

# Curriculum Vitae: Paolo Perinotti

## Personal Data

Family name: Perinotti

First name: Paolo

**Address** Dipartimento di Fisica, University of Pavia, via Bassi 6, 27100 Pavia, Italy

Tel: +39 0382 987675

Fax: +39 0382 987563

email: paolo.perinotti@unipv.it

URL: <http://www.qubit.it>

## Education

- Laurea (Master degree) in Physics (Quantum Optics) (1999), University of Pavia, Italy (Advisors: G. M. D'Ariano and C. Macchiavello)
- Phd in Physics, University of Milano, 2002 (Advisor: L. Lanz).

## Awards

- “Birkhoff-von Neumann prize” 2016 for research in quantum foundations.

## Teaching activity

- *October 2012-present.* Adjunct Professor of “Theoretical Physics of Information” for the master course in physics at University of Pavia, Department of Physics.
- *October 2015-present* Assistant Professor of “Quantum Mechanics” for the bachelor course in physics at University of Pavia, Department of Physics.
- *October 2016-present.* Adjunct Professor of “Mathematical Methods for Theoretical Physics” for the master course in physics at University of Pavia, Department of Physics.
- *2009-2010.* Taught the exercise lectures for the course “General Physics for Biologists” at University of Pavia.
- *2001-2002.* Taught the “Pre-course for Mathematical Analysis” for 1st year physics students at University of Milano.
- *2001-2002.* Taught the practical lectures of the course “Experimental physics” at the department of mechanical and Air and Space Engineering of Politecnico di Milano.

### Thesis supervision:

- F. Arzani, “Un Approccio Informativo alla Termodinamica Quantistica Fuori dal Regime di von Neumann” (2013).
- M. Ghio, “Il teorema di de Finetti in teoria quantistica dell’informazione” (2014).
- A. G. Orellana, “Nozioni di entropia nelle teorie probabilistiche operazionali” (2014).
- A. Olivo, “Quantum tagging: position verification in quantum information” (2015).
- T. Montani Fargna (2017)
- L. Poggiali (2017)

Co-supervisor of 11 master theses and 5 PhD theses in physics.

### Other institutional activities

- *December 2011-present.* Researcher at University of Pavia, Department of Physics.
- *June 2011-December 2011.* Research contractor for the COQUIT project at Dipartimento di Fisica “A. Volta”, Università di Pavia.
- *July 2006-June 2011.* Post-doc at Dipartimento di Fisica “A. Volta”, Università di Pavia.
- *January-June 2006.* Research Contractor of “Dipartimento di Fisica A. Volta” of the University of Pavia.
- *November-December 2005.* Research Contractor of INFN Unità di Pavia.
- *2002-2005.* INFN Post-doc(Assegno di Ricerca): Quantum Measurement, Quantum Open Systems, Quantum Information, Quantum Mechanics, Quantum Optics.
- *2002-present.* Referee for many international journals, among which Physical Review Letters, Physical Review, Physics Letters, Journal of Physics, Europhysics letters, International Journal of Physics.

### Research activity

**H-index:** 24 (google scholar), 22 (ResearchGate), 18 (Scopus), 17 (ISI).

**Total citations:** 2285 (google scholar), 1198 (ISI), 1170 (Scopus).

## Books and chapters

- G. Chiribella, G. M. D’Ariano, P. Perinotti, *Quantum theory from first principles: an informational approach*, Cambridge University Press (2017).
- G. Chiribella, G. M. D’Ariano, P. Perinotti, *Quantum from principles*, in *Quantum Theory: Informational Foundations and Foils*, G. Chiribella and R. Spekkens eds., Springer (2016).

## Funded projects

Local P. I. in the network project “Quantum Causal Structures” led by Prof. Časlav Brukner of the Austrian Academy of Sciences, and funded by the John Templeton Foundation.

He participated in the European projects ATESIT (FP6), CORNER and COQUIT (FP7), in three Italian national projects (PRIN), and in the Project “Quantum Digital Universe”, funded by the John Templeton Foundation.

**Membership:** Member of FQXi (Foundational Questions Institute) since 2013. Member of the International Quantum Structures Association since 2001.

**Research Interests:** Quantum Information and Quantum Foundations. Quantum Cellular Automata and Quantum Field Theory. Operational probabilistic theories. Quantum Theory of Measurements and Open Systems. Quantum Information Processing and Optimization.

