

Inna Vishik

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Current Position

Assistant Professor, University of California, Davis, Department of Physics

Professional Preparation

2013-2016: Massachusetts Institute of Technology, Pappalardo Postdoctoral Fellow in Department of Physics

2006-2013: Stanford University, Ph.D Department of Applied Physics

2005-2006: Stanford University, M.S. Department of Materials Science

2003-2006: Stanford University, B.S. Department of Physics

Current and recent funding

Alfred P. Sloan Foundation: "Superconductivity at the edge: creating and understanding unconventional superconductors" \$70,000 (Sept 2019-Sept 2021)

AFOSR-YIP: "The Electronic Ingredients for Oxide High- T_c : Making Connections Between Cuprates and Bismuthates" \$450,000 (Feb 2018-Feb 2021)

DOE: "Development of advanced photoemission and x-ray techniques and application to buried interfaces and quasi-2D quantum materials" \$200,000 (Jan 2019-Dec 2020)

NSF-EAGER (co-PI): "Enabling Quantum Leap: Towards Room Temperature Quantum Logic with Topological Exciton Condensates" \$300,000 (July 2018-July 2020)

Awards

2019-2021: Sloan Research Fellowship

2013-2016: Pappalardo Fellowship, Massachusetts Institute of Technology

2009-2011: Stanford Graduate Fellowship

2006-2009: National Science Foundation Graduate Research Fellowship

Manuscripts under review

1. *Observation of long excitation lifetime in photoexcited Sb-doped Bi_2Se_3 nanoplatelets*
Adam L. Gross, Yasen Hou, Antonio Rossi, Dong Yu, and **Inna M. Vishik**
arXiv:2005.13786

Publications

29. *Three interaction energy scales in single-layer high- T_C cuprate $HgBa_2CuO_{4+\delta}$*
S. A. Sreedhar, Antonio Rossi, J. Nayak, Z. Anderson, Y. Tang, B. Gregory, M. Hashimoto, D.-H. Lu, E. Rotenberg, R. J. Birgeneau, M. Greven, M. Yi, **I. M. Vishik**
Physical Review B **102** 205109 (2020)
28. *Two phase transitions driven by surface electron-doping in WTe_2*
Antonio Rossi, Giacomo Resta, Seng Huat Lee, Ronald Dean Redwing, Chris Jozwiak, Aaron Bostwick, Eli Rotenberg, Sergey Y. Savrasov, **Inna M. Vishik**
Physical Review B **102** 121110(R) (2020)
27. *A coexistence that CuO_2 planes can see*
Inna Vishik
Science **369** 775-776 (2020)
26. *Millimetre-long transport of photogenerated carriers in topological insulators*
Yasen Hou, Rui Wang, Rui Xiao, Luke McClintock, Henry Clark Travaglini, John P. Francia, Harry Fetsch, Onur Erten, Sergey Y. Savrasov, Baigeng Wang, Antonio Rossi, **Inna Vishik**, Eli Rotenberg, Dong Yu
Nature Communications **10** 5723 (2019)
25. *Topological surface states above the Fermi level in Hf_2Te_2P*
T. J. Boyle, A. Rossi, M. Walker, P. Carlson, M. K. Miller, J. Zhao, P. Klavins, C. Jozwiak, A. Bostwick, E. Rotenberg, V. Taufour, **I. M. Vishik**, and E. H. da Silva Neto.
Physical Review B **100**, 081105(R) (2019)
24. *Rapid change of superconductivity and electron-phonon coupling through 19% doping in $Bi2212$*
Yu He, Makoto Hashimoto, Dongjoon Song, Sudi Chen, Junfeng He, **Inna M. Vishik**, Brian Moritz, Dunghai Lee, Naoto Nagaosa, Jan Zaanen, Thomas P. Devereaux, Yoshiyuki Yoshida, Hiroshi Eisaki, Donghui Lu, Zhi-Xun Shen.
Science **362**, 62-65 (2018)
23. *Photoemission perspective on pseudogap, superconducting fluctuations, and charge order: a review of recent progress*
Inna Vishik
Rep. Prog. Phys. **81**, 062501 (2018)
22. *Photoemission of Quantum Materials*
Nuh Gedik and **Inna Vishik**
Nature Physics **13**, 1029-1033 (2017)
21. *Ultrafast dynamics in the presence of antiferromagnetic correlations in electron-doped cuprate $La_{2-x}Ce_xCuO_{4\pm\delta}$*
I. M. Vishik, F. Mahmood, Z. Alpichshev, N. Gedik, J. Higgins, and R. L. Greene
Phys. Rev. B **95**, 115125 (2017)
20. *High Resolution Angle Resolved Photoemission with Tabletop 11eV Laser*
Yu He, **Inna Vishik**, Ming Yi, Shuolong Yang, Zhongkai Liu, James Lee, Sudi Chen, Slavko Rebec, Dominik Leuenberger, Alfred Zong, Michael Jefferson, Robert Moore, Patrick Kirchmann, Andrew Merriam, Zhi-Xun Shen
Reviews of Scientific Instruments **87**, 011301 (2016)
19. *Direct spectroscopic evidence for phase competition between the pseudogap and superconductivity in $Bi_2Sr_2CaCu_2O_{8+\delta}$*

