

Filippo Caruso's Curriculum Vitae

First, last name: Filippo, Caruso
 Nationality: Italian
 Email address: filippo.caruso@lens.unifi.it

ResearcherID: [E-1607-2014](https://orcid.org/E-1607-2014)
 ORCID: [0000-0002-8366-4296](https://orcid.org/0000-0002-8366-4296)
 Web: www.qdab.org

Education

- July 1, 2008, Ph.D. in Physics, Scuola Normale Superiore - Pisa, with full marks and honours (70/70 cum laude). Thesis: “Quantum Information transfer over Quantum Channels”. Supervisors: Prof. R. Fazio, V. Giovannetti.
- April 21, 2005, Master in Physics, Physics Department, Catania University, with full marks and honours (110/110 cum Laude); GPA: 30/30 cum Laude (in all exams). Thesis: “Optimal Eavesdropping in Quantum Cryptography”, after a semester in Pavia. Supervisors: Prof. C. Macchiavello, Prof. R. Fazio, Dr. G. Piccitto.
- July 15, 2005, Diploma of Licenza, Scuola Superiore of Catania (University School of Excellence for Higher Education), with full marks and honours (70/70 cum Laude); GPA: 30/30 cum Laude. Thesis: “Storing Quantum Information via Atomic Dark Resonances”. Supervisor: Prof. F.S. Cataliotti.

Positions and professional qualifications

- Since 01/07/2018, **Associate Professor**, Physics Dept., University of Florence, Italy.
- 10/04/2017-10/04/2023, **National Scientific Habilitation as Full Professor**, awarded by the Italian Ministry of Educ., Univ. & Res. (MIUR). Scientific Area: FIS/03-02/B2 Theoretical Condensed Matter Physics.
- 01/07/2015-30/06/2018, **Tenure-Track Assistant Professor**, Physics Dept., University of Florence, Italy.
- 11/12/2013-11/12/2019, **National Scientific Habilitation as Associate Professor**, awarded by the Italian Ministry of Educ., Univ. & Res. (MIUR). Scientific Area: FIS/03-02/B2 Theoretical Condensed Matter Physics.
- 01/05/2012-30/04/2015, **Assistant Professor as FIRB-MIUR PI**, jointly among Physics Dept., LENS, and QSTAR Center for Quantum Science and Technology, University of Florence, Italy.
- 01/11/2011-30/04/2012, **EU Marie Curie Career Integration (FP7-PEOPLE-2011-CIG) Grant (293449) Researcher**, European Laboratory of Non-Linear Spectroscopy (LENS), University of Florence, Italy.
- 01/11/2009-31/10/2011, **EU Marie Curie Intra European (FP7-PEOPLE-IEF-2008) Postdoctoral Fellow**, grant 235086, Institute of Theoretical Physics, University of Ulm, Germany. Supervisor: Prof. M.B. Plenio.
- 01/10/2008-31/10/2009, Research Associate in Quantum Information Theory, Quantum Optics and Laser Science Group, Institute for Mathematical Sciences, Imperial College London, UK. Supervisor: Prof. M.B. Plenio.

Awards and Fellowships

- 2015 Physics Award, Accademia dei Lincei, Roma, with the President of the Italian Republic (Sergio Mattarella).
- 2012-2015 National PI of *Future in Research* (FIRB) project (No. RBFR10M3SB), by the Italian Ministry of Education, University and Research (MIUR), at Department of Physics and Astronomy, Florence Univ., Italy.
- 2011-2015 EU Marie Curie Career Integration Grant Individual Fellowship, LENS, Florence, Italy.
- 2009-2011 EU Marie Curie Intra European Individual Fellowship, Inst. Theo. Phys., Ulm Univ., Germany.
- 2006, 1) Award as the best young researcher in Physics by Italian Physical Society, and 2) “Ettore Majorana” Award as the best young researcher in Theoretical Physics (Majorana's birth centennial) by Rotary International.
- 2005-2008 Highly selective PhD Fellowship of Scuola Normale Superiore, Pisa, Italy.
- 2000-2005 ‘Higher Education University’ highly selective scholarship of Scuola Superiore of Catania, Italy.
- 1996-2000 Award-winning participation to Regional Chemistry Olympiads, National Mathematics Olympiads (Scuola Normale Superiore, Pisa, Italy), and National Physics Olympiads with related Summer School of Physics.

Commissions of Trust

- 2014-2018 Invited and selected as expert evaluator for the Physics Panel of EU Marie Curie Action Individual and Global Fellowships by the European Commission, Research Executive Agency, Brussels.

- 2013-now, examiner of bachelor and master student theses at Physics and Engineering Dept. of Florence Univ.
- Referee for: American Physical Society (APS) journals (PRL, PRA, PRE, etc.), Nature group, New Journal of Physics (NJP), Journal of Chemical Physics (JCP), Journal of Mathematical Physics (JMP), European Physical Journal (EPJ), Europhysics Letters (EPL), Int. Journal of Quantum Inf. (IJQI), Physica A (Elsevier), etc.

Funding Portfolio

- **Team Leader** of EuroHPC-2020-01-b: HPCQS ($\sim 12\text{M}\text{€}$ budget, 2021-2025)
- **EU Project Coordinator** of H2020-FETOPEN ($\sim 536\text{k}\text{€}$ for me, $\sim 2.6\text{M}\text{€}$ budget, 2019-2023)
- Principal Investigator of some research grants by Fondazione CR Firenze, being a foundation with banking origins ($\sim 170\text{k}\text{€}$ for me, 2015-2020), including national and international collaborations.
- **Principal Investigator** of National FIRB-MIUR grant ($\sim 343\text{k}\text{€}$ for me, $\sim 478\text{k}\text{€}$ budget, 2012-2015)
- **Principal Investigator** of EU Marie Curie Career Integration (Individual) Grant ($\sim 100\text{k}\text{€}$ for me, 2011-2015)
- **Principal Investigator** of EU Marie Curie Intra European (Individual) Fellowship ($\sim 160\text{k}\text{€}$ for me, 2009-2011)
- EU Integrating project Q-ESSENCE ($\sim 22\text{k}\text{€}$ for me, $\sim 4\text{M}\text{€}$ budget, 2010-2013)
- EU STREP CORNER ($\sim 22\text{k}\text{€}$ for me, $\sim 2\text{M}\text{€}$ budget, 2009-2012)
- EPSRC QIP-IRC ($\sim 22\text{k}\text{€}$ for me, $\sim 10\text{M}\text{€}$ budget, 2005-2010)
- EU Integrating project QAP ($\sim 22\text{k}\text{€}$ for me, $\sim 9.9\text{M}\text{€}$ budget, 2005-2010)

Memberships

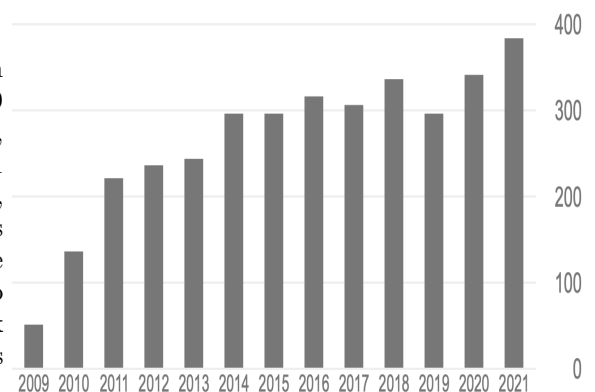
- 2014-2018, Member of the European COST Action MP1403: Nanoscale Quantum Optics.
- 2012-, Affiliated to CNR-INO & QSTAR (MPQ, IIT, LENS, UniFi Center for Quantum Science & Technology).
- Life-time member of EU Marie Curie Fellows Association (MCFA), since 2010.
- Member of American Physical Society (APS) 2010, and of Italian Physical Society (SIF) since 2005.

