



【个人情况综述】

沈宏志，理论物理专业博士，副教授/博士生导师。主要从事量子光学及开放量子系统理论研究，其主要工作为建立了非马尔可夫系统中的非传统单光子阻塞理论；给出了非马尔可夫开放系统中的线性响应公式；基于二阶非线性克尔介质材料研究了量子光学二极管；利用三阶克尔非线性材料实现了非常规单光子阻塞效应；在三能级拉曼原子系统中提出了存储单光子脉冲的方法；基于纯退相干的两模玻色-爱因斯坦凝聚系统给出了平均场近似的 BGGKY 高阶修正等。美国光学学会会员 (OSA Membership), 《New Journal of Physics》等英国物理学会 (IOP) 系列期刊审稿人, 在国外重要学术期刊上发表 SCI 论文 60 余篇。主持国家 (省) 自然科学基金项目 4 项。

【学习工作经历】

2007/09-2011/06,	渤海大学	理学学士
2011/09-2016/06,	大连理工大学	理学博士 (硕博连读)
2016/08-2018/08,	东北师范大学	师资博士后
2017/05-2017/06,	北京大学量子材料中心访问学者	
2018/03-2018/04,	西班牙巴斯克大学访问学者	
2018/09-至今,	东北师范大学 物理学院	副教授

【主要科研方向】

量子光学, 开放量子系统理论 (non-Markovian), 量子优化控制与量子器件, 光子阻塞理论, 量子响应理论, 玻色-爱因斯坦凝聚等

【本科生课程】

1. 普通物理 B: 热学
2. 复变函数与积分变换

【主要科研项目】

1. 国家自然科学基金青年基金项目: 非马尔可夫系统中的单光子阻塞效应及其应用, 27 万元, 2018.01-2020.12, 主持, 已结题。
2. 中国博士后科学基金会面上二等资助: 非马尔可夫过程对量子响应系数的影响, 8 万元, 2016.10-2018.7, 主持, 已结题。
3. 中国博士后科学基金特别资助: 非马尔可夫量子响应理论及其应用, 15 万元, 2017.06-2018.7, 主持,

已结题。

4. 吉林省教育厅项目：非马尔可夫系统中的光子阻塞效应，5 万元，2019.01-2020.12，主持，已结题。

【参加学术会议】

1. 第十三届冷原子物理青年学者学术讨论会（西安，邀请报告），2019 年 7 月
2. 超冷原子体系中的少体问题国际会议（北京，参加），2013 年 4 月。
3. 2017 年第三届全国量子物理青年学者研讨会（长春，报告），2017 年 7 月。
4. 量子少体问题和拓扑物理暑期学习讨论会（长春，主持），2017 年 8 月。
5. 2017 年郑州大学青年学者国际论坛（郑州，邀请报告），2017 年 12 月。
6. 第十八届全国量子光学学术会议（张家界，报告），2018 年 10 月。
7. 第八届全国原子分子光物理青年科学家论坛（北京，海报），2018 年 10 月。
8. 2018 东北地区量子物理前沿与进展研讨会（延吉，报告），2018 年 10 月。

【主要科研成果】

1. S. Xu, W. J. Gong, H. Z. Shen, and X. X. Yi, Effective decoherence of realistic clocks: General theory and application to a topological insulator, *Phys. Rev. A* 103.032207 (2021)
2. D. D. Zou, X. Y. Zhang, Q. C. Wu, B. L. Ye, J. H. Teng, D. W. Zhang, H. Z. Shen*, and C. P. Yang, Quantum optical switching based on local single-excitation resonance, *Int. J. Theor. Phys.* 59, 2606 (2020)
3. H. Z. Shen*, Q. Wang, J. Wang, and X. X. Yi, Nonreciprocal unconventional photon blockade in a driven dissipative cavity with parametric amplification, *Phys. Rev. A* 101.013826 (2020).
4. W. S. Xue, H. Z. Shen*, and X. X. Yi, Nonreciprocal conventional photon blockade in driven dissipative atom-cavity, *Opt. Lett.* 45, 4424 (2020).
5. Q. Wang, J. Wang, H. Z. Shen*, S. C. Hou, and X. X. Yi, Exceptional points and dynamics of a non-Hermitian two-level system without PT symmetry, *Europhysics letters*, 131 34001 (2020).
6. Y. H. Zhou, X. Y. Zhang, Q. C. Wu, B. L. Ye, Z. Q. Zhang, D. D. Zou, H. Z. Shen*, and C. P. Yang, Conventional photon blockade with a three-wave mixing, *Phys. Rev. A* 102, 033713 (2020) .
7. H. T. Cui, H. Z. Shen*, M. Qin, and X. X. Yi, Edge state, bound state, and anomalous dynamics in the Aubry-André-Harper system coupled to non-Markovian baths, *Phys. Rev. A* 102, 032209 (2020).
8. Y. H. Zhou, X. Y. Zhang, D. D. Zou, Q. C. Wu , B. L. Ye , Y. L. Fang, H. Z. Shen*, and C.

