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Curriculum Vitae

Ken Shiozaki

Assistant Professor

Yukawa Institute of Theoretical Physics, Kyoto University, Kitashirakawa Oiwakecho, Sakyo-ku, Kyoto 606-8502 Japan

Email: ken.shiozaki@yukawa.kyoto-u.ac.jp

Personal web site; Google Scholar

Professional appointments

- **September 2018** – present, Assistant Professor, Yukawa Institute for Theoretical Physics, Kyoto University.
- **October 2018 – March 2022**, JST PRESTO Researcher.
- **April 2017 – August 2018**, Special Postdoctoral Research Associate, Condensed Matter Theory Laboratory and Quantum Matter Theory Research Team, RIKEN.
- **April 2015 – March 2017**, JSPS Postdoctoral Fellow for Research Abroad, University of Illinois Urbana-Champaign.
- **April 2013 – March 2015**, JSPS Research Fellow (DC2), Japan Society for the Promotion of Science.

Education

- **March 2015**, Ph.D., Department of Physics I, Kyoto University. Thesis Title: Topological insulators and superconductors: classification of topological crystalline phases and axion phenomena. Thesis Adviser: Norio Kawakami.
- **March 2012**, M.S., Department of Physics I, Kyoto University. Adviser: Satoshi Fujimoto.
- **March 2010**, B.S., Department of Physics I, Kyoto University.

Professional Service (Committee Memberships)

- **April 2021 – March 2023**, Secretary and Journal Editor, Physical Society of Japan (Kyoto Branch).
- **April 2020 – March 2021**, Area Committee Member (Area 4: Semiconductors, Mesoscopic Systems and Quantum Transport), Physical Society of Japan.

Honors and Awards

- **March 2018**, The 12th Young Scientist Award of the Physical Society of Japan.
- **December 2020**, The 35th Nishinomiya Yukawa Memorial Award.

Grants and Funding

- Principal Investigator, JSPS Grant-in-Aid for Transformative Research Areas (A) (Publicly Offered Research) "Topological phase classification using spectral sequences and materials design development of geometric physical quantities", April 2026 – March 2028, Amount: JPY 2,400,000 (Direct cost, expected).
- Principal Investigator, JSPS Grant-in-Aid for Scientific Research (B), "Study of higher homotopy of phase space and geometric physical quantities in quantum many-body systems", April 2023 – March 2026, JPY 14,400,000 (Direct cost). Link: KAKEN Project 23H01097.
- Co-Investigator (PI: Kenji Fukushima), JSPS Grant-in-Aid for Transformative Research Areas (A) "Topological approaches to machine learning", June 2022 – March 2027, Link: KAKEN Project 22H05118.
- Principal Investigator, JST PRESTO (Sakigake) "Construction of topological materials science based on generalized cohomology theory" October 2018 – March 2022, JPY 30,000,000 (Direct cost, estimated), Link: JST Project JPMJPR18L4.

Research Interests

- Topological Phases of Matter
- Crystalline symmetry
- Geometric aspect of many-body quantum physics

Publications

[1] Ken Shiozaki, "Intrinsic non-Hermitian topological phases", SciPost Physics Core **9**, 011 (2026); arXiv:2509.06879.

[2] Ken Shiozaki, "Equivariant parameter families of spin chains: A discrete MPS formulation", SciPost Physics **20**, 024 (2026); arXiv:2507.19932.

[3] Chen-Shen Lee, Ken Shiozaki, Chang-Tse Hsieh, "Connection between free-fermion and interacting crystalline symmetry-protected topological phases", Physical Review B **113**, 045135 (2026); arXiv:2411.19287.

[4] Ken Shiozaki, "Classification of topological insulators and superconductors with multiple order-two point group symmetries", SciPost Physics Core **8**, 088 (2026); arXiv:2509.02168.

