LEONARDO RAZZAI

PhD Student in Physics

ME AT A GLANCE

I'm a PhD student in Physics with a strong background in photonics, atomic physics, and quantum technologies. Curiosity, commitment, rigorous application of the scientific method characterize my approach to new challenges, both at work and in my daily life.

My drive to address fundamental questions while advancing technological innovation led me to study Physics and to focus on experimental quantum physics, where I am constantly seeking opportunities to expand my knowledge and expertise.

CONTACT

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SKILLS

Experimental:
- Optics and photonics;
- Laser cooling and trapping;
- RF electronics and PID controllers;
- Ultra High Vacuum technology;

Programming and Data Analysis:
- Python (NumPy, SciPy, Matplotlib, Pandas);
- Matlab, Mathematica;
- Git and GitHub;
- HTML, CSS, JavaScript;

EDUCATION

PhD Student in Physics Nov 2024 – Present
University of Bologna, Bologna, Italy
Research on loading and cooling Rb atoms into a hollow-core photonic crystal fiber, exploiting laser cooling and optical dipole traps, to explore new phenomena emerging from the interplay between light and atomic gases. This project is part of a wider European initiative called *Cryst3*.

Master's Degree in Physics (with honors) 2022 – 2024
University of Bologna, Bologna, Italy

Thesis: *Setup of a MOT of cold ^{87}Rb atoms near a hollow core photonic crystal fiber.*

Supervisor: Prof. Francesco Minardi.
Co-supervisor: Prof. Marco Prevedelli.

Bachelor's Degree in Physics and Astrophysics (with honors) 2019 – 2022
University of Florence, Florence, Italy

Thesis: *Quantum key distribution with an up-conversion detector.*

Supervisor: Prof. Alessandro Zavatta.

Classical High School Diploma (with honors) 2014 – 2019
Classical High School "Cicognini-Rodari", Prato, Italy

RESEARCH EXPERIENCE

PhD Research Project Nov 2024 – Present
DIFA, University of Bologna

Realized and optimized sub-Doppler cooling for a Rb Magneto-optical trap (MOT). Simulated numerically the expected number of atoms loaded and trapped into a hollow-core Kagome fiber. Designed and built the optical path to inject a hollow-core fiber.

Systems: Linux, Windows

LANGUAGES

Italian: Native
English: C1 - Fluent

Master's Thesis Internship `Feb – Oct 2024`
DIFA, University of Bologna

Contributed to realizing and characterizing the laser system for a Rb MOT; implemented FM spectroscopy for laser locking to an atomic transition and optimized it via a PID controller; stabilized cooling and repumping laser frequencies via beat note locking.

Bachelor's Thesis Internship `May – Sep 2022`
INO-CNR, Florence

Developed a frequency up-conversion apparatus to enhance single-photon detector efficiency; characterized an in-fiber Quantum Key Distribution system with time-bin encoding.

SCHOOLS & CONFERENCES

Young Atomic Opticians Conference 2025 `6 – 11 Jul 2025`
University of Innsbruck, Innsbruck, Austria

Presented a poster titled:
Cold Rb atoms into a hollow-core Kagome fiber

CAPS and CQA Winter School on Ultracold Quantum Many-body Systems `16 – 21 Feb 2025`
Benasque Science Center, Benasque, Spain

Quantum Science and Technology Summer School `15 – 20 Sep 2024`
Aldo Moro University, Bari, Italy

Collective Phenomena in Quantum Many-Body Physics Summer School `8 – 13 Sep 2024`
MPI for Complex Systems, Dresden, Germany

TEACHING

Tutor for Scientific Subjects `Oct 2023 – Oct 2024`
University of Bologna

Supported students with Specific Learning Disabilities (SLD) in Classical Mechanics, Electromagnetism, Thermodynamics, Calculus, Linear Algebra, and Statistics.