CRC 1227
Designed Quantum States of Matter

SPECIAL SEMINAR

by

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05 June 2024, 10:00 am

Callinstraße 36, Building 3406, Seminar room 226

Title:

"Homogeneous Bose gases driven far from thermal equilibrium"

Abstract:

"Far-from-equilibrium systems are ubiquitous in nature, such as in glasses, active matter, and turbulence, but are still poorly understood when compared to the unifying description of thermodynamics for systems in thermal equilibrium. In this talk, I will present two different types of far-from-equilibrium phenomena realised by periodically driving a box-trapped, quasi-homogeneous Bose gas. First, by driving the ideal gas in the presence of disorder, the system shows subdiffusive dynamic scaling in the evolution of its momentum distribution and sublinear energy growth [1]. We show that this behaviour can be naturally understood as a random walk in energy space, and the resulting nonthermal momentum distribution is well-described by a compressed exponential [2]. Second, in the presence of interparticle interactions, the system features a turbulent cascade with a power-law momentum distribution, and its energy grows linearly until the dissipation scale, set by the trap depth, is reached [3, 4]. Thereafter, the system remains in a steady but nonthermal state. Finally, by varying the interparticle interaction strength, the system behaviour is shown to smoothly cross between these two phenomena [1], raising the possibility of systematically studying the interplay of drive, interactions, and disorder in far-from-equilibrium systems."

[1] G. Martirosyan, C. J. Ho, J. Etrych, Y. Zhang, A. Cao, Z. Hadzibabic and C. Eigen, *Phys. Rev. Lett.* **132**, 113401 (2024)
[2] Y. Zhang, G. Martirosyan, C. J. Ho, J. Etrych, C. Eigen and Z. Hadzibabic, *C. R. Phys.* **24**, 1 (2023)
[3] N. Navon, A. L. Gaunt, R. P. Smith and Z. Hadzibabic, *Nature* **539**, 72 (2016)
[4] N. Navon, C. Eigen, J. Zhang, R. Lopes, A. L. Gaunt, K. Fujimoto, M. Tsubota, R. P. Smith and Z. Hadzibabic, *Science* **366**, 382 (2019).

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