HK 3: Schwerionenkollisionen und QCD Phasen

Zeit: Montag 11:00–12:45 Raum: HSZ-201

Gruppenbericht HK 3.1 Mo 11:00 HSZ-201

Heavy-flavour measurements in the semi-electronic decay channel in proton-proton and Pb–Pb collisions with ALICE at the LHC — •Markus Fasel for the ALICE-Collaboration — Physikalisches Institut, Ruprecht-Karls Universität Heidelberg, Im Neuenheimer Feld 226, 69120 Heidelberg

Heavy quarks are produced in initial hard scatterings and experience the full history of nuclear collisions. Thus they are a unique tool to study properties of the hot and dense medium produced in heavy-ion collisions. In particular the dependence of the partonic energy loss in the quark-gluon plasma phase on the quark mass can be addressed. In addition, the measurement of the elliptic flow of heavy quarks allows to study the degree of their thermalization with the hot and dense medium. In proton-proton (pp) collisions, the measurement of heavy-flavour production allows to test perturbative QCD. Furthermore, it provides a reference for heavy-ion studies. With ALICE, the measurement of heavy-flavour production can be performed in the semi-electronic decay channel at midrapidity down to $p_{\mathrm{T}} = 0.5$ GeV/c. Besides the particle identification capabilities provided by the experiment, the Inner Tracking System allows a separation of electrons from charm and beauty hadron decays. We report on the measurement of electrons from heavy-flavour hadron decays, at midrapidity in pp collisions at $\sqrt{s} = 2.76$ TeV and $\sqrt{s} = 7$ TeV. For Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 2.76$ TeV the suppression and the elliptic flow of electrons from semi-leptonic heavy-flavour hadron decays will be presented, and an outlook on measurements in p+Pb collisions will be given.

HK 3.2 Mo 11:30 HSZ-201

Measurement of B meson production in pp collisions at $\sqrt{s} = 2.76$ TeV and $\sqrt{s} = 7$ TeV via displaced electrons in ALICE — •Markus Heide for the ALICE-Collaboration — WWU Münster

Measurements of the production cross section of B mesons in pp collisions in ALICE are important in two respects. They allow to test perturbative quantum chromodynamics calculations, and they provide an essential reference for comparison with studies in heavy-ion collisions at high energies, in which a hot and dense medium, the quark-gluon plasma (QGP), is created. When passing through this medium, quarks lose energy via the strong interaction. Since the amount of energy loss is expected to depend significantly on the quark mass, beauty as the heaviest observable flavour is of particular interest for the exploration of QGP properties. The measurement of electrons from beauty hadron decays at mid-rapidity will be presented for $\sqrt{s} = 2.76$ TeV and $\sqrt{s} = 7$ TeV. First, the electron identification in the ALICE central barrel, using the Time Projection Chamber (TPC) and Time Of Flight (TOF) detector, will be outlined. An explanation of the selection of electrons from beauty hadron decays with a large impact parameter will be given. It makes use of the B mesons' larger decay length ($\approx 500\ \mu m$) in comparison to D mesons and other background sources. The remaining electron background in the selected sample is estimated based on calculations using ALICE measured p_t spectra. The resulting B meson p_t spectra measured in pp collisions at $\sqrt{s} = 7$ TeV in 2010 and at $\sqrt{s} = 2.76$ TeV in 2011 will be shown.

HK 3.3 Mo 11:45 HSZ-201

Background subtraction techniques for heavy-flavour electrons with ALICE at the LHC — •Christian Alberto Schmidt for the ALICE-Collaboration — TU Darmstadt - Institut für Kernphysik, Darmstadt, Germany

ALICE is the dedicated heavy-ion experiment at the LHC at CERN. The LHC delivers proton and heavy-ion beams with center-of-mass-energies of currently up to $\sqrt{s} = 8$ TeV for protons and $\sqrt{s_{NN}} = 2.76$ TeV for heavy ions.

The heavy-flavour (charm and beauty) production serves as an important test of perturbative Quantum Chromodynamics (pQCD) calculations. It is investigated via the measurement of semi-electronic decays of heavy-flavour hadrons. In heavy-ion collisions, the modifications of the heavy-flavour electron momentum distributions compared to the one in pp collisions presents a sensitive probe for the properties of the hot dense matter created in such interactions.

