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Title: Influence of axisymmetric plasma shape on the plasma response to resonant magnetic perturbations

Abstract: Resonant magnetic perturbations (RMPs) have been demonstrated to be one effective technique to control edge localized modes (ELMs), which is one challenging issue for next generation fusion devices such as ITER. Recent works show significant differences in ELM control effects with different plasma shapes. Since the plasma response plays important role in controlling ELMs, it is necessary to understand the influence of the plasma shape on the plasma response to RMPs. In this work, the magnetic plasma response to RMPs is investigated for DIII-D, EAST and ASDEX Upgrade tokamaks using the MARS-F and GPEC code, by systematically varying the plasma triangularity, whilst keeping other equilibrium quantities largely unchanged or deliberately scanning them. Both resonant harmonics and sensor measurements reveal similar trends that the plasma response decreases with triangularity. The multi-mode plasma response is extracted based on the modeling results, which shows that the amplitude of the dominant mode also decreases with triangularity. The plasma response is strongly shielded at high triangularity compared to that at low triangularity, which implies different control effects of ELMs in shaping. This result suggests that shaping optimization should be taken into consideration for better controlling ELMs.

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List of related published papers (option)

- [1] Gu S. et al 2019 Edge localized mode suppression and plasma response using mixed toroidal harmonic resonant magnetic perturbations in DIII-D Nucl. Fusion 59 026012
- [2] Gu S. et al 2019 A new criterion for controlling edge localized modes based on a multi-mode plasma response Nucl. Fusion 59 126042
- [3] Paz-Soldan C. et al 2019 The effect of plasma shape and neutral beam mix on the rotation threshold for RMP-ELM suppression Nucl. Fusion 59 056012