ALBERT-LUDWIGS-UNIVERSITÄT FREIBURG GERMANY

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- **Address**

Fahnenbergplatz, Freiburg 79085,

Germany

- **Scientist in charge**

Giuseppe Sansone (experiment)

giuseppe.sansone@phyisk.uni-freiburg.de

Andreas Buchleitner (theory)

andreas.buchleitner@physik.uni-freiburg.de

Useful Links

https://quatto.eu/

Home Institution

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The **University of Freiburg** was founded in 1457 and is one of the oldest and most renowned universities in Germany. With eleven faculties, around 240 degree programs, and 440 full professorships as well as 32 junior professorships, it covers a broad interdisciplinary spectrum with high-quality research and teaching.

The University currently has around 24.500 students, 4.985 doctoral candidates, and a total of 8.200 employees, 5.800 of them in academic positions. Twenty-three Nobel laureates are associated with the University of Freiburg. The University secured 219 million euros in third-party funding in 2023 and received 16 ERC Grants between 2019 and 2023. Two Clusters of Excellence are currently being funded at the University of Freiburg.

Useful Links

https://uni-freiburg.de/

Group Leader

Giuseppe Sansone

- **Graduation:** Degree in Physics from the University Federico II, Naples, Italy. Completed final year at Friedrich Schiller University, Jena, Germany, with a master thesis on ultrashort femtosecond laser pulse characterization (2000).
- **PhD**: PhD in Physics from Politecnico Milano, Italy, focusing on ultrafast optics and attosecond pulse generation (2004).
- **Current Position**: Full Professor for Experimental Physics at the Physics Department University of Freiburg.
- I received my PhD in 2004 from the Politecnico Milano, Italy, where I continued my career first as assistant professor and then as associate professor. In 2007, I visited the Laser Technology Laboratory RIKEN, Japan with a JSPS Short-Term Postdoc Fellowship. In 2009-2010, I received an Alexander von Humboldt Fellowship to work in the group of the Max-Planck-Institute for Nuclear Physics in Heidelberg on the combination of coincidence spectroscopy with attosecond sources. I also contributed to the development of the Extreme-Light-Infrastructure Attosecond Light Pulse Source in Szeged (Hungary), initially as division head of the secondary sources and then as scientific advisor. In 2016, I became full professor for experimental physics at the University of Freiburg where I lead the Attosecond and Strong Field Physics group. My research interests are focused on attosecond metrology at free-electron lasers and on the investigation of ultrafast dynamics in molecules using coincidence spectroscopy.

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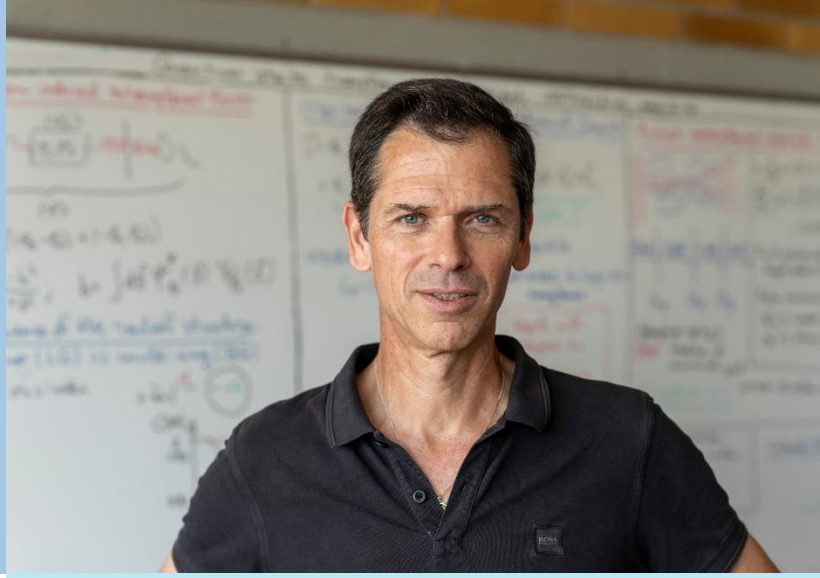
Useful Links

