tance measurements on $x = 3,7\%$ Co and $x = 6\%$ Ir doped single crystals. The data are compared with that of the undoped system. Although the ordering temperature is observed to change as expected we find the features associated with $T^\star$ to be robust upon doping.

TT 19.9 Tue 16:15 H 3010

Thermal expansion and magnetostriction measurements on a $CeCu_{5.85}Au_{0.15}$ single crystal — •Stefanie Drobnik[1,2], Kai Grube[1], Roland Schäfer[1], Frédéric Hardy[1], Christoph Meingast[1], Oliver Stockert[3], and Hilbert von Löhneysen[1,2] — [1]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, 76021 Karlsruhe, Germany — [2]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe, Germany — [3]MPI für chemische Physik fester Stoffe, 01187 Dresdenm, Germany

A well-studied magnetic quantum critical point (QCP) exists at the onset of antiferromagnetic order in the heavy-fermion system $CeCu_{6-x}Au_x$ with a critical gold concentration of $x_c \approx 0.1$. Due to the instability at the QCP the entropy S shows at finite temperatures a maximum as a function of x, volume, or pressure p. The maximum leads to a sign change of the thermal expansion coefficient, $\alpha = -(1/V)(\partial S/\partial p)$, and of the Grüneisen parameter Γ, the ratio of α and specific heat. This feature and the divergence of Γ at $T \to 0$ are important thermodynamic probes to detect and classify QCPs. We report low-temperature thermal expansion and magnetostriction measurements on a $CeCu_{5.85}Au_{0.15}$ single crystal with a Néel temperature of $T_N \approx 90$ mK. The thermal expansion was measured along all orthorhombic axes in a temperature range of $30\,\text{mK} < T < 10\,\text{K}$ in magnetic fields parallel to the c axis of up to 3 T. The results are compared with theoretical predictions and measurements on other heavy-fermion compounds close to a QCP.

TT 19.10 Tue 16:30 H 3010

Breakdown of a valence bond solid in a Heisenberg model with four-spin interaction on honeycomb layers — •Thomas C. Lang[1,2], Anders W. Sandvik[2], and Fakher F. Assaad[1] — [1]Institut für Theoretische Physik und Astrophysik, Universität Würzburg, D-97074 Würzburg, Germany — [2]Department of Physics, Boston University, Boston, MA 02115, USA

We investigate the scenario of the breakdown of a valence bond solid (VBS) in an $S = 1/2$ quantum antiferromagnet with non-frustrating four-spin interaction on the single and bilayer hexagonal lattice. By means of quantum Monte Carlo in the valence bond basis we find a strong first-order VBS-Néel phase transition in the single layer. In the bilayer the Néel regime separates the VBS and a disordered (zero tilted) phase by a continuous quantum phase transition. A quantum critical point marking a direct VBS-VBS or VBS-disorder transition is absent. This behavior is attributed to the lattice symmetry which allows rigid valence bond configurations to survive while spin-fluctuations are enhanced.

15 min. break

TT 19.11 Tue 17:00 H 3010

Quantum Critical Spin Dynamics of a Cu(II) S=1/2 antiferromagnetic Heisenberg chain studied by ^{13}C-NMR spectroscopy — •H. Kühne[1], H.-H. Klauss[1], J. Litterst[2], S. Grossjohann[3], W. Brenig[3], A.P. Reyes[4], P.L. Kuhns[4], C.P. Landee[5], M.M. Turnbull[5], H.-J. Grafe[6], B. Büchner[6], and J. Haase[6] — [1]Institut für Festkörperphysik, TU Dresden — [2]Institut für Physik der Kondensierten Materie, TU Braunschweig — [3]Institut für Theoretische Physik, TU Braunschweig — [4]NHMFL, FSU, Tallahassee, USA — [5]DPC, Clark University, Worcester, USA — [6]Leibniz-Institut für Werkstoffforschung, Dresden

The antiferromagnetic S=1/2 Heisenberg chain (S=1/2 AFHC) is a model system for quantum many-body physics. It allows a direct comparison between exact theoretical results and experiment for ground state properties and excitations. $Cu(C_4H_4N_2)(NO_3)_2$ (CuPzN) is a very good experimental realization of the unperturbed S=1/2 AFHC [1,2]. In this compound we study the low energy spin dynamics by means of NMR. We measured the nuclear spin-lattice relaxation rate T_1^{-1} of ^{13}C as a function of temperature in a wide external magnetic field range from 2T to 28T, with an emphasis on the vicinity of the quantum critical point (QCP) at 14T. The experimental data are in good agreement with Quantum Monte Carlo calculations and clearly show critical behavior at low temperatures, i.e. a divergence of T_1^{-1} at 14T and the linear opening of an energy gap for magnetic excitations with higher external fields. [1] P. Hammar et al., PRB. 59, 1008 (1999). [2] M.B. Stone et al., PRL 91, 037205 (2003).

