

Kenneth S. Burch

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Education

2006-Jan	PhD Physics	University of California, San Diego
2004	MSc Physics	University of California, San Diego
2001	BSc Physics-Honors	University of California, Santa Cruz

Professional Experience

2020-current	Professor	Boston College
2015-2020	Associate Professor	Boston College
2013-2015	Assistant Professor	Boston College
2012-2013	Founder of CREATE-HEATER program	University of Toronto
2008-2013	Assistant Professor	University of Toronto
2006-2008	Director's Fellow	Los Alamos National Laboratory
2001-2006	Graduate Student Researcher	University of California, San Diego
2001-2002	Chair	University of California Student Association
2000-2001	Undergraduate Researcher	Stanford University
2000	Undergraduate Researcher	University of California, San Diego
1997-1998	Undergraduate Research Assistant	University of California, Santa Cruz

Professional Affiliations and Activities

Member	American Physical Society, Canadian Association of Physicists
Chair	Graduate Committee(18-19), Search Committee (17-18), Integrated Science for Society Curricula Committee (15-16), Colloquium Committee (14-16), Physical & Technical Services Committee (12-13)
Representative	User Advisory Committee of The Canadian Light Source, National High Magnetic Field Laboratory Users Committee
Referee	Science, Nature, Nanoletters, Nature Materials, Phys. Rev. Lett., DOE, NSERC, NSF, Phys. Rev. B, J. of The Opt. Soc. of America, Appl. Phys. Lett., J. of Raman Spec., New J. of Phys., NSC-Poland

Awards

Lee-Osheroff-Richardson Prize	2012
Ontario Early Researcher Award	2011-2016
Los Alamos National Lab Director's Fellowship	2006 - 2008
APS Outstanding Dissertation in Magnetism	2006
Malcolm R. Stacey Memorial Scholarship	2003 - 2005
GAANN Fellowship	2001 - 2002

Popular Media Coverage

Quantum Computer Not Working? Grab Some Scotch Tape Wired, September 18th, 2012
Scotch tape may stick quantum computing to the masses NBC News, September 11th, 2012
Scotch Tape aids superconductivity breakthrough Toronto Star, September 13th, 2012
Scotch Tape Even Makes Semiconductors Better Gizmodo, September 16th, 2012

Invited Talks

Summary: Over 85 - 4 at the APS March Meeting; International workshops/conferences including GRC-Superconductivity, American Vacuum Society, Quantum Materials Symposium, E-MRS; Many N. American, European or Asian institutions including: MIT, Stanford, Princeton, Columbia, UC Boulder, Penn State, U. British Columbia, IOP-Beijing, Seoul National U., U. of Tokyo, Georgia Tech., Rice, U. of Rochester, l'Universite de Genève, EPF - Lausanne, Neel Institute - Grenoble, MPI-Stuttgart, NREL, LBNL, BNL

