

Fractional excitations in low dimensional quantum magnets

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This talk will examine some recent results related to fractional excitations in quasi-1D and quasi-2D magnetic systems. The natural excitations of the antiferromagnetic Heisenberg chain are fractional spinons and can be observed in many $S=1/2$ systems. Some experiments on the prototypical material KCuF_3 will be reviewed, including how quantum Fisher information provides an experimental measure of entanglement in the material [1]. This will be followed by a discussion of neutron scattering evidence for fractional excitations in the proposed Kitaev material RuCl_3 [2,3] including efforts to elucidate the effective $S=1/2$ spin Hamiltonian using high field measurements [4]. If time permits some new details of the sample dependence of the thermal conductivity and thermal Hall effect will also be examined [5].

[1] A. Scheie *et al.*, Phys. Rev. B **103**,224434 (2021); Phys. Rev. B **107**, 059902 (E) (2023).

[2] A. Banerjee *et al.*, Nat. Mat. **15**, 733 (2016); Science **356**, 1055 (2017); npj Qu. Mat. **3**, 8 (2018).

[3] C. Balz *et al.*, Phys. Rev. B **100**, 060405(R) (2019).

[4] C. Balz *et al.*, to be published.

[5] H. Zhang *et al.*, arXiv:2303.02098; arXiv:2303.03682; arXiv:2310.03917.