

Projekt 4.1. Quantum open systems of several ultra-cold atoms

Supervisor: dr hab. Tomasz Sowiński, prof. IFPAN

Institute: IFPAN

Unit: ON 5

Webpage of group: <http://www.FewBody.ifpan.edu.pl/>

Background:

Ultra-cold atomic systems containing a not very large and well-defined number of particles are one of the currently hot-debated topics in the atomic physics community. These scientific interests are inspired by recent experiments in which such systems are prepared with tremendous accuracy. The few-body systems with a well-controlled number of particles are crucially important for many branches of physics since they form a nontrivial but natural arena to study different aspects of the transition from a single quantum particle world to the many-body quantum systems. From this perspective, open few-body systems seem to be very good candidates for being quantum simulators of interplay between the quantum many-body coherence and its losses caused by environment. Simulations in the few-body regime provide an exceptional opportunity for direct and full inspection of the many-body quantum state of the system and multi-particle correlations. The main objective of the project is to immerse previous comprehensive studies on properties of closed ultra-cold one-dimensional few-atom systems in a fresh context of quantum open systems. These studies may shed a complementary light on different currently debated problems related to quantum open systems.

Aim:

The project is purely theoretical. Its main goal is to study dynamical properties of strongly interacting ultra-cold atoms confined in one-dimensional potential under presence of coupling to some external, adequately big quantum system serving as the environment.

Requirements:

- very good numerical modeling and programming skills
- research experience in a field related to the project
- very good spoken and written English