

CONDENSED MATTER SEMINAR

Friday 8th of September at 2.15pm

“Chiral Spin Soliton Lattice with Phase Coherence in Chiral Magnetic Crystals”

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Nontrivial spin order with magnetic chirality emerges in a particular class of magnetic materials with structural chirality, frequently referred to as chiral magnetic materials. They exhibit many kinds of emergent physical properties through the coupling of chiral magnetic order with conduction electrons and electromagnetic fields. One promising candidate for achieving these couplings is a chiral spin soliton lattice. Various material functions characteristic to the chiral soliton lattice are discussed in the literatures [1, 2]. Furthermore, because of the universality of the concept of chirality, chiral magnetism has attracted attention in many research areas.

In this talk, I will present recent experimental observations mainly carried out on the monoaxial chiral magnetic crystal CrNb_3S_6 [3-6], together with the underlying theoretical backgrounds [2]. The experiments were performed by means of magnetic imaging using electron beams as well as transport, magnetization, and resonance measurements. The chiral soliton lattice appears under a magnetic field perpendicular to the helical axis and is very robust and stable with phase coherence on a macroscopic length scale. The tunable and topological nature of the chiral soliton lattice gives rise to nontrivial physical properties. Indeed, it is demonstrated that many physical responses such as the interlayer magnetoresistance and magnetic resonance frequency scales to the soliton density, which plays an essential role as the order parameter of the chiral soliton lattice formation, and becomes quantized with the reduction of the system size

These interesting features arise from macroscopic phase coherence unique to the chiral soliton lattice and will lead to the exploration of routes to a new paradigm for applications in spin electronics using spin phase coherence.

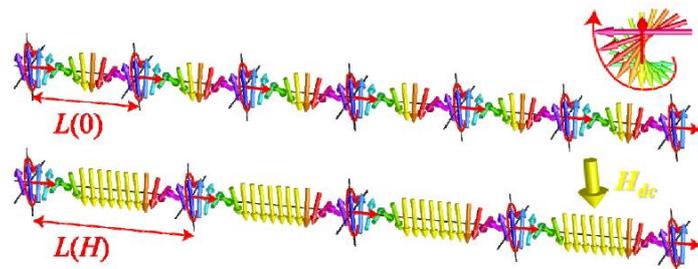


Figure. Schematics of chiral helimagnetic order and chiral soliton lattice.

Host: Prof Thorsten Hesjedal

Audrey Wood Seminar Room, Clarendon Laboratory