TT 93: Superconductivity – Poster II

Time: Thursday 18:00–20:00 Location: P4

TT 93.1 Thu 18:00 P4

The Search for 1144 Phases under Pressure — •Leonard Essich, Kristin Kliemt, and Cornelius Krellner — nstitute of Physics, Goethe University Frankfurt, Germany

Alternative stacking of 122 Fe-based pnictides has enabled the synthesis of the 1144 phase $AB\mathrm{Fe_4As_4}$ (A = alkali, B = alkaline earth). Examples include $\mathrm{CaKFe_4As_4}$, where a *half-collapsed* tetragonal phase emerges under pressure, and $\mathrm{EuRbFe_4As_4}$ or $\mathrm{EuCsFe_4As_4}$, where Eu magnetism coexists with superconductivity [1,2]. Theoretical studies predict the stability of further 1144 Fe-arsenides and an extension to phosphides ($AB(\mathrm{TM})_4\mathrm{P_4}$ where TM = Fe, Ru, Co, or Ni). Notably, $\mathrm{CaKRu_4P_4}$ has been successfully synthesised [1]. This work investigates the synthesis of other 1144 phases under high-pressure conditions, designed to support the incorporation of smaller phosphorus atoms on arsenic lattice positions. Multi-anvil presses offer precise pressure and temperature control, large sample sizes, and adaptable setups for crystal growth research. In this contribution, we present the capabilities of a multi-anvil press, the challenges encountered during sample preparation, and outline the pathway to synthesising 1144 phases. A Walker-type module, previously utilized in our laboratory, contains a 6-8 anvil configuration within a steel cylinder [3]. The choice of pressure-transmitting medium and internal configuration is crucial to achieving the desired outcome in these experiments.

[1] B. Q. Song *et al.*, Phys. Rev. Materials **5**, 094802 (2021)
[2] U. S. Kaluarachchi *et al.*, Phys. Rev. B **96**, 140501 (2017)
[3] A. A. Haghighirad *et al.*, Cryst. Growth Des. **8**, 1961 (2008)

TT 93.2 Thu 18:00 P4

MBE Growth and STM/STS Characterization of Monolayer and Bilayer Sb on $NbSe_2$ — •Zihao Ma, Ruijun Xi, and Hao Zheng — Shanghai Jiao Tong Univ, Tsung Dao Lee Inst, Key Lab Artificial Struct & Quantum Control, Sch Phys & Astron, Shanghai 200240, Peoples R China

Two dimensional antimony (Sb) has attracted increasing interest due to its strong spin-orbit coupling, unprecedented level of structural tunability, and potential topological phases. The atomically flat surface, weak interlayer bonding, and superconducting ground state of $NbSe_2$ make it an ideal substrate for epitaxial growth of Sb. Studying Sb/NbSe van der Waals heterostructures enables investigation of growth behavior, electronic reconstruction, and possible interface driven phenomena. Furthermore, the combination may be a new strategy to achieve topological superconductors. By molecular beam epitaxy (MBE), we achieve controlled growth of monolayer (1L) and bilayer (2L) Sb on $NbSe_2$. By STM/STS, we characterize surface morphology, atomic structure, and electronic states.

TT 93.3 Thu 18:00 P4

Superconductivity, CDW, and quasiparticle interaction in 2H-TaS_2 probed by point contacts — •Oksana Kvitnitskaya[1,2], Yurii Naidyuk[2], and Bernd Büchner[1] — [1]Leibniz-Institute for Solid State Research, IFW Dresden, Dresden, Germany — [2]B. Verkin Institute for Low Temperature Physics and Engineering NAS of Ukraine, Kharkiv, Ukraine

