Abstract Submitted
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Momentum polarization: an entanglement measure of topological spin[1] XIAOLIANG QI, Stanford University — Topologically ordered states are states of matter which are distinct from trivial states by topological properties such as ground state degeneracy and quasi-particles carrying fractional quantum numbers and fractional statistics. The topological spin is an important property of a topological quasi-particle, which is the Berry phase obtained in the adiabatic self-rotation of the quasi-particle by 2π. In this paper we propose a new approach to compute the topological spin in candidate systems of two-dimensional topologically ordered states. We identify the topological spin with a new quantity, the momentum polarization defined on the cylinder geometry. We show that the momentum polarization is determined by the quantum entanglement between the two halves of the cylinder, and can be computed from the reduced density matrix. As an example we present numerical results for the honeycomb lattice Kitaev model, which correctly reproduces the expected spin $e^{i\frac{2\pi}{16}}$ of the Ising non-Abelian anyon (σ particle). Our result provides a new efficient approach to characterize and identify topological states of matter from finite size numerics.

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Xiaoliang Qi
Stanford University

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