both anomalies are completely suppressed and superconductivity is observed. Remarkably, the temperature dependence of the normal state susceptibility well above T_C is almost independent of doping, i.e. both the absolute value and the slope are nearly unchanged compared to the undoped case [1]. This implies at least local antiferromagnetic interactions which barely depend on hole doping although the ground state changes entirely from an orthorhombic antiferromagnetic poor metal ($x \leq 0.04$) to a tetragonal superconductor ($x \geq 0.05$). These surprising results are discussed in terms of (i) - pseudogap formation, (ii) - antiferromagnetic correlations, and (iii) - preformed bipolarons which might be relevant to the pairing mechanism.

[1] R. Klingeler et al., Preprint at http://arxiv.org/abs/0808.0708

TT 40.2 Thu 14:15 HSZ 03

Electronic phase diagram of the $LaO_{1-x}F_xFeAs$ superconductor: A muon spin relaxation study — •H. Luetkens[1], H.-H. Klauss[2], F.J. Litterst[3], T. Dellmann[3], R. Klingeler[4], C. Hess[4], R. Khasanov[1], A. Amato[1], C. Baines[1], M. Kosmala[5], O.J. Schumann[5], M. Braden[5], J. Hamann-Borrero[4], N. Leps[4], A. Kondrat[4], G. Behr[4], J. Werner[4], M. Kraken[3], and B. Büchner[4] — [1]Laboratory for Muon-Spin Spectroscopy, Paul Scherrer Institut, Villigen, Switzerland — [2]Institut für Festkörperphysik, TU Dresden — [3]Institut für Physik der Kondensierten Materie, TU Braunschweig — [4]Leibniz-Institut für Festkörper- und Werkstoffforschung (IFW) Dresden — [5]II. Physikalisches Institut, U Köln

The structural and electronic phase diagram of $LaO_{1-x}F_xFeAs$ and, in particular, the exact nature of the change from the magnetically ordered to the superconducting state that was determined by means of x-ray scattering, muSR and Mössbauer spectroscopy will be presented [1-3]. A discontinuous first-order-like change of the Néel temperature, the superconducting transition temperature, the sublattice magnetisation and the superfluid density is found between x=0.04 and x=0.05. While these results strongly question the relevance of quantum critical behaviour in iron pnictides they prove an important role of the structural orthorhombic distortion disappearing exactly at the SDW magnetism and superconductivity phase boundary.

[1] H. Luetkens et al., Phys. Rev. Lett. 101, 097009 (2008).
[2] H.-H. Klauss et al., Phys. Rev. Lett. 101, 077005 (2008).
[3] H. Luetkens et al., arXiv:0806.3533 (2008).

TT 40.3 Thu 14:30 HSZ 03

Functional renormalization group study of the iron pnictides — •Christian Platt, Carsten Honerkamp, and Werner Hanke — Institute for Theoretical Physics and Astrophysics, University of Würzburg, Am Hubland, 97074 Würzburg, Germany

Recently, a new class of superconductors (sc) - Fe-based sc - was discovered. These sc iron pnictides are most likely less correlated than the high-T_c cuprates but present again a challenging case of competing magnetic and superconducting orders at low temperatures. Therefore, perturbative functional renormalization group (fRG) methods appear adequate for the theoretical modelling of the phase diagram. Here, we apply the fRG to a four-band (Fe-d-orbital) model including intra- and interband couplings as well as interband pair hoppings. We compute the leading instabilities, i.e. spin-ordered phase in the "underdoped"situation and the leading pairing instability as a function of the electron density and interaction parameters.

TT 40.4 Thu 14:45 HSZ 03

Thermodynamic study of the Co-doped Ba-122 iron pnictide — •Frédéric Hardy[1], Christoph Meingast[1], Thomas Wolf[1], Rolf Heid[1], Peter Adelmann[1], Peter Schweiss[1], Doris Ernst[1], and Hilbert v. Löhneysen[1,2] — [1]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, 76021 Karlsruhe, Germany — [2]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe, Germany

Since the discovery of the new high-T_c iron pnictides, many scenarios were put forward to describe the symmetry of the order parameter including d-wave and unconventional s-wave. Early heat capacity measurements suggested that the electron-doped 1111 compounds show a nodal gap, while K-hole-doped 122 materials are fully gapped. Here we present a critical analysis of our own specific-heat data on Co-doped 122 single crystals, in which we pay particular attention to the details of the phonon background subtraction as well as to the contribution of impurity phases. We also discuss an interesting field-dependence of the thermal expansivity below T_c(H).

