Abstract Submitted
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Stabilization of the Vertical Mode in Tokamaks by Localized Non-axisymmetric Fields[1] ALLAN REIMAN, Princeton Plasma Physics Laboratory, Princeton University, Princeton, NJ — We find that vertical instability of tokamak plasmas can be controlled by nonaxisymmetric magnetic fields localized near the plasma edge at the bottom and top of the torus, and that the required magnetic fields can be produced by a relatively simple set of parallelogram-shaped coils. By providing stable equilibria with more highly elongated cross-sections, the addition of these nonaxisymmetric fields can potentially lead to devices with improved confinement and/or beta limits. The analytical calculation assumes a large aspect ratio plasma that is well approximated by a cylinder, $\beta = 0$, and a uniform equilibrium current density. Stability is determined by a δW calculation, using the stellarator approximation [1] for both the equilibrium and stability calculations. The physical mechanism of the stabilization suggests that the stability properties do not depend on the precise shape of the coils, so that curvature can be introduced to optimize relative to other considerations.
[1] J. Greene and J. Johnson, Phys. Fluids **4**, 875 (1961); J. Johnson and J. Greene, Phys. Fluids **4**, 1417 (1961).

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