Poster-1-4

Spin and lattice dynamics in the two-ladder quantum magnet Cu-CPA

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Quantum spin ladders are materials that bridge the gap between spin dimer and spin chain systems. They can often be realized in metal-organic compounds in which large organic groups between the magnetic ions decrease the interaction strengths, so that the magnetization can be saturated with experimentally accessible magnetic fields. On the other hand, large organic groups can host low-lying phonons that make materials soft and susceptible to magnetoelastic effects as well as structural transitions at fairly low temperatures. Metal-organic $(C_5H_9NH_3)_2CuBr_4$ (Cu-CPA) was recently found to contain two inequivalent spin ladders at temperatures below such a structural transition [1]. A recent success in synthesis of large single crystals has allowed us to perform high-resolution neutron spectroscopy [2] and high-field magnetization measurements. In the former, we observe the two branches of the triplon dispersion that confirm the coexistence of two inequivalent spin ladders and help us estimate the relative strengths of their leg and rung exchange interactions, which are inherently difficult to determine from the thermodynamic measurements alone. Additionally, we show that the low-energy local phonons are sensitive to the spin correlations, making the material a great candidate to study the interplay of spin and lattice dynamics.

[1] J. Philippe *et al.*, $(C_5H_9NH_3)_2CuBr_4$: A metal-organic two-ladder quantum magnet, Phys. Rev. B **110**, 094101 (2024), https://doi.org/10.1103/PhysRevB.110.094101.

[2] J. Philippe, F. Elson, T. Arh *et al.*, Magnetic and phononic dynamics in the two-ladder quantum magnet $(C_5H_9NH_3)_2CuBr_4$, accepted for publication in Phys. Rev. B, https://doi.org/10.1103/89j6-f5zx.