TT 53: Poster Session: Superconductivity 1

Time: Wednesday 15:00–19:00 Location: P2-OG2

TT 53.1 Wed 15:00 P2-OG2

Disorder-driven insulating transition in few-layer $NbSe_2$ crystals. — •Nicola Paradiso, Andreas Eller, Tobias Scharff, Sofia Blanter, and Christoph Strunk — Institut für Experimentelle und Angewandte Physik, University of Regensburg

We investigate the impact of disorder on the transport characteristics of few-layer thick crystals of $NbSe_2$. This type II superconducting material is an interesting playground for the study of superconductivity in two dimensions. Recent experiments have demonstrated that in the low-disorder regime superconductivity can be observed even in the single-layer limit. Our measurements go in the opposite direction: we show that in the regime of high disorder a sharp resistance upturn is observed at low temperature. The insulating transition temperature is close to the critical temperature for the superconducting transition of clean $NbSe_2$ crystals. Our results indicate that single crystals behave in a similar way as metal films.

TT 53.2 Wed 15:00 P2-OG2

Superconducting properties of $[(\mathbf{SnSe})_{1+\delta}]_m[\mathbf{NbSe_2}]_1$ ferecrystals — •Martina Trahms[1], Corinna Grosse[1], Olivio Chiatti[1], Kyle Hite[2], Matti B. Alemayehu[2], Dave J. Johnson[2], and Saskia F. Fischer[1] — [1]Novel Materials Group, Humboldt-Universität zu Berlin, 12489 Berlin, Germany — [2]Department of Chemistry and Material Science Institute, University of Oregon, Eugene, Oregon 97403, United States

Recently much attention has been paid to the electrical properties of monolayers of the superconducting transition metal dichalcogenide $NbSe_2$ and especially on the influence of the dimensional cross-over. Because thin films are very sensitive to external influences, buried superconducting layers such as ferecrystals are of great interest. Ferecrystals are turbostratically disordered layered systems in which the involved materials are alternately stacked in a repeated sequence. This experimental work investigates the Ginzburg-Landau coherence length of $[(SnSe)_{1+\delta}]_m[NbSe_2]_1$ ferecrystals. In particular, whether two dimensional superconductivity can be established in these systems. By changing the SnSe content between 1 and 6 bilayers of SnSe, the distance of the superconducting $NbSe_2$ monolayers was increased, resulting in repeat unit distances between 1.25 nm and 4.14 nm. The coupling of the $NbSe_2$ layers was investigated by determining the out-of-plane Ginzburg-Landau coherence lengths by electrical transport measurements in a magnetic field closely below the transition temperature. A dimensional cross-over could not be identified; however, a decoupling trend with increasing distance of the $NbSe_2$ layers was observed.

TT 53.3 Wed 15:00 P2-OG2

Rhenium-molybdenum coplanar superconducting electronics compatible with carbon nanotube growth — •Stefan Blien, Karl J. G. Götz, Thomas Huber, Niklas Hüttner, Wolfgang Himmler, and Andreas K. Hüttel — Institute for Experimental and Applied Physics, Universität Regensburg, Regensburg, Germany

At low temperature, carbon nanotubes act as quantum dots as well as nano-electromechanical resonators. By growing them in a last fabrication step over pre-existing chip structures, one obtains "ultraclean" devices, displaying high mechanical quality factors as well as unperturbed electronic transport spectra. For integrating such structures with superconducting coplanar circuits, superconductors that withstand the nanotube CVD growth process are needed.

We compare rhenium-molybdenum alloys of different composition and different deposition technique, regarding their material composition and both dc and GHz electronic properties. The rhenium-molybdenum thin films still display superconductivity after the CVD process, with critical temperatures up to $T_c \simeq 8\,\mathrm{K}$. Coplanar waveguide resonators with $Q_i \simeq 5000$ at dilution refrigerator temperature are characterized and and dissipation mechanisms discussed.