Funding

NSF-DMR <i>Understanding the Hinge Modes in a Topological Superconductor</i>	\$553,954	(2020-2023)
ONR <i>2D Heterostructures of Relativistic Mott Insulators</i>	\$589,916	(2020-2023)
BC-RADS <i>Topological Semimetals as Next Generation Electrocatalysts</i>	\$50,000	(2020-2021)
NIH <i>Rapid Assessment of Illicit Drugs in Wastewater</i>	\$30,283	(2020)
AFOSR <i>DURIP: Multidimensional Probe of Next Generation Heterostructures</i>	\$156,693	(2019)
DOE-PBM <i>A Nonlinear Approach to Weyl Transport</i>	\$447,839	(2018-2021)
Giner Inc <i>Aptamer-Based Graphene Field Effect Transistor</i>	\$25,000	(2018)
NSF-DMR <i>Fermi Surface Topology and the Superconducting Proximity Effect</i>	\$454,234	(2017-2020)
NIH Supplemental <i>Sensing Antibiotic Resistance with Graphene</i>	\$100,000	(2017)
Giner Inc <i>Aptamer-Based Graphene Field Effect Transistor</i>	\$50,000	(2017)
NSF-BIO <i>REU Site: Integrated Science For Society (IS2)</i>	\$343,143	(2016-2019)
NSF-DMR <i>High Temperature, Topological Superconductivity via the Proximity Effect</i>	\$342,988	(2014-2017)
NSERC-CREATE <i>Taming the Lost Heat: Training and Research in Thermoelectrics</i>	\$1,650,000	(2013-2019)
NSERC-Canada Research Chair <i>Spectroscopy of Novel Materials</i>	\$500,000	(2013-2018)
MITACS-Accelerate <i>Incorporating Hyperflux in a Nanoptics Platform [with RHK Tech. and Montana Inst.</i>	\$15,000	(2013)
MITACS-Accelerate <i>Optimizing Thin Film Growth [with Angstrom Engineering</i>	\$15,000	(2013)
MITACS-Accelerate <i>Evaluating a QCL for Infrared Microscopy [with Bruker Optics & CLS</i>	\$15,000	(2012)
NSERC-Engage <i>Developing a new Raman spectrometer based on the Optical Slicer[with Tornado Spect. Syst.</i>	\$25,000	(2011)
NSERC-Engage <i>Testing a High Throughput Virtual Slit in a Raman Spectrometer [with ARJAE inc.</i>	\$25,000	(2011)
MRI-ERA <i>Creation, tuning and study of nanocrystals to address scientific and technical challenges</i>	\$100,000	(2011-2015)
CFI-IOF <i>Optical Spectroscopy: Unique Tools Providing Key Insights and Novel Devices</i>	\$96,600	(2010-2014)
NSERC-Engage <i>Entangled Photons from Superconductors</i>	\$24,850	(2010)
NSERC-Discovery <i>Optical Spectroscopy: A Route to Discoveries and Devices</i>	\$350,000	(2009-2013)
CFI-LOF <i>Optical Spectroscopy: Unique Tools Providing Key Insights and Novel Devices</i>	\$340,000	(2009-2010)
MRI-LOF <i>Optical Spectroscopy: Unique Tools Providing Key Insights and Novel Devices</i>	\$340,000	(2009-2010)

