HK 48: Heavy-Ion Collisions and QCD Phases IX

Zeit: Donnerstag 14:00–16:00 Raum: HS 15

Gruppenbericht HK 48.1 Do 14:00 HS 15

Electromagnetic radiation of hot and dense QCD matter formed in Au+Au collisions at $\sqrt{s_{NN}}$ = 2.4 GeV — •Szymon Harabasz for the HADES-Collaboration — TU Darmstadt

In heavy-ion collisions at energies 1-2 GeV per nucleon the QCD matter reaches the baryon density a few times higher than normal nuclear matter density. Its properties can be studied by means of electromagnetic radiation.

HADES has investigated dileptons produced in N+N, N+A, A+A and π+A reactions in this energy regime. Spectra obtained in elementary hadron collisions support the validity of Vector Meson Dominance (VMD) model. The results from the largest system – Au+Au at $\sqrt{s_{NN}}$ = 2.4 GeV – are characterized by nearly exponential shape of low invariant mass spectra. These findings suggest strong modification of vector meson spectral function in medium, due to coupling to abundant baryon resonances.

In this contribution, final results of differential data analysis will be presented and compared to the available model calculations. They will be accompanied by preliminary results on dilepton polarization and azimuthal anisotropy.

HK 48.2 Do 14:30 HS 15

4D track reconstruction in the CBM experiment — •Valentina Akishina for the CBM-Collaboration — Goethe-Universität, Frankfurt, Germany

The future heavy-ion Compressed Baryonic Matter (CBM) ex- periment will focus on the measurement of very rare probes at inter- action rates up to 10 MHz with data ow of up to 1 TB/s. The beam will provide free stream of beam particles without bunch structure. That requires full online event reconstruction and selection not only in space, but also in time, so-called 4D event building and selection. One of the most challenging reconstruction parts is the time-based reconstruction of tracks and grouping them into event-corresponding clusters. The core algorithms of the track reconstruction in CBM are Kalman lter and Cellular Automaton (CA) methods, which are used for the track reconstruction and tting. The algorithms are highly optimised with respect to speed and highly parallelised to be e ciently running online at the many-core architectures of the CBM online farm. The CA track nder algorithm used to reconstruct tracks in the main tracking detector Silicon Tracking System (STS) has been generalized and applied to simultaneous reconstruction of tracks in combined detector system STS and Muon Chamber (MuCh). Tests with simulated collisions have been performed. The resulting track reconstruction efficiency is at the level of 90%.

HK 48.3 Do 14:45 HS 15

Very soft dielectron production in pp collisions at $\sqrt{s}$=13 TeV with ALICE — •Jerome Jung — Institut für Kernphysik, Goethe-Universität Frankfurt

Low-mass dielectrons present an exceptional tool to deepen our understanding of the Quark-Gluon Plasma (QGP) created in the collision of ultra-relativistic heavy-ions, since they are produced at all stages of the collision while being unaffected by the strong interaction. To single out the interesting signal characteristics of the QGP, the primordial e^+e^- pair production in vacuum has to be understood first.
At the Intersecting Storage Rings (ISR) at CERN, an excess of dielectron pairs over the expectation from know dielectron sources had been measured at low invariant mass and small pair $p_{T,ee}$ in pp collisions at $\sqrt{s}$ = 63 GeV. In ALICE the reconstruction efficiency of low-p_T electrons can be increased by reducing the magnetic field of the central barrel solenoid. This allows a better electron background rejection and simultaneously gives the opportunity to access a similar phase space as the ISR experiments.
In this talk, results of the dielectron measurement in pp collisions at $\sqrt{s}$ = 13 TeV taken with reduced magnetic field will be presented including the analysis of new data from 2018. They are compared to the published nominal-field data, to illustrate the benefits of the low-field setting and to the expected yield from known hadronic sources to address the question of a possible excess at LHC energies.
Supported by BMBF and the Helmholtz Association.

HK 48.4 Do 15:00 HS 15

Dielectron production in p-Pb collisions at sqrt(sNN)= 5.02 TeV with ALICE — •Sebastian Scheid for the ALICE-Collaboration — IKF, Uni Frankfurt

Dileptons are a prime probe of the deconfined state of strongly-interacting matter, the Quark-Gluon Plasma (QGP), produced in high-energy heavy-ion collisions, as they are not affected by final-state interactions and produced at all stages of the collision. A measurement of the thermal radiation from the QGP in the dielectron intermediate-mass region gives information on the medium temperature.