Teaching activity and student/postdoc supervision

- 2017-2018, Full course of *Quantum Information* (3 CFU) for MSc., Physics Dept., Florence Univ., Italy.
- 2013-2017, Full course of *General Physics* (6 CFU) for ~ 200 BCs., Engineering Dept., Florence Univ., Italy.
- 2013-now, QDAB group leader & supervision of 3 BSc., 2 MSc., 3 PhD students, 2 postdocs, Florence University.
- 2011-now, Co-supervision of 1 MSc., 3 PhD students, and 2 postdocs, LENS-Phys. Dept., Florence Univ., Italy.
- 2010-2011, Tutorials & lectures of *Quantum Information Science* course for MSc. students, Ulm Univ., Germany.
- 2009-2011, Thesis supervision of 1 BSc. and 1 PhD student in Physics, Ulm Univ., Germany.
- 2009-2011, Tutorials of full course of *Quantum Mechanics*, for BCs. students in Physics, Ulm Univ., Germany.
- 2008-2009, Full course of *Interferometry & Holography 2-year Exp. Lab.*, for BCs., Imperial College London (UK).

Bibliometrics

- Since 2005 (as MSc. student), I have published more than 70 papers in international peer-reviewed journals, whereof 29 as **first author**, 11 as last author, and 1 as single author, including 1 **Rev. Mod. Phys.**, 3 **Nature Commun.**, 1 **Nature Mat.**, 3 **Nature Sci. Rep.**, 3 **Phys. Rev. Lett.**, 15 **Phys. Rev.**, 9 **NJP**, and 1 **AdP**. A full list of publications is shown below. As of December 2021, my publications have attracted more than **2400 citations** according to ISI-Web [**>3500 citations** according to Google Scholar]. My **h-index** is **23** (ISI-Web) [**28** (Google Scholar)], while my **i10-index** is **47** (Google Scholar).



Selected and nominated by the European Commission for participation in the **66th Lindau Nobel Laureate Meeting 2016** in Physics, where around 200 highly-talented young scientists from all over the world (**after highly competitive multi-step selection**) meet and discuss informally for one week with more than 30 **Nobel Laureates in Physics** (www.mediatheque.lindau-nobel.org/meetings/2016).

Conference Organization

- **Chair Organizer** of the Italian Quantum Information Science Conference IQIS2017 in Florence, 11-15 September 2017: around ~ 200 participants, 30 invited speakers, 10 tutorial lectures, and 150 contributions.
- **Chair** of the International Conference on Quantum Effects in Biological Systems, QuEBS2015. It has been organized earlier by very prestigious institutions, as Harvard and UC Berkeley, and has been for the first time in Italy, June 29-July 2, 2015, in the Hall of the Five Hundreds in Palazzo Vecchio and in Villa Bardini, Florence, organized by myself: ~ 150 participants, 25 invited speakers and around 70 contributions (quebs2015.weebly.com).
- **Single Organizer** of the International Meeting on Quantum Transport in Light-Harvesting Bio-Nanostructures, at Phys. Dept. of Florence Univ., March 2013, Florence, Italy. Around 80 participants and 6 invited speakers.
- **Local Organizer** of the Workshop QuEBS2011, with around 100 participants, August 2011, Ulm, Germany.

Summarized early achievements track-record with selected recent publications

My research activity, mainly based on theoretical, both analytical and numerical, analysis of quantum dynamical systems, has focused, since my PhD, on the following (chronologically ordered) topics: i) **noise as obstacle** for quantum information science (PhD) [6], ii) theoretical characterization of **memory effects and spatial correlations** of noise (EU MC-IEF) [6, 13], iii) quantum effects in biological molecular systems and counter-intuitive **advantageous role of noise** in quantum transport [14-15], iv) observation of similar effects in **atomic systems** [9, 10] (EU MC-CIG), v) simulation of noise-assisted quantum transport phenomena with **photonic platforms** (FIRB-MIUR) [1, 3, 4, 7, 12], vi) ultra-fast spectroscopy and **optimal control** on natural and artificial light-harvesting complexes [5, 11], vii) measurement-based and coherent control to protect the dynamics of fragile **atomic chips devices** [2, 8].

1. S. Viciani, S. Gherardini, M. Lima, M. Bellini, **F. Caruso**, “*Disorder and dephasing as control knobs for light transport in optical fiber cavity networks*”, Nature Sci. Rep. **6**, 37791; doi:10.1038/srep37791 (2016).
2. M.M. Müller, S. Gherardini, and **F. Caruso**, “*Stochastic quantum Zeno-based detection of noise correlations*”, Nature Sci. Rep. **6**, 38650; doi:10.1038/srep38650 (2016). Impact Factor: 5.5.
3. **F. Caruso**, A. Crespi, A.G. Ciriolo, F. Sciarrino, and R. Osellame, “*Fast Escape from Quantum Mazes in Integrated Photonics*”, Nature Commun. **7**, 11682 (2016). Impact Factor: 10.015.
4. S. Viciani, M. Lima, M. Bellini, **F. Caruso**, “*Observation of Noise-Assisted Transport in an All-Optical Cavity-Based Network*”, Phys. Rev. Lett. **115**, 083601 (2015), PRL Editors’ Suggestion. Impact Factor: 7.943.
5. H. Park, N. Heldman, P. Rebentrost, L. Abbondanza, A. Iagatti, A. Alessi, B. Patrizi, M. Salvalaggio, L. Bussotti, M. Mohseni, **F. Caruso**, H.C. Johnsen, R. Fusco, P. Foggi, P.F. Scudo, S. Lloyd, A.M. Belcher, “*Enhanced energy transport in genetically engineered excitonic networks*”, Nature Materials **15**, 211216 (2016); doi:10.1038/nmat4448. Impact Factor: 36.5.
6. **F. Caruso**, V. Giovannetti, C. Lupo, and S. Mancini, “*Quantum channels and memory effects*”, Rev. Mod. Phys. **86**, 1203 (2014). Impact Factor: 44.982.
7. **F. Caruso**, “*Universally Optimal Noisy Quantum Walks on Complex Networks*”, New J. Phys. **16**, 055015(2014).
8. F. Schäfer, I. Herrera, S. Cherukattil, C. Lovecchio, F.S. Cataliotti, **F. Caruso**, and A. Smerzi, “*Experimental realization of quantum zeno dynamics*”, Nature Commun. **5**, 3194 (2014). Impact Factor: 10.015.
9. M. Cramer, A. Bernard, N. Fabbri, L. Fallani, C. Fort, S. Rosi, **F. Caruso**, M. Inguscio, and M.B. Plenio, “*Spatial entanglement of bosons in optical lattices*”, Nature Commun. **4**, 2161 (2013). Impact Factor: 10.015.
10. C. D’Errico, M. Moratti, E. Lucioni, L. Tanzi, B. Deissler, M. Inguscio, G. Modugno, M.B. Plenio, and **F. Caruso**, “*Quantum diffusion with disorder, noise and interaction*”, New. J. Phys. **15**, 045007 (2013).
11. **F. Caruso**, S. Montangero, T. Calarco, S.F. Huelga, and M.B. Plenio, “*Coherent optimal control of photosynthetic molecules*”, Phys. Rev. A **85**, 042331 (2012). Impact Factor: 3.042.
12. **F. Caruso**, S.K. Saikin, E. Solano, S.F. Huelga, A. Aspuru-Guzik, and M.B. Plenio, “*Probing biological light-harvesting phenomena by optical cavities*”, Phys. Rev. B **85**, 125424 (2012). Impact Factor: 3.767.
13. **F. Caruso**, V. Giovannetti, and M. Palma, “*Teleportation-Induced Correlated Quantum Channels*”, Phys. Rev. Lett. **104**, 020503 (2010). Impact Factor: 7.943.
14. **F. Caruso**, S.F. Huelga, and M.B. Plenio, “*Noise-enhanced classical and quantum capacities in communication networks*”, Phys. Rev. Lett. **105**, 190501 (2010). Impact Factor: 7.943.
15. **F. Caruso**, A.W. Chin, A. Datta, S.F. Huelga, and M.B. Plenio, “*Highly efficient energy excitation transfer in light-harvesting complexes: The fundamental role of noise-assisted transport*”, J. Chem. Phys. **131**, 105106 (2009). Impact Factor: 3.164.

Highlighted Publications

- The paper in [15] has been the **most cited 2009's** paper (**~400 citations**) of Journal of Chemical Physics (JCP), and has been featured as one of JCP's research highlight articles. Furthermore, it has been selected for the September 2009 issue of JCP: BioChemical Physics. Two movies related to the numerical simulations, which were fully performed by me for this paper, have been **highlighted** and used by **APS** to increase public awareness and **media coverage** of the science presented at the APS March meeting in Pittsburgh in 2009. Moreover, the paper in [54] (see refs. listed below) has been included in the **New Journal of Physics Best of 2010**, Additionally, it has been selected by NJP to make a video abstract for the launch of NJP's new video abstract service in 2010.

