刘海文 (Haiwen Liu)

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EDUCATION & CAREER

2021.8-Now	Professor, Department of Physics, Beijing Normal University
2016.2-2021.7	Research Professor, Department of Physics, Beijing Normal University
2015.1 - 2016.1	Research Assistant Professor, ICQM, Peking University
2012.7-2014.12	Postdoc, ICQM, Peking University
2006.9-2012.6	PhD, Institute of Physics, CAS
2002.9-2006.6	Bachelor's Degree in physics & Mathematics, Peking University

RESEARCH AREA

My recent research interests include the disorder and dissipation effects on the quantum transport properties of superconducting and topological systems. The major contributions of my research include:

(1) in collaboration with experimentalists, we illustrate the quantum Griffith singularity associated with superconductor-metal phase transitions, Science 350, 542 (2015) ; Nature Commu. 10, 3633 (2019) ; PRL 127, 137001 (2021) ; verifying the bosonic strange metal phase in nanopatterned YBCO superconducting thin films, Nature 601, 205 (2022);

(2) based on microscopic model analysis, we generalize the concept of "Ising superconducting paring" to centrosymmetric systems and provide a general microscopic theory for Ising superconductors including few-layer stanene and ultra-thin Pb films, Science 367, 1454(2020); Phys. Rev. X 8, 021002 (2018);

(3) propose the discrete scale invariance in topological semimetals and uncover the relation of discrete scale invariance to logarithmic period magneto-resistance oscillations in topological materials including $ZrTe_5$, $HfTe_5$, etc. Science Advances 4, eaau5096 (2018); National Science Review 6, 914 (2019);

(4) theoretically investigate that the dephasing effect and disorder effect can give rise to a gap-like feature in the surface state of topological insulators, Phys. Rev. Lett. 113, 046805 (2014); theoretically investigate the topological Imbert-Fedorov shift associated with scattering process in topological semimetals, Phys. Rev. Lett. 115, 156602 (2015); and provide explanations for experiments in quantum oscillations and point contact spectroscopy of topological semimetals Cd_3As_2, Phys. Rev. X 5, 031037 (2015) ; Nature Mater. 15, 38 (2016).

I also largely participate in teaching courses, including graduate course “Theory of Solids” (with more than 200,000 views of online class video on the Koushare webinar [蔻享平台]) and undergraduate course “Electromagnetism” (with more than 100,000 views of online class video on Bilibili [哔哩哔哩]). I was granted the National Science Fund for Excellent Young Scholars [自然科学基金委优青项目] in 2020.

More information: http://physicsfaculty.bnu.edu.cn/Public/htm/news/5/1205.html

PUBLICATIONS #CO-FIRST AUTHOR *CORRESPONDING AUTHOR

谷歌学术: citation: 4500+, H-index: 34

谷歌学术主页：https://scholar.google.com/citations?user=FdTvuX0AAAAJ&hl=zh-CN

2024:

1. Qiang Zhao#, Ting-Na Shao#, Wen-Long Yang, Xue-Yan Wang, Xing-Yu Chen, Mei-Hui Chen, Fang-Hui Zhu, Cheng-Xue Chen, Rui-Fen Dou, Chang-Min Xiong, **Haiwen Liu***, and Jia-Cai Nie*, “Isotropic Quantum Griffiths Singularity in Nd0.8Sr0.2NiO2 Infinite-Layer Superconducting Thin Films”, **Phys. Rev. Lett. 133, 036003** (2024).
2. Yanan Li#, **Haiwen Liu**#, Shichao Qi, Haoran Ji, Xiaotong Jiao, Wenfeng Dong, Yi Sun, Wenhao Zhang, Chengcheng Ji, Zihan Cui, Minghu Pan, Nitin Samarth, Lili Wang, X.C. Xie, Qi-Kun Xue, Yi Liu* and Jian Wang*, “Bosonic metal states in crystalline iron-based superconductors at the two-dimensional limit”, **Phys. Rev. Lett. 132, 226003** (2024).
3. Junjie Qi*, **Haiwen Liu**, Jie Liu, Hua Jiang, Dong E. Liu, Chui-Zhen Chen*, Ke He, and X. C. Xie, “Anomalous Fraunhofer-like patterns in quantum anomalous Hall Josephson junctions”, **Phys. Rev. Research 6, 023293** (2024).

