

CONDENSED MATTER THEORY SEMINAR

Subject: **Monitored Quantum Systems**
Speaker: **Dr. Michael Buchhold (Universität zu Köln)**
Date & time: **Friday, 19thth of April 2024 at 3:15 p.m.**
Venue: **Room 01.114**

Abstract:

The potential of quantum devices for real-time measurements has sparked the field of „monitored quantum systems“. This term highlights a shift in measurements' role from information extraction to actively shaping quantum wave functions. Measurements in this context serve diverse purposes, including competing or aligning with reversible operations to induce long-range entanglement or driving dynamics via non-commuting operations.

Monitored quantum systems exhibit rich non-equilibrium dynamics and entanglement patterns, which often turn out to be insensitive to microscopic details. Instead they depend on global properties, including symmetry and kinetic constraints. This robustness defines entanglement phases of matter, akin to thermodynamic phases, separated by measurement-induced phase transitions (MITPs).

This talk offers an overview of monitored quantum systems and MITPs, while discussing two baseline models: monitored free fermion systems and monitored Clifford quantum circuits. I will emphasize phenomenology of entanglement phases and recently developed analytical approaches to describe their dynamics, the challenges in experimental detection, and prospects for entanglement steering in the generation of new states of matter.