K.S. Burch Publications

Summary: (<http://goo.gl/04ZDsY>)

76 Publications; 3 Invention Disclosures; > 3800 citations; H# = 29.

Peer-Reviewed Publications

- [1] M. J. Gray, N. Kumar, R. O'Connor, M. Hoek, E. Sheridan, M. C. Doyle, M. L. Romanelli, G. B. Osterhoudt, Y. Wang, V. Plisson, S. Lei, R. Zhong, B. Rachmilowitz, H. Zhao, H. Kitadai, S. Shepard, L. M. Schoop, G. D. Gu, I. Zeljkovic, X. Ling, and K. S. Burch, "A cleanroom in a glovebox," *Review of Scientific Instruments*, vol. 91, no. 7, p. 073909, 2020.
- [2] N. Kumar, W. Wang, J. C. Ortiz-Marquez, M. Catalano, M. Gray, N. Biglari, K. Hikari, X. Ling, J. Gao, T. van Opijnen, and K. S. Burch, "Dielectrophoresis assisted rapid, selective and single cell detection of antibiotic resistant bacteria with g-fets," *Biosensors and Bioelectronics*, p. 112123, 2020.
- [3] S. Lei, J. Lin, Y. Jia, M. Gray, A. Topp, G. Farahi, S. Klemenzt, T. Gao, F. Rodolakis, J. L. McChesney, C. R. Ast, A. Yazdani, K. S. Burch, S. Wu, N. P. Ong, and L. M. Schoop, "High mobility in a van der waals layered antiferromagnetic metal," *Science Advances (in press)*, 2020.
- [4] T. A. Tartaglia, J. N. Tang, J. L. Lado, F. Bahrami, M. Abramchuk, G. T. McCandless, M. C. Doyle, K. S. Burch, Y. Ran, J. Y. Chan, and F. Tafti, "Accessing new magnetic regimes by tuning the ligand spin-orbit coupling in van der waals magnets," *Science Advances*, vol. 6, no. 30, 2020.
- [5] Y. Wang, G. B. Osterhoudt, Y. Tian, P. Lampen-Kelley, A. Banerjee, T. Goldstein, J. Yan, J. Knolle, H. Ji, R. J. Cava, J. Nasu, Y. Motome, S. E. Nagler, D. Mandrus, and K. S. Burch, "The range of non-Kitaev terms and fractional particles in α -RuCl₃," *npj Quantum Materials*, vol. 5, no. 1, p. 14, 2020.
- [6] M. J. Gray, J. Freudenstein, S. Y. F. Zhao, R. O'Connor, S. Jenkins, N. Kumar, M. Hoek, A. Kopec, S. Huh, T. Taniguchi, K. Watanabe, R. Zhong, C. Kim, G. D. Gu, and K. S. Burch, "Evidence for helical hinge zero modes in an fe-based superconductor," *Nano Letters*, vol. 19, pp. 4890–4896, 08 2019.
- [7] M. Brotons-Gisbert, A. Branny, S. Kumar, R. Picard, R. Proux, M. Gray, K. S. Burch, K. Watanabe, T. Taniguchi, and B. D. Gerardot, "Coulomb blockade in an atomically thin quantum dot coupled to a tunable fermi reservoir," *Nature Nanotechnology*, vol. 14, no. 5, pp. 442–446, 2019.
- [8] J. Coulter, G. B. Osterhoudt, C. A. C. Garcia, Y. Wang, V. M. Plisson, B. Shen, N. Ni, K. S. Burch, and P. Narang, "Uncovering electron-phonon scattering and phonon dynamics in type-I Weyl semimetals," *Phys. Rev. B*, vol. 100, p. 220301, 2019.
- [9] G. B. Osterhoudt, L. K. Diebel, X. Yang, J. Stanco, X. Huang, B. Shen, N. Ni, P. Moll, Y. Ran, and K. S. Burch, "Colossal mid-infrared bulk photovoltaic effect in a type-i weyl semimetal," *Nature Materials*, vol. 18, pp. 471–475, 2019.
- [10] B. Zhou, Y. Wang, G. B. Osterhoudt, P. Lampen-Kelley, D. Mandrus, R. He, K. S. Burch, and E. A. Henriksen, "Possible structural transformation and enhanced magnetic fluctuations in exfoliated α -RuCl₃," *Journal of Physics and Chemistry of Solids*, vol. 128, pp. 291–295, 2019.
- [11] S. Gao, F. Flicker, R. Sankar, H. Zhao, Z. Ren, B. Rachmilowitz, S. Balachandar, F. Chou, K. S. Burch, Z. Wang, J. van Wezel, and I. Zeljkovic, "Atomic-scale strain manipulation of a charge density wave," *Proceedings of the National Academy of Sciences*, vol. 115, pp. 6986–6990, jul 2018.
- [12] G. B. Osterhoudt, R. Carelli, K. S. Burch, F. Katmis, N. Gedik, and J. S. Moodera, "Charge transfer in EuS/Bi₂Se₃ heterostructures as indicated by the absence of Raman scattering," *Phys. Rev. B*, vol. 98, p. 014308, Jul 2018.
- [13] M. Abramchuk, S. Jaszewski, K. R. Metz, G. B. Osterhoudt, Y. Wang, K. S. Burch, and F. Tafti, "Controlling Magnetic and Optical Properties of the van der Waals Crystal CrCl_{3-x}Br_x via Mixed Halide Chemistry," *Advanced Materials*, p. 1801325, 2018.

