

Serafim Teknowijoyo

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Education

- 2012 – 2018 Iowa State University, Ph.D. in Condensed Matter Physics
- 2007 – 2012 Iowa State University, B.S. Physics, minor: Mathematics

Research Experience

- 2019 – present Postdoctoral research scientist working with Dr. Armen Gulian, Advanced Physics Laboratory, Institute for Quantum Studies, Chapman University.

Major activities:

- Current: investigating novel effects in alkane-wetted graphene layer. The system shows nearly perfect diamagnetism at room temperature which has significant and exciting ramifications to condensed matter physics [preprint]. The current effort is focused on upgrading the apparatus and the experimental conditions to obtain stronger and more conclusive evidence.
- Trained in the operation and data processing of various characterization systems such as Raman and FT-infrared spectroscopies, SEM and quadrupole mass analyzer.
- Programmed and maintained LabView user interfaces for instrument data acquisition and automation.
- Contributed to proposal submission process for new funding opportunities.

- 2014 – 2018 Graduate research assistant under Prof. Ruslan Prozorov and Dr. Makariy A. Tanatar at Ames Laboratory, U.S. DOE.

Thesis title: Study of the energy gap structure in iron-based superconductors using London penetration depth and artificial disorder.

Major projects:

- Simplified thermal conductivity probe prototype that can be conveniently transported and installed on different cryostats when there is a need to access various key parameters (such as temperature, high magnetic field, vector-magnet, etc.). The whole unit is designed so that it can be installed and uninstalled without dismounting the sample. Possible instruments (but not limited to): dilution refrigerator, ^3He , PPMS, MPMS, etc.
- Probed the superconductivity in one of the earlier candidates for topological superconductor PdTe_2 . The results are consistent with a typical type-I superconductor [6] and a follow up project to probe the symmetry of the order parameter by electron irradiation is consistent with A_{1g}^+ symmetry [3].

- Probed the energy gap structure in various iron-based superconductors, including FeSe [11], SrP122 series [13], BaK122 series [5,12] and CaK1144 series [8,9] using London penetration depth and electron irradiation measurements. The results for these families can be explained in the s_{\pm} paradigm, which give more weight for the s_{\pm} symmetry being universally true for all iron-based superconductors.
- Investigated a frustrated pyrochlore magnet (dubbed “spin ice”) $\text{Dy}_2\text{Ti}_2\text{O}_7$ using AC magnetic measurement in the radio-frequency and low temperature regime. In the radio-frequency of 15 MHz, we found a shift in H of the phase boundaries which were previously studied in low-frequency regime. Our result gives new insight about the dynamical spin correlation and the frequency dependence of the low temperature magnetic phases of the spin ice material. The manuscript is being finalized for publication.

2011 Undergraduate summer research project with Prof. Michael Tringides. For two months I learned to analyze the topography and density of epitaxial lead islands on silicon substrate in scanning tunneling microscopy images.

2010 Three weeks research project in CERN, Switzerland with Prof. John Hauptman. We contributed in the development of dual-readout calorimeters (DREAM) using the nature of polarized Cherenkov light emitted by high-density scintillators for particle and energy detection purposes.

Skills

- Lab skills:
 - Cryogenics
 - Operation of ^3He , dilution refrigerator and PPMS cryostats
 - Tunnel-diode oscillator based London penetration depth and magnetic susceptibility measurements
 - Low-noise measurements in radio frequency regime
 - Taken a practical course on SEM
 - Drafting peer-reviewed publications
 - Designing low-temperature research apparatus
 - Vacuum leak detection and repair
 - Ability to maintain and observe safety protocols of general lab equipment and electronics
- Computer skills:
 - LabView
 - OriginLab
 - Igor Pro
 - Mathematica
 - LaTeX
 - Microsoft Office
 - Autodesk Inventor
 - basic PCB designing
 - Taken courses on Java, VB and Python.

