






Marco Scigliuzzo, MSc

 16th January 1987, Italy 

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I am a physicist interested in quantum optics, with experience in superconducting circuits, from design to fabrication, measurements and data analysis. My work focuses on unveiling nonclassical effects with hybrid quantum systems.



Employment History









2021 – Present  **Post doc** Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland.
Supervisor: prof. Tobias J. Kippenberg (1 month break for parental leave)

Education




- 2016 – 2021  **Graduate Student**, Chalmers University of Technology, Sweden. Supervisor: Per Delsing
Thesis: *Effects of the environment on quantum systems.*  ISBN: 978-91-7905-534-9 .
- 2010 – 2016  **M.Sc. Physics**, University of Salento, Italy. 110/110 Laude. Supervisor: Giuseppe Maruccio
Thesis: *Optimization of SAW filters and resonators*  doi:10.13140/RG.2.2.27702.19521.
- 2006 – 2010  **ISUFI License**, University of Salento, Italy. 100/100. Supervisor: Dario Pisignano
Thesis: *Realization and modeling of aqueous electrospun microjets* (in Italian)
- 2006 – 2009  **B.Sc. Physics**, University of Salento, Italy. 110/110 Laude. Supervisor: Luigi Martina
Thesis: *Vortexes in quantum fluids* (in Italian)

Competences

Prototyping and Simulation





- Microwave  Parametric electrostatic and electromagnetic simulation for circuits and sample holders design (electrodes capacitance, capacitive coupling, box and chips modes)
 Cmsol Multiphysics, 
- Acoustic  Quasistatic electro-mechanic simulation for surface and bulk acoustic wave generation by superconducting circuit in the GHz range
- Thermal  Thermalization dynamics and thermal gradient in cryogenic environment
- CAD  Lithography circuits patterns, sample holder and cryo-parts 3D design
 Autocad,  Solidworks

Fabrication









- Lithography  Fabrication of superconducting circuits based on Josephson Junctions with Lift Off and wet etching. Optical and Electron Beam Lithography, Electron beam metal deposition and Manhattan procedure Josephson Junction.
- Metrology  Standard characterization instrument: Scanning Electron microscopy (SEM), Atomic Force Microscopy (AFM), Optical Microscope, Profilometers.
- Chip  Wafer cliving or dicing machine (for GaAs or Si). Aluminium ultrasound bonder.

Competences (continued)







Cryogenic and Microwave Equipment

- Set-up  Coherent and pulsed **microwave resonators and qubits** setup: Vector Network Analyzer (VNA), up-down conversion board, arbitrary waveform (AWG) and Analog to digital converter (ADC), DC source for superconducting coil.
Software:  Labber
- Protocols  Single and multi-qubits characterization and control.
- Cryogenic  Operation, custom modification and maintenance of **Dilution refrigerator** (BF LD250).

Data Analysis and Programming

- Analysis  **Theory** Derive Hamiltonian and solve the dynamics for small scale superconducting circuits, including experimental non-idealities or fabrication scattering.
Data Process Model adaptation to measured data, device parameter extraction
Software:  Mathematica,  Python,  Matlab
- Languages  **Python** *Proficient* Instruments drivers, Data analysis and visualization. Elementary knowledge of quantum oriented libraries:  QuTip,  scQubits,  Qiskit Metal
C and C++ *Intermediate* Micro controller programming and solving simple algebraic or differential equations with parallel processing (MPI library)
Unix Bash *Intermediate* Scripts for file processing and computer maintenance.
HTML *Elementary* Basic syntax with little knowledge of CSS.

