Title: Some exact and non-exact gauge dynamics in honeycomb Kitaev model

Saptarshi Mandal, IOP Bhubaneswar

Abstract:

First we describe the effect of spin-fractionalization into static fluxes and dynamic majorana fermions in the Kitaev model and its consequences in various lattices in two and three dimensions. We show how the gauge structure in the honeycomb Kitaev model leads to fourfold topological degeneracies in the thermodynamic limit. We also discuss the effect of large anisotropy in the coupling constant and explain the basic differences of the effective Hamiltonian in two and three dimesional Kitaev model. We also relate 2d Toric code model as an effective model for Squaric acid system undert strong magnetic field. In the second part, we briefly discuss how the gauge dynamics changes in the presence of non-Kitaev interaction. We show that at zero temperature a Kitaev spin-liquid state is stable against non-Kitaev interactions(upto 10 percent of Heisenberg coupling). Finally within an exact diagonalization study of Kitaev-Heisenberg-Gamma model for different small size clusters we describe many interesting effects in the gauge and matter sectors, in particular we show that gauge fields can be stabilized to its Kitaev limit by external magnetic fields to a great extent. We also depict the qualitative differences in the gauge and matter dynamics which arises due to the relative sign and magnitude of Kitaev, Heisenberg and Gamma interactions.