Victor Gondret

Institut d'Optique Graduate School
Université Paris-Saclay

+337 516 253 32

victor.gondret@institutoptique.fr

www.normalesup.org/~gondret

Post-doctoral researcher in Quantum Physics

29 years old

Summary

I am a post-doctoral researcher working in the Quantum Atom Optics group at the Laboratoire Charles Fabry. My research focuses on a Metastable Helium Bose-Einstein condensate machine, in the group led by Chris Westbrook and Denis Boiron. Currently, I am working on two projects. The first one is my PhD project, which aims to probe quasi-particle entanglement and then characterize decoherence and thermalization. Quasi-particles 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

PhD — **Institut d'Optique, Université Paris-Saclay**, Physics — Oct. 2021 to January 2025

- Title: *On the entanglement of quasi-particles in a Bose-Einstein condensate, from Faraday waves to the dynamical Casimir effect.*
- Keywords: Quantum Physics ; Quantum simulations ; Cold atoms ; Dynamical Casimir Effect ; Bipartite entanglement ; Parametric resonance.
- PhD prepared under the supervision of Denis Boiron and Chris Westbrook at the Laboratoire Charles Fabry, Institut d'Optique.

Master — **École Normale Supérieure**, Quantum Physics — Sept. 2016 to June 2021

- Master's degree awarded with distinction
- *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.

Diplôme — **de l'École Normale Supérieure** — Sept. 2017 to June 2019

- Major in Physics. Minor courses in mathematics, economy, musicology, ecology, english, student representative.

Bachelor — **École Normale Supérieure**, General Physics — Sept. 2014 to June 2017

- Third year of bachelor at ENS,
- First and second year in preparatory school, Lycée Michelet, Vanves

Work experience

Quantum Gases group, PhD Student — Laboratoire Charles Fabry, Institut d'Optique, Université Paris-Saclay, Since October 2021

- 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)

Middle-school teacher, in Physics and Chemistry — Collège Victor Hugo, Paris, Sept. 2019 to Sept. 2020, 12 months

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

Bose-Einstein Condensate group, intern — Laboratoire de Physique des Lasers, Université Paris-Nord, 2019 - 3 months

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

Consorzio RFX, Padova, Intern — Padova, Italy, Feb. 2018 to June 2018, 5 months

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

Publications

Coherent coupling of momentum states: selectivity and phase control C. Leprince, V. Gondret, C. Lamirault, R. Dias, Q. Marolleau, D. Boiron and C. I. Westbrook. arXiv Preprint — Nov. 2024

Sub-shot-noise interferometry with two-mode quantum states Q. Marolleau, C. Leprince, V. Gondret, D. Boiron and C. I. Westbrook. *Phys. Rev. A* 109, 023701 — Feb. 2024

Relevant heating of the quiet solar corona by Alfvén waves: a result of adiabaticity breakdown D. F. Escande, V. Gondret, and F. Sattin. *Sci. Rep.* 9, 14274 — Oct 2019

Talks

Non-separability of phonon pairs in a time modulated Bose-Einstein Condensate, *Analogue Gravitation and Cosmology*, Paris — Nov. 2023

Non-separability of phonon pairs in a time-modulated BEC linked to inflationary scenarii, *PhD students seminar*, Palaiseau — Jan. 2023

Creation and non-separability of phonon pairs in a modulated BEC, *French Optical Society Conference*, Nice — July 2022

Organization of Scientific Meetings

- 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

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

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

Languages

Humans: French native speaker, fluent in English, basic knowledge of Spanish and Italian.

Machine: Proficient in Python, Familiar with C++, Matlab, Mathematica.

Software: Git, LaTeX, Linux, MyST, HTML and CSS,

Hobbies

Cello (orchestra) & Euphonium (brass band)

Hiking

Sewing

Football & rugby