Visual and written production

- Images   **InkScape** *Intermediate* Scientific drawing of info-grafic
 **Gimp** *Elementary* Basic command for image manipulation
- Videos   **Blender** *Elementary* Short animations for didactic purpose and video editing.
- Text  **LaTeX** *Proficient* Focus on scientific text (research articles)

Research Publications, Conference Talk and dissemination

Publication **Metrics:** Citations 317, H-index 8, i10-Index 8 (retrieved from *Google Scholar* on January 9, 2023)

Journal Articles





- 1** Aamir, M. A., Moreno, C. C., Sundelin, S., Biznárová, J., **Scigliuzzo, M.**, Patel, K. E., ... Gasparinetti, S. (2022). Engineering Symmetry-Selective Couplings of a Superconducting Artificial Molecule to Microwave Waveguides. *Physical Review Letters*, 129(12), 123604.
 doi:10.1103/PhysRevLett.129.123604
- 2** **Scigliuzzo, M.**, Calajò, G., Ciccarello, F., Perez Lozano, D., Bengtsson, A., Scarlino, P., ... Gasparinetti, S. (2022). Controlling Atom-Photon Bound States in an Array of Josephson-Junction Resonators. *Physical Review X*, 12(3), 031036.  doi:10.1103/PhysRevX.12.031036
- 3** Kudra, M., Kervinen, M., Strandberg, I., Ahmed, S., **Scigliuzzo, M.**, Osman, A., ... Gasparinetti, S. (2022). Robust Preparation of Wigner-Negative States with Optimized SNAP-Displacement Sequences. *PRX Quantum*, 3(3), 030301.  doi:10.1103/PRXQuantum.3.030301
- 4** Andersson, G., Jolin, S. W., **Scigliuzzo, M.**, Borgani, R., Tholén, M. O., Rivera Hernández, J., ... Delsing, P. (2022). Squeezing and Multimode Entanglement of Surface Acoustic Wave Phonons. *PRX Quantum*, 3(1), 010312.  doi:10.1103/PRXQuantum.3.010312

- 5 Lu, Y., Bengtsson, A., Burnett, J. J., Suri, B., Sathyamoorthy, S. R., Nilsson, H. R., ... Delsing, P. (2021). Quantum efficiency, purity and stability of a tunable, narrowband microwave single-photon source. *npj Quantum Information*, 7(1). [doi:10.1038/s41534-021-00480-5](https://doi.org/10.1038/s41534-021-00480-5)
- 6 Andersson, G., Bilobran, A. L. O., **Scigliuzzo, M.**, de Lima, M. M., Cole, J. H., & Delsing, P. (2021). Acoustic spectral hole-burning in a two-level system ensemble. *npj Quantum Information*, 7(1), 1–5. [doi:10.1038/s41534-020-00348-0](https://doi.org/10.1038/s41534-020-00348-0)
- 7 Osman, A., Simon, J., Bengtsson, A., Kosen, S., Krantz, P., P. Lozano, D., ... Fadavi Roudsari, A. (2021). Simplified Josephson-junction fabrication process for reproducibly high-performance superconducting qubits. *Applied Physics Letters*, 118(6), 064002. [doi:10.1063/5.0037093](https://doi.org/10.1063/5.0037093)
- 8 **Scigliuzzo, M.**, Bengtsson, A., Besse, J.-C., Wallraff, A., Delsing, P., & Gasparinetti, S. (2020). Primary Thermometry of Propagating Microwaves in the Quantum Regime. *Physical Review X*, 10(4), 041054. [doi:10.1103/PhysRevX.10.041054](https://doi.org/10.1103/PhysRevX.10.041054)
- 9 **Scigliuzzo, M.**, Bruhat, L. E., Bengtsson, A., Burnett, J. J., Roudsari, A. F., & Delsing, P. (2020). Phononic loss in superconducting resonators on piezoelectric substrates. *New Journal of Physics*, 22(5), 053027. [doi:10.1088/1367-2630/ab8044](https://doi.org/10.1088/1367-2630/ab8044)
- 10 Burnett, J. J., Bengtsson, A., **Scigliuzzo, M.**, Niepce, D., Kudra, M., Delsing, P., & Bylander, J. (2019). Decoherence benchmarking of superconducting qubits. *npj Quantum Information*, 5(1), 1–8. [doi:10.1038/s41534-019-0168-5](https://doi.org/10.1038/s41534-019-0168-5)
- 11 Maruccio, C., **Scigliuzzo, M.**, Rizzato, S., Scarlino, P., Quaranta, G., Chiriaco, M. S., ... Maruccio, G. (2019). Frequency and time domain analysis of surface acoustic wave propagation on a piezoelectric gallium arsenide substrate: A computational insight. *Journal of Intelligent Material Systems and Structures*, 30(6), 801–812. [doi:10.1177/1045389X18803461](https://doi.org/10.1177/1045389X18803461)
- 12 Rizzato, S., **Scigliuzzo, M.**, Chiriaco, M. S., Scarlino, P., Monteduro, A. G., Maruccio, C., ... Maruccio, G. (2017). Excitation and time resolved spectroscopy of SAW harmonics up to GHz regime in photolithographed GaAs devices. *Journal of Micromechanics and Microengineering*, 27(12), 125002. [doi:10.1088/1361-6439/aa8186](https://doi.org/10.1088/1361-6439/aa8186)


