Monitored Quantum Many-Body Systems

Unitarity is a fundamental property of quantum mechanics which underlies the dynamics of closed quantum many-body systems, the concept of thermalisation and the emergence of statistical mechanics. A different paradigm for quantum dynamics arises in presence of an external monitoring apparatus which locally measures a system observable. The resulting dynamics, conditioned to the a set of measurement outcomes describe a stochastic quantum trajectory[1].

The goal of this project is to explore the dynamics of monitored quantum many-body systems and the statistical properties of the resulting quantum trajectories, their entanglement properties and phase transitions. Examples include study the monitored dynamics in gaussian monitored systems[2,3], fully connected models[4,5] or or explore the connections with classical models for stochastic resetting[6,7].

During this theoretical internship, the Master's student will acquire, develop, and apply state- of-the-art techniques for open quantum many-body physics to solve paradigmatic models for non-unitary quantum systems. This internship can naturally evolve into a PhD Thesis at the interface between nonequilibrium quantum dynamics, open quantum systems, statistical physics and quantum information.

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