- [14] K. S. Burch, D. Mandrus, and J.-G. Park, “Magnetism in two-dimensional van der Waals materials,” *Nature*, vol. 563, no. 7729, pp. 47–52, 2018.
- [15] Y. Tian, S. Jia, R. Cava, R. Zhong, J. Schneeloch, G. Gu, and K. S. Burch, “Understanding the evolution of anomalous anharmonicity in $\text{Bi}_2\text{Te}_{3-x}\text{Se}_x$,” *Physical Review B*, vol. 95, no. 9, p. 094104, 2017.
- [16] P. Zareapour, A. Hayat, S. Y. F. Zhao, M. Kreshchuk, Z. Xu, T. Liu, G. Gu, S. Jia, R. J. Cava, H. Yang, *et al.*, “Andreev reflection without Fermi surface alignment in high- T_c van der Waals heterostructures,” *New Journal of Physics*, vol. 19, no. 4, p. 043026, 2017.
- [17] C.-K. Chan, P. A. Lee, K. S. Burch, J. H. Han, and Y. Ran, “When chiral photons meet chiral fermions: photoinduced anomalous hall effects in weyl semimetals,” *Physical review letters*, vol. 116, no. 2, p. 026805, 2016.
- [18] S. Kushwaha, I. Pletikosić, T. Liang, A. Gyenis, S. Lapidus, Y. Tian, H. Zhao, K. Burch, J. Lin, W. Wang, *et al.*, “Sn-doped $\text{Bi}_{1.1}\text{Sb}_{0.9}\text{Te}_2\text{S}$ bulk crystal topological insulator with excellent properties,” *Nature communications*, vol. 7, p. 11456, 2016.
- [19] H. Luo, W. Xie, J. Tao, I. Pletikosić, T. Valla, G. S. Sahasrabudhe, G. Osterhoudt, E. Sutton, K. S. Burch, E. M. Seibel, *et al.*, “Differences in Chemical Doping Matter: Superconductivity in $\text{Ti}_{1-x}\text{Ta}_x\text{Se}_2$ but Not in $\text{Ti}_{1-x}\text{Nb}_x\text{Se}_2$,” *Chemistry of Materials*, vol. 28, no. 6, pp. 1927–1935, 2016.
- [20] L. J. Sandilands, Y. Tian, A. A. Reijnders, H.-S. Kim, K. W. Plumb, Y.-J. Kim, H.-Y. Kee, and K. S. Burch, “Spin-orbit excitations and electronic structure of the putative Kitaev magnet $\alpha\text{-RuCl}_3$,” *Physical Review B*, vol. 93, no. 7, p. 075144, 2016.
- [21] Y. Tian and K. S. Burch, “Automatic Spike Removal Algorithm for Raman Spectra,” *Applied spectroscopy*, vol. 70, no. 11, pp. 1861–1871, 2016.
- [22] Y. Tian, G. B. Osterhoudt, S. Jia, R. Cava, and K. S. Burch, “Local phonon mode in thermoelectric $\text{Bi}_2\text{Te}_2\text{Se}$ from charge neutral antisites,” *Applied Physics Letters*, vol. 108, no. 4, p. 041911, 2016.
- [23] Y. Tian, A. A. Reijnders, G. B. Osterhoudt, I. Valmianski, J. Ramirez, C. Urban, R. Zhong, J. Schneeloch, G. Gu, I. Henslee, *et al.*, “Low vibration high numerical aperture automated variable temperature Raman microscope,” *Review of Scientific Instruments*, vol. 87, no. 4, p. 043105, 2016.
- [24] Y. Tian, M. J. Gray, H. Ji, R. Cava, and K. S. Burch, “Magneto-elastic coupling in a potential ferromagnetic 2D atomic crystal,” *2D Materials*, vol. 3, no. 2, p. 025035, 2016.
- [25] P. Zareapour, J. Xu, S. Y. F. Zhao, A. Jain, Z. Xu, T. Liu, G. Gu, and K. S. Burch, “Modeling tunneling for the unconventional superconducting proximity effect,” *Superconductor Science and Technology*, vol. 29, no. 12, p. 125006, 2016.
- [26] J. Moir, N. Soheilnia, K. Liao, P. O’Brien, Y. Tian, K. S. Burch, and G. A. Ozin, “Activation of ultrathin films of hematite for photoelectrochemical water splitting via H_2 treatment,” *ChemSusChem*, vol. 8, no. 9, pp. 1557–1567, 2015.
- [27] J. Moir, N. Soheilnia, K. Liao, P. O’Brien, Y. Tian, K. S. Burch, and G. A. Ozin, “Inside Back Cover: Activation of Ultrathin Films of Hematite for Photoelectrochemical Water Splitting via H_2 Treatment (ChemSusChem 9/2015),” *ChemSusChem*, vol. 8, no. 9, pp. 1627–1627, 2015.
- [28] K. Post, B. Chapler, M. Liu, J. Wu, H. Stinson, M. Goldflam, A. Richardella, J. Lee, A. Reijnders, K. Burch, *et al.*, “Sum-rule constraints on the surface state conductance of topological insulators,” *Physical review letters*, vol. 115, no. 11, p. 116804, 2015.
- [29] L. J. Sandilands, Y. Tian, K. W. Plumb, Y.-J. Kim, and K. S. Burch, “Scattering Continuum and Possible Fractionalized Excitations in $\alpha\text{-RuCl}_3$,” *Physical review letters*, vol. 114, no. 14, p. 147201, 2015.

