

Collisionality and beta dependence of confinement in JET ELMy H-modes

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JET has performed studies of the effect of normalised collisionality, ν^* , and pressure, β , on plasma confinement. In the ν^* study, sawtoothing, ELMy H-modes were produced in a low triangularity, $\delta \approx 0.2$, scenario at 4 different magnetic fields, B , with parameters scaled as $I \propto B$, $n = \text{const.}$, $T \propto B^2$ to produce a ν^* scan at fixed normalised Larmor radius, ρ^* , and β . Magnetic probe and MSE constrained equilibrium reconstruction indicated well matched q -profiles with $q_0 \approx 0.8$ and $q_0 \approx 3.9$. No significant NTMs, MARFEs, locked modes or other confinement affecting MHD were observed. The magnetic field varied from 2.95–1.7T, with an associated rise in ν^* from 0.007 to 0.06. For $\nu^* < 0.015$, normalised confinement, $B\tau_E$, remained almost constant, but for $\nu^* > 0.015$, a $\approx 40\%$ fall in $B\tau_E$ with increasing ν^* was observed. ν^* correlations with gas fuelling and density peaking complicate the analysis. In the β study, sawtoothing, ELMy Hybrid-like plasmas were produced in a $\delta \approx 0.45$ scenario at 3 different fields with parameters scaled as $I \propto B$, $n \propto B^4$, $T \propto B^2$ to produce a β scan at fixed ρ^* and ν^* . Equilibria, reconstructed as above, had well matched q -profiles with $q_0 \approx 0.9$ and $q_0 \approx 4.3$. As for the ν^* study, MHD activity was benign throughout. The field varied from 1.5–1.7 T, with an associated change in β from $\beta_N \approx 1.4$ –2.0. $B\tau_E$ decreased by $\approx 40\%$, with a similar decrease in pedestal confinement, indicating a negative β dependence of confinement in contrast to previous JET results for lower shaped, $\delta \approx 0.2$, ELMy H-modes. The reasons for these different dependencies are not yet clear, but will be investigated further. Local transport analyses, pedestal scaling and the impact of the results on transport scaling will also be presented.

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