TT 53.4 Wed 15:00 P2-OG2

Incommensurate magnetism of hole-doped cuprates in the normal phase: a LDA+(C)DMFT study — •Amin Kiani and Eva Pavarini — Institute for Advanced Simulation, Forschungszentrum Jülich, 52425 Jülich, Germany

In order to investigate the magnetic incommensurate structures in hole-doped cuprates, we calculate the static lattice magnetic susceptibility $\chi(\mathbf{q};0)$ of the single-band t-t' Hubbard model in the normal phase. The calculations are performed via the local density approximation+(cluster) dynamical mean-field theory (LDA+(C)DMFT), following the implementation presented in Ref. [1]. Within this approach we study the effect of the next-nearest-neighbor hopping t' and the Coulomb interaction U as a function of the filling. We will show our results for the representative case $La_{2-x}Sr_xCuO_4$ (LSCO), and compare with available experiments.

[1] A. Kiani and E. Pavarini, Phys. Rev. B **94**, 075112 (2016)

TT 53.5 Wed 15:00 P2-OG2

Properties of self-consistent random matrices: A Case study for the superconductor-insulator transition — •Matthias Stosiek and Ferdinand Evers — University of Regensburg, Germany

Our general interest is in the properties of ensembles of random Hamiltonians that satisfy a self-consistency property. Such ensembles typically appear in mean-field treatments of interacting systems. The example we here consider is the Superconductor Insulator Transition (SIT) where the superconducting gap is calculated self-consistently in the presence of short-range disorder. Our focus is on disordered films with conventional s-wave pairing that we study numerically employing the negative-U Hubbard model within the standard BogoliubovdeGennes approximation. The general question that we would like to address here concerns the auto-correlation function of the pairing amplitude: How does it decay in real space and in what way does it change across the SIT? This poster presents our first (preliminary) results. We speculate that our research might have significant impact on the understanding of the SIT if it turns out that the pairing amplitude decays in a power-law fashion (with exponent below two) at the critical point.

TT 53.6 Wed 15:00 P2-OG2

Unconventional superconductivity in the organic charge transfer salts beyond the Random Phase Approximation — •Karim Zantout and Roser Valentí — Institut für Theoretische Physik, Goethe-Universität Frankfurt am Main, Max-von-Laue-Straße 1, 60438 Frankfurt am Main, Germany

The κ-type organic charge transfer salts are often described by a single-band Hubbard model of dimers on an anisotropic triangular lattice at half filling. This work combines *ab initio* density functional theory calculations and the Two-Particle-Self-Consistent approach to calculate the superconducting transition temperature T_c and the symmetry of the superconducting gap function for some material representatives. Our results show that the dimer model is not sufficient to describe transition temperatures and gap symmetries in these systems and one has to invoke molecular-based models.

TT 53.7 Wed 15:00 P2-OG2

Ferroelectric quantum phase transition inside the superconducting dome of Ca doped $SrTiO_{3-x}$ — •Lin Xiao — II. Physikalisches Institut, Universität zu Köln, Zülpicher Str. 77, D-50937 Köln — LPEM, ESPCI, 10 Rue Vauquelin, 75005 Paris, France

Ferroelectricity and superconductivity are mutually exclusive. Ferroelectricity implies the alignment of electric dipoles in an insulator, and while superconductivity requires pairing of mobile electrons in a metal. However, recently a number of 'ferroelectric metals' have emerged during the past few years (See for example Nature Materials 12, 1024 (2013)). By employing a variety of experimental probes (electric conductivity, electric permittivity, Raman spectroscopy, thermal expansion and sound velocity), we find that calcium doped oxygen-reduced $SrTiO_3$, is the first solid in which ferroelectric-like and superconducting phase transitions occur one after each order.

A variety of superconducting domes have been found in the vicinity of a competing order during the past three decades. In this context, we find evidence for interplay between superconductivity in strontium titanate and a neighboring ferroelectric order. When the ferroelectric order is destroyed by doping, the superconducting critical temperature enhances. This observation may be the first experimental signature of a role played by ferroelectric quantum criticality in the formation of

Cooper pairs.

