HK 34: Heavy Ion Collisions and QCD Phases 4

Time: Tuesday 17:00–19:00 Location: T/HS1

Group Report HK 34.1 Tue 17:00 T/HS1

Soft and Hard Probes in p-Pb Collisions with the ALICE Experiment — •Annika Passfeld for the ALICE-Collaboration — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, Germany

In contrast to Pb-Pb collisions, the formation of a hot and dense medium as the quark-gluon plasma is not expected in p-Pb. Therefore, the effects of cold nuclear matter can be studied in isolation in this collision system. Furthermore p-Pb collisions bridge the multiplicity gap between pp and peripheral Pb-Pb collisions. Studying particle production in this region can improve the understanding of the underlying particle production mechanisms.

Whereas soft probes can shed light on effects like flow, hard probes are sensitive to the parton energy loss and can serve as an important constraint for the nuclear parton density functions providing information about the nuclear environment.

In this talk, p-Pb results from the ALICE group in Münster will be presented including the deuteron and neutral meson production as well as the analysis of charged jets.

HK 34.2 Tue 17:30 T/HS1

Charged pion, kaon and proton production in pp p-Pb and Pb-Pb collisions measured with ALICE — •Raul Tonatiuh Jimenez Bustamante for the ALICE-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung, Physikalisches Institut, Universität Heidelberg

The ALICE detector at the CERN LHC has excellent Particle IDentification (PID) capabilities in the central barrel ($|\eta| < 0.9$). This allows the production of pions, kaons and protons to be measured over a wide transverse momentum (p_T) range. The Inner Tracking System (ITS) and the Time Projection Chamber (TPC) measure the specific energy loss ($\mathrm{d}E/\mathrm{d}x$) of the particle, which provides track-by-track PID in the p_T range 0.1 to $\simeq$1.0 GeV/c. The time of flight detector (TOF) contributes to PID for the p_T range between 0.5 GeV/c and 3-4 GeV/c, while a Ring Imaging Cherenkov Detector (HMPID) extends the identification of protons till $p_T \simeq 6$ GeV/c. High p_T particles (up to 20 GeV/c) are identified using the relativistic rise of the specific energy loss in the TPC.

Results on identified particle spectra and production yield ratios at mid-rapidity measured by ALICE in different colliding systems (pp, p-Pb and Pb-Pb) will be presented. The similarities among them and the comparisons to models will be discussed. For Pb-Pb collisions the nuclear modification factor as a function of p_T will be shown for different collision centralities.

HK 34.3 Tue 17:45 T/HS1

π^0 reconstruction through a γ-conversion method with KF Particle Finder in the CBM experiment — •Maksym Zyzak[1,2,3], Ivan Kisel[1,2,3], and Iouri Vassiliev[1] for the CBM-Collaboration — [1]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany — [2]Goethe-Universitaet Frankfurt, Frankfurt am Main, Germany — [3]Frankfurt Institute for Advanced Studies, Frankfurt am Main, Germany

The CBM experiment is being designed to study heavy-ion collisions at extremely high interaction rates and track densities. One of the main observables for CBM are light vector mesons decaying through dilepton channels, that are of the particular importance for the physics program of the experiment. Because of the low branching ratio the key issue for reconstruction of light vector mesons is background suppression. Being a major source of this background, π^0 and γ-conversion have to be carefully studied.

π^0 reconstruction through a γ-conversion method was implemented in the KF Particle Finder package for short-lived particle reconstruction. Based on the Kalman filter mathematics, the package allows to achieve high reconstruction quality for γ-particles and as a result — high quality for π^0 reconstructed with a width of 3 MeV/c^2. Studies were performed for pC and AuAu collisions at 10 and 25 $AGeV$ using realistic RICH, TRD and ToF PID.

Supported by FIAS, HICforFAIR and HGS-HIRe for FAIR.

HK 34.4 Tue 18:00 T/HS1

Tagging Neutral Mesons using Photons from Conversions and Calorimeters in ALICE — •Daniel Mühlheim for the ALICE-Collaboration — Institut für Kernphysik, Wilhelm-Klemm-Str. 9, 48149 Münster

The ALICE experiment is dedicated to the investigation of the so-called Quark-Gluon Plasma (QGP), which is generally believed to be created in highly energetic Pb-Pb collisions. Furthermore, pp and p-Pb collisions are studied in order to identify and understand effects which are not related to the creation of the QGP. Since photons do not directly participate in the strong interaction, they can be regarded as an ideal probe in all three collisions systems.

In general, there are two different principles to measure photons. One way is to make use of electromagnetic calorimeters. The other possibility is to look for photon conversions which happen within the detector material. In this work, photons from both detection principles are combined in order to reconstruct neutral mesons. Since two independent measurements are combined, this method provides an important cross-check for the respective results. Furthermore, the detection efficiency is maximized. By means of tagging neutral pions, the goal of this measurement is to determine the fraction of decay photons from all generated photons, generally referred to as R_γ, in all available collision systems.

