



# Victor Gondret

Post-doctoral researcher in Quantum Physics

29 years old

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## Summary

I am a post-doctoral researcher with a strong experience in Quantum Physics, especially in quantum simulation and entanglement. I did my PhD on a Bose-Einstein Condensate experimental apparatus in the Paris-Saclay University. Currently, I am working on two projects. The first one is my PhD project, which probes quasiparticle entanglement and then characterizes decoherence and thermalization. Quasiparticles are generated using a parametric amplification process, analogous to the dynamical Casimir effect. The second project I am involved in focuses on setting up an efficient atomic interferometer and characterizing a bright source of momentum-entangled atomic pairs. We aim to violate Bell inequalities with momentum-entangled massive particles, which relates back to the original EPR paradox.

## Education

<b>PhD</b>	<b>Institut d'Optique, Université Paris-Saclay, Physics</b>	Oct. 2021 to January 2025
	<ul style="list-style-type: none"><li>• Title: <i>On the entanglement of quasi-particles in a Bose-Einstein condensate, from Faraday waves to the dynamical Casimir effect.</i></li><li>• Keywords: Quantum Physics ; Quantum simulations ; Cold atoms ; Dynamical Casimir Effect ; Bipartite entanglement ; Parametric resonance.</li><li>• PhD prepared under the supervision of Denis Boiron and Chris Westbrook at the Laboratoire Charles Fabry, Institut d'Optique.</li></ul>	
<b>Master</b>	<b>École Normale Supérieure, Quantum Physics</b>	Sept. 2016 to June 2021
	<ul style="list-style-type: none"><li>• Master's degree awarded with distinction</li><li>• Coursework: Advanced quantum mechanics, statistical mechanics, atoms and photons, ultra cold atoms, numerical physics, introduction to topological order, quantum optics in condensed matter, advanced biological physics.</li></ul>	
<b>Diplôme</b>	<b>de l'École Normale Supérieure</b>	Sept. 2017 to June 2019
	<ul style="list-style-type: none"><li>• Major in Physics. Minor courses in mathematics, economy, musicology, ecology, english, student representative.</li></ul>	
<b>Bachelor</b>	<b>École Normale Supérieure, General Physics</b>	Sept. 2014 to June 2017
	<ul style="list-style-type: none"><li>• Third year of bachelor at ENS,</li><li>• First and second year in preparatory school, Lycée Michelet, Vanves</li></ul>	

## Work experience

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### Quantum Gases group, PhD Student

- Experimental progress on the experiment: implementation of a new sequencer, rebuilt optical setup for the laser cooling, major changes in the detection scheme
- Implementation of optimized laser pulses for an atomic interferometer,
- Entanglement criteria, Parametric amplification, Acoustic analog to the dynamical Casimir effect, analog cosmology.
- Teacher in bachelor and first year of master. Practical works on detector and noise, Electromagnetism, Introduction to Fourier transform, Informatics for scientist (Matlab & Python)

Laboratoire Charles Fabry,  
Institut d'Optique,  
Université Paris-Saclay  
Since October 2021

### Middle-school teacher, in Physics and Chemistry

- Teacher with student aged from 12 to 15 years old. Experienced remote teaching during the 2 months covid lockdown.

Collège Victor Hugo,  
Paris  
Sept. 2019 to Sept. 2020  
12 months

### Bose-Einstein Condensate group, intern

- Theoretical work on one-dimensional quantum gases,
- Study of atomic Bragg diffraction with Laguerre-Gauss mode lasers.

