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Proton-cluster femtoscopy at the HADES experiment

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The coherent description of nuclear matter properties at high baryon densities is of utmost importance. The limited number of experimental references in the region of the phase diagram corresponding to Neutron Stars (NS) and NS mergers poses major challenges for constructing a universal Equation of State. The matter created in heavy-ion collisions at the HADES experiment can be characterized by similar thermodynamic quantities as NS mergers, thus becoming an essential reference for the studies of these compact stellar objects [1]. Understanding the properties of the newly created matter, such as the strong interaction between hadrons or the presence of bound states, provides substantial insight for such investigation.

One of the methods applied in these studies is femtoscopic correlations (FC). It is a unique tool for the determination of the interactions between hadrons and searching for possible nuclear matter exotic states. Nonetheless, FC is found to be sensitive to variations of EoS, which makes it a valuable reference for its studies.

This poster will present the newest results on the proton-cluster (deuteron, triton, and He-3) FC at the HADES experiment showing the presence of unbound ground state Li-4 and excited states of He-4. The interactions between proton and clusters will be discussed as well. This research brings us closer to understanding the essential properties of nuclear matter at higher baryon densities.

[1] HADES Collaboration: Nature Physics volume 15, pages 1040–1045 (2019)

Category

Experiment

Collaboration (if applicable)

HADES

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