Comparison of H-mode Pedestals in Different Confinement Regimes in DIII-D*

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It is well documented that the core confinement of standard ELMing H-mode discharges increases as the H-mode pedestal pressure increases [1]. However, the relation between core confinement and the pedestal in higher confinement regimes is not well studied. Therefore, the correlation between core performance and the pressure pedestal in conventional H-mode discharges, VH-mode discharges, hybrid H-mode discharges and AT (advanced tokamak) H-mode discharges in the DIII-D tokamak is being examined. In terms of pedestal width, these various confinement regimes are very similar. To lowest order, the electron pedestal pressure is proportional to the maximum gradient of the electron pressure in the pedestal. This relation implies that the scale length for pressure is approximately constant for all regimes and the average value is about 1 cm, projected to the outboard midplane. In terms of confinement, the $H_{ITER93H}$ confinement enhancement factor generally increases as the electron beta poloidal $\beta_{pol,e}^{ped}$ on the pedestal increases. However, there are deviations from this trend. For example, rapidly evolving VH-mode discharges achieve the highest values of $H_{ITER93H}$ but at somewhat lower values of $\beta_{pol,e}^{ped}$ than AT and even some conventional H-mode discharges. In terms of MHD stability, the basic trend is that global β_{pol} increases approximately linearly with $\beta_{pol,e}^{ped}$. Thus, the AT discharges have the highest values of $\beta_{pol,e}^{ped}$ and global β_{pol} of any discharges in this study. It is not clear why this correlation between $\beta_{pol,e}^{ped}$ and global β_{pol} exists. One possibility is that appropriate shaping, such as increased triangularity, allows both of these parameters to increase together. The correlation between plasma shape and $\beta_{pol,e}^{ped}$ will be examined as part of this study. The initial results of this study show that there is a continuum of pedestal parameters with various confinement regimes falling within this continuum. In other words, the higher confinement regimes do not correspond to some dramatic change in pedestal characteristics.

[1] T.H. Osborne, *et al.,* Proc. 24th Euro. Conf. on Controlled Fusion and Plasma Physics, Berchtesgaden, Germany, Vol. 21A (European Physical Society, Petit-Lancy, 1997) p. 1101.

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