HK 63: Schwerionenkollisionen und QCD Phasen

Zeit: Freitag 14:00–16:00 Raum: HZ 6

HK 63.1 Fr 14:00 HZ 6

Production of hypernuclei from excited nuclear residues in relativistic ion collisions — •Alexander Botvina[1], Marcus Bleicher[1], and Josef Pochodzalla[2] — [1]FIAS, J.W.Goethe University, Frankfurt/Main — [2]IKP, J.Gutenberg University, Mainz

Within dynamical and statistical theories we study the main regularities in the production of hypernuclei emerging from the projectile and target residues in relativistic ion collisions. We demonstrate that the yields of hypernuclei increase considerably at beam energies above the energy threshold for Lambda hyperons, followed by a saturation for yields of hypernuclei with increasing the beam energy up to few TeV [1]. These hypernuclei have a broad distribution in masses and isospin. They can even reach beyond the neutron and proton drip-lines since they are stable with respect to nucleon emission [2]. Weak decay of such hypernuclei may lead to formation of normal nuclei beyond the drip-lines also, thus providing a unique chance for reaching island of stability on the nuclear chart. The production of specific hypernuclei depend strongly on the isotopic composition of the projectile, therefore, there is an opportunity to obtain exotic hypernuclei that may be difficult to reach in traditional hypernuclear experiments [1]. The perspectives of hypernuclear studies involving these novel processes at the future FAIR facility are discussed.

[1] A.S. Botvina, K.K. Gudima, and J. Pochodzalla, Phys. Rev. C88, 054605 (2013).

[2] N. Buyukcizmeci, A.S. Botvina, J. Pochodzalla, and M. Bleicher, Phys. Rev. C88, 014611 (2013).

HK 63.2 Fr 14:15 HZ 6

Search for the Ξ^0-p bound state in $\sqrt{s_{\mathrm{NN}}} = 2.76$ TeV Pb–Pb collisions with ALICE at the LHC — •Joachim Tscheuschner for the ALICE-Collaboration — Research Division and ExtreMe Matter Institute, GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt — Institut für Kernphysik, Technische Universität Darmstadt, Schlossgrabenstr. 9, 64289 Darmstadt

Dibaryons, bound states of two baryons, have been predicted for a long time. However, despite the effort on the experimental side, none has been found yet, the deuteron being the only one known. Confirming their existence would give an insight into the interaction among baryons. At LHC energies they should have higher production probability since baryons are abundantly produced and the ALICE apparatus, with its excellent particle identification and vertexing capabilities, is particularly suited to the search of these unstable states. In this contribution the ongoing investigation of the Ξ^0-p dibaryon in Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 2.76$ TeV is presented. It is predicted to weakly decay mainly in Λ+p. This decay, with $\Lambda \to \pi^- + \mathrm{p}$, has a topology similar to the one of the multi-strange baryons already measured by the ALICE Collaboration.

HK 63.3 Fr 14:30 HZ 6

Search for the Λn bound state and the H-dibayron in $\sqrt{s_{\mathrm{NN}}} = 2.76$ TeV Pb–Pb collisions with ALICE at the LHC — •Nicole Martin for the ALICE-Collaboration — Research Division and ExtreMe Matter Institute EMMI, GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt — Institut für Kernphysik, Technische Universität Darmstadt, Schlossgrabenstr. 9, 64289 Darmstadt

ALICE is the experiment at the CERN LHC dedicated to the investigation of nucleus–nucleus collisions at the highest energies ever reached in the laboratory. The excellent particle identification capabilities and the ultralow momentum reach of ALICE allow for the reconstruction of a significant number of rare states or even exotic ones. In this talk we present results from a sample of Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 2.76$ TeV. Particles as well as the corresponding anti-particles have been identified based on their specific energy loss in the Time Projection Chamber and velocity information from the Time-Of-Flight detector. The Inner Tracking System allows a precise determination of the collision vertex. Therefore primary and secondary particles can be well separated. This helps for example in the search for lighter exotic hyper-matter states, i.e. Λ-Λ (also known as H-dibaryon) and Λn bound states. We present here the search for a possible Λn bound state decaying into a deuteron and a pion and for the H-dibaryon decaying into Λ, proton and pion. The results are compared with model calculations.

HK 63.4 Fr 14:45 HZ 6

Proton-Lambda Correlations in Pb-Pb Collisions at $\sqrt{s_{\mathrm{NN}}} = 2.76$ TeV with ALICE — •Hans Beck for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

Femtoscopic two-particle correlations carry important information about the particle emitting source. Of particular interest is the m_{T} dependence of the extracted source radii, which is introduced by the dynamics of the system created in heavy-ion collisions. The reach in m_{T} of the traditional pion-pion correlation measurements is limited by the small rest mass of the examined particles. Thus, it can be extended with the analysis of pairs of heavier particles, e.g. proton-lambda pairs, being the heaviest system for which source sizes can so far be extracted.

The excellent PID capabilities of ALICE allow to obtain lambda and proton samples with very high purities. The measured proton-lambda correlation functions are affected by feed-down due to weak decays of higher mass baryons. Using data-driven methods, a corresponding correction is applied to the data. This allows to extract radius parameters in several centrality classes and m_{T} intervals at larger m_{T} with high precision.

