RESUME

JUAN IGNACIO CIRAC

Personal Data

PLACE AND DATE OF BIRTH:	Manresa (Spain), October 11, 1965
NATIONALITY:	Spanish
ADDRESS:	Max-Planck Institut für Quantenoptik Hans-Kopfermann-Str. 1 D-85748 Garching
TELEPHONE:	+49 89 32905 705 / 736
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Education

July 1991	Ph. D. in Physics, Universidad Complutense de Madrid
June 1988	Licenciado (graduate) in Theoretical Physics, Universidad Complutense de Madrid

Fields of Specialization

Theoretical Quantum Optics, Quantum Information, Atomic Physics, Quantum Many-Body Physics.

Professional Experience

Since 2016	Speaker of the International Max-Planck Research School Quantum Science and Technology
2014 – 2015	Managing Director, Max-Planck Institut für Quantenoptik
2005 – 2007	Managing Director, Max-Planck Institut für Quantenoptik
Since 2002	“Honorarprofessor”, Technical University of Munich (Department of Physics).
Since 2001	Director of the Theory Division, Max-Planck Institut für Quantenoptik, and member of the Max-Planck Society.
1996 – 2001	Professor, Institut für Theoretische Physik, Leopold Franzens Universität Innsbruck.
1993 – 1994	Research Associate, Joint Institute for Laboratory Astrophysics, University of Colorado
1991 – 1996	"Profesor Titular de Universidad", Departamento de Física Aplicada, Universidad de Castilla-La Mancha.
1989 – 1991	Fellow "Formación del Personal Investigador" (Prog. General), Departamento de Óptica, Universidad Complutense de Madrid.

Other Activities

Since 2016	Member of the Board of Directors of Telefónica, S.A.
Since 2016	Member of the Advisory Board of Fundació LA CAIXA
Since 2015	Member of the Advisory Board of the Institute for Interdisciplinary Information Sciences, Tsinghua University
Since 2012	Member of the Advisory Board of the Russian Quantum Center
Since 2012	Member of the Advisory Board of *Annalen der Physik*
Since 2011	Member of the Review Panel, QSIT, Swiss National Science Foundation
Since 2010	Member of the Scientific Committee, Fundación BBVA
2008-2010	Member of Consejo Rector, Consejo Superior de Investigaciónes Cientificas
Since 2008	Member of the Advisory Board Centro de Ciencias de Benasque
2007-2008	Member of the CIAR Review Panel, Toronto, Canada
2007-2009	Member of the xQIT Visiting Committee, MIT
Since 2007	Member of the Scientific Advisory Board, Centre of Quantum Technology, NUS, Singapore
2007 - 2010	Member of the Advisory Board ITAMP, Harvard University
2005 - 2011	Associate Editor, Review of Modern Physics
2005 - 2008	Member of the International Advisory Board QIP IRC, EPSRC, United Kingdom
2005 - 2008	Member of the Kuratorium IQOQI, Austrian Academy of Sciences
2002 - 2005	Associate Editor, Revista Española de Física
Since 2001	Founding Managing Editor, Quantum Information and Computation
2000-2003	Associate Editor, Physical Review A

Awards

2015	Medal of Honor of the Foundation García Cabrerizo
2015	Hamburg Prize for Theoretical Physics
2013	Wolf Prize in Physics
2013	Niels Bohr Instiute Medal of Honor
2011	Gran Cruz de la Orden del Dos de Mayo de la Comunidad de Madrid
2010	Premi Nacional de Pensament i Cultura Científica
2010	Benjamin Franklin Medal
2009	Medalla de Honor, Universidad Complutense de Madrid
2009	BBVA Foundation Frontiers of Knowledge Award
2009	Carl Zeiss-Research Award

2009	"Premios de las artes y de la ciencia" - Castellano-Manchegos del Mundo, Junta Castilla-La Mancha
2007	National "Blas Cabrera" Prize for Physical, Material and Earth Sciences
2006	6th International Quantum Communication Award
2006	Prince of Asturias Award for Technical and Scientific Research
2005	Quantum Electronics Prize of the European Physical Society
2002	Medal of the Royal Physical Society of Spain
2001	Felix Kuschenitz Preis of the Austrian Academy of Sciences
1992	Premio Nacional a Investigadores Noveles of the Royal Physical Society of Spain

Other Honors

2016	Full member of the Royal Academy of Exact, Physical and Natural Sciences (RAC), Madrid, Spain
2015	"Doctor Honoris Causa", Universitat Politècnica de València, Spain
2015	Corresponding member of the Real Academia de Ciencias de Zaragoza, Spain
2015	"Doctor Honoris Causa", Universitat de València, Spain
2015	Distinguished Visiting Professor, Institute for Theoretical Physics, CSIC, Spain
2014	Honorary member of the Spanish Optical Society (SEDOPTICA), Madrid, Spain
2014	World's Most Influential Scientific Minds (Thomson Reuters)
2014	"Doctor Honoris Causa", Universidad de Zaragoza, Spain
2014	Visiting Miller Professorship Award, University of California Berkeley, California, USA
2013	Corresponding member of the Real Academia de Ciencias y Artes de Barcelona, Spain
2013	David Ben Gurion Medal, Ben Gurion University of the Negev, Israel
2013	Princeton Center for Theoretical Science Lecturer, Princeton University, NJ, USA
2012	Distinguished Lecturer, Technion, Haifa
2012	Tsinghua Songjian Turing Lecture, Beijing
2012	Erwin Schrödinger Distinguished Lecture, Vienna
2012	Moore Distinguished Scholar, CALTECH, California, USA
2009	Thomson Reuters Citation Laureate in Physics
2009	ISI highly cited scientist
2009	Distinguished Research Chair at Perimeter Institute, Waterloo, Ontario, Canada
2007	"Académico de Honor" de la Academia de Ciencias de la Región de Murcia
2007	"Doctor Honoris Causa", Universidad Politecnica de Catalunya (Barcelona)
2005	"Doctor Honoris Causa", Universidad Castilla-La Mancha

2003	Distinguished Guest Professor, Institut de Ciències Fotòniques (Barcelona)
2003	Corresponding member of the Austrian Academy of Sciences
2002	Corresponding member of the Real Academia de Ciencias, Spain
2002	Fellow of the American Physical Society
2001	ISI higly cited scientist

Former students and postdocs

Former master students	Position	Current institution
Azkune, Gorka		Tecnalia, Industry & Transport Division, San Sebastian (Spain)
Dür, Wolfgang	Prof.	University of Innsbruck (Austria)
Eckholt, Maria		TUM Technical University of Munich (Germany)
Greplova, Eliska		Aarhus University (Denmark)
Hackenbroich, Anna		Max Planck Institute for Quantum Optics, Garching (Germany)
Hammerer, Klemens	Prof.	Leibniz Universtity of Hanover (Germany)
Hauke, Philipp		University of Innsbruck (Austria)
Hecht, Theresa		
Horstmann, Birger		DLR, Helmholtz Institute Ulm (Germany)
Kohler, Dominic		Siemens, Munich (Germany)
Kraus, Barbara	Prof.	University of Innsbruck (Austria)
Mendl, Christian		Stanford University (USA)
Metalidis, Giorgio		
Murg, Valentin		University of Vienna (Austria)
Muschik, Christine		IQOQI, University of Innsbruck (Austria)
Ni, Xiaotong		Max Planck Institute for Quantum Optics, Garching (Germany)
Nigg, Simon		University of Basel (Switzerland)
Paulisch, Vanessa		Max Planck Institute for Quantum Optics, Garching (Germany)
Schwager, Heike		Intel, Munich (Germany)
Weinfurtner, Silke		SISSA, Trieste (Italy)

Former PhD students	Position	Current institution
Bermejo Vega, Juan		Freie Universität Berlin (Germany)
Bürschaper, Oliver		Freie Universität Berlin (Germany)
Clemente, Lucas		
Christ, Henning		BCG Munich (Germany)
Cubitt, Toby	Prof.	University College London (UK)
Deng, Xiaolong		Leibniz Universtity of Hanover (Germany)
Dür, Wolfgang	Prof.	University of Innsbruck (Austria)
Eckholt, Maria		Technical University of Munich (Germany)
Giedke, Géza	Prof.	University of the Basque Country, Bilbao (Spain)
Hammerer, Klemens	Prof.	Leibniz Universtity of Hanover (Germany)
Horstmann, Birger		DLR, Helmholtz Institut Ulm (Germany)
Keilmann, Tassilo		Wellness Heaven Ressort & Hotel Guide, Munich (Germany)
Kessler, Eric		IBM, New York (USA)
Kraus, Barbara	Prof.	University of Innsbruck (Austria)
Kraus, Christina		Patent lawyer, Munich, Germany
Lubasch, Michael		University of Oxford (UK)
Mazza, Leonardo		Ecole Normale Supérieure Paris (France)
Murg, Valentin		University of Vienna (Austria)
Muschik, Christine		IQOQI, University of Innsbruck (Austria)
Nemes Salgueiro, Andrea		SAP AG, Heidelberg (Germany)
Pastawski, Fernando		Freie Universität Berlin (Germany)
Perseguers, Sébastien		Rolex, Geneva (Switzerland)
Pflanzer, Anika		Mc Kinsey, Munich (Germany)
Popp, Marcus		Munich Re, Munich (Germany)
Poyatos Adeva, Juan Fernando	Prof.	Spanish National Biotechnology Centre (CNB-CSIC), Madrid (Spain)
Sanz Ruiz, Mikel		University of the Basque Country, Bilbao (Spain)
Schwager, Heike		Intel, Munich (Germany)
Schön, Christian		MAN, Munich (Germany)
Schuch, Norbert	Prof.	Max Planck Institute of Quantum Optics, Garching (Germany)
Wahl, Thorsten		University of Oxford (UK)

Fomer Post docs	Position	Current institution
Aguado, Miguel		European Patent Office, Munich (Germany)
Briegel, Hans	Prof.	University of Innsbruck (Austria)
de Vega, Ines		LMU Ludwig-Maximilian-Universität, Munich (Germany)
Endres, Manuel	Prof.	California Institute of Technology, Pasadena (USA)
Garcia-Patron Sanchez, Raul	Prof.	Université Libre de Bruxelles (Belgium)
García-Ripoll, Juan José	Prof.	CSIC-IFF Insitute of Fundamental Physics, Madrid (Spain)
Giedke, Géza	Prof.	University of the Basque Country, Bilbao (Spain)
Grosshans, Frédéric	Prof.	CNRS, Paris (France)
Kay, Alistair	Prof.	Royal Holloway, University of London (UK)
Lamata, Lucas		University of the Basque Country, Bilbao (Spain)
Mezzacapo, Fabio		University of Strasbourg (France)
Möckel, Michael	Prof.	University of Applied Sciences, Aschaffenburg (Germany)
Nielsen, Anne Ersbak Bang	Prof.	MPI for the Physics of Complex Systems, Dresden, (Germany)
Orús Lacort, Román	Prof.	University of Mainz (Germany)
Paredes Ariza, Belén	Prof.	LMU Ludwig-Maximilian-Universität, Munich (Germany)
Pérez-Garcia, David	Prof.	Universidad Complutense de Madrid (Spain)
Porras Torre, Diego	Prof.	University of Sussex (UK)
Rizzi, Matteo	Prof.	Universtity of Mainz (Germany)
Romero-Isart, Oriol	Prof.	IQOQI, University of Innsbruck (Austria)
Roncaglia, Marco		Politecnico di Torino, Turin (Italy)
Roscilde, Tommaso	Prof.	Ecole Normale Supérieure de Lyon (France)
Schmied, Roman		University of Basel (Switzerland)
Solano, Enrique	Prof.	University of the Basque Country, Bilbao (Spain)
Tóth, Géza	Prof.	University of the Basque Country, Bilbao (Spain)
van den Nest, Maarten		Patent Lawyer, Munich (Germany)
van Enk, Steven	Prof.	University of Oregon (USA)
Verstraete, Frank	Prof.	Ghent University (Belgium) and University of Vienna (Austria)
Vidal, Guifre	Prof.	Perimeter Institute, Waterloo (Canada)
Vollbrecht, Karl Gerd		Federal Authority, Bonn (Germany)
Wolf, Michael	Prof.	Technical University of Munich (Germany)
Yang, Shuo		Perimeter Institute, Waterloo (Canada)

