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Abstract for an Invited Paper
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Observing the plasma response to applied non-axisymmetric fields in the presence of an adjustable ferritic wall[1]

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We report high-resolution detection of the time-evolving, three-dimensional (3D) plasma response to applied non-axisymmetric magnetic fields in a tokamak with an adjustable ferromagnetic wall and with a variably-shaped equilibrium. Ferritic tiles (5mm thick, saturated $\mu/\mu_0 \sim 8$) have been added to the plasma-facing side of half of the in-vessel movable wall segments in the High Beta Tokamak – Extended Pulse (HBT-EP) device[2] in order to explore Ferromagnetic Resistive Wall Mode (FRWM) stability.[3] Low-activation ferritic steels are a candidate for structural components of a fusion reactor, and these controlled experiments examine MHD stability of plasmas with nearby ferromagnetic material. Plasma-wall separation for alternating ferritic and non-ferritic wall segments can be adjusted between discharges without opening the vacuum vessel. Amplification of applied resonant fields is observed to increase when the ferromagnetic wall is close to plasma surface instead of the standard stainless steel wall. Experiments with rapidly rotating external kink modes show wall stabilization despite the presence of the close ferritic wall ($b/a \sim 1.07$), extending previous observations in JFT-2M.[4] Plasmas are observed to have reduced wall stabilization when a biased electrode is used to slow the mode rotation. Resonant fields are also applied while the plasma evolves from circular limited cross-sections to shaped, single-null cross-sections in order to study the effects of shaping on multimode interactions. Multimode activity in diverted and limited plasmas is compared with DCON predictions.

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[2]J.P. Levesque *et al.*, **Nucl. Fusion 53**, 073037 (2013).
[3]V.D. Pustovitov and V.V. Yanovskiy, **Phys. Plasmas 21**, 022516 (2014).
[4]K. Tsuzuki *et al.*, **Nucl. Fusion 46**, 966 (2006).