[5] Ken Shiozaki, Niclas Heinsdorf, Shuhei Ohyama, "Higher Berry curvature from matrix product states", Physical Review B **112**, 035154 (2025); arXiv:2305.08109.
[6] Daichi Nakamura, Ken Shiozaki, Kenji Shimomura, Masatoshi Sato, Kohei Kawabata, "Non-Hermitian Origin of Detachable Boundary States in Topological Insulators", Physical Review Letters **135**, 096601 (2025); arXiv:2407.09458.
[7] Ken Shiozaki, Daichi Nakamura, Kenji Shimomura, Masatoshi Sato, Kohei Kawabata, "K-theory classification of Wannier localizability and detachable topological boundary states", Physical Review B **112**, 075152 (2025); arXiv:2407.18273.
[8] Shuhei Ohyama, Yuji Terashima, Ken Shiozaki, "Discrete higher Berry phases and matrix product states", Physical Review B **110**, 035114 (2024); arXiv:2303.04252.
[9] Seishiro Ono, Ken Shiozaki, Haruki Watanabe, "Classification of time-reversal symmetric topological superconducting phases for conventional pairing symmetries", Physical Review B **109**, 214502 (2024); arXiv:2206.02489.
[10] Edwin Langmann, Shinsei Ryu, Ken Shiozaki, "Higher-bracket structure of density operators in Weyl fermion systems and topological insulators", Physical Review B **110**, 195115 (2024); arXiv:2401.09683.
[11] Hidetoshi Wada, Katsuaki Naito, Seishiro Ono, Ken Shiozaki, Shuichi Murakami, "General corner charge formulas in various tetrahedral and cubic space groups", Physical Review B **109**, 085114 (2024); arXiv:2311.15761.
[12] Ken Shiozaki, Charles Zhaoxi Xiong, Kiyonori Gomi, "Generalized homology and Atiyah–Hirzebruch spectral sequence in crystalline symmetry protected topological phenomena", Progress of Theoretical and Experimental Physics **2023**, 083I01 (2023); arXiv:1810.00801.
[13] Kohei Kawabata, Ken Shiozaki, Shinsei Ryu, "Many-body topology of non-Hermitian systems", Physical Review B **105**, 165137 (2022); arXiv:2202.02548.
[14] Ken Shiozaki, Masatoshi Sato, Kiyonori Gomi, "Atiyah-Hirzebruch spectral sequence in band topology: General formalism and topological invariants for 230 space groups", Physical Review B **106**, 165103 (2022); arXiv:1802.06694.
[15] Seishiro Ono, Ken Shiozaki, "Symmetry-based approach to superconducting nodes: unification of compatibility conditions and gapless point classifications", Physical Review X **12**, 011021 (2022); arXiv:2102.07676.
[16] Ken Shiozaki, "Adiabatic cycles of quantum spin systems", Physical Review B **106**, 125108 (2022); arXiv:2110.10665.
[17] Ken Shiozaki, "The classification of surface states of topological insulators and superconductors with magnetic point group symmetry", Progress of Theoretical and Experimental Physics **2022**, 04A104 (2022); arXiv:1907.09354.
[18] Shuhei Ohyama, Ken Shiozaki, Masatoshi Sato, "Generalized Thouless pumps in (1+1)-dimensional interacting fermionic systems", Physical Review B **106**, 165115 (2022); arXiv:2206.01110.

[19] Kohei Kawabata, Ken Shiozaki, Shinsei Ryu, "Topological field theory of non-Hermitian systems", Physical Review Letters **126**, 216405 (2021); arXiv:2011.11449.

[20] Seishiro Ono, Hoi Chun Po, Ken Shiozaki, "Z_2-enriched symmetry indicators for topological superconductors in the 1651 magnetic space groups", Physical Review Research **3**, 023086 (2021); arXiv:2008.05499.

[21] Ken Shiozaki, Seishiro Ono, "Symmetry indicator in non-Hermitian systems", Physical Review B **104**, 035424 (2021); arXiv:2105.00677.

[22] Ryohei Kobayashi, Yasunori Lee, Ken Shiozaki, Yuya Tanizaki, "Topological terms of (2+ 1) d flag-manifold sigma models", Journal of High Energy Physics **2021**, 1-28 (2021); arXiv:2103.05035.

[23] Nobuyuki Okuma, Kohei Kawabata, Ken Shiozaki, Masatoshi Sato, "Topological origin of non-Hermitian skin effects", Physical Review Letters **124**, 086801 (2020); arXiv:1910.02878.

[24] Kohei Kawabata, Masatoshi Sato, Ken Shiozaki, "Higher-order non-Hermitian skin effect", Physical Review B **102**, 205118 (2020); arXiv:2008.07237.

