"Exact diagonalization for topological phases driven by interaction"

Prof. Maria Daghofer (University of Stuttgart)

Topologically nontrivial kinetic energy due to spin-orbit coupling and strong magnetic fields are two established ways to topologically nontrivial phases. We study alternative mechanisms, where electron-electron interaction, together with exotic magnetic states, might stabilize topologically nontrivial features [1]. Tools are either exact diagonalization or the variational cluster approach based on this method. We apply exact diagonalization to interacting Chern bands to detect signatures of "fractional Chern insulators", analogs of fractional quantum-Hall states, as well as of a more exotic pinball liquid that combines topological and conventional "Landau" order [2]. We also employ the variational cluster approach to investigate symmetry breaking of interacting fermions, possibly into topologically nontrivial phases [3].

[1] J. W. Venderbos, S. Kourtis, J. van den Brink, and M. Daghofer, PRL 108, 126405 (2012).

[2] S. Kourtis and M. Daghofer, PRL 113, 216404 (2014).

[3] M. Daghofer and M. Hohenadler, PRB 89, 035103 (2014).