



Relação de Disciplinas

41010020 Programa de Pós-Graduação em Física ME

Disciplina	Nome da Disciplina	Créditos			Situação
		T	TP	P	
FSC410109	<b>TÓPICOS ESPECIAIS EM FÍSICA D: Experimentos de Óptica e Informação Quântica com Fótons Gêmeos</b> Neste curso nós apresentaremos e discutiremos uma série de trabalhos experimentais que empregam técnicas de Óptica Quântica para estudar fundamentos da Mecânica Quântica e para propor e demonstrar sistemas de tratamento e transmissão de informação quântica. Daremos ênfase às técnicas que utilizam os fótons gêmeos da conversão paramétrica descendente. Os fundamentos teóricos necessários para a compreensão de cada trabalho também serão apresentados de forma resumida. Os temas abordados serão: i) conversão paramétrica descendente, fundamentos teóricos e a técnica de coincidência de fótons; ii) correlação temporal de fótons e aplicações; iii) coerência espacial da luz clássica e quântica; iv) momento angular orbital da luz e correlações quânticas; v) correlações de polarização, estados de Bell e dinâmica de emaranhamento; vi) criptografia quântica; vii) emaranhamento quântico com variáveis contínuas.  Bibliografia: Mandel and Wolf, Coherence and Quantum Optics, Cambridge University Press 1995  Lista de artigos: [Almeida07] M. P. Almeida, F. de Melo, M. Hor-Meyll, A. Salles, S. P. Walborn, P. H. Souto Ribeiro and L. Davidovich; Environment-Induced Sudden Death of Entanglement, Science 316, 579 (2007) [Anderson58] P. W. Anderson; Absence of Diffusion in Certain Random Lattices; Phys. Rev. 109, 1492–1505 (1958) [Ashkin70] A. Ashkin; Acceleration and Trapping of Particles by Radiation Pressure, Phys. Rev. Lett. 24, 156–159 (1970) [Aspuru12] A. Aspuru-Guzik, P. Walther; Review article on photonic quantum simulators, Nature Physics 8, 285-291 (2012) [Bennett83] C. H. Bennett, G. Brassard, C. Crepeau, R. Jozsa, A. Peres, and W. K. Wothers; Teleporting an unknown quantum state via dual classical and Einstein-Podolsky-Rosen channels, Phys. Rev. Lett. 70, 1895-1899 (1993) [Bennett84] C. H. Bennett and G. Brassard; Quantum cryptography: Public key distribution and coin tossing, Proceedings of IEEE International Conference on Computers, Systems and Signal Processing, volume 175, page 8, New York, (1984) [Boschi98] D. Boschi, S. Branca, F. De Martini, L. Hardy, and S. Popescu; Experimental Realization of Teleporting an Unknown Pure Quantum State via Dual Classical and Einstein-Podolsky-Rosen Channels, Phys. Rev. Lett. 80, 1121-1125 (1998) [Bouwmeester97] Dik Bouwmeester, Jian-Wei Pan, Klaus Mattle, Manfred Eibl, Harald Weinfurter and Anton Zeilinger; Experimental quantum teleportation, Nature 390, 575 (1997) [Brunner12] Nicolas Brunner, Noah Linden, Sandu Popescu, and Paul Skrzypczyk; Virtual qubits, virtual temperatures, and the foundations of thermodynamics, Phys. Rev. E 85, 051117 (2012) [Brunner14] Nicolas Brunner, Daniel Cavalcanti, Stefano Pironio, Valerio Scarani, and Stephanie Wehner; Bell nonlocality, Rev. Mod. Phys. 86, 419 (2014) [Deutsch92] David Deutsch and Richard Jozsa; Rapid solutions of problems by quantum computation, Proceedings of the Royal Society of London A 439: 553(1992) [Dwave] <a href="http://www.dwavesys.com/">http://www.dwavesys.com/</a> [Farias09] O. Jimenez-Farias, S. P. Walborn, L. Davidovich and P. H. Souto Ribeiro; Determining the Dynamics of Entanglement, Science 324, 1440 (2009) [Finet94] Pierre Pellat-Finet; Fresnel diffraction and the fractional-order Fourier transform, Optics Letters 19, 1388-1390 (1994) [Gomes09] R. M. Gomes, A. Salles, F. Toscano, P. H. Souto Ribeiro and S. P. Walborn; Genuine Non-Gaussian Entanglement, PNAS 106, 21517-21520 (2009) [Grier03] D. G. Grier; A revolution in optical manipulation, NATURE 424, 810-816 (2003) [Grover96] Lev. Grover; A fast quantum mechanical algorithm for database search,	2	0	0	Ativo



