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Title: Fermionic particles, fermionic loops, and gravitational anomalies

Abstract:

We construct infinitely many new exactly solvable local commuting projector lattice Hamiltonian models for beyond group cohomology invertible bosonic topological phases in any spacetime dimensions, whose boundaries are characterized by gravitational anomalies. In particular, we will focus on the beyond cohomology invertible phase “w2w3” in (4+1)D, which has an anomalous (3+1)D boundary topological order with fermionic particle and fermionic loop excitations that have mutual statistics. Finally, we will demonstrate a few examples of fermionic loop excitations in (3+1)D toric codes.

Reference: https://arxiv.org/abs/2110.14644