Requirements for alignment of electron cyclotron current drive for neoclassical tearing mode stabilization in ITER

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Abstract

ITER will rely on electron cyclotron stabilization of neoclassical tearing mode islands. The large size and low torque applied in ITER imply slow plasma rotation and susceptibility to island locking by the resistive wall; locking is likely to lead to a loss of the high confinement H-mode, a beta collapse, and possibly disruption. "Front" steering of the launcher, with narrower electron cyclotron current drive, has resolved the issue in "remote" steering of the driven current being too broad and relatively ineffective. However, narrower current drive places demands on alignment of the current drive on the rational surface that is being stabilized. DIII-D alignment techniques, with and without (preemptive) an island are reviewed. The results are used to check models for the effect of misalignment and are then applied to ITER. Criteria for accuracy of alignment as a function of injected power and for the necessary time response of the controller are presented.