Frédéric Mila invited by LPTM / Andreas Honecker

Project title: Thermodynamics of two-dimensional frustrated quantum magnets

Summary: The main purpose of the proposed invitation will be a continuation of our recent collaboration on the subject of spin-½ magnets on frustrated lattices [1-4]. Recently, we have focused on one-dimensional models and developed efficient methods for calculating the thermodynamic properties of these [2-4]. Now we want to return to 2D models in collaboration with colleagues from Aachen in Germany who will perform quantum Monte Carlo simulations. A first model is the so-called "Shastry-Sutherland" model which is relevant for experiments on SrCu2(BO3)2, see, e.g., [1]. Here, our task will be to better understand the effect of bound states on thermodynamics in the same spirit as in one dimension [2]. A second model will be a bilayer of the square lattice with maximal frustration. On the one hand, this model appears as a generalization of the "Shastry-Sutherland" model. On the other hand, for this model one can bypass the "sign problem" of quantum Monte Carlo simulations in the same way as in one dimension [2,4]. Here, our task will be to exploit the particular properties of this model to build a more analytical approach as well as to study possible phase transitions at finite temperature.

Beyond this project of concrete collaboration, the invitation of Prof. F. Mila will have a broader interest as contact points with other researchers in Cergy-Pontoise exist, especially on SU (N) models that are relevant, e.g., for ultra-cold atoms, see for example [5,6].

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