

Numerics and computation in gyrokinetic simulations of electromagnetic turbulence with global particle-in-cell codes

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Electromagnetic gyrokinetic particle-in-cell simulations have been inhibited for a long time by numerical problems. These problems are related to a subtle numerical cancellation in the field equations which has to happen in such simulations and is very difficult to achieve in practice. The "control-variate mitigation technique" and the "pullback transformation scheme" have been implemented in several global gyrokinetic PIC codes including EUTERPE, GYGLES, ORB5, and XGC. In all cases, a significant improvement in the code efficiency has been observed when these techniques were used. In our presentation, we will focus on numerical and computational challenges associated with simulations of electromagnetic turbulence in realistic parameter regimes. Both, tokamak and stellarator geometries will be considered.