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P2.1016 Effects of fuelling profile on pedestal density profile

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Recent experiments performed in DIII-D provide strong evidence that the edge particle source has important effects on the density pedestal structure. These experiments were performed primarily in two divertor configurations, one a very open divertor (little baffling of neutrals) and one highly closed (good baffling of neutrals), to vary the ionization profile in the pedestal with other discharge parameters held constant. Consistent with previous studies [1], modeling of the particle source shows that the more closed divertor reduced the particle source inside the separatrix. Increase of divertor
closure caused a measured reduction of the density pedestal height at about the same separatrix density as compared to that obtained in a more open divertor, implying that the ratio of separatrix to pedestal density increased as divertor closure increased. Increased divertor closure was also found to increase the separation between the locations at which the electron density and temperature gradients have their maximum values

and provided ηe =Lne/LTe, parameters significantly above unity. The decrease of pedestal electron density obtained with more closure was accompanied by an increase of the pedestal electron temperature, resulting in pedestal electron pressures that were comparable between open and closed divertors. Controlled gas scans showed that the rate of pedestal density buildup at the L-H transition and after an ELM collapse increased markedly as the gas puff rate was
increased. Nevertheless, the achieved pedestal height increased weakly with gas puff rate due to earlier onset of ELMs with higher gas fuelling. Modeling of discharges in the open divertor as well as in a highly closed slot configuration, shows that the pressure profiles are consistent with limits
expected from MHD stability. The studies here show that the fueling profile, the ELM threshold and small scale transport in the steep gradient region interact together to control the pedestal electron density profile in ELMing H-mode discharges.

[1] S.L. Allen, J. Nucl. Mat. 290-293 (2001) 995 Work supported by US DOE under DE-FC02-04ER54698, DE-AC02-09CH11466 and DE-AC05-00OR22725.

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