

HK 57: Heavy-Ion Collisions and QCD Phases XII

Time: Thursday 14:00–15:30

Location: HK-H2

HK 57.1 Thu 14:00 HK-H2

Measurement of direct photons in $\sqrt{s_{NN}} = 5.02$ TeV Pb-Pb collisions with ALICE at the LHC — ●MEIKE DANISCH for the ALICE-Collaboration — Physikalisches Institut Heidelberg

Measurements of direct photons can provide valuable information on the properties and dynamics of the quark-gluon plasma (QGP) by comparing them to model calculations that describe the whole evolution of the system created in heavy-ion collisions, from the initial conditions to the pre-equilibrium, QGP, and hadronic phases.

In the ALICE experiment, photons can be reconstructed either by using the calorimeters or via conversions in the detector material. The photon conversion method benefits from an excellent energy resolution and is able to provide direct photon measurements down to $p_T = 0.4$ GeV/c.

In this talk, we present the first measurements of direct photon production in Pb-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV by ALICE, including direct photon spectra from central to peripheral events.

HK 57.2 Thu 14:15 HK-H2

Virtual Photon Measurements with the HADES at GSI — ●JAN-HENDRIK OTTO for the HADES-Collaboration — Justus-Liebig Universität, Gießen, Germany

The **High Acceptance DiElectron Spectrometer (HADES)** is dedicated to the measurement of electromagnetic probes from heavy ion collisions and to study the in-medium behaviour of dileptons in the moderate temperature and high density regime of the QCD phase diagram. Dileptons as penetrating probes are messengers of this dense medium and can reveal the thermal properties and the lifetime of the medium but also give insight into meson properties at high densities. In this talk we present preliminary results of HADES on the dielectron analysis of 4.5 billion Ag+Ag collisions (0 – 40% centrality) at a centre-of-mass energy of $\sqrt{s_{NN}} = 2.55$ GeV. The upgraded RICH detector offers excellent electron identification and suppression of conversion-pairs resulting in a signal-to-background ratio larger than 1 for $M_{e^+e^-} > 500$ MeV/c². The high statistics data sample in combination with a strongly increased electron detection efficiency and background suppression allow for a differential analysis in terms of centrality or electron-pair-momentum with a signal up to the phi meson mass region. For higher pair-momenta a signal of the omega meson is clearly seen while vanishing for lower pair-momenta. The temperature extracted from the intermediate mass region compares well with the HADES measurement in Au+Au collisions at $\sqrt{s_{NN}} = 2.42$ GeV. The obtained dielectron signal spectrum is compared to simulated hadronic cocktail and nucleon-nucleon reference spectra.

HK 57.3 Thu 14:30 HK-H2

Physics opportunities with photons for the ALICE3 experiment — ●ABHISHEK NATH for the ALICE-Collaboration — Physikalisches Institut, Ruprecht Karl University of Heidelberg, Germany

The ALICE Collaboration is writing an LOI of a next-generation multipurpose detector, the ALICE 3, to further contribute to the characterization of the macroscopic QGP properties with unprecedented precision at the LHC Run 5.

Since direct photons provide information about the initial stage of the collision as well as the space-time evolution of the QCD medium, studying background photons signals from meson decays deserves mention. The possibility of reconstruction photons through their conversion in the detector material, benefiting from the good momentum resolution for charged particles, and the large pseudorapidity coverage of the ALICE 3 detector can be jointly exploited to measure neutral mesons with high precision over a large momentum range.

While measurements of J/ψ , Υ are abundant at the LHC, measurements of χ_c , χ_b and other $L = 1$ states in wide p_T and rapidity ranges are needed, to provide stronger constraints on the spectral properties of bound states in the QGP and allow for a more accurate description of the dynamics of quarkonium interactions with the medium.

In this talk, we present performance studies of η meson measurements using the photon conversion method for ALICE 3. Moreover, the performance of χ_c measured through the radiative decay channel $\chi_c \rightarrow J/\psi + \gamma$ is also presented.

HK 57.4 Thu 14:45 HK-H2

Direct photons in high-multiplicity pp collisions with dielectrons in ALICE — ●IVAN VOROBYEV for the ALICE-Collaboration — Technische Universität München

Low-mass e^+e^- pairs produced in ultra-relativistic heavy-ion collisions at the LHC carry important information about the system space-time evolution unperturbed by strong final-state interactions. The dielectron continuum is very rich in physics sources: on top of Dalitz and resonance decays of pseudo-scalar and vector mesons, thermal black-body radiation contains the information about the temperature of the hot and dense system created in heavy-ion collisions. In proton-proton (pp) collisions, measurement of direct photons serves as a fundamental test for perturbative QCD calculations and as a baseline for the studies in heavy-ion collisions. Recently, pp collisions with high charged-particle multiplicities have been found to exhibit interesting phenomena resembling some observations done in heavy-ion collisions. Low-mass dielectrons could provide additional information regarding the underlying physics processes in such collisions.

We present the latest results from the dielectron analysis of large data sample of pp collisions at $\sqrt{s} = 13$ TeV collected with ALICE during the LHC Run 2. A particular focus of the discussion is put on the production of direct photons in pp collisions collected with a trigger on high charged-particle multiplicities. The relative increase of dielectron production in high-multiplicity events with respect to all inelastic collisions is compared to the expectations from already measured multiplicity-dependent production of light and heavy hadrons.

HK 57.5 Thu 15:00 HK-H2

Physics opportunities with photons for the ALICE3 experiment — ●ABHISHEK NATH for the ALICE-Collaboration — Physikalisches Institut, Ruprecht Karl University of Heidelberg, Germany

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While measurements of J/ψ , Υ are abundant at the LHC, measurements of χ_c , χ_b and other $L = 1$ states in wide p_T and rapidity ranges are needed, to provide stronger constraints on the spectral properties of bound states in the QGP and allow for a more accurate description of the dynamics of quarkonium interactions with the medium.

In this talk, we present performance studies of η meson measurements using the photon conversion method for ALICE 3. Moreover, the performance of χ_c measured through the radiative decay channel $\chi_c \rightarrow J/\psi + \gamma$ is also presented.

HK 57.6 Thu 15:15 HK-H2

Background studies for a soft-photon measurement with the Forward Conversion Tracker in ALICE 3 — ●TIM ROGOSCHINSKI for the ALICE-Collaboration — IKF Frankfurt

We propose to construct a Forward Conversion Tracker at the LHC to measure photons of a few MeV in transverse momentum, so called ultra-soft photons, which have the potential to resolve the long standing "soft-photon puzzle": Several experiments have observed an excess of ultra-soft photons with respect to the expected yield from Low's theorem, which is very fundamentally relating ultra-soft photon production from inner Bremsstrahlung and the spectrum of charged hadrons. It is proposed to include a Forward Conversion Tracker (FCT) in ALICE 3, the next-generation heavy-ion collision experiment proposed for Run 5 and 6 at the LHC, to measure ultra-soft photons. The dominant background in this measurement, decay photons and external Bremsstrahlung, has been investigated and compared to the signal expectation derived from Low's theorem. pp collisions at 13 TeV are simulated via PYTHIA and the produced

particles are propagated through the proposed ALICE 3 geometry implemented in a GEANT4 setup. Aiming at a significant measurement, several background-suppression capabilities have been explored: Major improvements were achieved by the rejection of

events with an electron or positron in the η - range of the FCT and by reducing the material budget in optimising the shape of the beam pipe. In this talk the status of the simulation and the background studies for a soft-photon measurement with the FCT is presented.