HK 73: Heavy Ion Collisions and QCD Phases 10

Time: Friday 14:30–16:30 Location: T/HS2

Group Report HK 73.1 Fri 14:30 T/HS2

Low-Mass Dielectron Measurements in pp, p–Pb and Pb–Pb Collisions with ALICE — •Mahmut Özdemir for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

Low-mass dielectrons are an important experimental tool to investigate the properties of strongly interacting matter, in particular the quark-gluon plasma (QGP), which is created in ultrarelativistic heavy-ion collisions. Electrons do not interact strongly, therefore they provide information from all stages of the collision. Especially, possible modifications of the electromagnetic emission spectrum in the QGP can be probed with dielectrons, where pp collisions are used as medium-free reference and p–A collisions allow to probe cold from hot nuclear matter effects.
In this contribution, dielectron measurements in ALICE are presented, where electrons at mid-rapidity are identified by their specific energy loss in the Inner Tracking System (ITS) and the Time Projection Chamber, combined with time-of-flight information from the TOF detector. The invariant mass distributions in pp collisions at $\sqrt{s} = 7$ TeV and in p–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV are compared to the expected hadronic sources. Moreover, the cross section of virtual direct photons measured in pp collisions is compared to predictions from NLO calculations as a function of the transverse momentum. Also the status of the analysis of Pb–Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV is presented.

Group Report HK 73.2 Fri 15:00 T/HS2

Modification of hadron properties at normal nuclear matter density invested in π-induced reactions: Recent results from FOPI+GEM-TPC. — •Victoria Zinyuk[1], Felix Valentin Böhmer[3], Sverre Dørheim[2], Laura Fabbietti[2], Norbert Herrmann[1], and Bernhard Ketzer[3] for the FOPI-Collaboration — [1]Universität Heidelberg — [2]Technische Universität München — [3]HISKP Universität Bonn

In compressed baryonic matter the properties of hadrons are believed to alter as a consequence of various non-trivial in-medium effects such as the partial restoration of the spontaneously broken chiral symmetry, the modified baryon-meson couplings and the nuclear potential. In pion-induced reactions the in-medium modifications can be studied at normal nuclear matter density. At ρ=ρ_0 the chiral symmetry is expected to be partially restored to $\sim$ 30%.
The FOPI collaboration has performed fixed target experiments looking at π^- + C-, Cu- and Pb-reactions with p_π=1.7 GeV/c. For these experiments the FOPI apparatus was upgraded with a GEM-based Time Projection Chamber(TPC) leading to significant improvement of the vertex resolution and therefore improving the PID capability.
In this presentation we summarize the most recent results on possible modification of the momentum distribution for strange particles such as K^+, K^-, K^0_S, Λ^0 and ϕ-mesons.
This work was supported by BMBF 05P12VHFC7 and BMBF 05P12WOCAA.

HK 73.3 Fri 15:30 T/HS2

First results of dilepton reconstruction in pion-induced reactions — •Federico Scozzi for the HADES-Collaboration — TU Darmstadt

Precise understanding of the elementary reactions is important for the interpretation of di-electron emission in heavy-ion collisions. The coupling of virtual photons to baryonic resonances can be experimentally probed by means of the πN $\rightarrow$ R $\rightarrow e^+e^-N$ process for which neither experimental data nor reliable theoretical predictions exist. In view of these, it is necessary that the exclusive cross section or dilepton production on the nucleon be measured. In summer 2014 the High Acceptance Di-Electron Spectrometer (HADES) experiment at GSI took data from pion-induced reactions using three targets: tungsten, carbon and polyethylene, at several pion beam momenta. A large part of the data, using a polyethylene target, was taken at a pion beam momentum of 0.69 GeV/c in order to explore the sub-threshold coupling of the ρ to baryonic resonances. Combining these data with carbon data it is possible to extract pion-proton interactions. In this contribution the first results for dilepton production in pion-induced reactions will be discussed.
This work has been supported by VH-NG-823, Helmholtz Alliance HA216/EMMI and GSI.

HK 73.4 Fri 15:45 T/HS2

Angular distributions in $\pi N \rightarrow Ne^+e^-$ — •Enrico Speranza[1,2], Bengt Friman[1], György Wolf[3], and Miklós Zétényi[3] — [1]GSI Helmholtzzentrum für Schwerionenforschung GmbH, D-64291 Darmstadt, Germany — [2]Institut für Kernphysik, Technische Universität Darmstadt, D-64289 Darmstadt, Germany — [3]Institute for Particle and Nuclear Physics, Wigner Research Centre for Physics, Hungarian Academy of Sciences, H-1525 Budapest, Hungary

A calculation of angular dependencies of the cross section for the process $\pi N \rightarrow Ne^+e^-$ is presented. Three effective Lagrangians are used for the interaction vertex between a baryon resonance, a nucleon and a vector meson. The resulting angular dependencies are presented for different baryon spin states for the three interaction models. The goal of this investigation is twofold. First, to explore the possibility to identify the spin of a baryon resonance formed in the reaction, using the angular distributions. Second, to improve models for dilepton production in hadronic and nuclear collisions by confronting the results with the recent data of the HADES collaboration on this reaction.

HK 73.5 Fri 16:00 T/HS2

Dilepton and pion production at SIS energies — •Janus Weil — Frankfurt Institute for Advanced Studies, Ruth-Moufang-Strasse 1, 60438 Frankfurt, Germany

We discuss dilepton and pion production at SIS energies in a transport approach, both of which are tightly connected to the dynamics of baryonic resonances. In heavy-ion collisions, resonance contributions are very hard to pin down, and it has been shown that a good baseline from elementary (pp) reactions is essential for a better understanding of the resonance cocktail and the involved electromagnetic couplings and for distinguishing pure vacuum effects from actual in-medium modifications. Recent pion-beam measurements at GSI will provide further constraints for many of the assumptions and parameters that enter transport simulations, in particular resonance properties and transition form factors. We try to to get a consistent picture of dilepton and pion production at SIS energies by considering leptonic and hadronic observables from both elementary and heavy-ion collisions.

HK 73.6 Fri 16:15 T/HS2

Background rejection in dilepton analysis with CBM-MVD — •Erik Krebs for the CBM-MVD-Collaboration — Goethe-Universität Frankfurt am Main

The light vector mesons ρ, ω and ϕ are known to be excellent probes of the strongly interacting matter under extreme conditions. The leptonic decay channels of these mesons are of special interest as the leptons leave the hot and dense fireball without strong interaction and may reveal information on the characteristics of the matter created in the collisions. However, electrons and positrons from γ-conversions and Dalitz decays of π^0 are the main contributors to a large combinatorial background obscuring the information carried by the rare dileptons.

The Micro-Vertex Detector (MVD) of the Compressed Baryonic Matter (CBM) experiment can contribute to reduce this background by reconstructing the low momentum partner of background pair in the MVD. CBM has no detectors for electron identification in front of the magnetic field posing an additional challenge to dielectron analysis. Methods for background rejection will be presented.

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