TT 53.8 Wed 15:00 P2-OG2

Superconducting penetration depth measurement and zero field muon spin relaxation experiments under uniaxial strain in Sr_2RuO_4 — •Shreenanda Ghosh[1], Rajib Sarkar[1], Hubertus Luetkens[2], Clifford Hicks[3], and Hans-Henning Klauss[1] — [1]Institute for Solid State Physics, TU Dresden, Dresden, Germany — [2]Paul Scherrer Institute, Villigen, Switzerland — [3]Max Planck Institute for Chemical Physics of Solids, Dresden, Germany

We present zero-field muon spin relaxation (μSR) data on the unconventional superconductor Sr_2RuO_4 under uniaxial pressure. Results from previous μSR studies on unstressed Sr_2RuO_4 indicate a spontaneous magnetisation in the superconducting state [1], that has been associated with a time reversal symmetry breaking order parameter, $p_x \pm ip_y$.

The superconducting T_c of Sr_2RuO_4 has been shown experimentally to be sensitive to uniaxial pressure [2], so for more information about the complex superconducting order parameter, we investigate pressurized Sr_2RuO_4 by μSR. For this purpose, we have developed a dedicated device, which offers in situ uniaxial strain tuning via piezoelectric stacks.

[1] G. M. Luke et al., Nature **394**, 558 (1998)
[2] C. W. Hicks et al., Science **344**, 283 (2014)

TT 53.9 Wed 15:00 P2-OG2

Ferromagnetic order and superconductivity in new 1144 iron-based superconductors investigated with NMR — •Felix Brückner[1], Rajib Sarkar[1], Yi Liu[2], Guang-Han Cao[2], and Hans-Henning Klauss[1] — [1]Institut für Festkörperphysik, Technische Universität Dresden, Dresden, Germany — [2]Department of Physics, Zhejiang University of Science and Technology, Hangzhou, China

The recent discovery of two new iron-based superconductors – the so-called 1144 systems – enriches the list of ferromagnetic superconductors. These compounds crystallize in a structure similar to 122 systems. The unique feature is that adjacent interlayers contain different atoms. In our case two systems (Rb/Cs)$EuFe_4As_4$ are investigated with NMR to clarify the interplay between superconductivity and Eu-ferromagnetism. We present caracterization data as well as NMR spectroscopy and relaxation data.

TT 53.10 Wed 15:00 P2-OG2

Crystal growth and characterization of NdFeAs(O,F) — •Agnes Adamski, Mahmoud Abdel-Hafiez, and Cornelius Krellner — Physikalisches Institut, Goethe University Frankfurt

Since the discovery of iron-based superconductors, much effort was put on the crystal growth of the various systems and their characterization. Although, the initial flurry of activities was mainly performed on the so-called 1111 systems, the focus has been rapidly shifted towards other materials, were large high-quality single crystals are available. In contrast, the growth of sizable high-quality single crystals of 1111 compounds is extremely challenging, slowing down the scientific progress in this type of compounds.

Here, we report on the crystal growth of fluorine doped NdFeAsO under ambient pressure conditions by using the flux-growth technique. With this method we were able to grow single crystals up to 800 μm size and with superconducting transitions temperatures above 50 K. Subsequently, the obtained samples were analyzed with powder diffractometry, electron probe micro analysis, magnetic and transport measurements to determine the structural and physical properties. Using high-pressure electric resistance measurements on these crystals, we demonstrate a tentative $p-T$ phase diagram.

TT 53.11 Wed 15:00 P2-OG2

Detecting sign-changing superconducting gap in LiFeAs using quasiparticle interference — •Dustin Altenfeld[1], Peter J. Hirschfeld[2], Igor I. Mazin[3], and Ilya Eremin[1] — [1]Institut für Theoretische Physik III, Ruhr-Universität Bochum, D-44801 Bochum, Germany — [2]Department of Physics, University of Florida, Gainesville, Florida 32611, USA — [3]Code 6393, Naval Research Laboratory, Washington, DC 20375, USA

We present quasiparticle interference (QPI) measurement in Fe-based superconductors as a robust way of determining the superconducting gap sign structure in experiment. We show that the bias dependence of the signed symmetrized and antisymmetrized QPI maps are useful to obtain a characteristic signature of a gap sign change or lack thereof, starting from two-band model up to ab initio based band structure calculation. The experimental realization of the suggested method was successfully realized in FeSe, where a sign changing gap sign structure was identified. We provide a motivation for the application to the LiFeAs compounds.

