Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Ramification of error field correction and quasi-axisymmetry in tokamaks[1] J.-K. PARK, N. C. LOGAN, PPPL, C. PAZ-SOLDAN, GA, C. ZHU, S. M. YANG, M. C. ZARNSTORFF, PPPL, T. MARKOVIC, M. PETERKA, IPP-CAS, Y. GRIBOV, ITER Organization — Non-axisymmetric (3D) error field correction (EFC) in tokamaks aims at successful restoration of plasma performance to that expected for axisymmetry, even if the consequence of the "correction" is an overall increase of non-axisymmetry. This has been demonstrated in numerous examples, e.g. NSTX(-U), DIII-D, and COMPASS, with EFCs minimizing a dominant resonance. The remnant errors, including non-resonant fields, are typically subdominant with only minor degradation, but can also induce a critical event in particular scenarios that are sensitive to external perturbations. An important example is a disruption during L-H transition as shown in COMPASS, and also in a recent DIII-D study. EFCs against both of these resonant and non-resonant effects are in fact requiring remnant fields to be quasi-axisymmetric (QAS), or practically quasi-isodynamic with minimized parallel currents. Applied 3D fields optimized by the General Perturbed Equilibrium Code (GPEC) to be as QAS as possible within the capabilities of existing coils have been indeed shown to induce nearly no discernable performance degradation in DIII-D. New 3D coil designs using GPEC may be able to further optimize the distinct application or correction of resonant, non-resonant, and QAS 3D fields in tokamaks such as DIII-D, COMPASS-U, KSTAR and ITER.

[1]This work was supported by DOE Contracts DE-AC02-76CH03073 (PPPL) and DE-FC02-04ER54698 (GA).

Jong-Kyu Park
Princeton Plasma Physics Laboratory

Date submitted: 03 Jul 2019 Electronic form version 1.4