Open Quantum Sysytems in Strongly Interacting Regime

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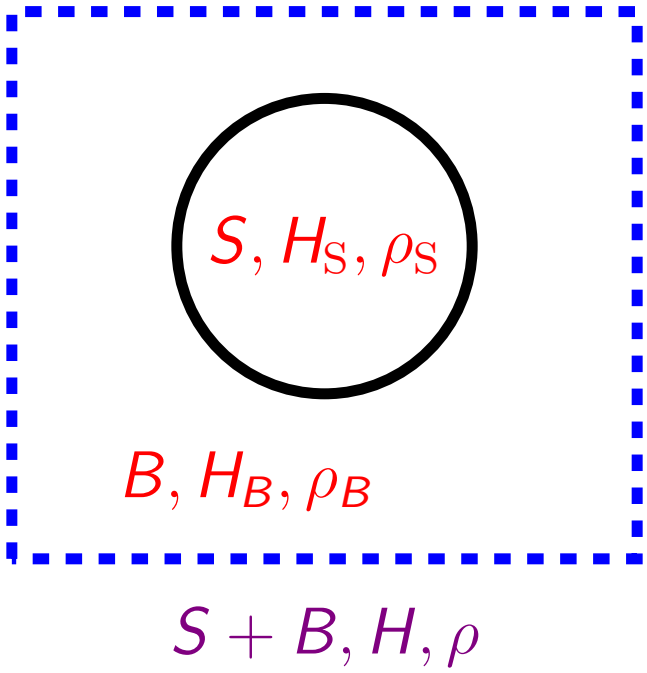
Summary of the Thesis Project



Approaches Considered

- HEOM
- Quantum Monte Carlo
- Tensor Networks

Goal

- Identify new dynamic behaviors
- Propose experimental signatures

Scientific Project

Context and Position of the Project on the International Scale

Context :

Formation of quantum phases and long-range correlations

Principal Objective :

Project aims to bridge this gap by developing theoretical models and advanced numerical simulations to explore these complex dynamics

International Positioning :

- Pr. Neil Lambert, Pr. Dral Pavlo and its collaborators

Scientific Project

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- Dr. Arrif Ullah

Scientific Project

Originality and Innovative Aspects

Originality

Project seeks to push the boundaries of existing models by combining advanced theoretical approaches with high-performance numerical techniques

- ultracold atoms in optical lattices
- cavity QED systems
- cutting-edge quantum technologies

Innovative Fields

- quantum thermodynamics
- error correction protocols
- development of quantum computing and sensing technologies

Scientific Project

Thesis Objectives and Proposed Research Program

Thesis Objectives

- Develop Theoretical Models for Strongly Interacting Open Quantum Systems
- Investigate Dissipative Dynamics and Steady-State Properties
- Identify Experimentally Testable Phenomena
- Explore Applications in Emerging Quantum Technologies

Research Program

- **Phase 1** : Theoretical Foundations
- **Phase 2** : Numerical Simulations
- **Phase 3** : Experimental Relevance and Applications

Scientific Project

Assets and Suitability of the Candidate for the Project

Title :

Prediction of excitation energy tranfer in photosynthetic light harvesting complexes

Authors :

Theodore GOUMAI VEDEKOI

Title :

An efficient Julia framework for hierarchical equations of motion in open quantum systems

Authors :

Yi-Te Huang, Po-Chen Kuo, Neill Lambert

Scientific Project

Interdisciplinary aspects / Ethics

Interdisciplinary aspects

- open quantum systems theory
- deep understanding of quantum coherence and many-body correlations
- advance computational and theoretical methods
- Incorporating frameworks such as **QuTiP**, **HierarchicalEOM.jl**, and **tensor networks**.

Ethical Considerations

- Minimize the energy resources used
- Protect data and ensure its confidentiality
- Taking measures to ensure my research is not used for malicious purposes


感謝你
Danke
Gracias
Grazie
Merci
Thanks!
THANK
YOU!