TT 53.12 Wed 15:00 P2-OG2

Spin resonance of $Ba_{1-x}K_xFe_2As_2$ studied by neutron scattering — •Chul-Ho Lee[1], Kunihiro Kihou[1], Jitae Park[2], Kazumasa Horigane[3], Florian Wasser[4], Navid Qureshi[5], Yvan Sidis[6], Jun Akimitsu[3], and Markus Braden[4] — [1]AIST, Japan — [2]MLZ, Germany — [3]Okayama Univ., Japan — [4]Universitat zu Koln, Germany — [5]ILL, France — [6]LLB, France

The remarkable enhancement of magnetic neutron scattering signals appearing in a superconducting phase, so called spin resonance, is important to examin since it could include information of Cooper pairing. Here, we examined the spin fluctuation of hole-doped $Ba_{1-x}K_xFe_2As_2$ by inelastic neutron scattering to clarify the doping dependence of spin resonance. Neutron scattering experiments were conducted using the triple-axis spectrometer PUMA at FRM ll, Germany and 2T1 at LLB, France. We have found that the behavior of the spin resonance dramatically changes around x = 0.66 [1]. Resonance peaks have been observed clearly below 2Δs in the optimum doping region, while they are absent in the overdoped region. Instead, there is a transfer of spectral weight from energies below 2Δs to higher energies, peaking at values of 3Δs for x = 0.84. These results indicate a reduced impact of magnetism on Cooper pair formation in the overdoped region.

[1] C. H. Lee et al., Sci. Rep. 6, 23424 (2016)

TT 53.13 Wed 15:00 P2-OG2

Fermi-surface topology of (Rb,Cs)Fe_2As_2 — •Tobias Förster[1], Johannes Klotz[1], Kathrin Götze[1], Seunghyun Khim[2], Helge Rosner[2], and Jochen Wosnitza[1] — [1]Dresden High Magnetic Field Laboratory (HLD-EMFL), Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany — [2]Max Planck Institute for Chemical Physics of Solids, Dresden, Germany

The unique Fermi-surface topology of many iron-pnictide superconductors stimulates a number of theories on the nature of the pairing interactions in these materials. In the case of (K,Rb,Cs)Fe_2As_2, there is an ongoing discussion whether a Lifshitz transition is connected to the superconducting properties of these 122 iron arsenides. Studies of the pressure dependence of H_{C2} did not find evidence for that kind of transition [1,2]. In contrast, high-resolution band structure calculations show a van-Hove singularity close to the Fermi energy, favouring a Lifshitz transition. In order to investigate the possible impact of this feature, a precise knowledge of the electronic structure is eminent. We, therefore, calculated the Fermi surface of (Rb,Cs)Fe_2As_2 using the full-potential-local-orbital scheme and started investigating the de Haas-van Alphen effect of (Rb,Cs)Fe_2As_2 in static fields up to 18 T. In our contribution, we show the first results of our ongoing torque-magnetometry measurements and compare them with the results of our band-structure calculations.

[1] F. F. Tafti *et al.*, Phys. Rev. B. **89** 134502 (2014).
[2] F. F. Tafti *et al.*, Phys. Rev. B. **91** 054511 (2015).

TT 53.14 Wed 15:00 P2-OG2

Magnetic properties and electronic correlations in $BaTM_2As_2$ (TM=Cr, Mn, Fe, Co, Ni, Cu, Zn) — •Francesco Scaravaggi[1], Sebastian Selter[1], Rhea Kappenberger[1], Saicharan Aswartham[1], Sabine Wurmehl[1], Anja U.B. Wolter[1], and Bernd Büchner[1,2] — [1]Leibniz-Institute for Solid State and Materials Research, IFW-Dresden, 01069 Dresden, Germany — [2]Institute for Solid State Physics, TU Dresden, 01069, Dresden, Germany

In order to better understand the multi-orbital nature of Fe-based superconductors in combination with strong electronic correlations in this class of materials, we report on a systematic investigation of the magnetic and thermodynamic properties of the isostructural series $BaTM_2As_2$ (TM=Cr, Mn, Fe, Co, Ni, Cu, Zn). Magnetization, specific heat and dilatometry measurements were performed on single crystalline samples to investigate the changes in the electronic and magnetic character and the degree of electronic correlation, varying the average occupancy of the 3d shell as a control parameter within the series. The results show that upon changing the occupation of the 3d orbitals, the electronic and magnetic character changes dramatically, which suggests a very complex interaction between on-site Coulomb repulsion, Hund's coupling and other competing effects.

