

Masaki TEZUKA (手塚 真樹)

Assistant Professor
Department of Physics I
Division of Physics and Astronomy
Graduate School of Science
Kyoto University

Kitashirakawa, Sakyo-ku, Kyoto 606-8502, Japan
E-mail: tezuka@scphys.kyoto-u.ac.jp
url: <http://cond.scphys.kyoto-u.ac.jp/~tezuka/>
Phone: +81-75-753-3798
Fax: +81-75-753-3819

Born: 18 January 1980 – Tokyo, Japan
Nationality: Japanese
Marital status: Married

Current position

Assistant Professor, Graduate School of Science, Kyoto University

Education

Graduate School of Science, University of Tokyo Ph.D., Physics	Tokyo, Japan March 2007
Graduate School of Science, University of Tokyo M.Sc., Physics	Tokyo, Japan March 2004
University of Tokyo B.Sc., Physics	Tokyo, Japan March 2002

Appointments Held

1. Research

Graduate School of Science, Kyoto University Assistant Professor (current position)	April 2010 – present
Graduate School of Science, Kyoto University Research Fellow	October 2009 – March 2010
Graduate School of Science, University of Tokyo JSPS Research Fellow-PD	April 2008 – September 2009
Graduate School of Science, Tokyo Institute of Technology JSPS Research Fellow-PD	April 2007 – March 2008

Graduate School of Science, University of Tokyo

Research Assistant

May 2004 – February 2007**Graduate School of Frontier Sciences, University of Tokyo**

Research Assistant

April 2005 – March 2006**2. Teaching****Faculty of Science, Kyoto University**Exercises for Electromagnetism 1 **October 2017 – March 2018, October 2018 – March 2019, October 2019 – March 2020, October 2020 – March 2021, October 2021 – March 2022**

Exercises for Statistical Mechanics C

October 2014 – March 2015, October 2015 – March 2016, October 2016 – March 2017Exercises for Electrodynamics 4 **October 2012 – March 2013, October 2013 – March 2014**

Exercises for Analytic Mechanics 1

April 2011 – September 2011Special Study Course (Physical Science) Q11: Condensed Matter Theory **April 2010 – present****Faculty of Science, University of Tokyo**

Teaching Assistant, Exercises for Quantum Mechanics

October 2003 – March 2004**Grants and awards****Japan Society of the Promotion of Science**Grant-in-Aid for Transformative Research Areas (A) (Project JP21H05185, 5 years, total direct cost 109.6M JPY) **FY2021 – FY2025**Grant-in-Aid for Scientific Research (C) (Project JP20K03787, 3 years, total direct cost 3.3M JPY) **FY2020 – FY2022**Grant-in-Aid for Scientific Research on Innovative Areas (Research in a proposed research area) (Project JP20H05270, 2 years, total direct cost 3.3M JPY) **FY2020 – FY2021**Grant-in-Aid for Encouragement of Young Scientists (B) (Project JP17K17822, 3+2 years, total direct cost 3.0M JPY) **FY2017 – FY2021**Grant-in-Aid for Encouragement of Young Scientists (B) (Project 26870284, 3 years, total direct cost 3.1M JPY) **FY2014 – FY2016**Research fellowship (3 years, with research funding 1.1M JPY per year) **FY2007 – FY2009****Japan Student Services Organization**Interest-free scholarship loan (3 years, half-waiver of the obligation to repay awarded in 2007) **2004****Japan Scholarship Foundation**Interest-free scholarship loan (2 years) **2002****Scholarly affiliation****The Physical Society of Japan**

Regular member

2004 – present

Steering Committee member of Division 11

April 2015 – March 2016

Steering Committee member of Division 8

April 2012 – March 2013**Journal Referees**

Physical Review Letters (> 15 manuscripts), Physical Review X, Physical Review A, Physical Review B, Physical Review E, New Journal of Physics, Journal of the Physical Society of Japan, Progress of Theoretical and Experimental Physics, International Journal of Modern Physics B and numerous conference proceedings

Languages

Japanese (native speaker), *English* (fluent), *German* (intermediate), *French* (basic).

