# Yoann **Piétri**

Post-Doctoral Researcher

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## Research activities

### Research interests

Continuous-Variable Quantum Key Distribution, Photonic Integrated Circuits for quantum applications, quantum communication infrastructures and networks, quantum cryptography beyond Quantum Key Distribution, overall integration of quantum communication systems, energetics of quantum information, practical security of Quantum Key Distribution.

### Research projects

**Open source software for CV-QKD (2021-2024):** programmation of a python software for experimental CV-QKD, including hardware control, advanced signal processing techniques, parameter estimation, secret key rate computation and classical communication. The software is highly modular, hardware-agnostic and has extensive documentation. It has been benchmarked with emulated distances, fiber spool and deployed fiber at metropolitan distances. This was done in the context of the QSNP project and led to the scientific publication [4]. It is now used for investigation of side-channel attacks and free space communications.

**Integrated devices for CV-QKD (2021-2024):** characterization and usage of a Si integrated receiver performing heterodyne dual-quadrature detection for CV-QKD. Benchmarked with emulated metropolitan distances. Led to the publication of [3]. Characterization of an InP-based phase-diverse dual quadrature receiver. Involved in the project of an InP-based transmitter (see [1]). This was done in the context of the QNSP project. Participated in the design of new integrated devices that are now expected in the QNSP project.

**Quantum Communication Infrastructure (2021-2024):** installation and characterization of fibers in the Paris region linking 8 nodes (total distance of around 200 km). Benchmark of the infrastructure with commercial QKD systems and implementation of a trusted node experiment with added security. This was part of the ParisRegionQCI and FranceQCI projects. A publication is in preparation [8].

**Energetic Analysis of Quantum Communication Protocols (2024):** introduction of two new metrics for estimating the energetic cost of quantum communication protocols (in particular QKD). Application to the case of DV-QKD protocols (BB84, E91, MDI) and CV-QKD (GMCS and DMCS), and extension to CKA protocols leading to the first analysis of this kind. Led to the publication [5].

## Experiences and Education

### Post-Doctoral Contract

*Padova, Italy*

Università degli Studi di Padova

*2025–Current*

- Development of novel Quantum Key Distribution protocols

### PhD in Physics

*Paris, France*

Sorbonne Université

*2021–2024*

- System Integration of High-Performance Continuous-Variable Quantum Key Distribution,
- Supervised by Amine Rhouni and Eleni Diamanti,
- Defended on 09/12/2024 in front of the following Jury:
  - Tobias Gehring, Associate Professor at DTU,
  - Christoph Marquardt, Professor at FAU,
  - Ségolène Olivier, Researcher at CEA,
  - Valentina Parigi, Professor at Sorbonne Université,
  - Amine Rhouni, Research Engineer at CNRS,
  - Eleni Diamanti, Research Director at CNRS.

### MsC in Physics

*London, United Kingdom*

Imperial College London

*2019–2020*

- Title: Quantum Fields and Fundamental Forces,
- Master thesis (title: Quantum Cryptography) supervised by Jonathan Halliwell,
- Master awarded with Distinction on 01/12/2020.

**Engineering diploma** — *Metz, France*
CentraleSupélec - Cursus Supélec — *2017 – 2021*
- Third year of specialization replaced by an international Master program,
- Engineering diploma awarded on 09/07/2021.

# Publications

## Journal articles

[1] Jennifer Aldama, Samael Sarmiento, Luis Trigo Vidarte, Sebastian Etcheverry, Ignacio López Grande, Lorenzo Castelvero, Alberto Hinojosa, Tobias Beckerwerth, **Yoann Piétri**, Amine Rhouni, Eleni Diamanti, and Valerio Pruneri. **Feb. 2025**. "Integrated InP-based transmitter for continuous-variable quantum key distribution". In: *Opt. Express* 33.4, pp. 8139–8149. DOI: 10.1364/OE.550386. URL: https://opg.optica.org/oe/abstract.cfm?URI=oe-33-4-8139.

[2] **Yoann Piétri** and Eleni Diamanti. **2025b**. "Communications Sécurisées avec des Variables Quantiques Continues". In: *Photoniques* 130. Invited. À paraître.

[3] **Yoann Piétri**, Luis Trigo Vidarte, Matteo Schiavon, Laurent Vivien, Philippe Grangier, Amine Rhouni, and Eleni Diamanti. **Dec. 2024**. "Experimental demonstration of continuous-variable quantum key distribution with a silicon photonics integrated receiver". In: *Optica Quantum* 2.6, pp. 428–437. DOI: 10.1364/OPTICAQ.534699. URL: https://opg.optica.org/opticaq/abstract.cfm?URI=opticaq-2-6-428.

[4] **Yoann Piétri**, Matteo Schiavon, Valentina Marulanda Acosta, Baptiste Gouraud, Luis Trigo Vidarte, Philippe Grangier, Amine Rhouni, and Eleni Diamanti. **Dec. 2024**. "QOSST: A Highly-Modular Open Source Platform for Experimental Continuous-Variable Quantum Key Distribution". In: *Quantum* 8, p. 1575. ISSN: 2521-327X. DOI: 10.22331/q-2024-12-23-1575. URL: https://doi.org/10.22331/q-2024-12-23-1575.