**Additional expertise:** General Quantum Mechanics, Quantum Optics, Group Theory, Lie algebras, Frame Theory, Quantum Field Theory, Statistical Mechanics.

**Event Organisation:** Member of the programme committee of QPL 2017. Member of the local organising committee of the workshop on quantum information processing and quantum communications 2003, University of Pavia. Member of the local organising committee of the workshop in quantum measurements and operations for cryptography and information processing 2004-2005, University of Pavia. Member of the local organising committee of the workshop on quantum quantum information and foundations of quantum mechanics 2005-2006, University of Pavia.

**Committees** Evaluation committee for the PhD defence of Mateus Araujo, Vienna University, January 24 2017. Evaluation committee for the PhD defence of Stefano Gogioso, Oxford University, February 13 2017.

**Short term visits** David Perez-Garcia, Universidad Complutense, Madrid, December 1-7 2008. Giulio Chiribella, Perimeter Institute, Waterloo, Canada, January 20-February 13 2010. Vladimir Buzek and Mario Ziman, Slovak Academy of science, Bratislava, June 7-11 2010. Pekka Lahti and Teiko Heinosaari, Turku University, October 16-25 2011. Valerio Scarani, CQT, National University of Singapore, November 6-16 2011.

**Research:** The research activity by Paolo Perinotti started in 1999 with his Graduation Thesis in Quantum Optics on “Isotropic phase squeezing and the arrow of time”. During his PhD he studied non-equilibrium statistical operator of confined quantum fields for the description of quantum experiments as the

emergence of quantum correlations in the dynamics of macroscopic/mesoscopic systems, an approach developed by his tutor Prof. L. Lanz. His personal contribution was the study of the transformation of such description under general symmetry transformations, and the covariant formulation of the statistical operator for relativistic symmetry groups. He also started the formalization of the description of QED settings.

In his post-doctoral activity Paolo Perinotti worked in collaboration with the QUIT group directed by Prof. G. M. D'Ariano. His research lines ranged from optimization of quantum measurement and processing devices, to informationally complete measurements for quantum tomography, and the analysis of complex quantum networks. He gave substantial contributions to the formulation and analysis of informationally complete POVMs, and to the discovery of the phenomenon called "super-broadcasting". He collaborated to a series of papers about the application of group theory to quantum estimation and to protocols for reference frame alignment, both for the public case (in collaboration with G. Chiribella, G. M. D'Ariano and M. F. Sacchi) and in the secret case (in collaboration with G. Chiribella, L. Maccone and V. Giovannetti). In collaboration with G. Chiribella and G. M. D'Ariano he worked out the construction of the theory of quantum combs, a theoretical tool for the comprehensive analysis of quantum computational networks with arbitrarily complex architecture, and its application to some relevant information processing tasks, among which cloning, discrimination, and tomography of transformations, and the proof of impossibility of quantum bit commitment.

More recently, his research interests were focused on foundational issues from the perspective of Quantum Information Theory, and he co-authored with G. M. D'Ariano and G. Chiribella two important papers on this subject, in which the framework of operational probabilistic theories was introduced and explored, and Quantum Theory was reconstructed starting from informational axioms.

He studied the nature of correlations in operational probabilistic theories, non-causal theories, hidden variable models for operational probabilistic theories and their relation with steering, complementarity and Schrödinger's cat-like paradoxes. He also studied deterministic theories, and co-authored a paper on the distinction between the notions of deterministic theory and causal theory, supported by a relevant example of non-causal deterministic theory.

In the last four years he studied Fermionic computation and entanglement, and published two papers on this subject, in collaboration with G. M. D'Ariano, F. Manessi and A. Tosini. He also worked on quantum cellular automata as the microscopic mechanism for physical laws. In this respect, he wrote a paper with G. M. D'Ariano about the derivation Weyl's and Dirac's equation, which emerge in the appropriate regime as the description of the two unique homogeneous and isotropic cellular automata that can be embedded in Euclidean space. He also co-authored two papers on the discrete path-integral description of quantum cellular automata, and two papers on tiling techniques for quantum walks. Finally, he co-authored with G. M. D'Ariano and A. Bisio a paper on the derivation of physics of the free quantum electromagnetic field in the same framework, and

one on the emergence of Poincaré covariance in a discrete framework.

He is referee for various international journals, among which Nature, Physical Review X, Physical Review Letters, Physical Review, Physics Letters, EPL, New Journal of Physics.

