

The Physikalisch-Technische Bundesanstalt (PTB) is the National Metrology Institute of Germany. The working group 4.32 Optical Lattice Clocks studies the interaction of atoms and ultra-stable laser light with respect to its application for highly precise measurements and optical atomic clocks based on neutral atoms.

We offer a

Master's Thesis:

Assembly and characterisation of a transportable ultrastable clock laser

in our **working group 4.32 Optical Lattice Clocks** at PTB in Braunschweig, Germany.

Optical atomic clocks are considered the future of atomic clocks. The oscillation of an electromagnetic wave in the visible part of the spectrum serves as their 'pendulum', i.e., the periodic oscillation that is at the very heart of every clock. Our working group develops and operates two optical lattice clocks – a laboratory clock and a transportable clock. The latter is used for measurement campaigns at various locations, e.g., at other research institutes. Designing the clock, we aimed for sufficient improvement of compactness and robustness to allow for convenient transport of the clock while retaining the accuracy and stability typical of a lab-sized optical atomic clock to the greatest possible extent. We develop highly stable optical reference resonators and laser systems in collaboration with working group 4.31. Assembling and characterising such a highly stable laser system will be the subject of this master's thesis.

About your tasks:

- You will assemble and characterise an ultrastable reference resonator.
- You will stabilize a laser to this reference resonator, using the Pound-Drever-Hall method.
- You will set up and improve several control circuits in collaboration with experienced Engineers to stabilise external influences like temperature and laser intensity.
- You need to consider that all components must be robust, compact, light and energy-efficient as the laser system must be transportable.

About you:

- You have knowledge in optics, laser physics, and control engineering or at least in a part of the topics.
- You have a bachelor's degree in physics or a comparable subject, with at least a good grade.
- You have strong communication and team working skills.
- You are motivated and enjoy experimenting.
- Fluency in spoken and written English is essential.

If you are interested or have further questions, please contact

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