1. Refereed original journal articles

Kazuki Yamamoto, Masaya Nakagawa, Masaki Tezuka, Masahito Ueda, and Norio Kawakami, “Universal properties of dissipative Tomonaga-Luttinger liquids: Case study of a non-Hermitian XXZ spin chain”, *Phys. Rev. B* in press.

Tzu-Chen Huang, Ying-Hsuan Lin, Kantaro Ohmori, Yuji Tachikawa, and Masaki Tezuka, “Numerical evidence for a Haagerup conformal field theory”, *Phys. Rev. Lett.* in press.

Chen-How Huang, Masaki Tezuka, and Miguel A. Cazalilla, “Topological Lifshitz Transitions, Orbital Currents, and Interactions in Low-dimensional Fermi Gases in Synthetic Gauge Fields”, *New J. Phys.* **24**, 033043 (2022).

doi: 10.1088/1367-2630/ac5a87

Felipe Monteiro, Masaki Tezuka, Alexander Altland, David A. Huse, and T. Micklitz, “Quantum ergodicity in the many-body localization problem”, *Phys. Rev. Lett.* **127**, 030601 (2021).

doi: 10.1103/PhysRevLett.127.030601

Pak Hang Chris Lau, Chen-Te Ma, Jeff Murugan, and Masaki Tezuka, “Correlated disorder in the SYK2 model”, *J. Phys. A* **54**, 095401 (2021).

doi: 10.1088/1751-8121/abde77

Felipe Monteiro, Tobias Micklitz, Masaki Tezuka, and Alexander Altland, “Minimal model of many-body localization”, *Phys. Rev. Research* **3**, 013023 (2021).

doi: 10.1103/PhysRevResearch.3.013023

Fuyuki Matsuda, Masaki Tezuka, and Norio Kawakami, “Two-Dimensional Thouless Pumping of Ultracold Fermions in Obliquely Introduced Optical Superlattice”, *J. Phys. Soc. Jpn.* **89**, 114708 (2020). [Editors’ Choice]

doi: 10.1088/1751-8121/abde77

Hrant Gharibyan, Masanori Hanada, Brian Swingle, and Masaki Tezuka (in alphabetical order), “Characterization of quantum chaos by two-point correlation functions”, *Phys. Rev. E* **102**, 022213 (2020).

doi: 10.1103/PhysRevE.102.022213

Pak Hang Chris Lau, Chen-Te Ma, Jeff Murugan, and Masaki Tezuka (in alphabetical order), “Randomness and Chaos in Qubit Models”, *Phys. Lett. B* **795**, 230-235 (2019).

doi: 10.1016/j.physletb.2019.05.052

Hrant Gharibyan, Masanori Hanada, Brian Swingle, and Masaki Tezuka (in alphabetical order), “Quantum Lyapunov Spectrum”, *J. High Energ. Phys.* **1904** (2019) 082.

doi: 10.1007/JHEP04(2019)082

Antonio M. García-García and Masaki Tezuka (in alphabetical order), “Many-body localization in a finite-range Sachdev-Ye-Kitaev model and holography”, *Phys. Rev. B* **99**, 054202 (2019).

doi: 10.1103/PhysRevB.99.054202

Mitsutoshi Fujita, Rene Meyer, Sumiran Pujari, and Masaki Tezuka (in alphabetical order), “Effective Hopping in Holographic Bose and Fermi Hubbard Models”, *J. High Energ. Phys.* **1901** (2019) 045.

doi: 10.1007/JHEP01(2019)045

Hrant Gharibyan, Masanori Hanada, Stephen H. Shenker, and Masaki Tezuka (in alphabetical order), “Onset of random matrix behavior in scrambling systems”, (Open Access) *J. High Energ.*

Phys. **1807** (2018) 124.

doi: 10.1007/JHEP07(2018)124

Antonio M. García-García, Bruno Loureiro, Aurelio Romero-Bermúdez, Masaki Tezuka (in alphabetical order), “Chaotic-Integrable Transition in the Sachdev-Ye-Kitaev Model”, (Open Access) Phys. Rev. Lett. **120**, 241603 (2018).

doi: 10.1103/PhysRevLett.120.241603

Masanori Hanada, Hidehiko Shimada, and Masaki Tezuka (in alphabetical order): “Universality in Chaos: Lyapunov Spectrum and Random Matrix Theory” Phys. Rev. E **97**, 022224 (2018).