### Invited Talks

1. “Symmetries of quantum walks on Cayley graphs and the Lorentz group”, Workshop on Quantum Simulations and Quantum Walks, University of Prague, November 17-20 2016.
2. “Quantum theory and information processing”, Birkhoff-von Neumann Prize Lecture, 13th biennial “International Quantum Structures Association” Meeting, Leicester, July 11-15 2016.
3. “Interacting quantum cellular automata field theories”, Quantum and Beyond, Linnaeus University, Växjö, June 13-16 2016.
4. “Quantum cellular automata and the electromagnetic field”, Journées Informatique Quantique, Geometry in Quantum Computation, Université Aix-Marseille, April 4-5 2016.
5. “Quantum Cellular automata for quantum field theory”, workshop on Causality in Quantum Mechanics, Bellairs Research Institute, Barbados, March 10-17 2016.
6. “A-temporal quantum computations”, Workshop on Time in Physics, ETH, Zurich, September 7-11 2015.
7. “Mechanics from principles: free quantum field theory”, Quantum Gravity Theory and Phenomenology, Universit La Sapienza, Rome, July 20-23 2015.
8. “Quantum cellular automata and free quantum fields”, Quantum Theory: from Foundations to Technologies, Linnaeus University, Växjö, Sweden, June 8-11 2015.
9. “Quantum Cellular Automata and the Theory of Light”, EMN Meeting on Quantum Technology, Beijing, April 14-17 2015.
10. “Fermionic Cellular Automata and Quantum Fields”, VI Nagoya Winter Workshop on Quantum Information, Measurement and Foundations, March 9-13 2015.
11. “Quantum Cellular Automata and free Quantum Fields”, Workshop on Quantum Metrology, Interaction and Causal Structure 2014, Tsinghua University, Beijing, December 1-5 2014.
12. “Quantum Cellular Automata and free Quantum Fields”, Conceptual and Technical Challenges for Quantum Gravity 2014, Rome, September 8-12 2014.

13. "Quantum Cellular Automata and Quantum Field Theory", 12th Biennial "International Quantum Structures Association" Meeting, June 23-27 2014.
14. "Fermionic computation, quantum cellular automata and Maxwell's equations", 46th Symposium on Mathematical Physics, Torun, Poland, June 15-17 2014.
15. "Quantum cellular automata and the electromagnetic field", Quantum Theory: from Problems to Advances, Linnaeus University, Växjö, Sweden, June 9-12 2014.
16. "Fermions and entanglement", V Nagoya Winter Workshop on Quantum Information, Measurement and Foundations, March 4 2014.
17. "Complementarity in operational probabilistic theories", Workshop on "Incompatible Quantum Measurements", TUM, Munich, September 11 2013.
18. "Locality, causality and determinism of physical theories in the light of information processing", Workshop on Physics and Information 2013, Institut Henry Poincaré, Paris, April 9 2013.
19. "3-d Quantum cellular automata and Dirac's equation", IV Nagoya Winter Workshop on Quantum Information, Measurement and Foundations, Nagoya, Japan, February 18 2013.
20. "The informational approach to quantum theory: probabilistic theories, quantum principles, and hidden variable models", Open Problems in Quantum Mechanics, Frascati, June 21 2012.
21. "Realistic models for probabilistic theories with spookiness and steering?", III Nagoya Winter Workshop on Quantum Information, Measurement, and Foundations, Nagoya, Japan, February 15 2012.
22. "Locality, causality and determinism of physical theories in the light of information processing", Workshop on Physics and Information 2013, Paris, April 9 2013.
23. "3-d Quantum cellular automata and Dirac's equation", IV Nagoya Winter Workshop on Quantum Information, Measurement and Foundations, Nagoya, Japan, February 18 2013.
24. "The informational approach to quantum theory: probabilistic theories, quantum principles, and hidden variable models", Open Problems in Quantum Mechanics, Frascati, June 21 2012.
25. "Realistic models for probabilistic theories with spookiness and steering?", III Nagoya Winter Workshop on Quantum Information, Measurement, and Foundations, Nagoya, Japan, February 15 2012.