Among Ta-based dichalcogenides, metallic 2H-TaS_2 exhibits physical properties that depend on its lattice perfection, vacancies, intercalation, and external pressure, etc. TaS_2 represents a classic example of a material in which charge density wave (CDW) order and superconductivity coexist and compete. Point contacts (PCs) propose a direct method for measuring electron-quasiparticle interaction by Yanson PC spectroscopy and superconducting gap via Andreev reflection. Also the phase transitions that affect electron transport can be detected using PC as a probe. In this report, we demonstrate the first PC study of 2H-TaS_2. Firstly, we observed enhanced Tc in produced PCs, which can reach up to 7 K, instead of 1 K in the bulk, and the critical magnetic field reaches up to 5T at 2K. The nonlinear current-voltage characteristics I(V) of PC also demonstrate features associated with the CDW transition, which is evident in dV/dI as dips symmetrically placed with respect to zero-bias voltage. Still, electron-phonon interaction features are not resolved undoubtedly in PC spectra, instead quadratic dependence of dV/dI(V) points out that the electron-electron interaction can be dominant at low biases. These preliminary results are very intriguing and give impetus to their deeper investigation.

TT 93.4 Thu 18:00 P4

Comprehensive Optimization of Structural Properties, Flux Pinning, and EXAFS-Revealed Local Structure in HgO-Engineered BiPb-2223 Superconductors — •Mustafa Shalaby[1], Ahmed Shalaby[2], Duc Tran[3], An Pham[3], Latif Khan[4], and Messoud Harfouche[4] — [1]NCRRT, Egyptian Atomic Energy Authority, Cairo, Egypt. — [2]Egyptian Russian University. Badr City, Cairo, Egypt — [3]Faculty of Physics, VNU University of Science, Hanoi, Vietnam — [4]SESAME, P.O. Box 7, Allan 19252, Jordan

A systematic investigation of HgO nanoparticle enhancement in $Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_{10-\delta}$ (BiPb-2223) HTSC, with strategic incorporation of 1-2 wt% HgO nanoparticles demonstrates an increase in high-T_c Bi-2223 phase fraction from 69% to 78% while effectively suppressing the detrimental Bi-2212 phase. Cu K-edge EXAFS analysis unveils exceptional structural stabilization, with achieved electronic structure with Cu valence states (V_{Cu}) was 3.04, 2.87, and 3.1 for pristine and HgO-doped samples respectively, maintaining the critical Cu^{+2}/Cu^{+3} mixed valence configuration necessary for superconducting behaviour in the CuO_2 planes. HgO works as a structural stabilizer rather than conventional substitutional dopant, evidenced by non-uniform distribution patterns and preserved superconducting frameworks. Critical current densities reach 900 A/m^2 at 10 K with irreversibility fields exceeding 100,000 Oe for the pure sample, while the 2% HgO composition exhibits optimized flux pinning force characteristics with J_c = 600 A/m^2 at 10K.

TT 93.5 Thu 18:00 P4

From surface to bulk: Superconductivity in doped γ-$PtBi_2$ — •Joshy Kochummachen Oommen, Manaswini Sahoo, Luminita Harnagea, Sabine Wurmehl, Anja Wolter-Giraud, and Bernd Büchner — Leibniz Institute for Solid State and Materials Research Dresden, Helmholtzstrasse 20, 01069 Dresden, Germany

Trigonal platinum bismuthide (γ-$PtBi_2$) has recently attracted significant interest due to the observation of superconductivity and its topologically protected surface states. So far, superconductivity has been detected only through surface-sensitive techniques such as ARPES and STM, with no signatures observed in bulk thermodynamic measurements. However, doped polycrystalline samples show bulk superconductivity. In this work, we investigate how chemical doping modifies this behaviour by studying $PtBi_{(2-x)}A_x$ (A = Te, Pd) in single crystals. Introducing the dopants transforms the system from a surface-confined superconductor into a bulk superconductor. DC and AC susceptibility measurements reveal a clear superconducting transition between 2-2.4 K, with the transition temperature T_c strongly dependent on the dopant concentration. The emergence of bulk superconductivity suggests a doping-induced structural change from a noncentrosymmetric to a centrosymmetric phase, offering an intriguing route to tune the interplay between structure and superconductivity in γ-$PtBi_2$. These results highlight the potential of doped γ-$PtBi_2$ as a platform for exploring exotic superconducting states and understanding how topological surface states evolve into bulk superconductivity.

