge electron temperature and density produces a pedestal profile just before and just after an ELM. The energy lost from the pedestal can be split up into convected and conducted energy. The conducted energy is a significant fraction of the ELM total energy at low density, but this fraction becomes smaller at high density. A model is explored where the ELM instability effectively opens field lines allowing parallel transport into the SOL and divertor. Processes that control the parallel energy loss include ELM duration, effective parallel length, flux limits to conduction, parallel convective transport time and sheath limits to the target heat flux. DIII–D data will be compared to this model and scaling to future next step tokamaks will be discussed.

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