## Preprints/Under review

[5] Raja Yehia, **Yoann Piétri**, Carlos Pascual-García, Pascal Lefebvre, and Federico Centrone. **Oct. 2024**. "Energetic Analysis of Emerging Quantum Communication Protocols". In: arXiv: 2410.10661 [quant-ph]. URL: https://arxiv.org/abs/2410.10661.

## Thesis and monographs

[6] **Yoann Piétri**. "System Integration of High-Performance Continuous-Variable Quantum Key Distribution". PhD Thesis.

[7] **Yoann Piétri**. **Sept. 2020**. "Quantum Cryptography". Master Thesis. Imperial College London.

## In preparation

[8] **Yoann Piétri**, Pierre-Enguerrand Verdier, Baptiste Lacour, Maxime Gautier, Heming Huang, Thomas Camus, Jean-Sébastien Pegon, Martin Zuber, Jean-Charles Faugère, Matteo Schiavon, Amine Rhouni, Yves Jaouën, Nicolas Fabre, Romain Alléaume, Thomas Rivera, and Eleni Diamanti. "Quantum Key Distribution with Efficient Post-Quantum Cryptography-Secured Trusted Node on a Quantum Network".

# Scientific Conferences

## Invited Talks

**Workshop Synchonisation de précision et réseaux** — *Villetaneuse, France*
QOSST: An Open Source Software for Continuous-Variable Quantum Key Distribution — *October 2024*

## Contributed Talks

**Second Quantum Energy Initiative Workshop** — *Grenoble, France*
Energetic Analysis of Emerging Quantum Communication Protocols — *January 2025*
*Presented by Raja Yehia*

**Quantum Optical 2.0 Conference and Exhibition** — *Rotterdam, Netherlands*
QOSST: A Highly Modular Open Source Platform for Continuous-Variable Quantum Key Distribution Applications — *June 2024*

**1st Colloquium GDR TeQ "Quantum Techologies"** — *Montpellier, France*
Development of industrial continuous-variable quantum key distribution systems — *November 2023*
*Presented by Manon Huguenot*

**23rd International Conference on Transparent Optical Networks (ICTON)** — *Bucharest, Romania*
High-Speed Continuous-Variable Quantum Key Distribution With Advanced Digital Signal Processing — *July 2023*
*Presented by Matteo Schiavon*

**Optical Fiber Communication Conference (OFC)** — *San Diego, USA*
CV-QKD Receiver Platform Based On A Silicon Photonic Integrated Circuit — *Mars 2023*

**Optical Fiber Communication Conference (OFC)** — *San Diego, USA*
InP-based CV-QKD PIC Transmitter — *Mars 2023*
*Presented by Jennifer Aldama*

**International Conference on Integrated Quantum Photonics (ICIQP)** — *Lyngby, Denmark*
A Versatile PIC-based CV-QKD receiver — *October 2022*

### Poster Presentations

**2nd Colloquium GDR TeQ Quantum Technologies** — *Paris, France*
QOSST : A Highly Modular Open Source Software for Continuous-Variable Quantum Key Distribution — *November 2024*

**14th International Conference on Quantum Cryptography (QCRYPT)** — *Vigo, Spain*
Post-Quantum Cryptographically-Secured Trusted Node for Quantum Key Distribution in a Deployed Network — *September 2024*

**6th Seefeld Workshop on Quantum Information, Seefeld, Austria (2024)** — *Seefeld, Austria*
Post-Quantum Cryptographically-Secured Trusted Node for Quantum Key Distribution in a Deployed Network — *June 2024*
*Presented by Verena Yacoub*

**1st Colloquium GDR TeQ "Quantum Techologies"** — *Montpellier, France*
Experimental Demonstration of Continuous-Variable Quantum Key Distribution with a Photonic Integrated Receiver and Modular Software — *November 2023*

**13th Colloquium on Quantum Engineering, Fundamental Aspects to Applications** — *Palaiseau, France*
CV-QKD Receiver Platform Based On A Silicon Photonic Chip — *November 2022*

**12th International Conference on Quantum Cryptography (QCRYPT)** — *Taiwan, Taiwan*
ParisRegionQCI: A Parisian Quantum Network — *August 2022*

**12th International Conference on Quantum Cryptography (QCRYPT)** — *Taiwan, Taiwan*
A Versatile PIC-based CV-QKD Receiver — *August 2022*

**International Conference on Quantum Communication, Measurement and Computing (QCMC)** — *Lisbon, Portugal*
A Versatile CV-QKD system with a PIC-based Receiver — *July 2022*

**12th Colloquium on Quantum Engineering, Fundamental Aspects to Applications** — *Lyon, France*
A Versatile and High-Performance PIC-based CV-QKD Receiver — *November 2021*

