HK 4: Schwerionenkollisionen und QCD Phasen

Zeit: Montag 11:00–12:45 Raum: HSZ-204

Gruppenbericht HK 4.1 Mo 11:00 HSZ-204

Investigating the In-medium Effects of Strange Particles with the FOPI detector — •Victoria Zinyuk and Norbert Herrmann for the FOPI-Collaboration — Physikalisches Institut, Uni Heidelberg

Strangeness production sub- or close-to-production threshold energies is believed to provide an insight into equilibration and the change of hadron properties in a hot and dense nuclear medium. K-mesons are predicted to exhibit a change of their effective in-medium mass and thus are an unique tool to study the partial restoration of the chiral symmetry of QCD.
The FOPI detector at SIS 18 allows the identification of charged kaons and the reconstruction of neutral particles as K^0_S, Λ^0 and ϕ-mesons by their charged decay products in a wide range of phase space.
This presentation gives an overview of FOPI's recent results from a high statistic heavy-ion experiment (Ni+Ni @ 1.93 AGeV) aiming at investigating the in-medium modifications in hot and compressed nuclear matter and from pion-induced reactions (π^- @ 1.7 GeV/c) offering a reference at normal nuclear matter density.

This work was supported by BMBF 06HD7141I.

HK 4.2 Mo 11:30 HSZ-204

HADES at SIS-100 — •Jerzy Pietraszko for the HADES-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung GmbH, Planckstraße 1, 64291 Darmstadt, Germany

This paper presents the concept of study electron-positron pair production in the beam-energy range of 2-10AGeV by making use of the High-Acceptance Di-Electron Spectrometer (HADES), being now in operation at SIS18. The planned new FAIR Facility will provide for the first time the opportunity to perform dielectron measurements by HADES at SIS100 in a hitherto completely unexplored range of beam energies, characterized by a substantially larger compression of nuclear matter. Our simulations of such a scenario show promising results in terms of achievable dilepton acceptance and resolution. Parasitically, hadrons are accessible, too, thus providing a link to the AGS energy range. The recently conducted heavy ion experiment, Au+Au at 1.23 AGeV, at SIS18 confirmed that the spectrometer is ready to be used at higher energies. The efforts to transport the spectrometer and install it at FAIR SIS100 involve only moderate costs and manpower.

HK 4.3 Mo 11:45 HSZ-204

Dilepton production in heavy-ion collisions at SIS energies — •Janus Weil[1,2] and Ulrich Mosel[1] — [1]Institut für Theoretische Physik, Justus-Liebig-Universität Giessen, Heinrich-Buff-Ring 16, D-35392 Giessen, Germany — [2]Present address: Frankfurt Institute for Advanced Studies (FIAS), Ruth-Moufang-Str. 1, D-60438 Frankfurt

We investigate dilepton production at SIS energies in a transport approach. As a first step, we fix the elementary cocktail composition in vacuum via dilepton data from nucleon-nucleon and light nucleus-nucleus collisions, where particular attention is drawn to the contributions of baryonic resonances. Furthermore, we investigate the density and system-size dependence of dileptonic observables and discuss the influence of in-medium spectral functions on dilepton spectra from heavy-ion collisions.
Supported by the Hessian LOEWE initiative through the Helmholtz International Center for FAIR (HIC for FAIR) and HGS-HIRe.

HK 4.4 Mo 12:00 HSZ-204

Studies of dilepton production with the UrQMD transport model — •Stephan Endres[1,2] and Marcus Bleicher[1,2] — [1]Institut für Theoretische Physik, Universität Frankfurt, Max-von-Laue-Str. 1, D-60438 Frankfurt — [2]Frankfurt Institute for Advanced Studies (FIAS), Ruth-Moufang-Str. 1, D-60438 Frankfurt

We present our ongoing studies of dilepton production within the UrQMD transport approach, with focus on SIS energies. Resulting invariant mass, transverse momentum and rapidity spectra for elementary and heavy-ion collisions are compared to available data. Dilepton contributions from the different production channels and respective cross-sections are investigated in detail. A special focus is set on the ρ-meson properties and its production, as it is assumed to significantly change its spectral function in the medium. We also calculated dilepton spectra using thermal emission from a coarse grained version of UrQMD for heavy-ion collisions. For this we accumulate an ensemble of events, determine local temperature and chemical potential in small space-time cells and directly calculate thermal emission rates. By this we avoid some problems of the hadronic transport approach, as the restriction to two-particle processes and baryon resonance interactions in the medium with unknown cross-sections and branching ratios. The outcome is compared with the pure transport results.
Supported by BMBF and the Hessian LOEWE initiative through the Helmholtz International Center for FAIR (HIC for FAIR).

HK 4.5 Mo 12:15 HSZ-204

Reconstruction of rare hadronic signals in Au+Au at 1.23 A GeV with HADES — •Manuel Lorenz for the HADES-Collaboration — Goethe-Universität, Frankfurt am Main

In April 2012 the HADES collaboration collected data of the long planned heavy-ion experiment Au+Au. A gold beam with a kinetic energy of 1.23A GeV was impinged on a 15-fold-segmented target with an average intensity of about 10^6 ions per second. In total $7*10^9$ events corresponding to a raw data volume of 140 TB were collected with a peak data rate of 8 kHz. These numbers specify a totally new era for GSI heavy-ion experiments giving new demands on the analysis procedures and computing resources.

Besides dileptons, hadrons containing strangeness are promising probes of the hot and dense phase as they are produced below their free NN-threshold and hence have a steep excitation function. Preliminary results including signals of all relevant particles containing strangeness ($K^{+-}, K^0_s, \Lambda, \Phi$) which we will present in this contribution are very promising and well beyond our expectations.

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HK 4.6 Mo 12:30 HSZ-204

Symmetry Energy Dependence of Light Fragment Production in Heavy Ion Collisions — Malgorzata Zielinska-Pfabe[1], Piotr Decowski[1], Maria Colonna[2], Remi Bougault[3], and •Hermann Wolter[4] — [1]Smith Coll., Northhampton, Mass 01063, USA — [2]LNS, INFN, I-95123 Catania, Italy — [3]LPC Caen, F-14050 Caen Cedex, France — [4]Univ. Munich, D-85748 Garching, Germany

The nuclear symmetry energy depends both on the density and on momentum, expressed by the difference in neutron and proton effective masses. Both behaviors are not well known microscopically and are investigated in heavy ion collisions. Here we discuss sensitive observables in a region of densities around saturation density. Of interest has been the emission (yields, spectra) of neutrons and protons. We extend these investigations to light fragments, in particular to $t/^3He$ ratios. We perform stochastic transport calculations of collisons of different Xe+Sn isotopes in the energy range of 32-150 AMeV with variation of the symmetry energy potential and the effective masses, and compare to preliminary INDRA data. We find, in particular, that the spectra of single n/p and $t/^3He$ ratios are promising to disentagle the density and momentum dependence of the symmetry energy.