TT 70: Correlated Electrons: Spin Systems and Itinerant Magnets – Chiral Magnets (jointly with MA)

Time: Wednesday 18:00–19:15 Location: H 3005

TT 70.1 Wed 18:00 H 3005

Gracing incidence small angle neutron scattering of incommensurate magnetic structures in MnSi thin films — Birgit Wiedemann[1], Shilei Zhang[2], Yury Khaydukov[3,4], Thorsten Hesjedal[2], Olaf Soltwedel[3,4], Thomas Keller[3,4], Sebastian Mühlbauer[5], •Alfonso Chacon[1,5], Christian Pfleiderer[1], and Peter Böni[1] — [1]Physik Department, Technische Universität München, Germany — [2]Clarendon Laboratory, Department of Physics, University of Oxford, UK — [3]Max-Planck-Institut für Festkörperforschung, Germany — [4]Max Planck Society, Outstation at FRM-II, Germany — [5]Forschungsneutronenquelle Heinz Maier Leibnitz, Technische Universität München, Germany

The topological stability of skyrmions in bulk samples of MnSi and the observation of spin transfer torque effects at ultra-low current densities have generated great interest in skyrmions in chiral magnets as a new route towards next generation spintronics devices. Yet, the formation of skyrmions in MBE grown thin films of MnSi reported in the literature is highly controversial. We report gracing incidence small angle neutron scattering (GISANS) of the magnetic order in selected thin films of MnSi grown by state of the art MBE techniques. In combination with polarised neutron reflectometry (PNR) and magnetisation measurements of the same samples our data provide direct reciprocal space information of the incommensurate magnetic order, clarifying the nature of magnetic phase diagram.

TT 70.2 Wed 18:15 H 3005

Neutron spin-echo spectroscopy of spin fluctuations in the skyrmion lattice phase of MnSi — •Franz Haslbeck[1], Jonas Kindervater[1], Andreas Bauer[1], Wolfgang Häussler[1,2], Peter Böni[1], and Christian Pfleiderer[1] — [1]Physik-Department, Technische Universität München, Germany — [2]Heinz Maier-Leibnitz Zentrum, Technische Universität München, Germany

Recent theoretical studies suggest that the skyrmion lattice phase in chiral magnets such as MnSi is stabilised by thermal spin fluctuations [1,2]. We report an experimental study of the quasielastic spectrum of spin fluctuations in the skyrmion lattice phase of MnSi. Using the so called MIEZE spin-echo technique at the spectrometer RESEDA at FRM II we achieved an unprecedented resolution below 1 μeV going well beyond a first preliminary study [3]. Applying a magnetic field parallel and perpendicular to the neutron beam allowed us to study the fluctuations in and out of plane of the skyrmion lattice.

[1] S. Mühlbauer *et al.*, Science **323**, 915 (2009).
[2] S. Buhrandt, L. Fritz, Phys. Rev. B **88**, 195137 (2013).
[3] R. Georgii *et al.*, Appl. Phys. Lett. **98**, 073505 (2011).

TT 70.3 Wed 18:30 H 3005

NMR-on site-probe of field-modulated and Skyrmion states in chiral magnets: FeGe and Cu_2OSeO_3 — •Michael Baenitz, Mayukh Majumder, Panchanan Khuntia, Hiroshi Yasuoka, and Markus Schmidt — MPI for the Chemical Physics of Solids, 01187 Dresden, Germany

Cubic FeGe is a prototype B20 chiral magnet (with $T_c = 280$K) which allows to study chiral excitations directly "on-site" via the ^{57}Fe nucleus because of its S=1/2 nuclear spin. NMR provides the local susceptibility (hyperfine field), the dynamic susceptibility (spin lattice relaxation rate SLRR = $1/T_1$) and the spin-spin interaction (spin-spin relaxation rate SSRR = $1/T_2$). Measurements were performed on crushed single crystals of ^{57}Fe enriched FeGe material between 2-300 K in zero and applied magnetic fields. Helical- conical- and field-polarized- states could be clearly identified from NMR and critical dynamics at these transitions are investigated. The field dependence of H_{hf}, SLRR and SSRR was studied in great detail at various temperatures below T_c. Especially an evidence of the Skyrmion -A- phase formation is given by NMR. Cubic Cu_2OSeO_3 is an oxide with a ferrimagnetic transition at about 60 K. Its magnetic phase diagram - including the Skyrmion phase - is very similar to FeGe. We present first ^{63,65}Cu NMR results on single crystals at zero field and in modulation fields.