- [30] A. Hayat, H.-Y. Kee, K. S. Burch, and A. M. Steinberg, “Cooper-pair-based photon entanglement without isolated emitters,” *Physical Review B*, vol. 89, no. 9, p. 094508, 2014.
- [31] P. Mirtchev, K. Liao, E. Jaluague, Q. Qiao, Y. Tian, M. Varela, K. S. Burch, S. J. Pennycook, D. D. Perovic, and G. Ozin, “Fe₂O₃/Cu₂O heterostructured nanocrystals,” *Journal of Materials Chemistry A*, vol. 2, no. 22, pp. 8525–8533, 2014.
- [32] K. Plumb, J. Clancy, L. Sandilands, V. V. Shankar, Y. Hu, K. Burch, H.-Y. Kee, and Y.-J. Kim, “ α -RuCl₃: A spin-orbit assisted Mott insulator on a honeycomb lattice,” *Physical Review B*, vol. 90, no. 4, p. 041112, 2014.
- [33] A. A. Reijnders, L. Sandilands, G. Pohl, K. Plumb, Y.-J. Kim, S. Jia, M. Charles, R. Cava, and K. Burch, “Fourier analysis of the IR response of van der Waals materials,” *arXiv preprint arXiv:1407.6713*, 2014.
- [34] A. A. Reijnders, Y. Tian, L. Sandilands, G. Pohl, I. Kivlichan, S. F. Zhao, S. Jia, M. Charles, R. Cava, N. Alidoust, *et al.*, “Optical evidence of surface state suppression in Bi-based topological insulators,” *Physical Review B*, vol. 89, no. 7, p. 075138, 2014.
- [35] L. J. Sandilands, A. A. Reijnders, M. Kriener, K. Segawa, S. Sasaki, Y. Ando, and K. S. Burch, “Doping-dependent charge dynamics in Cu_xBi₂Se₃,” *Physical Review B*, vol. 90, no. 9, p. 094503, 2014.
- [36] L. Sandilands, A. Reijnders, A. Su, V. Baydina, Z. Xu, A. Yang, G. Gu, T. Pedersen, F. Borondics, and K. Burch, “Origin of the insulating state in exfoliated high-T_c two-dimensional atomic crystals,” *Physical Review B*, vol. 90, no. 8, p. 081402, 2014.
- [37] X. G. Xu, J.-H. Jiang, L. Gilburd, R. G. Rensing, K. S. Burch, C. Zhi, Y. Bando, D. Golberg, and G. C. Walker, “Mid-infrared polaritonic coupling between boron nitride nanotubes and graphene,” *ACS nano*, vol. 8, no. 11, pp. 11305–11312, 2014.
- [38] P. Zareapour, A. Hayat, S. Y. F. Zhao, M. Kreshchuk, Y. K. Lee, A. A. Reijnders, A. Jain, Z. Xu, T. Liu, G. Gu, *et al.*, “Evidence for a new excitation at the interface between a high-T_c superconductor and a topological insulator,” *Physical Review B*, vol. 90, no. 24, p. 241106, 2014.
- [39] B. Chapler, S. Mack, R. Myers, A. Frenzel, B. Pursley, K. Burch, A. Dattelbaum, N. Samarth, D. Awschalom, and D. Basov, “Ferromagnetism and infrared electrodynamics of Ga_{1-x}Mn_xAs,” *Physical Review B*, vol. 87, no. 20, p. 205314, 2013.
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- [41] H. Ji, R. Stokes, L. Alegria, E. Blomberg, M. Tanatar, A. Reijnders, L. Schoop, T. Liang, R. Prozorov, K. Burch, *et al.*, “A ferromagnetic insulating substrate for the epitaxial growth of topological insulators,” *Journal of Applied Physics*, vol. 114, no. 11, p. 114907, 2013.
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- [46] P. Zareapour, A. Hayat, S. Y. F. Zhao, M. Kreshchuk, A. Jain, D. C. Kwok, N. Lee, S.-W. Cheong, Z. Xu, A. Yang, *et al.*, “Proximity-induced high-temperature superconductivity in the topological insulators Bi_2Se_3 and Bi_2Te_3 ,” *Nature communications*, vol. 3, p. 1056, 2012.
- [47] B. Chapler, R. Myers, S. Mack, A. Frenzel, B. Pursley, K. Burch, E. Singley, A. Dattelbaum, N. Samarth, D. Awschalom, *et al.*, “Infrared probe of the insulator-to-metal transition in $\text{Ga}_{1-x}\text{Mn}_x\text{As}$ and $\text{Ga}_{1-x}\text{Be}_x\text{As}$,” *Physical Review B*, vol. 84, no. 8, p. 081203, 2011.
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- [54] D. Talbayev, K. Burch, E. E. Chia, S. Trugman, J.-X. Zhu, E. Bauer, J. Kennison, J. Mitchell, J. Thompson, J. Sarrao, *et al.*, “Hybridization and superconducting gaps in the heavy-fermion superconductor PuCoGa_5 probed via the dynamics of photoinduced quasiparticles,” *Physical review letters*, vol. 104, no. 22, p. 227002, 2010.
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- [56] Z. Li, S. Tsai, W. Padilla, S. Dordevic, K. Burch, Y. Wang, and D. Basov, “Erratum: Infrared probe of the anomalous magnetotransport of highly oriented pyrolytic graphite in the extreme quantum limit [Phys. Rev. B 74, 195404 (2006)],” *Physical Review B*, vol. 79, no. 7, p. 079902, 2009.
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