MA 12 Kondo / Heavy Fermions

Time: Monday 16:30–17:45 Room: HSZ 403

MA 12.1 Mon 16:30 HSZ 403

Magnetic ground state of the frustrated one dimensional binary compound $CuCl_2$ — •MICHAEL BANKS[1], REINHARD K KREMER[1], and BACHIR OULADDIAF[2] — [1]MPI-FKF, 70569 Stuttgart — [2]ILL Grenoble, CEDEX 9

Historically, the binary $CuCl_2$ and the structurally similar $CuBr_2$ are among the very first systems the magnetic properties of which were analyzed in terms of a linear spin chain arrangements. Low-dimensional magnetism with typical signatures, e.g. a broad short-range ordering maxima in the susceptibility and heat capacity, have been found. The antiferromagnetic (afm) intra-chain exchange parameters are significant (e.g. ≈320K for $CuBr_2$). However, both systems are far from representing ideal one-dimensional magnets as must be concluded from the rather high transition temperatures to long-range ordering (e.g. 24 K for $CuCl_2$) indicating appreciable inter-chain coupling. To the best of our knowledge, the magnetic structures of $CuCl_2$ and $CuBr_2$ remain unsolved until now. We studied the afm ordering of $CuCl_2$ and $CuBr_2$ in detail by neutron powder diffraction using ILL's high flux powder diffractometer D20 in its high resolution option. Using single crystals of $CuCl_2$, we used the 4-circle diffractometer D10 also at the ILL to conclusively solve the magnetic structure. The magnetic structure of $CuCl_2$ will be presented as showing helicoidal ordering along the chain direction with an incommensurate propagation vector $\tau = [0.5,0.224,0]$. The magnetic phase diagram will be presented showing a spin-flop phase along the chain direction at $H_{SF} \approx 4T$.

MA 12.2 Mon 16:45 HSZ 403

High-resolution Fermi-Edge and energy dependent photoemission spectra of $Fe_{1-x}Co_xSi$ — •D. ZUR[1], I. JURSIC[1], D. MENZEL[1], L. PATTHEY[2], and J. SCHOENES[1] — [1]Institut für Physik der Kondensierten Materie, TU Braunschweig, Germany — [2]Swiss Light Source, Paul Scherrer Institut, Villigen, Switzerland

The interest on FeSi is renewed because of similarities with some rare-earth compounds known as Kondo insulators. In spite of several photoemission investigations, the size of the gap is still not clear. In addition, the influence on the electronic structure by doping with a 3d transition metal is interesting due to the changes in electronic and magnetic properties. We present high resolution photoemission spectra at 11 K of the Fermi edge of $Fe_{1-x}Co_xSi$ crystals with 0, 5 and 20 at.% Co, using synchrotron radiation at the SLS. Photon energies of 21.2 eV and 40.8 eV have been used. A gap of about 80 meV has been found, which is consistent with some theoretical predictions. This gap closes with increasing Co concentrations. Furthermore, changes in the electronic structure owing to different Co concentrations have been studied with angle- and photoenergy-resolved photoemission.

MA 12.3 Mon 17:00 HSZ 403

Field-induced parity breaking in isotropic frustrated spin chains — •OLEKSIY KOLEZHUK[1,2] and TEMO VEKUA[3] — [1]Physics Dept.., Harvard University, Cambridge MA 02138, USA — [2]Inst. f. Theor. Physik, Univ. Hannover, 30167 Hannover, Germany — [3]Univ. Louis Pasteur, Lab. de Physique Theorique, 67084 Strasbourg Cedex, France

It is argued that an external magnetic field applied to an isotropic zigzag spin chain with an arbitrary spin S and antiferromagnetic nearest-neighbor and next-nearest-neighbor exchange couplings J_1 and J_2 induces a quantum phase transition into a phase with spontaneously broken parity, characterized by long-range ordering of vector chirality. To show that, we use a bosonization approach for $S = 1/2$ and $S = 1$, valid in the limit of a weak zigzag interaction $J_1/J_2 \ll 1$, as well as an effective large-S theory applicable in the vicinity of the saturation field. Relevance to real materials and the possibility of experimental observation of chiral phases are discussed.

MA 12.4 Mon 17:15 HSZ 403

Thermodynamic properties of the magnetic layered compound $BaNi_2V_2O_8$ — •WILLIAM KNAFO[1,2], STEPHANIE DROBNIK[1,2], KAI GRUBE[1], HILBERT VON LÖHNEYSEN[1,2], CHRISTOPH MEINGAST[1], PAUL POPOVICH[1], PETER SCHWEISS[1], and THOMAS WOLF[1] — [1]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, D-76021 Karlsruhe, Germany. — [2]Physikalisches Institut, Universität Karlsruhe, D-76128 Karlsruhe, Germany.

$BaNi_2V_2O_8$ is a quasi two-dimensional magnetic system which consists of a planar honeycomb arrangement of spin-1 ions of Ni^{2+}. Although a small inter-plane interaction leads to three-dimensional magnetic order below $T_N = 47$ K, this system has been recently proposed as a candidate for a two-dimensional XY magnetic model where a Kosterlitz-Thouless transition should occur [1]. To test this scenario, we have grown large single crystals of $BaNi_2V_2O_8$ and have investigated their thermodynamic properties. We present here specific heat, thermal expansion, magnetostriction, and magnetization measurements, which were carried out for temperatures T between 3 and 300 K and magnetic fields $\mathbf{H}$ up to 14 T. The main features of the resulting $(\mathbf{H},\mathbf{T})$ phase diagram are (i) an increase of T_N when the field is applied in the plane and (ii) a cross-over to a "spin-flop"phase below T_N for fields higher than $\mathbf{H_{SF}} \approx 1.4$ T. The anisotropy of the magnetic moments and the dimensionality of their interactions will be considered carefully to discuss if a two dimensional XY model is relevant or not for this system.

[1] N. Rogado et al., Phys. Rev. B **65**, 144443 (2002).

MA 12.5 Mon 17:30 HSZ 403

Bose glass vs. Mott glass in site-diluted S=1 Heisenberg antiferromagnets — •TOMMASO ROSCILDE[1,2] and STEPHAN HAAS[2] — [1]Max-Planck-Institut fuer Quantenoptik, Garching (Germany) — [2]University of Southern California, Los Angeles

Making use of large-scale quantum Monte Carlo simulations, we investigate the ground-state phase diagram of the square-lattice S=1 Heisenberg antiferromagnet with strong single-ion anisotropy and in presence of site dilution of the magnetic lattice. Mapping the spins onto Holstein-Primakoff bosons, the single-ion anisotropy is seen to play the role of a repulsive on-site potential for the bosons. The clean limit of the model shows an anisotropy-driven quantum phase transition from an XY ordered (superfluid) phase to a quantum disordered (Mott insulating) phase. A similar transition is also driven by the application of a uniform field on the disordered state. Adding site dilution to the model, the non-trivial interplay between quantum fluctuations and lattice randomness gives rise to a novel quantum-disordered *Mott glass* phase in zero field, with a gapless spectrum and yet a vanishing uniform susceptibility. Upon applying a field, such phase is turned into a *Bose glass*, with gapless spectrum and finite susceptibility. The above picture is directly relevant for experiments on doped quasi-low-dimensional Ni compounds, as the recently investigated $NiCl_2$-$4SC(NH_2)_2$ (V.S. Zapf et al., cond-mat/0505562).