

Seminar

What is the correct spin model for α -RuCl₃,
a candidate material for the Kitaev spin liquid

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α -RuCl₃ has been studied as one of the candidate materials to realize a novel quantum spin state, i.e. the Kitaev spin liquid [1]. Extensive experimental studies have shown a glimpse of the Kitaev spin liquid behavior, such as a continuum in inelastic neutron scattering spectra [2], two-peak structure in the magnetic specific heat [3], and the half quantization of the thermal Hall coefficient [4]. However, a fundamental question remains unanswered: what is the correct spin model for α -RuCl₃?

In this talk, I will present our recent theoretical effort to describe the low-energy behavior of α -RuCl₃. We examined ~20 theoretical models proposed so far by numerically computing the dynamical spin structure factor [2] and the magnetic specific heat [3]. It is found that no existing model could simultaneously describe both quantities [5]; the energy scales suggested by different measurements seem to be incompatible. I will discuss if this conflict could be resolved.

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[3] S.-H. Do et al. Nat. Phys. 13, 1079 (2017); S. Widmann et al. Phys. Rev. B 99, 094415 (2019).

[4] Y. Kasahara et al. Nature (London) 559, 227 (2018).

[5] P. Laurell and S. Okamoto, arXiv:1906.07579.

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