Finally, my research achievements have been also cited and **highlighted**, among others, in **Nature** group journals, as in Nat. Phys. 6, 402-403 (2010), Nat. Phys. 8, 285-91 (2012), Nat. Phys. 8, 562-567 (2012), Nat. Phys. 9, 10-18 (2013), Nat. Phys. 9, 113-118 (2013), Nat. Phot. 8, 796-800 (2014), and in several chapters of the Book "*Quantum Effects in Biology*", eds. Mohseni, Omar, Engel, Plenio (Cambridge Univ. Press, 2014).

Independent Career (with citations to the 15 Refs. above)

- It is strongly demonstrated by the fact that, since the early university studies, **all my research activity** has been **supported by personally awarded highly selective** and very well funded **individual fellowships** as the university scholarship of Scuola Superiore of Catania (2000-2005), the PhD Fellowship of Scuola Normale Superiore of Pisa (2005-2008), the postdoctoral EU Marie-Curie Intra-European Fellowship (2009-2011), the EU Marie-Curie Career Integration Grant (2011-2015), and the FIRB-MIUR national project (2012-2015). Furthermore, most of my research activity has involved me as **key author** of the theoretical (analytical and numerical) analysis (75% of publications as **first author**), in several cases I have **personally proposed the project**, as shown for instance in Refs. [9, 14], and **led international collaborations** with expert scientists of worldwide famous institutions as Harvard and UC Berkeley as in Ref. [12]. My PhD activity is also summarized in a 57-page review article published in **Rev. Mod. Phys.** [6]. Finally, as **single author**, I've published a 17-page paper on the first (numerical) analysis of quantum stochastic walks on large complex networks [7].

Major currently running international collaborations

- A. Aspuru-Guzik, Quantum Walks, Harvard, USA
- A.M. Belcher, Genetically Engineering Light-Harvesting Antennas, MIT, USA
- S.C. Benjamin, Quantum Transport over Complex Networks, Oxford, UK
- T. Calarco, Quantum Optimal Control, Ulm University, Germany
- V. Giovannetti, Open Quantum Systems, Scuola Normale Superiore of Pisa, Italy
- S. Lloyd, Artificial Excitonic Nanostructures, MIT, USA
- R. Osellame, Integrated Waveguide Networks, IFN-CNR, Milan, Italy
- M. Paternostro, Out-of-Equilibrium Quantum Physics, Queen's University Belfast, Ireland
- M.B. Plenio, Quantum Transport Phenomena and Light-Harvesting Molecules, Ulm University, Germany
- F. Sciarrino, Photonics Quantum Transport, La Sapienza University, Rome, Italy
- K.B. Whaley, Coherent Control and Ultra-fast Spectroscopy, UC Berkeley, USA

Research Interests

- Quantum Information Science, Quantum Effects in Atomic and Molecular (Biological) Systems, Quantum Transport Phenomena, Noisy Quantum System Dynamics, Quantum Optimal Control, Quantum Measurements, Quantum Zeno Physics, Entanglement, Noise Correlations in Space/Time, Computational Physics, Quantum Random Walks, Quantum Optics and Communication, Complex Systems and Network Theory.

Miscellaneous

- Expert knowledge of Windows, Linux, MacOS, software for text/graphics editing (as OriginPro, MikTeX, MSOffice), analytical calculus and numerical simulations (as Mathematica, Matlab, GPU-CUDA parallel computing).
- Excellent skills in Fortran, basic skills in ALPS package, C, C++, Java, Pascal, Basic.
- Languages: Italian (native speaker), English (fluent), German (SD1 Goethe), French (basic).

Full List of Publications (and some recent preprints)

1. S. Gherardini, H.J. van Waarde, P. Tesi, **F. Caruso**, “*Topology identification of autonomous quantum dynamical network*”, Eprint arXiv:2111.00812 (2021).
2. S. Martina, L. Buffoni, S. Gherardini, **F. Caruso**, “*Learning the noise fingerprint of quantum devices*”, Eprint arXiv:2109.11405 (2021).
3. L. Buffoni, **F. Caruso**, “*New Trends in Quantum Machine Learning*”, Eur. Phys. Lett. 132, 60004 (2021), Eprint arXiv:2108.09664.
4. N. Dalla Pozza, L. Buffoni, S. Martina, **F. Caruso**, “*Quantum Reinforcement Learning: the Maze problem*”, Eprint arXiv:2108.04490 (2021).
5. A. Laneve, A. Gherardini, . Hamiti, P. Mataloni, **F. Caruso**, “*Experimental multi-state quantum discrimination through a Quantum network*”, Eprint arXiv:2107.09968 (2021).
6. P. Braccia, L. Banchi, **F. Caruso**, “*Quantum Noise Sensing by generating Fake Noise*”, Eprint arXiv:2107.08718 (2021).
7. I. Gianani, I. Mastroserio, L. Buffoni, N. Bruno, L. Donati, V. Cimini, M. Barbieri, F.S. Cataliotti, **F. Caruso**, “*Experimental Quantum Embedding for Machine Learning*”, Eprint arXiv:2106.13835 (2021).
8. S. Virzı, A. Avella, F. Piacentini, M. Gramegna, T. Opatrny, A. Kofman, G. Kurizki, S. Gherardini, **F. Caruso**, I.P. Degiovanni, M. Genovese, “*Quantum Zeno and Anti-Zeno probes of noise correlations in photon polarisation*”, Eprint arXiv:2103.03698 (2021).
9. S. Gherardini, A. Smirne, S. Huelga, **F. Caruso**, “*Transfer-tensor description of memory effects in open-system dynamics and multi-time statistics*”, in press in Quantum Sci. Tech., Eprint arXiv:2101.11662 (2021).
10. S. Martina, S., Gherardini, **F. Caruso**, “*Machine learning approach for quantum non-Markovian noise classification*”, Eprint arXiv:2101.03221.
11. P. Braccia, **F. Caruso**, L. Banchi, “*How to enhance quantum generative adversarial learning of noisy information*”, New J. Phys. 23 053024 (2021), Eprint arXiv:2012.05996.
12. S. Gherardini, M.M. Muller, S. Montangero, T. Calarco, **F. Caruso**, “*Information flow and error scaling for fully-quantum control*”, Eprint arXiv:2012.06234 (2020).
13. M.M. Muller, S. Gherardini, T. Calarco, S. Montangero, **F. Caruso**, “*Information Theoretical Limits for Quantum Optimal Control Solutions: Error Scaling of Noisy Channels*”, Eprint arXiv:2006.16113 (2020).
14. S. Gherardini, S. Marcantoni, **F. Caruso**, “*Irreversibility mitigation in unital non-Markovian quantum evolutions*”, Phys. Rev. Research 2, 033250 (2020), Eprint arXiv:2004.04619.
15. N. Dalla Pozza, **F. Caruso**, “*Quantum Stochastic Walk Models for Quantum State Discrimination*”, Physics Letters A 384, 126195 (2020), Eprint arXiv:2003.13257.
16. N. Dalla Pozza, **F. Caruso**, “*Quantum State Discrimination on Reconfigurable Noise-Robust Quantum Networks*”, Phys. Rev. Research 2, 043011 (2020), Eprint arXiv:2003.11586.
17. V. Cimini, S. Gherardini, M. Barbieri, I. Gianani, M. Sbroscia, L. Buffoni, M. Paternostro, and **F. Caruso**, “*Experimental characterization of the energetics of quantum logic gates*”, npj Quantum Inf 6, 96 (2020), Eprint arXiv:2001.11924.
18. N. Dalla Pozza, S., Gherardini, M.M. Muller, **F. Caruso**, “*Role of the filter functions in noise spectroscopy*”, International Journal of Quantum Information, Vol. 17, No. 08, 1941008 (2019), Eprint arXiv:1911.10598.
19. M.M. Muller, S., Gherardini, N. Dalla Pozza, **F. Caruso**, “*Noise Sensing via Stochastic Quantum Zeno*”, Physics Letters A 384, 126244 (2020), Eprint arXiv:1910.09251.
20. H.-V. Do, C. Lovecchio, I. Mastroserio, N. Fabbri, F.S. Cataliotti, S. Gherardini, M.M. Muller, N. Dalla Pozza, **F. Caruso**, “*Experimental proof of Quantum Zeno-assisted Noise Sensing*”, New J. Phys. 21, 113056 (2019), Eprint arXiv:1907.09618.
21. S. Gherardini, F. Campaioli, **F. Caruso**, F.C. Binder, “*Stabilizing Open Quantum Batteries by Sequential Measurements*”, Phys. Rev. Research 2, 013095 (2020), Eprint arXiv:1910.02458.
22. S. Gherardini, A. Smirne, M.M. Muller, **F. Caruso**, “*Advances in Sequential Measurement and Control of Open Quantum Systems*”, Proceedings 12(1), 11 (2019), Eprint arXiv:1811.05395.

