
FERRIER-BARBUT Igor

Laboratoire Charles Fabry
Institut d'optique
2 avenue Augustin Fresnel
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Birth: December 30th, 1987

Nationality: French, Canadian

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[Google Scholar](#)

RESEARCH EXPERIENCE:

Research interests: Atomic physics, cold atoms, light matter interactions, quantum many-body physics.

Positions

2018-present **Chargé de recherche CNRS**

Laboratoire Charles Fabry, Institut d'Optique

Palaiseau, France

Quantum optics - atoms team

2025-present **Professeur chargé de cours**

École Polytechnique

Palaiseau, France

2014-2018 **Post-doctoral researcher, group leader, Marie Skłodowska-Curie fellow**

5. Physikalisches Institut, Stuttgart University, group of Pr. Dr. Tilman Pfau,
Stuttgart, Germany

Dipolar quantum gases team

2011-2014 **Graduate student researcher**

Laboratoire Kastler-Brossel, ENS Paris, France

Ultracold fermions team

Advisors: Christophe Salomon and Frédéric Chevy

Advising

2018-present **Advising:** 8 graduate students, 3 postdocs, 8 Master students in collaboration with Antoine Browaeys

2014-2018 **Co-advising:** 6 graduate students, 4 master students and several bachelor students as group leader in Tilman Pfau's research group

TEACHING EXPERIENCE:

2025-present **École Polytechnique :**

Exercise sections: Waves and optics, quantum mechanics

2018-present **Institut d'Optique (IOGS):**

Lectures: Ultracold gases and quantum simulators (part of 'M2 LOM')

Exercise sections: Mathematics and signal analysis

2014-2018 **Stuttgart University physics department:**

Weekly exercise sections: Atomic physics, linear optics and non-linear optics

Lectures: Atomic physics and quantum gases of bosons and fermions

2011-2014 ENS Paris physics department:
Experimental projects: atomic physics, quantum optics
Weekly exercise sections: E&M and special relativity.
Examiner for ENS entrance exam, experimental physics.

EDUCATION:

2024 Habilitation à diriger des recherches

2011-2014 PhD *Ecole Normale Supérieure, physics dept., Paris, France*
Title: Mixtures of Bose and Fermi superfluids

2010-2011 Second year of Masters of Science in Physics at *Université Pierre et Marie Curie and Ecole Normale Supérieure, Paris, France*
Quantum Physics program

2009-2010 First year of Masters of Science in Physics at the *University of California at Berkeley, Berkeley, CA*
As part of the *Education Abroad Program*, exchange with UGA

2005-2009 Bachelor of science in Physics / Licence de Physique. *Université Grenoble Alpes (UGA), Grenoble, France*

AWARDS AND HONOURS:

CNRS Bronze medal, 2025

Grand Prix Jacques Herbrand, French academy of sciences, 2022

ERC Starting Grant, European Commission, CORSAIR, 1.5M€, 2022 - 2027

Young researcher grant / Financement JCJC, french national research agency (ANR), DEAR, 450k€, 2021 - 2024

Marie Skłodowska-Curie individual fellowship, MSCA Actions, European Union, DiplnQuantum, 2016 - 2018

Young Researcher Prize, "Prix Jeunes chercheurs" IFRAF/GDR atomes froids, french cold atoms research network, 2015

Doctoral School PhD grant, Government grant, Île de France Physics doctoral school (ED107), 2011 - 2014

REFeree SERVICE:

Referee for scientific articles: *Science, Nature, Nature Physics, Physical Review Letters, Physical Review X, Physical Review A, New Journal of Physics, Optics Express, Europhysics Letters, Applied Physics B, Physics Letters A.*

Referee for scientific proposals: *Various national science agencies.*

OUTREACH ACTIVITIES:

- 2019-2023 Organization of the science fair "Fête de la Science" for the Institut d'Optique
- 2015-2016 Preparation of hands-on experiments for the outreach activities of the PI5 in Stuttgart through "Spiel der Kräfte"
- 2011-2014 Organization and supervision of scientific weeks for high-school students in the Paris area offered by the association "Science Ouverte"

SCIENTIFIC PUBLICATIONS:

ResearcherID: J-8759-2016

ORCID: 0000-0002-4707-0474

Google Scholar

Perspective pieces:

- **Ultradilute quantum droplets**, Physics Today feature article
I. Ferrier-Barbut
Physics Today **72**, 4, 46 (2019)
- **Quantum liquids get thin**, perspective article about: *Science* **359**, 301 (2018)
I. Ferrier-Barbut and T. Pfau
Science **359**, 274 (2018)
- **Smashing magnets**, perspective article about: *New J. Phys.* **18**, 113004 (2016)
I. Ferrier-Barbut
New J. Phys. **18**, 111004 (2016)