26. “Causality, Locality, and Spooky Action at a Distance”, Quantum Foundations in the Light of Quantum Information III, CRM, Montreal, December 6 2011.
27. “Informational axioms for quantum theory”, Foundations of Probability and Physics, Linnaeus University, Vaxjo, June 13-17 2011.
28. “From information processing to Quantum Theory”, 8th CEQUIP Workshop, Znojmo, Czech Republic, June 1-4 2011.
29. “Quantum Theory as a Theory of Information Processing”, Conceptual Foundations and Foils for Quantum Information Processing, Perimeter Institute for Theoretical Physics, Waterloo, Canada, May 9-13 2011.
30. “Informational Axioms for Quantum Theory”, Problemi Attuali di Fisica Teorica XVII, Vietri sul Mare, Italy, April 15-21 2011.
31. “Informational Axioms for Quantum Theory”, Nagoya Winter Workshop on Quantum Information, Measurement, and Foundations, Nagoya, Japan, February 14-18 2011.
32. “Higher-order functions in Quantum Theory”, 16th Conference of the International Linear Algebra Society, Pisa, Italy, June 21-25 2010.
33. “Switching Boxes in Operational Theories”, Nagoya Winter Workshop on Quantum Information, Measurement, and Foundations, Nagoya, Japan, February 18-24 2010, Pisa, Italy, June 21-25 2010.
34. “Quantum Combs for Learning, Computing and Cryptography”, Cambridge Summer Workshop on Quantum Information, Cambridge, UK, July 6th 2009.
35. “Estimation and discrimination of quantum networks”, DEX-SMI Workshop on Quantum Statistical Inference, National Institute of Informatics, Tokyo, March 2-4 2009.
36. “Quantum combs: a complete framework for quantum networks”, 40th Symposium on Mathematical Physics, University of Torun, Torun, June 25-28, 2008.
37. “Quantum supermaps: multiport access devices”, 28th Conference on Quantum Probability and Related Topics, CIMAT-Guanajuato Guanajuato, Mexico, September 2nd-8th, 2007.
38. “Applications of the group  $SU(1,1)$  for quantum computation and tomography”, National Institute of Informatics, Tokyo, March 15 2007.
39. “On the impossibility of stretching a quantum spatial vector”, III Feynman Festival, University of Maryland, College Park, USA, August 25-29 2006.

40. “Superbroadcasting of continuous variables mixed states”, XI International Conference on Quantum Optics, Technology Symposium, Belarus Hotel, Minsk, Belarus, May 26-31 2006.
41. “Programming quantum devices”, COE-Kakenhi Workshop on Quantum Information Theory and Quantum Statistical Inference, University of Tokyo, Tokyo, Japan, November 17-18 2005.
42. “Programmable Quantum Detectors”, II Feynman Festival, University of Maryland, College Park, USA, August 20-25 2004.

**Invited seminars:**

1. “Higher-order quantum computations”, University of Vienna, February 4 2016.
2. “Fermionic Cellular Automata and Quantum Fields”, Quantum Meeting, Tsinghua University, Beijing April 15 2015.
3. “Entanglement in Fermionic Quantum Theory”, Tsinghua University, Beijing, November 2013.
4. “Information processing axioms for Quantum Theory”, CQT, Singapore, November 14 2011.
5. “Quantum theory from information processing axioms”, Turku University, October 17 2011.
6. “A set of operational axioms for Quantum Mechanics”, RCQI Seminar, Institute of Physics, Slovak Academy of Sciences, Bratislava, June 6th 2010.
7. “Switching boxes’ connections in operational theories and its consequence on causality”, Perimeter Institute for Theoretical Physics, Waterloo, Canada, February 2nd 2010.
8. “Estimation and discrimination of quantum networks”, Quantum Information and Quantum Foundations Seminar, Nagoya University, Japan, March 9th 2009.
9. “Quantum combs: a toolbox for quantum networks”, Universidad Complutense, Madrid, December 4 2008.
10. “Misure congiunte di osservabili incompatibili e completezza informazionale”, Università degli Studi di Milano, Dipartimento di Fisica, January 26 2007.
11. “Improving interferometry by use of entanglement”, Università degli studi di Pavia, Dipartimento di Fisica “A. Volta”, December 4 2001.
12. “Stima ottimale in Meccanica Quantistica”, Dipartimento di Matematica, Politecnico di Milano, February 21 2001.



