Discrete particle noise in gyrokinetic PIC simulations of plasma turbulence[1] IGOR HOLOD, ZHIHONG LIN, University of California, Irvine —
The studies of discrete particle noise have been done based on the gyrokinetic simulations of plasma turbulence using the gyrokinetic toroidal particle code (GTC). Statistical properties and associated transport of random fluctuations are first studied in a system with subcritical background gradients, such that no instabilities develop. Simulations in the parameter regime approaching marginality from below have subsequently been done, to study the effects of nonlinearity of the dielectric constant. The fluctuation spectra have been constructed from the direct simulation measurements of electrostatic potential. The noise- driven transport has been calculated using the quasilinear expression for the diffusivity. The obtained theoretical value for the diffusion coefficient is compared with the corresponding value obtained from the simulation, demonstrating good agreement. It has been shown that for the realistic parameters, the noise driven transport depends linearly on the entropy of the system, which, in particular, makes possible to estimate the noise contribution to the heat conductivity during simulations.

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