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TH/P2-04: Turbulent Optimization in Stellarators & Tokamaks via Shaping

Tuesday, 9 October 2012 14:00 (4h 45m)

A method[1,2] has recently been developed for evolving toroidal configurations to ones with reduced turbulent transport, using the STELLOPT optimization code and the GENE gyrokinetic code. The potential for this method is now being explored and extended. The growing body of results has found that the effectiveness of the current "proxy"figure of merit Qprox used by STELLOPT to estimate transport levels depends on the class of toroidal device considered. The present proxy works well for quasi-axisymmetric stellarators and tokamaks, and modestly for quasi-helically symmetric designs, but not for the W7X quasi-omnigenous/quasi-isodynamic design. We are exploring the origin of this variation, and improving the dependence of the proxy on key geometric factors, extending it to apply to transport channels other than the ITG turbulence it was originally developed for. We are also examining incorporating GENE directly into STELLOPT to improve the turbulent Qprox , and the relative effectiveness of different search algorithms. To aid in these efforts, we have adapted STELLOPT to provide a new capability for mapping the topography of the cost function in the search space.

[1] H.E. Mynick, N. Pomphrey, P. Xanthopoulos, Phys. Rev. Letters, 105, 095004 (2010).
[2] H.E. Mynick, N. Pomphrey, P. Xanthopoulos, Phys. Plasmas, 18, 056101 (2011).

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