HK 55: Heavy-Ion Collisions and QCD Phases XIII

Time: Wednesday 17:30–19:00 Location: HBR 62: EG 03

HK 55.1 Wed 17:30 HBR 62: EG 03

Feasibility Studies for Di-Electron Spectroscopy with CBM at FAIR — •Cornelius Feier-Riesen for the CBM-Collaboration — GSI, Darmstadt, Germany — Justus-Liebig-Universität, Gießen, Germany

The Compressed Baryonic Matter experiment (CBM) at FAIR is designed to explore the QCD phase diagram at high net baryon densities and moderate temperatures by means of heavy ion collisions with energies from 2-11 AGeV beam energy (Au+Au collisions) and interaction rates up to 10 MHz, provided by the SIS100 accelerator.

Leptons as penetrating probes not taking part in the strong interaction leave the fireball without being modified, thus carrying information from the dense baryonic matter. However, di-leptons are rare probes, therefore calling for high efficiency and high purity identification capabilities. In CBM, electron identification will be performed by a Ring Imaging Cherenkov Detector (RICH), a Transition Radiation Detector (TRD) and a Time-of-Flight detector (ToF).

In this contribution, feasibility studies of di-electron spectroscopy from low mass vector meson decays will be presented. Special emphasis is put on the application of Fast Simulations to achieve higher statistics for the rare di-electrons in order to evaluate the feasibility of e.g. temperature measurements in the intermediate mass region beyond 1 GeV/c^2.

HK 55.2 Wed 17:45 HBR 62: EG 03

Prospects of reconstructing low-momentum and low-mass dileptons in HADES — •Iuliana-Carina Udrea for the HADES-Collaboration — TU Darmstadt, Darmstadt, Germany

The dileptons resulting from the decay of virtual photons are not subject to the strong force, thus their mean-free path is much longer than the size of the fireball. This allows them to leave the medium without rescattering and be the direct source of information. The transport properties of the hot and dense matter, e.g. its electrical conductivity, can be extracted via the yield of virtual photons in the low mass, low momentum limit: $p_{ee} = 0$ MeV/c, $M_{ee} \to 0$ MeV/c^2.

In this contribution, we will present the analysis of low-momentum and low-mass dilepton spectra using the data collected by the HADES experiment in March 2019 of Ag+Ag collisions at $\sqrt{s_{NN}}$=2.42 GeV. Moreover, we will present a feasibility study of dielectrons with a reduced magnetic field.

This work is supported by GSI F&E and HGS-HIRe.

HK 55.3 Wed 18:00 HBR 62: EG 03

Improved electron identification in CBM RICH* — •Pavish Subramani for the CBM-Collaboration — Bergische Universität Wuppertal, Germany

The Compressed Baryonic Matter(CBM) experiment is a future fixed target experiment built as part of FAIR phase-1 at GSI, Darmstadt. The aim of the CBM experiment is to probe the QCD phase diagram at high baryonic densities and moderate temperatures by means of heavy ion collisions. Since the electrons are least affected by the QCD strong interactions, the di-electron channel is ideal to probe the dense fireball forming in such collisions. CBM features a Ring Imaging Cherenkov Detector (RICH) to efficiently identify those electrons up to 6 GeV/c with a pion suppression factor in the order of 100.

This talk will focus on recent improvements in the electron identification performance of the CBM RICH, where the machine learning technique used for ring-track matching is improved by changing the MLP to xGBoost. Further, the possibility of using CBM's Transition Radiation Detector (TRD), which is downstream of the RICH, as an intermediate tracker is discussed. Particularly, the use of this tracker to eliminate rings from secondary electrons not stemming from the target region is evaluated.

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HK 55.4 Wed 18:15 HBR 62: EG 03

In-Medium Vector Meson Spectral Functions from FRG — •Maximilian Wiest[1], Tetyana Galatyuk[1,2,4], Jochen Wambach[1], Lorenz von Smekal[3,4], and Arno Tripolt[3] — [1]TU Darmstadt, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [3]Justus Liebig University Giessen, Germany — [4]Helmholtz Research Academy Hesse for FAIR (HFHF)

In this talk, we will discuss the FRG treatment of the chiral parity doublet model (PDM) to extract in-medium vector-spectral functions at finite spatial momenta. The PDM incorporates mesons and baryons as effective degrees of freedom including chiral and parity partners. The in-medium rho-meson spectral function is calculated at finite momentum. Our results show strong modifications of the spectral functions with increasing spatial momentum, especially a broadening of the characteristic in-medium N*(1535)->rho+N(939) peak in the mirror baryon assignment. Using a coarse-graining approach, we can extract dilepton spectra from microscopic transport approaches using the obtained vector spectral functions and extract the impact of the mirror-baryon peak on the dilepton spectra. The extraction of finite momentum spectral functions also gives access to the polarization signal of the vector mesons, which we will supplement by including in-medium modifications of the rho-meson pion loop.

Supported by VH-NG-823, DFG CRC-TR 211 and GSI.

HK 55.5 Wed 18:30 HBR 62: EG 03

Development of a ML algorithm for neutral meson and photon reconstruction using PCM in ALICE — •Abhishek Nath for the ALICE Germany-Collaboration — Ruprecht Karl University of Heidelberg, Germany

Direct photon is a great probe for all stages of evolution in high-energy collisions. However, they are present amidst a large background of mostly decay photons. So a precise estimate of decay photons is necessary. The Photon Conversion Method (PCM) is a great tool to identify photons, especially at low transverse momentum as they result in oppositely charged track pairs when they interact with detector materials.

Armed with the current machine learning algorithms, we try to reconstruct photons and their source mesons in heavy ion collision using PCM. The aim is to have an efficient estimate of the mesons along with photon samples with high purity and compare both with the current standardized cuts-based method implemented in the PCM analysis workflow. Our analysis is based on 2018 Pb-Pb data where we aim to explore various algorithms (XGBoost and others) to classify photons on-fly. Based on the analysis, a roadmap for analyzing high luminosity run 3 data is stated at the end.

HK 55.6 Wed 18:45 HBR 62: EG 03

Software trigger in ALICE — •Victor Feuillard for the ALICE Germany-Collaboration — Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany

Since the beginning of Run3, ALICE has been recording data in a trigger less mode. As a consequence an enormous amount of data needs to be stored on disk. To mitigate for this situation, an offline trigger is applied on the data in order to reduce the volume of data stored in the long term. In this presentation, we will introduce the strategy implemented in ALICE to perform this offline filtering, as well as the result of the first two filtering campaigns in pp collisions at $\sqrt{s}$ = 13 TeV, regarding the data collected in 2022 and 2023