

Effective field theory for superfluid vortex crystals

Wednesday 3 December 2025 10:20 (50 minutes)

Rotating Bose-Einstein condensates of trapped cold atoms form quantum vortex crystals. In this talk, I will present a bottom-up derivation of the effective field theory governing the low-energy excitations of such vortex crystals in two spatial dimensions. By embedding the system in Newton-Cartan geometry and analyzing the isometries of the resulting background, I identify the nonrelativistic symmetry group that generalizes the Bargmann group in the presence of an effective magnetic field. Using the coset construction, I then construct the most general theory consistent with the associated symmetry-breaking pattern. Finally, I clarify the role of redundant Goldstone fields and discuss the structure of the resulting low-energy theory in the hydrodynamic limit.

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