Research Visits

1. Institute for Theoretical Physics, University of Innsbruck, 2 September to 23 November 1990.
2. Joint Institute for Laboratory Astrophysics, University of Colorado, 18 July to 30 September 1991.
3. Joint Institute for Laboratory Astrophysics, University of Colorado, 1 July to 18 September 1992.
4. Institute for Laser Physics, University of Hamburg, 30 November to 10 December 1992.
5. Joint Institute for Laboratory Astrophysics, Unversity. of Colorado, 15 June 1993 to 1 February 1994.
6. Joint Institute for Laboratory Astrophysics, University of Colorado, 25 June to 15 August 1994.
7. Institute for Theoretical Atomic and Molecular Physics, Harvard Univ., 15 August to 15 September 1994.
8. Institute for Theoretical Physics, University of Innsbruck, 10 October 1994 to 5 February 1995.
9. Centre d' Études Nucléaires de Saclay, 7 July 1995 to 7 August 1995.
10. Institut für Theoretische Physik, University of Innsbruck, 1 October to 23 December 1995.
11. Victoria University, Wellington, 27 January 1996 to 17 February 1996.
12. Institute for Theoretical Physics, University of Innsbruck, 20 March to 25 March 1996.
13. Centre d' Études Nucléaires de Saclay, 7 April to 14 April 1996.
14. Institute for Theoretical Physics, University of California in Santa Barbara, 1 October to 31 October 1996.
15. Clarendon Laboratory, Oxford University, 9 September to 15 September 1997.
16. Institute for Theoretical Physics, University of California in Santa Barbara, 2 February to 26 February 1998.
17. Clarendon Laboratory, Oxford University, 10 November to 15 November 1998.
18. Benasque Center for Physics, 9 July to 23 July 1999.
19. University Autónoma of Madrid, 26 August to 9 September 1999.
20. University of Hannover, 11 February to 27 February 2000.
21. University of Bristol, 20 May to 26 May 2000.
22. National Institute Standards and Technology (Gaithesburg), 3 March to 10 March 2001.
23. Institute for Theoretical Atomic and Molecular Physics, Harvard Univ., 10 March to 17 March 2001.
24. Joint Institute for Laboratory Astrophysics, University of Colorado, 6 February to 10 February 2002.
25. California Institute of Technology, 24 May to 28 May 2002.
26. University of Paris, Orsay, 15 December to 20 December 2003.
27. Harvard University and MIT, 3 April to 7 April 2004.
28. Institute for Theoretical Physics, University of California in Santa Barbara, 5 May to 28 May 2004.
29. Harvard University, 7 February to 10 February 2005.
30. Institut de Ciències Fotòniques, 23 April to 30 April 2006
31. Institut de Ciències Fotòniques, 17 July to 21 July 2006

32. Institut de Ciències Fotòniques, 04 December to 10 December 2006
33. Institut de Ciències Fotòniques, 05 March to 09 March 2007
34. Institut de Ciències Fotòniques, 18 July to 22 July 2007
35. Eidgenössische Technische Hochschule (ETH), 10 January to 11 January 2008
36. Erwin Schrödinger Institute, 16 January to 18 January 2008
37. Institut de Ciències Fotòniques, 09 March to 16 March 2008
38. University of Vienna, 18 December to 19 December 2008
39. University of Toronto, 1 February to 8 February 2009
40. Universidad Complutense de Madrid, 23 February to 27 February 2009
41. Institut de Ciències Fotòniques, 6 March to 14 March 2009
42. Perimeter Institute, Waterloo/Ontario, 3 October to 23 October 2009
43. Institut de Ciències Fotòniques, 2 November to 6 November 2009
44. Kavli Institute for Theoretical Physics, University of California in Santa Barbara, 30 Nov. to 10 Dec. 2009
45. Institut de Ciències Fotòniques, 15 March to 19 March 2010
46. Perimeter Institute, 24 May to 29 May 2010
47. Kavli Institute for Theoretical Physics, University of California in Santa Barbara, 22 Nov. to 10 Dec. 2010
48. Harvard University, 31 January to 11 February 2011
49. Perimeter Institute, 04 April to 21 April 2011
50. Institut de Ciènces Fotòniques, 16 January to 20 January 2012
51. California Institute of Technology (CALTECH), 25 January to 23 March 2012
52. Institut de Ciènces Fotòniques, 16 April to 20 April 2012
53. Institut de Ciències Fotòniques, 9 to 11 October 2012
54. Institute for Interdisciplinary Information Services (IIIS), Tsinghua University, Beijing
    20 October to 26 October 2012
55. Israel Institute of Technology, Technion, Haifa, 3 December to 7 December 2012
56. California Institute of Technology (CALTECH), 3 February to 3 March 2013
57. Princeton Center for Theoretical Science, Princeton University, 3 to 8 March 2013
58. Institut de Ciències Fotòniques, 23 to 26 April 2013
59. Institut de Ciències Fotòniques, 21 to 26 May 2013
60. Institut de Ciències Fotòniques, 9 to 12 September 2013
61. MIT/Harvard, Cambridge, Massachusetts, 3 to 7 November 2013
62. Perimeter Institute, Waterloo/Ontario, 7 to 22 November 2013

63. Institut de Ciències Fotòniques, 2 to 10 February 2014
64. University of California, Berkeley, 2 to 20 March 2014
65. University of California, Berkeley, 1 to 11 April 2014
66. University of California, Berkeley, 20 April to 2 May 2014
67. Institut de Ciències Fotòniques, 8 July to 15 July 2014
68. Institut de Ciències Fotòniques, 23 to 27 February 2015
69. Kavli Institute for Theoretical Physics, Santa Barbara, 19 April – 14 May 2015
70. Institut de Ciències Fotòniques, 20 to 23 July 2015
71. Instituto Balseiro, San Carlos de Bariloche, 15 to21 November 2015
72. Joint Institute for Laboratory Astrophysics, University of Colorado, 7 to 12 March 2016
73. Instituto de Física Teórica, Universidad Autónoma de Madrid (IFT, UAM-CSIC), 18 to 22 April 2016
74. Institute for Laser Physics, University of Hamburg, 30 May to 3 June 2016

Invited Presentations at Conferences and Workshops

1. *Non-classical states of motion in an ion trap,* Workshop on Fundamentals of Quantum Optics III, Innsbruck (Austria), March 1993.

2. *Squeezed states of motion in an ion trap*, Optical Society of America Annual Meeting 93, Toronto (Canada), October 1993.

3. *Quantum statistical properties of a laser cooled ideal gas*, Workshop on Quantum field theory of cold atoms, Boulder (Colorado), July 1994.

4. *Qubits and ions*, Workshop on Quantum Computation, Torino (Italy), October 1994.

5. *Quantum statistics of a laser cooled ideal gas*, Workshop on Theoretical Quantum Optics, Munich (Germany), November 1994.

6. *Quantum Computations with cold trapped ions*, Dynamics of simple quantum systems, atoms, molecules and heterostructures, Sandbjerg (Denmark), May 1995.

7. *Quantum Computations with cold trapped ions*, Workshop on Quantum Computation and Quantum Optics, Pisa (Italy), June 1995.

8. *Quantum Computations with cold trapped ions*, Workshop on Quantum Computation, Torino (Italy), June 1995.

9. *Quantum computations with cold trapped ions,* XXXI Reincontres Moriond, Les Arcs (France), January 1996.

10. *Quantum mechanics with trapped ions*, Quantum Optics satellite meeting, Queensland (Australia), July 1996.

11. *Quantum computing and error correction schemes*, International Conference on Quantum Electronics, Sydney (Australia), July 1996.

12. *Quantum mechanics with trapped ions*, Fundamental Problems in Quantum Mechanics, Oviedo (Spain), July 1996.

13. *Quantum computing with trapped ions*, European Physical Society meeting, Sevilla (Spain), September 1996.

14. *Quantum Computers and Quantum Networks*, V International Conference on Squeezed States and Uncertainty Relations (Plenary), Balatonfured (Hungary), May 1997.

15. *Communication in a quantum network: a quantum optical implementation*, Workshop on Quantum Optics and Quantum Computation, Pisa (Italy), June 1997.

16. *Quantum communication between distant nodes in a quantum network*, Gordon Conference on Atomic Physics, New Hampshire (USA), June 1997

17. *Manipulation of condensates with lasers*, Bose Einstein Condensation, Castelvecchio (Italy), July 1997.

18. *Transmission of quantum information in a quantum network: a quantum optical implementation*, Fundamental Problems in Quantum Theory Workshop, Baltimore (USA), August 1997.

19. *Quantum Computations with "hot" trapped ions*, Experimental Realizations of Quantum Logic, Cambridge (USA), August 1997.

20. *Quantum Communication and Computation*, V Reunión Nacional de Optica, Valencia (Spain), September 1997.

21. *Quantum Communication and Computation*, Física Estadística 97, Madrid (Spain), September 1997.

22. *Quantum Computations with Trapped Ions I: Theory*, Tutorial Workshop on Quantum Information, Almagro (Spain), October 1997.

23. *Creation of Dark Solitions and Vortices in BECs*, Workshop on Quantum Gases, Konstanz (Germany), June 1998.

24. *Quantum Communication and Computation*, XVI International Conference on Atomic Physics, Windsor (Canada), August 1998.

25. *Error Correction and Fault Tolerant Quantum Computing*, Quantum Computing Pathfinder Conference, Helsinki (Finland), September 1998.

26. *Quantum Information and Communication*, Physikertagung der deutschen physikalischen Gesellschaft 1999, Heidelberg (Germany), March 1999.

27. *Quantum computing with trapped atoms*, American Physical Society Centennial Meeting, Atlanta (USA), March 1999.

28. *Quantum optical implementations for quantum information*, 14th International Conference on Laser Spectroscopy, Innsbruck (Austria), June 1999.

29. *Quantum computation and communication*, International Conference of the EGAS 31, Marseille (France), July 1999.

30. *Quantum Information Processing with Quantum Optical Systems*, 49. Jahrestagung der Österreichischen Physikalischen Gesellschaft, September 1999.

31. *Quantum information processing with quantum optical systems*, Quantum Optics X, Palma de Mallorca (Spain), October 1999.

32. *Entanglement of Gaussian optical beams*, Workshop on Quantum Control and Information, Nof Genossar (Israel), November 1999.

33. *Quantum Communication and Computation*, 100 years of Quantum Mechanics, Museo de la Ciencia de Barcelona (Spain), March 2000.

34. *Multi-atom entangled states*, TMR-Network "The physics of quantum information" meeting, Vienna (Austria) September 2000.

35. *Quantum information processing with multi-level systems*, International workshop on mysteries, puzzles, and paradoxes in Quantum Mechanics, Gargano in Garda (Italy), September 2000.

36. *El futuro de la computación cuántica*, International conference “la ciencia y la tecnología ante el nuevo milenio”, CSIC Madrid (Spain), November 2000.

37. *Multiparticle entanglement*, Workshop of the A2 Konsortium, Hannover (Germany), February 2001.

38. *Multiparticle entanglement with Bose-Einstein condensates*, Workshop on solid state quantum computing, Warsaw (Poland), April 2001.

39. *Recent developments in quantum information theory*, 4th Annual Workshop on Resonances and Time Asymmetric Quantum Theory, Jaca (Spain), May 2001.

40. *Quantum repeaters with atomic ensembles*, International conference on Quantum Information, Rochester (USA), une 2001.

