

Complete list of Publications

1. M. Sirena, L. Aviles Felix, **G. Carvacho**, H. L. Navarro Fernandez, L. B. Steren, R. Bernard, J. Briatico, N. Bergeal, J. Lesueur, and G. Faini, "Structural and transport characterization of ultra-thin Ba_{0.05}Sr_{0.95}TiO₃ layers grown over Nb electrodes for the development of Josephson junctions", *Applied Physics Letters* 100, 012602 (2012).
2. A. Cuevas, **G. Carvacho**, G. Saavedra, J. Cariñe, W.A.T. Nogueira M. Figueroa, A. Cabello, P. Mataloni, G. Lima and G.B. Xavier, "Long-distance distribution of genuine energy-time entanglement", *Nature Communications* 4, 2871(2013).
3. **G. Carvacho**, J. Cariñe, G. Saavedra, A. Cuevas, J. Fuenzalida, F. Toledo, M. Figueroa, A. Cabello, J. Larsson, P. Mataloni, G. Lima and G.B. Xavier, "Post-Selection Loophole-Free Bell Test over an Installed Optical Fiber Network", *Phys. Rev. Lett.* 115, 030503 (2015).
4. V. D'Ambrosio, **G. Carvacho**, F. Graffitti, C. Vitelli, B. Piccirillo, L. Marrucci and F. Sciarrino, "Entangled vector vortex beams", *Phys. Rev. A* 94, 030304 (R) (2016).
5. **G. Carvacho**, F. Graffitti, V. D'Ambrosio, B. Hiesmayr and F. Sciarrino, "Experimental investigation on the geometry of GHZ states", *Scientific Reports* 7, 13265 (2017).
6. **G. Carvacho**, F. Andreoli, L. Santodonato, M. Bentivegna, R. Chaves and F. Sciarrino, "Experimental violation of local causality in a quantum network", *Nature Communications* 8, 14775 (2017).
7. F. Andreoli, **G. Carvacho**, L. Santodonato, M. Bentivegna, R. Chaves and F. Sciarrino, "Experimental bilocality violation without shared reference frames", *Phys. Rev. A* 95, 062315 (2017).
8. F. Andreoli, **G. Carvacho**, L. Santodonato, R. Chaves and F. Sciarrino, "Maximal violation of n-locality inequalities in a star-shaped quantum network", *New Journal of Physics* 19, 113020 (2017).
9. A. Crespi, M. Bentivegna, I. Pitsios, D. Rusca, D. Poderini, **G. Carvacho**, V. D'Ambrosio, A. Cabello, F. Sciarrino and R. Osellame, "Single-photon quantum contextuality on a chip", *ACS Photonics* 4, (2017).
10. R. Chaves, **G. Carvacho**, I. Agresti, V. Di Giulio, L. Aolita, S. Giacomini and F. Sciarrino, "Quantum violation of an instrumental test", *Nature Physics* 10, 1038 (2017).
11. **G. Carvacho**, F. Andreoli, L. Santodonato, M. Bentivegna, V. D'Ambrosio, P. Skrzypczyk, I. Supic, D. Cavalcanti and F. Sciarrino, "Experimental study of nonclassical teleportation beyond average fidelity", *Phys. Rev. Lett.* 121, 140501 (2018).
12. Big Bell Test Collaboration, "Challenging local realism with human randomness", *Nature* 557, 212-216 (2018).
13. E. Polino, I. Agresti, D. Poderini, **G. Carvacho**, G. Milani, G.B. Lemos, R. Chaves and F. Sciarrino, "Device-independent certification of a quantum delayed choice experiment", *Phys. Rev. A* 100, 022111 (2019).
14. **G. Carvacho**, R. Chaves and F. Sciarrino, "Perspectives on experimental quantum causality", *EPL (Europhysics Letters)* 125, 3 (2019).
15. A. Rocchetto, S. Aaronson, S. Severini, **G. Carvacho**, D. Poderini, I. Agresti, M. Bentivegna and F. Sciarrino, "Experimental learning of quantum states", *Science Advances* 5, eaau1946 (2019).
16. V. D'Ambrosio, **G. Carvacho**, I. Agresti, L. Marrucci and F. Sciarrino, "Tunable two-photon quantum interference of structured light", *Phys. Rev. Lett.* 122, 013601 (2019).
17. I. Agresti, D. Poderini, **G. Carvacho**, L. Sarra, R. Chaves and F. Sciarrino, "Experimental semi-device-independent tests of quantum channels", *Quantum Science and Technologies* (2019).
18. D. Cozzolino, E. Polino, M. Valeri, **G. Carvacho**, D. Bacco, N. Spagnolo, L. K. Oxenlowe and