### List of Publications

1. G. M. D'Ariano, M. Erba, P. Perinotti, and A. Tosini, *Virtually Abelian Quantum Walks*, J. Phys. A: Math. Theor. **50**, 035301 (2017).
2. G. M. D'Ariano and P. Perinotti, *Quantum cellular automata and free quantum field theory*, Front. Phys. **12**(1), 120301 (2017).
3. A. Bisio, G. M. D'Ariano, and P. Perinotti, *Special relativity in a discrete quantum universe*, Phys. Rev. A **94**, 042120 (2016).
4. A. Bisio, G. M. D'Ariano, M. Erba, P. Perinotti, A. Tosini, *Quantum walks without quantum coin*, Phys. Rev. A **93**, 062334 (2016).
5. G. M. D'Ariano, N. Mosco, P. Perinotti, A. Tosini, *Discrete time Dirac quantum walk in 3+1 dimensions*, Entropy **18**, 228 (2016).
6. A. Bisio, M. Dall'Arno, P. Perinotti, *Quantum conditional operations*, Phys. Rev. A **94**, 022340 (2016).
7. A. Bisio, G. M. D'Ariano, P. Perinotti, *Quantum cellular automaton theory of light*, Ann. Phys. **368**, pp. 177-190 (2016).
8. G. M. D'Ariano and P. Perinotti, *Quantum Theory is an Information Theory. The Operational Framework and the Axioms*, Found. Phys. **46**, 269 (2016).
9. A. Bisio, G. M. D'Ariano, P. Perinotti, *Quantum walks, deformed relativity, and Hopf algebra symmetries*, Phil. Trans. R. Soc. A **374**, 20150232 (2016).
10. A. Bisio, G. M. D'Ariano, P. Perinotti, A. Tosini, *Free quantum field theory from quantum cellular automata: derivation of Weyl, Dirac and Maxwell quantum cellular automata*, Found. Phys. **45**, pp. 1137-1152 (2015).
11. A. Bisio, G. M. D'Ariano, P. Perinotti, A. Tosini, *Weyl, Dirac and Maxwell Quantum Cellular Automata: analytical solutions and phenomenological predictions of the Quantum Cellular Automata Theory of Free Fields*, Found. Phys. **45**, pp. 1203-1221 (2015).
12. G. M. D'Ariano, N. Mosco, P. Perinotti, A. Tosini, *Discrete Feynman propagator for the Weyl quantum walk in 2+1 dimensions*, EPL **109**, 40012 (2015).
13. A. Bibeau-Delisle, A. Bisio, G. M. D'Ariano, P. Perinotti, A. Tosini, *Doubly-Special Relativity from Quantum Cellular Automata*, EPL **109**, 50003 (2015).
14. G. M. D'Ariano and P. Perinotti, *Derivation of Dirac equation from principles of information processing*, Phys. Rev. A **90**, 062106 (2014).

15. G. M. D'Ariano, N. Mosco, P. Perinotti, A. Tosini, *Path-integral solution of the one-dimensional Dirac quantum cellular automaton*, Phys. Lett. A **378**, pp. 3165-3168 (2014).
16. G. M. D'Ariano, F. Manessi, P. Perinotti, A. Tosini, *The Feynman problem and Fermionic entanglement: Fermionic theory versus qubit theory*, Int. J. Mod. Phys. A **29**, 1430025 (2014).
17. G. M. D'Ariano, F. Manessi, P. Perinotti, A. Tosini, *Fermionic computation is non-local tomographic and violates monogamy of entanglement*, EPL **107**, 20009 (2014).
18. A. Bisio, G. M. D'Ariano, P. Perinotti, M. Sedlák *Optimal processing of reversible quantum channels*, Phys. Lett. A **378**, p. 1797 (2014).
19. G. Chiribella, G. M. D'Ariano, P. Perinotti, B. Valiron, *Quantum computations without definite causal structure*, Phys. Rev. A **88**, 022318 (2013).
20. A. Belenchia, G. M. D'Ariano, P. Perinotti, *Universality of Computation in Real Quantum Theory*, EPL **104**, 20006 (2013).
21. D. Burgarth, G. Chiribella, V. Giovannetti, P. Perinotti, and K. Yuasa, *Ergodic and Mixing Quantum Channels in Finite Dimensions*, New J. Phys. **15**, 073045 (2013).
22. G. Chiribella, G. M. D'Ariano, P. Perinotti, D. M. Schlingemann, R. F. Werner, *A short impossibility proof of Quantum Bit Commitment*, Phys. Lett. A **377**, pp. 1076-1087 (2013).
23. G. Chiribella, V. Giovannetti, L. Maccone, P. Perinotti, *Teleportation transfers only speakable quantum information*, Phys. Rev. A **86**, 010304(R) (2012).
24. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Quantum Theory, namely the pure and reversible theory of information*, Entropy, **14**, pp. 1877-1893 (2012).
25. P. Perinotti *Discord and non-classicality in probabilistic theories*, Phys. Rev. Lett. **108**, 120502 (2012).
26. A. Bisio, G. M. D'Ariano, P. Perinotti, and M. Sedlák, *Memory cost of quantum protocols*, Phys. Rev. A **85**, 032333 (2012).
27. T. Colnaghi, G. M. D'Ariano, P. Perinotti, and S. Facchini, *Quantum computation with programmable connections between gates*, Phys. Lett. A **376**, pp. 2940-2943 (2012).
28. G. M. D'Ariano, F. Manessi, and P. Perinotti, *Spooky action at a distance in general probabilistic theories*, Phys. Lett. A **376**, pp. 2926-2930, (2012).