. Conference Presentations/Posters

- 2018 Presented at the American Physical Society March Meeting 2018 in Los Angeles. Presentation format: 10 minutes + 2 for questions; title: [Probing the superconducting state in \$\text{CaK}\(\text{Fe}_{1-x}\text{Ni}_x\)_4\text{As}_4\$ \(\$x = 0, 0.05\$ \) using artificial disorder](#)
- 2018 Poster session at the Fundamentals of Quantum Materials Winter School 2018 which was hosted by the University of Maryland. Poster title: [Study of superconducting gap structure in iron-based superconductors using London penetration depth and disorder](#)
- 2017 Presented at the American Physical Society March Meeting 2017 in New Orleans. Presentation format: 10 minutes + 2 for questions; title: [Fully-gapped anisotropic superconductivity robust against point-like disorder in FeSe single crystals](#)
- 2016 Presented at the American Physical Society March Meeting 2016 in Baltimore. Presentation format: 10 minutes + 2 for questions; title: [Radio-frequency magnetic susceptibility of spin ice crystals \$\text{Dy}_2\text{Ti}_2\text{O}_7\$ using tunnel diode resonator](#)
- 2015 Presented at the American Physical Society March Meeting 2015 in San Antonio. Presentation format: 10 minutes + 2 for questions; title: [Superconductivity of \$\(\text{Ba}_{1-x}\text{K}_x\)\text{Fe}_2\text{As}_2\$ with and without artificial disorder over the entire doping range](#)

Publication List

- [1] Yasushi Kawashima, Rajendra Dulal, Serafim Teknowijoyo, Sara Chahid and Armen Gulian, [Ideal diamagnetic response at room temperature by graphene-n-heptane-permalloy system](#), Modern Physics Letters B 2050415 (2020)
- [2] Armen Gulian, Rajendra Dulal, Serafim Teknowijoyo and Sara Chahid, [Dialogue on a superconducting laser operating via nonequilibrium inversed population](#), Modern Physics Letters B 2030005 (2020)
- [3] E. I. Timmons, S. Teknowijoyo, M. Konczykowski, O. Cavani, M. A. Tanatar, Sunil Ghimire, Kyuil Cho, Yongbin Lee, Liqin Ke, Na Hyun Jo, S. L. Bud'ko, P. C. Canfield, Peter P. Orth, Mathias S. Scheurer and R. Prozorov, [Electron irradiation effects on superconductivity in \$\text{PdTe}_2\$: An application of a generalized Anderson theorem](#), Physical Review Research **2**, 023140 (2020)
- [4] Kyuil Cho, M. Konczykowski, **S. Teknowijoyo**, M. A. Tanatar, J. Guss, P. B. Gartin, J. M. Wilde, A. Kreyssig, R. J. McQueeney, A. I. Goldman, V. Mishra, P. J. Hirschfeld and R. Prozorov, [Using controlled disorder to probe the interplay between charge order and superconductivity in \$\text{NbSe}_2\$](#) , Nature Communications **9**, 2796 (2018)
- [5] Avior Almoalem, Alon Yagil, Kyuil Cho, **Serafim Teknowijoyo**, Makariy A. Tanatar, Ruslan Prozorov, Yong Liu, Thomas A. Lograsso and Ophir M. Auslaender, [Dependence of the absolute value of the penetration depth in \$\(\text{Ba}_{1-x}\text{K}_x\)\text{Fe}_2\text{As}_2\$ on doping](#), Physical Review B **98**, 054516 (2018)
- [6] **S. Teknowijoyo**, Na Hyun Jo, Mathias S. Scheurer, M. A. Tanatar, Kyuil Cho, S. L. Bud'ko, Peter P. Orth, P. C. Canfield and R. Prozorov, [Nodeless superconductivity in the type-II Dirac semimetal \$\text{PdTe}_2\$: London penetration depth and pairing symmetry analysis](#), Physical Review B **98**, 024508 (2018)