23. M.M. Müller, S. Gherardini, and **F. Caruso**, “*Noise robust quantum sensing via optimal multi-probe spectroscopy*”, Nature Sci. Rep. 8, 14278 (2018), Eprint arXiv:1801.10220.
24. S. Gherardini, L. Buffoni, M.M. Müller, **F. Caruso**, M. Campisi, A. Trombettoni, and S. Ruffo, “*Non-equilibrium quantum-heat statistics under stochastic projective measurements*”, Phys. Rev. E 98, 032108 (2018), Eprint arXiv:1805.00773.
25. T.P. Le, L. Donati, S. Severini, and **F. Caruso**, “*How to Suppress Dark States in Quantum Networks and Bio-Engineered Structures*”, J. Phys. A: Math. Theor. 51, 365306 (2018), Eprint arXiv:1707.07482.
26. S. Gherardini, M.M. Müller, A. Trombettoni, S. Ruffo, and **F. Caruso**, “*Reconstructing quantum entropy production to probe irreversibility and correlations*”, Quantum Sci. Technol. 3, 035013 (2018), Eprint arXiv:1706.02193.
27. S. Viciani, S. Gherardini, M. Lima, M. Bellini, **F. Caruso**, “*Disorder and dephasing as control knobs for light transport in optical fiber cavity networks*”, Nature Sci. Rep. 6, 37791; doi: 10.1038/srep37791 (2016). Impact Factor: 5.5.
28. M.M. Müller, S. Gherardini, A. Smerzi, and **F. Caruso**, “*Fisher information from stochastic quantum measurements*”, Phys. Rev. A 94, 042322 (2016), Eprint arXiv:1606.05369. Impact Factor: 2.77.
29. M.M. Müller, S. Gherardini, and **F. Caruso**, “*Stochastic quantum Zeno-based detection of noise correlations*”, Nature Sci. Rep. 6, 38650; doi: 10.1038/srep38650 (2016). Impact Factor: 5.5.
30. M.M. Müller, S. Gherardini, and **F. Caruso**, “*Quantum Zeno Dynamics through stochastic protocols*”, Annalen der Physik 529, 1600206 (2016), Eprint arXiv:1607.08871. Impact Factor: 3.44.
31. S. Gherardini, C. Lovecchio, M.M. Müller, P. Lombardi, **F. Caruso**, and F.S. Cataliotti, “*Ergodicity in randomly perturbed quantum systems*”, Quantum Sci. Technol. 2, 015007 (2017), Eprint arXiv:1604.08518 (2016).
32. **F. Caruso**, A. Crespi, A.G. Ciriolo, F. Sciarrino, and R. Osellame, “*Fast Escape from Quantum Mazes in Integrated Photonics*”, Nature Commun. 7, 11682 (2016), Eprint arXiv:1501.06438. Impact Factor: 10.015.
33. S. Gherardini, S. Gupta, F.S. Cataliotti, A. Smerzi, **F. Caruso**, S. Ruffo, “*Stochastic Quantum Zeno by Large Deviation Theory*”, New J. Phys. 18, 013048 (2016), Eprint arXiv:1509.08122. Impact Factor: 3.57.
34. C. Lovecchio, F. Schäfer, S. Cherukattil, M. Alí Khan, I. Herrera, F.S. Cataliotti, T. Calarco, S. Montangero, **F. Caruso**, “*Optimal preparation of quantum states on an atom chip device*”, Phys. Rev. A 93, 010304(R) (2016), Eprint arXiv:1405.6918. Impact Factor: 2.77.
35. S. Viciani, M. Lima, M. Bellini, **F. Caruso**, “*Observation of Noise-Assisted Transport in an All-Optical Cavity-Based Network*”, Phys. Rev. Lett. 115, 083601 (2015), PRL Editors’ Suggestion, Eprint arXiv:1504.04809. Impact Factor: 7.943.
36. H. Park, N. Heldman, P. Rebentrost, L. Abbondanza, A. Iagatti, A. Alessi, B. Patrizi, M. Salvalaggio, L. Bussotti, M. Mohseni, **F. Caruso**, H.C. Johnsen, R. Fusco, P. Foggi, P.F. Scudo, S. Lloyd, A.M. Belcher, “*Enhanced energy transport in genetically engineered excitonic networks*”, Nature Materials 15, 211216 (2016); doi:10.1038/nmat4448. Impact Factor: 36.5.
37. R. Mencucci, S. Matteoli, A. Corvi, L. Terracciano, E. Favuzza, S. Gherardini, **F. Caruso**, R. Bellucci, “*Investigating the ocular temperature rise during femtosecond laser fragmentation: an in vitro study*”, Graefes Archive for Clinical and Experimental Ophthalmology 253, 2203-2210 (2015). Impact Factor: 2.349.
38. C. Lovecchio, S. Cherukattil, M. Alí Khan, F.S. Cataliotti, T. Calarco, S. Montangero, **F. Caruso**, “*Quantum state reconstruction on atom-chips*”, New J. Phys. 17, 093024 (2015), Eprint arXiv:1504.01963. Impact Factor: 4.063.
39. **F. Caruso**, V. Giovannetti, C. Lupo, and S. Mancini, “*Quantum channels and memory effects*”, Rev. Mod. Phys. 86, 1203 (2014), Eprint arXiv:1207.5435. Impact Factor: 44.982.
40. **F. Caruso**, “*Universally Optimal Noisy Quantum Walks on Complex Networks*”, New. J. Phys. 16, 055015 (2014), Focus on Quantum Efficiency, Eprint arXiv:1312.1832. Impact Factor: 4.063.
41. F. Schäfer, I. Herrera, S. Cherukattil, C. Lovecchio, F.S. Cataliotti, **F. Caruso**, A. Smerzi, “*Experimental realization of quantum zeno dynamics*”, Nature Commun. 5, 3194 (2014), Eprint arXiv:1309.1552. Impact Factor: 10.015.
42. M. Cramer, A. Bernard, N. Fabbri, L. Fallani, C. Fort, S. Rosi, **F. Caruso**, M. Inguscio, and M.B. Plenio, “*Spatial entanglement of bosons in optical lattices*”, Nature Commun. 4, 2161 (2013), Eprint arXiv:1302.4897. Impact Factor: 10.015.