Contributed Talks

- 1 APS -APS March Meeting 2019 - Event - Phononic Losses in Superconducting Coplanar Waveguide Resonators on Piezoelectric Substrates. (n.d.), In *Bulletin of the American Physical Society* (Vol. Volume 64, Number 2). Retrieved April 19, 2021, from <https://meetings.aps.org/Meeting/MAR19/Session/K26.14>
- 2 APS -APS March Meeting 2021 - Event - Probing nonlinear photon scattering with artificial atoms coupled to a slow-light waveguide. (n.d.), In *Bulletin of the American Physical Society*. Retrieved April 19, 2021, from <https://meetings.aps.org/Meeting/MAR21/Session/P28.8>








Teaching Activities

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|-------------|---|
| 2019 – 2019 |  Chalmers WACQT PhD Program: Hands-on Quantum Technology
Laboratory Sessions measuring decoherence of qubit and reports Correction |
| 2016 – 2019 |  Chalmers Master Program: Superconductivity and Low Temperature Physics
Hand-ins and Exams Correction. High- T_c SQUID lab session |
| 2017 – 2020 |  Chalmers Master Program: Quantum Optics and Quantum Informatics
Tutotial Classes, Laboratory Sessions, Hand-ins Correction |
| 2017 – 2018 |  Chalmers Master Program: Modeling and fabrication of micro/nanodevices
Cleanroom tutorial for small groups |






Teaching Activities (continued)

- 2017 – 2019  **Chalmers Bachelor Program: Physics and chemistry for civil engineers**
Elementary thermodynamics Tutorial Classes and exercise correction





Supervision

- 2022–Now  Hugo **Arbez** (Master student). Q-codes control of Quantum machines hardware. *EPFL*.
- 2021–Now  Amir **Youssefi** (PhD student). Microwave Optomechanics . *EPFL*.
-  Mahdi **Chegnizadeh** (PhD student). Microwave superconducting circuits . *EPFL*.
-  Evgenii **Guzovskii** (PhD student). traveling wave amplifiers for cQED *EPFL*.
-  Hao **Li** (PhD student). Microwave simulation for cQED. *EPFL*.
- 2019–2020  Kowshik E. **Patel** (Master). Engineering decay rates of Hybridised modes in Superconducting circuits. *Chalmers University*.
- 2017–2018  Vukan **Levajac** (Master). Measuring Coherence of a Coaxmon. *Chalmers University*.

Award and Scholarship


- 2016  **Research and Innovation Award**. *University of Salento*. Best Master Thesis of the year.
- 2011  **LLP/Erasmus Scholarship**. *University of Salento*. 5 months placement program in Oxford University, United Kingdom.
- 2011–2013  **Full Scholarship, 2 years**, *University of Salento*. Master study in university institute ISUFI.
- 2006–2009  **Full Scholarship, 3 years**, *University of Salento*. Undergraduate study in university institute ISUFI (national selection).
- 2006  **Ranked in 4th place for 5 years Scholarship** *Italian Physics Society*, national selection. (declined because not compatible with college scholarship)

Languages


-  Italian *Mother-tongue*
-  English *Proficient*. Written and oral production with scientific focus.
-  French *Elementary*. Limited understanding and small vocabulary.
-  Swedish *Elementary*. Limited understanding and small vocabulary.

References


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