HK 60 Physik mit schweren Ionen

Zeit: Freitag 14:00–16:00 Raum: D

Gruppenbericht

HK 60.1 Fr 14:00 D

K^0 and Λ in heavy-ion collisions at SIS — •Markus Merschmeyer for the FOPI collaboration — Physikalisches Institut, Universität Heidelberg

Strange particles are important probes from the hot and dense fireball created in relativistic heavy-ion collisions. In the SIS energy regime the production of these particles occurs close to the free $N + N$ thresholds, therefore their sensitivity to possible changes of hadron properties in the nuclear medium is high. While many analyses of K^+ and K^- have been done in the past, the available data for K^0_S and Λ is still scarce. Recently, experiments with Ni+Ni (1.93 AGeV) and Al+Al (1.90 AGeV) have been performed at SIS and large numbers of central events (10^8) have been measured with the FOPI detector. From those data, K^0_S and Λ are reconstructed and analysed. Inverse slope parameters from transverse mass spectra, rapidity densities and total yields of the strange particles will be presented for the two colliding systems. Comparisons of the experimental results to various transport model calculations will be discussed. (Supported by BMBF (06HD154) and GSI (HD-HER))

HK 60.2 Fr 14:30 D

Analysis of K^+ and Λ production in reactions C+C with HADES* — •Alexander Sadovsky and Kalliopi Kanaki for the HADES collaboration — Research Center Rossendorf, Institute of Nuclear and Hadron Physics, PF 51 01 19 D-01314 Dresden Germany.

The High Acceptance Di-Electron Spectrometer (HADES), installed at SIS/GSI, Darmstadt, can also be used for studies of hadron production in heavy ion collisions. The results of K^+ and Λ production analysis in C+C reactions at kinetic beam energy of 2 AGeV will be presented. The investigation of rare particles production such as strangeness production in this energy region involves the use of high resolution tracking and understanding of the detector performance.

* This work is supported by EU, BMBF and GSI.

HK 60.3 Fr 14:45 D

Kaonic Cluster Production in Heavy Ion Reactions — •Xavier Lopez[1], L. Fabbietti[2], P. Kienle[3], R. Krücken[2], K. Suzuki[2], T. Yamazaki[4], and J. Zmeskal[3] for the FOPI collaboration — [1]Gesellschaft für Schwerionenforschung(GSI), Darmstadt, Germany — [2]Technische Universität München — [3]Stefan Meyer Institut — [4]University of Tokyo

Recently, bound K^- nuclear systems have been predicted [1] to form narrow discrete bound states with large binding energies of about 100 MeV. Due to the strong K^--p attraction, these so-called antikaonic clusters are expected to have high density ($\rho/\rho_0 \sim 5$ - 6), which are predicted of being produced and identified in heavy ion reactions [2]. We have made an attempt to identify these kaonic nuclear systems in heavy ion collision via their invariant masses reconstructed from their decay to Λ-p and Λ-d. We present our recent data from Ni+Ni and Al+Al systems at 1.93 and 1.9 AGeV, respectively. We will discuss the techniques to reconstruct Λ-p and Λ-d correlations with the FOPI detector and show preliminary results.

[1] Y. Akaishi and T. Yamazaki, Phys. Rev. C65 (2002) 044005.
[2] T. Yamazaki, A. Doté, Y. Akaishi, Phys.Lett. B587 (2004) 167.

HK 60.4 Fr 15:00 D

Kaons in Dense Nuclear Matter at SIS Energies — •Young-Jin Kim for the FOPI collaboration — Gesellschaft für Schwerionenforschung (GSI), Darmstadt, Germany

Kaon production in nucleus-nucleus collisions at SIS energies can deliver insights into fundamental questions in nuclear physics which also have astrophysical implications as the equation of state of nuclear matter and in-medium properties of hadrons. We present the K^+/K^0 ratio, which has been proposed as a sensitive probe to the isospin dependence of the nuclear equation of state (EoS)[1], for $^{96}_{44}$Ru($^{96}_{40}$Zr) + $^{96}_{44}$Ru($^{96}_{40}$Zr) collisions at 1.528A GeV measured with the FOPI detector at GSI. In addition, we show results of charged kaon ($K^{\pm}$) flow in Ni + Ni collisions at 1.93A GeV as an observable to study of the kaon properties in the nuclear medium.