In this talk, the measurement principles of the combinational method are introduced and discussed. Moreover, a first look into the analysis will be presented.

HK 34.5 Tue 18:15 T/HS1

Rekonstruktion neutraler Mesonen mit dem CBM-RICH Detektor über Konversion* — •Sascha Reinecke für die CBM-Kollaboration — Bergische Universität Wuppertal, Germany

Eines der geplanten Projekte bei FAIR ist das Schwerionenexperiment Compressed Baryonic Matter (CBM). Ziel ist die Untersuchung des QCD-Phasendiagramms sowie des Phasenübergangs hadronischer Materie zum Quark-Gluon Plasma. Die Untersuchung des invarianten Massenspektrums dileptonischer Zerfälle, insbesondere von ρ und ω, bietet hierbei eine Möglichkeit hoch-verdichtete Kernmaterie im frühen Kollisionsstadium zu untersuchen, da Leptonen das hadronische Medium ohne weitere Wechselwirkung verlassen können. Selbst mit sehr guter Teilchenidentifikation der Elektronen ist das resultierende e^+e^- invariante Massenspektrum jedoch nicht untergrundfrei zu rekonstruieren. Nach Anwendung aller Schnitte stellen Dalitz-Zerfälle von η und π^0 ($\eta/\pi^0 \to e^+e^-\gamma$) den dominierenden Untergrund dar. Eine genaue Bestimmung des Anteils an π^0 und η ist daher wichtig für den Untergrundabzug. Da die verschiedenen Verzweigungsverhältnisse sehr genau bekannt sind, kann der Untergrund über die Rekonstruktion von $\eta/\pi^0 \to \gamma\gamma$ erfolgen. Eine mögliche Nachweismethode der Photonen erfolgt über die Konversion im Detektormaterial, $\gamma \to e^+e^-$, mit nachfolgender Rekonstruktion der Konversionselektronen. Dies erfordert jedoch eine genaue Kenntnis der Konversionswahrscheinlichkeit, sowie die sichere Rekonstruktion der Konversionselektronen. Der Vortrag gibt einen Überblick über den Stand der Analyse.

*Gefördert durch BMBF-Verbundforschung 05P12PXFCE und GSI

HK 34.6 Tue 18:30 T/HS1

Reconstruction of neutral mesons via conversion method in Au+Au at 1.23AGeV with HADES — •Behnke Claudia for the HADES-Collaboration — Mav.von-Laue Str 1, 60438 Frankfurt

Lepton pairs emerging from decays of virtual photons represent promising probes of matter under extreme conditions. In the energy domain of 1 - 2 GeV per nucleon, the HADES experiment at GSI Helmholtzzentrum fuer Schwerionenforschung in Darmstadt studies di-electron and strangeness production in various reactions, i.e. collisions of pions, protons, deuterons and heavy-ions with nuclei. An accurate determination of the medium radiation depends on a precise knowledge of the underlying hadronic cocktail composed of various sources contributing to the net spectra. Therefore, a measurement of the neutral meson yields together with the dileptons is crucial. In this contribution, the capability of HADES to detect e+ e* pairs from conversions of real photons will be demonstrated. We will present results from a two-photon analysis of Au+Au collisions at 1.23 GeV/u providing information on the production of neutral π^0 and η mesons. Supported by BMBF (06FY9100I and 05P12RFGHJ), HIC for FAIR, EMMI, GSI, HGS-Hire and H-QM

HK 34.7 Tue 18:45 T/HS1

Hadronic resonance reconstruction in πA and AA collisions at HADES — •Georgy Kornakov for the HADES-Collaboration — TU Darmstadt

Properties of nuclear matter at high temperatures and densities can be accessed by means of heavy ion collisions such as produced at SIS18 energies at GSI Helmholtzzentrum für Schwerionenforschung, in Darmstadt. The masses, widths and spectral shapes of the short lived resonances when embedded into a hot and dense medium can be modified. These modifications can be accessed by comparison of heavy-ion data to elementary and cold nuclear matter reactions. Moreover, their decay via a virtual photon contribute to the dilepton spectra and has to be properly handled in order to interpret the spectrum.

The inclusive reconstruction of strongly decaying particles with a lifetime close to that of the hot and dense medium is challenging as the decay products undergo rescattering and regeneration before freeze out. Moreover, the width and the low signal to background ratio of their invariant masses makes the reconstruction technically complicated.

In this contribution the method for inclusive resonance reconstruction in πA and AA collisions measured by HADES and preliminary results of such analysis will be presented.

This work has been supported by VH-NG-823, GSI and EMMI.