TT 93.6 Thu 18:00 P4

Nanoscale Characterization of Superconducting NbN Thin Films — •Janine Lorenz[1,2,3], Sven Linzen[4], Mario Ziegler[4], Gregor Oelsner[4], Rony Stolz[4], Evgeni Il'ichev[4], Thomas Smart[1], Yorgo Haddad[1], Marc Neis[1], Pavel Bushev[1], Rami Barends[1], F. Stefan Tautz[1,2,3], and Felix Lüpke[1,5] — [1]Peter Grünberg Institut, Forschungszentrum Jülich, Germany — [2]Jülich Aachen Research Alliance (JARA), Germany — [3]Institut für Experimentalphysik IV A, RWTH Aachen, Germany — [4]Leibniz Institute of Photonic Technology, 07702 Jena, Germany — [5]II. Physikalisches Institut, Universität zu Köln, Germany

Due to their high kinetic inductance, niobium nitride (NbN) films have recently gained attention for their application in quantum phase-slip devices. In this study, we use scanning tunnelling microscopy to investigate the spatial variation of the superconducting order parameter of NbN films grown by atomic layer deposition (ALD). Despite the increased likelihood of defect formation associated with the use of organic precursors in ALD, our measurements reveal a remarkably uniform superconducting gap, which surpasses the reported values for sputtered

NbN films. We attribute this to the well controlled thickness and small grain size of ALD grown films. For a 5 nm (4 nm) NbN film grown on a silicon (sapphire) substrate, we obtain an average BCS order parameter of 2.02 meV (1.59 meV), with a standard deviation of 0.04 meV (0.05 meV). This result highlights the high homogeneity of the superconducting order parameter in ALD-grown NbN films.

TT 93.7 Thu 18:00 P4

Development of Lenz lenses for NMR of micron-sized superconductors — •P. Swatosch[1,2], H. Kühne[1], F. Bärtl[1,2], and J. Wosnitza[1,2] — [1]Hochfeld-Magnetlabor Dresden (HLD-EMFL) and Würzburg-Dresden Cluster of Excellence ctd.qmat, HZDR — [2]IFMP, TU Dresden

Nuclear magnetic resonance (NMR) experiments on novel superconductors are often limited in their sensitivity when only submillimeter-sized samples are available, as in this case only a few nuclear spins contribute to the measurement signal, resulting in a low signal-to-noise ratio. One approach to solving this problem is to locally focus the high-frequency magnetic field of the NMR experiment in the sample volume. For this, structured conductor geometries in the form of Lenz lenses can amplify and shape magnetic fields through targeted eddy currents. For this purpose, we have performed comprehensive numerical simulations of the spatial distribution of electromagnetic fields. Based on geometries that have already proven useful in earlier studies [1-3], we have modeled various designs and evaluated them with respect to their field-focusing capabilities and NMR signal. The results provide a basis for the fabrication of optimized Lenz-lens geometries for highly sensitive NMR measurements of small-volume samples.

[1] Meier *et al.*, Sci. Adv. **3**, eaao5242 (2017)
[2] Schoenmaker *et al.*, Rev. Sci. Instrum. **84**, 085120 (2013)
[3] Sprengler *et al.*, PLoS ONE **12**, e0182779 (2017)

TT 93.8 Thu 18:00 P4

physical properties of the superconductor $NiBi_3$ — •Po-Yuan Cheng[1,2], Shan-Fu Chang[1,2], Pang-Shun Kuo[1,2], and Chien-Lung Huang[1,2] — [1]Department of Physics, National Cheng Kung University, Tainan 701, Taiwan — [2]Center for Quantum Frontiers of Research & Technology (QFort), National Cheng Kung University, Tainan 701, Taiwan

