Alessia Suprano

Curriculum Vitae

Education

Academic studies

2018–Present **PhD-Physics**, *Universitá degli Studi di Roma "Sapienza" (Rome, Italy)* Supervisor: Fabio Sciarrino and Paolo Mataloni

2016–2018 **Master degree in Physics of Matter**, *Universitá degli Studi di Roma "Sapienza"* (*Rome, Italy*) Final grade: 110/110 cum Laude

Masters Thesis

Title Ingegnerizzazione di stati quantistici tramite quantum walk in momento angolare

- Supervisor Fabio Sciarrino
- Description In this thesis a quantum walks in the orbital angular momentum degree of freedom of photons is implemented and is exploitated for d-dimensional quantum state engineering.
- 2013–2016 **Bachelor degree in Physics**, *Universitá degli Studi di Roma Sapienza (Rome, Italy)* Final grade: 110/110 cum Laude Title: Fenomeni di coerenza in ottica e statistica della radiazione Supervisor: Paolo Mataloni

Pre-university studies

2008–2013 Experimental scientific high school diploma, Liceo Scientifico Statale "Enrico Fermi" (Gaeta, Italy) Final grade: 100/100

Principal topics of my PhD thesis

- Generation, transmission and measurement of quantum states carrying Orbital Angular Momentum: generation of arbitrary high-dimensional quantum states encoded in the Orbital Angular Momentum degree of freedom through a Quantum Walk based platform. Investigation of structured light in both orbital angular momentum and polarization distribution propagating in scattering media such as latex beads in the water solution and tissue-mimicking phantoms.
- Machine Learning for quantum information: employment of machine learning techniques and optimization algorithms to detect Orbital Angular Momentum states and perform real-time optimizations of quantum information protocols.
- **Quantum Nonlocality:** experimental implementation of different causal structures that show nonlocality through quantum systems.

• **Sources of entangled photon pairs:** realization of entangled sources based on Sagnac interferometer at 808nm wavelengths, exploiting periodically poled crystals.

Awards

- 2013-2014 University taxes exoneration Studente Meritevole
- 2018-2021 Borsa di Dottorato offered by Sapienza Università di Roma
- 2020-2021 Progetti per Avvio alla Ricerca offered by Sapienza Università di Roma (importo: 1000 Euro)

Outreach activities

- 2018-Present **Member of RAYS (Rome Association of Young Scientist)**, *RAYS is Sapienza* student chapter and is supported by the societies OSA (Optical Society of America) and SPIE (International Society for Optics)
 - 2019-2020 Secretary of OSA Sapienza Student chapter, The chapter is supported by the american society OSA (The Optical Society).
 - 3rd April **Organization with RAYS of the workshop Quantum Leap: from Academia to** 2019 **industry**, event with the goal to give an overview over the job opportunities after PhD studies
 - 2018 Scientific divulgation in high schools with RAYS, *Rome, Italy* • Istituto paritario Sant'Apollinare

Computer skills

Operating
SystemsWindows, LinuxProgramming
LanguagesC/C++, PythonLibrariesSciPy library, TensorFlow, KerasOther
SoftwareOrigin, Mathematica, LATEX, MATLAB, Microsoft Office package, OpenOffice packageGraphicsInkscapeComputer
CertificationECDL (European Computer Driving Licence)

Languages

Italian Mothertongue English Fluent French A2

School attended

- 3–7 July 2017 Master School on New Frontiers in Optical Trapping and Optical Manipulation ICFO
 - 6–7 May Machine Learning for Quantum Technology School 2019 Max Planck Institute for the Science of Light
 - 30 Quantum devices for non-classical light generation and manipulation, -Poster
- September–5 presentation:"Engineering of Quantum States through Quantum Walk in the Angular October 2019 Momentum"

Ettore Majorana foundation and centre for scientific culture (Erice)

 21-25 June Cargese School of Quantum Information and Quantum Technology, -Poster
 2021 presentation: "Engineering and characterization of Orbital Angular Momentum states", Cargese Scientific Institute (Cargese)

Conference and Workshop attended

- 5–7 Engineering of Quantum Emitter Properties
- December University of Rome Sapienza
 - 2018
- 4–6 April Quantum Information and Measurement QIM V: Quantum Technologies, Poster
 2019 presentation: "Engineering of quantum states through quantum walk in the angular momentum", University of Rome Sapienza
- 6–10 May Machine Learning for Quantum Technology Workshop, -Contributed talk: "Ex 2019 perimental Protocol for Quantum State Engineering through one-dimensional Quantum Walk", Max Planck Institute for the Science of Light
 - 17-20 Causality in the quantum world: harnessing quantum effects in causal inference
- September **problems**, -Poster presentation: "Experimental Protocol for Quantum State Engineer-2019 ing through one-dimensional Quantum Walk" Anacapri
- 20-21 Jenuary 2020 **Quantum Technologies within INFN: status and perspectives**, -Contributed talk: 2020 "Certification of multi-photon experiments and Engineering and characterization of structured light" University of Padova
- 25 June 2020 **Photonic Online Meet-up**, *-Poster presentation: "Engineering and characterization of structured light"* Online
 - 28 Young IQIS 2020, -Contributed talk: "Manipulation and reconstruction of high-

September-2 dimensional states "

October 2020 Online

6-11 March SPIE Photonics West (OPTO), - Contributed talk: "Engineering and characterization 2021 of high-dimensional states" Online