- P. Yang, Controllable scattering of a single photon inside a one-dimensional coupled resonator waveguide with second-order nonlinearity, *Opt. Express* 28, 380250 (2020).
9. H. Z. Shen, S. Xu, H. T. Cui, and X. X. Yi, Non-Markovian dynamics of a system of two-level atoms coupled to a structured environment, *Phys. Rev. A* 99, 032101 (2019).
 10. H. Z. Shen, S. Xu, Y. H. Zhou, and X. X. Yi, System susceptibility and bound-states in structured reservoirs, *Opt. Express* 27, 31504 (2019).
 11. S. Xu, H. Z. Shen, X. X. Yi, and W. Wang, Readout of the spectral density of an environment from the dynamics of an open system, *Phys. Rev. A* 100, 032108 (2019).
 12. S. Xu, H. Z. Shen, and X. X. Yi, Current in an open tight-binding system, *Phys. Rev. A* 99, 012102 (2019).
 13. C. Shang, H. Z. Shen, X. X. Yi, Single photon transmission in strong three-mode optomechanical circulatory system, *Opt. Express* 27, 25882 (2019).
 14. G. C. Wang, R. Q. Xiao, H. Z. shen*, C. F. Sun, and K. Xue, Simulating Anisotropic quantum Rabi model via frequency modulation, *Sci. Rep.* 9, 4569 (2019).
 15. H. Z. Shen, S. Xu, Su Yi, X. X. Yi, Controllable dissipation of a qubit coupled to an engineering reservoir, *Phys. Rev. A* 98, 062106 (2018).
 16. H. Z. Shen, C. Shang, Y. H. Zhou, and X. X. Yi, Unconventional single-photon blockade in non-Markovian systems, *Phys. Rev. A* 98, 023856 (2018).
 17. H. Z. Shen, S. L. Su, Y. H. Zhou, and X. X. Yi, Non-Markovian quantum Brownian motion in electric fields, *Phys. Rev. A* 97, 042121 (2018).
 18. H. Z. Shen, S. Xu, Hong Li, S. L. Wu, and X. X. Yi, Linear response theory for periodically driven systems with non-Markovian effects, *Opt. Lett.* 43, 2852 (2018).
 19. H. Z. Shen, D. X. Li, S. L. Su, Y. H. Zhou, and X. X. Yi, Exact non-Markovian dynamics of qubits coupled to two interacting environments, *Phys. Rev. A* 96, 033805 (2017).
 20. H. Z. Shen, Hong Li, Y. F. Peng, and X. X. Yi, Mechanism for Hall conductance of

two-band systems against decoherence, *Phys. Rev. E* 95, 042129 (2017).

21. H. Z. Shen, D. X. Li, and X. X. Yi, Non-Markovian linear response theory for quantum open systems and its applications, *Phys. Rev. E* 95, 012156 (2017).
22. H. Z. Shen, S. Xu, Y. H. Zhou, G. C. Wang, and X. X. Yi, Unconventional photon blockade from bimodal driving and dissipations in coupled semiconductor microcavities, *J. Phys. B* 51, 035503 (2018).
23. H. Z. Shen, S. S. Zhang, C. M. Dai, and X. X. Yi, Master equation for open two-band systems and its applications to Hall conductance, *J. Phys. A* 51 065302 (2018).
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26. H. Z. Shen, X. Q. Shao, G. C. Wang, X. L. Zhao, and X. X. Yi, Quantum phase transition in a coupled two-level system embedded in anisotropic three dimensional photonic crystals, *Phys. Rev. E* 93, 012107 (2016).
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29. H. Z. Shen, Y. H. Zhou, H. D. Liu, G. C. Wang, and X. X. Yi, Exact optimal control of photon blockade with weakly nonlinear coupled cavities, *Opt. Express* 23, 32835 (2015).
30. H. Z. Shen, W. Wang, and X. X. Yi, Hall conductance and topological invariant for open systems, *Sci. Rep.* 4, 6455 (2014).
31. H. Z. Shen, Y. H. Zhou, and X. X. Yi, Quantum optical diode with semiconductor microcavities, *Phys. Rev. A* 90, 023849 (2014).
32. H. Z. Shen, M. Qin, X. M. Xiu, and X. X. Yi, Exact non-Markovian master equation

for a driven damped two-level system, *Phys. Rev. A* 89, 062113 (2014).

