

# Francesco Arzani

Researcher in quantum information and quantum optics



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📄 [frarzani.github.io/](https://frarzani.github.io/)

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## Academic positions

- 09/2020–current **Humboldt post-doctoral Fellow**, *Freie Universität Berlin – Quantum information theory, quantum many-body theory, and quantum optics group*,  
Supervisor: Pr. Jens Eisert.
- 10/2018–10/2019 **Post-doctoral researcher**, *MOCQUA team – Loria, Nancy & Quantum Information group – Laboratory of Informatics of Paris 6*,  
Supervisors: Dr. Damian Markham, Dr. Simon Pedrix.
- 04/2018–9/2018 **Post-doctoral researcher**, *Université Paris Diderot & Paris center for quantum computing*,  
Supervisors: Dr. Damian Markham, Dr. Iordanis Kerenidis.

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## Education

- 01/2015–03/2018 **PhD in Physics**, *École Normale Supérieure, Paris; Kastler Brossel Laboratory*,  
Thesis: “Measurement-based quantum information with optical frequency combs”,  
Supervisors: Prof. Nicolas Treps & Prof. Claude Fabre.  
Funding: Paris Sciences Lettres Research University
- 10/2012–12/2014 **Master’s Degree in Theoretical Physics**, *Università degli Studi di Pavia*,  
Master’s thesis: “Measurement-based quantum information with optical frequency combs”,  
Supervisor: Prof. Chiara Macchiavello; Co-supervisors Prof. Nicolas Treps & Dr. Giulia Ferrini.  
Grade: 110/110 cum laude (with honours)
- 02/2014–08/2014 **Master’s internship**, *Quantum Optics group – Kastler Brossel Laboratory, Université Paris 6 Pierre et Marie Curie*.
- 09/2013–07/2014 **ERASMUS exchange period**, *Université Paris 6 Pierre et Marie Curie*.
- 09/2009–10/2012 **Bachelor’s Degree in Physics**, *Università degli Studi di Pavia*,  
Bachelor’s thesis: “An informational approach to quantum thermodynamics beyond the von Neumann Regime”,  
Supervisor: Dr. Paolo Perinotti.  
Grade: 110/110
- 2009 **High school diploma**, *Liceo scientifico tecnologico, IIS "Guglielmo Marconi", Tortona*,  
Grade: 100/100 cum Laude (with honours) .

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## Awards and fellowships

- 09/2020–08/2022 **Humboldt postdoctoral fellowship**, *Freie Universität Berlin*.
- 09/2009–07/2015 **Student at IUSS**, *Istituto Universitario di Studi Superiori, Pavia*.
- 09/2009–07/2014 **Student at Collegio Ghislieri**, *Pavia*, Residence for university students with merit based admission.

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## Teaching and outreach

- 11/2019 **Fête de la Science**, *Sorbonne Université*,  
Presentation of quantum information to high school students.
- 09/2018–12/2018 **Teaching assistant and lab demonstrator**, *Université d’Évry val d’Essonne*,  
Introduction to experimental physics.

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## Academic reviewing

Phys. Rev. Lett., Phys. Rev. A, JOSA B, Eur. Phys. J. D, Optics Express, QIP (conference).

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## Languages

Mother tongue Italian  
Fluent English, French

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## Computer Skills

Operating Unix/Linux, Windows  
systems  
Programming Wolfram Mathematica, Python, C++  
languages

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## Publications

### Journal articles

*Random coding for sharing bosonic quantum secrets.*

**F. Arzani**, G. Ferrini, F. Grosshans, D. Markham  
Physical Review A 100 (2), 022303 (2019). (arXiv:1808.06870)

*Bloch-Messiah reduction for twin beams of light.*

D. B. Horoshko, L. La Volpe, **F. Arzani**, N. Treps, C. Fabre, M. I. Kolobov  
Physical Review A 100 (1), 013837(2019). (arXiv:1903.06578)

*High-dimensional quantum encoding via photon-subtracted squeezed states.*

**F. Arzani**, A. Ferraro, V. Parigi  
Physical Review A 99 (2), 022342 (2019). (arXiv:1811.09263)

*Violating Bell inequalities with entangled optical frequency combs and multi-pixel homodyne detection.*

