



CRC 1227  
Designed Quantum States of Matter



## GUEST LECTURE

# Prof. Dr. Kilian Singer

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

Leibniz Universität Hannover

DQ-mat Colloquium

**03 November 2022, 3.00 pm**

**(Room D326, Welfengarten 1)**

## "Heat engine with trapped ions"

Thermodynamic machines can be reduced to the ultimate atomic limit [1], using a single ion as a working agent. The confinement in a linear Paul trap with tapered geometry allows for coupling axial and radial modes of oscillation. The heat-engine is driven thermally by coupling it alternately to hot and cold reservoirs, using the output power of the engine to drive a harmonic oscillation. From direct measurements of the ion dynamics, the thermodynamic cycles for various temperature differences of the reservoirs can be determined and the efficiency compared with analytical estimates. I will describe how the engine principle can be exploited to implement a differential probe for non-classical baths [2].

[1] J. Rosnagel et al., "A single-atom heat engine", *Science* 352, 325 (2016).

[2] A. Levy, M. Göb, B. Deng, K. Singer, E. Torrontegui and D. Wang "Single-atom heat engine as a sensitive thermal probe." *New Journal of Physics*, 22, 093020 (2020)

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