Peer-reviewed:

1. **Narrowline cooling of dysprosium atoms in an optical tweezer array**
G. Biagioni, B. Hofer, N. Bonvalet, D. Bloch, A. Browaeys and I. Ferrier-Barbut.
Phys. Rev. A **112**, 133016 (2025)
2. **Emergence of second-order coherence in the superradiant emission from a free-space atomic ensemble**
G. Ferioli, I. Ferrier-Barbut and A. Browaeys.
Phys. Rev. Lett. **134**, 153602 (2025)
3. **Driven-dissipative phase separation in free-space atomic ensembles**
D. Goncalves, L. Bombieri, G. Ferioli, S. Pancaldi, I. Ferrier-Barbut, A. Browaeys, E. Shahmoon and D. E. Chang.
Phys. Rev. X Quantum **6**, 020303 (2025)
4. **Directional Superradiance in a Driven Ultracold Atomic Gas in Free Space**
S. Agarwal, E. Chaparro, D. Barbarena, A. Pineiro Orioli, G. Ferioli, S. Pancaldi, I. Ferrier-Barbut, A. Browaeys & A. M. Rey.
Phys. Rev. X Quantum **5**, 040335 (2024)
5. **Anisotropic polarizability of Dy at 532 nm on the intercombination transition**
D. Bloch, B. Hofer, S. R. Cohen, M. Lepers, A. Browaeys & I. Ferrier-Barbut.
Phys. Rev. A **110**, 033103 (2024)
6. **Non-Gaussian correlations in the steady-state of driven-dissipative clouds of two-level atoms**
G. Ferioli, S. Pancaldi, A. Glicenstein, D. Clément, A. Browaeys & I. Ferrier-Barbut
Phys. Rev. Lett. **132**, 133601 (2024)
7. **Trapping and Imaging Single Dysprosium Atoms in Optical Tweezer Arrays**
D. Bloch, B. Hofer, S. R. Cohen, A. Browaeys & I. Ferrier-Barbut.
Phys. Rev. Lett. **131**, 203401 (2023)
Subject of a *Physics Synopsis* by R. Berkowitz.
8. **Optical control of collective states in one-dimensional ordered atomic chains beyond the linear regime**
N. Fayard, I. Ferrier-Barbut, A. Browaeys & J.-J. Greffet.
Phys. Rev. A. **108**, 023116 (2023)
9. **A non-equilibrium superradiant phase transition in free space**
G. Ferioli, A. Glicenstein, I. Ferrier-Barbut & A. Browaeys.
Nat. Phys. **19**, 1345-1349 (2023)

10. Dipolar physics: A review of experiments with magnetic quantum gases
L. Chomaz, I. Ferrier-Barbut, F. Ferlaino, B. Laburthe-Tolra & T. Pfau
11. From superradiance to subradiance: exploring the many-body Dicke Ladder,
A. Glicenstein, G. Ferioli, A. Browaeys, & I. Ferrier-Barbut.
Optics Letters **45**, 1542 (2022)
12. Laser driven superradiant ensembles of two-level atoms near Dicke's regime
G. Ferioli, A. Glicenstein, F. Robicheaux, R. T. Sutherland, A. Browaeys & I. Ferrier-Barbut.
Phys. Rev. Lett **127**, 243602 (2021)
13. Storage and release of subradiant excitations in dense atomic clouds
G. Ferioli, A. Glicenstein, L. Henriot, I. Ferrier-Barbut & A. Browaeys.
Phys. Rev. X **11**, 021031 (2021)
Subject of a Physics Viewpoint by A. Asenjo Garcia.
14. Preparation of one-dimensional chains and dense cold atomic clouds with a high numerical aperture four-lens system
A. Glicenstein, G. Ferioli, L. Brossard, Y. R. P. Sortais, D. Barredo, F. Nogrette, I. Ferrier-Barbut and A. Browaeys.
Phys. Rev. A. **103**, 043301 (2021)
15. Many-body signatures of collective decay in atomic chains
S. J. Masson, I. Ferrier-Barbut, L. Orozco, A. Browaeys and A. Asenjo-Garcia
Phys. Rev. Lett. **125**, 263601 (2020)
16. Collective shift in resonant light scattering by a one-dimensional atomic chain
A. Glicenstein, G. Ferioli, N. Sibalic, L. Brossard, I. Ferrier-Barbut and A. Browaeys.
Phys. Rev. Lett. **124**, 253602 (2020)
17. Dilute dipolar quantum droplets beyond the extended Gross-Pitaevskii equation
F. Böttcher, M. Wenzel, J.-N. Schmidt, M. Guo, T. Langen, I. Ferrier-Barbut, T. Pfau, R. Bombin, J. Sánchez-Baena, J. Boronat and F. Mazzanti.
Phys. Rev. Res. **1**, 033088 (2019)
18. A fermionic impurity in a dipolar quantum droplet
M. Wenzel, T. Pfau and I. Ferrier-Barbut
Physica Scripta **113**, 104004 (2018)
19. Anisotropic superfluid behavior of a dipolar Bose-Einstein condensate
M. Wenzel, F. Böttcher, J. N. Schmidt, M. Eisenmann, T. Langen, T. Pfau and I. Ferrier-Barbut
Phys. Rev. Lett. **121**, 030401 (2018)
20. Scissors mode of a dipolar quantum droplet of dysprosium atoms
I. Ferrier-Barbut, M. Wenzel, F. Böttcher, T. Langen, M. Isoard, S. Stringari and T. Pfau
Phys. Rev. Lett. **120**, 160402 (2018)
21. Onset of a modulational instability in trapped dipolar Bose-Einstein condensates
I. Ferrier-Barbut, M. Wenzel, M. Schmitt, F. Böttcher, T. Pfau
Phys. Rev. A **97**, 011604(R) (2018)
22. Striped states in a many-body system of tilted dipoles
M. Wenzel, F. Böttcher, T. Langen, I. Ferrier-Barbut and T. Pfau
Phys. Rev. A **96**, 053630 (2017)
23. Self-bound droplets of a dilute magnetic quantum liquid
M. Schmitt, M. Wenzel, F. Böttcher, I. Ferrier-Barbut and T. Pfau
Nature **539**, 259 (2016)
subject of a News & Views article by B. Laburthe-Tolra
24. Liquid quantum droplets of ultracold magnetic atoms
I. Ferrier-Barbut, M. Schmitt, M. Wenzel, H. Kadau and T. Pfau,
J. Phys. B. **49**, 214004 (2016)

