

# Rodolphe MOMIER

## Postdoctoral researcher in trapped-ion quantum computing

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Born 16th May 1999 in Vesoul, France



I obtained my bachelor in Theoretical and Applied Physics in June 2019. Since then, I have been working under the supervision of Prof. Claude LEROY (Laboratoire Interdisciplinaire Carnot de Bourgogne - ICB, Dijon, France). In 2021, I obtained an MSc. in Physics, Photonics and Nanotechnologies (PPN) from Université Bourgogne Franche-Comté (UBFC, Dijon, France) during which I performed a research internship at the Institute for Physical Research (IPR), NAS of Armenia supervised by Prof. Claude LEROY and Prof. Aram PAPOYAN (IPR). My fields of interest are atomic spectroscopy, laser physics and numerical simulations.

### EDUCATION

PhD in Atomic Physics  
**Laboratoire ICB (Dijon) - Institute for Physical Research (Ashtarak)**  
2021 - 2024    Dijon, FR / Ashtarak, ARM  
• Advisors: Prof. Claude LEROY (ICB), Prof. Aram PAPOYAN (IPR), Dr. Armen SARGSYAN (IPR).

Master in Physics, Photonics and Nanotechnologies  
**Université Bourgogne Franche-Comté**  
2019 - 2021    Dijon, FR  
• Research internship at IPR - Ashtarak, Armenia.  
• 2nd year: 16.05/20 (major).  
• TOEIC, score: 990/990 - C1.

Bachelor in Theoretical and Applied Physics  
**Université Bourgogne Franche-Comté**  
2016 - 2019    Dijon, FR  
• 1-month research project, ICB - Dijon, France.  
• Grade: 13.253/20.

French Scientific Baccalaureate  
**Augustin Cournot high school**  
2013 - 2016    Gray, FR  
• Grade: 15.02/20  
• European section (reinforced english)

### STRENGTHS

- Hardworking
- Curious
- Autonomous
- Motivated
- Dynamic
- Rigorous

### LANGUAGES

- French

English

German

Russian
- Native

Fluent

Intermediate

Beginner

### PROFESSIONAL EXPERIENCE

Postdoctoral researcher  
**Johannes-Gutenberg Universität Mainz**  
October 2024 - ongoing    Mainz, DE

Part-time lecturer  
**Université de Bourgogne**  
September 2021 - ongoing    Dijon, FR  
• Supervision of Ray and Wave Optics lab sessions, Biophysics/Fluid mechanics lab sessions and Physical measurements lab sessions.  
• 64 hours of teaching each year.

Supervision of students  
**Université de Bourgogne**  
January 2022    Dijon, FR  
• Supervision (with Prof. Claude LEROY) of 3 students in 3rd year of BSc. in Physics during their micro-internship (TER). Subject: coupling of angular momenta and the Dirac equation in Quantum Mechanics.  
• Supervision of middle school students during their mandatory internship "Séquence d'observation en milieu professionnel". General presentation of research, vulgarization in atomic and molecular physics.

Private teacher  
**at home / AFEV organization**  
2017 - 2021    Dijon, FR  
• 2018 - 2021: Private teacher of Maths, Physics and Chemistry for middle- and high-school student. Courses, methodology and vulgarization.  
• 2017: Teaching sciences to struggling high-school students (mainly foreigners) for the AFEV organization.

### SKILLS

- Linux, MacOS, scientific computing: MATLAB, GNU Octave, Wolfram Mathematica, Python, notions of Fortran
- Scientific writing:  $\LaTeX$ , MS Office

### HOBBIES

Music (played with several bands in the past few years): drums and bass guitar. Bow, biking, travelling, swimming.

## SCIENTIFIC EXPERIENCE

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- **2019:** Bachelor research project (1 month) "*Demonstration of the Dirac equation in Quantum Mechanics*" supervised by Prof. Claude LEROY, **grade: 17/20**.
- **2020:** Master 1 research project (4 months) "*Transition cancellations of Alkali atomic vapors in external magnetic fields*", supervised by Prof. Claude LEROY and Artur ALEKSANYAN (PhD student ICB & IPR, Ashtarak, Armenia), **grade: 20/20**. Publication of two articles in peer-reviewed journals (Journal of Quantitative Spectroscopy and Radiative Transfer, Journal of the Optical Society of America B).
- **2021:** Master 2 research semester in Armenia: "*Behavior of hyperfine transitions of alkali vapors confined in nano-cells*", supervised by Prof. Claude LEROY and Prof. Aram PAPOYAN (IPR). Publication of two articles in peer-reviewed journals (Journal of Quantitative Spectroscopy and Radiative Transfer, Journal of Experimental and Theoretical Physics).
- Reviewer for New Journal of Physics (IOP) and Optics Letters (Optica).

