Fizički odsjek Prirodoslovno matematičkog fakulteta Sveučilišta u Zagrebu
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Seminar Fizičkog odsjeka

Vrijeme (s.t.)	Mjesto
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Spin chains probed by nuclear magnetic resonance: I. $SrCuO_2$ and Sr_2CuO_3 II. $LiCuSbO_4$

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In the first part of the talk, ^{63}Cu NMR measurements on the antiferromagnetic $S = 1/2$ Heisenberg chains $SrCuO_2$ and Sr_2CuO_3 doped with Ni, Zn, Pd, and Co will be presented. A line broadening of the NMR spectra for Ni, Zn, and Pd doping reveals the existence of an impurity-induced local alternating magnetization, and exponentially decaying spin-lattice relaxation rates T_1^{-1} towards low temperatures indicate the opening of a spin gap. The doping dependence indicates that the chains are cut into finite-size segments by the defects [1]. On the other hand, Co doping has a much stronger impact on the NMR spectra at low temperatures and does not induce a gap-ike decrease of T_1^{-1}. This can be explained by the different spin of the impurities: whereas Co is definitely $S \neq 0$, Pd, Zn and even Ni are $S = 0$ impurities in the chains.

In the second part of the talk, ^{7}Li NMR measurements on the strongly frustrated $S = 1/2$ Heisenberg chain $LiCuSbO_4$ in magnetic fields up to 16 T will be presented. In this compound, frustration of the ferromagnetic nearest neighbor exchange with the antiferromagnetic next nearest neighbor exchange leads to different field induced multipolar states at low temperatures. These states can be identified by different temperature dependencies of the spin lattice relaxation rate T_1^{-1}: at low fields a quasi long-range ordered spin density wave phase is more and more stabilized, leading to a power law like increase of T_1^{-1}. At higher fields above 13 T, a gapped behavior dominates the T dependence of T_1^{-1}, consistent with a spin-nematic state with quadrupolar correlations. The nematic scenario is supported by a microscopic theoretical approach using the DMRG technique.

[1] Y. Utz et al., Phys. Rev. B 92, 060405(R) (2015).
[2] H.-J. Grafe et al., arXiv:1607.05164 (2016).

Voditelji seminara FO

Damir Pajić i Ivica Smolić