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25. **Observation of quantum droplets in a strongly dipolar Bose gas**
I. Ferrier-Barbut, H. Kadau, M. Schmitt, M. Wenzel, and T. Pfau,
Phys. Rev. Lett. **116**, 215301 (2016)
Subject of a **Physics Viewpoint** by L. D. Carr & B. L. Lev
 26. **Observing the Rosensweig instability of a quantum ferrofluid**
H. Kadau, M. Schmitt, M. Wenzel, C. Wink, T. Maier, I. Ferrier-Barbut and T. Pfau
Nature **530**, 194 (2016)
 27. **Universal loss dynamics in a unitary Bose gas**
U. Eismann, L. Khaykovich, S. Laurent, I. Ferrier-Barbut, B. S. Rem, A. T. Grier, M. Delehaye, F. Chevy, C. Salomon, L.-C. Ha and C. Chin
Phys. Rev. X **6**, 021025 (2016)
 28. **Critical velocity and dissipation of an ultracold Bose-Fermi counterflow**
M. Delehaye, S. Laurent, I. Ferrier-Barbut, S. Jin, F. Chevy, and C. Salomon
Phys. Rev. Lett. **115**, 265303 (2015)
 29. **Broad universal Feshbach resonances in the chaotic spectrum of dysprosium atoms**
T. Maier, I. Ferrier-Barbut, H. Kadau, M. Schmitt, M. Wenzel, C. Wink, T. Pfau, K. Jachymski, and P. S. Julienne
Phys. Rev. A **92**, 060702 (2015)
 30. **Emergence of chaotic scattering in ultracold Er and Dy**
T. Maier, H. Kadau, M. Schmitt, M. Wenzel, I. Ferrier-Barbut, T. Pfau, A. Frisch, S. Baier, K. Aikawa, L. Chomaz, M. J. Mark, F. Ferlaino, C. Makrides, E. Tiesinga, A. Petrov, and S. Kotochigova
Phys. Rev. X **5**, 041029 (2015)
 31. **The Landau critical velocity for a particle in a Fermi superfluid**
Y. Castin, I. Ferrier-Barbut, C. Salomon
Comptes Rendus Physique **16**, 241 (2015) ([link to french version](#))
 32. **A mixture of Bose and Fermi superfluids**
I. Ferrier-Barbut, M. Delehaye, S. Laurent, A. T. Grier, M. Pierce, B. S. Rem, F. Chevy, and C. Salomon
Science **345**, 1035 (2014)
 33. **Λ -enhanced sub-Doppler cooling of lithium atoms in D1 gray molasses**
A. T. Grier, I. Ferrier-Barbut, B. S. Rem, M. Delehaye, L. Khaykovich, F. Chevy, and C. Salomon
Phys. Rev. A **87**, 063411 (2013)
 34. **Lifetime of the Bose Gas with resonant interactions**
B. S. Rem, A. Grier, I. Ferrier-Barbut, U. Eismann, T. Langen, N. Navon, L. Khaykovich, F. Werner, D. S. Petrov, F. Chevy, and C. Salomon
Phys. Rev. Lett. **110**, 163202 (2013)

