Category 1) Ergodization of the magnetic field

Study of Multi-Purpose Nonaxisymmetric Coils for ITER*

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ITER is designed with external coils to correct magnetic errors, but these correction coils appear to have limited utility for other roles, such as ELM amelioration, resistive wall mode (RWM) stabilization, and divertor thermal flux reduction by edge ergodization. This is because the correction coils are too far from the plasma to produce magnetic fields with relatively short poloidal periods. In contrast, smaller, low-current, nonaxisymmetric coils installed at the radius of the ITER vacuum vessel (outer and/or inner surfaces) and in ITER port plugs can produce suitable shorter-wavelength fields. If a sufficient number of such coils are powered by a sufficient number of independent power supplies, all the suggested applications and perhaps error correction, too, can be accomplished by a single multi purpose system. Divertor heat flux reduction would come mainly from rotating the spiral plasma strike pattern at low frequency (~10 Hz) rather than from increasing the instantaneous width of the strike pattern.

A good perturbing magnetic field should not only have the desired geometry near the plasma edge, but its magnitude should also decay rapidly into the plasma core, where nonaxisymmetric magnetic fields damp desirable plasma rotation. We study candidate perturbing fields computationally. The perturbing magnetic fields from realistic coil models are applied onto a realistic ITER equilibrium background plasma. The code TRIP3D traces magnetic lines, and the code SURFMN Fourier analyzes the perturbations on magnetic surfaces. New results will be presented.

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