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Study of Error Field Physics in Tokamaks and Implications for ITER JONG-KYU PARK, JONATHAN MENARD, STEFAN GERHARDT, Princeton Plasma Physics Laboratory, ALLEN BOOZER, STEVE SABBAGH, Columbia University, MICHAEL SCHAFFER, General Atomics, STEPHEN WOLFE, Massachusetts Institute of Technology — Tokamaks are sensitive to a small nonaxisymmetric field. Nonaxisymmetric error fields in tokamaks can cause a disruption by plasma locking, or degrade confinement by Neoclassical Toroidal Viscosity (NTV). Hence, the correction of error field is important to improve plasma performance. Recent NSTX experiments showed that the critical n=1 error field to cause a locking is much smaller at high beta than expected from the standard scaling at low beta, and also that the correction of n=3 field is essential to sustain high toroidal rotation. Both results indicate the importance of error field correction, not only for resonant n=1 field at low beta, but also at high beta and for nonresonant fields. This enlarged parametric space in error field physics requires a deeper understanding of the plasma response. Many useful insights on plasma response effects can be obtained using the Ideal Perturbed Equilibrium Code (IPEC) coupled with NTV theory. IPEC and NTV calculations for the recent NSTX results will be combined with the multi-machine locking scaling at low beta, in order to improve the predictability of error field thresholds and correction in ITER. This work was supported by US DOE Contract # DE-AC02-09CH11466.

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