Radial Particle Flux in the SOL of DIII-D During ELMing H-mode*

A.W. Leonard[1], J.A. Boedo[2], M. Groth[3], B.L. Lipschultz[4], G.D. Porter[3], D.L. Rudakov[2], D.G. Whyte[5], and L. Zeng[6]

[1]*General Atomics, San Diego, California 92186-5608, USA*
[2]*University of California-San Diego, La Jolla, California, USA*
[3]*Lawrence Livermore National Laboratory, Livermore, California, USA*
[4]*Massachusetts Intitute of Technology, Cambridge, Massachusetts, USA*
[5]*University of Wisconsin, Madison, Wisconsin, USA*
[6]*University of California-Los Angeles, Los Angeles, California, USA*

The radial particle flux across the separatrix and through the outboard, low field side (LFS) scrape-off-layer (SOL) in DIII-D is characterized for the periods between edge localized modes (ELMs) and during ELMs as a function of pedestal density. A previous comparison between DIII-D and Alcator C-Mod [1] found that in L-mode the SOL radial particle flux could be described by convective transport with an effective radial velocity profile that remained constant over a range of operating densities and collisionalities. This study extends the analysis to ELMing H-mode discharges where the radial particle transport in the LFS SOL between ELMs is examined separately from the transport due to ELMs by conditional averaging a number of diagnostics over numerous repeatable ELM cycles. The radial range of analysis extends from the separatrix into the far SOL, to the magnetic surface that first intersects a main chamber structure. The magnetic geometry is arranged such that this intersection is to a toroidally symmetric surface allowing for a "window frame" technique to assess global particle flux at that radius. A range in pedestal density from 20% of the Greenwald density to nearly 60% is produced by variations in divertor pumping and external gas puffing. The density scan produces a factor of 8 variation in the far SOL density while maintaining regular Type I ELMs. The density decay length and particle transport in the near SOL, just outside the separatrix, varies strongly with density. These changes in the near SOL region strongly affect the particle flux in the far SOL. Previous analysis indicated the time-averaged particle flux due to ELMs at low density is approximately one third of the total particle flux crossing the separatrix [2], but in the far SOL ELMs dominate the radial particle flux [3]. At high density the particle flux both between ELMs and during ELMs increase while in the far SOL the flux between ELMs increases to a level similar to that during ELMs. The implications of these measurements for pedestal fueling and main chamber particle flux to larger devices will be examined.

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