This work has been supported by Graduiertenkolleg GRK 1621.

TT 53.15 Wed 15:00 P2-OG2

High field properties of superconducting $Ba(Fe_{1-x}Ni_x)_2As_2$ thin films — •Stefan Richter[1,2], Fritz Kurth[1], Kazumasa Iida[3], Kirill Pervakov[4], Aurimas Pukenas[2], Saicharan Aswartham[1], Chiara Tarantini[5], Jan Jaroszynski[5], Jens Hänisch[6], Vadim Grinenko[1,2], Sabine Wurmehl[1], Werner Skrotzki[2], Bernd Büchner[1,2], Kornelius Nielsch[1,2], and Ruben Hühne[1] — [1]IFW, Dresden — [2]TU Dresden — [3]Nagoya University, Japan — [4]RAS, Moscow, Russia — [5]NHMFL, Tallahassee, USA — [6]KIT, Karlsruhe

The Fe based superconductors show great potential for high field applications due to their high upper critical field, their small anisotropy and their increased tolerance to small angle grain boundaries. The study of Fe-based superconducting thin films contributes to a better understanding of these correlated electron systems. We present results for epitaxial $Ba(Fe_{1-x}Ni_x)_2As_2$ thin films, which have been grown with pulsed laser deposition. The behavior of the upper critical field and critical current density has been measured in high magnetic fields up to 35 T. We find an increased slope of the upper critical field near T_c and compared to Co-doped thin films a smaller vortex liquid phase at low temperatures.

TT 53.16 Wed 15:00 P2-OG2

Doping effect of Mn impurities on the physical properties of optimally electron doped $Sr(Fe_{0.86}Co_{0.14})_2As_2$ — •Luminita Harnagea, Giri Mani, and Surjeet Singh — Indian Institute of Science Education and Research, Pune - 411008, India.

Using transport and magnetization measurements we studied the effect of Mn doping in optimally electron doped $Sr(Fe_{0.86}Co_{0.14})_2As_2$ single crystal. The as - grown $Sr(Fe_{0.86}Co_{0.14})_2As_2$ single crystal exhibits a superconducting transition temperature (T_c) of around 15 K. Doping with Mn at the Fe site in $Sr(Fe_{0.86}Co_{0.14})_2As_2$ leads to a gradual suppression of the transition temperature with an initial rate of about ΔT_c 5 K per Mn percentage. The residual resistivity of the doped samples increases with increasing Mn concentration. The low-temperature magnetic susceptibility of the Mn-doped samples exhibits a Curie tail, which gets progressively enhanced with increasing Mn - concentration, suggesting that the Mn - ions carry a localized magnetic moment consistent with S = 1/2 local moment. The paramagnetic Mn moments act as Cooper pair-breakers resulting in a gradual suppression of T_c, analogous to $Ba(Fe_{1-x-y}Co_xMn_y)_2As_2$ series of compounds [1]. These results are, however, in stark contrast with the case of Mn doped $LaFeAsO_{0.89}F_{0.11}$, where a Mn concentration as small as 0.2 %, suppresses the superconductivity completely [2]. These differences are rather surprising and their more detailed understanding might throw light on the nature of superconducting state in iron pnictides.

