Curriculum Vitae

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Education:

1986	**Ph.D.** in Physics (experimental condensed matter physics), Iowa State University.
1982	**B.S.** in Physics, University of Science and Technology of China (USTC)

Professional Positions:

2003 – Present	Professor, Dept. of Physics and Astronomy, University of Kansas.
2000 – 2003	Assoc. Prof. (tenured), Dept. of Physics and Astronomy, Univ. of Kansas
1997 – 2000	Assoc. Prof. (tenure-track), Dept. of Physics and Astronomy, Univ. of Kansas
1994 – 1997	Research Assoc. Prof., Dept. of Physics, Stony Brook University
1990 – 1994	Research Assistant Professor, Dept. of Physics, Stony Brook University
1988 – 1990	Research Scientist, Dept. of Physics, SUNY at Stony Brook
1986 – 1988	Postdoctoral Research Associate, Dept. of Physics, SUNY at Stony Brook.
1982 – 1986	Research Assistant, Dept. of Physics Iowa State Univ./Ames Lab, DOE

Other Positions:

2006 – 2012	Adjunct Professor, School of Electronic Science & Engineering, Nanjing University, China
2006 – 2008	Consultant, D-Wave Systems, Burnaby, BC, Canada

Teaching Interests (courses taught):

- Quantum Mechanics I & II (PHSX 711, PHSX 811)
- Condensed Matter Physics (CMP I – PHSX 781)
- Electromagnetism (PHSX 531) and Electrodynamics (PHSX 631)
- Physical Measurements (Advanced Lab – PHSX 516)
- Modern Physics (PHSX 313)
- General Physics I & II (PHSX 211, PHSX 212)
- Supervised 11 postdocs, 17 PhD students, 6 Master students, and 12 undergrads.

Research Interests:

- Quantum information science, quantum computing, circuit QED, quantum simulation
- Foundation of quantum mechanics, macroscopic quantum phenomena (e.g., Schrodinger cat)
- Quantum thermodynamics.
- Nano-science and technology

Awards and Memberships:

Higuchi - Olin K. Petefish Award, 2013
Changjiang Scholar, Nanjing University, China, 2007
Guanghua Fellowship, Nanjing University, China, 2006
Guomoruo Award in Physics, USTC, China, 1981
Member, American Association for the Advancement of Science (AAAS)
Member, Sigma Pi Sigma

Journal editorial board member/referee, proposal reviewer, and conference session chair:

- Member of Editorial Board – Modern Physics Letters
- Member of Editorial Board – International Journal of Modern Physics
- Member of Editorial Board – ISRN Condensed Matter Physics
- Member of Editorial Board – Progress in Physics, CPS
- Referee – Science, Physical Review Letters, Physical Review A, Physical Review B, Applied Physics Letters, Europhysics Letters, Journal of Applied Physics, IEEE Appl. Superconductivity, Optical Communications, Journal of Low Temperature Physics, Chinese Physics Letters.
- Reviewer – NSF, Research Grant Council of Hong Kong, Changjiang Scholar Program of China, Chinese Academy of Sciences, Chinese Ministry of Education, Netherland Foundation for Fundamental Research of Matter, Taiwan National Science Council
- Chair – Applied Superconductivity Conference (QC sessions), International Superconductive Electronics Conference (Plenary session), International Workshop on Solid State Quantum Computing (QC session), International Conference on Physics Education and Frontier Physics Research (QIS session), International Symposium on Microwave/THz Science & Applications, etc.

Book Editor:

Exploring the Quantum Classical Frontier: Recent Advances in Macroscopic Quantum Phenomena, ed. J. Friedman and **S. Han**, Nova Science Publishers, Inc. (February 2002).

Recent Invited Talks:

- *Scalable quantum computing with superconducting circuits - from a dream to reality*. Institute of Physics, Chinese Academy of Science, Beijing, China, June 9, 2017.
- *Quantum computation with superconducting circuits*. School of Physics, Hangzhou Normal University, Hangzhou, China, June 5, 2017.
- *Realization of Scalable quantum computing with superconducting circuits*. Center for Superconductor Research, South West Jiaotong University, Chengdu, China, May 23, 2017.
- *Scalable quantum computing with superconducting circuits-A dream becoming true*. Distinguished Scholar Lecture, Tsinghua University, Beijing, China, May 16, 2017.
- *Superconducting quantum computing – From dream to reality*, Future High Performance Computing Forum, Shanghai, China, December 14, 2016.
- *Effects of decoherence on adiabatic quantum computation*, Frontiers in Quantum Information Science Workshop, Hangzhou, China, May 16, 2015.
- *Multiplexed super-exchange interaction for efficient quantum computing networks*, The Fourth International Workshop on Entanglement, Decoherence and Quantum Control, SUNY at Buffalo, Buffalo, New York, October 22, 2014.
- *Quantum Phase Diffusion in Tilted Washboard Potentials*, The 13th Low Temperature Physics Workshop of Chinese Physical Society, Zunyi, China, October 23, 2013.
- *Single-Step SWAP of Multi-qubit States via a Qubit Coupler*, The 6th International Workshop on Solid State Quantum Computing, Beijing, China, October 19, 2013.