41. *Quantum repeaters with atomic ensembles*, Quantum Optics V, Zakopane (Poland), June 2001.

42. *Quantum repeaters with atomic ensembles*, Workshop on Quantum Computers and Quantum Chaos, Como (Italy), June 2001.

43. *Separability and distillability properties of Gaussian states*, Second ESF QIT Conference Quantum Information: Theory, Experiment, and Perspectives, Gdansk (Poland), July 2001.

44. *Separability and distillability properties of Gaussian states,* ESF Worshop on Quantum Information and Spacetime Structure, Madrid (Spain), September 2001.

45. *Separability and distillability*, Workshop on Quantum Challenges 2001, Essen (Germany), September 2001.

46. *Quantum Entanglement: Theory and Applications*, XXVIII Reunion Bienal de la RSEF, Sevilla (Spain), September 2001.

47. *Multiparticle Entanglement*, Quantum Optics XII, San Feliu de Guixols (Spain), October 2001.

48. *Quantum repeaters based on atomic ensembles,* QIPC Workshop, Torino (Italy), October 2001.

49. *Towards quantum information processing with quantum optical systems I and II*, Workshop on Quantum Computation, Seoul (Korea), November 2001.

50. *Towards quantum information processing with quantum optical system*, International Workshop on Quantum Computation and Quantum Optics, Pohang (Korea), November 2001.

51. *Quantum repeaters with atomic ensembles*, XII Solvay Conference in Physics, Delphi (Greece), November 2001.

52. *Strongly correlated systems and BEC,* Ringberg Meeting, Ringberg Schloss (Germany), December 2001.

53. *Entanglement in quantum optical systems,* Workshop on the future of quantum information, École Normal Supérieur, Paris (France), December 2001.

54. *Entanglement with atomic systems,* Kolloquium DFG Schwerpunkt Quanteninformationsverarbeitung, Bad Honnef (Germany), January 2002.

55. *General overview of entanglement with quantum optical systems,* 2002 Winter Conference on Condensed Matter Physics, Aspen (USA), February 2002.

56. *Entanglement and distillation in quantum optical systems,* IV Adriatico research conference on quantum interferometry, Trieste (Italy), March 2002.

57. *Recent results in quantum information theory,* European research conference on Quantum Information, San Feliu de Guixols (Spain), March 2002.

58. *Entanglement of states and operations*, Workshop on Decoherence, Durham (UK), April 2002.

59. *Entanglement in Quantum Optical Systems,* Quantum Electronics and Laser Conference, Long Beach (USA),May 2002.

60. *Advances in Quantum Information and Computation*, 2002 Meeting of the American Physical Society DAMOP, Williamsburg (USA), May 2002.

61. *Gaussian operations and states,* A2 Meeting, Braunschweig (Germany), June 2002.

62. *Entanglement of states and physical operations,* International conference on Quantum Communication, Measurement and Computing, Boston (USA),July 2002.

63. *Entangling atomic ensembles*, EPS 12 Trends in Physics, Budapest (Hungary), August 2002.

64. *Quantum Information Processing and Communication with Quantum Optical Systems*, Trends in Nanotechnology (TNT) 2002, Santiago de Compostela (Spain), September 2002.

65. *Quantum Information Processing and Communication*, COSMOCAIXA 2002, Madrid (Spain), September 2002.

66. *Entanglement in Multiparticle systems,* Symposium on Quantum Information, Uppsala (Sweden), October 2002.

67. *Entanglement properties of Gaussian states,* Workshop on Quantum Information, Cryptography, and Error Correction, MSRI, Berkley (USA), November 2002.

68. *Quantum Information Processing with Quantum Optical Systems*, Meeting of the Royal Society, London (UK), November 2002.

69. *Quantum information processing in optical lattices*, Symposium 'Cold atoms and quantum information', Collège de France, Paris (France), February 2003.

70. *Quantum Information processing with quantum optical systems*, SQUINT 5th Annual Meeting, Santa Fe (USA), February 2003.

71. *Entanglement creation in multiparticle systems*, Obergurgl Meeting 2003, Obergurgl (Austria), February 2003.

72. *Quantum information and quantum optical systems*, DPG Frühjahrstagung, Hannover (Germany), March 2003.

73. *Entanglement of Formation of Gaussian States*, Continuous Variable Quantum Information Processing Workshop, Aix en Provence (France), April 2003.

74. *Limits on Gates with trapped ions*, Simons Conference on Quantum and Reversible Computation, Stony Brook (USA), May 2003.

75. *Quantum Information with quantum optical systems*, Gordon Research Conference on Atomic Physics, Tilton School (USA), June 2003.

76. *Strong correlation effects in cold atomic gases*, ICOLS 03, Palm Cove (Australia), July 2003.

77. *Entanglement of Gaussian states and spin systems*, Workshop on Quantum Measurements and Quantum Stochastics, Aarhus (Denmark), August 2003.

78. *Entanglement in spin and harmonic oscillator lattices*, Quantum Challenges II, Warsaw (Poland), September 2003.

79. *Entanglement and strong correlation effects in optical lattices*, Euresco conference BEC 2003, San Feliu de Guixols (Spain), September 2003.

80. *Entanglement in Atomic Systems*, 304. WE-Heraeus-Seminar
81. , Bad Honnef (Germany), October 2003.

82. *Quantum cryptography*, Meeting of the Spanish Mathematical Society, Barcelona (Spain), November 2003.

83. *Entanglement and correlations in spin and quantum optical systems*, Lorentz Center Workshop Fundamentals of Solid State Quantum Information Processing, Leiden (Netherlands), December 2003.

84. *Entanglement in spin systems*, Gordon Conference on Quantum Information, Ventura (USA), February 2004.

85. *Quantum Information with Quantum Optical Systems*, LATSIS Symposium, Lausanne (Switzerland), March 2004.

86. *Boson and Fermions in Optical Lattices*, Workshop on Cold Fermions, Levico (Italy), March 2004.

87. *Studying strong correlation effects in optical lattices*, KITP Conference on Frontiers in Quantum Gases, Santa Barbara (USA), May 2004.

88. *Fast gates and quantum simulations with trapped ions*, "Ion Trap Quantum Computing" workshop on the development of the trapped ion quantum computer, University of Michigan, Ann Arbor (USA), May 2004.

89. *Fast Quantum Gates and Coherent Control with Trapped Ions*, CLEO/IQEC 2004, San Francisco (USA), May 2004.

90. *Quantum spin systems: entanglement and implementations*, ICAP 2004, Rio de Janeiro (Brasil), July 2004.

91. *Multiparticle entangled states*, Workshop on Quantum Entanglement, Decoherence, Information and Geometrical Phases in Complex Systems, Trieste (Italy), November 2004.

92. *Teoría cuántica de la información: conceptos básicos y aplicaciones,* Encuentro Física Fundamental "Alberto Galindo" November 2004.

93. *Projected-pair entangled states: properties and applications,* Workshop on Entanglement and Quantum Information, Pisa (Italy), December, 2004.

94. *PEPS: properties and applications,* Workshop on Entanglement and Quantum Information, Oberwolfach (Germany), January 2005.

95. *BEC with ions and scalable quantum computation with neutral atoms,* Banff Cold Atom Meeting, Calgary (Canada), February 2005.

96. *Quantum Information processing and simulations with quantum optical systems,* Gordon Conference on Quantum Information Science, Ventura (USA), February / March 2005.

97. *Ordenadores y dispositivos cuánticos: nuevos retos para el siglo XXI,* Jornadas Ciencia y sociedad IX: Españoles en la vanguardia de la ciencia, Madrid (Spain), March 2005.

98. *Quantum Information Processing with Quantum Optical Systems,* ESF-JSPS Frontier Science Conference Series for Young Researchers: Quantum information and Quantum Physics, Tokyo (Japan), March 2005.

99. *Quantum information, Quantum Optics and Spin Systems,* Physics 2005: a century after Einstein, Warwick (UK), April 2005.

100. *Quantum computations and simulations,* Frontiers in Quantum Physics, Madrid (Spain), April 2005.

101. *Entanglement in complex quantum systems,* Conference on Quantum Computation and Information, Crete (Greece), May 2005.

102. *Nuevos estados de la material,* Centenario del "annus mirabilis" de Einstein (1905-2005), Madrid (Spain), May 2005.

103. *Simulating quantum many-body systems,* International Conference on Laser, Applications and Technologies (LAT), St. Petersburg (Russia), May 2005.

104. *Información cuántica,* Las fronteras de física, Valencia (Spain), May 2005.

105. *Basic concepts in Quantum Information Theory,* Quantum Physics of Nature: Theory, Application and Interpretation, Vienna (Austria), May 2005.

106. *Simulating quantum Systems,* CMS/CSHPM Summer Meeting 2005.

107. *Quantum Information Processing with quantum Optical Systems,* Control and Manipulation of quantum Systems, Ascona (Switzerland), July 2005.

108. *Quantum Information Theory: Challenges and Perspectives,* Albert Einstein Annus Mirabilis 2005, San Sebastian (Spain), September 2005.

109. *Simulating quantum many-body systems,* Bose-Einstein Conference, San Feliu de Guixols (Spain), September 2005.

110. *Información Cuántica: nuevos retos y perspectives,* Bienal de Física, Ourense (Spain), September 2005.

111. *Quantum information,* Amazing Light Conference, Berkeley (USA), October 2005.

112. *Imaging the quantum world,* International Symposium: Scientific Imaging: Seeing the Invisible, Madrid (Spain), November 2005.

113. *Simulation of quantum many-body systems,* 13. International Conference on recent Progress in Many Body Physics, Buenos Aires (Argentina), December 2005.

114. *Simulating Quantum Many-Body Systems*, Workshop on Bose-Einstein Condensation and Quantum information, Vienna (Austria), December 2005.

115. *Entanglement with cold ions and atoms*, Quantum information Processing Meeting, Paris (France), January 2006.

116. *Ion Traps and cold atoms for quantum computers*, Annual APS March Meeting 2006, Baltimore (USA), March 2006.

117. *Quantum Simulations in Many-Body Systems*, Cold Atoms Meet condensed Matter (CATCOM), Dresden (Germany), March 2006.

118. *Many-body phenomena in ion traps*, Workshop: Correlated and Many-body Phenomena in Dipolar Systems, Dresden (Germany) May 2006.

119. *Sistemas cuánticos de comunicación y computación*, Seminario de Algorítmica y Criptografía cuántica, Madrid (Spain), June 2006.

120. *Simulating quantum many-body systems*, Workshop: Time in Quantum Mechanics, Tenerife (Spain), June 2006.

121. *Quantum simulations and phase transitions with trapped ions*, 20th International Conference on Atomic Physics (ICAP) Satellite Meeting "Atomic Physics with Trapped Ions", Innsbruck (Austria), July 2006.

122. *Quantum Simulations: Classical and quantum computational methods*, International Conference on Quantum Foundation and Technology (ICQFT) '06, Hangzhou (China), July 2006.

123. *Ions in Traps*, Workshop: Quantum Computation and Information, Universität Regensburg (Germany), November 2006.

124. *Efficient simulation of quantum systems*, QIP Workshop Brisbane (Australia), January 2007.

125. *Quantum Information*, Workshop on Quantum Information and Many-Body Quantum Systems, Pisa (Italy), March 2007.

126. *Quantum simulations with classical and quantum systems*, Workshop on Quantum Engineering with Neutral Atoms and Light, Herrsching (Germany), June 2007.

127. *La física cuántica en la sociedad de la información*, OPTOEL 07 Conference Bilbao (Spain), July 2007.

128. *New algorithms to simulate many-body quantum systems*, PAQ 07 Conference London (England), September 2007.

129. *Quantum Simualtions with Classical and Quantum Systems*, Seminar on Time Dependent Phenomena Blaubeuren (Germany), September 2007.

130. *Quantum Simulations: classical and quantum approaches*, DPG Physics School Quantum Informations and Quantum Simulation, Bad Honnef (Germany), September 2007.