This measurement will only have success, if the background of the electron p_{T}-spectra is understood, estimated and subtracted. In this talk we present results of the cocktail subtraction method and the statistical photonic electron subtraction method. Both analysis require a good understanding of the non heavy-flavour electron background. We will show results obtained from reconstructed pp collisions at $\sqrt{s} = 7$ TeV.

HK 3.4 Mo 12:00 HSZ-201

Trennung der Charm- und Beautyproduktion in pp- und Pb-Pb-Kollisionen mit ALICE — •Martin Völkl für die ALICE-Kollaboration — Physikalisches Institut Heidelberg

In Schwerionenkollisionen ist der Energieverlust schwerer Quarks eine interessante Größe, um die Eigenschaften des erzeugten Mediums - das Quark-Gluon-Plasma - zu erforschen. Schwere Quarks werden fast ausschließlich in den harten Partonstößen erzeugt und können so während der gesamten Entwicklung des Systems mit der umgebenden Materie wechselwirken. Aus den schweren Quarks bilden sich Hadronen, welche in Elektronen zerfallen können. Zugang zum Energieverlust der Teilchen im QGP bietet der Vergleich der Spektren solcher Elektronen aus Proton-Proton-Kollisionen mit denen aus Schwerionenkollisionen. Das genauere Verständnis der Daten ergibt sich aus dem Vergleich zur Theorie. Besonders interessant ist dabei die Möglichkeit zwischen beauty- und charm-Quarks experimentell zu unterscheiden um ihre unterschiedliche Charakteristik beim Energieverlust zu untersuchen. Dies kann durch statistische Trennung der Beiträge durch den Stoßparameter der Elektronen relativ zum Kollisionspunkt geschehen. Aufgrund ihrer großen Zerfallslänge ($c\tau \approx 500\mu$m) ergibt sich für Elektronen aus Hadronen mit beauty-Valenzquarks typischerweise ein größerer Stoßparameter. Eine reine Auswahl von Elektronen lässt sich durch die ausgezeichneten Teilchenidentifikationsfähigkeiten von ALICE erreichen. Hier sollen die bisherigen Ergebnisse der Studie in pp bei $\sqrt{s} = 7$TeV und in Pb-Pb bei $\sqrt{s_{NN}} = 2.76$TeV vorgestellt werden.

HK 3.5 Mo 12:15 HSZ-201

Open heavy flavor in ultra-relativistic heavy ion collisions — •Jan Uphoff[1], Oliver Fochler[1], Zhe Xu[2], and Carsten Greiner[1] — [1]Institut für Theoretische Physik, Goethe-Universität Frankfurt, Max-von-Laue-Straße 1, D-60438 Frankfurt, Germany — [2]Department of Physics, Tsinghua University, Beijing, China

The production and space-time evolution of heavy quarks in the quark gluon plasma is studied within the partonic transport model Boltzmann Approach to MultiParton Scatterings (BAMPS). An updated version of BAMPS is presented which allows interactions among all partons: gluons, light quarks and heavy quarks. Heavy quarks, in particular, interact with the rest of the medium via binary and radiative scatterings with a running coupling and a more precise Debye screening which is derived from hard thermal loop calculations. We compare our results of the elliptic flow and nuclear modification factor not only to experimental data of heavy flavor electrons and D mesons at RHIC, but also to LHC data of heavy flavor electrons, muons, D mesons, and non-prompt J/psi. The latter two are in particular sensitive to the mass difference of charm and bottom quarks.
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HK 3.6 Mo 12:30 HSZ-201

b-Jet tagging in ALICE — •Linus Feldkamp for the ALICE-Collaboration — WWU Münster

Jets from heavy quarks (charm and beauty) are ideal probes for the strongly interacting medium (Quark Gluon Plasma) produced in heavy ion collisions. Color-charged heavy quarks, produced in the very early stage of the collision, lose energy while traversing the medium due to collisional and radiative processes, with the consequent quenching of the associated jets. The energy loss is expected to be smaller for heavy quarks than for light quarks and gluons. It has also been argued that the presence of the medium could modify the parton fragmentation process. Thus, the interaction with the medium can modify jet spectra as well as their properties. Several methods have been developed and used by experiments in high energy particle physics to differentiate jets originating from light and heavy quarks. Most of them exploit the relativly long lifetimes of heavy flavor hadrons, which result in a de-

cay vertex displaced from the beam interaction point. We will give an overview of the of the on-going studies on b-jet tagging in pp collisions in the ALICE experiment at the LHC, and discuss their applicability to Pb-Pb collisions.