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Emergent conformal Hilbert spaces and anyon dynamics in partially filled Chern bands

Monday 1 December 2025 12:00 (1 hour)

The fractional quantum Hall (FQH) effect realized in Landau levels is a family of strongly correlated topological quantum fluids in two dimensional space, with exotic low-lying collective excitations that are anyonic and even non-Abelian. Here we propose a unified framework in understanding the integer and fractional quantum Hall systems via Hilbert spaces with emergent conformal symmetry, and show how it can be extended to more general Chern bands with no external magnetic field. The hierarchical structure of the conformal Hilbert spaces (CHS) allows us to reveal internal structures of anyons, which are "elementary particles"of the CHS, as well as the dynamical properties of geometric excitations crucial for the incompressibility gap of the topological phases. We discuss the fundamental similarities and differences between Landau levels and generic Chern bands via new analytic tools derived from the CHS, and the experimental relevance of the "high energy physics"in 2D topological systems.

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