

HK 34: Heavy-Ion Collisions and QCD Phases VI

Zeit: Mittwoch 14:00–16:00

Raum: HS 15

Gruppenbericht

HK 34.1 Mi 14:00 HS 15

Overview of neutral meson and direct photon production at the LHC measured with ALICE. Energy and system size dependence. — ●ANA MARIN for the ALICE-Collaboration — GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt

The ALICE experiment is dedicated to the study of the Quark-Gluon Plasma (QGP) formed in heavy-ion collisions. Among other observables, the properties of the QGP can be addressed by studying neutral meson and direct photon production in nucleus-nucleus collisions. Direct photons provide information about the initial stage of the collision as well as the space-time evolution of the QCD medium. In particular, the thermal photon spectrum and flow carry information about the temperature and development of collective flow in hot medium. Measurements of neutral meson production in different kinds of collision are interesting for many reasons: in pp collisions they serve as reference spectra, as well as a test of pQCD predictions and other theoretical model calculations; in p-Pb collisions cold nuclear matter effects are measured; in AA collisions neutral meson spectra give insights on the energy loss of partons traversing the hot and dense medium.

In this talk, an overview of neutral meson production as well as direct photon production and flow in pp, p-Pb and AA collisions at energies provided by the LHC and measured with ALICE will be presented.

HK 34.2 Mi 14:30 HS 15

Photon-photon scattering in the resonance region at midrapidity at the LHC — ●RAINER SCHICKER — Phys. Inst., Heidelberg

A study is presented to extend the measurements of photon-photon scattering in ultra-peripheral Pb-Pb collisions at the LHC into the diphoton mass range $0.4 < W_{\gamma\gamma} < 5$ GeV. The elementary photon-photon scattering cross section discussed in Ref.1 is extended to these low masses which include the pseudoscalar resonances η and η' . The main background to two-photon final states, arising from double π^0 production with two of the four decay photons escaping detection, is examined, and possible kinematical conditions are discussed to suppress the background for such measurements at midrapidity. The residual background is subtracted by a sideband subtraction such that the signal-to-background ratio is larger than one ($S/B > 1$) in the considered range of diphoton masses.

Ref.1: M. Klusek-Gawenda, P. Lebiedowicz, A. Szczurek, Phys.Rev.C93 (2016) no.4, 044907.

HK 34.3 Mi 14:45 HS 15

Low-mass dielectron measurements in minimum-bias pp collisions at $\sqrt{s} = 5.02$ TeV with ALICE — ●LEONHARDT VIEBACH and RAPHAELLE BAILHACHE for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

The production of low-mass dielectrons is the most promising tool for the understanding of the chiral-symmetry restoration and of the thermodynamical properties of the Quark-Gluon plasma (QGP) created in heavy-ion collisions. In the intermediate-mass region, the measurement of thermal dielectrons from the QGP is nevertheless very challenging at the LHC due to the dominant contribution of e^+e^- pairs from open-charm and -beauty hadron decays. To single out the interesting signal characteristics of the QGP, the primordial e^+e^- pair production in vacuum needs to be first understood. It can be studied in minimum-bias proton-proton collisions. Dielectron measurements in elementary collision systems serve not only as a reference for the heavy-ion analysis but provide also a test for Monte-Carlo event generators, aiming to reproduce the heavy-flavour production mechanisms.

In this talk, we present the status of the dielectron analysis in pp collisions at $\sqrt{s} = 5.02$ TeV with ALICE. The dielectron yield is studied as a function of invariant mass, pair transverse momentum, and pair transverse impact parameter (DCA_{ee}). The latter helps to disentangle prompt and non-prompt dielectron sources. The results will be compared to the expectations from known hadronic sources and their implications for the heavy-flavour production will be discussed.