Laboratoire de Physique  
des Lasers  
Université Paris-Nord  
2019 - 3 months

### Consorzio RFX, Padova, Intern

- Hamiltonian dynamics, transition to chaos, neo-adiabatic theory, Alfvén waves

Padova, Italy  
Feb. 2018 to June 2018  
5 months

## References

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- [1] V. Gondret, R. Dias, C. Lamirault, L. Camier, A. Micheli, C. Leprince, Q. Marollet, S. Robertson, D. Boiron, and C. I. Westbrook, Parametric pair production of collective excitations in a Bose-Einstein condensate, [ArXiv 2508.01654 \(2025\)](#).
- [2] V. Gondret, C. Lamirault, R. Dias, L. Camier, A. Micheli, C. Leprince, Q. Marollet, J.-R. Rullier, S. Robertson, D. Boiron, and C. I. Westbrook, Observation of entanglement in a cold atom analog of cosmological preheating, [arXiv 2506.22024 \(2025\)](#).
- [3] V. Gondret, C. Lamirault, R. Dias, C. Leprince, C. I. Westbrook, D. Clément, and D. Boiron, Quantifying two-mode entanglement of bosonic Gaussian states from their full counting statistics, Accepted in Phys. Rev. Lett. [10.1103/1y1p-zqhh \(2025\)](#).
- [4] C. Leprince, V. Gondret, C. Lamirault, R. Dias, Q. Marollet, D. Boiron, and C. I. Westbrook, Coherent coupling of momentum states: Selectivity and phase control, [Phys. Rev. A \*\*111\*\*, 063304 \(2025\)](#).
- [5] V. Gondret, *On the entanglement of quasi-particles in a Bose-Einstein Condensate*, [Ph.D. thesis](#), Université Paris-Saclay (2025), thesis work conducted under the supervision of Denis Boiron and Christoph I. Westbrook.
- [6] Q. Marollet, C. Leprince, V. Gondret, D. Boiron, and C. I. Westbrook, Sub-shot-noise interferometry with two-mode quantum states, [Phys. Rev. A \*\*109\*\*, 023701 \(2024\)](#).
- [7] D. F. Escande, V. Gondret, and F. Sattin, Relevant heating of the quiet solar corona by Alfvén waves: a result of adiabaticity breakdown, [Scientific Reports \*\*9\*\*, 14274 \(2019\)](#).

## Talks

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Quasiparticle entanglement in a Bose-Einstein: an analog preheating experiment, <i>Invited seminar</i> , Heidelberg (Germany).	May. 2025
Quantifying entanglement of two-mode Gaussian states of bosons from their full counting statistics, <i>Quantum Simulation for Fundamental Physics Workshop</i> , Nottingham (UK).	Mar. 2025
Non-separability of phonon pairs in a time modulated Bose-Einstein Condensate, <i>Analogue Gravitation and Cosmology</i> , Paris (France)	Nov. 2023
Non-separability of phonon pairs in a time-modulated BEC linked to inflationary scenarii, <i>PhD students seminar</i> , Palaiseau (France)	Jan. 2023
Creation and non-separability of phonon pairs in a modulated BEC, <i>French Optical Society Conference</i> , Nice (France)	July 2022

## Organization of Scientific Meetings

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- 2025 - Co-organizer of the conference *Quantum PhDay*, in partnership with the Netherlands Quantum network, Saclay.
- 2024 - Organizer of the conference *Quantum PhDay* at Saclay,
- 2023 - Co-organizer of the Scientific day of the Charles Fabry Laboratory,
- 2023 - Member of the organizing committee for the French Physicist Tournament.

## Funding




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**2021 - PhD scholarship:** 3-years PhD scholarship awarded by the Île-de-France region and the Center *Quantum Saclay*

**2016 - Ministry scholarship:** 4-years ministry scholarship to finish the bachelor and the master at ENS as a civil servant.





## Languages

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-  **Humans:** French native speaker, fluent in English, basic knowledge of Spanish and Italian.
-  **Machine:** Proficient in Python, Familiar with C++, Matlab, Mathematica.
-  **Software:** Git,  $\text{\LaTeX}$ , Linux, MyST, HTML and CSS,

## Hobbies

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-  Cello (orchestra) & Euphonium (brass band)
-  Hiking
-  Sewing
-  Football & rugby