- [7] Kyuil Cho, M. Konczykowski, **S. Teknowijoyo**, M. A. Tanatar and R. Prozorov, [Using electron irradiation to probe iron-based superconductors](#), *Superconductor Science and Technology* **31**, 6 (2018)
- [8] **S. Teknowijoyo**, K. Cho, M. Konczykowski, E. I. Timmons, M. A. Tanatar, W. R. Meier, M. Xu, S. L. Bud'ko, P. C. Canfield and R. Prozorov, [Robust \$s_{\pm}\$ pairing in \$\text{CaK}\(\text{Fe}_{1-x}\text{Ni}_x\)_4\text{As}_4\$ \(\$x = 0\$ and \$0.05\$ \) from the response to electron irradiation](#), *Physical Review B* **97**, 140508(R) (2018)
- [9] Kyuil Cho, A. Fente, **S. Teknowijoyo**, M. A. Tanatar, K. R. Joshi, N. M. Nusran, T. Kong, W. R. Meier, U. Kaluarachchi, I. Guillamon, H. Suderow, S. L. Bud'ko, P. C. Canfield and R. Prozorov, [Nodeless multiband superconductivity in stoichiometric single-crystalline \$\text{CaKFe}_4\text{As}_4\$](#) , *Physical Review B* **95**, 100502(R) (2017)
- [10] Mojammel A. Khan, A. B. Karki, T. Samanta, D. Browne, S. Stadler, I. Vekhter, Abhishek Pandey, P. W. Adams, D. P. Young, **S. Teknowijoyo**, R. Prozorov and D. E. Graf, [Complex superconductivity in the noncentrosymmetric compound \$\text{Re}_6\text{Zr}\$](#) , *Physical Review B* **94**, 144515 (2016)
- [11] **S. Teknowijoyo**, K. Cho, M. A. Tanatar, J. Gonzales, A. E. Bohmer, O. Cavani, V. Mishra, P. J. Hirschfeld, S. L. Bud'ko, P. C. Canfield and R. Prozorov, [Enhancement of superconducting transition temperature by pointlike disorder and anisotropic energy gap in FeSe single crystals](#), *Physical Review B* **94**, 064521 (2016)
- [12] Kyuil Cho, Marcin Konczykowski, **Serafim Teknowijoyo**, Makariy A. Tanatar, Yong Liu, Thomas Lograsso, Warren E. Straszheim, Vivek Mishra, Saurabh Maiti, Peter J. Hirschfeld and Ruslan Prozorov, [Energy gap evolution across the superconductivity dome in single crystals of \$\(\text{Ba}_{1-x}\text{K}_x\)\text{Fe}_2\text{As}_2\$](#) , *Science Advances* **2**, 9 e1600807 (2016)
- [13] C. P. Strehlow, M. Konczykowski, J. A. Murphy, **S. Teknowijoyo**, K. Cho, M. A. Tanatar, T. Kobayashi, S. Miyasaka, S. Tajima and R. Prozorov, [Comparative study of the effects of electron irradiation and natural disorder in single crystals of \$\text{SrFe}_2\(\text{As}_{1-x}\text{P}_x\)_2\$ superconductor \(\$x = 0.35\$ \)](#), *Physical Review B* **90**, 020508(R) (2014)
- [14] N. Akchurin, F. Bedeschi, A. Cardini, M. Cascella, G. Ciapetti, D. De Pedis, P. Dimpfl, R. Ferrari, S. Franchino, M. Fraternali, G. Gaudio, J. Hauptman, R. Holliday, M. Incagli, F. Lacava, L. La Rotonda, S. Lee, M. Livan, E. Meoni, A. Negri, D. Pinci, A. Policicchio, F. Scuri, A. Sill, G. Susinno, **S. Teknowijoyo**, T. Venturelli, P. Torres, C. Voena and R. Wigmans, [Polarization as a tool for dual-readout calorimetry](#), *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* **638**, 1 (2011)

Honors and Awards

- 2017 **Graduate Student Travel Grant Award**, the division of Condensed Matter Physics of the American Physical Society
- F07, S08, S10 – S11 **Dean's List**, College of Liberal Arts and Sciences, Iowa State University
- 2008 **Superior Academic Performance Award**, Department of Physics and Astronomy, Iowa State University

Teaching Experience

- F12, S13, F18 **Graduate teaching assistant at Iowa State University.** I taught laboratory and recitation sessions of first year (introductory) college physics courses.
- F13 **Teaching Assistant.** I assisted in the development and the test-run of a new introductory physics course for the education major undergraduate students.
- F08 **Tutoring.** I tutored math and physics undergraduate courses under Iowa State University Academic Success Center department

Volunteer Work and Services

- F08, S09 **Treasurer of the Indonesian Student Association.** I collected and managed the budget and expenses of the association's social and promotional student activities.
- Various summers Since I turned 25, I have helped >10 friends with driving practice when they needed to get a driver's license. This experience has honed my patience, quick judgment and how to give appropriate evaluation and instruction.