

The effect of interchain coupling on multipolar phases in quasi-1D quantum helimagnets

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Coupled frustrated spin-1/2 chains in high magnetic fields described within the ferro-antiferromagnetic J_1 - J_2 Heisenberg model are studied by density-matrix renormalization group, hard-core boson, and spin wave theory approaches [1,2]. Multipolar phases related to magnon bound states are destroyed (supported) by weak antiferromagnetic (ferromagnetic) interchain couplings J_{ic} . We show that quantum spin nematics might be found for LiVCuO_4 [3] whereas for $\text{Li}(\text{Na})\text{Cu}_2\text{O}_2$ it is prevented by a sizeable antiferromagnetic J_{ic} . Also for $\text{Li}_2\text{ZrCuO}_4$ with a small antiferromagnetic J_{ic} expected triatic or quartic phases are unlikely, too. The saturation field is found to be strongly affected even by a relatively small J_{ic} .

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[2] S. Nishimoto, S.-L. Drechsler, R.O. Kuzian, J. Richter, and J. van den Brink, arXiv:1005.5500v2 (2010).

[3] S.-L. Drechsler, S. Nishimoto, R.O. Kuzian, J. Málek, W.E.A. Lorenz, J. Richter, J. van den Brink, M. Schmitt, H. Rosner, arXiv:1006.5070v2 (2010), accepted to Phys. Rev. Lett.