131. *Quantum Information Processing: Present Status and Perspectives*, Symposium in Honor of CN Yan (Singapore), November 2007.

132. *Quantum State Generation in Many-Body Quantum Optical Systems*, QAO Downunder Workshop Wollongong (Australia), December 2007.

133. *Quantum Simulations*, TQC - University of Tokyo (Japan), February 2008.

134. *Simulation of many-body quantum systems: a quantum information perspective*,Aspen Conference, Aspen (USA), February 2008.

135. *Computación cuántica: Retos y Perspectivas*, Universidad Autónoma de Barcelona (Spain), May 2008.

136. *Quantum Information Theory: Applications and challenges*, 5th European Congress of Mathematics Amsterdam (Netherlands), July 2008.

137. *Quantum computing and state engineering via dissipation,* Gordon Research Conference Big Sky Montana (USA), September 2008.

138. *Efficient description of many-body quantum system,* Quantum Fluids and Strongly Correlated Systems Conference, Paris (France), September 2008.

139. *Quantum computation, quantum state engineering and quantum phase transitions driven by dissipation,* QICS Workshop Obergurgl (Austria), September 2008.

140. *Quantum Theory of Condensed Matter***,** 24th Solvay Conference in Physics, Brussel (Belgium), October 2008.

141. *Difficult Problems in Quantum Information Theory,* 2008 xQIT Conference at MIT, Cambridge (USA), November 2008.

142. *Open Quantum Systems: Decoherence and Control,* ITAMP Workshop Cambridge (USA), November 2008.

143. *Creation of entangled photons out of entangeld atoms,* SFB Conference at Innsbruck (Austria), January 2009.

144. *Scientific Symposium in honour of Prof. Ertmer,* Leibniz Universität Hannover (Germany), February 2009.

145. *Quantum computation, state engineering and phase transitions driven by dissipation,* SCALA Meeting at Cortina d'Ampezzo (Italy), February 2009.

146. *Bloch Oscillations and Landau-Zener Tunneling: From Hot Electrons to Ultracold Atoms – BOLTZ 2009,* Max-Planck Institute for Physics of Complex Systems, Dresden (Germany), May 2009 .

147. *Cooling & Calculating, Quantum Walks & Feedback,* Bonn (Germany), July 2009.

148. *Seminar on Physics of Cold Trapped Atoms* – LPHYS Workshop, Barcelona (Spain), July 2009.

149. *Quantum Theory and Symmetries 6,* Department of Physics&Astronomy, University of Kentucky, Lexington (USA), July 2009.

150. *Collective effects in the interaction of light and atoms,* Bose-Einstein Condensation 2009 Frontiers in Quantum Gases, San Feliu de Guixols Costa Brava, (Spain), September 2009.

151. *Átomos frios: un nuevo laboratorio para estudiar sistemas cuánticos de muchas partículas"* XXXII Edición de la Reunión de la Real Sociedad Española de Física, Ciudad Real, (Spain), September 2009.

152. *Classical and Quantum simulations,* (QIPC) International Conference, Rom, (Italy), September 2009.

153. *Protected Entangled-Pair and Plaquette States* ,CTS/Cecam/QSIT Workshop, Zurich, (Switzerland), November 2009.

154. *Simulation of Qantum Many-Body Systems: A Quantum Information Perspective,* Conference on Computational Physics (CCP*),* Kaohsiung, (Taiwan), December 2009.

155. *Efficient description of many-body systems with projected entangled-pair states,* Workshop on Quantum Information Science and Many-body Physics, Tainan, (Taiwan), December 2009.

156. *Classical simulation of many-body quantum systems,* QIP Workshop, Zurich, (Switzerland), January 2010.

157. *Quantum simulations: Experimental and Theoretical advances,* VI Encuentro Franco-Español de Química y Física del Estado Sólido, Tarragona (Spain), March 2010.

158. *Quantum optical technologies: from atomic ensembles to microscopic dielectric objects,* ISPQT – Tokyo (Japan), April 2010.

159. *Description of many-body systems using MPS,PEPS and other families of states,* Emergence&Entanglement Workshop – Waterloo/Ontario (Canada), May 2010.

160. *Quantum information: Theory, Applications and Challenges,* 10th European Conference on Atoms, Molecules and Photons, Salamanca (Spain), July 2010.

161. *A new view of Nature and much more,* DONOSTIA-Passion of Knowledge Workshop, San Sebastian (Spain), September 2010.

162. *Dissipation: a new tool for quantum information processing,* International Conference on Quantum Information and Computation, Stockholm (Sweden), October 2010.

163. *Theoretical methods for many-body quantum systems,* Conference on research frontiers in ultra-cold atoms and molecular gases, Goa (India), January 2011.

164. *Time-dependent methods for many body quantum systems,* Autumn College on Nano-Equilibrium Quantums Systems, Buenos Aires (Argentina), April / May 2011.

165. *Efficient description of quantum many-body systems,* 12th ICSSUR & 5th FEYNFEST, Foz de Iguazu (Brasil), May 2011.

166. *Tensor network approach to many-body quantum systems,* Strongly correlated systems, cooperativity and valencebond theory Workshop, La Coruña (Spain), July 2011.

167. *Engineered dissipation and quantum information,* QIPC2011 Conference, Zurich (Switzerland), 4 September to September 2011.

168. *Atomic Physics and Quantum Optics,* 25th Solvay Conference on Physics "The Theory of the Quantum World", Brussels (Belgium), October 2011.

169. *Tecnologías cuánticas para el siglo XXI,* Jornada Información Cuantica, Fundación Ramon Areces, Madrid (Spain), November 2011.

170. *Creating and detecting strongly correlated states in 1 dimension,* Symposium"Frontiers in Quantum Photon Science", University of Hamburg (Germany), November 2011.

171. *Quantum Information Theory: Applications and Challenges,* AAAS Annual Meeting at Vancouver Convention Centre (Canada), February 2012.

172. *An order parameter for symmetry-protected phases in one dimension,* Conference "New quantum states of matter in and out of equilibrium"at Galileo Galilei Institute (GGI) for Theoretical Physics, Florence (Italy), May 2012.

173. *Projected entangled pair states and many-body quantum systems,* Quantum Information Workshop, Seefeld (Austria), July 2012.

174. *Is science useful?* Culture Takes Centre Stage - Event, Palacio Euskalduna, Bilbao (Spain), July 2012.

175. *Quantum Memories for few Qubits: Design and Applications,* 11th International Conference on Quantum Communication, Measurement and Computing (QCMC), Vienna (Austria), July / 3August, 2012.

176. *Quantum information theory & many body system* - Discussion leader, Gordon Research Conference, Stonehill College, Easton (USA), August 2012.

177. *Bulk-Boundary correspondence in Many-Body Quantum Systems,* 2nd Conference on "Quantum Information meets Statistical Mechanics" (QISM2012), Innsbruck (Austria), September 2012.

178. *Bulk-Boundary Correspondence in Spin Lattices,* International Workshop on Entanglement Spectra in Complex Wavefunctions (ESICQW12), Max Planck Institute for the Physics of Complex Systems, Dresden (Germany), November 2012.

179. *Bulk-Boundary Correspondence in Spin Lattices at zero temperature,* Workshop "Entangle This: Strings, Fields and Atoms", Instituto de Física Teória (IFT), University of Madrid (Spain), November 2012.

180. *Self-Organization structures of Atoms in 1D*, 519th WE Heräus seminar "Hybrid Quantum Systems", Bad Honnef (Germany), November 2012.

181. *PEPS, Boundary Theories and Renormalization Group*, Workshop on Quantum Hamiltonian Complexity, Simons Institute for the Theory of Computing, University of California, Berkeley, California (USA), February 2013.

182. *What will the computers of the future look like?* invited talk at the Conference "Fysica 2013, Technical University of Delft (The Netherlands), April 2013.

183. *Quantum information and simulation with atomic systems*, Workshop on Quantum Simulations and Related Topics, Technion, Haifa (Israel), May 2013.

184. *Frontiers in Quantum Computing and Simulation*, MPQ-ICFO workshop, Barcelona (Spain), May, 2013.

185. *Física Cuántica: Del gato Schrödinger al ordenador del future*, Bienal de Física, Valencia (Spain), July 2013.

186. *Fractional quantum Hall states in lattices: Local models and physical implementation,* 2nd International Conference on Quantum Technologies (ICQT) 2013, Moscow (Russia), July 2013.

187. *Quantum simulation of High energy models with cold atoms*, 3rd QCD-TNT, Trento (Italy), September 2013.

188. *Los superordenadores del futuro*, Passion for knowledge – quantum 13, Donostia-San Sebastian (Spain), September 2013.

189. *Atomic Ensembles at Room Temperature: Theory and Experiments*, Frontiers in Optics Meeting, University of Copenhagen (Denmark), October 2013.

190. *Simulation of quantum many-body systems*, The Quantum Century: 100 years of the Bohr Atom, University of Copenhagen (Denmark), October 2013.

191. *Bulk-boundary correspondence and Tensor Network States,* COST action MP1006 Conference, Weizmann Institute, Rehovot (Israel), March 2014.

192. *Many-body localization from a quantum information perspective*, Workshop "Many-Body Localization and Associated Theory", Princeton Center for Theoretical Science (USA), March 2014.

193. *Quantum optics with atoms and dielectric materials,* The Quantum Optics Frontier Symposium, Caltech (USA), April 2014.

194. *Symmetries and boundary theories for chiral Projected Entangled Pair State*, Workshop on "Quantum Matter", Benasque (Spain), June 2014.

195. *Bulk-boundary theories from a quantum information theory perspective*, 2º workshop ICE-1 "Información Cuántica en España 1", Zaragoza (Spain), June 2014.

196. *Bulk-boundary correspondences with Projected Entangled Pair State*, "2nd Seefeld workshop on Quantum Information", Seefeld i. Tirol (Austria), June 2014.

197. *Symmetries and boundary theories for chiral Projected Entangled Pair State*, Workshop on "Topology and Entanglement in correlated Quantum Systems", MPI for Physics of Complex Systems, Dresden (Germany), July 2014.

198. *New Platforms for Quantum Simulations with Cold Atoms*, Gordon Research Conference on "Quantum Science", Stonehill College, Easton, MA (USA), July 2014.

199. *Tensor Networks and efficient description of many-body quantum systems*, Quantum Technologies Conference V, Krakow (Poland), September 2014.

200. *Quantum Physics and Computation*, XI International Ontology Congress, San Sebastian (Spain), October 2014.

201. *Chiral projected entangled-pair state with topological order*, workshop "Entangle This!",Instituto de la Física Teórica UAM/CSIC Madrid (Spain), February 2015.

202. *Quantum simulations with atoms in nano-structures*, conference "ImagineNano", Bilbao (Spain), March 2015.

203. *Tensor network states with chiral topological order*, KITP Program 'Entanglement in Strongly-Correlated Quantum Matter', Santa Barbara (USA), April 2015.

204. *Area Laws in Many-Body Systems and Tensor Networks*, KITP Program 'Entanglement in Strongly-Correlated Quantum Matter', Director's black board lunch, Santa Barbara (USA) May 2015.

205. *Efficient descriptions of many-body systems and tensor networks*, workshop "Quantum Hardness", Dresden (Germany), June 2015.