29. A. Bisio, G. M. D'Ariano, P. Perinotti, and M. Sedlák, *Cloning of a quantum measurement*, Phys. Rev. A **84**, 042330 (2011).
30. G. M. D'Ariano, P. Perinotti, M. Sedlák *Extremal quantum protocols*, J. Math. Phys. **52**, 082202 (2011).
31. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Informational derivation of Quantum Theory*, Phys. Rev. A **84**, 012311 (2011).
32. A. Bisio, G. M. D'Ariano, P. Perinotti, and M. Sedlák, *Quantum learning algorithms for quantum measurements*, Phys. Lett. A **375** (2011), pp. 3425-3434.
33. A. Bisio, G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Quantum Networks: General Theory and Applications*, Acta Physica Slovaca **61**, 273-390 (2011).
34. G. Chiribella, M. Dall'Arno, G. M. D'Ariano, C. Macchiavello, and P. Perinotti, *Quantum error correction with degenerate codes for correlated noise*, Phys. Rev. A **83**, 052305 (2011).
35. A. Bisio, G. M. D'Ariano, P. Perinotti, and G. Chiribella, *Minimal computational-space implementation of multiround quantum protocols*, Phys. Rev. A **83**, 022325 (2011).
36. G. M. D'Ariano, S. Facchini, and P. Perinotti, *No Signaling, Entanglement Breaking, and Localizability in Bipartite Channels*, Phys. Rev. Lett. **106**, 010501 (2011).
37. A. Bisio, G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Information-disturbance tradeoff in estimating a unitary transformation* Phys. Rev. A **82**, 062305 (2010).
38. A. Bisio, G. Chiribella, G. M. D'Ariano, S. Facchini, and P. Perinotti, *Optimal quantum learning of a unitary transformation* Phys. Rev. A **81**, 032324 (2010).
39. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Probabilistic theories with purification*, Phys. Rev. A **81**, 062348 (2010).
40. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Theoretical framework for quantum networks*, Phys. Rev. A **80**, 022339 (2009).
41. G. M. D'Ariano and P. Perinotti, *Quantum no-stretching: A geometrical interpretation of the no-cloning theorem*, Phys. Lett. A. **373**, 2416 (2009).
42. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Realization schemes for quantum instruments in finite dimensions*, J. Math. Phys. **50**, 042101 (2009).

43. G. M. D'Ariano, D. F. Magnani, and P. Perinotti, *Adaptive Bayesian and frequentist data processing for quantum tomography*, Phys. Lett. A. **373**, pag. 1111 (2009).
44. A. Bisio, G. Chiribella, G. M. D'Ariano, S. Facchini, and P. Perinotti, *Optimal quantum tomography*, IEEE J. Sel. Top. Quantum Electron. **15**, 1646 (2009).
45. A. Bisio, G. Chiribella, G. M. D'Ariano, S. Facchini, P. Perinotti, *Optimal quantum tomography for states, measurements, and transformations*, Phys. Rev. Lett. **102**, 010404 (2009).
46. G. M. D'Ariano, S. Facchini, P. Perinotti, and M. F. Sacchi, *Probability-fidelity tradeoffs for targeted quantum operations*, Phys. Lett. A **373**, 3011 (2009).
47. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Optimal cloning of unitary transformation*, Phys. Rev. Lett. **101**, 180504 (2008).
48. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Memory effects in quantum channel discrimination*, Phys. Rev. Lett. **101**, 180501 (2008).
49. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Quantum Circuits Architecture*, Phys. Rev. Lett. **101**, 060401 (2008).
50. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Transforming quantum operations: quantum supermaps*, Europhys. Lett. **83**, 30004 (2008).
51. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Quantum indirect estimation theory and joint estimates of all moments of two incompatible observables*, Phys. Rev. A, **77**, 052108 (2008).
52. G. M. D'Ariano, R. Demkowicz-Dobrzanski, P. Perinotti, and M. F. Sacchi, *Quantum state decorrelation*, Phys. Rev. A **77**, 032344 (2008).
53. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Superbroadcasting of harmonic oscillators mixed states*, Optics and Spectroscopy **103**, 170-176 (2007).
54. G. M. D'Ariano, R. Demkowicz-Dobrzanski, P. Perinotti, and M. F. Sacchi, *Erasable and Unerasable Correlations*, Phys. Rev. Lett. **99**, 070501 (2007).
55. G. Chiribella, L. Maccone, and P. Perinotti, *Secret Quantum Communication of a Reference Frame*, Phys. Rev. Lett. **98**, 120501 (2007).
56. G. M. D'Ariano and P. Perinotti, *Optimal data processing for quantum measurements*, Phys. Rev. Lett. **98**, 020403 (2007).

