Sustained Suppression of Type-I Edge Localized Modes with Dominantly $n = 2$ Magnetic Fields in DIII-D

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Abstract. Type-I edge-localized modes (ELM) have been suppressed in DIII-D [1] H-mode discharges with a H_{98Y2} confinement factor near 1.0 using magnetic perturbations with dominant toroidal mode number $n = 2$. This expands access to the ELM suppressed regime, which was previously attainable in DIII-D only with $n = 3$ fields. ELM suppression is obtained with two rows of internal coils for 1.8 s with normalized beta of 1.9 and average triangularity of 0.53, corresponding to a scaled version of ITER scenario 2 at an ITER relevant electron collisionality of 0.2. The applied field reduces the pedestal pressure and edge current via the density without degrading the edge thermal transport barrier. ELITE calculations find that the resulting profiles are stable to intermediate-n peeling-ballooning modes. ELM suppression is found within different ranges of q_{95} depending on the coil configuration used to generate the magnetic perturbation. The edge safety factors associated with suppression do not correspond to those that maximize the pitch-resonant components of the applied vacuum field. Instead, ELM suppression is correlated with an increase in the amplification of kink-resonant components of the calculated ideal MHD plasma response field.

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