PUBLICATIONS

1. Chao Song, Kai Xu, Wuxin Liu, Chuiping Yang, Shi-Biao Zheng, Hui Deng, Qiwei Xie, Keqiang Huang, Qiujiang Guo, Libo Zhang, Pengfei Zhang, Da Xu, Dongning Zheng, Xiaobo Zhu, H. Wang, Y.-A. Chen, C.-Y. Lu, **Siyuan Han**, and J.-W. Pan, *10-Qubit Entanglement and Parallel Logic Operations with a Superconducting Circuit*, Phys. Rev. Lett. **119**, 180511 (2017), Editors' Suggestion: "The largest

entangled state created to date is realized in a superconducting circuit, with complete connectivity for and of each qubit."

2. Zhen Chen, Yimin Wang, Tiefu Li, Lin Tian, Yueyin Qiu, Kunihiro Inomata, Fumiki Yoshihara, **Siyuan Han**, Franco Nori, J. S. Tsai, and J. Q. You, *Single-photon-driven high-order sideband transitions in an ultrastrongly coupled circuit-quantum-electrodynamics system*, Phys. Rev. A **96**, 012325 (2017)
3. Jamie Wilt, Youpin Gong, Ming Gong, Feifan Su, Huikai Xu, Ridwan Sakidja, Alan Elliot, Rongtao Lu, Shiping Zhao, **Siyuan Han**, and Judy Z. Wu, *Atomically thin Al_2O_3 films for tunnel junctions*, Phys. Rev. Appl. **7**, 064022 (2017).
4. Chui-Ping Yang, Qi-Ping Su, Shi-Biao Zheng, Franco Nori, and **Siyuan Han**, *Entangling two oscillators with arbitrary asymmetric initial state*, Phys. Rev. A **95**, 052341 (2017).
5. Hao Li, Jianshe Liu, Yingshan Zhang, Han Cai, Gang Li, Qichun Liu, **Siyuan Han**, and Wei Chen, *Principle and experimental investigation of current-driven negative-inductance superconducting quantum interference device*, Supercond. Sci. Technol. **30**, 035012 (2017).
6. Y. P. Zhong, D. Xu, P. Wang, C. Song, Q. J. Guo, W. X. Liu, K. Xu, B. X. Xia, C.-Y. Lu, **Siyuan Han**, Jian-Wei Pan, and H. Wang, *Emulating anyonic fractional statistical behavior in a superconducting quantum circuit*, Phys. Rev. Lett. **117**, 110501 (2016). Editors' Suggestion: "A superconducting circuit is used as a platform to experimentally study the fractional statistics of Abelian anyons."
7. D. V. Averin, K. Xu, Y. P. Zhong, C. Song, H. Wang, and **Siyuan Han**, *Suppression of dephasing by qubit motion in superconducting circuits*, Phys. Rev. Lett. **116**, 010501 (2016).
