

Discrete particle noise in particle-in-cell simulations of plasma turbulence

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The studies of discrete particle noise have been done based on the gyrokinetic simulations of stable plasma using the GTC code [*Lin et al. Science 281, 1835 (1998)*]. The fluctuation correlation function and fluctuation spectra have been constructed from the direct simulation measurements of electrostatic potential. Noise driven transport is calculated using the quasilinear expression for the diffusion coefficient and the obtained noise spectrum. The obtained theoretical value for the diffusion coefficient is compared with the measured value from the simulation, demonstrating good agreement. It has been shown that for the realistic parameters in actual turbulence simulations, the noise driven transport depends linearly on entropy of the system, which makes possible to estimate the noise contribution to the total transport during simulations.