

# Jean-Claude Besse

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Born: July 9, 1992

Nationality: Swiss

## Current position

2021-cur  
3 years *Senior Assistant*, ETH-PSI Quantum Computing Hub  
Superconducting Circuits Nano-Fabrication, Modular Quantum Computing, Quantum Optics and Communication.

## Areas of specialisation

Quantum Computing; Quantum Optics; Superconducting Circuits; Nano-Fabrication

## Past Appointments

2021-2021  
1 year *Postdoctoral Researcher*, ETH Zurich  
Quantum Device Lab / Andreas Wallraff.

## Education

2016-2021 *PhD*, ETH Zurich  
Thesis: *Generation, Manipulation, and Detection of Complex States of Microwave Radiation*. Andreas Wallraff, ETH Zurich.  
Awarded the ETH medal for outstanding PhD Thesis.

2013-2015 *MSc Physics*, ETH Zurich. GPA: 5.92/6.00  
Master thesis: *Design, optimization and measurements of 2D photonic crystals with high photon-phonon cooperativity*. Oskar Painter, Caltech.

Semester thesis: *Piezoelectric actuation of GaAs NEMS*. Ataç İmamoğlu, ETH Zurich.

2013 *International Diploma*, Imperial College London. GPA: 89/100  
Bachelor thesis: *Automated High-Resolution Structured Illumination Microscopy*.  
Peter Török, Imperial College.

2010-2013 *BSc Physics*, EPFL. GPA: 5.90/6.00. Second-best GPA award.  
Summer project: *External Cavity Diode Laser*. Tobias Kippenberg, EPFL.

## Publications & talks

22 published articles (2 Nature, 3 first-author publications), >1800 citations total and h-index of 17 on [Google Scholar](#). More than 20 contributed and invited talks.

### MAJOR ACHIEVEMENT 1

*Generation and detection of itinerant microwave radiation.*

In my PhD work, I led the effort on the detection [1] of individual itinerant microwave photons generated by a quantum source internally developed and characterized [2]. This work was extended to realize a parity detector that heralded propagating cat states of microwave light [3]. A clicking detector, sensitive to parity of the incoming radiation field, may prove useful in distributed error-corrected communication protocols.

[1] Besse, J.-C., Gasparinetti, S., Collodo, M. C., Walter, T., Kurpiers, P., Pechal, M., Eichler, C. and Wallraff, A. (2017). Single-Shot Quantum Nondemolition Detection of Individual Itinerant Microwave Photons. *Physical Review X* 8, 021003. [Open Access article](#).

[2] Pechal, M., Besse, J.-C., Mondal, M., Oppliger, M., Gasparinetti, S. and Wallraff, A. (2016). Superconducting Switch for Fast On-Chip Routing of Quantum Microwave Fields. *Physical Review Applied*, 6(2), 024009. [Article](#). [Open Access](#).

[3] Besse, J.-C., Gasparinetti, S., Collodo, M. C., Walter, T., Remm, A., Krause, J., Eichler, C. and Wallraff, A. (2020). Parity Detection of Propagating Microwave Fields. *Physical Review X* 10, 011046. [Open Access article](#).

### MAJOR ACHIEVEMENT 2

*Quantum networks.*

I have contributed, mostly in the nano-fabrication aspects, to a multi-year long effort geared at realizing non-local microwave quantum networks. This include the deterministic remote entanglement between superconducting qubits located physically on separated quantum devices [1], the engineering of a microwave quantum link allowing these two devices to be located in separate cryogenic systems [2], and the loophole-free experimental violation of a Bell-inequality with a solid-state system [3].

[1] Kurpiers, P., Magnard, P., Walter, T., Royer, B., Pechal, M., Heinsoo, J., Salathe, Y., Akin, A., Storz, S., Besse, J.-C., Gasparinetti, S., Blais, A., and Wallraff, A. (2018). Deterministic quantum state transfer and remote entanglement using microwave photons. *Nature*, 558, 264–267. [Open Access article](#).

[2] Magnard, P., Storz, S., Kurpiers, P., Schär, J., Marxer, F., Lütolf, J., Walter, T., Besse, J.-C., Gabureac, M., Reuer, K., Akin, A., Royer, B., Blais, A. and Wallraff, A. (2020). Microwave Quantum Link between

Superconducting Circuits Housed in Spatially Separated Cryogenic Systems. *Phys. Rev. Lett.*, 125, 260502. [Article](#). [Open Access](#).

[3] Storz, S., Schär, J., Kulikov, A., Magnard, P., Kurpiers, P., Lütolf, J., . . . Wallraff, A. (2023). Loophole-free Bell inequality violation with superconducting circuits. *Nature*, 617(7960), 265–270. [Open Access article](#).

## Teaching

Lecturer for postgraduate students at ETH Zurich, on *Quantum Science with Superconducting Circuits* (2x, ca. 40-80 students) and *Quantum Information Processing II: Implementations* (2x, ca. 100-150 students).

Teaching assistant for undergraduate students at EPFL and ETH Zurich on Informatique, Physik I, Physik II.

Supervision of ca. 12 semester and master theses.

## Services

Reviewer for PRX, PRX Quantum, Nature Communications, PRL, PRApplied, PRA, PRB, npjQI, ... (ca. 4 articles per year).