doi: 10.1103/PhysRevE.97.022224

Ippei Danshita, Masanori Hanada, and Masaki Tezuka (in alphabetical order), “Creating and probing the Sachdev–Ye–Kitaev model with ultracold gases: Towards experimental studies of quantum gravity” Prog. Theor. Exp. Phys. **2017**, 083I01 (2017).

doi: 10.1093/ptep/ptx108

Jordan S. Cotler, Guy Gur-Ari, Masanori Hanada, Joseph Polchinski, Phil Saad, Stephen H. Shenker, Douglas Stanford, Alexandre Streicher, and Masaki Tezuka (in alphabetical order): “Black holes and random matrices” J. High Energ. Phys. **1705**, 118 (2017).

doi: 10.1007/JHEP05(2017)118

Jun’ichi Ozaki, Masaki Tezuka, and Norio Kawakami: “Drag dynamics in one-dimensional Fermi systems” Physical Review A **92**, 023607 (2015).

doi: 10.1103/PhysRevA.92.023607

Masaki Tezuka, Antonio M. García-García, and Miguel A. Cazalilla: “Destruction of long-range order by quenching the hopping range in one dimension” Physical Review A **90**, 053618 (2014).

doi: 10.1103/PhysRevA.90.053618

Fuyuki Matsuda, Masaki Tezuka, and Norio Kawakami: “Topological Properties of Ultracold Bosons in One-Dimensional Quasiperiodic Optical Lattice” Journal of the Physical Society of Japan **83**, 083707 (2014). (Letter) doi: 10.7566/JPSJ.83.083707

Monodeep Chakraborty, Masaki Tezuka, and B. I. Min: “Interacting-Holstein and extended-Holstein bipolarons” Physical Review B **89**, 035146 (2014).

doi: 10.1103/PhysRevB.89.035146

Masaki Tezuka and Norio Kawakami: “Reentrant topological transitions with Majorana end states in one-dimensional superconductors by lattice modulation” Physical Review B **88**, 155428 (2013).

doi:10.1103/PhysRevB.88.155428

Alejandro M. Lobos, Masaki Tezuka and Antonio M. García-García: “Restoring phase coherence in a one-dimensional superconductor using power-law electron hopping” Physical Review B **88**, 134506 (2013).

doi:10.1103/PhysRevB.88.134506

Jun’ichi Ozaki, Masaki Tezuka and Norio Kawakami: “Collision of one-dimensional fermion clusters” Physical Review A **86**, 033621 (2012).

doi:10.1103/PhysRevA.86.033621

Masaki Tezuka, and Norio Kawakami: “Reentrant topological transitions in a quantum wire / superconductor system with quasiperiodic lattice modulation” Physical Review B **85**, 140508(R) (2012).

doi:10.1103/PhysRevB.85.140508

Masaki Tezuka and Antonio M. García-García: “Testing the universality of the many-body metal-insulator transition by time evolution of a disordered one-dimensional ultracold fermionic gas” Physical Review A **85**, 031602(R) (2012).

doi:10.1103/PhysRevA.85.031602

Masaki Tezuka and Antonio M. García-García: “Stability of the superfluid state in a disordered 1D ultracold fermionic gas” *Physical Review A* **82**, 043613 (2010).

doi:10.1103/PhysRevA.82.043613

Masaki Tezuka and Masahito Ueda: “Ground states and dynamics of population-imbalanced Fermi condensates in one dimension” *New Journal of Physics* **12**, 055029 (2010).

doi:10.1088/1367-2630/12/5/055029

Masaki Tezuka and Masahito Ueda: “Density-Matrix Renormalization Group Study of Trapped Imbalanced Fermi Condensates” *Physical Review Letters* **100**, 110403 (2008).

doi:10.1103/PhysRevLett.100.110403

Masaki Tezuka, Ryotaro Arita and Hideo Aoki: “Phase diagram for the one-dimensional Hubbard-Holstein model: A density-matrix renormalization group study” *Physical Review B* **76**, 155114 (2007).