43. Y. Li, **F. Caruso**, E. Gauger, S.C. Benjamin, “‘*Momentum rejuvenation*’ underlies the phenomenon of noise-assisted quantum energy flow”, *New J. Phys.* **17**, 013057 (2015), Eprint arXiv:1405.7914. Impact Factor: 4.063.
44. S. Hoyer, **F. Caruso**, S. Montangero, M. Sarovar, T. Calarco, M.B. Plenio, and K.B. Whaley, “*Realistic and verifiable coherent control of excitonic states in a light harvesting complex*”, *New J. Phys.* **16**, 045007 (2014), Focus on Coherent Control of Complex Quantum Systems, Eprint arXiv:1307.4807. Impact Factor: 4.063.
45. C. D’Errico, M. Moratti, E. Lucioni, L. Tanzi, B. Deissler, M. Inguscio, G. Modugno, M.B. Plenio, and **F. Caruso**, “*Quantum diffusion with disorder, noise and interaction*”, *New J. Phys.* **15**, 045007 (2013), Focus on The Frontiers of Disorder Physics, Eprint arXiv:1204.1313. Impact Factor: 4.063.
46. **F. Caruso**, S.K. Saikin, E. Solano, S.F. Huelga, A. Aspuru-Guzik, and M.B. Plenio, “*Probing biological light-harvesting phenomena by optical cavities*”, *Phys. Rev. B* **85**, 125424 (2012), Eprint arXiv:1110.1386. Impact Factor: 3.767.
47. J. Cai, **F. Caruso**, and M.B. Plenio, “*Quantum limits for the magnetic sensitivity of a chemical compass*”, *Phys. Rev. A* **85**, 040304(R) (2012), Eprint arXiv:1108.4304. Impact Factor: 3.042.
48. **F. Caruso**, S. Montangero, T. Calarco, S.F. Huelga, and M.B. Plenio, “*Coherent optimal control of photosynthetic molecules*”, *Phys. Rev. A* **85**, 042331 (2012), Eprint arXiv:1103.0929. Impact Factor: 3.042.
49. **F. Caruso**, N. Spagnolo, C. Vitelli, F. Sciarrino, and M.B. Plenio, “*Simulation of noise-assisted transport via optical cavity networks*”, *Phys. Rev. A* **83**, 013811 (2011), Eprint arXiv:1008.3398. Impact Factor: 3.042.
50. **F. Caruso**, J. Eisert, V. Giovannetti, and A.S. Holevo, “*Optimal unitary dilation for bosonic Gaussian channels*”, *Phys. Rev. A* **84**, 022306 (2011), Eprint arXiv:1009.1108 (2010). Impact Factor: 3.042.
51. **F. Caruso** and H. Kantz, “*Prediction of extreme events in the OFC model on a small world network*”, *Eur. Phys. J. B* **79**, 7 (2011), Eprint arXiv:1004.4774. Impact Factor: 1.282.
52. **F. Caruso**, S.F. Huelga, and M.B. Plenio, “*Noise-enhanced classical and quantum capacities in communication networks*”, *Phys. Rev. Lett.* **105**, 190501 (2010), Eprint arXiv:1003.5877. Impact Factor: 7.943.
53. **F. Caruso**, A.W. Chin, A. Datta, S.F. Huelga, and M.B. Plenio, “*Entanglement and entangling power of the dynamics in light-harvesting complexes*”, *Phys. Rev. A* **81**, 062346 (2010), Eprint arXiv:0912.0122. Impact Factor: 3.042.
54. A.W. Chin, A. Datta, **F. Caruso**, S.F. Huelga, M.B. Plenio, “*Noise-assisted energy transfer in quantum networks and light-harvesting complexes*”, *New J. Phys.* **12**, 065002 (2010), Focus on Quantum Effects and Noise in Biomolecules, Eprint arXiv:0910.4163. Impact Factor: 4.063.
55. **F. Caruso**, V. Giovannetti, and M. Palma, “*Teleportation-Induced Correlated Quantum Channels*”, *Phys. Rev. Lett.* **104**, 020503 (2010), Eprint arXiv:0906.0506. Impact Factor: 7.943.
56. A. Datta, A. W. Chin, **F. Caruso**, S. F. Huelga, and M. B. Plenio, “*Noise enhanced transport in light-harvesting complexes and networks*”, *Lasers and Electro-Optics 2009 and the European Quantum Electronics Conference. CLEO Europe - EQEC 2009*, IEEE Publisher, doi:10.1109/CLEOE-EQEC.2009.5191518 (2009).
57. **F. Caruso**, A.W. Chin, A. Datta, S.F. Huelga, and M.B. Plenio, “*Highly efficient energy excitation transfer in light-harvesting complexes: The fundamental role of noise-assisted transport*”, *J. Chem. Phys.* **131**, 105106 (2009), Eprint arXiv:0901.4454. Impact Factor: 3.164.
58. **F. Caruso**, J. Eisert, V. Giovannetti, and A.S. Holevo, “*Multi-mode bosonic Gaussian channels*”, *New. J. Phys.* **10**, 083030 (33pp) (2008), Eprint arXiv:0804.0511. Impact Factor: 4.063.
59. **F. Caruso**, V. Giovannetti, C. Macchiavello, and M.B. Ruskai, “*Qubit channels with small correlations*”, *Phys. Rev. A* **77**, 052323 (2008), Eprint arXiv:0803.3172. Impact Factor: 3.042.
60. **F. Caruso** and V. Giovannetti, “*A new approach to characterize qubit channels*”, *Int. J. Quantum Inf.* **6**, 621 (2008), Eprint arXiv:0802.2822. Impact Factor: 0.918.
61. **F. Caruso** and C. Tsallis, “*Nonadditive entropy reconciles the area law in quantum systems with classical thermodynamics*”, *Phys. Rev. E* **78**, 021102 (2008), Eprint arXiv:cond-mat/0612032. Impact Factor: 2.313.
62. **F. Caruso**, A. Pluchino, V. Latora, S. Vinciguerra, and A. Rapisarda, “*Analysis of Self-Organized Criticality in the Olami-Feder-Christensen model and in real earthquakes*”, *Phys. Rev. E* **75**, 055101(R) (2007), Eprint arXiv:cond-mat/0606118. Impact Factor: 2.313.

63. **F. Caruso** and V. Giovannetti, “*Qubit quantum channel: A characteristic function approach*”, Phys. Rev. A **76**, 042331 (2007), Eprint arXiv:0707.4443. Impact Factor: 3.042.
64. **F. Caruso** and C. Tsallis, “*Extensive nonadditive entropy in quantum spin chains*”, **invited paper** in AIP Conference Proceedings 965 (New York, 2007), p. 51, Eprint arXiv:0711.2641.
65. **F. Caruso**, A. Pluchino, V. Latora, S. Vinciguerra, and A. Rapisarda, “*Self-Organized Criticality and Earthquakes*”, **invited paper** in AIP Conference Proceedings 965 (New York, 2007), p. 281, Eprint arXiv:0711.1750.
66. **F. Caruso**, V. Giovannetti, and A.S. Holevo, “*One-mode bosonic Gaussian channels: a full weak-degradability classification*”, New J. Phys. **8**, 310 (18pp) (2006), Eprint arXiv:quant-ph/0609013. Impact Factor: 4.063.
67. **F. Caruso** and V. Giovannetti, “*Degradability of Bosonic Gaussian Channels*”, Phys. Rev. A **74**, 062307 (2006), Eprint arXiv:quant-ph/0603257. Impact Factor: 3.042.
68. **F. Caruso**, V. Latora, A. Pluchino, A. Rapisarda, and B. Tadic, “*Olami-Feder-Christensen Model on different Networks*”, Eur. Phys. J. B **50**, 243 (2006), Eprint arXiv:cond-mat/0509808. Impact Factor: 1.282.
69. **F. Caruso**, S. Vinciguerra, V. Latora, A. Rapisarda, and S. Malone, “*Multifractal Analysis of Mt. St. Helens Seismicity as a tool for identifying eruptive activity*”, Fractals **14**, 3, 179 (2006), Eprint arXiv:physics/0311049. Impact Factor: 0.36.
70. **F. Caruso**, H. Bechmann-Pasquinucci, and C. Macchiavello, “*Robustness of quantum key distribution with two and three mutually unbiased bases*”, Phys. Rev. A **72**, 032340 (2005), Eprint arXiv:quant-ph/0505146. Impact Factor: 3.042.
71. **F. Caruso** and P. Castorina, “*Opinion dynamics and decision of vote in bipolar political systems*”, Int. J. Modern Phys. C **16**, 9, 1473 (2005), Eprint arXiv:physics/0503199. Impact Factor: 0.615.
72. **F. Caruso**, V. Latora, A. Rapisarda, and B. Tadic, “*The Olami-Feder-Christensen Model on a Small World topology*”, The Science and Culture Series Physics (World Scientific, 2005), Eprint arXiv:cond-mat/0507643.
73. **F. Caruso**, I. Herrera, S. Bartalini, and F.S. Cataliotti, “*Slow Light amplification in a non-inverted gain medium*”, Europhys. Lett. **69**, 938 (2005), Eprint arXiv:quant-ph/0504045. Impact Factor: 2.260.