2023:

4. Ming Gong, **Haiwen Liu**, Hua Jiang*, Chui-Zhen Chen*, X. C. Xie*, “Half-quantized helical hinge currents in axion insulators”, **Natl. Sci. Rev. 10, nwad025** (2023).
5. Jiabin Qiao*, **Haiwen Liu**, and Ding Zhang*, “Electric Tuning of Vortex Ratchet Effect in $NbSe_2$”, **Nano Lett. 24, 511** (2024).
6. ZQ Zhang, H Liu, **Haiwen Liu**, H Jiang*, XC Xie, “Bulk-boundary correspondence in disordered non-Hermitian systems”, **Science Bulletin 68, 157** (2023).
7. H Yan, **Haiwen Liu***, “Weak Localization and Antilocalization in Twisted Bilayer Graphene”, **Phys. Rev. B 107, 224205** (2023).
8. Ting-Na Shao, Zi-Tao Zhang, Yu-Jie Qiao, Qiang Zhao, **Haiwen Liu***, Xin-Xiang Chen, Wei-Min Jiang, Chun-Li Yao, Xing-Yu Chen, Mei-Hui Chen, Rui-Fen Dou, Chang-Min Xiong, Guang-Ming Zhang*, Yi-Feng Yang*, and Jia-Cai Nie*, “Kondo scattering in underdoped Nd1-xSrxNiO2 infinite-layer superconducting thin films”, **Natl. Sci. Rev. 10, nwad112** (2023).

2022:

9. Chao Yang#, **Haiwen Liu**#, Yi Liu, Jiandong Wang, Sishuang Wang, Yang Wang, Qianmei He, Yue Tang, Jian Wang, X. C. Xie, James M. Valles Jr. *, Jie Xiong*, Yanrong Li, “A strange metal in a bosonic system”, **Nature 601**, **205** (2022).
10. Maoyuan Wang*, **Haiwen Liu**, and X. C. Xie, “New Type of Anticommutative Dynamical Magnetoelectric Response”, **Phys. Rev. Lett. 128**, **236601** (2022).

11. Yijia Wu, Hua Jiang, Hua Chen, **Haiwen Liu**, Jie Liu*, and X. C. Xie*, "Non-Abelian Braiding in Spin Superconductors Utilizing the Aharonov-Casher Effect", **Phys. Rev. Lett. 128, 106804** (2022).

2021:

12. Yi Liu#, Shichao Qi#, Jingchao Fang, Jian Sun, Chong Liu, Yanzhao Liu, Junjie Qi, Ying Xing, **Haiwen Liu***, Xi Lin, Lili Wang, Qi-Kun Xue, X. C. Xie, Jian Wang*, "The observation of in-plane quantum Griffiths singularity in two-dimensional crystalline superconductors", **Phys. Rev. Lett. 127, 137001** (2021).
13. H Ji, **Haiwen Liu***, H Jiang, XC Xie*, "Disorder effects on quantum transport and quantum phase transition in low-dimensional superconducting and topological systems", **Advances in Physics: X 6, 1884133** (2021).
14. Ce Huang#, Enze Zhang#, Yong Zhang#, Jinglei Zhang#, Faxian Xiu*, **Haiwen Liu***, Xiaoyi Xie, Linfeng Ai, Yunkun Yang, Minhao Zhao, Junjie Qi, Lun Li, Shanshan Liu, Zihan Li, Runze Zhan, Ya-Qing Bie, Xufeng Kou, Shaozhi Deng, X.C. Xie, "Observation of thickness-tuned universality class in superconducting β-W thin films", **Science Bulletin 66, 1830-1838** (2021)
15. Jiang Zeng, Haiwen Liu, Hua Jiang, Qing-Feng Sun, and X. C. Xie*, "Multiorbital model reveals a second-order topological insulator in 1 H transition metal dichalcogenides", **Phys. Rev. B 104, L161108** (2021).
16. J Zeng, M Lu, **Haiwen Liu**, H Jiang, XC Xie*, "Degenerate p orbitals flat band model and realization in two-dimensional materials", **Science Bulletin, j.scib.2021.01.006** (2021).
17. Ming Lu, Jiang Zeng, **Haiwen Liu**, Jin-Hua Gao*, and X. C. Xie, "Valley-selective Floquet Chern flat bands in twisted multilayer graphene", **Phys. Rev. B 103, 195146** (2021).
18. Mingrui Liu, **Haiwen Liu**, Tingna Shao, Weimin Jiang, Zitao Zhang, Jingzhuo Ling, Chunli Yao, Yujie Qiao, Qiang Zhao, Changmin Xiong, Ruifen Dou, and Jiacai Nie*, "Magnetic field controllable planar Hall effect in Sr2IrO4 films", Phys. Rev. B 104, 035301 (2021).

