

Lecture Course on: OPEN QUANTUM MANY-BODY SYSTEMS



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Abstract

The goal of this set of lectures is to discuss the recent advances in the understanding of open quantum many-body systems, i.e. platforms where both dissipative and coherent processes can be tuned and controlled to a high degree. In the first lecture we present an overview of the major experimental platforms relevant for our scope, from superconducting circuits to ultracold atoms, and discuss two theoretical frameworks used to describe open quantum systems, the Lindblad master equation with its unravellings and the Keldysh technique. In Lecture 2 we discuss the concept of dissipation engineering and discuss how by suitably tailoring the coupling to an environment one can induce non-reciprocal interactions or mimic active matter behavior. In Lecture 3 we review the emergence of dissipative phase transitions, with a special focus on boundary time crystals and phase transitions in non-reciprocal systems. Finally in Lecture 4 we move to monitored quantum systems, discuss Measurement-Induced phase transitions both at the level of the no-click limit as well as the role of stochastic noise and the post-selection problem, together with strategies to circumvent it.

Program:

- **Experimental Platforms and Theoretical Frameworks (2hrs)**
Monday, 26th October 2026, 15:00 - 17:00
- **Dissipation Engineering (2hrs)**
Tuesday, 27th October 2026, 15:00 - 17:00
- **Dissipative Phase Transitions (2hrs+ 1hr exercise)**
Wednesday, 28th October 2026, 15:00 - 18:00
- **Monitored Quantum Systems (2hrs+ 1hr exercise)**
Friday, 30th October 2026, 15:00 - 18:00



Location: **Lecture Room C** Via Archirafi, 36

TeamCode:
fwwizbh

PhD and Master's students are all wellcome!