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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 Delta_p increases with the square root of beta_pol_PED, as assumed in EPED, in H-modes with low D gas injection. In dimensionless experiments Delta_p broadens at constant beta_pol_PED with increasing nu_star_PED. In power and gas scans Delta_p/sqrt(beta_pol_PED) is constant with nu_star_PED, but is systematically wider at higher than at lower D rates. Delta_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 x PL_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 ˜ to the growth rate of the most unstable mode, gammaEcrit ˜ gamma_turb, the above result suggests gamma_turb independent of mass in the high n_e branch. In the low n_e branch P_L-H(H) » 2 x 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 gammaEcrit to trigger the L-H transition and suggesting an isotope effect on gamma_turb.

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