HK 46: Heavy-Ion Collisions and QCD Phases XI

Time: Wednesday 15:45–17:15 Location: HBR 62: EG 18

HK 46.1 Wed 15:45 HBR 62: EG 18

Dielectron analysis in p+p collisions at 1.58 GeV beam energy with HADES — •Karina Scharmann for the HADES-Collaboration — Justus-Liebig-Universität Gießen

In this contribution we present preliminary results on the dielectron production in $p + p$ interactions at $1.58\,GeV$ beam energy measured with the **H**igh **A**cceptance **DiE**lectron **S**pectrometer (HADES). The HADES RICH detector has been upgraded with a new photon detection camera which strongly enhances the electron efficiency and conversion pair rejection. With this upgrade, a signal-to-background ratio above 1 is achieved over the entire dielectron spectrum. 0.5 billion collisions have been analyzed showing a contribution of π^0 and η Dalitz decays in a signal up to an invariant mass of $500\,\mathrm{MeV/c^2}$. Furthermore, by analyzing elastic $p + p$ collisions, a normalization procedure for differential cross sections has been established.

The cross section spectrum shows a satisfactory agreement to previous HADES measurements as well as theoretical calculations from GiBUU. Furthermore this spectrum can serve as a baseline for the understanding and interpretation of $Ag + Ag$ collisions which have been measured in HADES at the same energy. A precise understanding of the dielectron production in elementary reactions is needed to disentangle the various contributions to the measured dielectron yield in $Ag + Ag$ collisions.

HK 46.2 Wed 16:00 HBR 62: EG 18

Dielectron production in Pb–Pb collisions with ALICE — •Jerome Jung for the ALICE Germany-Collaboration — Goethe University Frankfurt

Dielectrons are an exceptional tool for studying the evolution of the medium created in heavy-ion collisions as they are produced at all stages of the collision with negligible final-state interactions. In central collisions, the energy densities are sufficient to create a quark-gluon plasma (QGP). Thermal e^+e^- pairs radiating from this medium can be observed as an excess over the hadronic decay cocktail beyond the pion region.
For invariant masses above 1.2 GeV/c^2, correlated heavy-flavour (HF) hadron decays are expected to dominate the dielectron yield. Their contribution is modified in the medium compared to elementary collisions to an unknown extent, leading to large uncertainties in the subtraction of known hadronic sources. To control this contribution, a topological separation based on the distance-of-closest approach (DCA) to the primary vertex is crucial to disentangle the thermal dielectron from HF contributions based on their characteristic proper decay lengths.

In this talk, the final results on dielectron production in central Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}}$ = 5.02 TeV with ALICE in Run 2 will be presented. The measurements are compared to expectations from hadronic decays and calculations from theory. Finally, the topological separation of e^+e^- pairs is applied to extract a prompt thermal contribution in the intermediate-mass region.

HK 46.3 Wed 16:15 HBR 62: EG 18

Towards reconstructing dilepton flow in Au+Au collisions at low energies with HADES* — •Sukyung Kim for the HADES-Collaboration — Bergische Universität Wuppertal, Wuppertal, Germany

In March 2024, the High Acceptance DiElectron Spectrometer (HADES) at GSI Darmstadt, Germany will collect data on dielectron production in Au+Au collisions at beam energies ranging from 0.2 to 0.8 A GeV. One specific focus will be to characterize the collision system studying dielectron flow. In the HADES experiment, the Ring-Imaging CHerenkov (RICH) detector is responsible for efficient electron identification. Thus, the performance of the RICH will be the first crucial factor in dielectron flow extraction. In this contribution we will discuss the calibration and performance of the HADES RICH used for electron identification. Additionally, we will discuss preparatory simulation studies produced using the SMASH transport model.

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HK 46.4 Wed 16:30 HBR 62: EG 18

Polarization of thermal dilepton radiation — •Florian Seck[1], B. Friman[2,1], T. Galatyuk[2,1], H. van Hees[3,4], E. Speranza[5], R. Rapp[6], and J. Wambach[1] — [1]Technische Universität Darmstadt — [2]GSI, Darmstadt — [3]Universität Frankfurt — [4]Helmholtz Research Academy Hesse for FAIR, Frankfurt — [5]Theoretical Physics Department, CERN, Switzerland — [6]Texas A&M University, College Station, USA

Multi-differential measurements of dilepton spectra serve as a unique tool to characterize the properties of matter in the interior of the hot and dense fireball. An important property of virtual photons is their spin polarization defined in the rest frame of the virtual photon for a chosen quantization axis. While the total yield and observable spectra are proportional to the sum of the longitudinal and transverse components of the spectral function, the polarization depends on their difference. As the processes that drive the medium effects in the spectral function change with invariant mass and momentum, this becomes a powerful tool for studying the medium composition.

In this contribution, we present the polarization observables of thermal virtual photons as a function of mass and momentum, compare the results to existing measurements from HADES and NA60, and provide predictions for upcoming HADES data. Finally, we discuss the prospects of using dilepton polarization to disentangle the contributions of hadronic and partonic origin to thermal radiation.

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HK 46.5 Wed 16:45 HBR 62: EG 18

Measurement of dielectrons in pp collisions at $\sqrt{s}$ = 13.6 TeV with ALICE in Run 3 — •Florian Eisenhut — Goethe Universität Frankfurt

Dielectrons are a unique tool to study the space-time evolution of the hot and dense matter created in relativistic heavy-ion collisions. In pp collisions, measurements of the dielectron production serve as reference for heavy-ion studies, providing some insight into the different e^-e^+ background sources. In high charged-particle multiplicity events, dielectron measurements allow us to search for thermal radiation in small systems. Thanks to the upgrades performed during the LHC Long Shutdown 2, ALICE is now capable to read out pp collision data at an acquisition rate 1000 times faster than previously. The larger data samples recorded during the Run 3 data taking period, together with the improved tracking capabilities at low transverse momenta and pointing resolution of the detector, allow us to study the e^+e^- pair production of dielectrons originating from displaced open heavy-flavour hadron decays or prompt decays.

This talk will give an overview of the first results on dielectron production in pp collisions at $\sqrt{s}$ = 13.6 TeV obtained with ALICE Run 3 data. It will summarize the techniques used to select electrons and improve the signal-to-background ratio in the dielectron analysis, as well as present the separation power of the new detector for prompt and non-prompt dielectron sources.

HK 46.6 Wed 17:00 HBR 62: EG 18

Measurement of dielectrons in Pb-Pb collisions with ALICE in Run 3 — •Emma Ege for the ALICE Germany-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

Dielectrons are a unique probe to study the properties of strongly-interacting matter produced in heavy-ion collisions, especially of the quark-gluon plasma (QGP), as they do not interact strongly and are created in all stages of the collision. Thermal radiation from the QGP carries information about the early temperature of the medium. At LHC energies, it is nevertheless dominated by a large background from correlated heavy-flavor hadron decays.

With the upgrades of the ALICE detector for the LHC Run 3 data taking period, an improved pointing resolution and a higher data acquisition rate, by up to a factor 100 for Pb-Pb collisions, are achieved. Both will help to reduce significantly the statistical and systematic uncertainties of dielectron measurements and understand the contribution from displaced correlated open heavy-flavor hadron decays.

In this talk the status of the current analysis of Pb-Pb data from 2023 with ALICE will be presented. In particular the first dielectron

spectra will be shown. Additionally we will investigate the distance of closest approach (DCA) of the electrons to the primary vertex of the collision in different invariant mass ranges.