doi:10.1103/PhysRevB.76.155114

Masaki Tezuka: “An Improved Initialization Procedure for the Density-Matrix Renormalization Group” *Journal of the Physical Society of Japan* **76**, 053001 (Letter) (2007).

doi:10.1143/JPSJ.76.053001

Masaki Tezuka, Ryotaro Arita and Hideo Aoki: “Density-matrix renormalization group study of pairing when electron-electron and electron-phonon interactions coexist: effect of the electronic band structure” *Physical Review Letters* **95**, 226401 (2005).

doi:10.1103/PhysRevLett.95.226401

2. Refereed conference proceedings

Fuyuki Matsuda, Masaki Tezuka, and Norio Kawakami: “Correlation Effects in One-Dimensional Quasiperiodic Anderson-Lattice Model” *Physics Procedia* **75**, 245-251 (2015).

doi: 10.1016/j.phpro.2015.12.030

Masaki Tezuka, Alejandro M. Lobos and Antonio M. García-García: “Restoring long-range order in one-dimensional superconductivity by power-law hopping” *JPS Conference Proceedings* **3**, 016004 (2014).

doi:10.7566/JPSCP.3.016004

Fuyuki Matsuda, Masaki Tezuka, and Norio Kawakami: “Topological Properties of 1D Quasicrystal Bose-Mott Insulators” *JPS Conference Proceedings* **3**, 016013 (2014).

doi:10.7566/JPSCP.3.016013

Jun’ichi Ozaki, Masaki Tezuka, and Norio Kawakami: “Quantum effects on one-dimensional collision dynamics of fermion clusters” *Journal of Physics: Conference Series* **400**, 012059 (2012).

doi:10.1088/1742-6596/400/1/012059

Masaki Tezuka, Ryotaro Arita and Hideo Aoki: “Density-Matrix Renormalization Group Study of Phase Diagram in Systems with Strong Electron-Electron and Electron-Phonon Interactions”, *AIP Conference Proceedings* **850** (24th International Conference on Low Temperature Physics), 551-552 (2006).

doi:10.1063/1.2354829

Masaki Tezuka, Ryotaro Arita and Hideo Aoki: “A DMRG study of correlation functions in the Holstein-Hubbard model”, *Physica B* **359-361** (Proceedings of the International Conference on Strongly Correlated Electron Systems), 708-710 (2005).

doi:10.1016/j.physb.2005.01.20

3. Review articles

Masaki Tezuka: “The Sachdev-Ye-Kitaev (SYK) model, quantum scrambling and many-body localization” (in Japanese), *Kotai Butsuri* **57**, 217 (2022).

Fuyuki Matsuda, Masaki Tezuka, and Norio Kawakami: “Two-Dimensional Extension of Thouless Pumping and Diophantine Equation in Ultracold Atoms” (in Japanese), *Kotai Butsuri* **56**, 409 (2021).

Ippei Danshita, Masaki Tezuka, and Masanori Hanada: “Sachdev–Ye–Kitaev model, black holes, and ultra-cold gases” (in Japanese), *Butsuri* **73**, 569 (2018).

Masaki Tezuka: “Superfluidity in imbalanced systems — Fermi condensates observed in trapped neutral atoms” (in Japanese), *Bussei Kenkyu (Kyoto)* **95**, 34 (2010).

Invited talks at scientific meetings

Masaki Tezuka

“Fock space localization in a perturbed Sachdev-Ye-Kitaev model”, 17th Slovenia–Japan Seminar on Nonlinear Science, 22 March 2022. (online)

「Sachdev-Ye-Kitaev 模型における多体局在の定量的研究」, 「離散的手法による場と時空のダイナミクス 2021」, Kyoto University, 26 December 2021.

“Many-body localization in quasiperiodic systems and effect of nonhermitian terms”, IRN-APERIODIC “Open space between aperiodic order and physics & chemistry of materials”, Carry le Rouet, France, 6 October 2021. (online)

“Fock-space localization and entanglement in the Sachdev-Ye-Kitaev model”, YITP workshop “Recent progress in theoretical physics based on quantum information theory”, Kyoto, Japan, 1 March 2021. (online)

“Characterization of chaos in many-body quantum systems”, Pioneer Symposium, 2019 Korean Physical Society Fall Meeting, Gwangju, Korea, 23 October 2019.

