



# Alexei E. Koshelev

## CURRICULUM VITÆ

**Web sites:** Web of Science, ORCID, Google Scholar

### Education

- 1986 Ph.D. in Physics, Landau Institute of Theoretical Physics, USSR Academy of Sciences,  
Ph.D. *Interaction between excitations and dislocations in crystals.*,  
Supervisor: Prof. S. V. Iordanskii
- 1983-1986 Graduate School at the Landau Institute of Theoretical Physics, USSR Academy of Sciences.
- 1977-1983 Studies at the Moscow Institute of Physics and Technology.

### Employment

- 2024-present *Research Professor*, Department of Physics & Astronomy, UNIVERSITY OF NOTRE DAME, USA
- 1999-2024 *Physicist*, Materials Science Division, ARGONNE NATIONAL LABORATORY, USA
- 1996-1999 *Term scientist*, Materials Science Division, ARGONNE NATIONAL LABORATORY, USA
- 1993-1996 *Visiting scientist*, Materials Science Division, ARGONNE NATIONAL LABORATORY, USA
- 1991-1993 *Visiting scientist*, Kamerlingh Onnes Laboratory, LEIDEN UNIVERSITY, The Netherlands
- 1989-1991 *Senior Researcher*, INSTITUTE OF SOLID STATE PHYSICS, Chernogolovka, USSR
- 1986-1989 *Researcher*, INSTITUTE OF SOLID STATE PHYSICS, Chernogolovka, USSR

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## Awards

- 1998: Distinguished Performance Award of University of Chicago (together with G.Crabtree, W.Kwok, V.Vinokur, and U.Welp) for playing a leading role in the development of the science of magnetic vortex effects in superconductors
- 1998: STA Fellowship from Japan Science and Technology Corporation
- 2003: Fellow of the American Physical Society
- 2015: The Abrikosov Prize in Vortex Physics (together with Lev Bulaevskii and Masashi Tachiki)
- 2018: Outstanding Referee for the journals of the American Physical Society

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## Grants

- 2009-2018 Co-PI in Energy Frontier Research Center “*Center for Emergent Superconductivity*” (BNL, ANL, and Univ. of Illinois, Urbana-Champaign), Coordinators J.C. Séamus Davis (BNL), 2009-2014 and Peter Johnson (BNL), 2014-2018, Total award 11682 K\$
- 2012-2017 Co-PI in SciDAC project “*Optimizing Superconductor Transport Properties through Large-Scale Simulation* (OSCon)”, Coordinator Andreas Glatz (ANL), Total award 2500 K\$
- 2014-2017 PI in LDRD project “*Josephson plasma wave-based ultra-high frequency electronics*”, Total award 504 K\$

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## Research Activities

Since Fall 1993 till January 2024 I have been working in the Superconductivity and Magnetism group of the Materials Science Division, Argonne National Laboratory. My major field is theory of superconductivity including the vortex matter, intrinsic Josephson junctions, including generation of terahertz wave with Josephson effect, multiple-band superconductivity, and, more recently, magnetic iron pnictides. I am also working on theory of transport in antiferromagnetic and nearly-antiferromagnetic metals near quantum critical point.

### 2010-pres.

- Magnetically ordered Eu-based iron-pnictide superconductors[22, 20, 16, 14, 11, 9, 10, 7, 6, 5]
- Theory and simulations of vortex pinning (with R. Willa, A. Glatz, I. Sadovskyy, A. Kolton)[64, 37, 36, 34, 31, 28, 23, 17].
- Effect of orbital quantization on upper critical field in multiple-band superconductors (with K. W. Song)[29, 25, 18]
- Magnetotransport in antiferromagnetic metals [51, 32, 8]
- Theory of proximity effect in between  $s$  and  $s_{\pm}$  superconductors (with V. Stanev)[63, 58, 57].

### 2000-2010

- Josephson generation of terahertz radiation from layered high-temperature superconductors (with L.Bulaevskii (LANL))[99, 96, 92, 90, 89, 85, 83, 76, 70].
- Theory of two-band superconductivity in  $\text{MgB}_2$  (with A. Golubov (Univ. of Twente) and A.

Varlamov (Univ. of Rome))[118, 115, 111, 107, 101, 44].

- Dynamic and static properties of Josephson vortex lattice in layered superconductors[137, 136, 130, 123, 114, 100, 94, 93, 50].