In this region, the main component of the dielectron continuum is coming from correlated semi-leptonic decays of D- and B-mesons, which may be affected by the interaction of the heavy quarks with the QGP or the modification of their production cross section via the parton distribution function in the heavy nuclei with respect to protons. The latter can be studied in proton-lead collisions. Moreover, a small contribution from thermal radiation from the hadronic and partonic phase of the collision is predicted in such collision systems.

In this talk, first measurements of correlated e^+e^- pairs in p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV with ALICE will be presented. In particular, we will show how the distance of closest approach (DCA) of the electrons to the primary vertex of the collision gives experimental means to single out dielectrons from heavy-flavour decays and provides constraints on a possible contribution from thermal radiation.

HK 48.5 Do 15:15 HS 15

Dielectron production in Pb–Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV with ALICE — •Carsten Klein — Institut für Kernphysik, Goethe-Universität Frankfurt

Electron-positron pairs are an excellent probe to investigate the properties of the Quark-Gluon Plasma (QGP) created in ultra-relativistic heavy-ion collisions. Because they are produced at all stages of the collision and do not interact strongly with the medium, their spectra reflect the entire space-time evolution of the system. At low invariant mass, the dielectron production is sensitive to the properties of vector mesons in the dense medium which is related to the predicted restoration of chiral symmetry. In the intermediate-mass region, the dielectron continuum gives further insight into the heavy-quark energy loss in the QGP via the measurement of correlated electron-positron pairs from charm- and beauty-hadron decays.

In this talk, preliminary results of the dielectron production in Pb–Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV with ALICE will be presented. For the first time in heavy-ion collisions, a hint for a suppression of the heavy-flavour production in comparison to the N_{coll}-scaled vacuum expectations is observed. Finally, the status of the measurement of virtual direct photons will be discussed.
Supported by BMBF

HK 48.6 Do 15:30 HS 15

Application of MVA techniques to the J/ψ measurement via the di-electron decay channel with ALICE at the LHC — •Alena Harlenderova for the ALICE-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt

The J/ψ meson is an important probe of the Quark-Gluon Plasma due to the color screening of the quark-antiquark potential in the hot deconfined medium. At LHC energies, a strong reduction of J/ψ suppression in comparison to lower RHIC energies has been observed in Pb-Pb collisions, consistent with additional J/ψ production via (re)generation mechanisms. A precise measurement of J/ψ in pp collisions serves as a baseline for studies in Pb-Pb collisions.

At mid-rapidity, ALICE has the unique capability to reconstruct J/ψ down to zero p_T at the LHC. However, this measurement via the di-electron decay channel suffers from a small signal-to-background ratio, in particular in Pb-Pb collisions. The use of MultiVariate Analysis (MVA) techniques can help us to suppress the background while keeping the signal largely unaffected. The resulting larger signal significance leads to an improvement of the precision of the J/ψ measurement. In this talk, the application of MVA techniques to the J/ψ analysis via the di-electron decay channel will be presented.

HK 48.7 Do 15:45 HS 15

Measurement of electrons from heavy-flavour hadron decays

in pp collisions at $\sqrt{s}$ = 8 TeV with ALICE at the LHC — •Regina Michel for the ALICE-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung — Technische Universität Darmstadt

Measurements of heavy-flavour production in proton-proton collisions are important as a reference for measurements in heavy-ion collisions and to test perturbative Quantum Chromo Dynamics (pQCD). Heavy-flavour hadron production can be investigated via the measurement of electrons from their semileptonic decays. In ALICE electrons can be identified via their specific energy loss dE/dx in the Time Projection Chamber (TPC) and their time of flight measured by the Time of Flight detector (TOF). To determine the inclusive electron sample it is important to estimate the hadron contamination by applying different TOF cuts to the candidate sample after the dE/dx selection. The inclusive electron sample has a contribution from heavy-flavour decays but also a substantial background, which consists mainly of electrons coming from photon conversions and Dalitz decays of light neutral mesons. This background needs to be quantified and subtracted via the photonic-tagging method, which reduces the sample to the yield of electrons from semileptonic decay of heavy-flavour hadrons. The current status of the analysis will be presented and the results will be discussed in the context of pQCD calculations and in view of corresponding measurements in Pb-Pb collisions.