Control of asymmetric magnetic perturbation in tokamaks by computation of ideal perturbed equilibria

JONG-KYU PARK, JONATHAN MENARD, Princeton Plasma Physics Laboratory, ALLEN BOOZER, Columbia University, MICHAEL SCHAFFER, General Atomics — It is well known that tokamak plasmas are highly sensitive to a small breaking of axisymmetry by external magnetic perturbations. The newly developed Ideal Perturbed Equilibrium Code (IPEC) computes an ideally perturbed equilibrium by the perturbations, thereby yielding the three-dimensional features of the perturbed plasma in high resolution. The application of the code to observations of locked modes in NSTX and DIII-D resolved paradoxical results and revealed the most sensitive mode of external perturbations, whose reduction is most important for the control of field error problems in tokamaks. IPEC has numerous applications, such as error field mitigation in ITER or the plasma response to ELM control coils. IPEC can be extended to compute the perturbed equilibria in the presence of plasma viscous forces due to the toroidal asymmetries in the magnetic field strength and can be compared with measured plasma responses in NSTX.

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