

# Localization in open quantum systems

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Understanding how a many-body quantum system thermalises and when, at the opposite, it keeps memory of the initial preparation is an extraordinary challenge which has attracted enormous attention. Nowadays, most of the efforts focus on closed systems where the competition between disorder and interactions leads either to thermalization or many body localisation (MBL). In this context the presence of an external bath is believed to induce always thermalisation and destroy any fingerprint of localisation. This is in general not true. The goal of this project (an internship that can lead to a thesis) is to study localisation effects in open systems (e.g. in interaction with a thermal bath and eventually a drive). Two directions will be investigated:

- The quench of a many-body system prepared in a state out-of-equilibrium and let evolve in a bath of harmonic oscillators
- The stationary state of a system in contact with a thermal bath and driven out of equilibrium by irradiation.

In the first case we will focus on non-perturbative effects induced by the strong coupling with the bath.

In the second example we are interested in the nature of the stationary state using a weak coupling Lindblad approach. The work is both numerical and analytical and has strong connections with NMR experiments.