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Topological Materials Science Seminar (85)

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Neutron scattering signatures of pyrochlore spin liquids and nematic phases

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Place: Room273, Faculty of Engineering Bldg. #3, Higashiyama Campus, Nagoya Univ. (名大東山キャンパス工学部 3 号館 273 号室)
Date: Dec. 19 (Wednesday), 2018
Time: 10:30-12:00

Abstract:

Research on spin liquids has gradually evolved from the search of systems that do not order, to the quest of exotic quasi-particles and emergent gauge fields. But how to measure a gauge field in experiments ? Neutron scattering certainly offers a helpful microscopic probe, e.g. with Coulomb gauge fields famously identified by pinch points in spin ice materials. But there is no spin-liquid analog of a Bragg peak; the very diversity of spin liquids makes them both fascinating and evasive. In this talk, we will explore a broad range of pyrochlore physics with anisotropic exchange and further neighbour couplings, in order to explain the connection between several characteristic patterns of neutron scattering, their underlying Hamiltonian models and the strongly correlated magnetic phases they support. For example, “half-moon” patterns are a dispersive complement to the pinch points that have been observed in Tb2Ti2O7 and NaCaNi2F7, while in tensor spin liquids, the pinch points may evolve into lines or 4-fold singularities characteristic of higher-rank U(1) gauge fields. To conclude, we will discuss the nematic "hidden" order stabilised when the symmetry of the Heisenberg antiferromagnet is lowered by frustrating anisotropic exchange.

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