## INTERNATIONAL PROJECTS

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- **2021 - 2024 :** Participation as a researcher to the NATO SPS G5794 "Development of Optical Magnetic Sensing Systems for Security Checkpoints" project - 295 k€. University of Latvia, Université de Bourgogne - France and Institute for Physical Research - Armenia.

## PUBLICATIONS AND DISSEMINATION

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### Articles

- A. Sargsyan, R. Momier, C. Leroy, and D. Sarkisyan. "Influence of buffer gas on the formation of N-resonances in rubidium vapors". *Spectrochimica Acta Part B: Atomic Spectroscopy* 221 (2024), p. 107051.
- R. Momier, A. Sargsyan, A. Tonoyan, C. Leroy, and D. Sarkisyan. "Micrometric-Thin Cell Filled with Rb Vapor for High-Resolution Atomic Spectroscopy". *Opt. Mem. Neural Networks* 32.S3 (2023), S349–S355.
- A. Tonoyan, A. Sargsyan, R. Momier, C. Leroy, and D. Sarkisyan. "Formation of Narrow Atomic Lines of Rb in the UV Region Using a Magnetic Field". *Opt. Mem. Neural Networks* 32.S3 (2023), S343–S348.
- A. Sargsyan, R. Momier, C. Leroy, and D. Sarkisyan. "Competing van der Waals and dipole-dipole interactions in optical nanocells at thicknesses below 100 nm". *Phys. Lett. A* 483 (2023), p. 129069.
- A. Sargsyan, A. Tonoyan, R. Momier, C. Leroy, and D. Sarkisyan. "Formation of strongly shifted EIT resonances using "forbidden" transitions of Cesium". *J. Quant. Spectrosc. Radiat. Transf.* 303 (2023), p. 108582.
- A. Sargsyan, R. Momier, C. Leroy, and D. Sarkisyan. "Saturated absorption used in potassium microcells for magnetic field sensing". *Las. Phys.* 32 (2022), p. 105701.
- M. Auzinsh, A. Sargsyan, A. Tonoyan, C. Leroy, R. Momier, D. Sarkisyan, and A. Papoyan. "Wide range linear magnetometer based on a sub-microsized K vapor cell". *Appl. Opt.* 61.19 (2022), pp. 5749–5754.
- A. Aleksanyan, R. Momier, E. Gazazyan, A. Papoyan, and C. Leroy. "Cancellation of  $D_1$  line transitions of alkali-metal atoms by magnetic-field values". *Phys. Rev. A* 105 (2022), p. 042810.
- A. Sargsyan, A. Tonoyan, R. Momier, C. Leroy, and D. Sarkisyan. "Dominant Magnetically Induced Transitions in alkali metal atoms with nuclear spin  $3/2$ ". *J. Opt. Soc. Am. B* 39.4 (2022), pp. 973–978.
- R. Momier, A. V. Papoyan, and C. Leroy. "Sub-Doppler spectra of sodium D lines in a wide range of magnetic field: Theoretical study". *J. Quant. Spectrosc. Radiat. Transf.* 272 (2021), p. 107780.
- A. Sargsyan, R. Momier, A. Papoyan, and D. Sarkisyan. "Sub-Doppler spectroscopy in a 400 nm Cs atomic vapor column at room temperature". *J. Exp. Theor. Phys.* 133.4 (2021), pp. 404–410.
- A. Aleksanyan, R. Momier, E. Gazazyan, A. Papoyan, and C. Leroy. "Transition cancellations of 87Rb and 85Rb atoms in a magnetic field". *J. Opt. Soc. Am. B* 37.11 (2020), pp. 3504–3514.
- R. Momier, A. Aleksanyan, E. Gazazyan, A. Papoyan, and C. Leroy. "New standard magnetic field values determined by cancellations of 85Rb and 87Rb atomic vapors  $5^2S_{1/2} \rightarrow 6^2P_{1/2,3/2}$  transitions". *J. Quant. Spectrosc. Radiat. Transf.* 257 (2020), p. 107371.

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### Seminars and conferences

- R. Momier, A. Sargsyan, A. Tonoyan, D. Sarkisyan, and C. Leroy. "Generation of forbidden EIT resonances with  $\Delta F = +2$  transitions of Cs  $D_2$  line". Oral presentation, International Conference Laser Physics 23 (LP2023), Ashtarak, Armenia (September 2023).
- R. Momier, A. Sargsyan, A. Tonoyan, M. Auzinsh, D. Sarkisyan, A. Papoyan, and C. Leroy. "Sub-Doppler spectroscopy of  $^{39}\text{K}$  for magnetic field measurements". Poster presentation, High Resolution Molecular Spectroscopy Colloquium 2023 (HRMS 2023), Dijon, France (September 2023).

