Project 4.17. Temporal coherence of dipolar ultra-cold gases

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Unit: ON 5

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Background:
The physics of ultra-cold atomic gases is a rapidly developing field mainly because of extraordinary control over the system parameters that are achieved experimentally. It is also a reason why this many-body quantum system is thought and applied as a very sensitive sensor in quantum metrology or quantum simulators. The unique property of the system is its macroscopic spatial and temporal coherence among atoms. In this project, we propose to perform an accurate theoretical study of time coherence of ultra-cold atomic gases with long-range dipolar interactions. The motivation for the research proposed is recent experimental discoveries of novel quantum phases in the system and weakness of its present-day description. The understanding of the phase dynamics and resulting coherence time of the system is still poorly developed.

Aim:
The project aims at performing a comprehensive theoretical study of the coherence time of ultra-cold atomic gases with dipolar interactions at zero and nonzero temperatures, taking into account also the role of reduced spatial dimensions. The project will be performed in close collaboration with a theoretical group from LKB, ENS, Paris.

Requirements:
-interest in the physics of ultra-cold atoms
-good knowledge of quantum physics, previous experience with ultra-cold gases or quantum optics will be an advantage
-good numerical skills and willingness to learn new computational techniques
-good spoken and written English

Salary: 5000 PLN per month (grant funding, before obligatory employer and employee social security contributions).

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