33. H. Z. Shen, M. Qin, and X. X. Yi, Single-photon storing in coupled non-Markovian atom-cavity system, *Phys. Rev. A* 88, 033835 (2013).
34. H. Z. Shen, X. M. Xiu, and X. X. Yi, Atom-molecule-conversion system subject to phase noises, *Phys. Rev. A* 87, 063613 (2013).
35. H. Z. Shen, X. X. Yi, and C. H. Oh, Dynamical signature of the edge state in the 1D Aubry-Andre model, *J. Phys. B* 47, 085501 (2014).
36. Z. C. Shi, H. Z. Shen, Wei Wang, and X. X. Yi, Response of two-band systems to a single-mode quantized field, *Phys. Rev. E* 93, 032120 (2016).
37. M. Qin, H. Z. Shen, and X. X. Yi, A multi-pathway model for photosynthetic reaction center, *J. Chem. Phys.* 144, 125103 (2016).
38. Y. H. Zhou, H. Z. Shen, X. Q. Shao, and X. X. Yi, Strong photon antibunching with weak second-order nonlinearity under dissipation and coherent driving, *Opt. Express* 24, 17332 (2016).
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42. H. T. Cui, H. Z. Shen, S. C. Hou, and X. X. Yi, Bound state and localization of excitation in many-body open systems, *Phys. Rev. A* 97, 042129 (2018).
43. S. Xu, H. Z. Shen, and X. X. Yi, Demultiplexing of photonic temporal modes by a linear system, *Phys. Rev. A* 97, 033841 (2018).
44. M. Qin, H. Z. Shen, X. L. Zhao, and X. X. Yi, Effects of system-bath coupling on a photosynthetic heat engine: A polaron master-equation approach, *Phys. Rev. A* 96, 012125 (2017).

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46. Y. H. Zhou, S. S. Zhang, H. Z. Shen, and X. X. Yi, Second-order nonlinearity induced transparency, *Opt. Lett.* 42, 1289 (2017).
47. H. Li, H. Z. Shen, S. L. Wu, and X. X. Yi, Shortcuts to adiabaticity in non-Hermitian quantum systems without rotating-wave approximation, *Opt. Express* 25, 030135 (2017).
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50. W. Q. Zhang, H. Z. Shen, and X. X. Yi, Hall conductance for open two-band system beyond rotating-wave approximation, *Sci. Rep.* 6, 16243 (2017).
51. H. J. Shan, C. M. Dai, H. Z. Shen, and X. X. Yi, Control state transfer in a Heisenberg spin chain by periodic drives, *Sci. Rep.* 8, 13565 (2018).
52. H. Y. Sun, C. Shang, X. X. Luo, Y. H. Zhou, and H. Z. Shen, Optical-assisted Photon Blockade in a Cavity System via Parametric Interactions, *Int. J. Theor. Phys.* 58, 3640 (2019).
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54. G. C. Wang, H. Z. Shen, C. F. Sun, C. F. Wu, J. L. Chen, and K. Xue, Unconventional photon blockade in weakly nonlinear photonic molecules with bilateral drive, *J. Mod. Opt.* 64, 583 (2017).
55. Y. H. Zhou and H. Z. Shen, Unconventional photon blockade based on two-photon tunneling, *Int. J. Theor. Phys.* 56, 2935 (2017).
56. D. X. Li, S. Wu, H. Z. Shen, and X. X. Yi, Adiabatic Evolution of an Open Quantum System in its Instantaneous Steady State, *Int. J. Theor. Phys.* 56, 3562 (2017).
57. S. Xu, H. Z. Shen, and X. X. Yi, Single photon transistor based on tunable coupling

in cavity QED system, J. Opt. Soc. Am. B 33, 1600 (2016).

58. L. Dong, J. X. Wang, Q. Y. Li, H. Z. Shen, H. K. Dong, X. M. Xiu, Y. J. Gao, and C. H. Oh, Nearly deterministic preparation of the perfect W state with weak cross-Kerr nonlinearities, Phys. Rev. A 93, 012308 (2016).
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61. L. Dong, J. X. Wang, H. Z. Shen, Dan Li, X. M. Xiu, Y. J. Gao, X. X. Yi, Deterministic transmission of an arbitrary single-photon polarization state through bit-flip error channel, Quantum Inf. Process 13, 1413 (2014).