

量子光学

与库相互作用的非耦合的两比特系统的量子失协动力学

王小云 丁邦福 赵鹤平

吉首大学物理科学与信息工程学院, 湖南 吉首 416000

摘要:

推导出一个关于 结构密度矩阵的量子失协的表达式。在单一激发下, 给出两个非耦合的量子比特分别与库相互作用构成的系统的动力学的精确解, 然后用非马尔科夫主方程方法精确求解了这个系统的耗散动力学。在失谐光谱密度下, 讨论和比较不同耦合区域内系统的量子失协动力学特征。结果表明: 量子失协表达式适用于任意有 型密度矩阵的物理系统, 在失谐光谱密度下, 证实两类主方程分别适用于不同的耦合区域。这将为以后更加简便地计算量子失协, 以及在不同的耦合区域运用哪一类主方程提供一定的参考依据。

关键词: 量子光学 量子失协 非马尔科夫主方程 相干函数

Quantum discord dynamics of non-coupled two-qubit system interacting with reservoirs

WANG Xiao-yun, DIND Bang-fu, ZHAO He-ping

College of Physical Science and Information Engineering, Jishou University, Jishou 416000, China

Abstract:

A general expression of quantum discord for structure density matrix was derived. Then, the dissipative dynamics of non-coupled two qubits independently interacting with their reservoir was solved by the non-Markovian master equation in a single excitation state. Under the detuning spectral density, the quantum discord dynamics was discussed and compared in different coupling regime. The results showed that this expression was employed to any physical system having structure density matrix, and we further confirm the two variants of master equations were exploited in different coupled regimes in the description of quantum correlation dynamics. It is convenient to calculate the quantum discord for later study and provide certain reference about which kind of master equation used in different coupling areas.

Keywords: quantum optics quantum discord non-Markovian master equation correlation function

收稿日期 2011-04-25 修回日期 2011-05-15 网络版发布日期 2012-05-22

DOI:

基金项目:

湖南省自然科学基金 (09JJ6011), 湖南省教育厅资助项目 (10A100和07C528)

通讯作者: 王小云 (1975-), 女, 土家族, 湖南吉首人, 副教授, 硕士生导师, 主要从事纳米量子光学相关的实验研究。

作者简介:

作者Email: wxyyun@163.com

参考文献:

- [1] Nielsen M A, Chuang I I. Quantum Computation and Quantum Information [M], Cambridge University Press Cambridge, England, 2006: 500-522
- [2] Ma Ganglong, Zha Xinwei. Probabilistic teleportation of four particles W state [J]. Chinese journal of quantum Electronics (量子电子学报), 2010 27(3): 308-313 (in Chinese)
- [3] Wang Qiong, Liao Jieqiao, Zeng Haosheng. Quntum thermal discord in a two-spin- XXZ model [J]. Chin. Phys. B, 2010, 19(10): 100311
- [4] Pan Guixia. Quantum information splitting of arbitrary two-particle state using two GHZ states [J]. Chinese journal of quantum Electronics (量子电子学报), 2010, 27(5): 573-579 (in Chinese)

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF(730KB)
- ▶ [HTML全文]
- ▶ 参考文献[PDF]
- ▶ 参考文献

服务与反馈

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ 引用本文
- ▶ Email Alert
- ▶ 文章反馈
- ▶ 浏览反馈信息

本文关键词相关文章

- ▶ 量子光学
- ▶ 量子失协
- ▶ 非马尔科夫主方程
- ▶ 相干函数

本文作者相关文章

- ▶ 王小云
- ▶ 丁邦福

PubMed

- ▶ Article by Yu,X.Y
- ▶ Article by Ding,B.F

[5] Zhang Chiehua, Shan Chuerfu, Ge Rele, Quantum entanglement in a system of two coupled coherent state light field interacting with two entanglement atoms [J]. Chinese journal of quantum Electronics (量子电子学报), 2010, 27(1): 57-62 (in Chinese)

[6] Ollivier H, Zurek W H. Quantum Discord: A measure of the quantumness of correlation [J]. Phys. Rev. Lett., 2001, 88(1): 017901

[7] Ji Yinghua, Xu Lin. Entanglement decoherence of coupled superconductor qubits entangled states in non-Markovian environment [J]. Chinese journal of quantum Electronics (量子电子学报), 2011, 28(1):58-64 (in Chinese)

[8] Luo Shunlong. Quantum discord for two-qubit systems [J]. Phys. Rev. A 2008, 77(4): 042303

[9] Jin Xianmin, Roch Jugen, Yin Juan, Yang Tao. Experimental Non-local generation of entanglement from independent source [J]. Chin. Phys. Lett, 2009, 26(7): 070302

[10] Song Shijie. Maximal violation of Bell inequality and for Werner state [J]. Journal of university of JNAN (济南大学学报) . 2011, 25(1):0094-0099 (in Chinese)

[11]Werlang T, Souza S, Fanchini F F, Villasboas C J. Robustness of quantum discord to sudden death [J]. Phys. Rev. A, 2009, 80(2): 024103

[12] Zhang Jian, Shao Bin, Zou Jian. Entanglement of two atoms in two-mode Roman coupled model with intrinsic decoherence [J]. Chin. Phys. B, 2009, 18(12):5179-5189

