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# The 227th HENPIC seminar by Prof. Raffaele Del Grande, (Czech Technical University in Prague), June 05, 2025, Thursday, 4:30pm (Beijing time)

Title: Understanding two- and three-body hadronic interactions using femtoscopy.

#### Abstract:

The femtoscopy technique at the Large Hadron Collider has proven capable of providing unprecedented precision information on the low-energy interaction between nucleons and strange hadrons. The experimental methodology exploits the emission of particle pairs at the femtometer scale in the collisions and analyzes the momentum correlation induced by free scattering of the produced hadrons. The measurements of the p- $\Lambda$ and p- $\Xi$  - correlation functions by the ALICE collaboration have been used to challenge effective field theory results and to test for the first time lattice QCD calculations. Recently, the same experimental technique has been used to access the dynamics of three hadrons and three-nucleon (N-N-N) as well as N-N- $\Lambda$  correlation measurements became available. Phenomenological calculations indicate that the effect of the three-body forces in the N-N- $\Lambda$  correlation function is pronounced, demonstrating that correlation function analyses can be used to access the dynamics of few-body systems. In this seminar, I will discuss the impact of the femtoscopy method on the understanding of the two-and three-body interactions with hadrons.

## Brief introduction about the speaker:

### Dr. Raffaele Del Grande

Raffaele got a bachelor's degree in Physics in 2011 at University of L' Aquila; master's degree in Astronomy and Astrophysics in 2014 at the University of Rome La Sapienza. He did his PhD at the INFN in Frascati with a thesis on experimental hadronic physics within the SIDDHARTA-2 and AMADEUS experiments at DAFNE. During this period he classified all the absorption processes of Kaons in nuclei, by disentangling the two-, three-and four-nucleon absorptions and he measured for the first time the corresponding yields. Raffaele continued his experience in Frascati for 2 years as a Postdoc (2018-2020) working on kaonic atoms at DAFNE and "impossible" (Pauli-violating) atoms at the Gran Sasso Underground laboratories. Enriched by this experience on exotic atoms he moved for 6 months at the Jagiellonian University in Cracow where he analysed the three-body decay of the orthopositronium (the most simple particle-antiparticle atom) with the J-PET experiment. In 2020, Raffaele moved to the Technical University in Munich (TUM) where he joined the ALICE collaboration at CERN. Together with the TUM group, he initiated the study of hadronic interactions in three-body systems with the femtoscopy method. During this period he got important recognitions in ALICE and, from 2022 to 2024, he became coordinator and responsible of all the Femtoscopy analyses in the collaboration. In 2024, he got a tenure track position as Assistant Professor at the Czech Technical University in Prague where he moved in January 2025.

# Summary

Presenter: Prof. DEL GRANDE, Raffaele (Czech Technical University in Prague)