HK 71: Hadron Structure and Spectroscopy X

Time: Thursday 15:45–17:15 Location: HBR 62: EG 19

HK 71.1 Thu 15:45 HBR 62: EG 19

Measurement of mass A=4 hypernuclei in LHC Run 3 with ALICE — •Michael Hartung for the ALICE Germany-Collaboration — Institut für Kernphysik, Goethe Universität, Frankfurt, Germany

Hypernuclei are bound states that contain ordinary nucleons as well as hyperons (e.g. Λ). Their investigation allows the study of the hyperon-nucleon interaction, which can only be studied to limited extend by scattering experiments.

The most prominent example is the (anti)hypertriton, which is a bound state of a proton, a neutron and a Λ hyperon. It has been measured by the ALICE Collaboration in Run 1 and Run 2 of the Large Hadron Collider at CERN. The production of hypernuclei with mass A=4 is strongly suppressed compared to the (anti)hypertriton, thus an exact measurement of their properties has been impossible so far. Due to the high-interaction rate and the continuous readout of the ALICE detectors in RUN 3, a precise measurement of two mass A=4 hypernuclei, namely hyperhydrogen-4 and hyperhelium-4, will be possible for the first time. We will present the latest results of the production measurement of both hypernuclei in Run 3 Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.36$ TeV.

HK 71.2 Thu 16:00 HBR 62: EG 19

Luminosity Determination and Proton-Proton Elastic Scattering Analysis with the Upgraded HADES Spectrometer — •Gabriela Perez-Andrade[1], James Ritman[1,2,3], and Peter Wintz[3] for the HADES-Collaboration — [1]Ruhr Universität Bochum — [2]GSI Helmholtzzentrum für Schwerionenforschung — [3]Forschungszentrum Jülich

In 2022, an experiment focused on hyperon production was carried out with the upgraded HADES spectrometer. The upgrade includes a new Forward Detector system (FD), which consists of two PANDA-type Straw Tracking Stations and an RPC. The measurements were performed with a proton beam of T = 4.5 GeV impinging onto a LH_2 target.
Proton-proton elastic scattering events with low 4-momentum transfer were selected by demanding that one proton was detected in the FD ($\theta_{FD} < 6°$), and the other proton was measured in the main HADES acceptance ($70° < \theta_H < 79°$). The event selection based on kinematic observables will be explained in this talk. The number of elastic events, corrected for acceptance and reconstruction efficiency, is used to determine the time-integrated luminosity recorded during this experiment. The measured differential cross-section $d\sigma$ as a function of the square of the 4-momentum transfer t is well described by a function of the form $d\sigma/dt = Ae^{-B|t|}$, from which the optical point $A = d\sigma/dt\big|_{t=0}$ and the nuclear slope parameter B are obtained. Preliminary results of A and B are compared with existing data from other experiments.

HK 71.3 Thu 16:15 HBR 62: EG 19

Common femtoscopic hadron-emission source in pp collisions at the LHC — •Maximilian Korwieser for the ALICE Germany-Collaboration — Technische Universität München

The ALICE Collaboration recently published a plethora of results on the interaction between many exotic combinations of particles, most notably p−Ω, obtained from femtoscopic measurements in pp collisions at the LHC. Previous studies of the source in pp collisions at $\sqrt{s}$ = 13 TeV have been performed by analysing p−p and p−Λ correlations. The source was constructed using a Gaussian core for the primordial particles and introducing exponential deformations due to the decay of short-lived strongly decaying resonances. The conclusion was that the primordial sources for hadrons share a common m_{T} scaling. The goal of this work is to ascertain whether the primordial sources for mesons also exhibit the same m_{T} scaling, for example in the case of same charge π–π (or K^+–p), for which by far the largest contribution from resonances is expected. A differential study of the spatial extension of the source function as a function of transverse mass (m_{T}) and multiplicity is presented. The results are based on minimum-bias and high-multiplicity pp collisions at $\sqrt{s} = 13$ TeV recorded with the ALICE detector. An mT scaling behaviour of the source is observed and found to be compatible with previous results in the baryonic sector. This measurement gives confidence for a common source for hadrons in small systems, allowing to employ the same model to constrain the source for meson−baryon and meson−meson pairs. This research was funded by BmBf Verbundforschung (05P21WOCA1 ALICE).