- M. Hashimoto, E. A. Nowadnick, R.-H. He, **I. M. Vishik**, B. Moritz, Y. He, K. Tanaka, R. G. Moore, D. H. Lu, Y. Yoshida, M. Ishikado, T. Sasagawa, K. Fujita, S. Ishida, S. Uchida, H. Eisaki, Z. Hussain, T. P. Devereaux, and Z.-X. Shen
Nature Materials **14**, 37 (2015)
18. *Energy gaps in high-transition-temperature cuprate superconductors*
M. Hashimoto, **I. M. Vishik**, R. H. He, T. P. Devereaux, Z.-X. Shen
Nature Physics **10**, 483 (2014)
 17. *Angle resolved photoemission spectroscopy study of $HgBa_2CuO_{4+\delta}$*
I. M. Vishik, Neven Barišić, M.K. Chan, Yuan Li, D. D. Xia, Guichuan Yu, Xudong Zhao, W. S. Lee, W. Meevasana, T. P. Devereaux, Martin Greven, and Z.-X. Shen
Phys. Rev. B **89** 195141 (2014)
 16. *Phase competition in trisected superconducting dome*
I. M. Vishik, M. Hashimoto, R.-H. He, W. S. Lee, F. Schmitt, D. H. Lu, R. G. Moore, C. Zhang, W. Meevasana, T. Sasagawa, S. Uchida, K. Fujita, S. Ishida, M. Ishikado, Y. Yoshida, H. Eisaki, Z. Hussain, T. P. Devereaux, and Z.-X. Shen
Proc. Natl. Acad. Sci. **109** 18332 (2012)
 15. *Superconductivity distorted by the coexisting pseudogap in the antinodal region of $Bi_{1.5}Pb_{0.55}Sr_{1.6}La_{0.4}CuO_{6+\delta}$: A photon-energy-dependent angle-resolved photoemission study*
M. Hashimoto, R.-H. He, **I. M. Vishik**, F. Schmitt, R. G. Moore, D. H. Lu, Y. Yoshida, H. Eisaki, Z. Hussain, T. P. Devereaux, and Z.-X. Shen
Phys. Rev. B **86**, 094504 (2012)
 14. *Intrinsic ultrathin topological insulators grown via molecular beam epitaxy characterized by in-situ angle resolved photoemission spectroscopy*
J. J. Lee, F. T. Schmitt, R. G. Moore, **I. M. Vishik**, Y. Ma, and Z. X. Shen
Appl. Phys. Lett. **101**, 013118 (2012)
 13. *Angle-Resolved Photoemission Studies of Quantum Materials*
Donghui Lu, **Inna M. Vishik**, Ming Yi, Yulin Chen, Rob G. Moore, and Zhi-Xun Shen
Annual Reviews of Condensed Matter Physics **3**, 129 (2012)
 12. *Pseudogap, Superconducting Gap, and Fermi Arc in High-Tc Cuprates Revealed by Angle-Resolved Photoemission Spectroscopy*
Teppei Yoshida, Makoto Hashimoto, **Inna M. Vishik**, Zhi-Xun Shen, and Atsushi Fujimori
Journal of the Physical Society of Japan **81**, 011006 (2012)
 11. *Evidence for the Importance of Extended Coulomb Interactions and Forward Scattering in Cuprate Superconductors*
S. Johnston, **I. M. Vishik**, W. S. Lee, F. Schmitt, S. Uchida, K. Fujita, S. Ishida, N. Nagaosa, Z.-X. Shen, and T. P. Devereaux
Phys. Rev. Lett. **108**, 166404 (2012)
 10. *ARPES studies of cuprate Fermiology: superconductivity, pseudogap and quasiparticle dynamics*
I. M. Vishik, W.-S. Lee, R.-H. He, M. Hashimoto, Z. Hussain, T. P. Devereaux, and Z.-X. Shen
New Journal of Physics **12**, 105008 (2010)
 9. *Doping-Dependent Nodal Fermi Velocity of the High-Temperature Superconductor $Bi_2Sr_2CaCu_2O_{8+\delta}$ Revealed Using High-Resolution Angle-Resolved Photoemission Spectroscopy*
I. M. Vishik, W. S. Lee, F. Schmitt, B. Moritz, T. Sasagawa, S. Uchida, K. Fujita, S. Ishida,

