沈宏志

东北师范大学物理学院

职　　称：副教授

研究方向：量子光学/开放量子系统理论

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个人简历

【个人情况综述】

沈宏志，副教授，理论物理专业博士，博士生导师，东北师范大学优秀师资博士后。主要从事量子光学及开放量子系统理论研究，其主要贡献在于：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》、《Journal of Physics A》、《Journal of Physics B》、《Journal of Physics C》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64篇（其中美国物理学会物理评论系列 Physical Review A/Physical Review E文章30篇）。主持/参与国家（省）自然科学基金项目8项，主持中国博士后科学基金项目2项（一等面上、特别资助）。

【学习工作简历】

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
3. 量子信息与量子计算

【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。
2. 中国博士后科学基金会面上一等资助： 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。
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。

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。

5. 东北师范大学理论物理量子信息研究团队的学术交流平台建设，30万，2017.01-2017.12，参加。

6. 准粒子的量子控制及其在量子信息处理中的应用: 国家自然科学基金面上项目, 85万，2015.01-2018.12，参加。

【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】*代表通讯作者

1.H. Z. Shen, Q. Wang, J. Wang, and X. X. Yi, Nonreciprocal unconventional photon blockade in driven cavity with parametric interactions with non-Markovian bath, Phys. Rev. A 101, 013826 (2020).

2.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).

3.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).

4.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).

5.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).

6.S. Xu, H. Z. Shen, and X. X. Yi, Current in an open tight-binding system, Phys. Rev. A 99, 012102 (2019).

7.C. Shang, H. Z. Shen, X. X. Yi, Single photon transmission in strong three-mode optomechanical circulatory system, Opt. Express 27, 25882 (2019).

8.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).

9.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).

10.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).

11.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).

12.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).

13.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).

14.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).

15.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).

16.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).

17.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).

18.S. L Su, Y. Z. Tian, H. Z. Shen*, H. P. Zang, E. j. Liang, and S. Zhang, Applications of the modified Rydberg antiblockade regime with simultaneous driving, Phys. Rev. A 96, 042335 (2017).

19.S. L Su, H. Z. Shen*, E. j. Liang, and S. Zhang, One-step construction of the multiple-qubit Rydberg controlled-PHASE gate, Phys. Rev. A 98, 032306 (2018).

20.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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22.H. Z. Shen, M. Qin, X. Q. Shao, and X. X. Yi, General response formula and application to topological insulator in quantum open system, Phys. Rev. E 92, 052122 (2015).

23.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).

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25.H. Z. Shen, Y. H. Zhou, and X. X. Yi, Quantum optical diode with semiconductor microcavities, Phys. Rev. A 90, 023849 (2014).

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27.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).

28.H. Z. Shen, X. M. Xiu, and X. X. Yi, Atom-molecule-conversion system subject to phase noises, Phys. Rev. A 87, 063613 (2013).

29.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).

30.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).

31.M. Qin, H. Z. Shen, and X. X. Yi, A multi-pathway model for photosynthetic reaction center, J. Chem. Phys. 144, 125103 (2016).

32.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).

33.Y. H. Zhou, H. Z. Shen, and X. X. Yi, Unconventional photon blockade with second-order nonlinearity, Phys. Rev. A 92, 023838 (2015).

34.M. Qin, H. Z. Shen, X. L. Zhao, and X. X. Yi, Dynamics and quantumness of excitation energy transfer through a complex quantum network, Phys. Rev. E 90, 042140 (2014).

35.Y. H. Zhou, H. Z. Shen, X. Y. Zhang, and X. X. Yi, Zero eigenvalues of a photon blockade induced by a non-Hermitian Hamiltonian with a gain cavity, Phys. Rev. A 97, 043819 (2018).

36.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).

37.S. Xu, H. Z. Shen, and X. X. Yi, Demultiplexing of photonic temporal modes by a linear system, Phys. Rev. A 97, 033841 (2018).

38.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).

39.Y. H. Zhou, H. Z. Shen, X. Y. Luo, Y. Wang, F. Gao, and C. Y. Xin, Tunable three-wave- mixing-induced transparency, Phys. Rev. A 96, 063815 (2017).

40.Y. H. Zhou, S. S. Zhang, H. Z. Shen, and X. X. Yi, Second-order nonlinearity induced transparency, Opt. Lett. 42, 1289 (2017).

41.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).

42.Y. F. Peng, C. M. Dai, H. Z. Shen, and X. X. Yi, Optically tunable spin texture of the surface state for Bi2Se3 and SmB6 topological insulators,

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43.D. X. Li, H. Z. Shen, H. D. Liu, and X. X. Yi, Effect of spin relaxations on the spin mixing conductances for a bilayer structure, Sci. Rep. 8, 1475 (2018).

44.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).

45.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).

46.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. Teor. Phys. 58, 3640 (2019).

47.Y. H. Zhou, Q. C. Wu, B. L. Ye, L. Y. Xue, H. Z. Shen*, Second-order Nonlinearity Induced Unconventional Photon Blockade, Int. J. Teor. Phys. 58, 472 (2019).

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50.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).

51.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).

52.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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54.L. Dong, J. X. Wang, Q. Y. Li, H. Z. Shen, H. K. Dong, X. M. Xiu, Y. P. Ren, and Y. J. Gao, Quantum secure direct communication against the

collective noise with polarization-entangled Bell states, Prog. Theor. Exp. Phys. 12, 123A02 (2015).

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56.X. M. Xiu, L. Dong, H. Z. Shen, Y. J. Gao, and X. X. Yi, Two-party quantum privacy comparison with polarization-entangled bell states and the coherent states，Quantum inf. comput. 14, 236 (2014).

57.X. M. Xiu, L. Dong, H. Z. Shen, Y. J. Gao, and X. X. Yi, Construction scheme of a two-photon polarization controlled arbitrary phase gate mediated by weak crossphase modulation J. Opt. Soc. Am. B 30, 589 (2013).

58.L. Dong, Y. F. Lin, J. X. Wang, Q. Y. Li, H. Z. Shen, H. K. Dong, Y. P. Ren, X. M. Xiu, Y. J. Gao, and C. H. Oh. Nearly deterministic Fredkin gate based on weak cross-Kerr nonlinearities, J. Opt. Soc. Am. B 33, 253 (2016).

59.X. M. Xiu, Q. Y. Li, L. Dong, H. Z. Shen, Dan Li, Y. J. Gao, X. X. Yi, Distributing a multi-photon polarization-entangled state with unitary fidelity via arbitrary collective noise channels, Quantum Inf. Process 14, 361 (2015).

60.L. Dong, X. M. Xiu, H. Z. Shen, Y. J. Gao, and X. X. Yi, Quantum Fourier transform of polarization photons mediated by weak cross-Kerr nonlinearity, J. Opt. Soc. Am. B 30, 2765 (2013).

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62.X. M. Xiu, L. Dong, H. Z. Shen, Y. J. Gao, and X. X. Yi. Preparing, linking, and unlinking cluster-type polarization-entangled states by integrating modules, Prog. Theor. Exp. Phys. 9, 093A01 (2013).

社会兼职

获奖情况 (数据来源：科学技术处、社会科学处)

教学信息

科研信息 (数据来源：科学技术处、社会科学处)

其它信息

信息维护