Extended early achievements track-record

- During the awarded very selective **PhD** Fellowship in Physics in the Science Faculty of **Scuola Normale Superiore** (Pisa), my work in R. Fazio’s group was focused on the theoretical analysis of the dynamical evolution of **open quantum systems**, with particular attention to the transfer of information and its loss to the external environment. Indeed, noise is believed to be one of the main obstacle to the realization of quantum technologies and a better understanding of the deleterious effects of noise in the transmission and storage of quantum information is crucial towards possibly commercial applications. Finally, we have introduced a new approach to memory quantum operations, in which the memory effects are induced by a noisy teleportation protocol with the transmission rates being related to the correlation properties of (critical) ground states of many-body quantum systems (**4 PRA, 1 PRE, 2 NJP, 1 PRL**). I got the PhD in Physics (70/70 cum laude) on July 1st, 2008.
- In 2008-2009, I was a **postdoctoral researcher** in Quantum Information Theory, Quantum Optics and Laser Science Group, at Dept. of Physics and Inst. for Mathematical Sciences, **Imperial College London** (UK), under the supervision of M.B. Plenio. The main project focused on the theoretical analysis of quantum transport in complex networks, i.e. the transfer of electronic excitation energy in **light-harvesting molecules** involved in natural photosynthesis. As main achievement, we found and investigated the key mechanisms (inhibition of destructive interference and line broadening) underlying the remarkably efficient (almost 100%), fast (around 5 ps) and robust transmission of energy in these molecules, where quantum coherence and noise play a key role. This was reflected by the beginning of a series of well cited papers, published in international refereed journals, that now already collect **more than 1000 citations since 2010**, allowing me to move the first steps in a new exciting and promising field, nowadays known as quantum biology, focused on **quantum effects in biological systems**. This field is expected to allow one to have a deeper understanding of how Nature has been exploiting, since billions of years, quantum coherence and environmental noise to get very efficient and robust energy transfer in photosynthesis, and, even more desirably, to design new quantum ICT technologies and novel light-harvesting molecular geometries, leading to future quantum solar cells more efficient than today clean energy devices.

- In 2009-2011, I was awarded a **two-year EU Marie-Curie Intra-European Fellowship** at the Institute of Theoretical Physics, **Ulm University** (Germany), moving there together with my supervisor M.B. Plenio. Here, my research activity was based on the investigation of **temporal and spatial noise correlations** in quantum systems, by using also a many-body approach where the memory effects are induced by the presence of long-range correlations in the environmental system, e.g. across a quantum phase transition. Furthermore, we have found that the transmission of classical and quantum information over a large family of communication networks can be remarkably enhanced by introducing dephasing noise in the dynamics, by analytically and numerically calculating the so-called channel capacities measuring the optimal information transmission rates (**1PRL, 4PRA, 1PRB, 1NJP, 1JCP**). These results were also inspired by our investigations on the role of noise in quantum transport phenomena characterizing light-harvesting complexes, where we applied **for the first time the idea of noise-assisted transport in natural photosynthesis**. Meanwhile, I have also acquired a consolidated experience in Quantum Optimal Control theory to manipulate fragile quantum noisy systems, thanks to the local collaboration with T. Calarco and S. Montangero. In particular, we have shown the possibility of remarkably enhancing the presence of quantum beatings in biomolecular dynamics, that is currently experimentally investigated in G.R. Fleming's lab in UC Berkeley, where the first experiments of quantum biology took place in 2007.
- In 2011-2015, I was awarded a **four-year EU Marie-Curie Career Integration Grant** allowing me to get reintegrated in my own country, carrying on my work without unfavorable delays in a stimulating and internationally renowned research centre, at the European Laboratory of Non-Linear Spectroscopy (**LENS**), in Florence, with worldwide known expertise, especially experimentally, in quantum phenomena, atomic physics, biology, optics. This project (www.qubiot.com) addressed theoretically and experimentally the role of quantum effects in biology, especially in natural photosynthesis, by studying theoretical models of energy transport in quantum structures and testing them by means of **designed experiments** based on quantum optical simulators, **cold atoms**, and also ultra-fast laser spectroscopy on natural and artificial light-harvesting biomolecules. As first results of this project, we have reported the first experimental investigation of a quite old but actually not yet clearly understood fundamental problem of physics, i.e. the diffusion of a wave-packet in presence of noise, interaction and disorder, by employing ultra-cold atoms in a disordered lattice. On top of that, my reintegration led also to **transferring of knowledge**, previously acquired abroad, in a very young and rapidly developing field, i.e. quantum biology, which was not yet investigated in Italy. This allowed me to enhance my **leadership qualities**, supervising postdocs, PhD and undergraduate students, and making a pioneering contribution to Italian science towards a permanent position with an own research team.
- In 2012, as **National Principal Investigator (PI)** of a **very prestigious three-year Future in Research project (FIRB)**, received by the Italian Ministry of Education, University and Research (MIUR), I got the position of Assistant Professor at the **Physics Dept. of Florence Univ.** I became also one of the funding members of a new Joint Research Center on Quantum Science and Technology (QSTAR) involving University of Florence, the Italian Institute of Technologies, National Research Council and the Max Planck Institute of Quantum Optics. The main goal of this project, that we have recently achieved, is the theoretical analysis and the experimental realization of scalable, tunable, and feasible **optical simulators** of quantum transport in photosynthetic systems (i.e., noise-assisted efficiency and suppression of trapping states) towards new solar energy technologies, also in collaboration with ENI, an Italy-based multinational oil and gas company that is very interested in designing specific light-harvesting structures and, eventually, realizing prototypes of new solar cells based on our achievements. As **single author**, I've published the first analysis of quantum stochastic walks on large complex networks. Then, in collaboration with the experimental FIRB-unit at INO-CNR, we have theoretically and experimentally shown, by (simple, cheap, room temperature, controllable, and scalable) **optical fiber cavity networks (PRL & Nat. Sci. Rep.)**, that it is possible to simulate noise-assisted transport, Zeno effect, destructive and constructive interference, static and dynamical disorder, hence allowing us to **simulate phenomena that**, to the best of our knowledge, **have never been observed on the same physical setup**.
- More recently, my research activity has also led to the publication of several papers in very high impact-factor journals, as, among others, **Nature Communications** and **Review of Modern Physics**. In particular, we have shown the **first** rigorous experimental large-scale **entanglement quantification** in a scalable quantum simulator that was represented by many-body ultra-cold interacting bosons in optical lattices (**Nature Communications 2013**). Furthermore, in the context of another atom physics experiment at LENS, we have demonstrated the role of engineered external noise and strong coupling in tailoring and protecting the coherent evolution of a quantum system. This profound and counterintuitive phenomenon, known as **Quantum Zeno Dynamics (QZD)**, was theoretically predicted but never observed before. Indeed, although it is generally impossible to probe a quantum system without disturbing it, we have exploited measurements and strong couplings to dynamically disconnect different groups of quantum states and constrain the atoms to coherently evolve inside a two-level subregion. These results were an important step forward in protecting and controlling quantum dynamics and, broadly speaking, transport phenomena in quantum systems (**Nature Communications 2014**), earlier than a similar experiment performed by S. Haroche (**Nobel Prize in Physics 2012**) and published later in Nature Physics. Recently, I have applied numerical tools of quantum optimal control to experimentally pro-

tect, manipulate and steer the dynamics of atom-chip devices (**Nature Sci. Rep.**, **2PRA**, **2NJP**, **QST-IOP**, **AdP**). Moreover, my consolidated experience on noise and open quantum systems has allowed me to publish a 57-page review paper in the very prestigious **Review of Modern Physics** (the journal with the **highest impact factor** in natural sciences, ~ 45), describing open quantum systems in a very broad framework including also memory effects. The information transmission channel capacities of such quantum systems provide the ultimate limits of communication, which will likely be pursued by future quantum ICT technologies.

- In **collaboration with ENI and MIT**, we have recently created and studied a tunable material consisting of a 3D chromophore network on an ordered biological virus template (patent no. 8859456, October 14, 2014), where we have observed the interplay of quantum coherent and classical, incoherent energy transport at room temperature. In particular, through genetic modifications, we have obtained a significant enhancement of the energy transport in an intermediate quantum-classical regime (**Nature Materials 2015**). Besides, I have **proposed** and **personally driven** another project, carrying out the whole theoretical work, in collaboration with experimental groups in Rome Univ. and CNR, where, inspired by my recent observations in biological energy transport phenomena, we have demonstrated how to solve much more efficiently the **maze problem** by partially suppressing the presence of interference. In particular, we have shown theoretically an unprecedented improvement in transport efficiency for increasing maze size with respect to purely quantum and classical approaches. In addition, we have experimentally investigated these hybrid transport phenomena by mapping the maze problem in an **integrated waveguide** array probed by coherent light, hence successfully testing our theoretical results, towards future bio-inspired photonics technologies (**Nature Communications 2016**).