- C. Zhang, T. P. Devereaux, and Z.-X. Shen
Phys. Rev. Lett. **104**, 207002 (2010)
8. *A momentum-dependent perspective on quasiparticle interference in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$*
I. M. Vishik, E. A. Nowadnick, W. S. Lee, Z. X. Shen, B. Moritz, T. P. Devereaux, K. Tanaka, T. Sasagawa, T. Fujii
Nature Physics **5**, 718 (2009)
 7. *Dependence of Band-Renormalization Effects on the Number of Copper Oxide Layers in Tl-Based Copper Oxide Superconductors Revealed by Angle-Resolved Photoemission Spectroscopy*
W. S. Lee, K. Tanaka, **I. M. Vishik**, D. H. Lu, R. G. Moore, H. Eisaki, A. Iyo, T. P. Devereaux, and Z. X. Shen
Phys. Rev. Lett. **103**, 067003 (2009)
 6. *A brief update of angle-resolved photoemission spectroscopy on a correlated electron system*
W. S. Lee, *I. M. Vishik*, D. H. Lu, Z. X. Shen
Journal of Physics: Condensed Matter **21**, 164217 (2009)
 5. *Superconductivity-induced self-energy evolution of the nodal electron of optimally doped $\text{Bi}_2\text{Sr}_2\text{Ca}_{0.92}\text{Y}_{0.08}\text{Cu}_2\text{O}_{8+\delta}$*
W. S. Lee, W. Meevasana, S. Johnston, D. H. Lu, **I. M. Vishik**, R. G. Moore, H. Eisaki, N. Kaneko, T. P. Devereaux, and Z. X. Shen
Phys. Rev. B **77**, 140504 (2008)
 4. *Abrupt onset of a second energy gap at the superconducting transition of underdoped $\text{Bi}2212$*
W. S. Lee, **I. M. Vishik**, K. Tanaka, D. H. Lu, T. Sasagawa, N. Nagaosa, T. P. Devereaux, Z. Hussain, and Z.-X. Shen
Nature **450**, 81 (2007)
 3. *Spin correlations in the electron-doped high-transition-temperature superconductor $\text{Nd}_{2-x}\text{Ce}_x\text{CuO}_{4\pm\delta}$*
E. M. Motoyama, G. Yu, **I. M. Vishik**, O.P. Vajk, P.K. Mang, and M. Greven
Nature **455**, 186 (2007)
 2. *Magnetic field effect on the superconducting magnetic gap of $\text{Nd}_{1.85}\text{Ce}_{0.15}\text{CuO}_4$*
E. M. Motoyama, P.K. Mang, D. Petitgrand, G. Yu, O.P. Vajk, **I. Vishik**, and M. Greven
Phys. Rev. Lett. **96**, 137002 (2006)
 1. *Dynamics of drag and force distributions for projectile impact in a granular medium*
Massimo Pica Ciamarra, Antonio H. Lara, Andrew T. Lee, Daniel I. Goldman, **Inna Vishik** and Harry L. Swinney
Phys. Rev. Lett. **92**, 194301 (2004)

