TT 81: Correlated Electrons: Chiral Magnets

Time: Friday 9:30–10:30 Location: HSZ 304

TT 81.1 Fri 9:30 HSZ 304

Stability of Skyrmion in Chiral Magnets — •Alfonso Chacon[1], Marco Halder[1], Jonas Kindervater[2], Andreas Bauer[1], Sebastian Mühlbauer[3], and Christian Pfleiderer[1] — [1]Technische Universität München, München, Germany — [2]John Hopkins University, Baltimore, USA — [3]Heinz Maier-Leibnitz Zentrum, Garching, Germany

The non-trivial topological winding of skyrmions in chiral magnets distinguishes them from conventional forms of magnetic order and micromagnetic textures. This topological protection of skyrmions promises a new route to advanced non-volatile high density data storage devices. We report a detailed study of the stability and the decay of skyrmion lattices in chiral magnets when prepared in a metastable state. We consider possible decay mechanisms and discuss the underlying energy scales associated with the topological protection.

TT 81.2 Fri 9:45 HSZ 304

Nanostructured MnSi - physical and electronic characterization — •David Schroeter[1], Nico Steinki[1], Alexander Fernández Scarioni[2], Hans Werner Schumacher[2], Stefan Süllow[1], and Dirk Menzel[1] — [1]Technische Universität Braunschweig, Institut für Physik der Kondensierten Materie, D-38106 Braunschweig, Germany — [2]Physikalisch Technische Bundesanstalt, D-38116 Braunschweig, Germany

Manganese silicide (MnSi), which crystallizes in the noncentrosymmetric cubic B20 structure, shows intriguing magnetic properties involving the existence of skyrmions in the magnetic phase diagram. Since MnSi as bulk crystal has been intensively investigated using a multitude of different experimental techniques, the magnetic and transport properties are well understood. In contrast, measurements of the electronic transport in MnSi thin films reported in literature show irregular and sample dependent results.

In this situation, we have set out to reinvestigate the (magneto)resistivity and Hall effect in MnSi thin films. We have carefully performed Hall and resistivity experiments on nanostructured MnSi thin films and have analyzed the electronic transport properties in Hall geometries of various size to determine the intrinsic behavior. We compare bulk, thin film and nanostructure data and discuss our results in consideration of the structural and morphologic characterization of the samples.

TT 81.3 Fri 10:00 HSZ 304

Mott physics of the frustrated triangular lattice Hubbard model with SU(3) fermions and fluxes — •Carolin Boos[1], Frédéric Mila[2], and Kai Schmidt[1] — [1]FAU Erlangen-Nürnberg, Deutschland — [2]EPF Lausanne, Schweiz

Ultra cold atoms allow to study fermions with SU(N)-symmetry on artificial lattices with fluxes. The theoretical description of such systems is given by the SU(N)-Hubbard model. In the strong-coupling limit the fermions exhibit a Mott phase, that can be described by effective spin models. Here we go beyond the leading-order Heisenberg model and use a linked-cluster expansion up to order five to derive effective models for the square and triangular lattice for general N and flux Φ.

In this work we investigate the Mott phase of the frustrated triangular lattice Hubbard model for $N = 3$ but general flux Φ by applying exact diagonalization on the effective spin model. To this end we exploit the full SU(3) symmetry allowing to treat periodic clusters up to 21 sites. Tuning the value of the flux Φ, we find a rich Mott phase including ordered and chiral phases.

TT 81.4 Fri 10:15 HSZ 304

Chiral Spin Liquids in Frustrated Quantum Magnetism — •Alexander Wietek — Universität Innsbruck

Topological states of matter are of of fundamental interest in contemporate condensed matter physics. The Fractional Quantum Hall effect is the main experimental system where this physics can be observed in a laboratory. The question remains whether also different systems might exhibit topological ordering. Candidate systems are certain frustrated quantum magnets. Chiral Spin Liquids are a lattice analogue of Fractional Quantum Hall Effect wave functions. These wavefunctions have been envisioned in 1987 but only very recently several simple local lattice models have been proposed realizing chiral spin liquid physics. In this talk I will introduce chiral spin liquids, discuss their relation to the Fractional Quantum Hall effect and present recent numerical studies that provide conclusive evidence for the emergence of this exotic state of matter in frustrated extended Heisenberg models.

[1] P. Nataf, M. Lajkó, A. Wietek, K. Penc, F. Mila, and A. M. Läuchli, Phys. Rev. Lett. 117 167202 (2016)

[2] A. Wietek, A. Sterdyniak, and A. M. Läuchli, Phys. Rev. B 92 125122 (2015)

[3] A. Wietek and A. M. Läuchli, arXiv:1604.07829 [cond-mat]