

# The effect of randomized sampling on filamentation and recurrence effect in kinetic simulation with periodic boundary conditions

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Kinetic simulation technique based on Vlasov-Poisson set of equations with periodic boundary conditions is employed to examine filamentation and recurrence effect. These effects have been found to exist by the first attempt of kinetic simulation [1,2] as intrinsic unphysical phenomena happen due to discretization of phase space in order to use finite difference or other computational techniques. The simulation approach adopted here is using the Liouville's theorem by following phase points trajectories which provide higher precision of temporal evolution in phase space [3].

Previously the idea of randomizing sampling has been suggested to overcome recurrence effect [4], however here a detailed analysis is presented while examining the underlying mechanism of filamentation responsible for recurrence effect, and furthermore the Linear Landau damping and the entropy behavior are studied in the randomized sampling regime and compared to the normal sampling.

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[3] F. Kazeminezhad, S. Kuhn, A. Tavakoli, *Physical Review E* **67**, 026704 (2003).

[4] H. Abbasi , M. H. Jenab, H. Hakimi Pajouh, *Physical Review E* **84**, 036702 (2011).