Stability of Chern and Fractional Chern insulators

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Chern insulators (CI) and fractional Chern insulators (FCI) are zero field lattice analogues of the integer and fractional quantum Hall effects respectively. In this talk we will address the important problem of when and how they are induced by interactions, an issue relevant for both cold-atomic and condensed matter experiments. For the former, we will focus on the existing disagreement between mean field theory results and exact diagonalization/infinite density matrix renormalization group (iDMRG) studies regarding the emergence of the CI state from a semi-metal via short range interactions. For the FCI state I will exemplify its full numerical characterization with the help of iDMRG, a method which allows us to address the character of the Metal-FCI phase transition, a possible benchmark for future experiments.

[1] arXiv:1407.6985.

[2] Phys. Rev. B 88, 245123 (2013).

[3] Phys. Rev. B 87, 085136 (2013).