[1] D. LeBoeuf et al., Phys. Rev. B 89, 035114 (2014)
[2] F. Hammerath et al., Phys. Rev. B 89, 134503 (2014)

TT 53.17 Wed 15:00 P2-OG2

Magnetic and electric characterization of bulk FeSe superconductors with Ag addition — Thomas Karwoth[1], •XianLin Zeng[1], Koichi Furutani[1,2], Alex Wiederhold[1], Michael Koblischka[1], M Muralidhar[2], M Murakami[2], and Uwe Hartmann[1] — [1]Institute of Experimental Physics, Saarland University, Campus C 6 3, 66123 Saarbrücken, Germany. — [2]Superconducting Materials Laboratory, Department of Materials Science and Engineering, Shibaura Institute of Technology, 3-7-5 Toyosu, Koto-ku, Tokyo 135-8548, Japan

Superconductivity of bulk FeSe samples was characterized through magnetic and electric measurements. In order to improve the superconducting properties, the sintering temperature was varied up to 900 oC and to improve the connectivity, silver was applied in low concentrations to the samples ranging from 0 to 7%. The electric properties of the samples were investigated by the four point probe method (R-T measurement and V-I characteristics). Generally, the sample with 4The magnetic properties (M-T and M-H) of the samples were measured using an extraction magnetometer in a Quantum Design PPMS with fields up to 7 T. The critical current densities and the flux pinning forces were estimated using the extended Bean model, extending the work published in [1].

[1] M. Muralidhar et al., Phys. stat. solidi (a), DOI 10.1002/pssa.201600299.

TT 53.18 Wed 15:00 P2-OG2

High field ^{77}Se NMR on single crystalline FeSe. — •Sebastian Molatta[1,2,3], Z. T. Zhang[1,4], R. Sarkar[2,3], P. Biswas[5], T. Wolf[6], H. v. Löhneysen[6], J. Wosnitza[1,2,3], and H. Kühne[1] — [1]Hochfeld-Magnetlabor Dresden (HLD-EMFL), Helmholtz-Zentrum Dresden-Rossendorf, Germany — [2]IFP, Technical University of Dresden, Germany — [3]DFG GRK 1621 — [4]Institute of Ion Beam Physics and Materials Research, Helmholtz-Zentrum Dresden-Rossendorf, Germany — [5]Paul-Scherrer-Institute, Switzerland — [6]IFP, Karlsruhe Institute of Technology, Germany

FeSe is currently discussed as a superconductor in the crossover regime between the weakly coupled Bardeen-Cooper-Schrieffer (BCS) and the strongly coupled Bose-Einstein-condensate (BEC) limit. In particular, at high magnetic fields, the energies of the Zeeman interaction, superconducting gap, and the Fermi temperature are comparable in FeSe. We report recent results of the spin susceptibility and low-energy quasiparticle excitations probed by means of nuclear magnetic resonance (NMR) spectroscopy in the highly spin-polarized state close to the upper critical field of superconductivity. The superconducting state is evidenced by a reduced radio-frequency penetration depth reflected by a decreasing NMR signal intensity towards low temperatures. The spin-lattice relaxation rate points towards a field-induced change of the gap structure within the superconducting state.

TT 53.19 Wed 15:00 P2-OG2

Disorder-promoted C_4-symmetric magnetic order in iron-based superconductors — •Mareike Hoyer[1], Rafael M. Fernandes[2], Alex Levchenko[3], and Jörg Schmalian[1] — [1]Institut für Theorie der Kondensierten Materie und Institut für Festkörperphysik, Karlsruher Institut für Technologie, Deutschland — [2]School of Physics and Astronomy, University of Minnesota, USA — [3]Department of Physics, University of Wisconsin-Madison, USA

In most iron-based superconductors, the transition to the magnetically ordered state is closely linked to a lowering of structural symmetry from tetragonal (C_4) to orthorhombic (C_2). However, recently, a regime of C_4-symmetric magnetic order has been reported in certain hole-doped compounds. This novel magnetic ground state can be understood as a double-**Q** spin density wave, and depending on the relative orientations of the two order parameters $\mathbf{M}_1$ and $\mathbf{M}_2$, either a noncollinear spin-vortex crystal (SVC) or a nonuniform charge-spin density wave (CSDW) could form. Experimentally, CSDW has been established as the magnetic configuration of some of these optimally hole-doped compounds, whereas in low-energy itinerant models SVC and CSDW states are nearly degenerate. Extensions of these low-energy models including additional electronic interactions even tip the balance in favor of the SVC, in apparent contradiction with the recent experimental findings.

