

# Curriculum vitae: Alessandro Bisio

## Personal Information

Name: Alessandro  
Surname: Bisio  
Date of Birth: November 23, 1982  
Place of Birth: Tortona (AL)  
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## Research activity

Alessandro Bisio is a postdoctoral research fellow at the University of Pavia, member of the research group QUIT (Quantum Information Theory).

During his PhD and his early years of postdoc his research activities were mainly focused on the theoretical and mathematical aspects of Quantum Theory and Quantum Information. He actively contributed to the development of the quantum comb formalism, which generalizes the notions of channel and positive-operator valued measure to quantum networks. His personal contributions were: the discovery of a new realization theorem which, given the Choi representation of a Quantum network, allows to recover a concrete implementation of it as a sequence of elementary devices; the application of the formalism to the solution of many optimization problems. Among those there were: the first optimal solution to the long-standing problem of quantum channel tomography, the introduction of the storing-retrieving protocol for a quantum gate along with its optimal realization for unitary channels and measurements, the information-disturbance tradeoff in the estimation of a unitary channel, cloning of quantum measurement. He also provided the analytical solution of the information energy-tradeoff in the discrimination of passive optical devices. The quantum protocol derived in this last work was implemented experimentally.

In the last three years of research, he shifted his interests towards foundational issues in quantum field theory from the perspective of Quantum Information Theory. In collaboration with the QUIT group, he started a project aimed to the information theoretic reconstruction of Quantum Field

Theory based on the Quantum Cellular Automata (QCA) formalism. He contributed to the development of the 1+1 dimensional model for the evolution of free fermions and to the QCA model for free electrodynamics. More recently, he combined a model of deformed special relativity with a QCA evolution, which, for the first time in the literature, allows to formalize the notion of change of inertial frame in the QCA framework.

## Education

2010–present	Post-Doc at Università di Pavia
2007–2010	PhD at Università di Pavia, supervisor Prof. Giacomo M. D’Ariano, thesis on “Quantum Networks: General Theory and Applications”.
2007	Second Degree at Università di Pavia, supervisor Prof. Giacomo M. D’Ariano, thesis on “A game theoretical approach to Quantum Coin Flipping”, grade: 110/110 cum laude
2004	First Degree at Università di Pavia, supervisor Dott. Oreste Nicosini, thesis on “Stochastic Processes in Finance”, grade: 110/110 cum laude
2001–2006	Fellow of the “Almo Collegio Borromeo”
2001–2006	Fellow of the “IUSS”

## Publications

(see List of Publications)

ORCID: <http://orcid.org/0000-0002-9356-3448>

Google Scholar: <https://scholar.google.it/citations?user=Ajo25vgAAAAJ>

## Invited talks and seminars

Hangzhou, July 13th 2017, School of Mathematical Sciences, Zhejiang University, “Quantum Cellular Automata for Quantum Field Theory”

Bratislava, November 4th 2016, Invited talk at the Slovak Academy of Sciences, “Adding a control to unknown quantum channels”

Phuket, April 9th 2016, EMN Quantum Meeting, “Quantum Cellular Automata, Quantum Fields and Deformed Special Relativity”

Singapore, April 14th 2015, Centre for Quantum Technologies, “Quantum Cellular Automata, Quantum Field Theory and Deformed Special Relativity”

Grenoble, February 6th 2014, Meeting on Relativistic Quantum Walks, “A Quantum Cellular Automata approach to Quantum Field Theory”

Olomouc, July 3rd 2013, Palacky University, “Optimal covariant processing of Unitary Transformations”

Tianjin, August 20th 2012, Chern Institute of Mathematics, Nankai University, XXIX International Colloquium on Group-Theoretical Methods in Physics, “Optimal covariant processing of Quantum Gates”

Bratislava, June 8th 2010, Slovak Academy of Sciences, “Quantum Circuits Optimization”

### **Contributed talks and seminars**

Kolymbari, July 13th 2016, 5th International Conference on New Frontiers in Physics “Quantum Walks and Deformed Special Relativity”

Yokohama, November 16th 2015, Workshop of Quantum Simulation and Quantum Walks, “Quantum Walks, Quantum Fields and (deformed) Relativity”

Monopoli, September 11th 2015, IQIS 2015 - 8th Italian Quantum Information Science, “Quantum Cellular Automata, Quantum Fields and Deformed Special Relativity”

Telc, June 19th 2015, 12th Central European Quantum Information Processing Workshop, “Quantum Cellular Automata, Quantum Fields and Deformed Special Relativity”

Castiglioncello, September 17th 2014, DICE2014 – Spacetime - Matter - Quantum Mechanics, “From Quantum Cellular Automata to Deformed Special Relativity”

Marseille, July 17th 2014, Frontiers of Fundamental Physics, “From Quantum Cellular Automata to Quantum Field Theory”

Valtice, June 8th 2010, 7th Central European Quantum Information Processing Workshop, “Quantum Circuits Optimization”

### Teaching activities

- 2017 Invited series of lectures at the Quantum Networks Summer School, School of Mathematical Sciences, Zhejinag University.
- 2016–2017 Teaching assistant for the course “Fisica (General Physics)” (First Degree Course in Biology).
- 2015–2017 Teaching assistant for the course “Struttura della Materia (Atomic Physics and Condensed Matter)” (First Degree Course in Physics).
- 2014–2015 Tutor for the project “Fisica II (Electromagnetism)” (First Degree Course in Mathematics).
- 2009–2011 Teaching assistant for the course “Fisica I con laboratorio (General Physics)” (First Degree Course in Chemistry).
- 2009–2011 Tutor for the project “Introduzione alla Fisica Moderna (Introduction to Quantum Mechanics)” (First Degree Course in Physics).
- 2009–2010 Teaching assistant for the course “Meccanica Razionale e Analitica (Analytical Mechanincs)” (First Degree Course in Physics).
- 2009–present *Cultore della materia* for the courses “Teoria Fisica dell’Informazione (Quantum Information)”, “Fondamenti della Meccanica Quantistica (Foundations of Quantum Mechanics)” and “Ottica Quantistica (Quantum Optics)”
- 2008–2010 Tutor for the project “Adeguamento delle conoscenze matematiche di base” (First Degree Course in Nursing)

### Other activities

- Organizer of the workshop “Quantum Foundations Workshop”, Pavia, June 21-22 2016

- Referee for international journals. Among them: Physical Review Letters, Physical Review A, Annals of Physics, Journal of Physics A, Foundations of Physics.

I, Alessandro Bisio, born in TORTONA (AL) on 23/11/1982, resident in via Vaccari n.7, PAVIA (IT), declare under penalty of perjury subject to all applicable laws (art.76 D.P.R. 28/12/2000 n.445), that the information provided is true and correct to the best of my knowledge, information and belief.

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Pavia, 6 settembre 2017