Twisting a topological phase on a lattice

MENG CHENG, Microsoft Research Station Q, YI-ZHUANG YOU, University of California, Santa Barbara — When a two-dimensional topological phase inhabits a torus, it possesses a ground state degeneracy robust to any local perturbations. These degenerate ground states can transform nontrivially under modular transformations of the torus, generated by Dehn twists. Representation of Dehn twists on the ground states characterizes the topological order. We propose that the Dehn twists can be obtained as a non-Abelian Berry phase of an adiabatic deformation of the lattice model. We apply this method to the example of a $p_x + ip_y$ superconductor and provide a TQFT interpretation of the numerical results.

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