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Chern-Simons theory for frustrated Heisenberg spins on Kagome Lattice KRISHNA KUMAR, University of Illinois at Urbana-Champaign, KAI SUN, University of Michigan, Ann Arbor, EDUARDO FRADKIN, University of Illinois at Urbana-Champaign — There has been a lot of renewed interest in frustrated spin systems on Kagome lattices especially with the discovery of materials like volborthite and herbertsmithite. In the presence of an external magnetic field (or at fractional fillings), these systems can give rise to magnetization plateaus. Numerous studies indicate the existence of a m=1/3 plateau on the Kagome lattice. Here, we look at the problem of anti-ferromagnetic Heisenberg spins using a Jordan-Wigner transformation that maps the spins onto a problem of fermions coupled to a Chern-Simons gauge field. This method has been used successfully to study unfrustrated systems like the square lattice. At a mean-field level the above ideas have also been applied to frustrated systems. However, fluctuations are generally strong in these models and can affect the mean-field physics. We report a method to rigorously extend the Chern-Simon's term to frustrated lattices like the Kagome lattice. We discuss the different phases that arise at the mean-field level from this theory focusing specifically on the case of 1/3-filling, which gives rise to a magnetization plateau and is a topological phase. Finally, we will also comment on the implications of our model in the case of 1/2-filling.

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