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量子通信的理论基础与线路实现

(吉首大学物理科学与信息工程学院，湖南 吉首 416000)

Theoretical Basis and Circuitry Implementation of Quantum Communication

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摘要 量子通信是目前物理学和信息学科研究的热门领域，文章从量子通信的物理基础出发，研究了通信双方对信息的处理方法和信息的传输过程，从理论上分别计算了在4个Bell基下传输实体的量子态的变化和接收者的幺正变换矩阵；给出了实现通信的量子线路，并以该线路为基础计算了Bell基及对应的幺正变换矩阵和量子门.

关键词： 量子通信 幺正变换矩阵 纠缠 量子门

Abstract: Quantum communication is a fashionable field of physics and informatics at present.Starting with the theoretical basis of quautum communication,the author investigats the method of dealing with information and the process of carrying information for both sides of communication.The variety of quantum state of transfers' particle and unitary transformation matrix of acceptant are calculated in theory by four Bell radix.The circuitry of quantum communication is provided,and the author obtains Bell radix and quantum gate for corresponding unitary transformation matrix by the circuitry.

Key words: quantum communications unitary transformation matrix entangle quantum gate

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[1] DEUTSCH D.Quantum Theory,the Church-Turing Principle and the Universal Quantum Computer [J].Proc. R. Soc. London A,1985,400:97-117.

[2] BENNETT C H,BRASSARD G,CREPEAU C,et al.,Teleporting an Unknown Quantum State Via Dual Classical and Einstein-Podolsky-Rosen Channels [J].Phys. Rev. Lett.,1993,70 (13):1 895-1 899.

[3] SOLANO E,CESAR C L,DE MATOS R L,et al.Reliable Teleportation in Trapped Ions[J].Eur. Phys. J. D.,2001,13(1):121-128.

[4] BOUWMEESTER D,Pan J W,et al.Experimental Quantum Teleportation [J].Nature，1997,390 (6660):575-579.

[5] BOSCHI D,BRANCA S,DE MARTINI F,et al.Experimental Realizationvia Dual Classical and Einstein-Podolsky-Rosen Channels [J].Phys. Rev. Lett.,1998,80(6):1 121-1 125.

[6] FURUSAWA A,SORENSEN J L,BRAUNSTEIN S L,et al.Unconditional Quantum Teleportation [J].Science，1998,282(5389):706-709.

[7] NIELSEN M A,KNILL E,LAFLAMME R.Complete Quantum Teleportation Using Nuclear Magnetic Resonance [J].Nature,1998,396(6706):52-55.

[8] KIM Y H,KULIK S P,SHIH Y H.Quantum Teleportation of a Polarization State with a Complete Bell State Measurement [J].Phys. Rev. Lett.，2001,86(7):1 370-1 373.

[9] LOMBARDI E,SCIARRINO F,POPESCU S,et al.Teleportation of a Vacuum-One-Photon Qubit [J].Phys.Rev.Lett.,2002,88 (7):070402.

[10] EINSTEIN A.,PODOLSKY,B.ROSEN,N.Can Quantum-Mechanical Description of Physical Reality be Considered Complete? [J].Phys. Rev.,1935,47:777-780.

[11] BELL J S.On the Einstein-Podolsky-Rosen Paradox[J].Physics,1964,1:195-200.

[12] ASPECT A,et al.Experimental Test of Bell's Inequalities Using Time-Varying Analyzers [J].Phys. Rev. Lett.,1982,49:1804-1807.

[13] FREEDMAN,S.J.& CLAUSER,J.F.Experimental Test of Local Hidden-Variable Theories [J].Phys. Rev. Lett.,1972,28:938-941.

[14] ASPECT,A.et al.Experimental Tests of Realistic Local Theories via Bell's Theorem [J].Phys. Rev. Lett.,1981,47:460-463.

[15] CERF,N.J.& ADAMI,C.Negative Entropy and Information in Quantummechanics [J].Phys. Rev. Lett.,1997,79:5 194-5 197.

[16] RAUSCHENBEUTEL,A.et al.Step-by-Step Engineered Multiparticle Entanglement [J].Science,2000,288:2 024-2 028.

[17] LIEBFRIED,D.et al.Experimental Demonstration of a Robust,High-Fidelity Geometric two Ion-Qubit Phase Gate [J].Nature,2003,422:412-415.

[18] SCHMIDT-KALER,F.et al.Realization of the Cirac-Zollercontrolled-NOT Quantum Gate [J].Nature,2003,422:408-411.

[19] BLINOV,B.B.,MOEHRING,D.L.,DUAN,L.-M.& MONROE,C.Observation of Entanglement Between a Single Trapped Atom and a Single Photon [J].Nature,2004,428:153-157.

[20] WU YUN-WEN,HAI WEN-HUA and CAI LI-HUA.Energh Band Structure of Two Ions In a One-Dimensinal Paul Trap [J].Acta Physica Sinica,2006,55(2):99-105.

[21] CLAUSER J F,et al.Proposed Experiment to Test Local Hidden-Variable Theories [J].Phys. Rev. Lett.,1969,23:880.

[22] JULSGAARD,B.,SHERSON,J.,CIRAC,J.I.,FIURá-EK,J.& POLZIK,E.S.Experimental Demonstration of Quantum Memory for Light [J].Nature,2004,432:482-486.

[1] 伊健, 邹云文. **耗散腔场中双光子Tavies-Cummings模型量子纠缠分析**[J]. 吉首大学学报自然科学版, 2011, 32(4): 50-54.

[2] 杨小琳, 周小洁, 赵晗, 王朋朋. **基于量子隐形传态的数据链路层停等协议**[J]. 吉首大学学报自然科学版, 2010, 31(6): 60-63.

[3] 周小洁, 邹云文. **三粒子GHZ态隐形传输令牌环网的保真度分析**[J]. 吉首大学学报自然科学版, 2010, 31(4): 67-70.

[4] 周小洁, 邹云文. **利用三粒子GHZ态实现令牌环量子隐形传态网络**[J]. 吉首大学学报自然科学版, 2009, 30(1): 56-62.

[5] 赵晗, 周小洁. **基于四粒子GHZ态的任意三粒子GHZ态量子隐形传送**[J]. 吉首大学学报自然科学版, 2008, 29(1): 58-61.

[6] 孔永红, 汪新文. **量子隐形传送两体任意态的真实四体纠缠通道方案**[J]. 吉首大学学报自然科学版, 2007, 28(2): 71-74.

[7] 赵晗, 周小洁. **基于四粒子GHZ态的任意三粒子GHZ态量子隐形传送**[J]. 吉首大学学报自然科学版, 0, (): 58-61.