57. G. Chiribella, F. Buscemi, G. M. D'Ariano, C. Macchiavello, and P. Perinotti, *Superbroadcasting and classical information*, Phys. Rev. A **75**, 012315 (2007).
58. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Applications of the group  $SU(1,1)$  for quantum computation and tomography*, Laser Physics **16**, 1572 (2006).
59. F. Buscemi, G. M. D'Ariano, C. Macchiavello and P. Perinotti, *Universal and phase covariant superbroadcasting for mixed qubit states*, Phys. Rev. A **74**, 042309 (2006).
60. G. Chiribella, G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Maximum likelihood estimation for a group of physical transformations*, Int. J. Quant. Inf. **4**, 453 (2006).
61. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Superbroadcasting of conjugate quantum variables*, Europhys. Lett. **75**, 195 (2006).
62. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Superbroadcasting of continuous variable mixed states*, New J. Phys. **8**, 99 (2006).
63. G. M. D'Ariano, V. Giovannetti, and P. Perinotti, *Optimal estimation of quantum observables*, J. Math. Phys. **47**, 022102 (2006).
64. G. Chiribella, G. M. D'Ariano, P. Perinotti, and N. Cerf, *Extremal quantum cloning machines*, Phys. Rev. A **72**, 042336 (2005).
65. G. M. D'Ariano, C. Macchiavello, P. Perinotti, *Optimal phase estimation for qubits in mixed states*, Phys. Rev. A **72** 042327 (2005).
66. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Informationally complete measurements on bipartite quantum systems: Comparing local with global measurements*, Phys. Rev. A **72**, 042108 (2005).
67. G. M. D'Ariano, C. Macchiavello, and P. Perinotti, *Superbroadcasting of mixed states*, Phys. Rev. Lett. **95**, 060503 (2005).
68. F. Buscemi, G. M. D'Ariano, M. Keyl, P. Perinotti, and R. F. Werner, *Clean Positive Operator Valued Measures*, J. Math. Phys. **46**, 082109 (2005).
69. G. M. D'Ariano, P. Perinotti, and P. Lo Presti, *Classical randomness in quantum measurements*, J. Phys. A: Math. Gen. **38**, 5979-5991 (2005).
70. G. M. D'Ariano and P. Perinotti, *Efficient universal programmable quantum measurements*, Phys. Rev. Lett. **94**, 090401 (2005).
71. G. Chiribella, G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Covariant quantum measurements which maximize the likelihood*, Phys. Rev A **70**, 062105 (2004).