HK 71.4 Thu 16:30 HBR 62: EG 19

p-d femtoscopy and p-p source size measurement in PbPb collisions with ALICE at the LHC — •Dongfang Wang for the ALICE Germany-Collaboration — Fudan university, Shanghai, China

The ALICE Collaboration recently published a measurement of p-d correlation function in pp collisions at 13TeV. In order to describe the data a three-body analysis was needed. The small source size (of 1 fm) makes the measurement sensitive to the interaction of the proton with the compositions of the deuteron. However we do not know the sensitivity in Pb-Pb which has about 5-10 fm of the typical distances depending on the centralities. In general, these studies depend on a precise measurement of the effective particle emitting source. In small systems extensive studies performed by ALICE showed that the source exhibits an m_T-scaling behavior. Currently, relevant for proton-deuteron studies measurements of proton mt scaling are absent in Pb-Pb 5.02TeV. In this contribution, we extend proton-deuteron study from pp to Pb-Pb collisions and the p-p correlation function analysis differentially in m_T and centrality has to be performed. The obtained correlation functions are fitted and the source size is extracted. Next the detailed information about the source dependence on mT are used as an input to state-of-the-art of source prediction of correlation function. This control of source is necessary for investigation of the sensitivity of 3-body effects present in the p-d correlation function in Pb-Pb.

HK 71.5 Thu 16:45 HBR 62: EG 19

Properties of Heavy-Flavour Four-Quark states from Functional Methods — •Joshua Hoffer[1,2], Gernot Eichmann[3], and Christian S. Fischer[1,2] — [1]Institut für Theoretische Physik, Justus-Liebig-Universität Gießen, 35392 Gießen, Germany — [2]Helmholtz Forschungsakademie Hessen für FAIR (HFHF), GSIHelmholtzzentrum für Schwerionenforschung, Campus Gießen, 35392 Gießen, Germany — [3]Institute of Physics, University of Graz, Universitätsplatz 5, 8010 Graz, Austria

Since the experimental discovery of the first tetraquarks in 2003, there has been a lot of excitement around this topic from the theoretical as well as the experimental side. We employ hadronic bound state equations, i.e., Bethe-Salpeter equations, to study the properties of these four-quark states. In this talk we will present a comprehensive overview of the mass spectra for hidden- and open-flavour four-quark states in the charmonium and bottomonium sector, as well as their internal structure.

HK 71.6 Thu 17:00 HBR 62: EG 19

Studying the interaction between charm and light-flavor mesons — •Daniel Battistini for the ALICE Germany-Collaboration — Technical University of Munich, Munich, Germany

In the last years, several exotic states have been observed in the charm sector. Such particles cannot be interpreted as regular baryons or mesons and are thought to be either quark bags or molecular states. To unveil their nature, it is crucial to experimentally constrain the strong force that governs the interaction between the charm hadrons and other hadrons. The knowledge of the strong interaction in the charm sector is also essential for the study of ultrarelativistic heavy–ion collisions. In fact, during the hadronic phase of the system expansion, the charm hadrons interact with the hadron gas produced in the collisions. Such interactions modify the heavy-ion observables, and, to disentangle this effect from the signatures of the quark-gluon plasma formation, the scattering parameters of the charm hadrons with light-flavor hadrons are required. The available experimental knowledge on the charm-hadron interactions is, however, very poor. In this contribution, the first measurement of the strong final-state interaction between open-charm and light-flavor meson systems is presented. The measurement is performed using the femtoscopy technique and high-multiplicity proton-proton collisions at $\sqrt{s} = 13$ TeV collected by the ALICE Collaboration. Funded by BMBF Verbundforschung (05P21WOCA1 ALICE).