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Spin Dynamics: the Role of Disorder

The magnetic excitation spectrum in a material of interest is governed by the interactions between spins within the lattice. Muon spin relaxation, beta detected nuclear magnetic resonance and the complementary technique of inelastic neutron scattering, among others, yield unique knowledge of the dynamic response of the system. However, the nature of the excitation spectrum at low energies will at some level be complicated by extrinsic effects like disorder. Indeed, as an example, the presence or absence of a gap in the excitation spectrum of the spin liquid candidate material Herbertsmithite, based on a kagome lattice, became a contentious issue, possibly due to the presence of 5-15% interlayer spins. As a guide for the unwary, I discuss a literature search of the nature of disorder in a variety of magnetic materials and its impact on the observed inelastic neutron scattering spectrum and spin lattice relaxation rate observed using spin resonance techniques.

Email

dunsiger@triumf.ca

Funding Agency

Supervisors Name

Supervisors Email

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Primary author: DUNSIGER, Sarah (TRIUMF / Simon Fraser University)

Presenter: DUNSIGER, Sarah (TRIUMF / Simon Fraser University)

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