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Realizing non-Abelian statistics in time-reversal invariant systems

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Motivated by the search for a quantum computer robust against errors, much theoretical effort has been devoted to finding systems with quasiparticles obeying non-abelian statistics. I discuss a general method of constucting quantum loop gases with such behavior, focusing in particular on the simplest time-reversal-invariant model (P. Fendley and E. Fradkin, Phys. Rev. B 72 (2005) 024412 [cond-mat/0502071]). The quasiparticles of this model are called "Fibonacci anyons", and their braiding is related to SO(3) Chern-Simons theory. I also discuss the quantum critical point governing the transition from a topological phase to a conventionally-ordered phase.