### 1993-2000

- Crossing vortex lattices and phase diagram in very anisotropic layered superconductors in tilted magnetic field[142, 116, 103, 98, 97, 66, 24].
- Theory of the Josephson plasma resonance in vortex state in layered superconductors (with L.Bulaevskii (LANL))[155, 143, 140, 134].
- Probing of phase diagram of layered superconductors by large-scale Monte Carlo simulations[149]. Crossover between the pointlike and linelike regimes of melting. Universal properties of the linelike melting regime [145, 13] (with H. Nordborg). Melting of pancake vortex lattices in layered superconductors with only magnetic interlayer coupling (with M.Dodgson and H.Fangohr)[138, 120].
- Vortex fluctuations in layered superconductors with columnar defects. Thermal depinning of vortex lines from columnar defects (with V.Vinokur and P.Le Doussal)[160].
- Influence of pancake vortices on c-axis transport in layered superconductors[161].
- Influence of pinning potential on the melting transition of static and moving vortex lattice. Dynamic melting transition and dynamic phase diagram in the temperature-current plane (with V.Vinokur)[168].

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## Major Achievements

*Citations as of March 2024*

2007 *Coherent terahertz radiation from intrinsic Josephson junctions*, Ref. [90] [617 citations]

Intrinsic Josephson-junction stacks are realized in mesas fabricated out of high-temperature superconductors may be used as sources of coherent electromagnetic radiation in the terahertz range. The major challenge is to synchronize Josephson oscillations in all junctions in the stack to get significant radiation out of the crystal edge parallel to the c axis. In wide stacks phase oscillations excite the in-phase cavity mode when the Josephson frequency matches the resonance frequency which is set by the stack lateral size. This wave synchronizes all junctions in the stack. Successful detection of resonant continuous-wave radiation of sizable power from mesoscopic crystals of the layered high-temperature superconductor  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$  marked a breakthrough in the field and led to many new developments. The observed resonance frequencies are in the range 0.4-0.85 THz, they scale roughly inversely proportional to the mesa widths. Further theoretical developments include evaluation of the I-V characteristics and radiated power near the resonance for arbitrary modulation of Josephson current [89] [97 citations] and discovery of novel dynamic kink state self-generated by internal resonance in stacks of intrinsic Josephson junctions[85] [99 citations].

1991 *Decoupling between superconducting layers due to vortex fluctuations in high-temperature superconductors*, Ref. [188] [518 citations]

The effect of suppression of the interlayer coupling by vortex fluctuations in layered superconductors was first proposed in this paper. The position of the phase line, at which this suppression becomes strong, (the decoupling line) was estimated. The effect was found to have a major influence on the magnetic and transport properties of layered High  $T_c$  superconductors in a wide field and temperature range.

1994 *Dynamic melting of the vortex lattice*, Ref. [168] [497 citations]

A distinct transition in the moving vortex array from the incoherent fluidlike motion to the coherent crystallike motion with increase of the driving force was predicted theoretically and found in numerical simulations. A new concept of dynamic phase transitions had strong experimental and theoretical impact.

1999 *Crossing vortex lattices in layered superconductors*, Ref. [142] [218 citations]

Magnetic field applied at finite angle with respect to the layers generates a unique vortex configuration, crossing lattices of Josephson vortices and stacks of pancake vortices. Vortex densities of two sublattices depend on magnitude and orientation of magnetic field and can be varied in wide ranges leading to a very rich spectrum of vortex-lattice configurations. Significant attractive coupling between the two sublattices leads to the phase-separated states in which pancake lattice splits into stripes with different density. Underlying Josephson vortex lattice influences melting transition of the pancake vortex lattice leading to anomalous angular dependence of the melting field. Theory was further developed in Refs. [116, 103]. In particular, rich internal structure of vortex chains has been revealed in Ref. [103].

2003 *Theory of multiple-band superconductors*, Ref. [118] [116 citations], Ref. [115] [110 citations], Ref. [111] [63 citations]

