Reduction of Edge Localized Mode Intensity Using High Repetition Rate Pellet Injection in Tokamak H-mode Plasmas

L.R. Baylor[1], N. Commaux[1], T.C. Jernigan[1], N. H. Brooks[2], T.E. Evans[2], M.E. Fenstermacher[3], R. C Isler[1], T.H. Osborne[2], P.B. Parks[2], E.J. Strait[2], C.J. Lasnier[3], R.A. Moyer[4], T.H. Osborne[2], P.B. Parks[2], P.B. Snyder[2], E.J. Strait[2], E.A. Unterberg[1], and A. Loarte[5]

[1] *Oak Ridge National Laboratory, Oak Ridge, Tennessee, 37831-8072*

[2] *General Atomics, San Diego, California 92186-5608*

[3] *Lawrence Livermore National Laboratory, Livermore, CA, USA*

[4] *University of California San Diego, La Jolla, California 92093-0319*

[5] *ITER Organization, CS 90 046, 13067 St Paul Lez Durance Cedex, France*

Abstract. The injection of high repetition rate deuterium pellets is shown to trigger high-frequency edge localized modes (ELMs) at up to 12 times the low natural ELM frequency in H-mode deuterium discharges in the DIII-D tokamak. The resulting triggered ELMs have 12 times 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 results show that pellets, which have been observed to previously trigger ELMs, can dramatically accelerate the ELM cycle with a corresponding reduction in ELM intensity. The experiments were performed in plasmas designed to match the ITER baseline configuration in shape and normalized β operation with input power just above the H-mode power threshold. This strongly reduced ELM intensity shows promise for exploitation in ITER to control ELM size while maintaining high plasma purity and performance.

PACS Nos. 52.55.Fa, 52.25.Vy, 52.25.Xz