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	<p>arXiv:quant-ph/9605043 (1996)</p> <p>[Hong85] C.K. Hong and L. Mandel; Theory of parametric frequency down conversion of light, Phys. Rev. A 31, 2409 (1985)</p> <p>[Horodecki09] Ryszard Horodecki, Pawel Horodecki, Michal Horodecki, and Karol Horodecki; Quantum entanglement, Rev. Mod. Phys. 81, 865 (2009)</p> <p>[Jaeger09] Greg Jaeger; Entanglement, Information, and the Interpretation of Quantum Mechanics, Springer (2009)</p> <p>[Jarzynski97] C. Jarzynski; Nonequilibrium equality for free energy differences, Phys. Rev. Lett. 78, 2690 - 2694 (1997)</p> <p>[Lemos12] Gabriela B. Lemos, Rafael M. Gomes, Stephen P. Walborn, Paulo H. Souto Ribeiro, and Fabricio Toscano; Experimental observation of quantum chaos in a beam of light, Nature Communications 3, 1211 (2012)</p> <p>[Lemos14] G. B. Lemos, P. H. Souto Ribeiro, S. P. Walborn; Optical integration of a real-valued function by measurement of a Stokes parameter, J. Opt. Soc. Am. A 31, 704-707 (2014)</p> <p>[Mattle96] Klaus Mattle, Harald Weinfurter, Paul G. Kwiat and Anton Zeilinger; Dense coding in experimental quantum communication, Phys. Rev. Lett. 76, 4656 (1996)</p> <p>[Monken98] C. H. Monken, P. H. Souto Ribeiro and S. Pádua; Transfer of angular spectrum and image formation in spontaneous parametric down-conversion, Phys. Rev. A 57, 3123 (1998)</p> <p>[Monteiro]</p> <p>[Mosk12] Allard P. Mosk1, Ad Lagendijk, Geoffroy Lerosey and Mathias Fink; Controlling waves in space and time for imaging and focusing in complex media, Nature Photonics 6, 283-292 (2012)</p> <p>[Nienhuis93] Paraxial wave optics and harmonic oscillators; G. Nienhuis and L. Allen, Phys. Rev. A 48, 656-665 (1993)</p> <p>[Ozaktas01] H. M. Ozaktas, Z. Zalevsky and M. A. Kutay; The Fractional Fourier Transform: with Applications in Optics and Signal Processing, John Wiley and Sons Ltd, West Sussex, (2001)</p> <p>[Padgett00] Miles Padgett and L. Allen; Light with a twist in its tail, Contemporary Physics 41, 275 - 285 (2000)</p> <p>[Qtermo] <a href="http://www.quantumthermodynamics.org/">http://www.quantumthermodynamics.org/</a></p> <p>[Roma14] P. M. S. Roma, L. Siman, F. T. Amaral, U. Agero, O. N. Mesquita; Total 3D imaging of phase objects using defocusing microscopy: application to red blood cells, arXiv:1404.2968</p> <p>[Simon11] Jonathan Simon, Waseem S. Bakr, Ruichao Ma, M. Eric Tai, Philipp M. Preiss, and Markus Greiner; Quantum simulation of antiferromagnetic spin chains in an optical lattice, Nature 472, 307-312 (2011)</p> <p>[Tasca08] D. S. Tasca, S. P. Walborn, F. Toscano and P. H. Souto Ribeiro; Detection of transverse entanglement in phase space, Phys Rev. A 78, 010304(R) (2008)</p> <p>[Tasca09a] D. S. Tasca, S. P. Walborn, F. Toscano, P. Pellat-Finet and P. H. Souto Ribeiro; Propagation of transverse intensity correlations of a two-photon state, Phys. Rev. A 79, 033801 (2009)</p> <p>[Tasca09b] D. S. Tasca, S. P. Walborn, F. Toscano and P. H. Souto Ribeiro; Observation of tunable Popescu-Rohrlich correlations through post-selection of a gaussian state, Phys. Rev. A 80, 030101(R) (2009)</p> <p>[Tasca14] D. S. Tasca, M. M. Santos, M. Hor-Meyll, S. P. Walborn, E. I. Duzzioni, and P. H. Souto Ribeiro; In preparation (2014)</p> <p>[Walborn06] S. P. Walborn, P. H. Souto Ribeiro, L. Davidovich, F. Mintert and A. Buchleitner; Experimental determination of entanglement with a single measurement, Nature 440, 1022 (2006)</p> <p>[Walborn10] Spatial correlations in parametric down-conversion; S.P. Walborn, C.H. Monken, S. Pádua, P.H. Souto Ribeiro, Physics Reports 495, 87-139 (2010)</p> <p>[Walther05] P. Walther, K. J. Resch, T. Rudolph, E. Schenck, H. Weinfurter, V. Vedral, M. Aspelmeyer and A. Zeilinger; Experimental one-way quantum computing, Nature 434, 169-176 (2005)</p>				