- F. Sciarrino, "Air-core fiber distribution of hybrid vector vortex-polarization entangled states", *Advanced Photonics* 1, 046005 (2019).
19. D. Poderini, R. Chaves, I. Agresti, **G. Carvacho**, F. Sciarrino, "Exclusivity graph approach to Instrumental inequalities", *Proceedings of Conference on Uncertainty in Artificial Intelligence (UAI)* (2019).
 20. T. Giordani, D. J. Brod, C. Esposito, N. Viggianiello, M. Romano, F. Flamini, **G. Carvacho**, N. Spagnolo, E. F. Galvao and F. Sciarrino, "Experimental quantification of genuine four-photon indistinguishability", *New Journal of physics* 22, 043001 (2020).
 21. I. Agresti, D. Poderini, L. Guerini, M. Mancusi, **G. Carvacho**, L. Aolita, D. Cavalcanti, R. Chaves and F. Sciarrino, "Experimental device-independent certified randomness generation with an instrumental causal structure", *Communication Physics* 3, 110 (2020).
 22. D. Poderini, I. Agresti, G. Marchese, E. Polino, T. Giordani, A. Suprano, M. Valeri, G. Milani, N. Spagnolo, **G. Carvacho**, R. Chaves and F. Sciarrino, "Experimental violation of n-locality in a star quantum network", *Nature Communications* 11, 2467 (2020).
 23. F. Basso Basset, M. Valeri, E. Roccia, V. Muredda, D. Poderini, J. Neuwirth, N. Spagnolo, M. Rota, S. F. Covre da Silva, **G. Carvacho**, F. Sciarrino and R. Trotta, "Quantum key distribution with entangled photons generated on-demand by a quantum dot", *Science Advances* eabe6379 (2021).
 24. I. Agresti, B. Polacchi, D. Poderini, E. Polino, A. Suprano, I. Supic, J. Bowles, **G. Carvacho**, D. Cavalcanti and F. Sciarrino, "Experimental robust self-testing on the state generated by a quantum network", *PRX Quantum* 2, 020346 (2021).
 25. T. Giordani, C. Esposito, F. Hoch, **G. Carvacho**, D. J. Brod, E. F. Galvao, N. Spagnolo and F. Sciarrino, "Witnesses of coherence and dimension from multiphoton indistinguishability tests", *Physical Review Research* 3, 023031 (2021).
 26. R. Chaves, G. Moreno, E. Polino, D. Poderini, I. Agresti, A. Suprano, M. R. Barros, **G. Carvacho**, E. Wolfe, A. Canabarro, R. W. Spekkens and F. Sciarrino, "Causal networks and freedom of choice in Bell's theorem", *PRX Quantum* 2, 040323 (2021).
 27. F. Hoch, S. Piacentini, T. Giordani, Z.-N. Tian, M. Iuliano, C. Esposito, A. Camillini, **G. Carvacho**, F. Ceccarelli, N. Spagnolo, A. Crespi, F. Sciarrino and R. Osellame, "Reconfigurable continuously-coupled 3D photonic circuit for Boson Sampling experiments", *npj Quantum Information* 8, 55 (2022).
 28. **G. Carvacho**, E. Roccia, M. Valeri, F. Basso Basset, D. Poderini, C. Pardo, E. Polino, L. Carosini, M. B. Rota, J. Neuwirth, S. F. Covre da Silva, A. Rastelli, N. Spagnolo, R. Chaves, R. Trotta and F. Sciarrino "Quantum violation of local causality in urban network with hybrid photonic technologies", *Optica* 9, Issue 5, pp. 572-578 (2022).
 29. I. Agresti, D. Poderini, B. Polacchi, N. Miklin, M. Gachechiladze, A. Suprano, E. Polino, G. Milani, **G. Carvacho**, R. Chaves and F. Sciarrino, "Experimental test of quantum causal influences", *Science Advances* 8, eabm1515 (2022).
 30. A. Suprano, D. Poderini, E. Polino, I. Agresti, **G. Carvacho**, A. Canabarro, E. Wolfe, R. Chaves and F. Sciarrino, "Experimental genuine tripartite nonlocality in a quantum triangle network", *arXiv preprint arXiv:2204.00388* (2022).

Proceedings

- C. Esposito, **G. Carvacho**, M. Barros, A. D. Hernandez, F. Cardano, N. Spagnolo, L. Marrucci and F. Sciarrino, "Two dimensional multiphoton Quantum Walk in transverse momentum of light", Bulletin of the American Physical Society, *American Physical Society* (18th March 2021).

- D. Cozzolino, E. Polino, M. Valeri, **G. Carvacho**, D. Bacco, N. Spagnolo, L. K. Oxenlowe and F. Sciarrino, "Towards hybrid entanglement distribution with an orbital angular momentum supporting fiber", Quantum Information and Measurement, *Optical Society of America* (4th April 2019).
- I. Agresti, **G. Carvacho**, D. Poderini, L. Aolita, R. Chaves and F. Sciarrino, "Experimental Connection between the Instrumental and Bell Inequalities", *Multidisciplinary Digital Publishing Institute Proceedings* 12, pp. 27 (2019).
- A. Crespi, M. Bentivegna, I. Pitsios, D. Rusca, D. Poderini, **G. Carvacho**, V. D'Ambrosio, A. Cabello, F. Sciarrino and R. Osellame, "Integrated-optics circuits for validation of non-classicality", European Quantum Electronics Conference, *Optical Society of America* (25th June 2017).

Thesis Direction

- **Toward free-space quantum communication with entangled photon pairs**, Valerio Muredda (2020)
- **Boson Sampling in a 3D continuous coupling integrated photonic device**, Anita Camillini (2020)
- **Experimental implementation of Quantum Switch via q-plate devices**, Enrico Vignola (2019)
- **Quantum walk**, Mario Roggi (2022)
- **Quantum key distribution**, Francesco Sirovich (2022)