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Studies of the pedestal structure in JET with the ITER-like wall

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The H-mode pedestal structure is characterized in JET-ILW plasmas limited by type I ELMs. The pre-ELM pressure width Δ_p increases with the square root of β_{pol_PED} , as assumed in EPED, in H-modes with low D gas injection. In dimensionless experiments Δ_p broadens at constant β_{pol_PED} with increasing ν_{star_PED} . In power and gas scans $\Delta_p/\sqrt{\beta_{pol_PED}}$ is constant with ν_{star_PED} , but is systematically wider at higher than at lower D rates. Δ_p may therefore depend also on other parameters, directly or indirectly connected with the D neutral content in the plasma, implying that atomic physics could contribute in setting the pedestal width.

The pedestal evolution during the ELM cycle is more complex than what would be expected if KBMs were to control the inter-ELM pressure gradient evolution. At high beta and low D gas injection rates p_{e_PED} increases due to narrowing of the width and steepening of the gradient. The n_e width narrows and the gradient increases until the ELM, suggesting qualitative consistency with the neutral penetration model. The n_e pedestal structure evolves similarly at low and high D gas rates. At high beta T_{e_PED} saturates half way through the ELM cycle at high D gas rates. This causes the reduction in p_{e_PED} in higher beta plasmas when the D gas rate is increased at constant net input power. The edge bootstrap current J_{BS} , derived with NEO from the measured kinetic profiles and Z_{eff} , increases throughout the ELM cycle at low beta, while it saturates well in advance of the ELM crash at high beta.

Initial isotope experiments have investigated pedestal formation in H vs D. In the high density branch, $P_{L-H}(H) = 2 \times P_{L-H}(D)$. H and D plasmas have matched stored energy and diamagnetic edge E_r . The higher power in H required to achieve the same stored energy as in D is consistent with the lower L-mode energy confinement in H. Assuming that the L-H transition requires an Er_x_B shearing rate \sim to the growth rate of the most unstable mode, $\gamma_{Ecrit} \sim \gamma_{turb}$, the above result suggests γ_{turb} independent of mass in the high n_e branch. In the low n_e branch $P_{L-H}(H) \gg 2 \times P_{L-H}(D)$. Similar edge n_e profiles are observed in H and D, but H plasmas have a stronger T_e gradient, indicating the need for a larger γ_{Ecrit} to trigger the L-H transition and suggesting an isotope effect on γ_{turb} .

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