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Spin-orbital excitations in d-transition metal ion compounds

Tuesday, October 19, 2021 4:30 PM (30 minutes)

We will discuss a framework for modeling and understanding the magnetic excitations in localized, intermediate coupling magnets where the interplay between spin-orbit coupling, magnetic exchange, and crystal-field effects create unconventional ground states. A spin-orbit exciton approach for modelling these excitations is developed based upon a Hamiltonian which explicitly incorporates single-ion crystalline electric field and spin-exchange. We will discuss the application of this to understand neutron spectroscopy data in a series of examples including CaFe2O4 [1], CoO [2], Ca2RuO4 [3], and VI3 [4]. We will further link neutron scattering data with other magnetic probes including x-ray spectroscopic measurements and susceptibility and discuss possible new types of excitations that can be measured and predicted. We will discuss the possible utility of modern neutron spectroscopy instrumentation for the identification and tuning of such excitations.

[1] H. Lane et al. Phys. Rev. B 104, 104404 (2021).
[2] P.M. Sarte et al. Phys. Rev. B 100, 075143 (2019).
[3] P.M. Sarte et al. Phys. Rev. B 102, 245119 (2020).
[4] H. Lane et al. Phys. Rev. B 104, L020411 (2021).

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