TT 15: Frustrated Magnets - General 2 (joint session TT/MA)

Time: Monday 15:00–16:00 Location: HSZ 304

TT 15.1 Mon 15:00 HSZ 304

Quantum domain wall induced incommensurate magnetic phase in frustrated Ising model — •Zheng Zhou[1], Zheng Yan[1,2], Dong-Xu Liu[3], Yan Chen[1,4], and Xue-Feng Zhang[5] — [1]Department of Physics and State Key Laboratory of Surface Physics, Fudan University, Shanghai 200438, China — [2]Department of Physics, The University of Hong Kong, Hong Kong, China — [3]Department of Physics, Chongqing University, Chongqing, 401331, China — [4]Collaborative Innovation Center of Advanced Microstructures, Nanjing 210093, China — [5]Department of Physics, and Center of Quantum Materials and Devices, Chongqing University, Chongqing, 401331, China

We study the AFM Ising model with transverse field h and NNN Ising interaction J' on triangular lattice, which describes the magnet $TmMgGaO_4$. Between the known clock and stripe phase at weak and moderate J', an incommensurate order may emerge due to the interplay between quantum fluctuation and geometrical frustration. In particular, the proliferation of quantum domain walls (DW) may stabilize such a novel phase. Numerical calculation of DW density and peaks of structure factor at certain positions provides evidence for this phase. Furthermore, we study its dynamical spectrum, which can be measured by neutron refraction. At a low h, we found a low-lying mode which agrees well with the behavior of DWs. At the h level of $TmMgGaO_4$, this mode merges with a high-lying mode corresponding to KT physics. We suggest that in materials with smaller splitting, distinct DW modes as strong evidence of this phase may be observed.

TT 15.2 Mon 15:15 HSZ 304

Non-Hermitian Topology of Spontaneous Magnon Decay — •Paul McClarty[1] and Jeff Rau[1,2] — [1]Max Planck Institute for the Physics of Complex Systems, Dresden, Germany — [2]University of Windsor, Ontario, Canada

I will briefly review recent progress on topological magnons placing particular emphasis on the effects of magnon-magnon interactions on the bulk and the boundary magnons. We show that the effects of interactions on single magnon states can often be recast in terms of an energy-independent non-Hermitian Hamiltonian. The spectral function has a characteristic anisotropy, in the vicinity of magnon touching points, arising from topologically protected exceptional points or lines in the non-Hermitian spectrum. This is, in principle, detectable using inelastic neutron scattering.

[1] P.A. McClarty and J. G. Rau, Phys. Rev. B 100, 100405(R) (2019)

TT 15.3 Mon 15:30 HSZ 304

Tuning the two-step melting of magnetic order in dipolar kagome ice by quantum fluctuations — Yao Wang[1,2], •Stephan Humeniuk[1], and Yuan Wan[1,2] — [1]Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China — [2]University of Chinese Academy of Sciences, Beijing 100049, China

Complex magnetic orders in frustrated magnets may exhibit rich melting processes when the magnet is heated toward the paramagnetic phase. We show that one may tune such melting processes by quantum fluctuations. We consider a kagome lattice dipolar Ising model subject to transverse field and focus on the thermal transitions out of its magnetic ground state, which features a $\sqrt{3} \times \sqrt{3}$ magnetic unit cell. Our quantum Monte Carlo simulations suggest that, at weak transverse field, the $\sqrt{3} \times \sqrt{3}$ magnetic order melts by way of an intervening, magnetically charge ordered phase where the lattice translation symmetry is restored whilst the time reversal symmetry remains broken. By contrast, at strong transverse field, quantum Monte Carlo simulations suggest the $\sqrt{3} \times \sqrt{3}$ order melts through a floating Kosterlitz-Thouless phase. The two distinct melting processes are likely separated by a multicritical point.

TT 15.4 Mon 15:45 HSZ 304

Nematic correlations in the coupled J1-J2 chains — •Clio Efthimia Agrapidis[1], Stefan-Ludwig Drechsler[2], and Satoshi Nishimoto[1,3] — [1]Faculty of Physics, University of Warsaw — [2]Institute for theoretical solid state physics, IFW Dresden — [3]Department of Physics, Technical University Dresden

It is known that the ferromagnetic frustrated J_1-J_2 chain is a good minimal model for several cuprate chain materials. Moreover, this model exhibits multipolar physics in magnetic field. Motivated by this, we study antiferromagnetically coupled J_1-J_2 chains: the interchain coupling J' is considered to vary from pure Ising to Heisenberg exchange by varying the XXZ anisotropy parameter Δ. In general, the interchain coupling can act as an effective magnetic field. When J' is Ising-like, the system exhibits a fully magnetised state for $J'/|J_1| > 1$. This magnetisation might be related to the existence of a nematic state. Remarkably, the system shows finite magnetisation also in the limit of Heisenberg interchain coupling.