TT 40.5 Thu 15:00 HSZ 03

Strong coupling of superconductivity to c/a in $Ba(Fe,Co)_2As_2$ — •Christoph Meingast[1], Frederic Hardy[1], Peter Adelmann[1], Peter Schweiss[1], Doris Ernst[1], Hilbert v. Löhneysen[1,2], and Thomas Wolf[1] — [1]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, — [2]Physikalisches Institut, Universität Karlsruhe, D-76128 Karlsruhe, Germany.

Just as in the cuprates, magnetism and superconductivity occur in close proximity to each other in the newly discovered FeAs-based materials. Here, using high-resolution thermal expansion and specific heat measurements, we study the thermodynamic response of the lattice parameters to superconducting and magnetic order in $Ba(Fe,Co)_2As_2$ single crystals. We show that there is a strong coupling of the c/a ratio to both the superconducting and magnetic/structural phase transitions. According to the Ehrenfest relationship, the ordering temperatures of both ordered states are expected to increase with increasing c/a. This suggests that the occurrence of superconductivity is strongly linked to the magnetic/structural transition.

TT 40.6 Thu 15:15 HSZ 03

Electronic phase separation in the slightly underdoped iron pnictide superconductor $Ba_{1-x}K_xFe_2As_2$ — •Ji Tae Park[1], D. S. Inosov[1], Ch. Niedermayer[2], G. L. Sun[1], D. Haug[1], N. B. Christensen[2], R Dinnebier[1], A. V. Boris[1], A. J. Drew[3], L. Schulz[3], T. Shapoval[4], U. Wolff[4], V. Neu[4], X. Yang[1], C. T. Lin[1], B. Keimer[1], and V. Hinkov[1] — [1]Max-Planck-Institut für Festkörperforschung, Heisenbergstraße 1, Stuttgart, Germany — [2]ETHZ & PSI, Villigen PSI, Switzerland — [3]Department of Physics, University of Fribourg, Chemin du Musée 3, Fribourg, Switzerland — [4]IFW Dresden, Institute for Metallic Materials, P.O. Box 270116, D-01171 Dresden, Germany

We performed a combined study of the slightly underdoped novel iron pnictide superconductor $Ba_{1-x}K_xFe_2As_2$ by means of X-ray powder diffraction, neutron scattering, muon spin rotation (μSR), and magnetic force microscopy (MFM). Commensurate static magnetic order sets in below $T_m \sim 70$ K as inferred from the emergence of the magnetic (1 0 3) reflection in the neutron scattering data and from the observation of damped oscillations in the zero-field-μSR asymmetry. Transverse-field μSR below T_c shows a coexistence of magnetically ordered and non-magnetic states, which is also confirmed by MFM imaging. This coexistence could be explained by electronic phase separation into antiferromagnetic and superconducting/normal state regions on a scale of several tens of nanometers indicating that such mesoscopic phase separation can be considered an intrinsic property of some iron pnictide superconductors.

15 min. break

TT 40.7 Thu 15:45 HSZ 03

The intrinsic electronic phase diagram of iron-pnictide superconductors — •C. Hess, A. Kondrat, A. Narduzzo, J. E. Hamann-Borrero, R. Klingeler, H. Grafe, G. Lang, F. Hammerath, D. Paar, A. Alfonsov, V. Kataev, J. Werner, G. Behr, and B. Büchner — Leibniz-Institute for Solid State and Materials Research, IFW Dresden, 01171 Dresden, Germany

We present a detailed study of the intrinsic electronic phase diagram of the oxypnictide superconductors in the normal state based on the analysis of the electrical resistivity ρ of both $LaO_{1-x}F_xFeAs$ and $SmO_{1-x}F_xFeAs$ for a wide range of doping. Our data give clear-cut evidence for unusual normal state properties in these new materials. As a function of doping ρ of $LaO_{1-x}F_xFeAs$ shows a clear transition from pseudogap to Fermi liquid-like behavior, mimicking the phase diagram of the cuprates. Moreover, our data reveal a correlation between the strength of the pseudogap signatures and the stability of the superconducting phase. The pseudogap signatures, which are clearly connected with the structural and magnetic transitions of the parent material, become stronger in $SmO_{1-x}F_xFeAs$ where superconductivity is enhanced and vanish when superconductivity is reduced in the doping region with Fermi liquid-like behavior [1]. We further present evidence for the connection between the pseudogap signatures in electrical transport and the slowing-down of spin fluctuation.

[1] C. Hess et al., Preprint at http://arxiv.org/abs/0811.1601

TT 40.8 Thu 16:00 HSZ 03

Magnetic properties of $LaO_{1-x}F_xFeAs$ — •Sangeeta Sharma[1,2], John Kay Dewhurst[1,2], Sam Shallcross[3], Christophe Bersier[1,2], Francesco Cricchio[4], Antonio Sanna[2,5], Sandro