Motivated by discovery of two-band superconducting compound  $\text{MgB}_2$  with transition temperature close to 40 K, the comprehensive theory of two-band superconductors has been developed. The vortex state in a two-band superconductor with strong intraband and weak interband scattering rates was investigated in Ref. [118]. The results demonstrated the existence of two distinct length scales corresponding to different bands provided qualitative interpretation of STM experiments on vortex structure imaging in  $\text{MgB}_2$ . In the Ref. [115], the upper critical field for different orientations were calculated. It was shown that strong disparities in pairing interactions and diffusion constant anisotropies for two bands influence the in-plane  $H_{c2}$  in a different way at high and low temperatures. This causes temperature-dependent  $H_{c2}$  anisotropy, in agreement with experimental data in  $\text{MgB}_2$ . The three-dimensional band most strongly influences the in-plane  $H_{c2}$  near the transition temperature  $T_c$ , in the Ginzburg-Landau (GL) region. However the GL theory is applicable only in an extremely narrow temperature range near  $T_c$ . The angular dependence of  $H_{c2}$  deviates from a simple effective-mass law even near  $T_c$ . The predicted angular dependence has been confirmed by experiment. In later work, Ref. [111], it was established that the reason for insufficiency of the GL theory in materials like  $\text{MgB}_2$  lies in strong disparity between the coherence lengths in two bands. As a consequence, the expansion with respect to the gradients of the order parameter fails very close to the transition temperature.

1996 *Josephson plasma resonance in layered superconductors*, Ref. [155] [110 citations]

Plasma resonance is proven to be a powerful tool to probe interlayer Josephson coupling in different regions of vortex phase diagram. Surprisingly, the resonance has been found to persist deeply in

the vortex liquid phase. It was shown in this paper that the Josephson plasma resonance probes a short-time/small-scale coherence and therefore persists in the region where the global phase coherence is broken. The plasma frequency in the liquid phase has been calculated using the high-temperature expansion with respect to the Josephson coupling energy and found to be in a good quantitative agreement with experiment. These ideas were further developed in the series of articles [147], [144], [143], [140], and [134] [collaboration with Lev Bulaevskii (LANL)].

2003 *Concept of  $\varphi$  Josephson junction*, Ref. [117] [132 citations]

We considered the properties of a periodic structure consisting of small alternating 0- and  $\pi$ -Josephson junctions. We demonstrated that depending on the relation between the lengths of individual junctions, this system can be either in the homogeneous or in the phase-modulated state. The modulated phase appears via a second-order phase transition when the mismatch between the lengths of individual junctions drops below the critical value. In the modulated state, the equilibrium phase difference in the structure can take any value from  $-\pi$  to  $\pi$ . We named this state as “ $\varphi$ -junction” and investigated its unusual properties. Later such peculiar Josephson junctions have been found in several physical systems [collaboration with Alexander Buzdin].

1990 *Surface-barrier effects in magnetization of High- $T_c$  superconductors*, Ref. [190] [236 citations], Ref. [171] [143 citations]

It was experimentally and theoretically demonstrated that thermally activated penetration of pancake vortices through the surface barrier have strong influence on the magnetic properties of high- $T_c$  superconductors. Importance of surface effects was later widely recognized by the research community. The theoretical ideas were further developed in the articles [182], [175], and [157].

## Professional Activities

Member of the American Physical Society, since 1994

Member of International Advisory committee for the International Symposium on Intrinsic Josephson Effects and Plasma Oscillations in High- $T_c$  Superconductors

Member of International Advisory committee for the International Conference on Superconductivity and Magnetism (ICSM), Turkey

Scientific referee for Physical Review B, Physical Review Applied, Physical Review E, Nature, Scientific Reports, Journal of Physics, and Physica C

## Patents

*A tunable, superconducting, surface-emitting terahertz source*, U. Welp, A. E. Koshelev, K. E. Gray, W.-K. Kwok, V. Vlasko-Vlasov, United States Patent US 7,610,071 B2

## Recent and selected invited talks

2022 35th International Symposium on Superconductivity (ISS2022), Nagoya, Japan, November 29- December 1, 2022 (online)

2021 7th International Conference on Superconductivity and Magnetism- ICSM2020, Bodrum/Mugla, Turkey, October 21-27, 2021 (online)