[1] G. Ferini, *et al*. Nucl. Phys. A 762, 147 (2005)

HK 60.5 Fr 15:15 D

Surveying Spectator Fragmentation at Relativistic Energy — •Concettina Sfienti for the ALADiN2000 Collaboration collaboration — GSI Darmstadt, Planckstr. 1, 64291 Darmstadt

A systematic study of the multifragmentation reaction mechanism of projectile spectator has been investigated at the ALADiN spectrometer at the GSI. Stable as well as radioactive beams have been used for this purpose.

Specific charge correlations have been analysed: they reveal details about the relevant phase-space for the decaying system. Critical exponent, scaling and bimodal distributions have been studied to gain a deeper insight also in view of the interpretation of such mechanism as manifesting liquid-gas phase transition.

Challenging motivations for isotopic studies are derived from the importance of the density dependence of the symmetry-term of the nuclear equation of state. In this context isoscaling analysis and the study of neutron-yield distributions have been carried-out.

HK 60.6 Fr 15:30 D

Laser cooling of relativistic C^{3+} ion beams at the ESR† — •U. Schramm[1], M. Bussmann[1], D. Habs[1], M. Steck[2], T. Kühl[2], P. Beller[2], B. Franzke[2], F. Nolden[2], G. Saathoff[3], S. Reinhardt[3], and S. Karpuk[4] — [1]LMU München, Department für Physik — [2]GSI, Darmstadt — [3]MPI für Kernphysik, Heidelberg — [4]Universität Mainz, Institut für Physik

Laser cooling represents a way of cooling beams of highly charged heavy ions in a relativistic regime, i.e., at the future FAIR facility, where no established beam cooling techniques scheme seems feasible [1].
At the ESR (GSI) a test experiment was performed with C^{3+} beams (Li-like ions) at an energy of 1.47 GeV. Applying a decelerating narrow band laser force bunched ion beams of several 10 μA were cooled into the longitudinally space-charge dominated regime showing hitherto unseen features in the Schottky-noise spectra, possibly hinting a collective behaviour of the ions. The further application of extremely weak transverse electron cooling provided a Coulomb-coupling of the longitudinal laser cooling to the transverse motion [2]. Fast cooling of the initial momentum spread can be achieved by using a combination of a broad- and a narrow-band laser system, presently under construction.

[†] partially funded by BMBF (06ML183)

[1] Prog. Part. Nucl. Phys. 53, 583-677 (2004)
[2] U. Schramm et al., Proc. PAC05 JACoW FOAD004 (2005) and Proc. COOL05 (2005) in press (for reprints see www.ha.physik.uni-muenchen.de/uschramm/)

HK 60.7 Fr 15:45 D

Ion acceleration from high-intensity laser irradiated thin foils — •Jörg Schreiber[1,2], Florian Grüner[1], Ulrich Schramm[1], Dieter Habs[1], Michael Geissler[2], Ferenc Krausz[2], Manuel Hegelich[3], Kirk Flippo[3], and Juan Fernandez[3] — [1]LMU München, Am Coulombwall 1, 85748 Garching — [2]MPQ Garching, Hans-Kopfermann-Str. 1, 85748 Garching — [3]LANL, P.O. Box 1663, Los Alamos, NM 87545, USA

Collimated MeV jets of ions from the rear surface of thin foils irradiated with ultrashort laser pulses reached high attention during the last years. In previous single shot experiments with high power (100 TW) laser facilities exponential energy distributions were observed with a high energy cutoff of up to 5 MeV/nucleon and 10^{12} ions per bunch. This was explained by a modified target normal sheath acceleration mechanism (TNSA). In recent experiments at the 100-TW-TRIDENT-laser facility (Los Alamos National laboratory) quasi-monoenergetic C^{5+}-ions could be detected [1]. A state of the art in the field of high-intensity laser-ion acceleration and a prognosis for the future is given.

[1] M. Hegelich *et al.*, accepted by nature