ITER ASYMMETRIC ERROR FIELDS AND THEIR CORRECTION*

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Locked mode phenomena [1] in present tokamak devices can lead to performance degradation and premature discharge termination. Locked modes are a consequence of interactions between the plasma and non-axisymmetric error fields. Misalignment of coil currents from an ideal axisymmetric configuration is the primary source of error fields in operating tokamaks. Size scaling from present experiments indicates that the ITER limits will be an order-of-magnitude more stringent than those of present devices. This paper presents a summary of the major error field sources expected in ITER and defines the methods and hardware that are being proposed to reduce the error fields below the locked mode threshold. The magnitude and phase of these error fields are presented in terms of their normal magnetic field components, decomposed into helical harmonics on the plasma q=2 surface. Other sources of error fields, such as ferromagnetic materials used in the ITER construction, are investigated for their impact. Statistical and systematic methods are used to combine individual coil components to estimate the overall level and spectrum of the error fields. A correction coil (CC) system is being designed to reduce the final machine error fields to below the locked mode threshold. The proposed system consists of three sets of picture frame coils located at the top, outside midplane and bottom of the device. Coils within each set are connected to produce a toroidal, n=1 field. The system is designed to reduce the most troublesome, lower order, poloidal mode number fields (m = 1,2,3). The system is shown to provide a wide range of error field correction in both magnitude and phase and should allow ITER to operate below the locked mode threshold.

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[1]La Haye, *et al.*, Phys. Fluids B **4**, 2098 (1992).

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