Early research experience during undergraduate studies

- In 2004-2005, my Physics **Master thesis** was on **Quantum Cryptography** after 6 months at Quantum Information Theory group (Pavia Univ., Italy), supervised by C. Macchiavello and H. Bechmann-Pasquinucci. We studied the robustness of quantum key distribution protocols by analytically deriving the optimal eavesdropping strategies (mutually unbiased bases) for quantum systems of arbitrary finite dimension (Phys. Rev. A).
- In 2002-2005, as awarded student of Scuola Superiore of Catania (Italy), my Diploma thesis focused on the theoretical and experimental realization of **quantum state transfer** and **quantum cloning machine** based on realistic **three-** and **four-level atomic schemes**, under the supervision of F.S. Cataliotti at Quantum Information Laboratory. We investigated the scattering of dark-state polaritons and how to obtain a quantum memory of a coherent state by pointing out that it is possible to compensate the unavoidable losses using the amplification without inversion in the electromagnetically induced transparency (EIT) regime (Europhys. Lett.).
- In 2001-2005, **my first research activity**, at the beginning of my undergraduate studies in Physics, addressed interdisciplinary aspects of **Chaos** and **Statistical Mechanics**, under the supervision of A. Rapisarda, V. Latora, A. Pluchino, S. Vinciguerra, P. Castorina, in the Chaos And Complexity Theoretical University Study (CACTUS) group, at Phys. Dept. (Catania), and in collaboration with B. Tadic (Slovenia). In particular, spatial and temporal discretization of **diffusion** models, **multifractal** geometries, and different topologies of complex **networks** (small-world, scale-free, random graphs, etc.) have been investigated in the context of widespread **self-organized critical phenomena** (Phys. Rev. E, Fractals, Eur. Phys. J. B, Int. J. Modern Phys.).

Outreach activity and press office (qdab.org/press.html)

- My research profile and activity have been highlighted in two full pages by the Italian edition of Scientific American (Le Scienze) for the entire month of March 2017 for sale in any Italian newsstand.
- The research work on *Fast Escape from Quantum Mazes in Integrated Photonics* (Nature Communications 2016) has been highlighted by MIT Technology Review and the Italian Newspapers as ANSA and Repubblica.
- The participation to the 66th Lindau Nobel Laureate Meeting in Physics 2016 has been highlighted by very long articles in the Italian Newspapers as Corriere della Sera and La Sicilia.
- Invited Blog on Quantum Biology for Nobel Laureate Meeting (www.lindau-nobel.org/what-is-quantum-biology).
- Press release in several national newspapers for the Physics 2015 Award (with the President of the Italian Republic On. Prof. Dr. Mattarella), and for the invited participation (with outreach talk to a public general audience) in presence of the Italian President of the Chamber of Deputies, Mrs. Laura Boldrini (2013).
- Invited talk on Reverse Brain Drain & Quantum Technologies, by the Italian Presidency of the Council of Ministers, in front of around 50.000 people and live (Sky) TV streaming, in Piazza del Popolo, Rome, Oct. 29, 2016.
- Invited public talk on University and Research, with the Italian Minister of Education, Universities and Research, Cascine Park, Florence, August 2017.

- Invited public talk as representative of the financial support on research and innovation by a bank foundation, to celebrate the 25-year birthday of Fondazione CR Firenze, Salone dei Cinquecento, Palazzo Vecchio, Florence, September 2017.
- Invited public talk at EU Researchers' Night, an event promoted by the European Commission in 300 cities across 24 countries, to promote scientific culture and research-based professions, Florence, September 2017.

Conferences/Schools/Visits, including 43 invited talks

1. High Performance Computing and Quantum Computing 2021 - Fourth Edition (HPCQC), CINECA workshop, December 2021 - **Invited Talk**.
2. Italian Quantum Information Science Conference (IQIS2021), September 2021, Naples, Italy - **Invited Talk**.
3. Italian Quantum Information Science Conference (IQIS2019), September 2019, Milan, Italy - **Invited Talk**.
4. Optics at the Nanoscale Conference (ONS19), September 2019, Capri, Italy - **Invited Talk**.
5. International conference Quantum 2019, From Foundations of Quantum Mechanics to Quantum Information and Quantum Metrology Sensing, May-June 2019, Torino, Italy - **Invited Talk**.
6. Kick-off meeting of EU FET-OPEN project (PATHOS), May 2019, Florence, Italy - **Chair Organizer**.
7. Workshop on Ubiquitous Quantum Physics: the New Quantum Revolution I (ICTP), February 2019, Trieste, Italy - **Invited Talk**.
8. Italian Quantum Information Science Conference (IQIS2018), September 2018, Catania, Italy - **Member of the Scientific Committee**.
9. **Invited outreach seminar** for the the 25-year birthday of the Foundation CR Firenze, September 2017, Salone dei Cinquecento, Palazzo Vecchio, Florence, Italy.
10. **Invited outreach seminar** for the EU Researchers' Night, at the Botanic Garden of Florence Univ., September 2017, Florence, Italy.
11. Italian Quantum Information Science Conference (IQIS2017), September 2017, Florence, Italy - **Chair (single) organizer**.
12. **Invited public talk** about University and Research, with the Italian Minister of Education, Universities and Research, August 2017, Cascine Park, Florence.
13. International Conference on Statistical Physics, Sigma Phi 2017, July 2017, Corfu, Greece - Talk and **Invited Speaker Grant Award by the European Physics Society**.
14. International conference Quantum 2017, From Foundations of Quantum Mechanics to Quantum Information and Quantum Metrology Sensing, May 2017, Torino, Italy - Talk.
15. **Invited outreach seminar** at the Florence Univ. Academic Year Opening Day, October 2016, Florence, Italy.
16. IQIS 2016, 9th Italian Quantum Information Science Conference, September 2016, Rome, Italy - Talk.
17. ECT* workshop on Testing the limits of the quantum superposition principle in nuclear, atomic and optomechanical systems, September 2016, Trento, Italy - **Invited Talk**.
18. 66th Lindau **Nobel Laureate Meeting** 2016 in Physics - as selected by the European Commission, after highly competitive multi-step selection, with ~200 worldwide highly-talented young scientists and more than 30 Nobel Laureates in Physics (www.mediatheque.lindau-nobel.org/meetings/2016), Lindau, Germany, June 2016.
19. International conference on Quantum Simulations and Many-Body Physics with Light, jointly with the meeting for the COST Action MP1403 Nanoscale Quantum Optics, Chania, Crete, Greece, June 2016.
20. QuEBS 2015, Workshop on Quantum Effects in Biological Systems, June 2015, Florence, Italy - **chair organizer**.
21. IQIS 2014, 7th Italian Quantum Information Science Conference, September 2014, Salerno, Italy - **Invited Talk**.
22. CAMEL10 Workshop on Control of Atoms, Molecules & Ensembles by Light, June 2014, Bulgaria - Talk.
23. Quantum 2014 Workshop on Advances in Foundations of Quantum Mechanics and Quantum Information with atoms and photons, at I.N.Ri.M., May 2014, Turin, Italy - **Invited Talk**.

