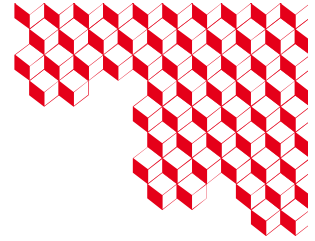




Institute of Research into the
Fundamental laws of the Universe

Nuclear Physics Department



PhD Defense Friday, September 27th 2024, 14h

Bat 703, Room 135, CEA Saclay, Orme des Merisiers

Andrea LAGNI

DPhN LENA

**Looking for short-range correlations
in proton-induced Quasi-Free Scattering (QFS) reactions in inverse kinematics**

The formation of short-range correlated nucleon-nucleon pairs (SRCs), primarily composed of neutron-proton pairs [1], appears to be a universal feature in atomic nuclei [2]. Interestingly, measurements in electron scattering indicate that protons become significantly more correlated in asymmetric nuclei as a function of neutron excess. This has potential implications for the description of cold dense nuclear matter as for neutron stars. However, available data are limited to stable nuclei, which have maximum neutron excess of ~ 1.6 and, at the same time as they become more neutron-rich, they also become heavier.

To overcome these limitations, we performed a pilot experiment at the R³B setup at GSI-FAIR [3] as part of the FAIR Phase-0 experimental program to measure SRC in the most neutron-rich nucleus yet, ^{16}C . We employed hard proton knockout reactions in inverse kinematics of ^{16}C beam at 1.25 GeV/nucleon, as well as ^{12}C beam as reference, to study SRC behavior.

I will explain the analysis work of this experiment that I have performed during my PhD.
I will discuss the results of this SRC investigation in neutron-rich nuclei and the prospects for the follow-up research program at FAIR.

[1] R. Subedi, R. Shneor, Science, 1156675, 2008.

[2] M. Duer et al. (CLAS Collaboration), Nature, 560:617, 2018.

[3] <https://www.gsi.de/work/forschung/nustarennanustarennadivisions/kernreaktionen/activities/r3b>.

LENA laboratory Nuclear Structure Group

https://irfu.cea.fr/dphn/en/Phoce/Vie_des_labos/Ast/ast_groupe.php?id_groupe=4069

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