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HK 34.4 Mi 15:00 HS 15

Reconstruction of eta meson at CBM-RICH detector using

conversion method* — ●IEVGENII KRES, KARL-HEINZ KAMPERT, and CHRISTIAN PAULY for the CBM-Collaboration — Bergische Universität Wuppertal

The Compressed Baryonic Matter (CBM) experiment is part of a worldwide research program devoted to study the phase diagram of strongly interacting matter at high baryon density ρ_B and moderate temperatures T in A+A collisions from 2–11 AGeV (SIS100). One of the main physics motivations of CBM is dilepton measurements. Lepton pairs offer the unique possibility to look into the fireball and to study the microscopic properties of hot and dense strongly interacting matter, since they are not affected by hadronic final state interactions. A central component of the proposed detector setup is a Ring Imaging Cherenkov Detector (RICH), which is intended to identify leptons among all other particles. The measured dilepton invariant mass spectrum at low mass region is dominated by physical background from decays of π^0 and η mesons. The presented analysis aims to reconstruct η mesons via double conversion ($\eta \rightarrow \gamma + \gamma \rightarrow (e^+e^-) + (e^+e^-)$) in order to scale these background channels accurately in the integral e^+e^- invariant mass spectrum. Proper counting of the η mesons requires an exact description of the combinatorial background below the η invariant mass peak, which is achieved using the event mixing technique. First results of this conversion analysis are presented, including reconstruction efficiencies and signal to background estimation.

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HK 34.5 Mi 15:15 HS 15

Measurement of ω and η mesons with ALICE in pp collisions at $\sqrt{s} = 7$ TeV — ●FLORIAN JONAS for the ALICE-Collaboration — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster

ALICE has been designed as a heavy-ion experiment and its research focuses on the phase space of strongly interacting matter, in particular the properties of the quark-gluon plasma (QGP) – a phase in which quarks and gluons exist as unconfined particles. The measurement of neutral meson cross sections allows to test and constrain pQCD predictions of meson production. Furthermore, the cross sections are needed as input for other analyses such as direct photon and di-lepton measurements.

In this contribution, the differential invariant cross sections of ω and η meson production at mid-rapidity in proton-proton collisions at $\sqrt{s} = 7$ TeV are presented. Both mesons are reconstructed using their $\pi^+\pi^-\pi^0$ decay channel, requiring the measurement of charged pions using ALICE's tracking capabilities as well as the reconstruction of neutral pions via their decay into two photons. All methods available in ALICE to measure photons at mid-rapidity are used: Its two calorimeters, the EMCal and the PHOS, as well as the so-called Photon Conversion Method (PCM), which allows to measure photons via pair conversions. In addition, two hybrid approaches are used for the neutral pion reconstruction which combine calorimeter photon measurements with the PCM.

HK 34.6 Mi 15:30 HS 15

Measurement of Neutral Mesons in pp Collisions at the LHC with ALICE — ●JENS ROBERT LÜHDER for the ALICE-Collaboration — Institut für Kernphysik, Münster

In ALICE, the measurement of photons is performed in two different ways: First, via the tracking of e^+e^- pairs and secondly, via their energy deposits in electromagnetic calorimeters. The first method is called PCM (Photon Conversion Method) as photons may convert to e^+e^- pairs when interacting with the detector material. By using the measured photons to reconstruct the amount of neutral mesons, the fraction of decay photons out of all measured photons can be acquired. The talk will cover the measurement principles of the hybrid method, which combines these two methods in order to benefit from both detection principles and a first look into the PCM-PHOS analysis of neutral mesons in the data of LHC Run 2 with a center of mass energy $\sqrt{s} = 13$ TeV will be shown.

HK 34.7 Mi 15:45 HS 15

Measurement of transverse momentum spectra of neutral mesons with the ALICE calorimeters — ●ADRIAN MECHLER for the ALICE-Collaboration — Institut für Kernphysik, Goethe Universität Frankfurt, Deutschland

The ALICE experiment at the CERN LHC investigates the properties of the quark-gluon plasma (QGP) which is believed to be produced in Pb–Pb collisions at high collision energies. Hadron production measurements in pp collisions provide information about the underlying QCD processes and fragmentation functions. Furthermore, pp results provide an important baseline for the interpretation of heavy-ion collisions. In ALICE, neutral mesons can be measured via their two-photon decay channel facilitating the ALICE calorimeters EMCal, PHOS and

DCal to measure the position and energy of the decay photons.

This talk will discuss measurements of neutral mesons in various collision systems from the recently finished RUN2 data taking period using the ALICE calorimeters. The talk will focus on transverse momentum spectra and their dependence on the different collision systems.

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