2020:

19. Joseph Falson, Yong Xu, Menghan Liao, Yunyi Zang, Kejing Zhu, Chong Wang, Zetao Zhang, Hongchao Liu, Wenhui Duan, Ke He, **Haiwen Liu***, Jurgen H Smet*, Ding Zhang*, Qi-Kun Xue, "Type-II Ising pairing in few-layer stanine", **Science 367, 1454-1457** (2020).
20. Y Wu, H Jiang, J Liu, **Haiwen Liu**, XC Xie*, "Non-Abelian braiding of Dirac fermionic modes using topological corner states in higher-order topological insulator", **Phys. Rev. Lett. 125, 036801** (2020).
21. H Li, **Haiwen Liu**, H Jiang*, XC Xie*, "3D quantum Hall effect and a global picture of edge states in Weyl semimetals", **Phys. Rev. Lett. 125, 036602** (2020).
22. Y Wu, **Haiwen Liu**, J Liu*, H Jiang, XC Xie*, "Double-frequency Aharonov-Bohm effect and non-Abelian braiding properties of Jackiw-Rebbi zero-mode", **National Science Review 7, 572-578** (2020).
23. Jun Ge#, Da Ma#, Yanzhao Liu, Huichao Wang, Yanan Li, Jiawei Luo, Tianchuang Luo, Ying Xing, Jiaqiang Yan, David Mandrus, **Haiwen Liu**, XC Xie*, Jian Wang*, "Unconventional Hall effect induced by Berry curvature", **National Science Review 7, 1879-1885** (2020).
24. H Liu, **Haiwen Liu***, D Zhang, XC Xie, "Microscopic theory of in-plane critical field in two-dimensional Ising superconducting systems", **Phys. Rev. B 102, 174510** (2020).
25. X Shang, **Haiwen Liu***, K Xia*, "Andreev spectroscopy of the triplet-superconductor state in the Bi/Ni bilayer system", **Phys. Rev. B 101, 174514** (2020).
26. S Cheng, J Liu, **Haiwen Liu***, H Jiang*, QF Sun, XC Xie, Majorana zero modes from topological kink states in the two-dimensional electron gas, **Phys. Rev. B 101, 165420** (2020).
27. Y Pan, H Ji, XQ Li, **Haiwen Liu***, "Quasi-bound states in an NPN-type nanometer-scale graphene quantum dot under a magnetic field", **Scientific Reports 10, 1-9** (2020).

28. H Ji, Y Pan, **Haiwen Liu***, "Evolution of quasi-bound states in the circular n–p junction of bilayer graphene under magnetic field", **Scientific Reports 10, 1-10** (2020).
29. Zhong-Qiu Fu, Yueting Pan, Jiao-Jiao Zhou, Ke-Ke Bai, Dong-Lin Ma, Yu Zhang, Jia-Bin Qiao, Hua Jiang*, **Haiwen Liu***, Lin He*, "Relativistic Artificial Molecules Realized by Two Coupled Graphene Quantum Dots", **Nano Letters 20, 6738-6743** (2020).

