



CRC 1227
Designed Quantum States of Matter



GUEST LECTURE

Ass. Prof. Dr. Onur Hosten

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(Guest of Prof. P. Schmidt and Prof. K. Hammerer)

Leibniz Universität Hannover

DQ-mat Colloquium

12 January 2023, 4.00 pm

(Room D326, Welfengarten 1)

"Quantum sensing with entangled atoms and mechanical pendulums"

Advances in the level of precision in controlling atomic and optical systems have enabled the routine generation of entangled states for sensing applications. In the first part of the talk I will focus on a particular set of entangled states called spin squeezed states, and focus on our implementations in a cavity QED system. These include 20 dB spin squeezing for atomic clock applications and the concept of quantum phase magnification. I will then present the status of our efforts for developing a squeezed state-atom interferometer.

For a brief interlude I will advertise a new worthwhile method – squash locking – that we developed for laser-cavity frequency stabilization and for stabilization of laser injection locking. In the second part of the talk I will outline our new thrust for developing a hybrid system of atoms and mechanical oscillators in the form of torsional pendulums – intended for eventually sensing gravitational couplings in the quantum regime. To the experimental end, I will present laser cooling of a milligram scale pendulum from room temperature to 250 μ K, resulting currently into the coldest oscillator in the mass spectrum from microgram to kilograms.

All DQ-mat members and all interested are cordially invited to attend.