8. H. K. Xu, C. Song, W. Y. Liu, G. M. Xue, F. F. Su, H. Deng, Ye Tian, D. N. Zheng, **Siyuan Han**, Y. P. Zhong, H. Wang, Yu-xi Liu, and S. P. Zhao, *Coherent population transfer between un- or weakly-coupled states in ladder-type superconducting Qutrits*, Nat. Comm. **7**, 11018 (2016).
9. Ming Gong, Xueda Wen, Guozhu Sun, Dan-Wei Zhang, Dong Lan, Yu Zhou, Yunyi Fan, Yuhao Liu, Xinsheng Tan, Haifeng Yu, Yang Yu, Shi-Liang Zhu, **Siyuan Han**, and Peiheng Wu, *Simulating the Kibble-Zurek mechanism of the Ising model with a superconducting qubit system*, Sci. Rep. **6**, 22667 (2016).
10. Ming Gong, Yu Zhou, Dong Lan, Yunyi Fan, Jiazheng Pan, Haifeng Yu, Jian Chen, Guozhu Sun, Yang Yu, **Siyuan Han**, and Peiheng Wu, *Landau-Zener-Stuckelberg-Majorana interference in a 3D transmon driven by a chirping microwave*, Appl. Phys. Lett. **108**, 112602 (2016).
11. Shi-Biao Zheng, You-Peng Zhong, Kai Xu, Qi-Jue Wang, H. Wang, Li-Tuo Shen, Chui-Ping Yang, John M. Martinis, A. N. Cleland, and **Siyuan Han**, *Quantum Delayed-Choice Experiment with a Beam Splitter in a Quantum Superposition*, Phys. Rev. Lett. **115**, 260403 (2015), Editors' Suggestion: "A beam splitter is placed in a quantum superposition state of being both active and inactive allowing the wave and particle aspects of the system to be observed in a single setup."
12. Xinsheng Tan, Haifeng Yu, Yang Yu, and **Siyuan Han**, *Rapid characterization of microscopic two-level systems using Landau-Zener transitions in a superconducting qubit*, Appl. Phys. Lett. **107**, 102601 (2015).
13. Chui-Ping Yang , Qi-Ping Su , Shi-Biao Zheng, and **Siyuan Han**, *One-step transfer or exchange of arbitrary multipartite quantum states with a single-qubit coupler*, Phys. Rev. B **92**, 054509 (2015).
14. Guozhu Sun, Jiquan Zhai, Xueda Wen, Yang Yu, Lin Kang, Weiwei Xu, Jian Chen, Peiheng Wu, and **Siyuan Han**, *Detection of small single-cycle signals by stochastic resonance using a bistable superconducting quantum interference device*, Appl. Phys. Lett. 106, 172602 (2015).
15. Guozhu Sun, Xueda Wen, Ming Gong, Danwei Zhang, Yang Yu, Shiliang Zhu, Jian Chen, Peiheng Wu, and **Siyuan Han**, *Observation of coherent oscillation in single-passage Landau-Zener transitions*, Sci. Rep., **5**, 8463 (2015).

