

**Speaker:** Tim Alhuser

**Title:** Quantum Thermodynamics in Strongly Coupled Open Systems: Analysis of Multiple Bath Scenarios

**Date:** Monday, December 9th, 14:00 pm (s.t.).

**Place:** Seminar room 915

**Title:** Quantum Thermodynamics in Strongly Coupled Open Systems: Analysis of Multiple Bath Scenarios

**Abstract:**

Using the framework of Dynamically Emergent Quantum Thermodynamics, a theory that adopts an open system approach to derive quantum thermodynamic properties, this work focuses on the definitions of heat, work, and a renormalized temperature in strongly coupled and structured environments beyond the Born approximation.

Thermodynamic properties of open systems are studied with the Fano-Anderson model serving as the main model of studies in this thesis. A comparison is made between exact solutions and those obtained through the expansion of the time-convolutionless (TCL) master equation at second and fourth order, in both single and multiple bath scenarios. The study emphasizes the advantages of the TCL approach in multiple bath cases, where the dissipator of the master equation can be split into individual bath contributions based on heat currents and bath temperatures. Numerical results demonstrate the feasibility of fourth order TCL expansions and identify the parameter regimes where these methods are applicable. Additionally, the renormalized temperature of the system is derived from its steady state in complex environments, highlighting its dependence on temperature gradients between different baths.