24. Physics Dept., Catania Univ., April 2014, Catania, Italy - **Invited Talk**.
25. Institute of Complex Systems (ISC-CNR), January 2014, Florence, Italy - **Invited Talk**.
26. Workshop on Frontiers in the Quantum World, in honour of E. Arimondo, December 2013, Florence, Italy.
27. Prof. O. Mülken's group at Inst. Phys. of Freiburg University, December 2013, Germany - **Invited Talk** .
28. *The Future is Quantum* Workshop, QSTAR-CNR-UNIFI, December 2013, Florence, Italy - **Invited Talk**.
29. 'Quantum simulations & quantum walks' meeting, November 2013, Scuola Normale Superiore, Pisa, Italy - Talk.
30. Public Meeting with the **Italian President of the Chamber of Deputies**, Mrs. Laura Boldrini, on *Talents from the South to face the crisis*, October 2013, Catania, Italy - **Invited Talk** (selected, by the Chamber of Deputies staff, as one of the three invited special guests on the topic of Reverse Brain Drain).
31. Conference on Noise Information & Complexity @ Quantum Scale, October 2013, Erice, Italy - Talk.
32. IQIS 2013, 6th Italian Quantum Information Science Conference, September 2013, Como, Italy - Talk.
33. Gordon Conference on Quantum Control of Light & Matter, July 2013, South Hadley, MA, USA- **Invited Talk**.
34. QIPC 2013, Quantum Inf. Processing & Communication Int. Conference, July 2013, Florence, Italy - Talk.
35. QuEBS 2013, Workshop on Quantum Effects in Biological Systems, June 2013, Vienna, Austria - Talk.
36. Workshop on New Trends in Complex Quantum System Dynamics, April 2013, Cartagena, Spain - Talk.
37. Workshop on Quantum Transport in Light-Harvesting Bio-Nanostructures, March 2013, Florence, Italy.
38. Workshop on New Research Horizon in Arcetri, by QSTAR & CNR, March 2013, Florence, Italy.
39. IQIS 2012, 5th Italian Quantum Information Science Conference, September 2012, Padova, Italy - Talk.
40. QuEBS 2012, Workshop on Quantum Effects in Biological Systems, June 2012, Berkeley, CA, USA - Talk.
41. Photonics 2012 meeting, May 2012, Florence, Italy - **Invited Talk as FIRB-MIUR PI**.
42. Chemistry Dept., UC Berkeley (Prof. B. Whaley), May 2012, Berkeley, CA, USA - **Invited Talk**.
43. European Optical Society (SIOF) meeting, Dec. 2011, Naples, Italy - **Invited Talk as FIRB-MIUR PI**.
44. Since 2011, periodic research visits of M.B. Plenio's and T. Calarco's groups, Ulm University (Germany).
45. Workshop on Engineering and Control of Quantum Systems, MPI-PKS, October 2011, Dresden, Germany.
46. QuEBS2011, Workshop on Quantum Effects in Biological Systems, August 2011, Ulm, Germany - Talk.
47. APS March Meeting 2011, Session: Quantum Coherence in Biology, March 2011, Dallas, TX, USA - Talk.
48. 'Quantum Life' meeting (by S. Lloyd) at Santa Fe Institute, March 2011, Santa Fe, NM, USA - **Invited Talk**.
49. Invited visit to European Laboratory for Non-linear Spectroscopy (LENS), February 2011, Florence, Italy.
50. Workshop on Complex Quantum Systems, October 14-15 2010, Palma de Mallorca, Spain - **Invited Talk**.
51. TU Darmstadt - Institute of Applied Physics, November 2010, Darmstadt, Germany - **Invited Colloquium**.
52. Workshop on Quantum Mechanics of biosystems, July 8-9 2010, Torino, Italy - **Invited Talk**.
53. Workshop on Transport in Complex Quantum Systems, July 5-7 2010, Novara, Italy - **Invited Talk**.
54. CAMEL6 Workshop on Control of Atoms, Molecules & Ensembles by Light, June 2010, Bulgaria- **Invited Talk**.
55. Visit to Chemistry Dept. in Harvard University (Prof. A. Aspuru-Guzik), June 2010, Cambridge, MA, USA.
56. Invited visit to Center for Extreme Quantum Information Theory (Prof. S. Lloyd) and to ENI-MIT Solar Frontiers Center, Massachusetts Institute of Technology (MIT), June 2010, Cambridge, MA, USA.
57. QuEBS2010, Quantum Effects in Biological Systems Workshop, June 2010, Harvard, MA, USA - Talk.
58. Quantum 2010, Advances in Foundations of Quantum Mechanics and Quantum Information with atoms and photons, and 3rd Italian Quantum Information Science Conference IQIS 2010, May 2010, Torino, Italy - Talk.

59. Alternative Energy Research Centre - ENI Donegani Institute, May 2010, Novara, Italy - **Invited Talk.**
60. Quantum Information Theory & Complex Systems Workshop, May 2010, Reims, Germany - **Invited Talk.**
61. Physics Dept., Catania Univ., April 2010, Catania, Italy - **Invited Talk.**
62. European Laboratory for Non-linear Spectroscopy (LENs), December 2009, Florence, Italy - **Invited Talk.**
63. QIPC2009, Int. Conf. on Quantum Information Processing & Communication, Sept. 2009, Rome, Italy - Poster.
64. QuEBS2009, Workshop on Quantum Effects in Biological Systems, July 2009, Lisbon, Portugal - Poster.
65. 4th Feynman Festival and 11th International Conference on Squeezed States and Uncertainty Relations, International conference, June 2009, Olomouc, Czech Republic - Talk.
66. QUROPE09 Int. School on Quantum Information and Many-Body Systems, May 2009, Cortona, Italy - Talk.
67. Physics Dept., Catania Univ., April 2009, Catania, Italy - **Invited Talk.**
68. IMA conference on Quantum Computing and Complexity of Quantum Simulation, Institute for Mathematical Sciences, Imperial College London, April 2009, London, UK.
69. Workshop on Quantum Information and Graph Theory, Hertfordshire Univ., March 2009, UK - **Invited Talk.**
70. Centre for Quantum Technology (Prof. F. Petruccione), University of KwaZulu-Natal, February 2009, Durban, South Africa - **Three Invited Colloquia.**
71. QUOXIC meeting, Oxford University Computing Lab, December 2008, Oxford, UK.
72. Italian Quantum Information Science Conference (IQIS2008), October 2008, Camerino (Macerata), Italy - Poster.
73. Center for Extreme Quantum Information Theory (Profs. S. Lloyd, J.H. Shapiro), Massachusetts Institute of Technology (MIT), April 2008, Cambridge, MA, USA - **Invited Talk.**
74. Invited visit to Prof. M.B. Plenio's group, Imperial College London, March 2008, London, UK - **Invited Talk.**
75. Int. Conference on Noise, Complexity & Information @ Quantum Scale, November 2007, Erice, Italy - Poster.
76. XCIII Congress of Italian Physical Society, September 24-29, 2007, Pisa, Italy - Talk.
77. Summer School 2007, Scuola Superiore of Catania, August 2007, Catania, Italy - Expository Talk.
78. XXIII IUPAP International Conference on Statistical Physics StatPhys23, July 2007, Genova, Italy - 2 Posters.
79. International Conference on Complexity, Metastability and Nonextensivity, satellite conference of StatPhys23, July 1-5, 2007, Catania, Italy - **Invited Talk.**
80. Taming the Quantum World conference: the 7th Canadian Summer School on Quantum Information, 4th Canadian Quantum Information Students' Conference, Theory and Realization of Practical Quantum Key Distribution, May 27 - June 14, 2007, at IQC and PI, Waterloo, Ontario, Canada - Talk and Poster.
81. Workshop on Quantum Information and Many-Body Quantum Systems, March 26-31, 2007, Centro di Ricerca Matematica Ennio de Giorgi of Scuola Normale Superiore, Pisa, Italy - Poster.
82. Centro Brasileiro de Pesquisas Físicas (CBPF) for a scientific collaboration with Prof. C. Tsallis, February 2007, Rio de Janeiro, Brazil - **Invited Talk.**
83. Summer School on Scalable Quantum Information Processing and Computing and Workshop on Quantum-Classical Transition and Quantum Information, June 11-30, 2006, Benasque Center for Science, Spain - Poster.
84. Physics Dept., Catania Univ., May 2006, Catania, Italy - **Invited Talk.**
85. XCI Congress of Italian Physical Society, September 26 - October 1, 2005, Catania, Italy - Talk.
86. 3rd NEXT International Conference: News Expectations and Trends in Statistical Physics, August 13-18, 2005, Kolimbari (Crete), Greece - Talk and Poster.
87. Int. School of Physics "E. Fermi", Quantum Computers, Algorithms & Chaos, July 2005, Varenna, Italy - Talk.
88. Workshop on Quantum Entanglement, December 14-18, 2004, Scuola Normale Superiore, Pisa, Italy.
89. 31st Workshop of International School of Solid State Physics on Complexity, Metastability and Nonextensivity, July 20-26, 2004, Erice (Trapani), Italy - Poster.
90. NEXT2003, Int. Conference on News and Expectations in Thermostatistics, September 2003, Villasimius, Italy.