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Breakdown of Spin-Waves in Anisotropic Magnets: Spin Dynamics in α-$RuCl_3$ STEPHEN WINTER, KIRA RIEDL, Institut fur Theoretische Physik, Frankfurt, ANDREAS HONECKER, Laboratoire de Physique Thorique et Modlisation, Universit de Cergy-Pontoise, ROSER VALENTI, Institut fur Theoretische Physik, Frankfurt — α-$RuCl_3$ has recently emerged as a promising candidate for realizing the hexagonal Kitaev model in a real material. Similar to the related iridates (e.g. Na_2IrO_3), complex magnetic interactions arise from a competition between various similar energy scales, including spin-orbit coupling (SOC), Hund's coupling, and crystal-field splitting. Due to this complexity, the correct spin Hamiltonians for such systems remain hotly debated. For α-$RuCl_3$, a combination of ab-initio calculations, microscopic considerations, and analysis of the static magnetic response have suggested off-diagonal couplings (Γ, Γ') and long-range interactions in addition to the expected Kitaev exchange (1,2). However, the effect of such additional terms on the dynamic response remains unclear.
In this contribution, we discuss the recently measured inelastic neutron scattering response in the context of realistic proposals for the microscopic spin Hamiltonian. We conclude that the observed scattering continuum, which has been taken as a signature of Kitaev spin liquid physics, likely persists over a broad range of parameters.
(1) S. M. Winter, et al, PRB 93, 214431 (2016).
(2) R. Yadav, et al, arXiv:1604.04755 (2016).
(3) A. Banerjee, et al, arXiv:1609.00103 (2016).

Stephen Winter
Institut fur Theoretische Physik, Frankfurt

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