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PARAFERMIONIC MODELS IN TOPOLOGICAL SYSTEMS

Abstract:

Recent works show that, in particular topological systems, it may be possible to fractionalize Majorana zero modes to obtain more exotic anyons called parafermions.

In this talk I will first review some aspects of the Majorana zero modes appearing in topological superconductors, then I will describe how parafermionic zero modes arise at the interface between a superconductor and a ferromagnet along the edge of a fractional topological insulator (FTI) and I will examine their properties.

Finally I will address the physics of two-dimensional arrays of interacting parafermionic modes. The geometry of the underlying topological insulators is strictly related to the topological characteristics of these systems. In a geometry where the length of the FTI edges is independent on the system size, the array has a topologically ordered phase, giving rise to a qudit toric code Hamiltonian in perturbation theory. In a geometry where the length of the edges scales instead with system size, an exact duality maps the system to an Abelian lattice gauge theory without topological order.