Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Poloidal structure of the plasma response to n=2 perturbations[1]

S MUNARETTO, E.J. STRAIT, General Atomics, S.R. HASKEY, N.C. LOGAN, PPPL, C. PAZ-SOLDAN, General Atomics — A study of the plasma response to n=2 resonant magnetic perturbations (RMP) in DIII-D plasmas highlights the presence of two dominant modes, in good agreement with predictions from the MHD code MARS-Q. The use of RMPs offers potential benefits for nuclear fusion, for example ELM suppression or the correction of error fields, although their effect on the plasma needs to be better understood to predict how best to apply these fields. RMPs with n=2 and variable poloidal spectra are applied in plasma discharges with $q_{95} \sim$ 4.1 and $\beta_N \sim 2.2$. Singular value decomposition (SVD) analysis was found to decouple the poloidal structure of the plasma response from the dependence on the spectrum of the perturbation applied. This analysis highlighted the presence of two modes, with the dominant mode peaking at the low-field-side midplane and the secondary one off-midplane, with indications of the latter being correlated with ELM suppression. The experimental observations are in good agreement with predictions of a dual-mode response from MARS-Q, improving prospects for projecting optimization of ELM control without triggering deleterious instabilities in future reactors.

[1]Work supported by US DOE under DE-FC02-04ER54698, DE-AC02-09CH11466.

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Date submitted: 06 Jul 2017 Electronic form version 1.4