- 2021 The 12th International Conference on Intrinsic Josephson Effect and Horizons of Superconducting Spintronics, Chisinau, Moldova, September 22-25, 2021 (online)
- 2021 18th International Online Conference on Vortex Matter in Superconductors , Kanpur and Mumbai, India, May 27-June 4 2021 (online)
- 2020 Superconducting Terahertz Device 2020 (STD20), Glasgow, UK, August 21 (online)
- 2020 Niobium-3-Tin Superconducting Radio Frequency Science, Technology, and Applications (Nb3SnSRF20), Cornell University, Ithaca, NY, USA, November 10-13, 2020 (online)
- 2019 XVII International Workshop on Vortex Matter in Superconductors, Antwerp, Belgium, May 20-25
- 2019 International Symposium on Intrinsic Josephson Effects and Plasma Oscillations in High-Tc Superconductors (PLASMA 2019), University of Central Florida, Orlando, FL, USA, January 18-21
- 2018 6th International Conference on Superconductivity and Magnetism (ICSM2018), Beldibi/Antalya, Turkey, April 29 - May 04
- 2017 16th International Workshop on Vortex Matter, Natal, Brazil, May 28 -June 03
- 2016 10th International Symposium on Intrinsic Josephson Effects and Plasma Oscillations in High-Tc Superconductors (Plasma+ 2016), Nanjing, China, Oct. 9-12
- 2016 International Workshop “Interference of Magnetism and Superconductivity”, Natal, Brazil, July 18 to September 02
- 2015 11th International Conference on Materials and Mechanisms in Superconductivity (M2S-XI), Geneva, Switzerland, August 23-28
- 2015 15th International Workshop on Vortex Matter in Superconductors, El Escorial, Spain, May 10-15
- 2015 14th International Workshop on Vortex Matter in Superconductors, Nanjing, China, May 21-27
- 2013 APS March Meeting, Baltimore, Maryland, USA, March 18-22
- 2012 Novel Phenomena in Multi-Condensate Superconductors, Superfluids, and Ultracold Gases, CECAM-HQ-EPFL, Lausanne, Switzerland, August 27 - 29
- 2012 8th International Symposium on Intrinsic Josephson Effects and Plasma Oscillations in High-Tc Superconductors (PLASMA 2012), Cesme, Izmir, Turkey, June 10 - 13
- 2011 Second JST-DFG Workshop on Terahertz Superconductor Electronics, Blaubeuren, Germany, October 16-19
- 2011 Workshop “Superconductivity and Magnetism, SM-2011”, Chisinau, Moldova, October 6 - 10
- 2011 4th International Conference “Fundamental Problems of High-Temperature Superconductivity” (FPS-11), Zvenigorod, Russia, October 3-7
- 2009 APS March meeting, Pittsburgh, PA, USA, March 16-20

- 2008 International Conference On Superconductivity and Magnetism (ICSM 2008), Side, Antalya, Turkey, August 25-29
- 2008 25th International Conference on Low Temperature Physics (LT25), Amsterdam, The Netherlands, August 6-13
- 2008 APS March meeting, New Orleans, Louisiana, March 10-14, 2008

## Languages

Russian **Mother tongue**  
 English **Fluent**

**PUBLICATION METRICS** (Mar 2024): 209 publications, 8620 citations, h-index 46

## Publications

- [1] A. E. Koshelev, R. Chapai, D. Y. Chung, J. F. Mitchell, and U. Welp. “Origin of anomalous magnetotransport in kagome superconductors  $AV_3Sb_5$  ( $A = K, Rb, Cs$ )”. In: *Phys. Rev. B* 110 (2 2024), p. 024512.
- [2] Kelly J. Neubauer, Mason L. Klemm, Shirin Mozaffari, Lin Jiao, Alexei E. Koshelev, Alexander Yaresko, Ming Yi, Luis Balicas, and Pengcheng Dai. “In-plane anisotropic magnetoresistance in detwinned  $BaFe_{2-x}Ni_xAs_2$  ( $x = 0, 0.6$ )”. In: *Phys. Rev. B* 109 (5 2024), p. 054435.
- [3] K.J. Kihlstrom, K.C. Reddy, S. Elghazoly, T.E. Sharma, A.E. Koshelev, U. Welp, Y. Hao, R. Divan, M. Tsujimoto, K. Kadowaki, W.-K. Kwok, and T.M. Benseman. “Powerful Terahertz Emission from a  $Bi_2Sr_2CaCu_2O_{8+\delta}$  Mesa Operating Above 77 K”. In: *Phys. Rev. Appl.* 19 (3 2023), p. 034055.
- [4] R. Chapai, A. Rydh, M. P. Smylie, D. Y. Chung, H. Zheng, A. E. Koshelev, J. E. Pearson, W.-K. Kwok, J. F. Mitchell, and U. Welp. “Superconducting properties of the spin Hall candidate  $Ta_3Sb$  with eightfold degeneracy”. In: *Phys. Rev. B* 105 (18 2022), p. 184510.
- [5] A. E. Koshelev. “Phenomenological theory of the magnetic  $90^\circ$  helical state”. In: *Phys. Rev. B* 105 (9 2022), p. 094441.
- [6] A. E. Koshelev. “Spin waves and high-frequency response in layered superconductors with helical magnetic structure”. In: *Phys. Rev. B* 103 (21 2021), p. 214503.
- [7] D. Collomb, S. J. Bending, A. E. Koshelev, M. P. Smylie, L. Farrar, J.-K. Bao, D. Y. Chung, M. G. Kanatzidis, W.-K. Kwok, and U. Welp. “Observing the Suppression of Superconductivity in  $RbEuFe_4As_4$  by Correlated Magnetic Fluctuations”. In: *Phys. Rev. Lett.* 126 (15 2021), p. 157001.
- [8] Nikola Maksimovic, Ian M. Hayes, Vikram Nagarajan, James G. Analytis, Alexei E. Koshelev, John Singleton, Yeonbae Lee, and Thomas Schenkel. “Magnetoresistance Scaling and the Origin of  $H$ -Linear Resistivity in  $BaFe_2(As_{1-x}P_x)_2$ ”. In: *PHYSICAL REVIEW X* 10 (4 2020), p. 041062.

