

# Phase transitions between Wigner Crystals and Fractional Chern Insulator phase

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We investigate phase transitions between the Wigner crystallization (WC) and Fractional Chern Insulator (FCI) phase. FCI are quantum liquid phases related to partially filled Chern Insulators - insulators with non-trivial band topology exhibiting a non-zero Hall conductance in analogy to Landau level (LL) physics, but in systems preserving translational symmetry [1-4]. Similarly to LL physics, at the low density limit strongly correlated liquid phases compete with Wigner Crystals [5-6]. We have shown that the Wigner crystallization occur on nontrivial bands of Chern Insulators for filling fractions when FCI is absent [7].

In this work, we analyze a competition between FCI and WC on 1/7 filling fraction by manipulation of two-body interaction range using screening parameter in Coulomb interaction. The low energy many-body spectrum is obtained by exact diagonalization method. FCI Laughlin-like phase for 1/7 filling is expected for short range interaction. We confirmed its existence by looking at the many-body ground state degeneracy, spectral flow upon flux intersection and quasi-particle excitation spectra. We show that for long range interaction the liquid phase vanishes and Wigner crystals occurs. We analyze a transitions between both phases by looking at low energy many-body spectrum and the Fourier peaks high of cartesian and angular Fourier transform of the pair correlation density of the many-body ground state.

## References

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