206. *Quantum simulations with atoms in nano-structures*, 3rd International Conference on Quantum Technologies (ICQT) 2015, Moscow (Russia), July 2015

207. *Quantum simulations of high-energy physics models*, conference 'Bose-Einstein Condensation 2015 – Frontiers in Quantum Gases', San Feliu de Guixols (Spain), September 2015

208. *Quantum information and Tensor Network techniques to describe many-body localization*, workshop 'The Non-Equilibrium Quantum Frontier', Princeton Center for Theoretical Science (USA), September 2015

209. *New Frontiers in Quantum Optics and Many-Body Physics*, International Symposium 2015, University of Hamburg, CUI The Hamburg Centre for Ultrafast Imaging (Germany), November 2015

210. *Tensor Network Techniques and systems out of equilibrium*, workshop "Quantum Integrable Models out of Equilibrium", Cambridge (UK), January 2016

211. *Quantum simulation and quantum optics in photonic crystals*, Solvay Conference on Quantum Simulation with Cold Matter and Photons 2016, Université Libre de Bruxelles (Belgium), February 2016

212. *Tensor Networks and Applications*, workshop "Entanglement in Strongly Correlated Systems", CCBPP Benasque (Spain), February 2016

213. *Quantum Optics and Lattice Gauge Systems*, Symposium on Effective Field Theories and Lattice Gauge Theory, Technical University of Munich (Germany), May 2016

214. *Tensor Network Techniques and systems out of equilibrium*, workshop on "Theoretical Challenges: Simulating Materials out of Equilibrium", CFEL / Max Planck Institute for Structure and Dynamics of Matter, Hamburg (Germany), June 2016

215. *Bulk-boundary correspondence for gauge theories*, YKIS 2016 Conference on "Quantum Matter, Spacetime and Information", Kyoto (Japan), June 2016

216. *Renormalization flows in matrix product operators*, 3rd Seefeld workshop on Quantum Information, Seefeld i. T. (Austria), June 2016

217. *Quantum simulation of high-energy physics models with cold atoms*, Humboldt Kolleg on Particle Physics, Kitzbühel (Austria), July 2016

218. *On the difficulty of simulating complex quantum systems*, International Symposium "Julio Palacios, Universidade da Coruña, July 2016.

219. *Quantum Information Processing and Dissipation*, Gordon Research Conference on "Quantum Science", Stonehill College, Easton, MA (USA), July 2016.

220. *Tensor Network Techniques and systems out of equilibrium*, Workshop on Many-Body Dynamics and Open Quantum Systems DOQS 2016, Glasgow, UK, September 2016

Lectures in Summer Schools and Special Courses

1. *Quantum Communication and Computing*, (4 lectures of 1 hour), European PhD Summer School in Physics, Trento (Italy), 8-20 June 1997.

2. *Quantum Information*, (5 lectures of 1.5 hours), Universidad de Barcelona (Spain), 26-30 January 1998.

3. *Quantum Information*, (4 lectures of 1 hour), International School of Physics Enrico Fermi, Varenna (Italy), 27 June-9 July 2000.

4. *Error correction and physical implementations*, DPG Schule für Physik Quanten-Computing und Information, Physikzentrum Bad Honnef (Germany), 9-13 October 2000.

5. *Quantum Information*, (6 lectures of 1 hour), Summer school on theoretical Physics, Stellenbosch (Southafrica), 23 January- 2 February 2001.

6. *The physics of entanglement*, (3 lectures of 1 hour), Seminar of Rhodanien, Dolomieu (France), 26 February-2 March 2001.

7. *Entanglement*, (3 lectures of 1.5 hours), Les Houches school on quantum entanglement, Les Houches (France), 26 - 28 March 2001.

8. *Quantum Information*, (3 lectures of 2 hours), University of Heidelberg, Heidelberg (Germany), 17-19 April 2001.

9. *Quantum Computation*, (2 lectures of 2 hours), Cursos de verano de la Universidad Internacional Menendez Pelayo (Spain), 2-7 July 2001.

10. *Entanglement in Atomic Systems*, (1 lecture of 1 hour), International School of Physics Enrico Fermi, Varenna (Italy), 17-27 July 2001.

11. *Entanglement and distillability*, (3 lectures of 1.5 hours), IX Escuela de Fisica Teorica, Santiago de Compostela (Spain), 3-14 September 2001.

12. *Quantum Information*, (4 lectures of 1 hour), VII Granada Seminar, Granada (Spain), 1-4 September 2002.

13. *Quantum entanglement theory: measurements and manipulation* (2 lectures of 1.5 hours), International School on Quantum Computation and Information, Lisboa (Portugal), 4-7 September 2002.

14. *Entanglement in Atomics Systems I and II* (2 lectures of 1.5 hours), Workshop on Quantum Information and Quantum Computation, Trieste (Italy), 14-25 October 2002.

15. *Separability and entanglement in Quantum Information* (1 lecture of 1 hour), Workshop on Entanglement at the nanoscale, Trieste (Italy), 28 October- 8 November 2002.

16. *Strongly correlated systems with cold atomic gases* (3 lectures of 1.5 hours), School on quantum gases in low dimensions, Les Houches (France), 15-25 April 2003.

17. *Quantum Optics and Quantum Computation Theory* (3 lectures of 1.5 hours), WEH Summer School, Wittenberg (Germany), 28-30 July 2003.

18. *Quantum Information Theory* (20 hours), Curso de Doctorado, University Autónoma of Madrid (Spain), 2-6 February 2004.

19. *Basics of Quantum Information Theory* (3 hours), Summer School on Quantum Optics and Quantum Information, Niels Bohr Institute, Copenhagen (Denmark), 11-13 August 2004.

20. *Entanglement and purification* (4.5 hours), Summer School on the Basics of Quantum Information, Cargesse (France), 22-25 August 2004.

21. *Quantum computations and simulations*, Campus de Excelencia 2005, Tenerife (Spain), June 2005.

22. *Efficient representation of certain many-body quantum states* (3 lectures of 1.5 hours), Summer School on Quantum Information Science, Kochi (Japan), 30 August – 3 September 2005.

23. *Quantum Repeaters & Quantum Computing* (2 Lectures of 1.5 hours), Winter College on Quantum and Classical Aspects of information Optics, Trieste (Italy), 30 January – 10 February 2006.

24. *Fermions and Quantum Information* (2 Lectures of 1.5 hours), International School of Physics "Enrico Fermi"on Ultra-Cold Fermi Gases, Varenna (Italy), 26 June – 28 June 2006.

25. *Quantum Information* (2 Lectures of 1.5 hours), International Conference on Atomic Physics (ICAP) – Summer School, Innsbruck (Austria), 10 July – 11 July 2006.

26. *Computación y Comunicación Cuántica*, Cursos de Verano de la Universidad Complutense de Madrid, San Lorenzo de El Escorial (Spain), 31 July 2006.

27. *Quantum Information* (5 Lectures of 1.5 hours), Pre-Doctoral School on Laser Cooling and Bose Einstein Condensation, Les Houches (France), 18 September – 20 September 2006.

28. *Ensemble-based Quantum Information Processing*, QUROPE Winter School on Quantum Information, Obergurgl (Austria), 18 February – 24 February 2007.

29. *Quantum Computation and Topological Orders*, Cursos de Verano de la Universidad Complutense de Madrid, San Lorenzo de El Escorial (Spain), 16 July – 20 July 2007.

30. *Hacia una nueva sociedad de la información a través de la física cuántica* (1 lecture of 2 hours) ,UIMP Aula de Verano Santander (Spain), 27 August 2007.

31. *Entangled States: theory and applications* , QUIC 07 Summer School Maynooth (Ireland), 31 August 2007.

32. *Física Cuántica, Informática y Comunicación: una nueva era tecnológica para el siglo XXI* (3 lectures of 1 hour*)*, Clases Magistrales Cátedra Madrid (Spain), 12 November 2007.

33. *Condensed Matter Physics and Quantum Information with Cold Atoms* (3 lectures of 1.5 hours) 25th Jerusalem Winter School in Theoretical Physics (Israel), 26 December – 30 December 2007.

34. *Introducción a los simuladores cuánticos*, Summer school Universidad de Oviedo (Spain), 15 September 2009.

35. *A quantum information perspective of quantum many-body systems*, Spring school on transport in nanostructures, Capri (Italy), 12 April to 13 April 2010.

36. *Entanglement in quantum many-body systems: from area laws to tensor networks* (4 lectures of 1.5 hours), summer school on Many-body physics with ultracold gases, Les Houches (France), 28 June to 2 July 2010.

37. *La física cuántica:misterios, paradojas y aplicaciones*, Summer school Universidad Internacional Menéndez Pelayo, Santander (Spain), 8 August to 12 August 2011.

38. *Quantum information, Quantum simulation* (3 lectures of 1.5 hours), ICAP summer school – Ecole Normale Supérieure, Paris (France), 16 July to 19 July 2012.

39. *Quantum Information, Condensed Matter, Quantum Theory* (3 lectures of 1 hour), Israel Institute of Technology, Technion, Haifa (Israel), 3rd December to 7th December 2012.

40. *Quantum Many-Body Systems, Quantum Information* (3 lectures of 1 hour), Third Annual PCTS Lecture Series, Princeton Center for Theoretical Science, Princeton University, New Jersey (USA), 4 March to 8 March 2013.

41. *Tensor networks for the efficient descriptions on many body quantum system* (2 lectures of 1.5 hours), 1st RQC summer school, Moscow (Russia), 15 July to 18 July 2013.

42. *Tensor network methods* (2 lectures of 1.5 hours), ICFO summer school 2013 "Frontiers of Quantum Physics and Quantum Information", Barcelona (Spain), 25 July – 27 July 2013.

43. *Tensor networks* (3 lectures of 1.5 hours), CECAM school at SISSA, Trieste (Italy), 16 and 17 September 2013.

44. *Física Cuántica e informacion*, Summer school at Universidad Internacional Menéndez Pelayo, Santander (Spain), 25 August – 29 August 2014.

45. *Quantum optics with atoms close to dielectric materials*, ICFO summer fellow program 2016, Castelldefels (Spain), 5 July 2016

46. *Quantum Information and Quantum Simulation* (2 lectures of 1 ¾ hours), summer school "Nanotechnology meets Quantum Information (NanoQI), Donostia-San Sebastian (Spain), 11 and 12 July 2016

Seminars and Colloquia

1. *Cooling a trapped ion with a standing wave*, Joint Institute for Laboratory Astrophysics, Boulder (USA), 12 September 1991.

2. *Preparation of Fock states by observation of quantum jumps in ion traps*, National Institute for Standards and Technology, Gaithersburg (USA), 9 September 1992.

3. *Generation of nonclassical motional states in ion traps*, University of Hamburg (Germany), 8 December 1992.

4. *Non-classical states of motion in ion traps*, Joint Institute for Laboratory Astrophysics, Boulder (USA), 17 September 1993.

5. *Quantum statistical properties of a laser cooled ideal gas*, National Institute of Standards and Technology, Gaithersburg (USA), 19 November 1993.

6. *Schemes for atomic state teleportation*, National Institute of Standards and Technology, Gaithersburg (USA), 19 August 1994.

7. *The boser: a theoretical description for the atom laser*, Harvard University, Cambridge (USA), 17 August 1994.

8. *Cooling with external fields: the elevator cooling*, Massachusetts Institute of Technology, Cambridge (USA), 10 September 1994.

9. *Teleportation*, University of Innsbruck (Austria), 17 November 1994.

10. *Quantum computations with trapped ions*, University Konstanz (Germany), 25 November 1994.

11. *Quantum computations with cold trapped ions*, École Normal Supérieure, Paris (France), 11 July 1995.

12. *Ion traps*, University of Ulm (Germany), 27 November 1995.

13. *Ion traps*, University of Innsbruck (Austria), 11 December 1995.

14. *Trapped ions in the strong excitation regime: ion interferometry and non-classical states*, Joint Institute for Laboratory Astrophysics, Boulder (USA), 17 October 1995.

15. *Trapped ions in the strong excitation regime: ion interferometry and non-classical states*, Los Alamos National Laboratory (USA), 20 October 1995.

16. *Error correction in Quantum Computing*, California Institute for Technology, Pasadena (USA), 30 January 1996.

17. *Quantum Reservoir Engineering*, University of Auckland (New Zealand), 2 February 1996.

18. *Computación Cuántica*, University of Granada (Spain), 29 April 1996.