We investigate the superconducting properties of the needle-like compound $NiBi_3$ by electrical resistivity and specific-heat measurements down to low temperatures. Both probes reveal a superconducting transition at a critical temperature $T_c = 4$ K, with an upper critical field $H_{c2} = 4$ kOe. High-pressure resistivity measurements up to 20 GPa show that T_c decreases linearly with pressure, which is consistent with phonon-mediated superconductivity. The temperature dependence of the electronic specific-heat is well described by a single-gap s-wave model. In conclusion, these experimental results demonstrate that $NiBi_3$ is a conventional BCS superconductor.

TT 93.9 Thu 18:00 P4

Optical Response of Multi-orbital Superconductors: Role of Fermi Surface Topology and Geometry — •Meghdad Yazdani-Hamid[1], Mehdi Biderang[2], and Akbari Alireza[3] — [1]Department of Physics, Bu-Ali Sina University, 65178, 016016 Hamedan, Iran — [2]Department of Physics, University of Toronto, 60 St. George Street, Toronto, Ontario M5S 1A7, Canada — [3]Beijing Institute of Mathematical Sciences and Applications (BIMSA), Huairou District, Beijing 101408, China

Motivated by the sensitivity of Sr_2RuO_4 to Fermi surface reconstructions under strain, we investigate how Fermi surface geometry and Van Hove singularities influence the optical Hall response and polar Kerr effect. Within a three-orbital model, we explore the impact of chemical potential and interlayer hopping on superconducting pairing and response functions. We find that $d_{x^2-y^2}$ and $d_{x^2-y^2}+ig$ symmetries are the leading candidates for the quasi-2D orbital, while a chiral p-wave state in the quasi-1D orbitals is essential for generating an accessible Kerr angle. Increasing interlayer hopping amplifies coherence factors, producing sharp signatures in T_c and optical transport. Inter-orbital charge transfer further enhances these effects by modifying the balance between quasi-1D and quasi-2D contributions. These results provide a framework for interpreting Kerr effect experiments in multi-orbital superconductors.

[1] M. Yazdani-Hamid, M. Biderang, A. Akbari, arXive:2501.14254

TT 93.10 Thu 18:00 P4

Resistance Measurements of $SmFe_{1-x}Co_xAsO$ single crystall — •Assem Adam[1], Nils-Torben Hahn[1], Thomas Terödе[1], Franz-Michel Eckelt[1], Ralph Wagner[1], Christian Hess[1,2], Bernd Büchner[2], Felix Anger[2], and Sabine Wurmehl[2] — [1]Fakultät für Mathematik und Naturwissenschaften, Bergische Universität Wuppertal, Wuppertal, Germany — [2]Leibniz-Institut für Festkörper- und Werkstoffforschung (IFW) Dresden, 01069 Dresden, Germany

Doped SmFeAsO is has been discovered in the early days of Fe-based superconductivity. However, sizeable single crystals of this material have not been available for a long time. Here, we present resistance measurements of Co-doped SmFeAsO as a function of temperature. The data reveal well defined anomalies, presumably related to the structural and magnetic transitions in this compound. The evolution upon doping is discussed.

TT 93.11 Thu 18:00 P4

Pressure-driven evolution of upper critical field and Fermi-surface reconstruction in strong-coupling superconductor Ti_4Ir_2O — •Lifen Shi[1], Bosen Wang[2,3], and Jinguang Cheng[2,3] — [1]Max Planck Institute for Chemical Physics of Solids, 01187 Dresden, Germany — [2]Beijing National Laboratory for Condensed Matter Physics and Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China — [3]School of Physical Sciences, University of Chinese Academy of Sciences, Beijing 100190, China

