Abstract Submitted
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Fast-Time-Scale Equilibria for Rotating Nonaxisymmetric Toroidal Plasmas[1] LINDA SUGIYAMA, Massachusetts Institute of Technology — Toroidal fusion plasmas are strongly driven systems sustained by complicated and incompletely characterized sources and sinks. For tokamaks, basic axisymmetric ideal MHD equilibria based on the poloidal magnetic flux are a useful first approximation to the plasma and magnetic geometry for experimental data analysis and physics studies. The large MHD terms in the plasma force balance rapidly establish a quasi-steady state, on time scales much faster than other plasma processes. Widely used equilibrium reconstruction tools, such as EFIT, usually ignore additional effects such as plasma rotation, applied nonaxisymmetry, and non-MHD processes, except for the edge bootstrap current. Good general ideal MHD configurations exist for nonaxisymmetry or rotation separately, but for the combination of the two, the single-fluid nature of MHD requires that the toroidal dependences of the plasma density, rotation, and magnetic field be related by simple expressions. These are unlikely to be satisfied over the wide range of applied heating, torque, current drive, and nonaxisymmetric fields; the mismatch is experimentally testable. This work investigates the minimal additions to basic axisymmetric ideal MHD needed to provide more consistent fast-time-scale steady states.

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