- [9] A. E. Koshelev. “Suppression of Superconducting Parameters by Correlated Quasi-two-dimensional Magnetic Fluctuations”. In: *PHYSICAL REVIEW B* 102.5 (2020), 054505.
- [10] V. K. Vlasko-Vlasov, U. Welp, A. E. Koshelev, M. Smylie, J.-K. Bao, D. Y. Chung, M. G. Kanatzidis, and W.-K. Kwok. “Cooperative Response of Magnetism and Superconductivity in the Magnetic Superconductor  $\text{RbEuFe}_4\text{As}_4$ ”. In: *PHYSICAL REVIEW B* 101.10 (2020), 104504.
- [11] A. E. Koshelev. “Helical Structures in Layered Magnetic Superconductors Due to Indirect Exchange Interactions Mediated by Interlayer Tunneling”. In: *PHYSICAL REVIEW B* 100.22 (2019), 224503.
- [12] T. M. Benseman, A. E. Koshelev, V. Vlasko-Vlasov, Y. Hao, U. Welp, W.-K. Kwok, B. Gross, M. Lange, D. Koelle, R. Kleiner, H. Minami, M. Tsujimoto, and K. Kadowaki. “Observation of a Two-mode Resonant State in a  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$  Mesa Device for Terahertz Emission”. In: *PHYSICAL REVIEW B* 100.14 (2019), 144503.
- [13] A. E. Koshelev, K. Willa, R. Willa, M. P. Smylie, J.-K. Bao, D. Y. Chung, M. G. Kanatzidis, W.-K. Kwok, and U. Welp. “Melting of Vortex Lattice in the Magnetic Superconductor  $\text{RbEuFe}_4\text{As}_4$ ”. In: *PHYSICAL REVIEW B* 100.9 (2019), 094518.
- [14] M. P. Smylie, A. E. Koshelev, K. Willa, R. Willa, W.-K. Kwok, D. Y. Bao J.-K. and Chung, M. G. Kanatzidis, J. Singleton, F. F. Balakirev, H. Hebbeker, P. Niraula, E. Bokari, A. Kayani, and U. Welp. “Anisotropic Upper Critical Field of Pristine and Proton-irradiated Single Crystals of the Magnetically Ordered Superconductor  $\text{RbEuFe}_4\text{As}_4$ ”. In: *PHYSICAL REVIEW B* 100.5 (2019), 054507.
- [15] V. G. Kogan, R. Prozorov, and A. E. Koshelev. “Temperature-dependent Anisotropies of Upper Critical Field and London Penetration Depth”. In: *PHYSICAL REVIEW B* 100.1 (2019), 014518.
- [16] K. Willa, R. Willa, J.-K. Bao, A. E. Koshelev, D. Y. Chung, M. G. Kanatzidis, W.-K. Kwok, and U. Welp. “Strongly Fluctuating Moments in the High-temperature Magnetic Superconductor  $\text{RbEuFe}_4\text{As}_4$ ”. In: *PHYSICAL REVIEW B* 99.18 (2019), 180502.
- [17] Ivan A. Sadovskyy, Alexei E. Koshelev, Wai-Kwong Kwok, Ulrich Welp, and Andreas Glatz. “Targeted Evolution of Pinning Landscapes for Large Superconducting Critical Currents”. In: *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA* 116.21 (2019), pp. 10291–10296.
- [18] Kok Wee Song and Alexei E. Koshelev. “Quantum FFLO State in Clean Layered Superconductors”. In: *PHYSICAL REVIEW X* 9.2 (2019), 021025.
- [19] A. V. Putilov, C. Di Giorgio, V. L. Vadimov, D. J. Trainer, E. M. Lechner, J. L. Curtis, M. Abdel-hafiez, O. S. Volkova, A. N. Vasiliev, D. A. Chareev, G. Karapetrov, A. E. Koshelev, A. Yu. Aladyshkin, A. S. Mel’nikov, and M. Iavarone. “Vortex-core Properties and Vortex-lattice Transformation in  $\text{FeSe}$ ”. In: *PHYSICAL REVIEW B* 99.14 (2019), 144514.
- [20] V. K. Vlasko-Vlasov, A. E. Koshelev, M. Smylie, D. Y. Bao J.-K. and Chung, M. G. Kanatzidis, U. Welp, and W.-K. Kwok. “Self-induced Magnetic Flux Structure in the Magnetic Superconductor  $\text{RbEuFe}_4\text{As}_4$ ”. In: *PHYSICAL REVIEW B* 99.13 (2019), 134503.



