

Optimization of 3D fields towards edge-localized 3D ELM control

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An external 3D magnetic perturbation typically drives resonant response at the rational surfaces from the core to the edge of tokamak plasmas, due to strong mode coupling and amplification. Here we present new approaches to isolate the resonant fields from each other using the IPEC code and to design an edge-localized resonant magnetic perturbation (RMP) for effective ELM control. A generic feature of the edge-localized RMP is the curtailed response to the field at the low-field-side (LFS) midplane, as opposed to typical RMPs which strongly resonate with the LFS fields. The edge-localized RMP also provides a new insight to design a 3D coil for ELM control. For example, a smaller window-pane 3D coil at the top and bottom can greatly improve ELM suppression window in KSTAR compare to the existing coil. A more intelligent coil optimizers, FOCUS, is also applied to the edge-localized RMP, and shows feasibility to further improve ELM suppression window.