## Seminars

**Cryptography in a Quantum World - Paris Rally** — *Paris, France*
Experimental Quantum Cryptography at LIP6 — *May 2024*

**Qontinuous Variable Days** — *Paris, France*
Experimental Verification of Boson Sampling — *May 2024*

**QURIOSITY Seminar at Telecom Paris** — *Palaiseau, France*
Experimental Continuous-Variable Quantum Key Distribution in LIP6: open source software, integrated photonics and deployed networks — *Mars 2024*

**Quantum Future group Seminar at UniPadova** — *Padova, Italy*
High speed Quantum Key Distribution with Continuous Variable: System, Integrated Devices and Quantum Network in Paris — *May 2023*

## Supervision

### Internships

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|---|---|---|
| 2024 | **Tom Guerinel**, M1 Internship, *Study of Hybrid Quantum Key Distribution Systems* | *Co-supervised at 60%* |
| 2024 | **Salomé Perrin**, M1 Internship, *Implementation of a BB84 pedagogical demonstrator* | *Co-supervised at 80%* |
| 2024 | **Thomas Liege**, Master Thesis, *Study and optimization of Quantum Key Distribution devices on an optical link simulating atmospheric disturbances.* | *Co-supervised at 30%* |
| 2024 | **Sarah Layani**, M1 Internship, *Experimental Quantum Key Distribution: Techniques and Applications* | *Co-supervised at 80%* |
| 2023 | **Nessim Dridi**, M1 Internship, *Real Time Calibration for Continuous-Variable Quantum Key Distribution* | *Co-supervised at 20%* |
| 2022 | **George Crisan**, M2 Internship, *Post Processing of Continuous-Variable Quantum Key Distribution* | *Co-supervised at 80%* |

### Research projects

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|---|---|---|
| 2024 | **Émilie Gillet**, M1 Research Project, *Optimization of Digital Signal Processing algorithms for Continuous-Variable Quantum Key Distribution* | |

## Reviewing activities

**Referee for the following journals/conferences:** Quantum, Optica, Journal of Lightwave Technology (JTL), Physical Review Applied, Photonics Research, New Journal of Physics (NJP), QIP, Optics Communications, Quantum Science and Technology (QST), Optics Express, IEEE Photonics.

## Teaching

Teaching summary: 226h total (6h lectures, 220h tutorials). L1 and M2, including Mathematics, programming (C, Python) and Quantum Cryptography at Sorbonne Université.

**Lecture (4h), Tutorial (14h)** — *Sorbonne Université, France*
MU5INQ02, Quantum Cryptography, M2 — *2024*

**Tutorial (38.5h)** — *Sorbonne Université, France*
LU1IN002, Éléments de programmation 2, L1 — *2024*

**Lecture (2h), Tutorial (16h)** — *Sorbonne Université, France*
MU5INQ02, Quantum Cryptography, M2 — *2023*

**Tutorial (38.5h)** — *Sorbonne Université, France*
LU1IN002, Éléments de programmation 2, L1 — *2023*

**Tutorial (36h)** — *Sorbonne Université, France*
P1.LU1MA011, Mathématiques pour les études scientifiques, L1 — *2022*

**Tutorial (38.5h)** — *Sorbonne Université, France*
LU1IN001, Éléments de programmation 1, L1 — *2022*

**Tutorial (38.5h)** — *Sorbonne Université, France*
LU1IN002, Éléments de programmation 2, L1 — *2022*

## Outreach

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|---|---|---|
| 2024 | **Fête de la Science**, French national Science fair | *Sorbonne Université* |
| 2023 | **Fête de la Science**, French national Science fair | *Sorbonne Université* |
| 2022 | **Fête de la Science**, French national Science fair | *Sorbonne Université* |
| 2022 | **Creation of an animated vulgarization video**, On the subject of entanglement | *QICS* |
| 2022 | **Quantum vulgarization talk**, at FedeRez, national Federation of student network organisations | *Lille, France* |
| 2021 | **Fête de la Science**, French national Science fair | *Sorbonne Université* |
| 2021 | **Quantum vulgarization talk**, at FedeRez, national Federation of student network organisations | *Saclay, France* |

## Open Source work

**QEnergy** — *2024*
Software to estimate the energetic consumption of quantum communication protocols
`https://github.com/RajaYehia/QEnergy`

**QOSST: Quantum Open Source Software for Secure Transmissions** — *2024*
Open Source Software for Experimental Continuous-Variable Quantum Key Distribution
`https://github.com/qosst/`

**etsi-qkd-014-client** — *2022*
Python client of the ETSI QKD 014 client
`https://github.com/nanoy42/etsi-qkd-014-client`

## Responsibilities

2021-2024 **Participation to the organization of the QI team group yearly workshop**
2021-2022 **Organizer of group seminars in the QI Team of LIP6**
2021-2022 **Website manager the QI Team of LIP6**, Including creation of the website, `https://qi.lip6.fr`

## Languages

**Spoken languages:** French (native), English (fluent), Spanish (elementary), German (beginner).

**Programming languages:** Python (advanced), C (intermediate), Julia (beginner).