[25] Kohei Kawabata, Ken Shiozaki, Masahito Ueda, Masatoshi Sato, "Symmetry and topology in non-Hermitian physics", Physical Review X **9**, 041015 (2019); arXiv:1812.09133.

[26] Byungmin Kang, Ken Shiozaki, Gil Young Cho, "Many-body order parameters for multipoles in solids", Physical Review B **100**, 245134 (2019); arXiv:1812.06999.

[27] Nobuyuki Okuma, Masatoshi Sato, Ken Shiozaki, "Topological classification under nonmagnetic and magnetic point group symmetry: Application of real-space Atiyah-Hirzebruch spectral sequence to higher-order topology", Physical Review B **99**, 085127 (2019); arXiv:1810.12601.

[28] Ryohei Kobayashi, Ken Shiozaki, Yuta Kikuchi, Shinsei Ryu, "Lieb-Schultz-Mattis type theorem with higher-form symmetry and the quantum dimer models", Physical Review B **99**, 014402 (2019); arXiv:1805.05367.

[29] Shuntaro Sumita, Takuya Nomoto, Ken Shiozaki, Youichi Yanase, "Classification of topological crystalline superconducting nodes on high-symmetry lines: Point nodes, line nodes, and Bogoliubov Fermi surfaces", Physical Review B **99**, 134513 (2019); arXiv:1811.08627.

[30] Heejae Kim, Ken Shiozaki, Shuichi Murakami, "Glide-symmetric magnetic topological crystalline insulators with inversion symmetry", Physical Review B **100**, 165202 (2019); arXiv:1811.05153.

[31] Kohei Kawabata, Ken Shiozaki, Masahito Ueda, "Anomalous helical edge states in a non-Hermitian Chern insulator", Physical Review B **98**, 165148 (2018); arXiv:1805.09632.

[32] Ken Shiozaki, Hassan Shapourian, Kiyonori Gomi, Shinsei Ryu, "Many-body topological invariants for fermionic short-range entangled topological phases

protected by antiunitary symmetries", Physical Review B **98**, 035151 (2018); arXiv:1710.01886.

[33] Apoorv Tiwari, Xiao Chen, Ken Shiozaki, Shinsei Ryu, "Bosonic topological phases of matter: Bulk-boundary correspondence, symmetry protected topological invariants, and gauging", Physical Review B **97**, 245133 (2018); arXiv:1710.04730.

[34] Akishi Matsugatani, Yuri Ishiguro, Ken Shiozaki, Haruki Watanabe, "Universal relation among the many-body chern number, rotation symmetry, and filling", Physical Review Letters **120**, 096601 (2018); arXiv:1710.07012.

[35] Hassan Shapourian, Ken Shiozaki, Shinsei Ryu, "Partial time-reversal transformation and entanglement negativity in fermionic systems", Physical Review B **95**, 165101 (2017); arXiv:1611.07536.

[36] Ken Shiozaki, Masatoshi Sato, Kiyonori Gomi, "Topological crystalline materials: General formulation, module structure, and wallpaper groups", Physical Review B **95**, 235425 (2017); arXiv:1701.08725.

[37] Hassan Shapourian, Ken Shiozaki, Shinsei Ryu, "Many-body topological invariants for fermionic symmetry-protected topological phases", Physical Review Letters **118**, 216402 (2017); arXiv:1607.03896.

[38] Ken Shiozaki, Hassan Shapourian, Shinsei Ryu, "Many-body topological invariants in fermionic symmetry-protected topological phases: Cases of point group symmetries", Physical Review B **95**, 205139 (2017); arXiv:1609.05970.

[39] Youichi Yanase, Ken Shiozaki, "Möbius topological superconductivity in UPt_3", Physical Review B **95**, 224514 (2017); arXiv:1706.09614.

[40] Ken Shiozaki, Shinsei Ryu, "Matrix product states and equivariant topological field theories for bosonic symmetry-protected topological phases in (1+1) dimensions", Journal of High Energy Physics **2017**, 1-47 (2017); arXiv:1607.06504.

[41] Gil Young Cho, Ken Shiozaki, Shinsei Ryu, Andreas WW Ludwig, "Relationship between symmetry protected topological phases and boundary conformal field theories via the entanglement spectrum", Journal of Physics A: Mathematical and Theoretical **50**, 304002 (2017); arXiv:1606.06402.