- [21] Kristin Willa, Roland Willa, Kok Wee Song, G. D. Gu, John A. Schneeloch, Ruidan Zhong, Alexei E. Koshelev, Wai-Kwong Kwok, and Ulrich Welp. “Nanocalorimetric Evidence for Nematic Superconductivity in the Doped Topological Insulator  $\text{Sr}_{0.1}\text{Bi}_2\text{Se}_3$ ”. In: *PHYSICAL REVIEW B* 98.18 (2018), 184509.
- [22] M. P. Smylie, K. Willa, K. Bao J.-K. and Ryan, Z. Islam, H. Claus, Y. Simsek, Z. Diao, A. Rydh, A. E. Koshelev, W.-K. Kwok, D. Y. Chung, M. G. Kanatzidis, and U. Welp. “Anisotropic Superconductivity and Magnetism in Single-crystal  $\text{RbEuFe}_4\text{As}_4$ ”. In: *PHYSICAL REVIEW B* 98.10 (2018), 104503.
- [23] Roland Willa, Alexei E. Koshelev, Ivan A. Sadovskyy, and Andreas Glatz. “Peak Effect Due to Competing Vortex Ground States in Superconductors with Large Inclusions”. In: *PHYSICAL REVIEW B* 98.5 (2018), 054517.
- [24] P. J. Curran, H. A. Mohammed, S. J. Bending, A. E. Koshelev, Y. Tsuchiya, and T. Tamegai. “Tuning the Structure of the Josephson Vortex Lattice in  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$  Single Crystals with Pancake Vortices”. In: *SCIENTIFIC REPORTS* 8 (2018), 10914.
- [25] Kok Wee Song and Alexei E. Koshelev. “Interplay between Orbital-quantization Effects and the Fulde-Ferrell-Larkin-Ovchinnikov Instability in Multiple-band Layered Superconductors”. In: *PHYSICAL REVIEW B* 97.22 (2018), 224520.
- [26] M. P. Smylie, K. Willa, H. Claus, A. E. Koshelev, K. W. Song, W. K. Kwok, Z. Islam, G. D. Gu, J. A. Schneeloch, R. D. Zhong, and U. Welp. “Superconducting and Normal-state Anisotropy of the Doped Topological Insulator  $\text{Sr}_{0.1}\text{Bi}_2\text{Se}_3$ ”. In: *SCIENTIFIC REPORTS* 8 (2018), 7666.
- [27] Y. Simsek, V. Vlasko-Vlasov, A. E. Koshelev, T. Benseman, Y. Hao, I. Kesgin, H. Claus, J. Pearson, W.-K. Kwok, and U. Welp. “Thick  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$  Films Grown by Liquid-phase Epitaxy for Josephson THz Applications”. In: *SUPERCONDUCTOR SCIENCE & TECHNOLOGY* 31.1 (2018), 015009.
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- [33] Kok Wee Song and Alexei E. Koshelev. “Surface Nematic Order in Iron Pnictides”. In: *PHYSICAL REVIEW B* 94.9 (2016), 094509.
- [34] Ivan A. Sadovskyy, Ying Jia, Maxime Leroux, Jihwan Kwon, Hefei Hu, Lei Fang, Carlos Chaparro, Shaofei Zhu, Ulrich Welp, Jian-min Zuo, Yifei Zhang, Ryusuke Nakasaki, Venkat Selvamanickam, George W. Crabtree, Alexei E. Koshelev, Andreas Glatz, and Wai-Kwong Kwok. “Toward Superconducting Critical Current by Design”. In: *ADVANCED MATERIALS* 28.23 (2016), pp. 4593–4600.
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