TT 70.4 Wed 18:45 H 3005

Spin chirality flip in $Fe_{1-x}Co_xSi$ — •Sven-Arne Siegfried[1], Evgeny.V. Altenbayev[2,3], Nadezhda M. Chubova[2,3], Vadim Dyadkin[4,2], Dirk Menzel[5], Charles D. Dewhurst[6], André Heinemann[1], Dimitry Chernyshov[4], Ravil A. Sadykov[7,8], Sergey N. Axenov[7], Ludmila N. Formicheva[8], Anatoly V. Tsvyashchenko[8], Andreas Schreyer[1], and Sergey V. Grigoriev[2,3] — [1]Helmholtz-Zentrum Geesthacht, Germany. — [2]Petersburg Nuclear Physics Institute, Russia. — [3]Saint- Petersburg State University, Russia. — [4]SwissNorwegian Beamlines at ESRF, France. — [5]TU Braunschweig, Braunschweig, Germany. — [6]Institute Laue-Langevin, France. — [7]Institute for Nuclear Research, Russia. — [8]Institute for High Pressure Physics,Russia.

Recently the experimental evidence was given for the flip of the spin helix chirality in the two Fe-based germanide compounds $Mn_{1-x}Fe_xGe$ [1] and $Fe_{1-x}Co_xGe$ [2]. In this talk we report the similar effect for the Fe-based silicide $Fe_{1-x}Co_xSi$ at a critical concentration x_c. We have synthesized single-crystalline $Fe_{1-x}Co_xSi$ compounds with x running from 0.5 to 0.7 via Czochralski-method. SQUID magnetization measurements have shown the magnetic ordering of all these samples below T_c. At the critical concentration $x_c \approx 0.65$ we observed a transformation of the helical structure to a ferromagnetic one ($|\mathbf{k}_s| \to 0$). Polarized small-angle neutron scattering revealed the different sign of the spin helicity for compounds with $x > x_c$ and $x < x_c$.

[1] S.V. Grigoriev et al.,PRL. 110, 207201 (2013).
[2] S.V. Grigoriev et al.,PRB 90, 174414 (2014).

TT 70.5 Wed 19:00 H 3005

$BaMn_9[VO_4]_6(OH)_2$, a novel candidate for the observation of a Skyrmion lattice — •Angela Möller[1], Kewen Sun[1], Vladimir Gnezdilov[2,3], and Peter Lemmens[3] — [1]Department of Chemistry and TcSUH, University of Houston, United States — [2]ILTPE NAS, Kharkov, Ukraine — [3]IPKM, TU-BS, Braunschweig, Germany

The search for topologically stable vortex-like objects (Skyrmions) in insulating chiral magnets lead to their discovery in Cu_2OSeO_3 [1]. We will show that the combination of certain structural features, such as chirality and frustration might expedite the finding of new candidates of this rare class. A chiral paddle-wheel type of structure featuring geometric frustration has been reported for the metrically cubic title compound with ferrimagnetic, Tc=18 K, and dielectric anomalies [2]. Interestingly, Raman scattering shows magnetoelastic coupling of several phonons but no spontaneous symmetry reduction. This is considered a prerequisite for the existence of a Skyrmion lattice.

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[1] Seki et al., Science 336, 198 (2012);
T. Adams et al., PRL 108, 237204 (2012).
[2] K. Sun et al., Inorg. Chem. dx.doi.org/10.1021/ic502266k.