16. G. M. Xue, Ming Gong, H. K. Xu, W. Y. Liu, H. Deng, Ye Tian, H. F. Yu, Yang Yu, D. N. Zheng, S. P. Zhao, and **Siyuan Han**, *Observation of quantum stochastic synchronization in a dissipative quantum system*, Phys. Rev. B **90**, 224505 (2014).
17. Xinsheng Tan, Dan-Wei Zhang, Zhentao Zhang, Yang Yu, **Siyuan Han**, and Shi-Liang Zhu, *Demonstration of Geometric Landau-Zener Interferometry in a Superconducting Qubit*, Phys. Rev. Lett. **112**, 027001 (2014).
18. Chui-Ping Yang, Qi-Ping Su, Shi-Biao Zheng, and **Siyuan Han**, *Generating entanglement between microwave photons and qubits in multiple cavities coupled by a superconducting qutrit*, Phys. Rev. A **87**, 022320 (2013).
19. Rongtao Lu, Alan J. Elliot, Logan Wille, Bo Mao, **Siyuan Han**, Judy Z. Wu, John Talvacchio, Heidi M. Schulze, Rupert M. Lewis, Daniel J. Ewing, H. F. Yu, G. M. Xue, and S. P. Zhao, *Fabrication of Nb/Al2O3/Nb Josephson Junctions Using in situ Magnetron Sputtering and Atomic Layer Deposition*, IEEE Trans. Appl. Supercon. **23**, 1100705 (2013).
20. Chui-Ping Yang, Qi-Ping Su, and **Siyuan Han**, *Generation of Greenberger-Horne-Zeilinger entangled states of photons in multiple cavities via a superconducting qutrit or an atom through resonant interaction*, Phys. Rev. A **86**, 022329 (2012).
21. Guozhu Sun, Zhongyuan Zhou, Bo Mao, Xueda Wen, Peiheng Wu, and **Siyuan Han**, *Entanglement dynamics of a phase qubit coupled to a two-level system*, Phys. Rev. B **86**, 064502 (2012).
22. Ye Tian, H. F. Yu, H. Deng, G. M. Xue, D. T. Liu, Y. F. Ren, G. H. Chen, D. N. Zheng, X. N. Jing, Li Lu, S. P. Zhao, and **Siyuan Han**, *A cryogen-free dilution refrigerator based Josephson qubit measurement system*, Rev. Sci. Inst. 83, 033907 (2012).
23. H. F. Yu, X. B. Zhu, Z. H. Peng, Ye Tian, D. J. Cui, G. H. Chen, D. N. Zheng, X. N. Jing, Li Lu, S. P. Zhao, and **Siyuan Han**, Quantum Phase Diffusion in a Small Underdamped Josephson Junction, *Phys. Rev. Lett.*, **107**, 067004 (2011).
24. Guozhu Sun, Xueda Wen, Bo Mao, Yang Yu, Jian Chen, Weiwei Xu, Lin Kang, Peiheng Wu, and **Siyuan Han**, Landau-Zener-Stuckelberg Interference of Microwave Dressed States of a Superconducting Phase Qubit, *Phys. Rev. B* **83**, 180507(R) (2011).
25. Guozhu Sun, Xueda Wen, Bo Mao, Zhongyuan Zhou, Yang Yu, Peiheng Wu, and **Siyuan Han**, Quantum Dynamics of a Microwave Driven Superconducting Phase Qubit Coupled to a Two-Level System, *Phys. Rev. B* **82**, 132501 (2010)
26. Guozhu Sun, Xueda Wen, Bo Mao, Yang Yu, Jian Chen, Peiheng Wu, and **Siyuan Han**, Tunable Quantum Beam Splitters for Coherent Manipulation of a Solid-State Tripartite Qubit System, *Nat. Comm.* **1**: 51, doi:10.1038/ncomms1050 (2010).
27. Xiao-Ling He, Chui-Ping Yang, Sheng Li, Jun-Yan Luo, and **Siyuan Han**, Quantum logical gates with four-level superconducting quantum interference devices coupled to a superconducting resonator: A scheme without adjustment of the level spacings and with tolerance for nonuniform device parameter, *Phys. Rev. A* **82**, 024301 (2010).
28. H. F. Yu, X. B. Zhu, Z. H. Peng, W. H. Cao, D. J. Cui, Ye Tian, G. H. Chen, D. N. Zheng, X. N. Jing, Li Lu, and S. P. Zhao, and **Siyuan Han**, Quantum and classical resonant escapes of a strongly-driven Josephson junction, *Phys. Rev. B* **81**, 144518 (2010).
29. R. Harris, J. Johansson, A.J. Berkley, M.W. Johnson, T. Lanting, **Siyuan Han**, P. Bunyk, E. Ladizinsky, T. Oh, I. Perminov, E. Tolkacheva, S. Uchaikin, E. Chapple, C. Enderud, C. Rich, M. Thom, J. Wang, B. Wilson, and G. Rose, Experimental Demonstration of a Robust and Scalable Flux Qubit, *Phys. Rev. B* **81**, 134510 (2010).
30. R. Harris, F. Brito, A.J. Berkley, J. Johansson, M.W. Johnson, T. Lanting, P. Bunyk, E. Ladizinsky, B. Bumble, A. Fung, A. Kaul, A. Kleinsasser, and **S. Han**, Synchronization of Multiple Coupled rf-SQUID Flux Qubits, *New J. Phys*. **11**, 123022 (2009).

