

Theoretical Physics Division Seminar

Fundamental Research Department
NATIONAL CENTRE FOR NUCLEAR RESEARCH

24.05.2023 (Wednesday); Time: 11:15
The seminar is held in person
@ Pasteura 7, 207

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Ultra-cold atomic gases, neutron stars, and nuclei from the perspective of density functional theory.

ABSTRACT:

Ultracold atoms, nuclear matter in neutron stars, and nuclei: these strongly interacting systems may appear as rather distinct; however, all of them can be described within the common theoretical framework of Density Functional Theory. It is a versatile method describing with very good accuracy the static, dynamic, and thermodynamic properties of many-body Fermi systems in a unified framework while keeping the numerical cost at the same level as the mean-field approach. The development of (super)computing techniques in the last decade allows for DFT approaches to simulate nowadays microscopic dynamics of systems consisting of tens of thousands of particles. It opens the possibility for studies of a plethora of many-body phenomena across various systems. I will summarize these developments of the DFT dedicated to strongly interacting and superfluid Fermi systems, together with its numerical implementation. Selected applications of the method to various experimental setups with ultracold atomic gases will be presented. Finally, I will discuss opportunities offered by the DFT method in the context of the modeling systems that are not directly accessible, like neutron stars.

Best regards,

T. Altinoluk, M. Kowal, P. Małkiewicz, E. Sessolo, P. Zin