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Shape and profile dependencies of RMP ELM suppression windows and their implications to 3D coils[11] S. M. YANG, J.-K. PARK, N. C. LOGAN, C. ZHU, Q. HU, PPPL, Y. M. JEON, NFRI, Y. IN, UNIST, W. H. KO, G. Y. PARK, NFRI, S. K. KIM, Y. H. LEE, YONG-SU NA, SNU, PPPL TEAM, KSTAR TEAM — The operating windows for RMP ELM suppression in KSTAR have been greatly expanded in recent years across different target plasmas and 3D coil configurations. The window variations are qualitatively consistent with the multi-modal aspects of resonant responses, but have proven difficult to quantitatively predict when associated with modified shapes and profiles. New kinetic EFIT analyses show that a highly favorable condition features density profile broadening in addition to the higher triangularity discussed in earlier studies, which tends to increase the edge resonance relative to the core. The higher density over a wider region also implies higher tolerance to the core field penetration as seen in experiments, while its influence to the edge is relatively weaker as indicated by TM1 simulations. This improved physics understanding of RMP ELM suppression conditions has been then utilized to explore optimizations of the KSTAR 3D coils. Stellarator design tools such as FOCUS have been integrated with GPEC in the OMFIT framework to optimize 3D coil geometries and currents to efficiently access ELM suppression windows in a variety of KSTAR equilibria with differing shapes and kinetic profiles. These optimized 3D coils may be able to broaden access to ELM suppression in many KSTAR scenarios.

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