

Prof. Dr. Peter van Loock
Institut für Physik
loock@uni-mainz.de

JOHANNES GUTENBERG
UNIVERSITÄT MAINZ



Dr. Lars von der Wense
Institut für Physik
lars.vonderwense@uni-mainz.de

Seminar über Quanten-, Atom- und Neutronenphysik (QUANTUM)

Nov. 18, 2021 at 2 p.m.
None

Prof. Morgan Mitchell
The Institute of Photonic Sciences

CANCELLED Quantum-enhanced sensing and metrology with atoms

In 1981, a newly-minted PhD named Carlton Caves proposed to use "squeezed light" to beat the shot noise limit, and thereby improve the sensitivity of gravitational wave detectors. Thirty years later, the GEO600 gravitational wave detector demonstrated improved sensitivity using squeezed light. Today, forty years after his proposal, Caves is a Professor Emeritus, and gravitational waves are routinely detected with the help of squeezed light. Meanwhile, in 1993, the squeezing of atomic spins was proposed as a way to improve the sensitivity of atomic clocks, magnetometers, gravimeters, and so forth. If these atomic instruments proceed along the same time-line as gravitational-wave detectors, we should expect to see the first real-world use of squeezing in atomic instruments in the next few years. In this talk, I will describe some of the progress in this direction, including the use of squeezed light and squeezed spins in magnetometry. I will try to explain how quantum noise in a magnetometer is, and is not, like quantum noise in a gravitational wave detector, and some unexpected features that make magnetometers particularly well-suited for spin squeezing. If time permits, I will say something about the potential to use squeezing in optical lattice clocks, to improve the stability of our best time-keeping instruments.

Contact:
Andrea Graham
Institut für Physik
graham@uni-mainz.de