

FRANCESCO HOCH

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EDUCATION

SEPTEMBER 2009 – AUGUST 2014

ELECTROTECHNICAL EXPERT DIPLOMA

Istituto IIS Pascal, Manerbio (BS)

Final Grade: 100/100

SEPTEMBER 2014 – SEPTEMBER 2017

BACHELOR'S DEGREE IN PHYSICS

Università di Pisa (Italy), Physics Department

Supervisor: Prof. Alberto Di Lieto

Title: Revelation of optical tunnel effect with microwave

Final Grade: 110/110 with honours

SEPTEMBER 2017 - OCTOBER 2019

MASTER DEGREE IN MATTER PHYSICS

Università di Pisa (Italy), Physics Department

Supervisor: Prof. Fabio Sciarrino (Università la Sapienza, Roma (Italy))

Title: Characterization of photonics technology for quantum information

Final Grade: 110/110

SEPTEMBER 2014 – FEBRUARY 2021

DIPLOMA AT THE SCUOLA NORMALE SUPERIORE DI PISA

Scuola Normale Superiore, Pisa (Italy)

Supervisor: Prof. Vittorio Giovannetti

Title: Experimental proposal of a quantum-to-quantum Bernoulli factory

Final Grade: 100/100 with honours

NOVEMBER 2019 – MAGGIO 2023

PHD PROGRAM IN PHYSICS

Università Sapienza, Roma (Italy)

Supervisor: Prof. Fabio Sciarrino

Title: Integrated optics for quantum information and quantum computation

FEBRUARY 2023 – ONGOING

RESEARCH GRANT

Università Sapienza, Roma (Italy)

Supervisor: Prof. Fabio Sciarrino

Title: Quantum information processing con quantum dots e integrated photonics

SCIENTIFIC PUBLICATIONS

1. Witnesses of coherence and dimension from multiphoton indistinguishability tests

Taira Giordani, Chiara Esposito, **Francesco Hoch**, Gonzalo Carvacho, Daniel J. Brod, Ernesto F. Galvão, Nicolò Spagnolo, and Fabio Sciarrino, Phys. Rev. Research 3, 023031 – Published 9 April 2021

2. Reconfigurable continuously-coupled 3D photonic circuit for Boson Sampling experiments

Francesco Hoch, Simone Piacentini, Taira Giordani, Zhen-Nan Tian, Mariagrazia Iuliano, Chiara Esposito, Anita Camillini, Gonzalo Carvacho, Francesco Ceccarelli, Nicolò Spagnolo, Andrea Crespi, Fabio Sciarrino, Roberto Osellame, npj Quantum Information volume 8, Article number: 55 (2022)

3. Characterization of multimode linear optical networks

Francesco Hoch, Taira Giordani, Nicolò Spagnolo, Andrea Crespi, Roberto Osellame, Fabio Sciarrino, Advanced Photonics Nexus, Vol. 2, Issue 1, 016007 (2023)

4. Integrated photonics in quantum technologies

Taira Giordani, **Francesco Hoch**, Gonzalo Carvacho, Nicolò Spagnolo, Fabio Sciarrino, La Rivista del Nuovo Cimento volume 46, pages71–103 (2023)

5. Experimental multiparameter quantum metrology in adaptive regime

Mauro Valeri, Valeria Cimini, Simone Piacentini, Francesco Ceccarelli, Emanuele Polino, **Francesco Hoch**, Gabriele Bizzarri, Giacomo Corrielli, Nicolò Spagnolo, Roberto Osellame, Fabio Sciarrino, Phys. Rev. Research 5, 013138 –23 February 2023

6. Experimental metrology beyond the standard quantum limit for a wide resources range

Valeria Cimini, Emanuele Polino, Federico Belliardo, **Francesco Hoch**, Bruno Piccirillo, Nicolò Spagnolo, Vittorio Giovannetti, Fabio Sciarrino, npj Quantum Information volume 9, Article number: 20 (2023)

7. Generation of high-dimensional qudit quantum states via two-dimensional quantum walks

Chiara Esposito, Francesco Di Colandrea, **Francesco Hoch**, Gonzalo Carvacho, Filippo Cardano, Nicolò Spagnolo, Lorenzo Marrucci, Fabio Sciarrin, Phys. Rev. Research 5, 043025 – Published October 2023

8. Experimental certification of contextuality, coherence, and dimension in a programmable universal photonic processor

Taira Giordani, Rafael Wagner, Chiara Esposito, Anita Camillini, **Francesco Hoch**, Gonzalo Carvacho, Ciro Pentangelo, Francesco Ceccarelli, Simone Piacentini, Andrea Crespi, Nicolò Spagnolo, Roberto Osellame, Ernesto F Galvão, Fabio Sciarrino, Science Advances 9, Article number: 44 (2023)

9. Optimizing quantum-enhanced Bayesian multiparameter estimation of phase and noise in practical sensors

Federico Belliardo, Valeria Cimini, Emanuele Polino, **Francesco Hoch**, Bruno Piccirillo, Nicolò Spagnolo, Vittorio Giovannetti, Fabio Sciarrino, Phys. Rev. Research 6, 023201 – Published May 2024

