# Marco Scigliuzzo, MSc


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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 the effects of classical and quantum environments on mechanical and electrical quantum system.

## Education

2016 – now **Graduate Student** , *Chalmers University of Technology*, Sweden. Supervisor: Per Delsing
Thesis preliminary title: Effects of the environment on quantum systems.

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)
Comsol Multiphysics, SONNET

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.

### 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

## Competences (continued)

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 and Conference Talk

Publication **Metrics**: Citations 99, H-index 3, i10-Index 2 (retrieved from *Google Scholar* on August 10, 2021)

### Journal Articles


1. Osman, A., Simon, J., Bengtsson, A., Kosen, S., Krantz, P., Lozano, D., … Fadavi Roudsari, A. (2021). Simplified josephson-junction fabrication process for reproducibly high-performance superconducting qubits. *Applied Physics Letters*, *118*(6), 064002. Publisher: American Institute of Physics. doi:10.1063/5.0037093

2. 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. Number: 1 Publisher: Nature Publishing Group. doi:10.1038/s41534-020-00348-0

3. **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. Publisher: American Physical Society. doi:10.1103/PhysRevX.10.041054

4. **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. Publisher: IOP Publishing. doi:10.1088/1367-2630/ab8044

5. 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. Number: 1 Publisher: Nature Publishing Group. doi:10.1038/s41534-019-0168-5

6. 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. Publisher: SAGE Publications Ltd STM. doi:10.1177/1045389X18803461

7 Rizzato, S., **Scigliuzzo**, **M.**, Chiriacò, 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. Publisher: IOP Publishing. doi:10.1088/1361-6439/aa8186

### Submitted for publication

1 Andersson, G., Jolin, S. W., **Scigliuzzo**, **M.**, Borgani, R., Tholén, M. O., Haviland, D. B., & Delsing, P. (2020, July 11). *Squeezing and correlations of multiple modes in a parametric acoustic cavity*. arXiv: 2007.05826. Retrieved from http://arxiv.org/abs/2007.05826

### Contributed Talks

1 **Scigliuzzo**, **M.**, Calajò, G., Ciccarello, F., Lozano, D., Bengtsson, A., Scarlino, P., … Gasparinetti, S. (2021). Probing nonlinear photon scattering with artificial atoms coupled to a slow-light waveguide. APS march meeting. Retrieved from https://meetings.aps.org/Meeting/MAR21/Session/P28.8

2 **Scigliuzzo**, **M.**, Bruhat, L. E., Bengtsson, A., Burnett, J. J., Roudsari, A. F., & Delsing, P. (2019). Phononic losses in superconducting coplanar waveguide resonators on piezoelectric substrates. APS march meeting. Retrieved from https://meetings.aps.org/Meeting/MAR19/Session/K26.14

## Teaching Experience

Teaching Assistant — *Chalmers University of Technology*, Sweden.
*PhD program:* **Hands-on Quantum Technology** (2019-2020)
Laboratory Sessions measuring dechoerence of qubit and reports Correction
*Master Program:* **Quantum Optics and Quantum Informatics** (2017-2020)
Tutotial Classes, Laboratory Sessions, Hand-ins Correction
*Master Program:* **Superconductivity and Low Temperature Physics** (2016-2019)
Hand-ins and Exams Correction. High-$T_c$ SQUID lab session
*Bachelor Program:* **Physics and chemistry for civil engineers** (2017-2019)
Elementary thermodynamics Tutorial Classes and exercise correction
*Master Program:* **Modeling and fabrication of micro/nanodevices** (2017-2018)
Cleanroom tutorial for small groups

Student Supervision — *Chalmers University of Technology*, Sweden.
**Master student Supervision**: Vukan Levajac, Measuring Coherence of a Coaxmon (now @ TU Delft - QuTech)

## 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 $4^{th}$ place for 5 years Scholarship** *Italian Physics Society*, national selection. (declined because not compatible with college scholarship)

## Languages

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|---|---|
| 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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