Preprints

- *Ubiquitous antinodal quasiparticles and deviation from simple d-wave form in Bi-2212*
I. M. Vishik, Makoto Hashimoto, W. S. Lee, T. P. Devereaux, and Z.-X. Shen
arXiv:1405.4961

Invited Talks

37. *Universality vs materials-dependence in cuprates: ARPES studies of the model cuprate Hg1201*
Strongly Correlated/High- T_c Superconductor seminar series on Harvard CMSA ZOOM
Sept. 24, 2020

36. *The faces of WTe₂*
Aspen Winter Conference: Theory meets Experiment, March. 13, 2020
35. *The faces of WTe₂*
Flatiron Institute, Quantum Cafe, Oct. 23, 2019
34. *The faces of WTe₂*
Advanced Lightsource seminar, July 17, 2019
33. *The faces of WTe₂*
First Nanjing conference on Quantum Materials, June 17, 2019
32. *A photoemission perspective on Cuprates*
Gordon Research Seminar Keynote, May 11, 2019
31. *ARPES studies of the model cuprate HgBa₂CuO_{4+δ} (Hg1201)*
Condensed Matter Seminar, University of Minnesota, Minneapolis, MN, Sept. 26, 2018
30. *ARPES studies of the model cuprate HgBa₂CuO_{4+δ} (Hg1201)*
Condensed Matter Physics in the City, London, UK, June 18, 2018
29. *Electronic structure and dynamics in cuprates*
Condensed Matter Physics in the City, Rutherford Appleton Laboratory, UK, June 18, 2018
28. *Low energy excitations in cuprates*
Condensed Matter Seminar, Rice University, Houston, TX, Nov. 21, 2017
27. *Low energy excitations in cuprates*
Condensed Matter Seminar, UC Santa Cruz, Santa Cruz, CA, Nov. 17, 2017
26. *Adventures in momentum space: shedding light on unconventional superconductors*
Physics Department Seminar, Reed College, Portland, OR, Oct. 26, 2017
25. *ARPES investigations of the model cuprate Hg1201*
International workshop on superconductivity and magnetism, Dresden, Germany, Sept. 28, 2017
24. *Electronic Ingredients for high-T_c: ARPES results and opportunities in cuprates*
Workshop on Quantum Materials: UC Berkeley, June 14, 2017
23. *Collective Excitations in Hg1201*
Gordon Research Conference–Superconductivity, Waterville Valley, NH, June 5, 2017
22. *NanoARPES and Unconventional Superconductivity*
ALS-U workshop–Quantum materials session, Lawrence Berkeley National Lab, Jan. 19, 2017
21. *Ultrafast dynamics in the presence of antiferromagnetic correlations in electron-doped cuprates*
Condensed matter seminar, The Ohio State University, Dec. 8, 2016
20. *Ultrafast dynamics in the presence of antiferromagnetic correlations in electron-doped cuprates*
Condensed matter seminar, University of California, Los Angeles, Oct. 26, 2016
19. *Ultrafast dynamics in unconventional superconductors*
Condensed matter seminar, University of Maryland, Dec. 10, 2015
18. *Ultrafast dynamics in unconventional superconductors*
Condensed matter seminar, Rutgers University, Nov. 10, 2015
17. *ARPES studies of low energy excitations in cuprate superconductors*
The 11th International Conference on Materials and Mechanisms of Superconductivity (M2S)
Geneva, Switzerland, August 2015