31. R. Harris, T. Lanting, A. J. Berkley, J. Johansson, M. W. Johnson, P. Bunyk, E. Ladizinsky, N. Ladizinsky, T. Oh, and **Siyuan Han**, Compound Josephson-junction coupler for flux qubits with minimum crosstalk, *Phys. Rev*. B **80**, 052506 (2009).
32. Guozhu Sun, Xueda Wen, Yiwen Wang, Shanhua Cong, Jian Chen, Lin Kang, Weiwei Xu, Yang Yu, **Siyuan Han**, and Peiheng Wu, Population inversion induced by Landau--Zener transition in a strongly driven rf superconducting quantum interference device. *Appl. Phys. Lett.* **94**, 102502 (2009).
33. Sang-Kil Son, **Siyuan Han**, and Shih-I Chu, Floquet formulation for the investigation of multiphoton quantum interference in a superconducting qubit driven by a strong ac field, *Phys. Rev.* A **79**, 032301 (2009).
34. Yang Yu, Shiliang Zhu, Guozhu Sun, Xueda Wen, Ning Dong, Jian Chen, Peiheng Wu, and **Siyuan Han**, Quantum Jumps between Macroscopic Quantum States of Superconducting Qubit Coupled to a Microscopic Two-Level System, *Phys. Rev. Lett*. **101**, 151001 (2008).
35. R. Harris, M.W. Johnson, **Siyuan Han**, A.J. Berkley, J. Johannsson, P. Bunyk, S. Govorkov, M.C. Thom, S. Uchaikin, B. Bumble, A. Fung, A. Kaul, A. Kleinsasser, C.J.S. Truncik, M.H.S. Amin, and D.V. Averin, Probing temperature dependent noise in flux qubits via macroscopic resonant tunneling, *Phys. Rev. Lett*. **101**, 117003 (2008).
36. Sun Guozhu, Wang Yiwen, Cao Junyu, Chen Jian, Ji Zhengming, Kang Lin, Xu Weiwei, Yu Yang, **Han Siyuan**, and Wu Peiheng, Microwave-induced phase escape in a Josephson tunnel junction, *Phys. Rev. B* **77**, 104531 (2008).
37. Zhongyuan Zhou, Shih-I Chu, and **Siyuan Han**, Relaxation and decoherence in a resonantly driven qubit, *J. Phys. B: At. Mol, Opt. Phys*. **41**, 045506 (2008).
38. Shao-Xiong Li, Wei Qiu, **Siyuan Han**, Y. F. Wei, X. B. Zhu, C. Z. Gu, S. P. Zhao, and H. B. Wang, Observation of Macroscopic Quantum Tunneling in a Single Bi-2212 Surface Intrinsic Josephson Junction, *Phys. Rev. Lett*, **99**, 037002 (2007).
39. Chui-Ping Yang and **Siyuan Han**, Local measurement for a set of n-qubit maximally entangled states in cavity QED, *Phys. Rev. A*, **75**, 052315 (2007).
40. Chui-Ping Yang and **Siyuan Han**, Rotation gate for a three-level superconducting quantum interference device qubit with resonant interaction, *Phys. Rev. A*, **74,** 044302 (2006).
41. Zhongyuan Zhou, Shih-I Chu, and **Siyuan Han**, A unified approach to realize universal quantum gates in a coupled two-qubit system with fixed always-on coupling, *Phys. Rev. B*, **73,** 104521 (2006).
42. Chui-Ping Yang and **Siyuan Han**, Realization of an n-qubit controlled-U gate with superconducting quantum interference devices or atoms in cavity QED, *Phys. Rev. A*, **73,** 032317 (2006).
43. P. K. Gagnebin, S. R. Skinner, E. C. Behrman, J. E. Steck, Z. Zhou, and **S. Han**, Quantum gates using a pulsed bias scheme, *Phys. Rev. A*, **72,** 042311 (2005).
44. Chui-Ping Yang and **Siyuan Han**, n-qubit controlled phase gate with superconducting quantum interference devices coupled to a resonator, *Phys. Rev. A*, **72**, 032311 (2005).
45. Zhongyuan Zhou, Shih-I Chu, and **Siyuan Han**, Rapid optimization of working parameters of microwave-driven multi-level qubits for minimal gate leakage, *Phys. Rev. Lett*. **95**, 120501 (2005).
46. Chui-Ping Yang and **Siyuan Han**, Extracting an arbitrary relative phase from a multiqubit two-component entangled state, *Phys. Rev. A*, **72**, 014306 (2005).
47. Chui-Ping Yang and **Siyuan Han**, A scheme for the teleportation of multiqubit quantum information via the control of many agents in a network, *Phys. Lett. A*, **343**, 267-273 (2005).
48. J. Mannik, S. Li, W. Qiu, W. Chen, V. Patel, **S. Han**, and J. E. Lukens, Crossover from Kramers to phase-diffusion switching in hysteretic DC-SQUIDs, *Phys. Rev. B* **71**, 220509(R) (2005).
49. Chui-Ping Yang and **Siyuan Han**, Generation of Greenberger-Horne-Zeilinger entangled states with three SQUID qubits: a scheme with tolerance to non-uniform device parameters, *Physica A* **347**, 253-267 (2005).