TT 19.12 Tue 17:15 H 3010

Quantum Critical Dynamics of the S=1/2 AFM Heisenberg Chain in Finite Magnetic Fields: a QMC Study — •Simon Grossjohann[1], Wolfram Brenig[1], Hannes Kühne[2], and Hans-Henning Klauss[2] — [1]Institut für Theoretische Physik, TU Braunschweig — [2]Institut für Festkörperphysik, TU Dresden

We investigate the field driven quantum critical dynamics of the antiferromagnetic S=1/2 Heisenberg chain using Quantum Monte-Carlo techniques (SSE) and analytic continuation by Maximum Entropy methods. Results for the transverse and longitudinal dynamical structure factor $S_{\alpha\beta}(q,\omega)$ will be presented for different temperatures T, with $0.1 \leq T/J \leq 1$ and various magnetic fields below and above saturation field h_c. In the vicinity of h_c, condensation of the elementary excitations of the fully polarized phase induce a diverging longitudinal NMR relaxation rate $1/T_1$. Such quantum critical slowing down has been observed in recent experiments on $Cu(C_4H_4N_2)(NO_3)_2$ and agrees very well with our theoretical findings. In addition our spectra will be shown to be consistent with sum rules for the static structure factor and static susceptibility.

TT 19.13 Tue 17:30 H 3010

Dynamical Scaling Properties of a Doped Quantum Heisenberg Antiferromagnet in Two Dimensions — •Marcello Silva Neto, Juergen Falb, and Alejandro Muramatsu — Institut für Theoretische Physik III, Pfaffenwaldring 57, 70550, Stuttgart, Germany

We study the dynamical scaling properties of an effective quantum field theory for the magnetic degrees of freedom of the $t-t'-t''-J$ model, which is believed to be the relevant model for the physics of cuprate superconductors. We find that, at the lowest doping, where the Fermi surface for the doped holes is composed of very small hole pockets at special points in the magnetic Brillouin zone, damping due to the scattering of magnons from particle-hole excitations is *absent* and the dynamical critical exponent is $z = 1$. As doping increases, however, a nonzero damping term is present. In this case, we find that: i) for the case of Landau damping (clean limit), such term does not modify the dynamical exponent which remains at $z = 1$ for a large portion of the phase diagram, in agreement with experiments; ii) for the case of diffusive damping (dirty limit), such term changes the dynamical exponent from $z = 1$ to $1 < z \leq 2$, and for even larger doping a crossover to a Fermi liquid regime is expected. We compare our findings to previous discussions available in the literature and we discuss the relevance of our results to the physics of high-Tc superconductors.

TT 19.14 Tue 17:45 H 3010

Critical Properties of an Effective Field Theory for 2D Doped Antiferromagnets — •Juergen Falb, Marcello Silva Neto, and Alejandro Muramatsu — Institut für Theoretische Physik, Universität Stuttgart, Pfaffenwaldring 57, 70550, Stuttgart, Deutschland

Starting from the $t - t' - t'' - J$ model for high-Tc cuprate superconductors we derive an anisotropic and gauge massive CP^1 effective field theory that describes the low energy magnetic properties at low doping, establishing a link between doped antiferromagnets on a bipartite lattice and frustrated quantum antiferromagnets [1]. We first discuss the generation of mass for the gauge field introduced by doping, and comment on the possible incommensurate phases associated to it. The massive gauge field opens the possibility of deconfined spinons in the symmetric phase. We find a region of stability for the microscopic parameters J, t' and t'' where the theory is valid. Through a renormalization group study of the theory in weak coupling we obtain its phase diagram. The connection between our results and previous works on the literature are also discussed.

[1] J. Falb and A. Muramatsu, arXiv:0705.1918, accepted for publication in Nucl. Phys. B.

TT 19.15 Tue 18:00 H 3010

Probing field-induced quantum criticality in molecule-based low-dimensional spin systems — •Bernd Wolf[1], Yeekin Tsui[1], Ulrich Tutsch[1], Katarina Removic-Langer[1], Andrej Prokofiev[1], Wolf Assmus[1], Roser Valenti[2], Stefan Wessel[3], Andreas Honecker[4], Matthias Wagner[5], and Michael Lang[1] — [1]Physikalisches Institut, JWG-Universität Frankfurt; SFB/TRR49 — [2]Institut für Theoretische Physik, JWG-Universität Frankfurt; SFB/TRR49 — [3]Institut für Theoretische Physik, Univer-