LPMMC
Quantum internship – Academic year 2025-2026

Title : Information and energy transport in fermionic quantum channels

Level : Master 1

General Scope :

Understanding and controlling excitation transfer in quantum many-body systems is a fundamental challenge with direct relevance to transport phenomena in spintronics and atomtronics, as well as to quantum communication and information processing. The outcome of this study will set the stage for applications such as quantum battery charging, source-to-drain transport in atomtronics, and quantum state transfer protocols.

Research topic and facilities available :

This project aims to investigate coherent multi-excitation transfer in one-dimensional quantum many-body systems, focusing on transport between the edges of an open chain in which sender and receiver blocks are weakly coupled to an intermediate quantum wire. Building on existing results for spinless fermions, the work will analyze how interactions (attractive or repulsive) and internal degrees of freedom (spin) modify the resonant-mode structure, transfer conditions, and time scales governing high-fidelity transport of information, magnetisation, and energy.

Required skills :

Taste for theory and modeling
Computer programming in python or julia

Starting date and duration : May 2nd, 2026; 2 to 3 months

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