Physikalisches Kolloquium — Physics Colloquium

Einladung — **Invitation**

Monday, 06 July 2026

Lecture Hall O25/H2, at 16:15 hrs
Coffee and cookies will be served in front of the lecture hall from 16:00 hrs

Optical Atomic Clocks: From Quantum Correlations to Relativistic Sensing

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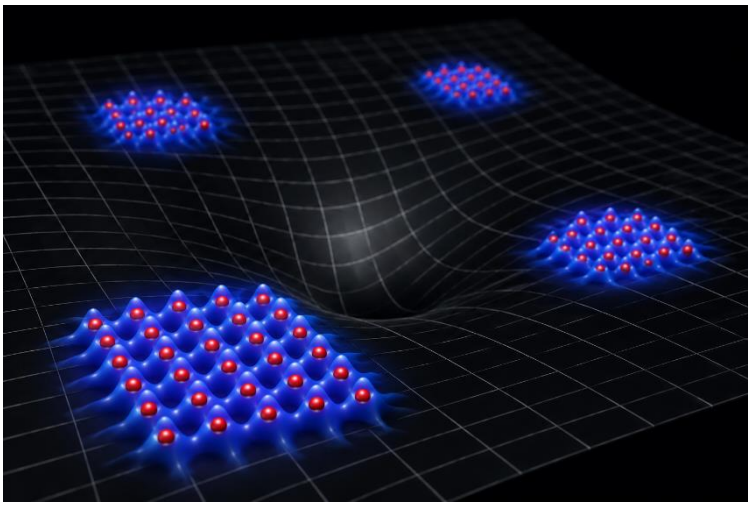
https://www.uibk.ac.at/de/th-physik/staff/hammerer-klemens/

Optical atomic clocks are the most precise measurement devices ever built, achieving accuracies that correspond to less than one second of drift over the age of the universe. Their extraordinary performance is enabling applications ranging from improved timekeeping and navigation to new tests of fundamental physics. In this colloquium, I will discuss theoretical work on two frontiers of optical clock research. First, I will show how quantum correlations between atoms can be harnessed to improve clock stability beyond conventional limits, emphasizing how their usefulness depends on the dominant noise sources and experimental constraints. I will then turn to relativistic effects, which at current levels of precision have become directly observable: they must be accounted for as systematic shifts, but also offer new opportunities for sensing gravitational and kinematic phenomena. In particular, I will outline how networks of atomic ensembles with long-lived optical transitions can be used to access such signals. These examples illustrate how theoretical advances in quantum metrology and precision measurement can help guide the development of future optical clock experiments and their applications in fundamental physics.



Host: Prof. Benjamin Stickler, Institute of Complexe Quantum Systems

Organisation: Prof. Dr. Jens Michaelis, Institute of Biophysics, jens.michaelis@uni-ulm.de, +49-731-50-23050