We report on pressure-driven evolution of the superconducting transition temperature (T_c) and upper critical field $B_{c2}(0)$ of strong-coupling superconductor Ti_4Ir_2O that possesses an unusually large $B_{c2}(0)$ at ambient pressure (AP). Our results reveal an extremely low-pressure coefficients of T_c, i.e. dT_c/dP = -0.047 K/GPa for $P < 15$ GPa and -0.017 K/GPa for $15 < P < 50$ GPa, presumably associated with an inherent large bulk modulus of 252 GPa. Interestingly, we find that its Bc2(0) undergoes a smooth crossover at 35.6 GPa from well beyond to less than the Pauli paramagnetic limit BpBCS(0) = 1.84Tc; i.e., the $B_{c2}(0) = 18.2$ T = 1.7 $B_{pBCS}(0)$ at AP decreases to 5.8 T = 0.88 $B_{pBCS}(0)$ at 50 GPa. The density functional calculations predicted the possible occurrence of pressure-induced Fermi-surface reconstruction for the energy bands near the K point with strong spin-orbit coupling in 31-41 GPa. The present work sheds more light on this intriguing superconductor capable of resisting to large external compression and strong magnetic fields.

TT 93.12 Thu 18:00 P4

Fluxon mass in superconductors probed by circularly polarized terahertz radiation — •Roman Tesař[1], Michal Šindler[1], Pavel Lipavský[2], Christelle Kadlec[1], and Jan Koláček[1] — [1]Institute of Physics of the Czech Academy of Sciences, Prague, Czech Republic — [2]Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic

We employ an original method for detecting magnetic circular dichroism in YBCO thin films using FIR/THz laser radiation. The observed dichroism is clearly related to Abrikosov vortices (fluxons). Differential transmission of left- and right-handed circular polarization arises in the superconducting state under an applied magnetic field, but vanishes at zero magnetic field and in the normal state. Fluxon dynamics can be understood within a theoretical model that incorporates the fluxon mass, the equation of fluxon motion, and the interaction with circularly polarized light. The electric field drives a supercurrent that deflects fluxons via the Magnus effect perpendicular to the current flow. The resulting cyclotron motion of fluxons affects the supercurrent and thus the transmittance. We measured circular dichroism as a function of magnetic field and temperature at several laser frequencies for two YBCO samples with distinct doping. A good agreement with theoretical predictions allowed us to estimate the effective mass of a fluxon. Nevertheless, the fluxon mass still remains somewhat controversial and not fully resolved. The presented experimental technique is also applicable for the investigation of cyclotron resonance in semiconductors and magnon modes in magnetic materials.

TT 93.13 Thu 18:00 P4

Statistics of the local spectral gap and order parameter in disordered superconducting films — Johannes Dieplinger[1], Animesh Panda[1], •Arpan Das[1], Ferdinand Evers[1], and Matthias Stosiek[2,3] — [1]Institute of Theoretical Physics, University of Regensburg, Universitaetsstrasse 31, 93053 Regensburg, Germany — [2]Department of Applied Physics, Aalto University, Otakaari 24, 02150 Espoo, Finland — [3]Physics Department, Technical University of Munich, James-Frank-Str. 1, 85748 Garching, Germany

The disorder-tuned superconductor-insulator transition has been a widely studied phenomenon that highlights the interplay between superconductivity and disorder. Local fluctuations in superconducting observables are crucial for understanding related effects, such as superconducting islands and the disorder-induced enhancement of the critical temperature. Using a self-consistent Bogoliubov-de Gennes Hamiltonian, we present a study of $2D$ disordered superconductors, focusing on the statistics of the local spectral gap and the local order parameter. We emphasise the fact that the similarity of three energy scales - the spectral gap E_g, the order parameter Δ, and the critical temperature T_c - is a peculiarity of clean superconductors. For instance, in the presence of disorder, the mean-field T_c can increase, while the mean $\langle\Delta(T=0)\rangle$ might even decrease. Further, we analyse the flow of the distribution functions of the local order parameter and the local spectral gap as disorder changes. At large disorder, the flow of the (mean-field) distribution functions exhibits a percolation-type transition that appears to have gone unnoticed so far.

