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Theoretical perspective on nearly frozen coulomb liquids HANNA TERLETSKA, YOHANES PRAMUDYA, SERGEY PANKOV, EFSTRATIOS MANOUSAKIS, VLADIMIR DOBROSAVLJEVIC, Department of Physics and NHMFL, Florida State University — Various studies on systems with charge ordered states, such as Wigner crystal, show their extreme fragility resulting from strong frustrations caused by long-range Colulomb-like interactions. Here, a so-called nearly-frozen Coulomb liquid regime is identified featuring a soft Coulomb pseudo-gap with unconventional insulating-like transport. Despite intensive studies, such pseudo-gap regime is still poorly understood. By employing extended dynamical mean field theory (EDMFT) [1] to study a semi-classical lattice gas model of spinless electrons, we successfully demonstrate the existence of such an intermediate liquid regime, and show that the pseudo-gap is, in fact, a general feature for models with long-range interactions. Our analytical results are well supported by exact Monte Carlo calculations. Moreover, we show that standard theories, like self-consistent Gaussian approximation ("spherical model") and RPA, are ill-suited to describe this interesting regime. The spherical model approach provides the same as EDMFT freezing temperature Tc, but fails to capture the pseudo-gap feature. RPA, however, not only overestimates Tc, but also completely misses the pseudo-gap regime.
[1] S. Pankov and V. Dobrosavljevic, Phys. Rev. Lett. **94**, 046402 (2005).

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