[42] Ken Shiozaki, Masatoshi Sato, Kiyonori Gomi, "Topology of nonsymmorphic crystalline insulators and superconductors", Physical Review B **93**, 195413 (2016); arXiv:1511.01463.

[43] Ken Shiozaki, Masatoshi Sato, Kiyonori Gomi, "Z_2 topology in nonsymmorphic crystalline insulators: Möbius twist in surface states", Physical Review B **91**, 155120 (2015); arXiv:1502.03265.

[44] Yasumasa Tsutsumi, Takuto Kawakami, Ken Shiozaki, Masatoshi Sato, Kazushige Machida, "Symmetry-protected vortex bound state in superfluid 3He-B phase", Physical Review B **91**, 144504 (2015); arXiv:1503.03136.

[45] Ken Shiozaki, Masatoshi Sato, "Topology of crystalline insulators and superconductors", Physical Review B **90**, 165114 (2014); arXiv:1403.3331.

[46] Shingo Kobayashi, Ken Shiozaki, Yukio Tanaka, Masatoshi Sato, "Topological Blount's theorem of odd-parity superconductors", Physical Review B **90**, 024516 (2014); arXiv:1403.6253.

[47] Ken Shiozaki, Satoshi Fujimoto, "Dynamical axion in topological superconductors and superfluids", Physical Review B **89**, 054506 (2014); arXiv:1310.4982.

[48] Ken Shiozaki, Satoshi Fujimoto, "Electromagnetic and Thermal Responses of Z Topological Insulators and Superconductors in Odd Spatial Dimensions", Physical Review Letters **110**, 076804 (2013); arXiv:1210.2825.

[49] Takahiro Fukui, Ken Shiozaki, Takanori Fujiwara, Satoshi Fujimoto, "Bulk-edge correspondence for Chern topological phases: A viewpoint from a generalized index theorem", Journal of the Physical Society of Japan **81**, 114602 (2012); arXiv:1206.4410.

[50] Ken Shiozaki, Takahiro Fukui, Satoshi Fujimoto, "Index theorem for topological heterostructure systems", Physical Review B **86**, 125405 (2012); arXiv:1203.2086.

[51] Ken Shiozaki, Satoshi Fujimoto, "Green's function method for line defects and gapless modes in topological insulators: Beyond the semiclassical approach", Physical Review B **85**, 085409 (2012); arXiv:1111.1685.

Preprints

[1] Ken Shiozaki, “Z_2 topological invariant in three-dimensional PT- and PC-symmetric class CI band structures”, arXiv:2509.19825.

[2] Daichi Nakamura, Yutaro Tanaka, Ken Shiozaki, Kohei Kawabata, "Nonsymmorphic Topological Phases of Non-Hermitian Systems", arXiv:2504.20743.

[3] Zhongyi Zhang, Ken Shiozaki, Chen Fang, Seishiro Ono, "Fermi-surface diagnosis for s-wave-like topological superconductivity", arXiv:2407.20231.

[4] Ken Shiozaki, Jing-Yuan Chen, "A Discrete Formulation of Second Stiefel-Whitney Class for Band Theory", arXiv:2412.18796.

[5] Chen-Shen Lee, Ken Shiozaki, Chang-Tse Hsieh, "Crystalline-equivalent topological phases of many-body fermionic systems in one dimension", arXiv:2411.19268.

[6] Ken Shiozaki, "A discrete formulation for three-dimensional winding number", arXiv:2403.05291.

[7] Seishiro Ono, Ken Shiozaki, "Towards complete characterization of topological insulators and superconductors: a systematic construction of topological invariants based on Atiyah-Hirzebruch spectral sequence", arXiv:2311.15814.

[8] Ken Shiozaki, Seishiro Ono, "Atiyah-Hirzebruch spectral sequence for topological insulators and superconductors: E_2 pages for 1651 magnetic space groups", arXiv:2304.01827.

[9] Ken Shiozaki, "A discrete formulation of the Kane-Mele Z_2 invariant", arXiv:2305.05615.
[10] Ken Shiozaki, "Variants of the symmetry-based indicator", arXiv:1907.13632.
[11] Ryohei Kobayashi, Ken Shiozaki, "Anomaly indicator of rotation symmetry in (3+1) D topological order", arXiv:1901.06195.