HK 13: Physik mit schweren Ionen

Zeit: Dienstag 14:15–16:30 Raum: F

HK 13.1 Di 14:15 F

Observation of $\Sigma(1385)$ in proton induced reactions at FOPI — •Laura Fabbietti[1], Paul Bühler[2], Michael Cargnelli[2], Paul Kienle[2,1], Reiner Krücken[2], Philippe Schmid[2], Ken Suzuki[2], Hannes Zmeskal[2], and Toshimutzo Yamazaki[3] for the FOPI-Collaboration — [1]Technische Universität München — [2]Stefan Meyer Institut, Wien — [3]Tokio University

Strangeness production in proton induced reactions is only sparsely known in the threshold energy range, especially for higher lying hyperon resonances. The reaction p+C was investigated at a bombarding energy of 3.5 GeV with the FOPI detector at the SIS18 accelerator of GSI. Employing a correlation analysis of $\Lambda-\pi$-pairs, we show the experimental results obtained for the reconstruction of the $\Sigma^*(1385)^{+-}$ resonance. Our results provide a lower limit of the absolute cross section and give a first indication of the phase space distribution of the produced resonance. The $\Sigma^*(1385)/\Lambda$ ratio will be shown as well. The reconstruction and quantitative control of the background in the $\Lambda-\pi$-decay channel, is considered a reference point for the planned investigations of the $\Lambda-p$ system that will address the question of the existence of di-baryonic strange resonances.

HK 13.2 Di 14:30 F

Measurement of strange baryon resonances in heavy ion collisions — •Xavier Lopez for the FOPI-Collaboration — Gesellschaft für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany

In-medium modifications of the production and propagation of strange particles in hot and dense nuclear matter [1] is one of the main topics in relativistic heavy-ion collisions. At SIS energies, complex mechanisms like strangeness exchange reaction (π+Y$\leftrightarrow K^-$+B) complicate the interpretation of existing data [2], e.g. recent theoretical calculations predict an important coupling of the K^- with the $\Sigma(1385)$ in the medium [3]. Therefore a systematic study of strange baryon resonances is needed to achieve a better understanding of strangeness production close to threshold.

The FOPI detector at the SIS accelerator of GSI-Darmstadt allows to measure and reconstruct a large variety of strange particles. Different excited states of strange baryon resonances like $\Sigma(1385)$, $K(892)$, H-dibaryons [4] and hypertritons have decay channels that allow their detection in large statistics data samples. The evidence for the resonances in the Ni+Ni and Al+Al systems at 1.9 AGeV will be presented.

(Work supported by BMBF (06HD155))

[1] J. Schaffner et al., Nucl. Phys. A **625**, 325 (1997).
[2] W. Cassing et al., Nucl. Phys. A **727**, 59 (2003).
[3] M.F.M. Lutz et al., Nucl. Phys. A **700**, 193 (2002).
[4] R.L. Jaffe, Phys. Rev. Lett. **38**, 195 (1977).

HK 13.3 Di 14:45 F

Charged kaon flow measurement with FOPI at SIS — •Young Jin Kim for the FOPI-Collaboration — Gesellschaft für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany

The study of strange particles produced at (sub)threshold energies in nucleus-nucleus collisions can deliver insights into fundamental questions about the in-medium properties of hadrons in dense baryonic matter. Many theoretical calculations for the production and propagation of strangeness at SIS energies lead to various predictions concerning the existence and magnitude of in-medium effects for strange particles in nuclear matter [1]. As demonstrated in recent theoretical calculations [2], directed and elliptic flow of $K^{\pm}$ show dependences on the sign and magnitude of the $K^{\pm}$ in-medium potentials under different model approaches. We present results on flow for charged kaons in Ni + Ni collisions at 1.93A GeV measured with the FOPI detector at GSI-Darmstadt. The comparison between data and model calculations will be discussed. This work was supported by BMBF project 06HD953 and KOSEF grant F01-2006-000-10035-0.

[1] C. Fuchs, Prog. Part. Nucl. Phys. **56** 1 (2006), and references therein.
[2] A. Mishra *et al.*, Phys. Rev. C **70** 044904 (2004).