W. N. Plick, **F. Arzani**, N. Treps, E. Diamanti, D. Markham  
Physical Review A 98 (6), 062101 (2018). (arXiv:1805.06059)

*Reconfigurable optical implementation of quantum complex networks.*

J. Nokkala, **F. Arzani**, F. Galve, R. Zambrini, S. Maniscalco, J. Piilo, N. Treps, V. Parigi.  
New Journal of Physics 20 (5), 053024 (2018). (arXiv:1708.08726)

*Versatile engineering of multimode squeezed states by optimizing the pump spectral profile in spontaneous parametric down-conversion.*

**F. Arzani**, C. Fabre, N. Treps.  
Physical Review A 97 (3), 033808 (2018). (arXiv:1709.10055)

*Polynomial approximation of non-Gaussian unitaries by counting one photon at a time.*

**F. Arzani**, N. Treps, G. Ferrini  
Physical Review A 95 (5), 052352 (2017). (arXiv:1703.06693)

*Multimode entanglement in reconfigurable graph states using optical frequency combs.*

Y. Cai, J. Roslund, G. Ferrini, **F. Arzani**, X. Xu, C. Fabre, N. Treps.  
Nature Communications 8, 15645 (2017). (arXiv:1605.02303)

*A direct approach to Gaussian measurement based quantum computation.*

G. Ferrini, J. Roslund, **F. Arzani**, C. Fabre, N. Treps.  
Physical Review A 94 (6), 062332 (2016). ( arXiv:1605.03350)

*Optimization of networks for measurement-based quantum computation.*

G. Ferrini, J. Roslund, **F. Arzani**, Y. Cai, C. Fabre, N. Treps.  
Physical Review A 91 (3), 032314 (2015). (arXiv:1407.5318)

### Other

*Measurement based quantum information with optical frequency combs.*

**F. Arzani**  
PhD Thesis, Paris Sciences Lettres and École Normale Supérieure de Paris (2018)

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## Conferences, workshops, schools

- 08/2019 **CQIQC VIII**,  
Contributed talk *Conference on quantum information and quantum control, Fields Institute, Toronto, Canada,*  
"Random coding for sharing bosonic quantum secrets".
- 11/2018 **Q-Turn 2018**,  
Contributed talk *Workshop on changing paradigms in quantum science, Universidade Federal de Santa Catarina, Florianópolis, Brazil,*  
"Quantum secret sharing using squeezing and almost any passive interferometer".
- 11/2018 **JIQ 2018**,  
Contributed talk *Journées d'Informatique Quantique, Laboratoire Lorrain de recherche en informatique et ses applications, Nancy, France,*  
"Quantum secret sharing using squeezing and almost any passive interferometer".
- 09/2018 **QuTech 2018**,  
Contributed talk *Quantum technology international conference, 1st edition, Kastler Brossel laboratory, Paris, France,*  
"Versatile engineering of multimode squeezed states by optimizing the pump spectral profile in spontaneous parametric down-conversion".
- 09/2017 **Workshop on quantum science and technologies**,  
Contributed talk *International Center for Theoretical Physics, Trieste, Italy,*  
"Polynomial approximation of non-Gaussian unitaries by counting one photon at a time".
- 05/2017 **Photons beyond qubits 2017**,  
Invited talk *Palacký University, Olomouc, Czech Republic,*  
"Measurement-based quantum information protocols with optical frequency combs".
- 04/2017 **Quantum information and measurement 2017**,  
Contributed talk *4th edition, Université Pierre et Marie Curie, Paris, France,*  
"Shaping the Pump of a Synchronously Pumped Optical Parametric Oscillator for Continuous - Variable Quantum Information".
- 11/2016 **GDR Quantum Information 2016**,  
Poster *7th colloquium of the CNRS research network on Quantum information, foundations and applications, Télécom ParisTech, Paris, France,*  
"Shaping the Pump of a Synchronously Pumped Optical Parametric Oscillator for Continuous - Variable Quantum Information".
- 06/2016 **CEWQO 2016**,  
Poster *23rd central european workshop on quantum optics, Orthodox Academy of Crete, in Kolymbari, Crete, Greece,*  
"Quantum Computing with Optical Frequency Combs".
- 04/2015 **International School on Parametric Nonlinear Optics**,  
Attendance *Les Houches School of Physics, Les Houches, France.*