10. Polarization-encoded photonic quantum-to-quantum Bernoulli factory based on a

quantum dot source

Giovanni Rodari, **Francesco Hoch**, Alessia Suprano, Taira Giordani, Elena Negro, Gonzalo Carvacho, Nicolò Spagnolo, Ernesto F Galvão, Fabio Sciarrino, *Science Advances* **10**, Article number: 30 (2024)

11. Modular quantum-to-quantum Bernoulli factory in an integrated photonic processor

Francesco Hoch, Taira Giordani, Luca Castello, Gonzalo Carvacho, Nicolò Spagnolo, Francesco Ceccarelli, Ciro Pentangelo, Simone Piacentini, Andrea Crespi, Roberto Osellame, Ernesto F Galvão, Fabio Sciarrino, *Nature Photonics* (2024)

PREPRINT

1. Quantum teleportation of a genuine vacuum-one-photon qubit generated via a quantum dot source

Beatrice Polacchi, **Francesco Hoch**, Giovanni Rodari, Stefano Savo, Gonzalo Carvacho, Nicolò Spagnolo, Taira Giordani, Fabio Sciarrino, arXiv:2310.20521

2. Semi-device independent characterisation of multiphoton indistinguishability

Giovanni Rodari, Leonardo Novo, Riccardo Albiero, Alessia Suprano, Carlos T Tavares, Eugenio Caruccio, **Francesco Hoch**, Taira Giordani, Gonzalo Carvacho, Marco Gardina, Niki Di Giano, Serena Di Giorgio, Giacomo Corrielli, Francesco Ceccarelli, Roberto Osellame, Nicolò Spagnolo, Ernesto F Galvão, Fabio Sciarrino, arXiv:2404.18636

3. Variational quantum cloning machine on a photonic integrated interferometer

Francesco Hoch, Giovanni Rodari, Eugenio Caruccio, Beatrice Polacchi, Gonzalo Carvacho, Taira Giordani, Mina Doosti, Sebastia Nicolau, Ciro Pentangelo, Simone Piacentini, Andrea Crespi, Francesco Ceccarelli, Roberto Osellame, Ernesto F Galvão, Nicolò Spagnolo, Fabio Sciarrino, arXiv:2407.06026

4. Variational approach to photonic quantum circuits via the parameter shift rule

Francesco Hoch, Giovanni Rodari, Taira Giordani, Paul Perret, Nicolò Spagnolo, Gonzalo Carvacho, Ciro Pentangelo, Simone Piacentini, Andrea Crespi, Francesco Ceccarelli, Roberto Osellame, Fabio Sciarrino, arXiv:2410.06966

4. Experimental observation of counter-intuitive features of photonic bunching

Giovanni Rodari, Carlos Fernandes, Eugenio Caruccio, Alessia Suprano, **Francesco Hoch**, Taira Giordani, Gonzalo Carvacho, Riccardo Albiero, Niki Di Giano, Giacomo Corrielli, Francesco Ceccarelli, Roberto Osellame, Daniel J Brod, Leonardo Novo, Nicolò Spagnolo, Ernesto F Galvão, Fabio Sciarrino, arXiv:2410.15883

COMPUTER SKILLS

OPERATING SYSTEMS

Windows, Linux

PROGRAMMING LANGUAGES

C/C++, Python

2

LIBRARIES

Numerical Libraries (Numpy, Scipy, etc); Machine Learning Frameworks (Tensorflow, Keras)

GRAPHIC SOFTWARE

Inkscape

OTHERS

Latex, Matlab, LabView, Microsoft Office Package, OpenOffice package

LANGUAGES

MOTHER TONGUE LANGUAGE

Italian

OTHER LANGUAGE

English

CONFERENCE AND PRESENTATIONS

APS March Meeting 2021 15-19 March 2021 **Poster contributions:** Witnesses of coherence and dimension from multiphoton indistinguishability tests.

Cargese School of Quantum information and Quantum technology 21-25 June 2021 **Poster contributions:** Witnesses of coherence and dimension from multiphoton indistinguishability tests.

The Bristol Quantum Information Technologies Workshop 24-27 April 2023 **Poster contributions:** Characterization of multimode linear optical networks

Quantum Matter International Conference – QUANTUMatter 2024 7-10 May 2024 **Oral Talk:** Teleportation of a genuine single-rail vacuum/one-photon qubit generated via a quantum dot source

AQUIS 24 Sapporo 26-30 august 2024 **Poster contributions:** Photonic quantum-to-quantum Bernoulli factory

Autorizzo il **trattamento** dei miei **dati personali** ai sensi del Decreto Legislativo 196/2003, coordinato con il Decreto Legislativo 101/2018, e dell'art. 13 del GDPR (Regolamento UE 2016/679) ai fini della pubblicazione in Trasparenza Ateneo - Sapienza come da normativa vigente.