72. G. Chiribella, G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Efficient use of quantum resources for the transmission of a reference frame*, Phys. Rev. Lett. **93**, 180503 (2004).
73. G. M. D'Ariano and P. Perinotti, *On the realization of Bell observables*, Phys. Lett. A **329**, 188-192 (2004).
74. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Informationally complete measurements and groups representation*, J. Opt. B: Quantum Semiclass. Opt. **6**, S487-S491 (2004).
75. F. Buscemi, G. M. D'Ariano and P. Perinotti, *There Exist Nonorthogonal Quantum Measurements that are Perfectly Repeatable*, Phys. Rev. Lett. **92**, 070403 (2004).
76. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Quantum Universal Detectors*, Europhys. Lett. **65**, 165 (2004).
77. F. Buscemi, G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Optimal realization of the transposition maps*, Phys. Lett. A **314**, 374 (2003).
78. M. G. A. Paris, G. M. D'Ariano, P. Lo Presti, and P. Perinotti, *About the use of entanglement in the optical implementation of quantum information processing*, Fortschr. Phys. **51**, 449 (2003).
79. G. M. D'Ariano, M. G. A Paris, P. Perinotti, *To take a (binary) decision you'd better use entanglement*, J. Opt. B Quant. Semiclass. Opt. **4**, S277-S280 (2002).
80. G. M. D'Ariano, M. G. A. Paris, and P. Perinotti, *Improving quantum interferometry by using entanglement*, Phys. Rev. A **65**, 062106 (2002).
81. G. M. D'Ariano, M. G. A. Paris, and P. Perinotti, *Optimal quantum estimation of the coupling between two bosonic modes*, J. Opt. B **3**, 337 (2001).
82. G. M. D'Ariano, C. Macchiavello, P. Perinotti, M. F. Sacchi, *Isotropic phase squeezing and the arrow of time*, Phys. Lett. A **268**, 241 (2000).

PROCEEDINGS

1. G. M. D'Ariano, F. Manessi, P. Perinotti, *Determinism without causality*, Phys. Scr. **T163**, 014013 (2014).
2. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Informational axioms for quantum theory*, in *Foundations of Probability and Physics - 6*, AIP Conf. Proc. **1424**, 270 (2012).
3. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Optimal covariant quantum networks*, in *Proceedings of the Ninth International Conference on Quantum Communication, Measurement and Computing*, A. Lvovsky ed. (American Institute of Physics, 2009), pag. 47.

4. P. Perinotti and G. M. D'Ariano, *Optimal estimation of ensemble averages from a quantum measurement*, in *Proceedings of the 8th International conference on Quantum Communication, Measurement and Computing*, Ed. by O. Hirota, J. Shapiro, and M. Sasaki, (NICT press, Japan, 2007), pag. 327.
5. G. M. D'Ariano and P. Perinotti, *On the most efficient unitary transformation for programming quantum channels*, in *Quantum Probability and Infinite Dimensional Analysis: Proceedings of the 26th Conference*, Ed. by L. Accardi, W. Freudenberg, and M. Schurmann, (World Scientific, Singapore, 2007), pag. 173.
6. F. Buscemi, G. M. D'Ariano, C. Macchiavello, and P. Perinotti, *Optimal Superbroadcasting of Qubit Mixed States*, in *13th Quantum Information Technology Symposium (QIT13)*, Tohoku University, (Sendai University Press, Sendai, 2005).
7. G. M. D'Ariano and P. Perinotti *Programmable quantum channels and measurements*, in *Quantum Information Theory and Quantum Statistical Inference* (University of Tokyo Press, Tokyo, 2005).
8. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Optimization of Quantum Universal Detectors*, in *Proceedings of the Conference on Squeezed States and Uncertainty Relations* ed. by H. Moya-Cessa, R. Jauregui, S. Hacyan, and O. Castanos, (Rinton Press, Princeton, 2003), pag. 86.
9. G. A. Barbosa, E. Corndorf, P. Kumar, H. P. Yuen, G. M. D'Ariano, M. G. A. Paris, and P. Perinotti, *Secure communication using coherent states*, in *Proceedings of the 4th International Conference on Quantum Communication, Measurement and Computing*, Edited by J. Shapiro and O. Hirota, (Rinton Press, Princeton, 2003), pag. 357.

**Collaborations:** R. Werner (Technische Universität Karolo-Wilhelmina, Braunschweig), G. Chiribella (Hong Kong University), D. Burgarth (Aberystwyth University), Stefano Mancini (Università di Camerino), Rafał Demkowicz-Dobrzanski (Polish Academy of Sciences, Warsaw), V. Giovannetti (Scuola Normale Superiore di Pisa), N. Cerf (Université Libre de Bruxelles), M. Keyl and D. Schlingemann (ISI, Torino), H. P. Yuen, P. Kumar, G. A. Barbosa (Northwestern University, Evanston), H. De Guise (Lakehead University, Thunder Bay), V. Scarani (NUS, Singapore), A. J. Short (Bristol University), M. Paris (Università di Milano), R. Renner (ETH, Zürich), R. Colbeck (University of York), T. Heinosaari (Turku University), M. Ziman (Slovak Academy of Sciences, Bratislava), M. Sedlák (Slovak Academy of Sciences, Bratislava).