50. Chui-Ping Yang and **Siyuan Han**, Preparation of Greenberger-Horne-Zeilinger entangled states with multiple superconducting quantum interference device qubits/atoms in cavity QED, *Phys. Rev. A* **70**, 062323 (2004).
51. Chui-Ping Yang, Shih-I Chu, and **Siyuan Han**, Simplified realization of quantum phase gate with two four-level qubits in cavity QED, *Phys. Rev. A* **70**, 044303 (2004).
52. Zhongyuan Zhou, Shih-I Chu, and **Siyuan Han**, Suppression of energy-relaxation-induced decoherence in Λ-type three-level SQUID flux qubits: A dark-state approach, *Phys. Rev. B* **70**, 094513 (2004).
53. Chui-Ping Yang, Shih-I Chu, and **Siyuan Han**, Efficient many party controlled teleportation of multiqubit quantum information via entanglement, *Phys. Rev. A* **70**, 022329 (2004).
54. Chui-Ping Yang, Shih-I Chu, and **Siyuan Han**, An energy relaxation tolerant approach to quantum entanglement, information transfer, and gates with superconducting-quantum-interference-device qubits in cavity QED, *J. Phys. Cond. Matt.*, **16**, 1907 (2004).
55. Chui-Ping Yang, Shih-I Chu, and **Siyuan Han**, A small error-correction code for protecting three-qubit quantum information, *JETP Lett.* **79**, 236 (2004).
56. Chui-Ping Yang and **Siyuan Han**, Arbitrary single-qubit operations without energy relaxation in a three-level SQUID qubit, *Phys. Lett. A*, **321**, 273 (2004).
57. Chui-Ping Yang, Shih-I Chu, and **Siyuan Han**, Quantum information transfer and entanglement with SQUID qubits in cavity QED: A dark-state scheme with tolerance to non-uniform device parameters, *Phys. Rev. Lett.* **92**, 117902 (2004).
58. Yang Yu and **Siyuan Han**, Resonant Escape over an Oscillating Barrier in Under-damped Josephson Tunnel Junction, *Phys. Rev. Lett*. **91**, 127003 (2003).
59. Chui-Ping Yang, Shih-I Chu, and **Siyuan Han**, Possible realization of entanglement, logical gates, and quantum information transfer with superconducting-quantum-interference-device qubits in cavity QED. *Phys. Rev. A* .**67**, 042311 (2003).
60. Chui-Ping Yang, Shih-I Chu, and **Siyuan Han**, A scheme for protecting one-qubit information against erasure error. *J. Opt. B* **4**, 256-259 (2002).
61. Chui-Ping Yang, Shih-I Chu, and **Siyuan Han**, An error prevention scheme with two pairs of qubits. *Phys. Rev. A* **66**, 034301 (2002).
62. Zhongyuan Zhou, Shih-I Chu, and **Siyuan Han**, Quantum computing with superconducting device: A three-level SQUID qubit. *Phys. Rev. B* **66**, 054527 *(*2002).
63. Shaoxiong Li, Yang Yu, Yu Zhang, Wei Qiu, **Siyuan Han**, and Zhen Wang, Quantitative study of macroscopic quantum tunneling in a dc SQUID - A system with two degrees of freedom. *Phys. Rev. Lett.* **89**, 098301 (2002).
64. Chui-Ping Yang, Shih-I Chu, and **Siyuan Han**. Error-prevention scheme for protecting three- qubit quantum information. *Phys. Lett. A* **299**, 31 *(*2002).
65. Yang Yu, **Siyuan Han**, Xi Chu, Shih-I Chu, and Zhen Wang, Coherent temporal oscillations of macroscopic quantum states in a Josephson junction. *Science* **296**, 889-892 (2002).
66. Roberto S. Aga Jr., Yi-Yuan Xie, Shao-Lin Yan, Judy Z. Wu, and **Siyuan Han**, Microwave power handling capability of $RgBa_2CaCu_2O_6$ superconducting micros trip lines. *Appl. Phys. Lett.* **79**, 2417-2419 (2001).
67. **Siyuan Han**, Yang Yu, Xi Chu, Shih-I Chu, and Zhen Wang, Time resolved measurement of disspation-induced decoherence in a Josephson junction. *Science* **293**, 1457 (2001).
68. **Siyuan Han** and R. Rouse, Comment on "Measurement of the intrinsic dissipation of a macroscopic system in the quantum regime". *Phys. Rev. Lett.* **86**, 4191 (2001).
69. Roberto S. Aga, Shao-Lin Yan, Yiyuan Xie, **Siyuan Han**, Judy Z. Wu, Quan-Xi Jia, and Chuhee Kwon, Microwave surface impedance of RgBa2CaCu2O6+8 thin films. *Appl. Phys. Lett.* **76**, 1606-1608 (2000).