Here, we revisit the phase diagram of magnetic ground states of low-energy multi-band models in the presence of weak disorder. We show that impurity scattering not only promotes the transition from C_2 to C_4-magnetic order, but also favors the CSDW over the SVC phase.

TT 53.20 Wed 15:00 P2-OG2

Tetragonal magnetic order and superconductivity in iron pnictides — •Chris Koschenz and Carsten Timm — Institute of Theoretical Physics, Technische Universität Dresden

Multiband and multiorbital physics is crucial for understanding superconductivity and magnetism in iron pnictides. We employ a realistic multiorbital model to study the newly discovered tetragonal magnetic phase in $Ba_{x-1}Na_xFe_2As_2$ and $Ba_{1-x}K_xFe_2As_2$.This additional fourfold symmetric phase is observed in $Ba_{x-1}Na_xFe_2As_2$ by neutron powder diffraction close to the suppression of the spin-density-wave (SDW) order and is in agreement with the scenario of magnetically driven nematic order.

We elucidate the role played by orbital effects and compare them to other multiorbital systems. Furthermore, we study the coexistence and competition of tetragonal magnetic order and superconductivity as well as the possibility of additional phase transitions in this regime.

TT 53.21 Wed 15:00 P2-OG2

Constraints on the total coupling strength to bosons in the Fe based superconductors — •Stefan-Ludwig Drechsler[1], Helge Rosner[2], Vadim Grinenko[3], and Steve Johnston[1,4] — [1]Leibniz-Institute IFW-Dresden, D-01171 dresden, Germany — [2]Max-Planck Institute f. Chemical Physics of Solids, Dresden, Germany — [3]TU Dresden, Dresden, Germany — [4]Deptm. of Physics and Astronomy, University of Tennesee, Knoxville 37996, USA

There is still no consistent interpretation of the normal state of Fe based superconductors (FeSC) properties, where the strength of the el-el interaction and the role of correlation effects are under debate. Based on empirical observations and qualitative insight from DFT calculations, we show that the superconducting and low-energy thermodynamic properties of the FeSC can be described semi-quantitively within multiband Eliashberg-theory. An important high-energy mass renormalization (MR) is accounted for phenomenologically in accord with constraints provided by thermodynamic, optical, and angle-resolved photoemission data. When viewed in this way, all FeSC with $T_c < 40$ K studied so far are found to belong to an *intermediate* coupling regime. This is in contrast to strong coupling scenarios proposed in the early period of the FeSC history. We also discuss several related issues, including the role of band shifts as measured by the positions of van Hove singularities, and a recently suggested a quantum critical point in the strongly hole-doped systems AFe_2As_2 (A = K, Rb, Cs). Using high-precision full relativistic GGA-band structure calculations, we arrive at a somewhat milder MR in comparison with other studies.

TT 53.22 Wed 15:00 P2-OG2

Kinetics of quasiparticles in conventional superconductors beyond mean field — •Frank Lengers, Peter Kettmann, Simon Hannibal, and Tilmann Kuhn — Institut für Festkörpertheorie, Westfälische Wilhelms-Universität Münster, Wilhelm-Klemm-Str. 10, 48149 Münster

Nonequilibrium dynamics of superconductors offer a versatile tool for understanding the underlying many particle interactions. Conventional superconductors can be excited into the nonadiabatic regime by THz pulses to study the Higgs mode in those materials. Theoretical modelling of those processes is typically done on the mean field level. Here we present a quantum kinetic treatment of the well-known BCS-model for conventional superconductors beyond the mean field approximation. We treat the quasiparticle correlations as independent variables in a density-matrix formalism by truncating the quantum mechanical BBGKY hierarchy at certain order. It is shown that the well-known mean field equations of motion are recovered at the lowest truncation level. The dynamics of a conventional superconductor after excitation into the nonadiabatic regime is modelled by a sudden quench of the coupling parameter of the BCS-model. Thereby we study the Higgs mode in a conventional superconductor and compare the results to the mean field case. In a second part we introduce semiclassical equations of motion. We observe that the resulting changes due to the extension of the model compared to the mean field case are rather small. Yet relaxation and dephasing behaviour of quasiparticles and coherences can be observed.