https://www.atto.uni-freiburg.de/

Group Leader



Andreas Buchleitner

- **Graduation:** Diploma in (experimental) Physics from Ludwig-Maximilians-Universität München, Germany (1989).
- **PhD**: docteur en physique at Laboratoire de Spectroscopie Hertzienne de l'Ecole Normale Supérieure et de l'Université Pierre et Marie Curie, Paris (1993). Research on microwave driven Rydberg states, complex dilation of Floquet Hamiltonians, wave functions of atomic resonances, dynamical localization, non-dispersive wave packets, adiabatic stabilization.
- **Habilitation:** Habilitation (Dr. rer. nat. habil.) from the Ludwig Maximilians-Universität München (1999). Research on the statistics of the decay rates of atomic resonances (eigenstates of non-Hermitian Hamiltonians), atomic conductance fluctuations, open system dynamics of atomic resonances, Floquet states and (chaotic) classical dynamics of doubly excited helium under periodic driving, stochastic resonance in the micromaser.
- **Current Position**: Full Professor of Theoretical Physics at the University of Freiburg, Germany.

Andreas Buchleitner coaches the Quantum Optics and Statistics group. Our research focusses onto the coherence, entanglement and transport properties of quantum systems with possibly strongly coupled degrees of freedom, with the ultimate goal to control specific target properties. Concrete physical realisations reach from cold or warm atoms, across strong field light-matter interaction to cavity QED and photonics. Our theoretical toolbox combines methods from mathematical as well as computational physics, together with ingredients from quantum statistics, modern semiclassics. quantum optics and quantum chaos. We like to interact not only with theoretical physicists, but also with mathematicians and experimentalists.

Useful Links

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Research Training Modules

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Attosecond coincidence spectroscopy

Coincidence spectroscopy is very powerful technique for the investigation of multiple photoionization in atoms and photoionization / photodissociation mechanisms in molecules. Our goal is to investigate electronic and nuclear dynamics in small molecules excited by an isolated or an attosecond pulse train. The subsequent electronic and nuclear dynamics is probed by means of a synchronized infrared field. Photoelectron/photoion spectrometers working in coincidence give the opportunity to disentangle the different photoionization and photodissociation channels, thus delivering a complete description of the molecular dynamics after the initial triggering event. Moreover this technique gives the opportunity to compare the dynamics in different molecules under the same experimental conditions. The successful implementation of this technique requires high-repetition rate attosecond sources.

Useful Links

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Scientific courses of the Physics Department

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The Master program in Physics in Freiburg offers participants to consolidate their knowledge in advanced theoretical and experimental physics.

- Advanced laser and optics
- Advanced atomic and molecular physics
- Strong-field physics and attosecond spectroscopy
- Theoretical Quantum Optics
- Complex Quantum Systems
- Quantum Information Theory
- Quantum Hardware

Useful Links

https://www.physik.uni-freiburg.de/studium-en/vorlesungsverzeichnis

Transferable skills modules

The Graduate Centre (GraCe) offers around 40 courses and workshops per semester in German and English to provide doctoral candidates transdisciplinary further qualifications. The courses teach core competencies and transferable skills in five areas:

- Management, Leadership & Mental Health
- Communication & Presentation
- Orientation & Career Planning
- Research Practice & Teaching Qualification
- Language Courses

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Useful Links

https://uni-freiburg.de/frs-en/grace/qualification-docs/

Life in Freiburg

Freiburg is a vibrant, student-friendly city nestled at the edge of the Black Forest in southwest Germany. Known for its sunny climate, green initiatives, and lively atmosphere, Freiburg offers an ideal balance between academic focus and quality of life.

As a PhD student, you'll enjoy excellent public transportation, a strong international community, and easy access to nature for weekend hikes or cycling. The city's historic center is full of cafes, bookshops, and cultural events, making it easy to feel at home. Whether you're looking for research inspiration or just a good spot for coffee with fellow students, Freiburg is a welcoming and intellectually stimulating place to live and study.

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Useful Links

https://www.gemeinsamer-ausschuss-der-doktorandenkonvente.uni-freiburg.de/en/

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