HK 13.4 Di 15:00 F

Hypernucleus formation in high-energy nuclear collisions — •Theodoros Gaitanos, Horst Lenske, and Ulrich Mosel — Institut für Theoretische Physik, Universität Giessen, Germany

Hypernucleus production in high energy collisions with rare isotope and antiproton beams will be one of the major projects under study in the new experimental facilities at GSI (HypHI and PANDA collaborations, respectively). Such investigations will be important in understanding the interaction between hyperons and nucleons, which can be accessed so far mainly from studies on hypernuclei. We thus plan to theoretically investigate hypernucleus formation in such dynamical processes (heavy ion and antiproton-nucleus induced reactions at energies above the strangeness production threshold, $E_{beam} \sim 2-5$ AGeV, as proposed for the pilot experiment) within kinetic equations of a Boltzmann-type. In particular, since the mechanism of hypernucleus production is not well known in such dynamical situations, we will attempt to study the influence of the cluster coalescence mechanism, secondary pionic rescattering, e.g. $\pi N \longrightarrow YK$ and mean-field applied, on the hypernucleus formation.

Work supported by BMBF.

HK 13.5 Di 15:15 F

Energy dependence of K^0_S production in central Pb+Pb collisions at the CERN SPS — •Claudia Strabel[1], Christopher Alt[1], Alexandra Argyrakis[1], Christoph Blume[1], Peter Dinkelaker[1], Volker Friese[2], Marek Gazdzicki[1], Claudia Höhne[2], Michael Kliemant[1], Stefan Kniege[1], Dmytro Kresan[2], Benjamin Lungwitz[1], Michael Mitrovski[1], Rainer Renfordt[1], Tim Schuster[1], Reinhard Stock[1], Herbert Ströbele[1], Millica Utvic[1], and Alexander Wetzler[1] for the NA49-Collaboration — [1]Fachbereich Physik der Universität Frankfurt — [2]Gesellschaft für Schwerionenforschung (GSI), Darmstadt

The NA49 experiment at the CERN SPS has collected data on central Pb+Pb collisions in the beam energy range 20A-158A GeV. One of the most striking observations is the pronounced maximum in the ratio of the strangeness to pion yield at low SPS energies. In order to cross-check these results and to complete the analysis of strange particles, the K^0_S production was studied. K^0_S were identified via decay topology and invariant mass determination.

Recent results on K^0_S production in central Pb+Pb collisions will be discussed for 30A, 40A and 158A GeV. Preliminary transverse mass spectra, rapidity spectra as well as the total yields will be presented and compared to models and the corresponding results for charged kaons. Furthermore, a comparison to K^0_S results of the CERES and the NA57 experiment will be shown. Additionally, the kaon-to-pion ratio will be compared to data obtained at AGS and RHIC energies.

HK 13.6 Di 15:30 F

Recent results from NA49 — •Michael Kosta Mitrovski[1], Christopher Alt[1], Alexandra Argyrakis[1], Christoph Blume[1], Peter Dinkelaker[1], Volker Friese[2], Marek Gazdzicki[1], Claudia Höhne[2], Michael Kliemant[1], Stefan Kniege[1], Dmytro Kresan[2], Benjamin Lungwitz[1], Rainer Renfordt[1], Tim Schuster[1], Reinhard Stock[1], Claudia Strabel[1], Herber Ströbele[1], Millica Utvic[1], and Alexander Wetzler[1] for the NA49-Collaboration — [1]Fachbereich Physik der Universität Frankfurt — [2]Gesellschaft für Schwerionenforschung (GSI), Darmstadt

Due to its large acceptance, the NA49 experiment has aquired a large amount of data for a variety of collision systems and energies, from p+p up to Pb+Pb. We will present new results from NA49 on the system size dependence of Λ and Ξ production in A+A collisions at 40A and 158A GeV, as well as the energy dependence of hyperon, (anti-)proton and K^0_s production. Together with the results for other identified particles (charged pions and kaons and ϕ mesons) and data from AGS and RHIC, this allows for a comprehensive study of the energy and system size dependence of various hadronic observables, with the aim to identify phenomena related to the onset of deconfinement. We will discuss in detail the variation of transverse as well as longitudinal spectra to adress the evolution of the fireball and the stopping of the incoming nuclei; including strangeness enhancement. The results will be discussed for possible indications for an onset of deconfinement and compared to different model predictions.