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30. Chao Yang#, Yi Liu#, Yang Wang, Liu Feng, Qianmei He, Jian Sun, Yue Tang, Chunchun Wu, Jie Xiong*, Wanli Zhang, Xi Lin, Hong Yao, **Haiwen Liu**, Gustavo Fernandes, Jimmy Xu, James M Valles, Jian Wang*, Yanrong Li, "Intermediate bosonic metallic state in the superconductor-insulator transition", **Science 366, 1505-1509** (2019).
31. Yi Liu#, Ziqiao Wang#, Pujia Shan, Yue Tang, Chaofei Liu, Cheng Chen, Ying Xing, Qingyan Wang, **Haiwen Liu***, Xi Lin, XC Xie, Jian Wang*, "Anomalous quantum Griffiths singularity in ultrathin crystalline lead films", **Nature communications 10, 1-6** (2019).
32. Hailong Fu, Yijia Wu, Ruoxi Zhang, Jian Sun, Pujia Shan, Pengjie Wang, Zheyi Zhu, LN Pfeiffer, KW West, **Haiwen Liu**, XC Xie, Xi Lin*, "3/2 fractional quantum Hall plateau in confined two-dimensional electron gas", **Nature communications 10, 1-6** (2019).
33. Huichao Wang, Yanzhao Liu, Yongjie Liu, Chuanying Xi, Junfeng Wang, Jun Liu, Yong Wang, Liang Li, Shu Ping Lau, Mingliang Tian, Jiaqiang Yan, David Mandrus, Ji-Yan Dai*, **Haiwen Liu***, Xincheng Xie, Jian Wang*, "Log-periodic quantum magneto-oscillations and discrete-scale invariance in topological material HfTe5", **National Science Review 6, 914-920** (2019).
34. CZ Chen*, **Haiwen Liu**, XC Xie, "Effects of random domains on the zero Hall plateau in the quantum anomalous Hall effect", **Phys. Rev. Lett. 122, 026601** (2019).
35. D Ma, H Jiang*, **Haiwen Liu***, XC Xie, "Planar Hall effect in tilted Weyl semimetals", **Phys. Rev. B 99, 115121** (2019).
36. H Liu, **Haiwen Liu***, R Joynt, XC Xie, "Effect of Coulomb screening on the discrete scale invariance of quasibound states in three-dimensional topological semimetals", **Phys. Rev. B 100, 195140** (2019).

2018:

37. Huichao Wang#, **Haiwen Liu**#, Yanan Li, Yongjie Liu, Junfeng Wang, Jun Liu, Ji-Yan Dai, Yong Wang, Liang Li, Jiaqiang Yan, David Mandrus, XC Xie*, Jian Wang*, "Discovery of log-periodic oscillations in ultraquantum topological materials", **Science advances 4, eaau5096** (2018).
38. Yi Liu, Ziqiao Wang, Xuefeng Zhang, Chaofei Liu, Yongjie Liu, Zhimou Zhou, Junfeng Wang, Qingyan Wang, Yanzhao Liu, Chuanying Xi, Mingliang Tian, **Haiwen Liu***, Ji Feng, XC Xie, Jian Wang*, "Interface-induced Zeeman-protected superconductivity in ultrathin crystalline lead films", **Phys. Rev. X 8, 021002** (2018).
39. S Cheng, **Haiwen Liu**, H Jiang*, QF Sun*, XC Xie, "Manipulation and characterization of the valley-polarized topological kink states in graphene-based interferometers", **Phys. Rev. Lett. 121, 156801** (2018).
40. D Ma, H Chen, **Haiwen Liu***, XC Xie, "Kondo effect with Weyl semimetal Fermi arcs", **Phys. Rev. B 97, 045148** (2018).