70. **Siyuan Han**, R. Rouse, and J. E. Lukens, Observation of cascade two-photon-induced transitions between fluxoid states of a SQUID. *Phys. Rev. Lett.* **84**, 1300 (2000).
71. **Siyuan Han** and R. Rouse, Scaling property and sign-reversal effect of periodically driven stochastic bistable systems in strong adiabatic regime. *Phys. Rev. B* **59**, 4427 (1999).
72. Wei Zheng, Jonathan Friedman, D. V. Averin, **Siyuan Han**, and J. E. Lukens, Observation of strong coulomb blockade in resistively isolated tunnel junctions. *Solid State Comm.* **108**, 839-843 (1998).
73. K. A. Matsuoka, K. K. Likharev, P. D. Dresselhaus, L. Ji, **Siyuan Han**, and J. E. Lukens, Single-electron traps: A quantitative comparison of theory and experiment. *J. Appl. Phys.* **81**, 2269 (1997).
74. Daniel J. Flees, **Siyuan Han**, and J. E. Lukens, Interband transitions and band gap measurement in Bloch transistors. *Phys. Rev. Lett.* **78**, 4817-4820 (1997).
75. **Siyuan Han**, R. Rouse, and J. E. Lukens, Generation of a population inversion between quantum states of a macroscopic variable. *Phys. Rev. Lett.* **76**, 3404-3407 (1996).
76. R. Rouse, **Siyuan Han**, and J. E. Lukens, Observation of resonant tunneling between macroscopically distinct quantum levels. *Phys. Rev. Lett.* **75**, 1614-1617 (1995).
77. R. Rouse, **Siyuan Han**, and J. E. Lukens, Flux amplification using stochastic superconducting quantum interference devices. *Appl. Phys. Lett.* **66**, 108-110 (1995).
78. P. D. Dresselhaus, L. Ji, **Siyuan Han**, J. E. Lukens, and K. K. Likharev, Measurement of single electron lifetime in a multijunction trap. *Phys. Rev. Lett.* **72**, 3226-3229 (1994).
79. **Siyuan Han**, Baokang Bi, Wenxing Zhang, and J. E. Lukens, Demonstration of Josephson effect submillimeter wave sources with increased power. *Appl. Phys. Lett.* **64**, 1424-1426 (1994).
80. Baokang Bi, **Siyuan Han**, and J. E. Lukens, Radiation linewidth of phase-locked distributed array in the submillimeter wave range. *Appl. Phys. Lett.* **62**, 2745-2747 (1993).
81. **Siyuan Han**, J. Lapointe, and J. E. Lukens, Effect of a two-dimensional potential on the rate of thermally induced escape over the potential barrier. *Phys. Rev. B* **46**, 6338-6345 (1992).
82. **Siyuan Han**, Jean Lapointe, and J. E. Lukens, Observation of incoherent relaxation by tunneling in a macroscopic two-state system. *Phys. Rev. Lett.* **66**, 810-813 (1991).
83. **Siyuan Han**, L. F. Cohen, and E. L. Wolf, Apparent critical current and rf steps in a second- order proximity-induced Josephson effect. *Phys. Rev. B* **42**, R8682-8685 (1990).
84. **Siyuan Han**, J. Lapointe, and J. E. Lukens, Thermal activation in a two-dimensional potential. *Phys. Rev. Lett.* **63**, 1712-1715 (1989).
85. E. L. Wolf, **Siyuan Han**, and K. W. Ng, Comment on macroscopic theory of the proximity induced Josephson effect, *Phys. Rev. Lett.* **62**, 2334 (1989).
86. **S. Han** and E. L. Wolf. Temperature dependence of the critical Josephson current in superconductor-insulator-normal metal proximity junction near T_c. *Phys. Rev. B* **35**, 4669 (1987).
87. E. L. Wolf, A.J. Millis, and **Siyuan Han**, Reply to comment on "Observation of negative s-wave proximity effect in superconducting UBe_{13}", *Phys. Rev. Lett.* **58**, 2276 (1987).
88. **S. Han**, K. W. Ng, E. L. Wolf, A. J. Minis, A. J. Smith, and Z. Fisk, Observation of negative s-wave proximity effect in superconducting UBe_{13}. *Phys. Rev. Lett.* **57**, 238-241 (1986).
89. **S. Han**, K. W. Ng, E. L. Wolf, R. F. Braun, L. Tanner, A. J. Smith, and M. R. Beasley, Anomalous s-wave proximity-induced Josephson effect UBe_{13}, $CeCu_2Si_2$ and $LaBe_{13}$: A new probe of heavy-fermion superconductivity. *Phys. Rev. B* **32**, R7567-7570 (1985).

