RMP ELM suppression in DIII-D plasmas with ITER similar shapes and collisionalities

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Abstract. Large Type-I Edge Localized Modes (ELMs) are completely eliminated with small $n = 3$ resonant magnetic perturbations (RMP) in low average triangularity, $\bar{\delta} = 0.26$, plasmas and in ITER Similar Shaped (ISS) plasmas, $\bar{\delta} = 0.53$, with ITER relevant collisionalities $\nu_e^* \leq 0.2$. Significant differences in the RMP requirements and in the properties of the ELM suppressed plasmas are found when comparing the two triangularities. In ISS plasmas, the current required to suppress ELMs is approximately 25% higher than in low average triangularity plasmas. It is also found that the width of the resonant q_{95} window required for ELM suppression is smaller in ISS plasmas than in low average triangularity plasmas. An analysis of the positions and widths of resonant magnetic islands across the pedestal region, in the absence of resonant field screening or a self-consistent plasma response, indicates that differences in the shape of the q profile may explain the need for higher RMP coil currents during ELM suppression in ISS plasmas. Changes in the pedestal profiles are compared for each plasma shape as well as with changes in the injected neutral beam power and the RMP amplitude. Implications of these results are discussed in terms of requirements for optimal ELM control coil designs and for establishing the physics basis needed in order to scale this approach to future burning plasma devices such as ITER.