- 6-11 March SPIE Photonics West (BIOS), Contributed talk:"Characterization of the transmis-2021 sion of structured light in scattering media" Online
- 15-19 March APS March Meeting 2021, Contributed talk: "Manipulation and reconstruction of 2021 structured light" Online
 - 9-14 May
 2021 CLEO Laser Science to Photonics Applications, Poster presentation: "Detection techniques of Orbital Angular Momentum states"
 Online
 - 18-20 May
 2021 Twinning in non-gaussian physics for quantum technology, Poster presen 2021 tation: "Experimental Engineering and Machine Learning-based detection of Orbital Angular Momentum states"
 Online
- 1-5 November **Quantum Information and Measurement QIM VI: Quantum Technologies**, -2021 *Contributed talk: "Real-time optimization of quantum stateengineering protocol"* Online

Publications

- Giordani Taira, Polino Emanuele, Emiliani Sabrina, Suprano Alessia, Innocenti Luca, Majury Helena, Marrucci Lorenzo, Paternostro Mauro, Ferraro Alessandro, Spagnolo Nicolò and Sciarrino Fabio. Experimental Engineering of Arbitrary Qudit States with Discrete-Time Quantum Walks, Phys. Rev. Lett., American Physical Society, 2019, 122, 020503
- Taira Giordani, Alessia Suprano, Emanuele Polino, Francesca Acanfora, Luca Innocenti, Alessandro Ferraro, Mauro Paternostro, Nicoló Spagnolo and Fabio Sciarrino. Machine Learning-Based Classification of Vector Vortex Beams, Phys. Rev. Lett., American Physical Society, 2020, 124, 160401
- Ilaria Gianani, Alessia Suprano, Taira Giordani, Nicoló Spagnolo, Fabio Sciarrino, Dimitris Gorpas, Vasilis Ntziachristos, Katja Pinker, Netanel Biton, Judy Kupferman and Shlomi Arnon. Transmission of vector vortex beams in dispersive media. Advanced Photonics, 2020, 2(3), 036003
- Davide Poderini, Iris Agresti, Guglielmo Marchese, Emanuele Polino, Taira Giordani, Alessia Suprano, Mauro Valeri, Giorgio Milani, Nicoló Spagnolo, Gonzalo Carvacho, Rafael Chaves and Fabio Sciarrino. Experimental violation of n-locality in a star quantum network. Nature Communications, 2020, 11, 2467
- Alessia Suprano, Taira Giordani, Ilaria Gianani, Nicoló Spagnolo, Katja Pinker, Judy Kupferman, Shlomi Arnon, Uwe Klemm, Dimitris Gorpas, Vasilis Ntziachristos and Fabio Sciarrino. Propagation of structured light through tissue-mimicking phantoms. Optics Express, 2020, 28, 35427-35437
- Taira Giordani, Luca Innocenti, **Alessia Suprano**, Emanuele Polino, Mauro Paternostro, Nicolò Spagnolo, Fabio Sciarrino and Alessandro Ferraro. Entanglement transfer, accumulation and retrieval via quantum-walk-based qubit–qudit dynamics. **New Journal of Physics**, *2021*, 23(2),023012
- Alessia Suprano, Danilo Zia, Emanuele Polino, Taira Giordani, Luca Innocenti, Mauro Paternostro, Alessandro Ferraro, Nicolò Spagnolo and Fabio Sciarrino. Enhanced detection techniques of orbital angular momentum states in the classical and quantum regimes. New Journal of Physics, 2021,

23, 073014

- Iris Agresti, Beatrice Polacchi, Davide Poderini, Emanuele Polino, Alessia Suprano, Ivan Šupić, Joseph Bowles, Gonzalo Carvacho, Daniel Cavalcant and, Fabio Sciarrin. Experimental robust self-testing of the state generated by a quantum network. PRX Quantum, 2021, 2, 020346
- Rafael Chaves, George Moreno, Emanuele Polino, Davide Poderini, Iris Agresti, Alessia Suprano, Mariana R Barros, Gonzalo Carvacho, Elie Wolfe, Askery Canabarro, Robert W Spekkens, Fabio Sciarrino. Causal networks and freedom of choice in Bell's theorem. PRX Quantum, 2021, 2, 040323
- Iris Agresti, Davide Poderini, Beatrice Polacchi, Nikolai Miklin, Mariami Gachechiladze, Alessia Suprano, Emanuele Polino, Giorgio Milani, Gonzalo Carvacho, Rafael Chaves and Fabio Sciarrino. Experimental test of quantum causal influences. Science Advances, (in press)
- Davide Poderini, Emanuele Polino, Giovanni Rodari, Alessia Suprano, Rafael Chaves and Fabio Sciarrino. Ab-initio experimental violation of Bell inequalities. Phys. Rev. Research, American Physical Society, (in press)
- Alessia Suprano, Danilo Zia, Emanuele Polino, Taira Giordani, Luca Innocenti, Alessandro Ferraro, Mauro Paternostro, Nicolò Spagnolo and Fabio Sciarrino, Dynamical learning of a photonics quantum state-engineering process. Advanced Photonics, (in press)

Proceedings Contributions

- Alessia Suprano, Taira Giordani, Emanuele Polino, Danilo Zia, Sabrina Emiliani, Francesca Acanfora, Luca Innocenti, Helena Majury, Lorenzo Marrucci, Alessandro Ferraro, Mauro Paternostro, Nicolò Spagnolo and Fabio Sciarrino. Engineering and characterization of high-dimensional states. Proc. SPIE 11699, Quantum Computing, Communication, and Simulation, 1169917, 2021
- Taira Giordani, Emanuele Polino, Sabrina Emiliani, Alessia Suprano, Nicoló Spagnolo, Fabio Sciarrino, Luca Innocenti, Helena Majury, Mauro Paternostro, Alessandro Ferraro, Lorenzo Marrucci. Engineering of Quantum States through Quantum Walk in the Angular Momentum. Quantum Information and Measurement, F5A. 48 2019

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