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HK 63.5 Fr 15:00 HZ 6

Short-lived particles reconstruction with KF Particle Finder for the CBM experiment — Ivan Kisel[1,2,3], Iouri Vassiliev[3], and •Maksym Zyzak[1,2,3] for the CBM-Collaboration — [1]Goethe-Universität Frankfurt am Main — [2]Frankfurt Institute for Advanced Studies — [3]GSI Helmholtzzentrum fur Schwerionenforschung GmbH

The CBM experiment is being designed to operate at extreme interaction rate up to 10^7 Hz. Due to the complicated triggering the full online event reconstruction is required.

The KF Particle Finder package is being developed for the online reconstruction and selection of short-lived particles. The package reconstructs about 50 particles including strange mesons, hyperons, charmed particles, low mass vector mesons, strange and charmed resonances. The Au+Au collisions with energies from 4 to 35 AGeV were investigated with realistic detector simulation. The package shows high reconstruction efficiency. For example, for K^0_s and Λ particles it is about 20%.

Since the speed is of particular importance for online reconstruction, the package was vectorized and parallelized. KF Particle Finder shows linear scalability with respect to the number of cores. The processing time for one mbias Au+Au event at 25 AGeV is about 1.5 ms per core.

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HK 63.6 Fr 15:15 HZ 6

Fast reconstruction of multi-strange hyperons in the CBM experiment — •Iouri Vassiliev[1], Ivan Kisel[1,2], and Maxim Zyzak[1,2,3] for the CBM-Collaboration — [1]GSI, Helmholtzzentrum für Schwerionenforschung Darmstadt, Germany — [2]Institute for Advanced Studies, Frankfurt am Main, Germany — [3]Goethe University Frankfurt am Main, Frankfurt am Main, Germany

The main goal of the CBM experiment is to study the behaviour of nuclear matter at very high baryonic density in which the transition to a deconfined and chirally restored phase is expected to happen. One of the promissing signatures of this new state is the enhanced production of multi-strange particles, therefore the reconstruction of multi-strange hyperons is essential for the understanding of the heavy ion collision dynamics. Another experimental challenge of the CBM experiment is online selection of open charm particles via the displaced vertex of the hadronic decay, charmonium and low mass vector mesons in the environment of a heavy-ion collision. This task requires fast and efficient track reconstruction algorithms, primary vertex finder and particles finder. Results of feasibility studies of the multi-strange hyperons in the CBM experiment will be presented.

HK 63.7 Fr 15:30 HZ 6

Untersuchung der Multiplizität charakteristischer Röntgenstrahlung nach Fusionsprozessen schwerer Kerne mit dem MINIBALL Spektrometer — •Sebastian Reichert, Dennis Muecher und Walter Henning — TU Muenchen, Physik Department E12, Deutschland

Die Identifikation schwerer und super schwerer Kerne nach Fusion mittels Recoil Spektroskopie ist ein probates Mittel, das bei zunehmend geringeren Wirkungsquerschnitten der Fusionsprodukte und der sehr geringen Statistik an ihre Grenzen stoesst. Eine bisher wenig genutzte Art einer zusaetzlichen Identifikationsmoeglichkeit bietet die Messung der charakteristischen Roentgenstrahlung waehrend der Abregung des Evaporation Residues, die nach einer internen Konversion auftritt. Im Gegensatz zu den Uebergangslinien ist diese sehr gut berechenbar. Dieser Vortrag stellt eine Masterarbeit vor, in der eine (grobe) theoretische Vorhersage ueber die Haeufigkeit des Auftretens der internen Konversion getroffen wird. Am MINIBALL-Setup am Maier Leibnitz Laboratorium wurden Multiplizitaeten mittelschwerer Kerne auf Basis verschiedener Analysemethoden bestimmt. Die Unterdrueckung des Untergrunds fuer schwere Kerne war ein weiterer Teil und wurde als Vorarbeit fuer anstehende Experimente am RIKEN gesehen.

HK 63.8 Fr 15:45 HZ 6

What happens actually in multinucleon transfer reactions ? — Geneviève Mouze and •Christian Ythier — Faculté des Sciences,Université de Nice, 06108 Nice cedex 2,France

In the 90Zr + 208Pb reaction at 560 MeV identical Gaussian isotopic distributions having a width of 2.5 u are observed for products of Z comprised between 40 and 32 [1]: Are they really due to a multineutron pick-up process accompanying any proton stripping, as believed today [2] ? In fact they are distributions of the neutron number N of the product around its most probable value: This uncertainty in N results from the lifetime of only 0.17 yoctosecond of a new state of nuclear matter, which has been also found in the fission reaction[3]. Interestingly, the new state is characterized by the disappearance of any proton charge and might be triggered, in fission, by a combined shifting of the proton phase against the neutron phase of ordinary matter: It may be asked whether this state is triggered, in transfer reactions, by the crossing of the Coulomb barrier, at which any proton charge should logically disappear. [1] C.A. Ur et al., Fusion 06,A.I.P., vol.853 (2006) p.43. [2] G. Pollarolo, Fusion 06,A.I.P., vol.853 (2006) p.29. [3] G. Mouze et al., http://arxiv.org/abs/1004.1337