Heterogeneous dynamics and stretched exponential decay of spatio-temporal correlations for Coulomb-interacting particles in confined geometries AMIT GHOSAL, BISWARUP ASH, Indian Institute of Science Education and Research-Kolkata, Mohanpur Campus, India-741252, JAYDEB CHAKRABARTI, S. N. Bose National Centre for Basic Sciences, Kolkata, India-700098 — We investigate the dynamics of Coulomb-interacting confined particles over a range of temperatures capturing the crossover from a Wigner molecule to a liquid-like phase. Dynamical signatures, derived from the Van-Hove correlations, develop pivotal understanding of the phases as well as the intervening crossover, which are inaccessible from the study of static correlations alone. The motion of the particles shows frustrations, produces heterogeneities depending on the observation time-scales and temperatures and results into a non-Gaussian behavior. The extent and nature of the departure of the behavior of spatio-temporal correlations from the conventional wisdom depends crucially on the symmetry of the confinements. In particular, we find that the decay of correlations follow a stretched-exponential form in traps that lack any symmetry. Our data offers a broad support to a theoretical model that integrates the non-Gaussian behavior arising from the convolution of Gaussian fluctuations weighted by appropriate diffusivities, consistent with local dynamics. The richness of information from the dynamic correlation will be shown to improve the understanding of melting in confined systems in a powerful manner.

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