19. *Quantum mechanics with trapped ions*, Max Plank Institute for Quantum Optics, Garching (Germany), 11 June 1996.

20. *Quantum reservoir engineering*, Institute for Theoretical Physics, Santa Barbara (USA), 18 October 1996.

21. *Schrödinger lions made out of bosons*, University of Trento (Italy), 13 February 1997.

22. *Quantum Communication and Computation*, University Autónoma of Madrid (Spain), 22 September 1997.

23. *Quantum Communication and Computation*, University Complutense of Madrid (Spain), 23 September 1997.

24. *Creation of Solitons and Vortices in Bose-Einstein-Condensates*, Institute for Theoretical Physics, Santa Barbara (USA), 11 February 1998.

25. *Communicacion cuantica en presencia de ruido*, University of Salamanca (Spain), 19 November 1998.

26. *Black holes with Bose-Einstein condensates*, Benasque Center for Science (Spain), 24 July 1999.

27. *Quantum Information Processing*, AMOLF, Amsterdam (Netherlands), 6 December 1999.

28. *Quantum Communication and Computation*, University Autónoma of Madrid (Spain), 17 December 1999.

29. *Quantum Computing with arrays of microtraps*, Max-Planck Institute for Quantum Optics, Garching (Germany), 17 February 2000.

30. *Separability and distillability of mixed states*, University Autónoma of Madrid (Spain), 22 May 2000.

31. *Separability and distillability of mixed states*, Laboratory Kastler, École Normal Supérieur, Paris (France), 7 June 2000.

32. *Quantum optical approach to Bose-Einstein condensation and quantum information process*, Max--Plank Institute for Quantum Optics, Garching (Germany), 1 September 2000.

33. *Multiatom entanglement with Bose-Einstein condensates*, Erwin Schrödinger Institute, Vienna (Austria), 4 December 2000.

34. *Irreversibilidad en la manipulación asymptotical de entanglement*, Universidad de Cantabria, Santander (Spain), 9 February 2001.

35. *Progress on Bose-Einstein condensation and quantum information*, University of Hannover (Germany), 14 February 2001.

36. *Anyons in Bose-Einstein condensates*, NIST, Gaithersburg (USA), 7 March 2001.

37. *Anyons in Bose-Einstein condensates*, ITAMP, Cambridge (USA), 12 March 2001.

38. *Entanglement in Bose-Einstein condensates*, University of Kaiserslautern (Germany), 7 May 2001.

39. *Separability and distillability in quantum information*, Technische Universität Munich (Germany), 30 May 2001.

40. *Quantum Entanglement: Theory and Applications*, University of Castilla-La Mancha, Ciudad Real (Spain), 26 September 2001.

41. *Anyons in Bose-Einstein condensates*, Ludwig-Maximilian Universität, Munich (Germany), 9 January 2002.

42. *Anyons in Bose-Einstein condensates*, Joint Institute for Laboratory Astrophysics, Boulder (USA), 7 February 2002.

43. *Quantum information processing with quantum optical systems*, Max-Planck Institut für Quantenoptik, Garching (Germany), 26 February 2002.

44. *Some mathematical problems in Quantum Information Theory*, École Normal Supérieur, Paris (France), 2 April 2002.

45. *Strongly correlated systems and BEC,* LENS, Florence (Italy), 10 May 2002.

46. *Physical operations with Gaussian states,* CALTECH, Pasadena (USA), 24 May 2002.

47. *Quantum information in quantum optical systems,* University of Regensburg (Germany), 17 November 2003.

48. *Quantum information in quantum optical systems,* ETH Zürich (Switzerland), 12 November 2003.

49. *Entanglement and correlations in spin systems,* University of Augsburg (Germany), 2 December 2003.

50. *Quantum Information: basic concepts and applications,* Orsay (France), 16 December 2003.

51. *Quantum Information processing with quantum optical systems,* Orsay (France), 18 December 2003.

52. *Quantum Information and Quantum Optical Systems,* University of Geneva (Switzerland), 23 January 2004.

53. *Quantum Information and Quantum Optical Systems,* University of Freiburg (Germany), 9 February 2004.

54. *Localizable entanglement and projected entangled pair states,* MIT (USA), 5 April 2004.

55. *Quantum Behaviour in ion traps and optical lattices,* University of Harvard (USA), 6 April 2004.

56. *Quantum Information and Quantum Optical systems,* University of Tübingen (Germany), 20 April 2004.

57. *Quantum information processing and quantum optical systems,* University of Karlsruhe, 11 June 2004.

58. *Projected entangled-pair states: properties and applications,* University Toronto (Canada), 19 November 2004.

59. *BEC and strong correlation behavior in trapped-ion systems,* University Toronto (Canada), 19 November 2004.

60. *BEC with ions and scalable quantum computation with neutral atoms,* Harvard University (USA), 9 February 2005.

61. *Entangled-Pair Protected States: Properties and Applications,* CALTECH, Pasadena (USA), 22 February 2005.

62. *Simulation of quantum many-body systems,* Max-Planck Institut für Physik komplexer Systeme, Dresden (Germany), 25 April 2005.

63. *Renormalization algorithms for the simulation of many-body quantum systems,* Universita La Sapienza, Roma (Italy), 17 May 2005.

64. *Quantum information Processing with Quantum Optical Systems,* Max-Planck Institut für Quantenoptik, Dresden (Germany), 23 May 2005.

65. *Challenges and Perspectives,* Instituto Nacional de Técnica Aerospacial, Madrid (Spain), 11 November 2005.

66. *Quantum Simulations in Many-Body Systems,* Universität Kaiserslautern (Germany), 31 January 2006.

67. *Trapped ions for quantum simulations and computations,* Universität Ulm (Germany), 02 February 2006.

68. *PEPS: theory and applications,* University of Cambridge (UK), 01 March 2006.

69. *Quantum simulations in many-body systems* , Center of Logic and Computation, Intituto Superior Técnico, Lissabon (Portugal), 16 May 2006.

70. *Quantum Many-Body Systems: A quantum information perspective,* Universität Marburg (Germany), 22 May 2006.

71. *Quantum Simulations with Trapped Ions,* SFB Herrsching (Germany), 25 May 2006.

72. *Quantum Simulations,* Universidad Autónoma de Barcelona (Spain), 14 September 2006.

73. *Many-body physics: a quantum information perspective*, Universidad de Zaragoza (Spain), 24 October 2006.

74. *Computación y Simulación cuántica*, Universidad de Valencia (Spain), 11 January 2007.

75. *Informática y comunicación a través de la física cuántica,* Imaginatica 07 Sevilla (Spain), 07 February 2007.

76. *Quantum Many-Body Systems: Simulations and beyond,* University of Maryland (USA), 16 April 2007.

77. *Tecnologías cuánticas para la información,* Universidad Complutense de Madrid (Spain), 26 April 2007.

78. *Conferencia de Clausura*, El área europea del conocimiento, Universidad Complutense de Madrid (Spain), 11 March 2007.

79. *Quantum many-body systems: simulations and beyond,* DIPC, San Sebastian (Spain), 04 May 2007.

80. *Efficient descriptions of many-body systems: Simulations and beyond,* Universität Köln (Germany) , 11 May 2007.

81. *Quantum Entanglement and it's measures,* Institut Henri Poincaré Paris (France), 16 May 2007.

82. *Quantum many-body systems: simulations and beyond,* UPV Bilbao (Spain), 10 July 2007

83. *Efficient descriptions of many-body systems: Simulations and beyond,* PSI Villigen (Switzerland), 07 September 2007.

84. *A quantum information perspective of many-body physics,* Physikalisches Kolloquium der Univ. Bayreuth (Germany), 8. Januar 2008.

85. *A quantum information perspective of many-body physics,* University of Conneticut (USA), 11 February 2008.

86. *Quantum State Generation in Many-Body Quantum Optical System,* University of Conneticut (USA), 12 February 2008.

87. *Tecnologías cuánticas para el siglo XXI,* CSIC Jornadas Madrid (Spain), 19 February to 20 February 2008.

88. *Quantum simulations using classical and quantum computers,* MATHQCI Workshop Madrid (Spain), 26 May to 30 May 2008.

89. *Classical and quantum simulation of quantum many-body systems,* Physikalisches Kolloquium Universität Ulm (Germany) 23 June 2008.

90. *Simulation of quantum many-body systems: a quantum information perspective,* UAB-Instituti Física Teórica Barcelona (Spain), 14 October 2008.

91. *Theoretical aspects of tensor network states,* Universidad Complutense de Madrid (Spain), 15 October 2008.

92. *Quantum Computational models for quantum optical systems,* ICFO Barcelona (Spain), 20 October 2008.

93. *Inauguration – Caixa Manresa Event,* ICFO Barcelona (Spain), 23 October 2008.

94. *Tensor networks, many-body systems and quantum information,* Harvard University Cambridge (USA), 24 November 2008.

95. *Superradiance, photon processing and anyon braiding with cold atoms,* CUA at MIT Cambridge (USA), 25 November 2008.

96. *Quantum computers and communication systems,* IRST Povo/Trento (Italy), 18 May to 19 May 2009.

97. *Quantum information: Theory & Experiments,* Facultad de Ciencias (UAM) Madrid, 13 January 2010.

98. *Efficient description of many-body systems: simulations and beyond,* Universität Duisburg-Essen, 20 January 2010.

99. *Many-body quantum systems: a quantum information perspective,* Universität Stuttgart, 26 January 2010.

100. *Informática y Física Cuántica,* Jornada von Neumann at Facultat de Matemátiques, Barcelona (Spain), 24 February 2010.

101. *Dissipation: A New tool in Quantum Information Science,* ETH Zurich (Switzerland), 28 October 2010.

102. *Efficient descriptions of quantum many-body systems,*ETH Zurich (Switzerland), 29 October 2010.

103. *Dissipation: a new tool in quantum information science,* KITP, University of California, Santa Barbara (USA), 23 November 2010.

104. *Efficient descriptions of quantum many-body systems,* Berkeley University, San Francisco (USA), 29 November 2010.

105. *Efficient descriptions of quantum many-body system,* Niels-Bohr Institute, Copenhagen (Denmark), 19 January 2011.

106. *Dissipation: A New tool in Quantum Information Science,* Instituto Ciencia de Materiales de Madrid (Spain), 15 February 2011.

107. *Dissipation: A New tool in Quantum Information processing,* Collège de France, Paris (France), 21 February 2011.

108. *Quantum Physics an Information,* ICREA Colloquium, Barcelona (Spain), 22 March 2011.

109. *Quantum Information: theory application and challenges,* Departement of Physics&Astronomy, University of Aarhus (Denmark), 01 June 2011.

110. *Dissipation: A new tool in quantum information Science,* Fakultät für Mathematik & Physik, Leibniz University of Hanover (Germany), 8 November 2011.

111. *Quantum simulations of many-body systems,* University of Girona (Spain), 18 November 2011.

112. *Dissipation: A new tool in quantum information science,* Stanford University, California (USA), 7 February 2012.

113. *Dissipation: A new tool in quantum information science,* Joint Quantum Institute - University of Maryland (USA), 20 February 2012.

114. *Dissipation: A new tool in quantum information science,* Institut de Ciència de Materials de Barcelona (ICMAB), Bellaterra (Spain), 16 April 2012.

115. *Computers in the 21st century and beyond,* Centro Nacional de Biotecnologia (CBN), Madrid (Spain), 28 September 2012.

116. *Quantum memories: Design and Applications,* Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University, 25 October 2012.

117. *A new tool in Quantum Information Science,* Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen (Germany), 5 November 2012.

118. *Quantum memories: design and applications,* Quantum Information Science Center, Racah Institute, Hebrew University, Jerusalem (Israel), 6 May 2013.

119. *Quantum simulations with atoms and ions,* Ben Gurion University, Be'er Sheva (Israel), 7 May 2013.

120. *Simulation of HEP models with cold atoms,* EFT seminar, Technical University of Munich (TUM), Garching, (Germany), 12 June 2013.