“The Sachdev-Ye-Kitaev model as a maximally chaotic lattice model: study towards experimental realization, and new characterizations of chaos”, Workshop on Holography and Quantum Matter, Beijing, China, 26 August 2019.

“The Sachdev-Ye-Kitaev model, scrambling and chaos”, Youth Symposium on theoretical high energy physics in Southeast University, Nanjing, China, 20 August 2019.

“The Sachdev-Ye-Kitaev model, random matrices and quantum chaos”, KMI Interdisciplinary Seminar “Recent developments in SYK model and wormholes”, Nagoya, Japan, 22 July 2019.

“Characterization of chaotic dynamics in quantum systems”, 3rd French Russian Conference on Random Geometry and Physics: Sachdev-Ye-Kitaev Model and Related Topics, Moscow, Russia, 5 June 2019.

“Sachdev-Ye-Kitaev model, topological materials and chaos”, 第4回「トポロジーが紡ぐ物質科学のフロンティア」領域研究会, Nagoya, Japan, 22 January 2019.

“Level statistics and Lyapunov spectrum of the SYK model”, Discrete Approaches to the Dynamics of Fields and Space-Time (「離散的手法による場と時空のダイナミクス」研究会 2018), Sendai, Japan, 11 September 2018.

「Sachdev–Ye–Kitaev 模型と量子カオス」, 量子カオスとホログラフィー (30 March 2018), Kyoto, Japan, 13:30 - 14:30, 30 March 2018.

“The Sachdev–Ye–Kitaev model, random matrices and Lyapunov exponents”, Black Holes, Quantum Chaos, and Solvable Quantum Systems (22-26 January 2018), Sanya, China, 14:00 - 15:00, 25 January 2018.

“Proposal for a cold atom realization of the Sachdev-Ye-Kitaev model: a desktop quantum gravity laboratory”, The 2nd Tokyo-Beijing Workshop on Ultracold Atoms (1-2 October 2017), Tokyo, Japan, 10:50 - 11:30, 1 October 2017.

“The Sachdev–Ye–Kitaev model: proposal for ultracold gas realization and numerical study of the dynamics”, Quantum Simulations and Numerical Studies on Many-Body Physics (9-11 December 2016), Hsinchu, Taiwan, 11:30 - 12:20, 11 December 2016.

“Topological properties of quasi-periodic quantum systems”, Quantum Science Symposium Europe-2016 (1-2 November 2016), Cambridge, UK, 10:05 - 10:30, 1 November 2016.

“Fermions on quasiperiodically modulated lattices: pairing, localization, and topology”, EMN Meeting on Quantum 2016 (8-10 April 2016), Phuket, Thailand, 11:35 - 12:00, 9 April 2016.

“Dynamics of interacting fermions on a bichromatic optical lattice”, Correlations and coherence in quantum systems (8-12 October 2012), Evora, Portugal, 16:00 - 16:30, 8 October 2012.

“Dynamics of two-component Fermi gas close to insulating transition in a quasiperiodic potential”, Ultracold Gases: Superfluidity and Strong Correlations (USS-2012) (11-13 January 2012), Tokyo, 17:40-18:10, 12 January 2012.

“Dynamics of an interacting one-dimensional Fermi system in a quasiperiodic potential”, New Electronic Properties through Structure and Correlation (Japan Swiss Workshop 2011), Zurich, Switzerland, 14:30 - 15:00, 16 September 2011.

“One-dimensional Fermi gases: Density-matrix renormalization group study of ground state properties and dynamics”, Renormalization Group Approach from Ultra Cold Atoms to the Hot QGP, Kyoto, 17:00 - 18:00, 30 August 2011.

“Population-imbalanced Fermi Condensates: Effect of Trap Geometry”, Ultracold Fermi Gas: Superfluidity and Strong-Correlation (USS-2010), Ueno, Tokyo, 14:10 - 14:40, 13 May 2010.

「電子格子系及び調和型トラップ中の粒子数不均衡フェルミオン系の DMRG」, 密度行列繰り込み群法を用いた物性研究の新展開 (16-17 December 2008), Kyoto, 17:30 - 18:00, 16 December 2008.

References

Available upon request.

Last updated: May 10, 2022.