HK 11 Physik mit schweren Ionen

Zeit: Freitag 16:30–19:00 Raum: TU MA042

Gruppenbericht

HK 11.1 Fr 16:30 TU MA042

Kaon and pion production in heavy-ion collisions at 1-40 A GeV — •Alexei Larionov, Ulrich Mosel, and Markus Wagner — Institut für Theoretische Physik, Universität Giessen, Germany

We present transport calculations of heavy-ion collisions at SIS, AGS and lower SPS energies basing on the BUU model [1]. At SIS energies we study an influence of the K^+ mean field potential on the phase space distributions of kaons. To describe the data on the in-plane flow, a strong repulsive K^+ potential (+30 MeV at $\rho = \rho_0$) is needed in order to compensate an effect of the Lorentz force caused by the space component of the kaon vector field, in agreement with [2]. We show that also the K^+ azimuthal distribution is well described using the same potential. At AGS and SPS energies we introduce the new meson-meson channels of the $K\bar{K}$ production which leads to the enhancement of the K^+/π^+ ratio in central Au+Au and Pb+Pb collisions in a better agreement with data. We also propose a simple method to take into account the in-medium (Dirac) masses of incoming and outgoing particles in FRITIOF events and study an influence of this effect on particle production. Supported by GSI Darmstadt.

[1] M. Effenberger, E.L. Bratkovskaya, and U. Mosel, Phys. Rev. C **60**, 44614 (1999); M. Effenberger, PhD thesis, Uni. Giessen, 1999, http://theorie.physik.uni-giessen.de/html/dissertations.html.
[2] Y.-M. Zheng, C. Fuchs, A. Faessler, K. Shekhter, Y.-P. Yan and C. Kobdaj, Phys. Rev. C **69**, 034907 (2004).

HK 11.2 Fr 17:00 TU MA042

Results from C+C reactions at 2 GeV per nucleon at HADES* — •Peter Zumbruch[1], Malgorzata Sudol[1], Tassilo Christ[2], and Kalliopi Kanaki[3] for the HADES collaboration — [1]Gesellschaft für Schwerionenforschung Darmstadt — [2]Technische Universität München — [3]Forschungszentrum Rossendorf

HADES, the High Acceptance Di-Electron Spectrometer operational at the GSI SIS facility in Darmstadt, designed to study pair correlations of leptons emitted in heavy ion as well as elementary reactions, offers due to its large acceptance and momentum reconstruction precision also the possibilities to study hadrons and hadronic pair correlations in detail.
This paper will report on analysis and the results taken in two beamtimes in November 2001 and November 2002 with an incindent energy of 2 GeV per nucleon. Besides single particle production we will present results from hadronic pair correlations.
The K^0_S meson with its decay channel $K^0_S \rightarrow \pi^+\pi^-$ and a lifetime of 8.9×10^{-11} ns, is a valuable candidate to explore the identification and track reconstruction capabilities of the HADES setup.
The results will be contrasted/compared to simulations as well as available experimental data.

*supported by GSI, BMBF, DFG, INTAS, EC

Gruppenbericht

HK 11.3 Fr 17:15 TU MA042

The Compressed Baryonic Matter (CBM) Experiment at FAIR — •Volker Friese for the CBM collaboration — Gesellschaft für Schwerionenforschung mbH Darmstadt

The goal of the proposed Compressed Baryonic Matter (CBM) experiment at the future Facility for Antiproton and Ion Research (FAIR) in Darmstadt is to explore the QCD phase diagram in the region of the highest baryon densities. The beam energy range (up to 45 AGeV (35 AGeV) for nuclei with Z = 0.5A (0.4 A)) is well suited to study fundamental aspects of QCD including the chiral and deconfinement phase transition at high baryon densities, the critical endpoint of the deconfinement phase transition, the properties of highly compressed baryonic matter and the in-medium properties of hadrons. The corresponding key observables include low-mass vector mesons decaying into electron-positron pairs which serve as penetrating probes, hidden and open charm produced at threshold beam energies, (multi-) strange hyperons, and global features like collective flow of hadrons and event-by-event fluctuations of observables. The CBM detector is designed as a universal instrument measuring both hadrons and electrons with large acceptance. Particular technical challenges are the operation of detectors at very high particle intensities and the handling of very high data rates. A status report will be presented.

