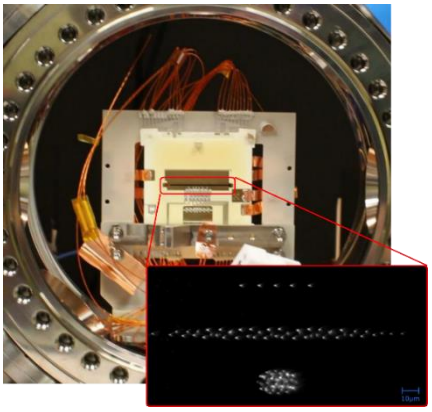
The QUEST Institute for Experimental Quantum Metrology is a joint institution of Leibniz Universität Hannover and PTB Braunschweig. The research revolves around quantum computing techniques for spectroscopy, optical clocks, and tests of fundamental physics with trapped ions.

Master/PhD Thesis Experimental Physics

In the field of optical atomic clocks based on trapped ions

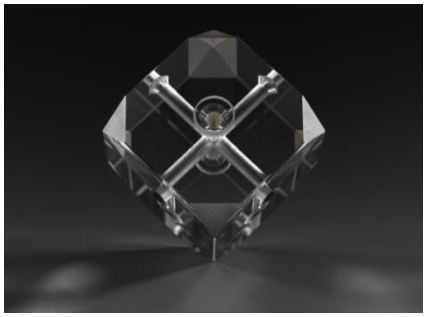
to join us at any time in our labs at PTB in Braunschweig.

Optical atomic clocks are the most accurate measurement devices known to mankind. Therefore, frequency comparisons of atomic clocks offer broad applications beside timekeeping. With relativistic geodesy clock comparisons are used to measure height differences over continental scales and variations in atomic levels can contribute to the search for dark matter. In our lab we investigate new concepts based on quantum control and quantum computing techniques to entangle multiple ions and reduce the averaging time of the clock to achieve a frequency uncertainty of 10^{-18}.



Possible topics include:

- Setup and characterisation of a low-noise laser system based on cavity-filtered ECDL-laser
- Programming (Python) of experimental sequences and data evaluation of multi-ion clocks
- Investigation of novel cooling techniques for multi-ion crystals
- Testing of electronics for active magnetic field noise suppression using the ions as sensor
- Develop dynamical decoupling and entanglement techniques for multi-ion clocks
- Evaluate systematic shifts to achieve world-record uncertainties
- Perform frequency comparisons with other high-accuracy clocks at PTB to contribute to the search for physics beyond the standard model



We offer:

- A position at one of the world's leading research institutions with an excellent infrastructure
- Hands-on training in modern experimental techniques of laser and quantum physics, and actively contribute to the development of experiments at the forefront of quantum physics research
- All projects are worked on in a small team supported by experienced scientists
- Possibility to present scientific results at international conferences
- Possibility to spend some time abroad
- Excellent national and international connections

Your profile:

- You are interested in quantum and atomic physics and aim for hands-on experience in the field of quantum optics, laser cooling, laser spectroscopy or related
- You are interested in contributing to precision experiments
- You are highly committed and capable of working as part of a team

Contact:

Prof. Dr. Piet O. Schmidt
Tel.: +49 (0)531 592 4700,
piet.schmidt@quantummetrology.de

Dr. Lennart Pelzer
Tel.: +49 (0)531 592 4722
lennart.pelzer@quantummetrology.de

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