

Abstract Submitted
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Spatio-temporal correlations in Coulomb clusters AMIT GHOSAL, BISWARUP ASH, Indian Institute of Science Education and Research-Kolkata, Mohanpur Campus, India-741246, JAYDEB CHAKRABARTI, S. N. Bose National Centre for Basic Sciences, Kolkata, India-700098 — Dynamical response of Coulomb-particles in nanoclusters are investigated at different temperatures characterizing their solid-like (Wigner molecule) and liquid-like behavior. The density correlations probe spatio-temporal relaxation, uncovering distinct behavior at multiple time scales in these systems. They show a stretched-Gaussian or stretched-exponential spatial decay at long times in circular and irregular traps. Interplay of confinement and long-range nature of interactions yields spatially correlated motion of the particles in string-like paths, leaving the system heterogeneous even at long times. While particles in a ‘solid’ flow producing dynamic heterogeneities, their random motion in ‘liquid’ defies central limit theorem. Distinguishing the two confinements, temperature dependent motional signatures serve as a criterion for the crossover between ‘solid’ and ‘liquid’. The irregular Wigner molecule turns into a nearly homogeneous liquid over a much wider temperature window compared to the circular case. The temperature dependence of different relaxation time scales builds crucial insights. A phenomenological model, relating the unusual dynamics to the heterogeneous nature of the diffusivities in the system, captures much of the subtleties of our numerical simulations.

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