

Simulation of fully global electromagnetic turbulence in the Stellarator

W7-X

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The optimization of neoclassical transport in stellarators, and consequent reduction, compels us to consider turbulence as the limiting factor for accessing high performances. While electrostatic low- β turbulence, like the one driven by ion-temperature-gradient modes, is more and more understood, electromagnetic high- β turbulence studies are still in an exploratory phase [1]. Here $\beta = \langle p \rangle / (B^2 / 2\mu_0)$ is the ratio of plasma pressure to magnetic pressure. Fully global electromagnetic simulation codes are at the forefront of the numerical investigation of turbulence behaviour. And while strongly adding to the understanding of these physical problems they are more demanding in terms of computational resources and numerical complexity. In the context of the 4th Fusion HPC Workshop this talk focuses on sharing some of the numerical challenges encountered while simulating fully global linear electromagnetic turbulence in the stellarator Wendelstein 7-X using the global gyrokinetic code Euterpe [2].

References

- [1] A. Mishchenko et al., *Plasma Physics and Controlled Fusion* **64**, 104009 (2022)
- [2] R. Kleiber et al., submitted to *Computer Physics Communications* (2023)