[13] Wang Lincheng, Shen jian, Yi Xuexi. Discord under the influence of a quantum phase transition [J]. Chin. Phys. B, 2011, 20(5):050306

[14] Modi K, Paterek T, Son W, Vedral V, Williamson M. Unified view of quantum and classical correlations [J]. Phys. Rev. Lett., 2010, 104(8): 080501

[15] Dillenschneider R, Lutz E. Energetics of quantum correlation. Europe. Phys. Lett., 2009, 88(5): 50003

[16] Satandy M S. Classical correlation and quantum discord in critical systems [J]. 2009 Phys. Rev. A, 2009, 80(2): 022108

[17] Cui J, Fan H. Correlation in the Grover search [J]. J. Phys. A: Math. Theor., 2009, 43(4): 045305

[18] Werlang T, Souza S, Fanchini F F, Villas Boas C J. Robustness of quantum discord to sudden death [J]. Phys. Rev. A, 2009, 80(2): 024103

[19] Wang B, Xu Z Y, Chen Z Q, Feng M. Non-Markovian effect on the quantum discord [J]. Phys. Rev. A, 2010, 81(1): 014101

[20] Fanchini F F, Werlang T, Brasil C A, Arruda L G E, Caldeira A O. Non-Markovian dynamics of quantum discord [J]. Phys. Rev. A, 2010, 81(5): 052107

[21] Nakajima S. On quantum theory of transport phenomena [J]. Prog. Theor. Phys., 1958, 20(6): 948-959

[22] Zwanzig R. Ensemble method in the theory of irreversibility [J]. 1960 J. Chem. Phys., 1960, 33(5): 1338-1341

[23] Chaturvedi S, Shibata F. Time-convolutionless projection operator formalism for elimination of fast variable application to Brownian motion [J]. Z. Phys., 1979, 35(3): 297-308

[24]Breuer H P, Petruccione F. the Theory of open Quantum Systems [M], Oxford University Press, 2002: 466-468

[25] Zhou Ling, Yi Xuexi, Song Heshan, Guo Yan Qing. Thermal entanglement in 1D optical Lattice chains with nonlinear coupling[J]. Chin.Phys. B, 2005 14(6):1168-1174

[26] Ferraro E, Scala M, Migliore R, Napoli A. Non-Markovian dissipative dynamics of two coupled qubits in independent reservoirs: comparison between exact solutions and master equation approaches [J]. Phys. Rev. A, 2009, 80(4): 042112

[27] Ferraro E, Scala M, Migliore R, Napoli A. On the validity of non-Markovian master equation approaches for the entanglement dynamics of two-qubit systems [J]. Phys. Scr., 2010, T140: 014042

本刊中的类似文章

1. 邹艳.V型三能级原子与双模奇偶纠缠相干光场相互作用的量子态保真度[J]. 量子电子学报, 2009,26(3): 320-326

2. 臧学平 杨名.二项式光场中运动的 Ξ 型三能级原子偶极振幅平方压缩[J]. 量子电子学报, 2009,26(3): 327-332

3. 王帅 .数-相量子化及介观电路在自由热态下的量子效应[J]. 量子电子学报, 2009,26(3): 333-337

4. 黄正逸 金铨 马骥 徐雷 陈宪锋.一维光子晶体的全向反射特性[J]. 量子电子学报, 2009,26(3): 338-341

5. 张仲 周波 王培吉 陶冶薇.各向异性n维耦合谐振子能量本征值的代数解法[J]. 量子电子学报, 2009,26(4): 405-412

6. 周锐 朱玉兰 聂义友 黄亦斌.不完全依赖仲裁的量子签名协议[J]. 量子电子学报, 2009,26(4): 442-445

7. 杨庆怡 易施光.普遍意义下介观RLC并联电路的量子化及在真空态下的量子涨落[J]. 量子电子学报, 2009,26(4): 451-455

8. 额尔敦朝鲁 王宝昌.温度对非对称量子点中强磁耦合极化子声子平均数的影响[J]. 量子电子学报, 2009,26(4): 477-481

9. 胡桂玉 杨振 叶柳.在离子阱中实现量子SWAP门的方案[J]. 量子电子学报, 2009,26(5): 555-559

10. 吴张斌 陈光 杨伯君.基于BBM92协议的量子密钥分发系统改进方案[J]. 量子电子学报, 2009,26(5): 560-

11. 熊狂炜 艾剑锋.利用非最大纠缠态实现未知原子态的受控传递[J]. 量子电子学报, 2009,26(5): 565-569
 12. 陶蕊 郑小虎 曹卓良.用约瑟夫森结量子比特制备簇态[J]. 量子电子学报, 2009,26(5): 570-576
 13. 苑秋红 谢康 刘正华 韩艳芬.一种数值模拟含kerr介质一维光子晶体传播特性的新算法[J]. 量子电子学报, 2009,26(6): 703-707
 14. 赵峰 王少华 陈莉 龙光利.点到多点量子密钥分配扩展研究[J]. 量子电子学报, 2009,26(6): 675-680
 15. 王忠纯.偶极相互作用对T-C模型中原子纠缠突然死亡的影响[J]. 量子电子学报, 2009,26(6): 681-688
-