Simulations of a resonant plasma kink response to externally applied magnetic perturbations in the AUG tokamak

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Using the MARS-F spectral stability code, the plasma response to an applied resonant magnetic perturbation (RMP) field was studied. Experimental plasma profiles were used to reconstruct the equilibrium, with the RMP coil currents and geometry taken from a neutral beam heated H-mode plasma (#28061 at t=1615ms). MARS-F solves the linearised equations of resistive MHD in full toroidal geometry, in order to compute the linear plasma response to a given perturbation, and has been extensively benchmarked against vacuum codes. Simulations scanned the relative phase between the upper and lower RMP coils ($\Delta\varphi_{ul}$), calculating the plasma response to the applied n=2 RMP field. Simulation output, plotted as spectrograms of the RMP including plasma response, showed that the kink resonant component of the plasma response dominates over the vacuum field. Also demonstrated is how the kink response varies continuously from a minimum at even parity ($\Delta\varphi_{ul}$=0,±180 degrees) to a maximum at odd parity ($\Delta\varphi_{ul}$=±90 degrees). Future work to validate both MARS-F and MARS-K using AUG experiments are summarised.