Over 100 peer-reviewed publications including more than 20 on *Science*, *Nature Comm*., and *Physical Review Letters*, cited by more than 4000 times according to Google Scholar.

MAJOR DISCOVERIES & ACHIEVEMENTS

Prof. Han is one of the pioneers in the field of superconducting quantum computing and circuit QED based on Josephson junctions and SQUIDs (Superconducting QUantum Interference Devices). He has more than twenty years of experience in the study of Josephson junctions and SQUIDs for experimental exploration of macroscopic quantum phenomena (MQP). His work resulted in the ground breaking discovery of

- Macroscopic resonant tunneling and photon-assisted transition of magnetic flux in SQUIDs [Rouse, Han, and Lukens, PRL, 1995; Han, Rouse, and Lukens, PRL, 2000]. These results demonstrated unambiguously energy level quantization of macroscopic quantum objects.
- Population inversion in flux qubits [Han, Rouse, and Lukens, 1996] and Rabi oscillation in Josephson junction phase qubits [Yu *et al.*, Science, 2002]. These discoveries laid the foundation for the development of superconducting qubits for scalable quantum computing.
- Proposed a new approach of using superconducting qubits coupled to microwave cavities – circuit QED – for scalable quantum information processing [Yang, Chu, and Han, PRB 2003; Yang, Chu, Han, PRL, 2004]. Circuit QED has become one of the hottest interdisciplinary subfield of quantum information science attracting researchers from condensed matter physics, AMO (atomic/molecular physics and optics), and theoretical physics.
- Coherent manipulation of tripartite solid-state systems by Landau-Zener-Stuckelberg interference [Sun *et al*., Nature Comm. 2010]. This has been the first demonstration of coherent control of three solid-state qubits. The result opens a new venue for quantum information processing.
- Time-domain spectroscopy for the study of Josephson phase qubits [Han *et al*., Science, 2001]. The method and its variations are now ubiquitous and indispensable in studying dynamics of quantum information processing.
- Entanglement sudden death (ESD), sudden death and revival (ESDR), and damped entanglement oscillation (DEO) in a bipartite phase qubit – TLS system [Sun et al., PRB, 2002]. The result shows that while oscillation and revival of entanglement are caused by qubit-TLS interaction ESD and exponential decay of entanglement are due to coupling to the environment.
- Demonstration of Landau-Zener interferometry of geometric phase using a superconducting qubit [Tan et al. PRL 2014]. This is the first time that the existence of the geometric phase of a superconducting artificial atom's wave-function is shown via interferometry.

He is among the world's leading experts in the design, modeling, simulation, characterization, measurement, and development of superconducting phase and flux qubits based on Josephson tunnel junctions. He has close collaboration with researchers in U.S., Japan, Canada, and China and has made significant impact to the research and development of quantum information processing.

MAJOR EXTERNAL RESEARCH FUNDINGS

Quantum Mechanics of Macroscopic Variables
NSF/DMR
$240,955
07/15/1999 – 06/30/2002
PI

Experimental Investigation of Superconducting Quantum Interference Devices as Solid State Qubits for Quantum Computing
AFOSR/DEPSCoR
$265,304
04/01/1999 – 03/31/2002
PI

Fast Superconducting qubit and qugate for Quantum Computation
NSF/ITR
$499,971
08/15/2000 – 7/31/2003
PI

Experimental and Theoretical Investigations of Quantum Neural Networks
NSF/QuBIC
$209,190
06/15/2002 – 05/31/2005
Co-PI ($209,190 out of $360,000)

Novel Approaches to Quantum Computation using Superconducting Qubits
ARO and NSA
$899,575
06/15/2001 – 06/14/2007
Co-PI ($899,575 out of $5,000,000)

Superconducting Qubits and Qugates for Scalable Quantum Computing
NSF/ITR
$3,236,000
09/01/2003 – 08/31/2010
PI ($1,560,400 out of $3,236,000)

Quantum Computation with Superconducting Qubits
Defense Microelectronics Activities/Northrup Grumman
$139,975
06/23/2010 – 09/30/2011
Co-PI ($139,975 out of $347,015)

Collaborative Research: Transmission of Quantum Information in Circuits Superconducting Qubits
NSF
$210,000
September 1, 2013 - August 31, 2017
PI

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