2017:

41. J Liao, Y Ou, **Haiwen Liu**, K He, X Ma, QK Xue, Y Li*, "Enhanced electron dephasing in three-dimensional topological insulators", **Nature communications 8, 1-7** (2017).
42. J Liu, **Haiwen Liu**, J Song, QF Sun, XC Xie, "Superconductor-graphene-superconductor Josephson junction in the quantum Hall regime", **Phys. Rev. B 96, 045401** (2017).
43. Y Wu, **Haiwen Liu**, H Jiang, XC Xie, "Global phase diagram of disordered type-II Weyl semimetals", **Phys. Rev. B 96, 024201** (2017).
44. KK Bai, JB Qiao, H Jiang*, **Haiwen Liu***, L He*, "Massless Dirac fermions trapping in a quasi-one-dimensional junction of a continuous graphene monolayer", **Phys. Rev. B 95, 201406** (2017).

2016:

45. CZ Chen, **Haiwen Liu,** H Jiang, XC Xie, "Positive magnetoconductivity of Weyl semimetals in the ultraquantum limit", **Phys. Rev. B 93, 165420** (2016).
46. QD Jiang, H Jiang, **Haiwen Liu**, QF Sun, XC Xie, "Chiral wave-packet scattering in Weyl semimetals", **Phys. Rev. B 93, 195165** (2016).
47. J Song, **Haiwen Liu**, J Liu, YX Li, R Joynt, Q Sun, XC Xie, "Quantum interference in topological insulator Josephson junctions", **Phys. Rev. B 93, 195302** (2016).
48. Xuebin Wang#, **Haiwen Liu**#, Junbo Zhu, Pujia Shan, Pengjie Wang, Hailong Fu, Lingjie Du, L. N. Pfeiffer, K. W. West, X. C. Xie, Rui-Rui Du, and Xi Lin, "Scaling properties of the plateau transitions in the two-dimensional hole gas system", **Phys. Rev. B 93, 075307** (2016).
49. Ming Lu, **Haiwen Liu**, Pei Wang, and X. C. Xie, "Higgs amplitude mode in massless Dirac fermion systems", **Phys. Rev. B 93, 064516** (2016).

2015:

50. Ying Xing#, Hui-Min Zhang#, Hai-Long Fu#, **Haiwen Liu**#, Yi Sun, Jun-Ping Peng, Fa Wang, Xi Lin, Xu-Cun Ma, Qi-Kun Xue, Jian Wang and X. C. Xie, "Quantum Griffiths Singularity of Superconductor-Metal Transition in Ga Thin Films", **Science 350, 542-545** (2015).
51. He Wang*, Huichao Wang*, **Haiwen Liu***, Hong Lu, Wuhao Yang, Shuang Jia, Xiong-Jun Liu, X. C. Xie, Jian Wei, Jian Wang, "Observation of superconductivity in 3D Dirac semimetal Cd3As2 crystal", **Nature Materials 15 38**, (2016)**.**
52. Qing-Dong Jiang*, Hua Jiang*, **Haiwen Liu***, Qing-Feng Sun, X. C. Xie, "Topological Imbert-Fedorov shift in Weyl semimetals", **Phys. Rev. Lett. 115, 156602** (2015).
53. Yanfei Zhao*, **Haiwen Liu***, Chenglong Zhang, Huichao Wang, Junfeng Wang, Ziquan Lin, Ying Xing, Hong Lu, Jun Liu, Yong Wang, Shuang Jia, X. C. Xie, Jian Wang, "Anisotropic Fermi Surface and Quantum Limit Transport in High Mobility 3D Dirac Semimetal Cd3As2", **Phys. Rev. X 5, 031037** (2015).
54. Cai-Zhen Li, Li-Xian Wang, **Haiwen Liu**, Jian Wang, Zhi-Min Liao, Da-Peng Yu, "Giant negative magnetoresistance induced by the chiral anomaly in individual Cd3As2 nanowires", **Nature Communications 6, 10137** (2015)
55. Yanfei Zhao*, **Haiwen Liu***, Chenglong Zhang, Huichao Wang, Junfeng Wang, Ziquan Lin, Ying Xing, Hong Lu, Jun Liu, Yong Wang,Shuang Jia, X. C. Xie, Jian Wang, "Anisotropic Magnetotransport and Exotic Longitudinal Linear Magnetoresistance in WTe2 Crystals", **Phys. Rev. B 92, 041104** (2015).
56. Chui-Zhen Chen, **Haiwen Liu**, Hua Jiang, Qing-feng Sun, and X. C. Xie,"Tunable Anderson transition of quantum spin Hall insulator", **Phys. Rev. B 91, 214202** (2015).
57. Zi-bo Wang, Hua Jiang, **Haiwen Liu*** and X. C. Xie, "Floquet Majorana fermions in driven hexagonal lattice systems", **Solid State Communications 215, 18** (2015).
58. Zibo Wang, Juntao Song, **Haiwen Liu**, Hua Jiang, X. C. Xie, "Building topological device through emerging robust helical surface states", **New J. Phys. 17, 113040** (2015).

