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Twist Defects in Topological Systems with Anyonic Symmetries[1]
JEFFREY TEO, ABHISHEK ROY, XIAO CHEN, University of Illinois at Urbana-Champaign — Twist defects are point-like objects that support robust non-local storage of quantum information and non-abelian unitary operations. Unlike quantum deconfined anyonic excitations, they rely on symmetry rather than a non-abelian topological order. Zero energy Majorana bound states can arise at lattice defects, such as disclinations and dislocations, in a topological crystalline superconductor. More general parafermion bound state can appear as twist defects in a topological phase with an anyonic symmetry, such as a bilayer fractional quantum Hall state and the Kitaev toric code. They are however fundamentally different from quantum anyonic excitations in a true topological phase. This is demonstrated by their unconventional exchange and braiding behavior, which is characterized by a modified spin statistics theorem and modular invariance. Gauging anyonic symmetries by treating twist defects as quantum excitations provides a connection between some non-abelian topological states and abelian ones.

[1]Simons Foundation

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