121. *Simulation of high-energy physics models with cold atoms,* Ludwig-Maximilians-Universität (LMU), Munich, (Germany), 18 June 2013.

122. *¿Como serán los superordenadores del futuro?*, III Jornadas Doctorales de la UCLM, Albacete (Spain), 22 October 2013.

123. *Quantum simulations of high energy physics models*, Harvard-MIT CUA seminar, Cambridge, MA, (USA) 5 November 2013.

124. *Bulk-boundary correspondence in PEPS*, Perimeter Institute for Theoretical Physics, Waterloo, ON, (Canada), 13 November 2013.

125. *Quantum simulations of high-energy physics*, Centre for Mathematical Sciences, University of Cambrigde (UK), 22 January 2014.

126. *Quantum simulation of high-energy physics models with cold atoms*, Instituut Lorentz for Theoretical Physics, University of Leiden (The Netherlands), 26 February 2014.

127. *Bulk-boundary correspondences in tensor networks*, Stanford University, Palo Alto (USA), 14 March 2014.

128. *Why are Many-Body Problems in Physics so difficult? A Quantum Information Perspective*, Simons Institute, Berkeley (USA), 2 May 2014.

129. *Quantum simulations of high energy physics models*, Summer Fellows Lectures at ICFO, Castelldefels (Spain), 9 July 2014.

130. *New Platforms for Quantum Simulations with Cold Atoms*, University College Cork, Physics Department, (Ireland) 13 October 2014.

131. *Efficient descriptions of many-body quantum systems with tensor networks*, National University of Ireland Maynooth (Ireland), 14 October 2014.

132. *Quantum simulations with cold atoms: From condensed matter to high-energy models*, Queen's University Belfast, Centre for Theoretical Atomic, Molecular and Optical Physics, Belfast (Ireland), 15 October 2014.

133. *Quantum Physics: From the Schrödinger cat to the most powerful computers*, CNIO Distinguished Seminars, Centro Nacional de Investigaciones Oncológicas, Madrid (Spain), 23 January 2015.

134. *Simuladores Cuánticos*, Encuentros de Excelencia Internacional, Universitat de Valencia (Spain), 29 January 2015.

135. *Quantum Simulations*, Universitat de Barcelona, Facultat Física/Química, Institut d'estudis Espacials de Catalunya (Spain), 26 February 2015.

136. *Quantum Simulations of high energy physics models*, Instituto de la Física Teórica UAM/CSIC Madrid (Spain), 6 March 2015.

137. *Quantum simulations of high energy physics*, University of Ulm (Germany), 1 June 2015.

138. *Quantum simulations with atoms in nano-structures*, MPL Distinguished Lecturer Series, Max Planck Institut for the Physics of Light, Erlangen (Germany), 5 November 2015

139. *Quantum simulation of high energy physics models*, Instituto Balseiro, San Carlos de Bariloche (Argentina), 16 November 2015

140. *Collective phenomena with atoms in nano-structures*, Instituto Balseiro, San Carlos de Bariloche (Argentina), 18 November 2015

141. *Bulk-boundary correspondence and tensor network states*, Instituto Balseiro, San Carlos de Bariloche (Argentina), 19 November 2015

142. *Simulaciones cuánticas y la dificultad de resolver problemas complejos*, Colloquium, Instituto Balseiro, San Carlos de Bariloche (Argentina), 20 November 2015

143. *Quantum simulations of high energy physics models*, Colloquium at Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany), 20 January 2016

144. *Quantum Optics and Simulations with Atoms and Photonic Crystals*, Colloquium, Institute for Quantum Optics and Quantum Information (IQOQI), Innsbruck (Austria), 17 February 2016

145. *Quantum optics with emitters in waveguides*, Colloquium at Yale Quantum Institue, New Haven (USA), 4 March 2016

146. *Quantum simulations: From condensed matter to high energy models*, Physics Dept. Colloquium at JILA, Boulder (USA), 9 March 2016

147. *Tensor networks for quantum many-body systems*, CTQM Seminar at JILA, Boulder (USA), 11 March 2016

148. *Quantum optics with emitters in waveguides*, Colloquium at the Departament of Condensed Matter Physics, Faculty of Sciences (IFIMAC-UAM), Madrid (Spain), 18 April 2016

149. *Tensor Networks for symmetry protected phases*, Journal Club, Institute of Theoretical Physics (IFT, UAM-CSIC), Madrid (Spain), 19 April 2016

150. *Quantum Optics with emitters in waveguides*, Wiener Physik Kolloquium, University of Vienna (Austria), 9 May 2016

151. *Simulación cuántica de problemas complejos*, Conference commemorating the 100th anniversary of the Royal Academy of Sciences of Zaragoza (Spain), 16 May 2016

152. *Quantum Optics close to dielectric materials*, SFB/ZOQ seminar at the Institute of Laser Physics, University of Hamburg (Germany), 1 June 2016

153. *Quantum Simulations of low and high energy physics models using cold atoms*, Physikalisches Kolloquium, University of Augsburg (Germany), 6 June 2016

154. "*Quantum Simulations: From Low to High Energy"*, Summer Fellows Lectures at ICFO, Castelldefels (Spain), 5 July 2014

Public Lectures

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1. *¿Se puede construir un ordenador cuántico?*, Agora de la Ciencia, Residencia de Estudiantes del CSIC, Madrid (Spain), 19 October 2000.

2. *El futuro de la computación cuántica*, University of Zaragoza (Spain), 13 November 2000.

3. *Algo sobre información cuántica*, Universidad de Sevilla (Spain), 22 November 2005.

4. *Computación y comunicación cuántica: Retos y perspectivas*, Real Academia española de Ciencias, Madrid (Spain), 17 May 2006

5. *Computación y comunicación cuántica: Retos y perspectivas*, Cap Aranjuez , Madrid (Spain), 18 May 2006

6. *Computación y comunicación cuántica*, Universidad de La Laguna, Tenerife (Spain), 14 June 2006

7. *La Física cuántica en la sociedad de la información*, Universidad de Zaragoza (Spain), 25 October 2006.

8. *La Física Cuántica en la sociedad de la información*, Universidad de Santiago de Compostela (Spain), 17 November 2006.

9. *La vision del mundo desde la óptica de la física cuantica*, Taller de periodismo científico, Ciudad Real (Spain), 11 December 2006.

10. *Una vision del mundo a través de la Física Cuántica,* Universidad de Murcia (Spain), 09 January 2007.

11. *La visión del mundo desde la perspectiva de la física cuántica,* Ayuntamiento de Manresa (Spain), 15 January 2007.

12. *Una ventana al mundo microscópico,* Academia de Bellas Artes Barcelona (Spain), 16 January 2007.

13. *La física cuántica en la sociedad de información,* Ateneo de Madrid (Spain), 27 April 2007.

14. *El impacto de la física cuántica en la sociedad,* CSIC Jornadas Madrid (Spain), 14 June 2007.

15. *La física cuántica en la sociedad de la información,* CosmoCaixa Set of Talks Barcelona (Spain), 16 October 2007.

16. *Fiscal Cuánitca: de paradojas a nuevas tecnologías de la información,* Conferencía del Colegio Madrid,(Spain), 31 May 2008.

17. *La Física Cuántica: implicaciones filosóficas y technolóicas para el siglo XXI,* Cortes de Aragón, Zaragoza (Spain), 27 October 2008.

18. *Current challenges in the field of quantum technology,* Queen Sofia Spanish Institute New York (USA), 18 November 2008.

19. *Nuevas fases de la materia: Una expedición en busca del frio, C*aixa Manresa Event at the Auditorium of Barcelona (Spain), 10 January 2009.

20. *Computación cuántica:Retos y Perspectivas,* Encuentro sobre Fronteras de la Ciencia – Fundacion de Duques, Salamanca (Spain) 25 February 2009.

21. *Cooperación hispano-aleman en material de investigación,* Foro Hispano Alemán – Palacio de la Bolsa de Madrid (Spain), 13 March 2009.

22. *Computación Cuántica,* Fundación Marcelino Botín, Santander (Spain), 11 March 2010.

23. *Computación Cuántica: nuevas tecnologías para el siglo XXI,* Caixa Forum, Tarragona (Spain), 16 March 2010.

24. *Información cuántica para el siglo XXI,* XXVII Universitat d'Estiu, Andorra, 19 March 2010.

25. *Fisíca Cuantica: de paradojas y ordenadores,* INDITEX, La Coruña (Spain), 3 March 2011.

26. *Gatos, ordenadores y alguna cosa mas,* Residencia d'Investigadors, Barcelona (Spain), 23 March 2011.

27. *De gatos y ordenadores: la Física Cuántica para el Siglo XXI,* Instituto Quimica de Sarria (IQS), Barcelona (Spain), 24 March 2011.

28. *De gatos y ordenadores: la Física Cuántica para el Siglo XXI,* Colegio Miguel de Cervantes de Sao Paolo, (Brasil), 4 May 2011.

29. *Nuevas fases de la material: una expedición en busca del frio,* Donostia International Physics Center (DIPC), San Sebastián (Spain), 2 December 2011.

30. *Quantum Physics: A source of mysteries and applications",* Erwin Schrödinger Lecture at the Austrian Academy of Sciences, Vienna, 27 March 2012.

31. *Estarán los ordenadores del futuro basados en la Física Cuántica?* Universitat Politècnica de Catalunya (UPC), Barcelona (Spain) 19 April 2012.

32. *Ordenadores cuánticos, ACTS Ordenadores cuánticos y Retos Tecnológicos,* Residencia d'Investigadors CSIC-Generalitat de Catalunya, Barcelona (Spain), 20 April 2012.

33. *Simuldores cuánticos con atomos, ions y fotones*, Institut d'Estudis Catalans, Societat Catalana de Física, Barcelona (Spain), 24 April 2013.

34. *Los superordenadores del futuro,* Spanish Embassy, Stockholm (Sweden), 11 June 2013.

35. *Física cuántica y los ordenadores del futuro,* Centro de Estudios Comarcales del Bajo Aragón, Caspe (Spain), 5 July 2013.

36. *Superordenadores para el siglo XXI*, Universitat de Vic (Spain), 5 February 2014.

37. *Conversaciones en la Fundación*, Fundación Juan March, Madrid (Spain), 23 May 2014.

38. *Ciencia para el siglo XXI: Algunos retos cruciales*, "LaCaixa", CaixaForum, Madrid (Spain), 16 June 2014.

39. *Una vision de la ciencia desde Alemania,* Universidade A Coruña (Spain), 19 September 2014.

40. *"De la física cuántica al gato de Schrödinger*, Semana de la Ciencia, Alcoy, Universitat Politècnica de València (Spain), 18 November 2014.

41. *Física cuántica: Del gato Schrödinger al ordenador del futuro,* Universidad de Burgos (Spain), 20 January 2015.

42. *Cuando investigar es una pasión más que una profesión*, Jornada APD, Auditorio BBVA, Madrid (Spain), 22 January 2015.

43. *La Luz y los cuantos,* Inauguration of the International Year of Light in Spain, Barcelona (Spain), 16 February 2015.

44. *Algunos retos de la física para el siglo XXI,* Inauguración Cátedra Julio Palacios, Madrid (Spain), 14 April 2015.

45. *Superordenadores del futuro,* Fundación CEDE, Madrid (Spain), 11 June 2015.

46. *Los retos de la Física para el siglo XXI,* Fundación CEDE, Madrid (Spain), 12 June 2015.

47. *¿Cómo serán los superordenadores del futuro?* Fórum IMPULSA, Girona (Spain), 26 June 2015.