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nematic fluctuations and electronic correlations in heavily hole-doped $Ba_{1-x}K_xFe_2As_2$ probed by Elastoresistance — •Franz Eckelt[1], Xiaochen Hong[1,2], Steffen Sykora[3], Vilmos Kocsis[3], Vadim Grinenko[4], Kunihiro Kihou[5], Chul-Ho Lee[5], Bernd Büchner[3], and Christian Hess[1] — [1]University of Wuppertal, School of Mathematics and Natural Sciences, 42097 Wuppertal, Germany — [2]Department of Applied Physics and Center of Quantum Materials and Devices, Chongqing University, 401331 Chongqing, China — [3]Leibniz-Institute for Solid State and Materials Research, 01069 Dresden, Germany — [4]Tsung-Dao Lee Institute, Shanghai Jiao Tong University, Shanghai 201210, China — [5]National Institute of Advanced Industrial Science and Technology, Tsukuba, Ibaraki 305-8568, Japan

We measure the elastoresistance of $Ba_{1-x}K_xFe_2As_2$ in the strongly hole-doped regime using longitudinal and transverse configurations. The subsequent symmetry decomposition of the elastoresistance reveals a crossover from dominant nematic fluctuations in the B_{2g} channel at low doping to a correlation-driven A_{1g} contribution that becomes visible for $x > 0.7$. Complementary multi-orbital model calculations reproduce this doping evolution and indicate that strengthened electronic correlations in the d_{xy} orbital govern the observed A_{1g} response in the heavily hole-doped regime.

TT 93.15 Thu 18:00 P4

Atomic-scale visualization of the superconducting order parameter in the misfit compound $(SnS)_{1.17}NbS_2$ — Dongming Zhao[1], •Shamarita Deb[1,2], Dmytro S. Inosov[2], Claudia Felser[1], Sushmita Chandra[1], and Jian-Feng Ge[1] — [1]Max Planck Institute for Chemical Physics of Solids, 01187 Dresden, Germany — [2]Technical University of Dresden, 01062 Dresden, Germany

Misfit compounds are naturally stacked heterostructures, composed of layers with distinct sublattices. Owing to the incommensurate structural modulations and interlayer coupling, they can exhibit exotic phenomena such as Ising superconductivity and charge density waves. Here, we investigate the high-quality misfit superconductor $(SnS)_{1.17}NbS_2$, a non-centrosymmetric superconductor composed of alternating Sn_2 and NbS_2 layers. Utilising scanning tunnelling microscopy, we obtained atomic-resolution images that clearly resolve, for the first time, both the square lattice on the SnS layer and the hexagonal lattice on the NbS_2 layer. Scanning tunnelling spectroscopy measurements further reveal well-defined superconducting gaps on both layers. Our ongoing experiments aim to visualise its superconducting order parameter with atomic resolution and to explore possible unconventional pairing mechanisms enabled by the intrinsic structural modulations.

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Transport properties of superconducting misfit layered compound — •Tarushi Agarwal, Chandan Patra, Poulami Manna, Shashank Srivastava, Priya Mishra, Suhani Sharma, and Ravi Prakash Singh — Indian Institute of Science Education & Research Bhopal

Misfit layered compounds, naturally occurring bulk heterostructures, present a compelling alternative to artificially engineered ones, offering a unique platform for exploring correlated phases and quantum phenomena. This study investigates the magnetotransport and superconducting properties of the misfit compound $(PbS)_{1.13}TaS_2$, comprising alternating PbS and 1H-TaS_2 layers. It exhibits distinctive transport properties, including a prominent planar Hall effect and a fourfold oscillatory anisotropic magnetoresistance. Moreover, it shows multigap 2D superconductivity with a high in-plane upper critical field, exceeding the Pauli limit. The coexistence of multigap superconductivity and anomalous transport within the same material firmly positions misfit compounds as an ideal platform for realizing quantum effects in the two-dimensional limit of bulk crystals. This opens the door to the development of quantum devices with less complexity and enhanced tunability.

