From Majoranas to parafermions: topological zero modes in condensed matter systems

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Abstract

The so-called "search for Majoranas" has mobilized several groups over the last decade with the goal of achieving the "holy grail" of topological quantum computation in condensed matter systems [1-2]. In spite of the advances, particularly in devices of semiconductor nanowires with proximity induced superconductivity, many unanswered questions and challenges remain, as highlighted the recent events that shook the community [3]. This begs the question of whether other platforms hosting Majorana zero modes or other topological excitations which could be used as non-Abelian anyons can be viewed in a different light.

In this talk, I will discuss some of the scenarios for what's next in the Majorana saga. I will present some of the works in our group involving Majoranas in alternative platforms such as vortex cores in 2D topological superconductors [4]. I will also discuss our recent proposals for modeling parafermionic zero modes, Majoranas' Z_n symmetric cousins, in strongly interacting electronic systems [5,6]. We also propose a way to detect these rather exotic quasiparticles using quantum dots [5].

References

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