48. *La era del conocimiento: Nuevos modelos de negocio*, round table debate with César Alierta, J. Ignacio Cirac y Carlos Slim at the "XVI Asamblea Annual del Foro Iberoaméricana, Barcelona (Spain), 12-13 October 2015

49. *La luz, los cuantos, y las nuevas tecnologías*, Fundación Ramón Areces, Madrid (Spain), 3 December 2015

50. *La luz, los cuantos, y las nuevas tecnologías*, Reial Academia de Ciencies i Arts de Barcelona (Spain), 25 February 2016

51. *La luz, los cuantos, y las nuevas tecnologías*, Universidad Católica del Norte, Antofagasta (Chile), 8 April 2016

52. Computadores cuánticos: ¿Una nueva revolución tecnológica? Puerto de Ideas, Festival de Ciencia, Antofagasta (Chile), 10 April 2016

53. *Innovación e impacto en nuestro futuro,* Impact Innovation Talks, Telefónica SA, Madrid (Spain), 21 June 2016

Organization of Conferences and Workshops

1. Benasque Workshop on Quantum Information Science (coorganized with A. Ekert), Benasque (Spain)
   1998: 5 July to 25 July
   2000: 2 July to 21 July
   2003: 22 June to 11 July
   2005: 12 June to 1 July
   2007: 17 June to 29 June
   2009: 07 June to 28 June
   2011: 12 June to 30 June
   2013: 23 June to 12 July
   2015: 21 June to 10 July

2. Euresco Conference on Bose-Einstein Condensation, San Feliu de Guixols (Spain), 15 September to 20 September 2001.

3. Gordon Research Conference on Quantum Information Science (coorganized with P. Zoller), Il Ciocco (Italy), 7 May to 12 May 2006

4. ICTP Workshop on Quantum Phenomena and Information: *From Atomic to Mesoscopic Systems*, Triest (Italy) 5 May to 16 May 2008

5. Joint Workshop MPQ/Barcelona Research Centers on Quantum Information, San Benet (Spain), 3 December to 6 December 2008

6. Workshop on Quantum Simulation/Computation with Cold Atoms and Molecules, Aspen (USA), 24 May to 6 June 2009

7. Políticas para la excelencia científica de España, UIMP, Santander (Spain), 25 Julio to 27 Julio 2011

8. Joint ICFO-MPQ workshop at ICFO, Barcelona, (Spain), 22 May to 24 May 2013

9. 2nd Kavli-MPQ workshop, MPQ, Garching (Germany), 12 June - 13 June 2014

LIST OF PUBLICATIONS

JUAN IGNACIO CIRAC

1.- Published

2016

1. *Dissipative Long-Range Entanglement Generation between Electronic Spins*
M. Benito, M. J. A. Schuetz, J. I. Cirac, G. Platero, and G. Giedke, Phys. Rev. B **94**, 115404 (2016)

2. *Projected Entangled Pair States with non-Abelian gauge symmetries: an SU(2) study*
E. Zohar, T. B. Wahl, M. Burrello, and J. I. Cirac, Annals of Physics **374**, p. 84–137 (2016)

3. *Ultrashort Pulses for Far-Field Nanoscopy*
P. Maurer, J. I. Cirac, and O. Romero-Isart, Phys. Rev. Lett. **117**, 103602 (2016

4. *Systematic construction of density functionals based on matrix product state computations*
M. Lubasch, J. Fuks, H. Appel, A. Rubio, J. I. Cirac, and M. C. Banuls, New J. Phys. **18**, 083039 (2016)

5. *Quantum Spin Dynamics with Pairwise-Tunable, Long-Range Interactions*
C.-L. Hung, A. González-Tudela, J. I. Cirac, and H. J. Kimble, PNAS vol. **113** (no. 34), E4946–E4955 (2016)

6. *Efficient variational diagonalization of fully many-body localized Hamiltonians*
F. Pollmann, V. Khemani, J. I. Cirac, S. L. Sondhi, Phys. Rev. B **94**, 041116(R) (2016)

7. *Fundamental limitations in the purifications of tensor networks*
G. De las Cuevas, T. S. Cubitt, J. I. Cirac, M. M. Wolf, D. Pérez-García, J. Math. Phys. **57**, 071902 (2016)

8. *Bound states in boson impurity models*
T. Shi, A. González-Tudela, J. I. Cirac, Phys. Rev. X 6, 021027 (2016)

9. *Rapid adiabatic preparation of injective PEPS and Gibbs states*
Y. Ge, A. Molnar, J. I. Cirac, Phys. Rev. Lett 116, 080503 (2016)

10. *Quantum simulations of lattice gauge theories using ultracold atoms in optical lattices*
E. Zohar, J. I. Cirac, and B. Reznik, Rep. Prog. Phys. (79) 014401 (2016)

2015

11. *Edge states for the Kalmeyer-Laughlin wave function*
B. Herwerth, G. Sierra, H.-H. Tu, J. I. Cirac, A. E. B. Nielsen, Phys. Rev. B **92**, 245111 (2015)

12. *Fermionic Projected Entangled Pair States and Local U(1) Gauge Theories*
E. Zohar, M. Burrello, T. Wahl, J. I. Cirac
Annals of Phys. **363**, pp. 385-439 (2015)

13. *Multiphoton scattering theory and generalized master equations*
T. Shi, D. E. Chang, J. I. Cirac, Phys. Rev. A **92**, 053834 (2015)

14. *Quantum dynamics of propagating photons with strong interactions: a generalized input-output formalism*
T. Caneva, M. T. Manzoni, T. Shi, J. S. Douglas, J. I. Cirac, and D. E. Chang
New J. Phys. 17 (2015) 113001

15. *Deterministic Generation of Arbitrary Photonic States Assisted by Dissipation*
A. González-Tudela, V. Paulisch, D. E. Chang, H. J. Kimble, and J. I. Cirac
Phys. Rev. Lett. 115, 163603 (2015)

16. *Universal Quantum Transducers based on Surface Acoustic Waves*
M. J. A. Schuetz, E. M. Kessler, G. Giedke, L. M. K. Vandersypen, M. D. Lukin, and J. I. Cirac,
Phys. Rev. X **5**, 031031 (2015)

17. *Thermal evolution of the Schwinger model with Matrix Product Operators*
M. C. Bañuls, K. Cichy, J. I. Cirac, K. Jansen, H. Saito, Phys. Rev. D **92**, 034519 (2015)

18. *Exact parent Hamiltonians of bosonic and fermionic Moore-Read states on lattices and local models*
I. Glasser, J. I. Cirac, G. Sierra, and A. E. B. Nielsen
New J. Phys. **17**, 082001 (2015)

19. *Non-Abelian string breaking phenomena with Matrix Product States*
S. Kühn, E.Zohar, J. I. Cirac, and M. C. Bañuls
JHEP **1507** (2015) 130

20. *Slowest local operators in quantum spin chains*
H. Kim, M. C. Bañuls, J. I. Cirac, M. B. Hastings, D. A. Huse,
Phys. Rev. E **92**, 012128 (2015)

21. *Chiral topological spin liquids with projected entangled pair states*
D. Poilblanc, J. I. Cirac, and N. Schuch
Phys. Rev. B **91**, 224431 (2015)

22. *Variational matrix product operators for the steady state of dissipative quantum systems*
J. Cui, J. I. Cirac, and M. C. Bañuls,
Phys. Rev. Lett. **114**, 220601, (2015)

23. *Subwavelength vacuum lattices and atom-atom interactions in photonic crystals*
A. González-Tudela, C.-L. Hung, D. E. Chang, J. I. Cirac, H. J. Kimble,
Nature Photonics **9**, 320-325 (2015)

24. *Chiral projected entangled-pair state with topological order*
S. Yang, T. B. Wahl, H.-H. Tu, N. Schuch, and J. I. Cirac
Phys. Rev. Lett. **114**, 106803 (2015)

25. *Gauging quantum states: from global to local symmetries in many-body systems*
J. Haegeman, K. Van Acoleyen, N. Schuch, J. I. Cirac, F. Verstraete
Phys. Rev. X **5**, 011024 (2015)

26. *Approximating Gibbs states of local Hamiltonians efficiently with PEPS*
A. Molnar, N. Schuch, F. Verstraete, J. I. Cirac
Phys. Rev. B **91**, 045138 (2015)

27. *Frustration free gapless Hamiltonians for Matrix Product States*
C. Fernández-González, N. Schuch, M. M. Wolf, J. I. Cirac, D. Pérez-García,
Commun. Math. Phys. **333**, 299-333 (2015)

2014

28. *Quantum simulation of the Schwinger model: A study of feasibility*
S. Kühn, J. I. Cirac, M. C. Bañuls, Phys. Rev. A **90**, 042305 (2014)

29. *Symmetries and boundary theories for chiral projected entangled pair states*
T. B. Wahl, S. T. Hassler, Hong-Hao Tu, J. I. Cirac, N. Schuch, Phys. Rev. B **90**, 115133 (2014)

30. *Construction of spin models displaying quantum criticality from quantum field theory*
I. Glasser, J. I. Cirac, G. Sierra, A. E. B. Nielsen, Nuclear Physics B **886**, p. 63-74 (2014)

31. *Algorithms for finite projected entangled pair states*
M. Lubasch, J. I. Cirac, M. C. Bañuls, Phys. Rev. B **90**, 064425 (2014)

32. *Optical-lattice implementation scheme of a bosonic topological model with fermionic atoms*
A. E. B. Nielsen, G. Sierra, J. I. Cirac, Phys. Rev. A **90**, 013606 (2014)

33. *Resonating-valence-bond superconductors with fermionic projected entangled pair states*
D. Poilblanc, P. Corboz, N. Schuch, J. I. Cirac, Phys. Rev. B **89**, 241106 (2014)

34. *Long-Distance Transfer and Routing of Static Magnetic Fields*
C. Navau, J. Prat-Camps, O. Romero-Isart, J. I. Cirac, A. Sanchez, Phys. Rev. Lett. **112**, 253901 (2014)

35. *Nuclear spin dynamics in double quantum dots: Multistability, dynamical polarization, criticality, and entanglement*
M. J. A. Schuetz, E. M. Kessler, L. M. K. Vandersypen, J. I. Cirac, and G. Giedke
Phys. Rev. B **89**, 195310 (2014)

36. *Lattice Laughlin states of bosons and fermions at filling fractions 1/q*
H.-H. Tu, A. E. B. Nielsen, J. I. Cirac, G. Sierra, New J. Phys. **16**, 033025 (2014)

37. *Unifying projected entangled pair state contractions*
M. Lubasch, J. I. Cirac, M.C. Bañuls, New J. Phys. **16**, 033014 (2014)

38. *Edge Theories in Projected Entangled Pair State Models*
S. Yang, L. Lehman, D. Poilblanc, K. Van Acoleyen, F. Verstraete, J. I. Cirac, N. Schuch,
Phys. Rev. Lett. **112**, 036402 (2014)

39. *The temperature dependence of the chiral condensate in the Schwinger model with Matrix Product States*
H. Saito, M. C. Bañuls, K. Cichy, J. I. Cirac, K. Jansen, PoS(LATTICE2014)302

2013

40. *Purifications of multipartite states: limitations and constructive methods*
G. De las Cuevas, N. Schuch, D. Pérez-García, J. I. Cirac, New J. Phys. **15,** 123021 (2013)

41. *Steady-State Entanglement in the Nuclear Spin Dynamics of a Double Quantum Dot*
M. J. A. Schuetz, E. M. Kessler, L. M. K. Vandersypen, J. I. Cirac, G. Giedke, Phys. Rev. Lett. **111**, 246802 (2013)

42. *Projected entangled-pair states can describe chiral topological states*
T.B. Wahl, H.-H. Tu, N. Schuch, J.I. Cirac, Phys. Rev. Lett. **111**, 236805 (2013)

43. *Robustness of quantum memories based on Majorana zero modes*
L. Mazza, M. Rizzi, M. D. Lukin, J. I. Cirac, Phys. Rev. B **88**, 205142 (2013)

44. *The mass spectrum of the Schwinger model with matrix product states*
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Entanglement in many-body quantum systems
J.I. Cirac, 1205.3742

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