TT 93.17 Thu 18:00 P4

High pressure magnetic measurements in Cr- and U-based superconductors — •Meghan Moody[1], Ran Tao[1], Mads Hansen[1], Callum Stevens[2], Zheyu Wu[1], Theodore Weinberger[1], Andrej Cabala[3], Michal Vališka[3], Vladimir Sechovský[3], Andrew Huxley[2], Alexander Eaton[1], and Malte Grosche[1] — [1]Cavendish Laboratory, University of Cambridge, UK — [2]School of Physics and Astronomy, University of Edinburgh, UK — [3]Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic

Mapping the high pressure phase diagram of unconventional superconductors can provide new insights into the nature of their superconducting and magnetic states. We present recent high pressure magnetic susceptibility and SQUID magnetisation measurements in d- and f-electron superconductors, focusing on the Cr-based Kagomé system $CsCr_3Sb_5$ and the field-resilient U-based superconductor UTe_2. In the former, antiferromagnetic order is suppressed under pressure, giving way to a superconducting dome that peaks around 7 K at 4 GPa. In the latter, the superconducting transition line bifurcates at a moderate pressure of about 0.3 GPa, above which two transitions are observed in susceptibility and heat capacity measurements.

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Granularity-induced higher harmonics in the Little-Parks effect of Kagome superconductors — •Artem Kokovin[1], Daniel Schultz[1], and Jörg Schmalian[1,2] — [1]Institut für Theorie der Kondensierten Materie, Karlsruher Institut für Technologie, 76131 Karlsruhe, Germany — [2]Institut für Quantenmaterialien und Technologien, Karlsruher Institut für Technologie, 76131 Karlsruhe, Germany

We develop a theoretical framework for the emergence of higher-order harmonics in the Little-Parks oscillations observed in Kagome superconductors. Motivated by recent experiments suggesting that certain Kagome compounds exhibit pronounced granularity, an effect that appears to be enhanced by the onset of charge-density-wave order, we construct a two-stage model capturing the interplay of microscopic and mesoscopic physics. On the microscopic level, we derive the effective Josephson coupling of a granular structure, including higher-harmonic contributions to the coupling. On the mesoscopic level, we analyze the magnetic-field dependence of the superconducting free energy in the presence of these Josephson couplings, demonstrating how disorder and granularity convert these Josephson interactions into higher-order Little-Parks oscillations. Our central result is that such higher harmonics naturally arise when the underlying pairing state in Kagome materials is unconventional, providing a clear diagnostic for identifying nontrivial superconducting order in this family of systems.

TT 93.19 Thu 18:00 P4

Superconductivity in Mott Altermagnets — •Robin Schleicher and Maria Daghofer — Institute for Functional Matter and Quantum Technologies, University of Stuttgart

Earlier studies on the Hubbard model have shown that the ground state of two holes in a small cluster lattice shows d-wave symmetry. While pairing by holes doped into half-filled Hubbard models has been intensively investigated, we extend such an analysis to the case of doped strong-coupling altermagnets. In this new approach, we investigate differences to strong-coupling antiferromagnets as well as to weak-coupling superconductivity in altermagnets. To do so, we use exact diagonalization techniques for a checkerboard model. In our case, nodes in d-wave altermagnetism do not coincide with gap nodes expected from the Hubbard model. We discuss the extend of d-wave superconductivity and its competition with other pairing symmetries. We find altermagnetism to suppress pairing compared to antiferromangetism. We also discuss applications to inverted Lieb lattices relevant to Mott-altermagnet materials.