- R. Momier, A. Sargsyan, A. Tonoyan, D. Sarkisyan, and C. Leroy. "Formation of strongly shifted EIT resonances using "forbidden" transitions of Cesium". Poster presentation, High Resolution Molecular Spectroscopy Colloquium 2023 (HRMS 2023), Dijon, France (September 2023).
- R. Momier, A. Sargsyan, A. Tonoyan, D. Sarkisyan, and C. Leroy. "Formation of strongly shifted EIT resonances using "forbidden" transitions of Cesium". Poster presentation, XXII<sup>e</sup> Journées de l'Ecole Doctorale Carnot-Pasteur, Dijon, France (June 30, 2023). **Best poster communication prize.**
- R. Momier, A. Sargsyan, A. Tonoyan, D. Sarkisyan, and C. Leroy. "Formation of strongly shifted EIT resonances using "forbidden" transitions of Cesium". Poster presentation, 54th Conference of the European Group on Atomic Systems (EGAS 54), Strasbourg, France (June 18-22, 2023).
- R. Momier, A. Sargsyan, A. Tonoyan, M. Auzinsh, D. Sarkisyan, A. Papoyan, and C. Leroy. "Sub-Doppler spectroscopy of  $^{39}\text{K}$  for magnetic field measurements". Poster presentation, 54th Conference of the European Group on Atomic Systems (EGAS 54), Strasbourg, France (June 18-22, 2023).
- A. Aleksanyan, R. Momier, E. Gazazyan, A. Papoyan, and C. Leroy. "Magnetic field values annihilating alkali atoms' transitions". Poster presentation, International Conference Laser Physics 22 (LP2022), Ashtarak, Armenia (September 14-16, 2022).
- R. Momier, A. Sargsyan, A. Tonoyan, M. Auzinsh, D. Sarkisyan, A. Papoyan, and C. Leroy. "Nanometric-Thin K Vapor Cell used as a Large-Range Magnetometer". International Conference Laser Physics 22 (LP2022), Ashtarak, Armenia (September 14-16, 2022). **Best student presentation prize.**
- A. Aleksanyan, R. Momier, E. Gazazyan, A. Papoyan, and C. Leroy. "Magnetic field values cancelling alkali atoms' transitions". Poster presentation, 14th European Conference on Atoms, Molecules and Photons (ECAMP 14), Vilnius, Lithuania (June 27 - July 1, 2022).
- R. Momier, A. Aleksanyan, A. Sargsyan, A. Tonoyan, M. Auzinsh, D. Sarkisyan, A. Papoyan, and C. Leroy. "Magnetometry with a nanometric-thin K vapor cell". **Invited speaker**, 14th European Conference on Atoms, Molecules and Photons (ECAMP 14), Vilnius, Lithuania (June 27 - July 1, 2022).
- A. Aleksanyan, R. Momier, E. Gazazyan, C. Leroy, and A. Papoyan. "Determination of the magnetic field values cancelling  $D_1$  line transitions of alkali-metal atoms". Internal seminar, Institute for Physical Research, NAS of Armenia (June 2, 2022).
- R. Momier, A. Papoyan, and C. Leroy. "Theoretical study of sodium D lines in a wide range of magnetic field with sub-Doppler resolution". International Conference Laser Physics 21 (LP2021), Ashtarak, Armenia (September 21-24, 2021). **Second best student presentation prize.**
- A. Aleksanyan, R. Momier, E. Gazazyan, A. Papoyan, and C. Leroy. "Alkali atom transition cancellations within magnetic field". 52nd Conference of the European Group on Atomic Systems (EGAS 52), Zagreb, Croatia (online, July 6-8, 2021).
- R. Momier, C. Leroy, and A. Papoyan. "Zeeman transitions of  $^{23}\text{Na}$  in a external magnetic field". Internal seminar, Institute for Physical Research, NAS of Armenia (April 16, 2021).
- R. Momier, A. Aleksanyan, E. Gazazyan, A. Papoyan, and C. Leroy. "B-field values cancellings  $5S \rightarrow 6P$  transitions hyperfine of  $^{85}\text{Rb}$  and  $^{87}\text{Rb}$ ". International online seminar ICB-Institute for Physical Research, NAS of Armenia (May 7, 2020).

Last update: October 2, 2024