HK 13.7 Di 15:45 F

Charmonium suppression in In+In at SPS as a signal of quark-gluon plasma — •Olena Linnyk[1], Elena Bratkovskaya[1],

Wolfgang Cassing[2], and Horst Stoecker[1] — [1]FIAS, Universitaet Frankfurt, Max von Laue Str 1, 60438 Frankfurt — [2]Institut fuer Theoretische Physik, Universitaet Giessen, Heinrich Buff Ring 16, 35392 Giessen

We explain the anomalous charmonium suppression, which was recently observed by NA60 collaboration in In+In collisions, in two different scenarios: 1) scattering on comoving mesons, 2) melting in quark-gluon plasma. The results suggest that the data do not rule out the purely hadronic suppression mechanism. Additional, in particular experimental, studies are necessary, before the clear signature of the creation of a deconfined partonic state can be established. Predictions for the future CMB experiment at FAIR are presented as well.

HK 13.8 Di 16:00 F

Teilchenproduktion in Schwerionenstößen zur Bestimmung der Symmetrieenergie* — •Hermann Wolter[1], Theodoros Gaitanos[1,2], Massimo Di Toro[3], Graziella Ferini[3] und Vaia Prassa[4] — [1]Dep. Physik, Univ. München — [2]Inst. Theor. Physik, Univ. Giessen — [3]LNS, INFN, Catania, Italien — [4]Dep. Theor. Physics, Univ. Thessaloniki, Griechenland

Die Teilchenproduktion in energetischen Schwerionenstößen ist empfindlich auf die Zustandsgleichung von hadronischer Materie, insbes. in der Nähe von Schwellen. Dies gilt besonders für $K^{0,+}$-Mesonen, die schwach mit Kernmaterie wechselwirken, und daher Information über die Hochdichtephase tragen. Kaon-Produktion wurde erfolgreich verwendet, um eine weiche Zustandsgleichung für symmetrische Kernmaterie festzulegen (C. Fuchs, et al., PRL **86**). Von großem Interesse ist heute die Bestimmung des Isovektoranteils der Zustandsgleichung, der von der Theorie sehr unsicher vorrausgesagt wird, aber für exotische Kerne wie für Neutronensterne wichtig ist. Die Verhältnisse der Produktion verschiedener Kaon-Sorten, z.B. K^0/K^+, sollten empfindlich auf die Symmetrieenergie bei hohen Dichte sein, da die Schwellen über die Selbstenergien von dieser abhängen. Wir präsentieren Resultate von Kaon- aber auch Pion-Verhältnissen im SIS Energiebereich, in denen die Signifikanz und auch die Robustheit gegenüber Unsicherheiten in den Wirkungsquerschnitten und Kaon-Potentialen solcher Signale vorhergesagt wird.

* gefördert z.T. durch BMBF Vorhaben 06ML189

HK 13.9 Di 16:15 F

A new SPS ion programme — Marek Gazdzicki, Benjamin Lungwitz, Michael Mitrovski, Rainer Renfordt, •Tim Schuster, Claudia Strabel, and Herbert Ströbele for the NA49-future-Collaboration — Johann Wolfgang Goethe-Universität, Frankfurt, Germany

The NA49-future collaboration has proposed a new experimental program to study hadron production in hadron-nucleus and nucleus-nucleus collisions at the CERN SPS, using an upgraded version of the NA49 detector.

This program comprises an energy and system size scan of nucleus-nucleus collisions with the objective to study the properties of the onset of deconfinement and to discover the critical point in the phase diagram of strongly interacting matter. Reference measurements of proton-nucleus interactions are also planned for a better understanding of the nucleus-nucleus results.

In addition, the collaboration intends to measure the hadron production in hadron-nucleus interactions that is needed for the analysis of data from neutrino (T2K) and cosmic ray (Pierre Auger and KASCADE) experiments.