2014:

59. **Haiwen Liu**, Hua Jiang, Qing-feng Sun and X.C. Xie, "Dephasing effect on backscattering of helical surface states in 3D topological insulators", **Phys. Rev. Lett. 113, 046805** (2014).
60. Hua Jiang, **Haiwen Liu**, Ji Feng, Qing-feng Sun and X. C. Xie, "Transport discovery of emerging robust helical surface states in $Z_2=0$ systems", **Phys. Rev. Lett. 112, 176601** (2014).
61. Yanfei Zhao*, **Haiwen Liu***, Xin Guo, Ying Jiang, Yi Sun, Huichao Wang, Yong Wang, Handong Li, M. H. Xie, X. C. Xie and Jian Wang, "Crossover from 3D to 2D quantum transport in Bi2Se3/In2Se3 superlattices", **Nano Lett. 14 (9), pp 5244–5249**, (2014).
62. Xiao Li*, **Haiwen Liu***, Hua Jiang, Fa Wang and Ji Feng, "The edge engineering of topological Bi(111) bilayer", **Phys. Rev. B 90, 165412** (2014).

63. Junjie Qi, **Haiwen Liu***, and X. C. Xie, "Surface plasmon polaritons in topological insulators" **Phys. Rev. B 89, 155420** (2014).
64. Huichao Wang, **Haiwen Liu**, Cui-Zu Chang, Huakun Zuo, Yanfei Zhao, Yi Sun, Zhengcai Xia, Ke He, Xucun Ma, X. C. Xie, Qi-Kun Xue and Jian Wang, "Crossover between Weak Antilocalization and Weak Localization of Bulk States in Ultrathin Bi2Se3 Films", **Scientific Reports 4, 5817** (2014).

BEFORE 2014:

65. Hua Jiang, Zhenhua Qiao, **Haiwen Liu**, Junren Shi, and Qian Niu, "Stabilizing Topological Phases in Graphene via Random Adsorption", **Phys. Rev. Lett. 109, 116803** (2012).
66. **Haiwen Liu**, Hua Jiang, X. C. Xie, and Qing-feng Sun, "Spontaneous spin-triplet exciton condensation in ABC-stacked trilayer graphene", **Phys. Rev. B 86, 085441** (2012).
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69. Juntao Song, **Haiwen Liu**, Hua Jiang, Qing-feng Sun, and X. C. Xie, "Dependence of topological Anderson insulator on the type of disorder", **Phys. Rev. B 85, 195125** (2012).
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71. Juntao Song, **Haiwen Liu** and Hua Jiang, "Quantum pump effect induced by a linearly polarized microwave in a two-dimensional electron gas", **Journal of Physics: Condensed Matter 24, 215304** (2012).
72. Sheng-nan Zhang, Hua Jiang and **Haiwen Liu***, "Numerical Study of Transport Properties in Topological Insulator Quantum Dots under Magnetic Field", **Modern Physics Letters B** 27, 135014 (2013).
73. Dong-wei Xu, **Haiwen Liu**, Vincent Sacksteder IV, Juntao Song, Hua Jiang, Qing-feng Sun and X. C. Xie, "A disorder induced field effect transistor in bilayer and trilayer graphene", **Journal of Physics: Condensed Matter 25, 105303** (2013).