Gruppenbericht

HK 11.4 Fr 17:45 TU MA042

Mass and Isospin Effects in Multifragmentation — •Concettina Sfienti for the ALADiN2000 collaboration — GSI, Planckstr. 1, D-64291 Darmstadt

A systematic study of isospin effects in the breakup of projectile spectators at relativistic energies has been performed with the ALADiN spectrometer at the GSI laboratory. Four different stable and unstable projectiles ^{197}Au, ^{124}La, ^{124}Sn and ^{107}Sn, all with an incident energy of 600 AMeV, have been used, thus allowing a study of various combinations of masses and N/Z ratios in the entrance channel.
The measurement of the momentum vector and of the charge of all projectile fragments with $Z > 1$ entering the acceptance of the ALADiN magnet has been performed with the high efficiency and resolution achieved with the TP-MUSIC IV detector.
The Rise and Fall behavior of the mean multiplicity of IMFs as a function of Z_{bound} and its dependence on the isotopic composition has been determined for the studied systems. Other observables investigated so far include mean N/Z values of the emitted light fragments and neutron multiplicities.

HK 11.5 Fr 18:15 TU MA042

Spectator response to the participant blast in the reaction 197Au+197Au at 1A GeV - results of the first dedicated experiment — •Vladimir Henzl for the CHARMS collaboration — GSI, Planckstr. 1, 64291, Darmstadt, Germany

The response of the spectators to the participants' blast can result in a gain of the residue longitudinal momenta such that the mean spectator-like residue velocities can exceed the velocity of the original projectile. Such re-acceleration effect is predicted to exhibit sensitivity to the momentum-dependent properties of the nuclear mean field and at the same time stay almost unaffected by the stiffness of the nuclear matter. This indicates that the re-acceleration of projectile spectators represents a new tool for investigating the momentum dependent properties of nuclear matter and its impact on the nuclear EOS.

This contribution presents the results of the first experiment entirely dedicated to the precise measurements of the momenta of the projectile fragments in the reaction 197Au+197Au at 1 A GeV performed with the high-resolution magnetic spectrometer FRS at GSI-Darmstadt. The experimental results are confronted with BUU calculations for different nuclear equations of state and mean-field potentials.

HK 11.6 Fr 18:30 TU MA042

Isotopically resolved residues from the fragmentation of projectiles with largely different N/Z — •Daniela Henzlova for the CHARMS collaboration — GSI Darmstadt, Planckstrasse 1, 642 91, Germany — on leave from Nuclear Physics Institute, 25068 Rez, Czech Republic

With the use of the high-resolution magnetic spectrometer, the FRagment Separator (FRS), at GSI Darmstadt, the isotopic identification of the final residues may be extended up to the mass of the heavy projectile. The dependence of the isotopic composition of final residues on the N/Z of the projectile is studied over the full range of residue charge for 136Xe (N/Z=1.519) and 124Xe (N/Z=1.296) projectiles, fragmenting in a lead target at 1 A GeV. The final mean N-over-Z of the final residues as well as the ratio of isotopic yields from both reactions is investigated. The final mean N-over-Z preserves a memory on the N/Z of the projectile for all charges, a feature which may be related to the break-up of the highly excited primary fragment. The sensitivity of the data to the thermal conditions at the freeze-out after break-up is explored and the isospin-thermometer method is applied to deduce the corresponding freeze-out temperature. The ratios of the isotopic yields from the two reactions exhibit exponential dependence on N and Z, the observation termed isoscaling. The corresponding logarithmic slope is used to extract the symmetry-term coefficient.

HK 11.7 Fr 18:45 TU MA042

Systematic study of spallation reactions in inverse kinematics at the FRS at GSI. — •Maria Valentina Ricciardi[1], P. Armbruster[1], J. Benlliure[1,2], M. Bernas[3], A. Boudard[4], E. Casarejos[2], S. Casarejos[5], T. Enqvist[1], B. Fernandez[4], A. Kelic[1], S. Leray[4], P. Napolitani[1,3], J. Pereira[2], F. Rejmund[1,3], K.-H. Schmidt[1], C. Stéphan[3], J. Taieb[1,3], L. Tassan-Got[3], C. Villagrasa[4], C. Volant[4], W. Wlazlo[4], and O. Yordanov[1] — [1]GSI Darmstadt, Germany — [2]Univ. Santiago de Compostela, Spain — [3]IPN Orsay, France — [4]DAPNIA / SPhN CEA / Saclay, France — [5]CEN Bordeaux, France

In 1996, at GSI, Darmstadt, a European collaboration started a dedicated experimental program to investigate spallation reactions. Spallation residues and fission fragments from ^{238}U, ^{208}Pb, ^{197}Au, ^{136}Xe and ^{56}Fe projectiles, in the energy range 200-1500 MeV per nucleon, irradiating liquid ^{1,2}H targets were studied with the FRagment Separator for magnetic selection of reaction products including ray-tracing, energy-loss and ToF techniques. All nuclides were fully identified, and from the longitudinal-momentum evaporation residues and fission fragments could be separated. For almost all the produced nuclides, production cross-sections and velocity distributions were determined. These results provided an important insight into the physics of these reactions. In addition, these data are relevant for the design of ADS and RIBs facilities.