LECTURES:

- Winter School on ultracold quantum many-body systems (3x60 min lectures)
Benasque, Spain (2025)
- Giryd Summer School (1x90 min lectures)
Weizmann Institute, Rehovot, Israel (2022)
- International school on quantum gases (3x60 min lectures)
Chlef, Algeria (2018)
- Granada quantum matter summer school (2x90 min lectures)
Granada, Spain (2017)

INVITED TALKS IN INTERNATIONAL CONFERENCES:

- Long-range interactions in the ultracold workshop 2025
Stuttgart, Germany (2025)
- Central European workshop on quantum optics
Vilnius, Lithuania (2025)
- Workshop on correlations in complex systems
Institut d'Optique, France (2025)
- Workshop on light-matter interactions and collective effects
École Normale Supérieure Paris Saclay, France (2025)
- New Perspectives in Many-body Physics with Quantum Optical Systems
Kavli Institute for Theoretical Physics, Santa Barbara, USA (2024)
- Open quantum many-body physics 2024
Institut Pascal, Orsay, France (2024)
- Dipolar Quantum Matter
Durham, United Kingdom (2024)
- Collective scattering of light CoScaLi 2023
Heraklion, Grece (2023)
- Open quantum many-body physics 2023,
Institut Pascal, Orsay, France (2023)
- Waveguide QED, WQED23
Erice, Sicily (2023)
- Long-range interactions in the ultracold workshop 2022
Innsbruck, Austria (2022)
- Workshop on collective scattering of light COSCALI 2021
Porquerolles, France (2021)
- Optique 2021 Colloque Horizons de l'Optique (2021)
Dijon, France (2021)
- Cold atoms online meeting
Online, France (2021)
- WE-Heraeus Seminar Collective Effects and Non-Equilibrium Quantum Dynamics
Bad Honnef (online), Germany (2021)
- XXII conference on few-body problems in physics
Caen, France (2018)
- Workshop on long-range interactions in atomic systems
São Carlos, Brazil (2017)
- From few to many, exploring quantum systems one atom at a time
Oberurgl, Austria (2017)

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- 47th colloquium on the physics of quantum electronics PQE2017
Snowbird, Utah (2017)
 - Gauge field dynamics with ultracold gas systems 2016
Bad Honnef, Germany (2016)
 - Long-range interactions in the ultracold workshop 2016
Ercolano, Italy (2016)
 - Quantum gases and quantum coherence BEC 2016
Salerno, Italy (2016)
 - Ultracold quantum gases, current trends and perspectives Quo Vadis BEC 2016
Bad Honnef, Germany (2016)
 - Quantum Optics 2016
Oberurg, Austria (2016)
 - Workshop: Advanced atomic sources and extreme cooling of atoms and molecules 2016
Les Houches, France (2016)
 - Synthetic Quantum Magnetism International Workshop 2015
Dresden, Germany (2015)
 - 2015 International Symposium on Quantum Fluids and Solids QFS2015
Niagara Falls, NY (2015)

CONTRIBUTED TALKS:

- 7th colloquium of the CNRS research network "quantum engineering, foundations and applications" (2016)
Paris, France
- Quantum technologies conference V
Krakow, Poland (2014)
- Laser Physics international workshop LPHYS13
Prague, Czech Republic (2013)

SEMINARS:

- ICFO, Castelldefels, Spain (2023)
- Colloquium of the ENS Lyon Physics department, Lyon, France (2022)
- Max Planck institute for quantum optics, Bloch group, Garching, Germany, (2022)
- Laboratoire de physique de l'École Normale Supérieure, France (2021)
- Laboratoire de physique des lasers Université Sorbonne Paris Nord, France (2021)
- Syddansk University, Odense, Denmark - online - (2020)
- Durham University, UK (2019)
- LPTMS, Orsay, France (2019)
- FEMTO-ST Time & Frequency Department, Besançon, France (2019)
- Syddansk University, Odense, Denmark (2018)
- Institute of Photonic Sciences, Barcelona, Spain (2017)
- Weizmann Institute of Science, Rehovot, Israel (2017)
- Institut d'Optique Graduate School, Palaiseau, France (2016)
- Leibniz Universität Hannover, seminar series of the research training group 1991, Hannover, Germany (2016)
- Heidelberg University, Heidelberg, Germany (2016)

- Toronto University, Toronto, Canada (2015)
- Néel Institut, Grenoble, France (2014)
- Heidelberg University, Kirchhoff Institute, Heidelberg, Germany (2014)
- Cambridge University, Cavendish Laboratory, Cambridge, UK (2014)
- University of Stuttgart in the 5. Physikalisches Institut, Stuttgart, Germany (2014)