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Numerical studies of band geometry of fractional topological insulators THOMAS JACKSON, University of California at Los Angeles, ABISHEK ROY, University of Illinois at Urbana-Champaign, GUNNAR MÖLLER, University of Cambridge, RAHUL ROY, University of California at Los Angeles — One of the chief motivations behind the current interest in topological insulators is the possibility that they may offer an alternate, more experimentally accessible venue for studying fractional quantum Hall effect (FQHE) physics, as well as possible novel states arising from the larger phase space relative to the lowest Landau level. Roy [1] identified several sufficient conditions on the single-particle Berry curvature and quantum metric for the algebra of projected density operators to be isomorphic to the Girvin-MacDonald-Platzman algebra of the FQHE. Here, we study the influence of these conditions in determining the stability of topological phases arising from density-density interactions in fractionally filled Chern bands. We present numerical results on the correlations between single-particle band geometry and the gaps in the energy and entanglement spectra for the corresponding interacting many-body state in a variety of lattice models exhibiting fractional Chern insulator phases. There is a key geometrical distinction between two- and multiple-band models. We also discuss extensions of the W_∞ algebra and explore connections between the quantum metric and Hall viscosity.
[1] R. Roy, arXiv:1208.2055.

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