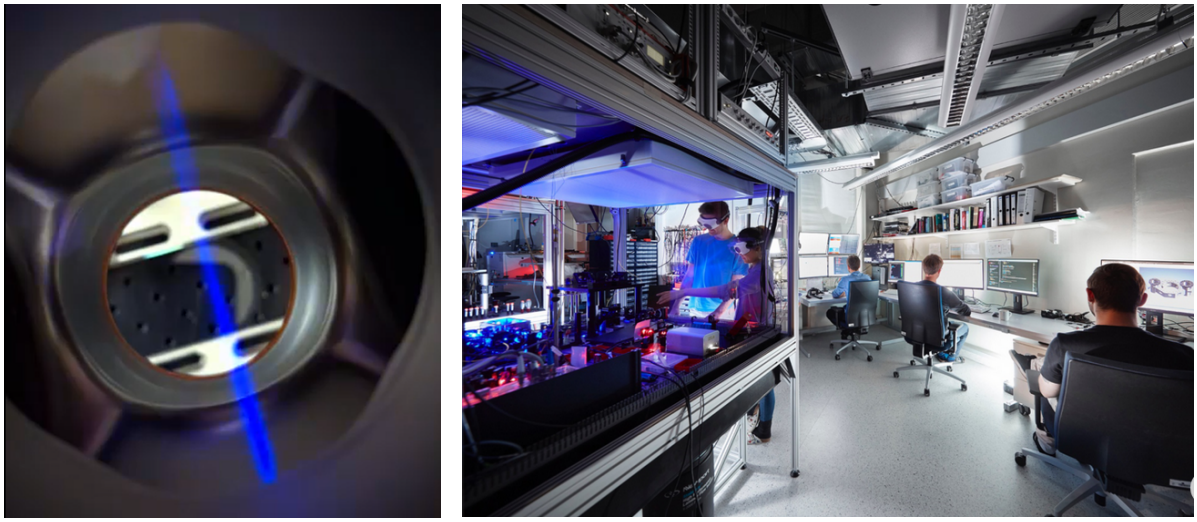
PhD and Master Theses

Quantum Optics Group (LMU)
Quantum Many Body Systems Division (MPQ)

Quantum Information meets the best Atomic Clocks
A New Experiment with Ultracold Strontium Atoms in Optical Lattices

As part of our activities on quantum information science using strontium atoms, we are looking for highly motivated PhD and Master students in experimental quantum physics.

The pursuit of better atomic clocks has advanced many research areas, providing better quantum state control, new insights into quantum science, and improved tests for physics beyond the standard model. The record for the best stability and accuracy is currently held by clocks based on strontium atoms trapped in optical lattices. Clocks of this type have made strontium a strong candidate to replace cesium as the definition for the unit of time. Our group plays a world-leading role in the control of strontium atoms in optical lattices. We will trap the atoms in an optical lattice inside an ultra-high vacuum chamber and then use an ultra-stable laser to interrogate the clock transition. By adding precisely controlled Rydberg interactions between the atoms, we aim to create highly entangled many-body quantum states that enable measurements beyond the standard quantum limit. This experimental setup then provides a flexible platform for a variety of new and exciting experiments at the interface of quantum information science, quantum many-body physics, quantum metrology, and quantum sensing.



Left: A beam of fluorescing strontium atoms. **Right**: Besides requiring a state-of-the-art lab, our experiments can only be done by a highly motivated team working on a shared goal.

As a PhD or Master student, you will work on a variety of projects, including the design and implementation of laser systems, optical systems, low-noise electronics, and an ultrahigh-vacuum apparatus. You will use the systems you develop directly in your own experiments. You will support and guide your experiments with theoretical calculations and simulations, and use state-of-the-art data analysis to extract meaningful answers.

As a new team member, you will become part of an international team of experts who will support you in becoming a scientist. Progress is regularly evaluated in discussions. Goals are set and problems are solved together.

A background in atomic physics, laser physics, spectroscopy, or optical technologies is desired. If you are interested, do not hesitate to contact us.

Contact:

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