16. *Low energy excitations in cuprate high temperature superconductors*
CORPES 2015, Paris, France, July 2015
15. *Ultrafast dynamics in heavy fermions and electron-doped cuprates*
Condensed matter seminar, Princeton University, May 2015
14. *Momentum space imaging of cuprate superconductors*
Kavli Institute for Theoretical Physics, University of California, Santa Barbara, November 2014
13. *Low energy excitations in cuprate high temperature superconductors*
The New Generation in Strongly Correlated Electron Systems, Nice, France, June 2014
12. *Low energy excitations in cuprate high temperature superconductors*
Condensed matter seminar, University of Connecticut, April 2014
11. *Low energy excitations in cuprates: an ARPES perspective*
Aspen conference, *Beyond quasiparticles: new paradigms for quantum fluids*, January 2014
10. *Gap measurements and the cuprate phase diagram*
Aspen conference, *Unconventional order in strongly correlated electron systems*, January 2014
9. *Laser-ARPES studies of cuprate high temperature superconductors: elucidating low-energy excitations*
Physics in the field, NHMFL, Los Alamos National Lab., November 2013
8. *Low-energy excitations in cuprates: laser-ARPES studies*
Condensed matter seminar, Northeastern University, November 2013
7. *Laser ARPES studies of cuprate high temperature superconductors*
Physics seminar, San Jose State University, October 2013
6. *Phase competition in trisected superconducting dome*
Spectroscopies of Novel Superconductors, June 2013
5. *ARPES studies of high-T_c cuprates*
Gordon Research Seminar-Superconductivity, May 2013
4. *Phase competition in trisected superconducting dome*
American Physical Society March Meeting 2012
3. *Phase competition in cuprate superconducting dome*
Condensed Matter Seminar at University of California, Riverside, February 2012
2. *Laser-ARPES studies of cuprate Fermiology*
Condensed Matter Seminar at University of Minnesota, April 2011
1. *Quasiparticles in Bi-2212*
Workshop on High-Temperature Superconductors at the University of Tokyo, Jan 2009

Summer School Lectures

2. *Angle-resolved photoemission spectroscopy (ARPES) overview*
Angle-resolved photoemission spectroscopy (ARPES): applications to quantum materials
Quantum Science Summer School (QS3), Cornell University, June 2018
1. *Identifying competing phases in cuprates using ARPES* *Sunset 2017*
School on unconventional superconductivity, experiment and theory, Cargese, France, August, 2017

Outreach and General Audience Talks

4. *The Physics of Many-Research in experimental condensed matter physics*
Freshman Seminar, UC Davis, Physics Department, Oct. 4, 2017
3. *A picosecond in the life of a superconductor*
MIT 15th Annual Pappalardo Fellowships in Physics Symposium, May 12, 2016
2. *Frontiers in superconductivity*
MIT Physics IAP Lecture Series, Jan. 2015
1. *Adventures in unconventional superconductivity*
MIT 13th Annual Pappalardo Fellowships in Physics Symposium, May 16, 2014

Teaching

5. *Physics 112: Thermodynamics and statistical mechanics*
UC Davis, Fall 2020
4. *Physics 140B: Introduction to solid state physics (2nd quarter)*
UC Davis, Spring 2018,2020
3. *Physics 9HE: Applications of quantum mechanics*
UC Davis, Winter 2018,2020
2. *Physics 250: Spectroscopies of quantum materials (co-designed course)*
UC Davis, Fall 2016, Winter 2018
1. *Physics 140A: Introduction to solid state physics (1st quarter)*
UC Davis, Winter 2017

Service and synergistic activities

- Development of curriculum materials for a special topics course at UC Davis entitled “Advanced spectroscopies of modern quantum materials.”
Topics include the technique of angle-resolved photoemission spectroscopy (ARPES), developments in ARPES technology, superconductors, topological materials, Dirac materials, 2D materials(Fall Quarter 2016, Winter 2018)
- Member of (three-person) Frederica Darema Lecture Committee in the physics department at UC Davis, which facilitates colloquia by early career (pre-tenure) women and minority physicists from across the US
- Referee for Physical Review Letters, Physical Review B, Physical Review X, Nature Communications, Science, Nature Physics, and synchrotron beamtime proposals (ongoing)
- Technical blogging: answering public's questions about condensed matter physics, its manifestations in everyday phenomena, and careers in this field on social media site Quora. Writing has been featured in general-audience avenues such as forbes.com and huffingtonpost.com