Poster-2-12

Topological phase transitions in quantum magnets

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Quantum spin chains and ladders exhibit a host of properties quite different from their higher dimensional counterparts, including topological excitations such as spinons, and exotic physics such as the Tomonaga-Luttinger liquid. This physics has been spectacularly analyzed and observed in compounds such as BPCB or DIMPY.
In the compound $BaCo_2V_2O_8$, a spin chain compound, under magnetic field transverse to the chains, one observes, by neutron diffraction, a quantum phase transition between an Ising like phase and a flopped one with staggered magnetization perpendicular to the chains. Using both analytical and numerical studies we show that this transition is a topological one, characterized by a dual sine-Gordon field theory and study its properties [1,2].
When the field is longitudinal to the chain, another iconic transition occurs in this material: the Pokrovski-Talapov transition between a commensurate magnetic phase and an incommensurate one [3].
This poster will present the analysis of these transitions, using a combination of numerical and field theory techniques and the comparison with experimental data. It will also present the difficulties both for this compound and numerous other, in taking properly into account the interchain (or interladder coupling) and discuss the resulting consequences for the phase diagram, as well as the theoretical challenges.

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[3] Q. Faure, S. Takayoshi, V. Simonet, B. Grenier, M. Månsson, J. S. White, G. S. Tucker, C. Rüegg, P. Lejay, T. Giamarchi, S. Petit, Phys. Rev. Lett. 123, 027204 (2019).