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Two-dimensional topological order of kinetically constrained quantum particles[1] STEFANOS KOURTIS, TCM Group, Cavendish Laboratory, University of Cambridge, Cambridge CB3 0HE, United Kingdom — Motivated by recent experimental and theoretical work on driven optical lattices, we investigate how imposing kinetic restrictions on quantum particles that would otherwise hop freely on a two-dimensional lattice can lead to topologically ordered states. The kinetically constrained models introduced here are derived as an approximate generalization of strongly interacting particles hopping on Haldane and equivalent lattices and are pertinent to systems irradiated by circularly polarized light. After introducing a broad class of models, we focus on particular realizations and show numerically that they exhibit topological order, by observing topological ground-state degeneracies and the quantization of corresponding invariants. Apart from potentially being crucial for the interpretation of forthcoming cold-atom experiments, our results also hint at unexplored possibilities for the realization of topologically ordered matter. A further implication, relevant to fractional quantum Hall (FQH) physics, is that the correlations responsible for FQH-like states can arise from processes other than density-density interactions.

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