Category 4) Influence of stochastization on barriers/ELM mitigation

ELM Control during RMP H-modes in DIII-D Plasmas With ITER Similar Shapes*

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Resonant magnetic perturbation (RMP) experiments focused on the suppression of large Type-I ELMs, referred to here as RMP H-modes, have been carried out in variety of shapes in DIII-D with electron pedestal collisionalities (ν_e^*) ranging from ~1 to ~0.2 [1-5]. Beginning in 2006, with the extension of the lower divertor baffle, it has become possible to operate DIII-D at ITER relevant ν_e^* with average triangularities close to those anticipated in ITER $\langle\delta_{ul}\rangle = (\delta_{upper} + \delta_{lower})/2 = 0.53$. We refer to these cases as ITER Similar Shaped (ISS) plasmas.

Complete ELM suppression has been obtained in ISS plasmas with n=3 RMPs. Nevertheless, significant differences in the plasma response to the RMP are observed in the ISS configuration compared to low average triangularity (LAT) RMP H-modes with $\langle\delta_{ul}\rangle = 0.26$ and $\nu_e^* = 0.2$ obtained prior to the extension of lower divertor baffle. For example, the resonant q_{95} window needed for ELM suppression in RMP H-modes is narrower in ISS plasmas ($3.5 \leq q_{95} \leq 3.6$) than in LAT plasmas ($3.5 \leq q_{95} \leq 3.8$) and the RMP coil current needed for ELM suppression is typically 20% higher in ISS plasmas. While this is qualitatively consistent with an increase observed in the magnetic shear during ISS plasmas, quantitatively this difference suggests that the resonant screening factor may be somewhat higher in ISS plasmas. An increase in the resonant screening factor would also be qualitatively consistent with an increase in the toroidal rotation of the plasmas (~50%) observed inside the $\psi_N = 0.95$ surface in ISS versus LAT plasmas during RMP H-modes. Other observations to be discussed in this presentation are: 1) the existence of a smaller peeling-ballooning stability window in ISS plasmas (both j_{edge} and p' are reduced), 2) measurements of the effective particle residence time in RMP and ELMing H-modes, 3) D_2 pellet injection results during RMP H-modes and 4) pressure profile broadening during RMP H-modes in ISS plasmas.

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