HK 77: Hadronenstruktur und -spektroskopie

Zeit: Donnerstag 16:45–19:00 Raum: HSZ-304

Gruppenbericht HK 77.1 Do 16:45 HSZ-304

Hadron Spectroscopy with COMPASS — •Boris Grube — Physik-Department E18, Technische Universität München

COMPASS is a multi-purpose fixed-target experiment at the CERN Super Proton Synchrotron aimed at studying the structure and spectrum of hadrons. One main goal is the search for new hadronic states, in particular hybrid mesons and glueballs. Its large acceptance, high resolution, and high-rate capability make the COMPASS experiment an excellent device to study the spectrum of light-quark mesons in diffractive and central production up to masses of about 2.5 GeV/c^2. COMPASS is able to measure final states with charged as well as neutral particles, so that resonances can be studied in different reactions and decay channels. During 2008 and 2009, COMPASS took a large data sample using 190 GeV negative and positive hadron beams on various targets. The presented overview of the first results from this data set focuses in particular on the search for spin-exotic mesons in diffractively produced multi-particle final states and the analysis of central-production reactions in order to study glueballs in the scalar sector.

This work was supported by the BMBF, the DFG Cluster of Excellence "Origin and Structure of the Universe" (Exc 153), and the Maier-Leibnitz-Laboratorium der Universität und der Technischen Universität München.

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Baryon Spectroscopy at COMPASS — •Tobias Weisrock — Institut für Kernphysik, Universität Mainz

The COMPASS 2009 data taking with a 190 GeV/c proton beam impinging on a liquid hydrogen target offers the possibility to study baryon resonances in multiple channels. Complementary to existing data obtained from electro- and photoproduction these hadron-induced reactions can help to complement the known spectrum of baryons.

Only exclusive events will be used for analyses, therefore the recoiling target proton has to be measured using a recoil proton detector. First studies of $p_f\pi^+\pi^-p_{\text{rec}}$, $p_fK^+K^-p_{\text{rec}}$ and $p_f\pi^0\pi^0p_{\text{rec}}$ final states will be presented and an outlook on further analyses given.

Supported by BMBF under the contract 05P12UMCC1 and GRK Symmetry Breaking (DFG/GRK 1581).

HK 77.3 Do 17:30 HSZ-304

Towards spectroscopy of final states with neutral particles at COMPASS — •Sebastian Uhl — Technische Universität München, Physik Department E18, 85748 Garching

COMPASS aims to study the structure and the spectrum of hadrons. The fixed-target spectrometer is located at CERN's Super Proton Synchrotron. Equipped with precise tracking detectors and two electromagnetic calorimeters, it features a wide angular acceptance, and high resolution for charged and neutral particles. In 2008 and 2009 several billion events of a π^- beam impinging on a liquid hydrogen target have been recorded. These data can be used to study the light-quark meson spectrum in diffractive production.

The reconstruction of photons has recently been improved, allowing a new insight into final states containing neutral particles. Events with a single charged particle and four photons in the final state are studied for the occurrence of either two π^0 or two η mesons. The prospects of a partial-wave analysis of these data will be discussed. In case the final state is $\pi^-\pi^0\pi^0$, a comparison to the $\pi^-\pi^+\pi^-$ final state should allow an important consistency check, and provide a handle on systematic effects.

This work was supported by the BMBF, the DFG Cluster of Excellence "Origin and Structure of the Universe" (Exc 153), and the Maier-Leibnitz-Laboratorium der Universität und der Technischen Universität München.

HK 77.4 Do 17:45 HSZ-304

Messung der Pion-Polarisierbarkeit bei COMPASS — •Stefan Huber für die COMPASS Kollaboration — Technische Universität München, Garching, Deutschland

Die Pion-Polarisierbarkeit ist eine Grösse, deren Wert durch die Chirale Störungsrechnung vorhergesagt wird. Bisherige experimentelle Untersuchungen stehen sowohl in Widerspruch mit diesem Wert als auch untereinander. Ende 2009 wurde dazu am COMPASS Experiment eine Messung über die sogenannte Primakoff Reaktion an Nickel ($\pi^- + Z \to \pi^- + \gamma + Z$) durchgeführt. Die dabei erhaltene Statistik, sowie die möglichkeit systematische Effekte anhand des analogen Prozesses mit Muonen zu studieren, erlaubt es den bisher genauesten experimentellen Wert zu bestimmen.

In diesem Vortrag wird die experimentelle Methode vorgestellt sowie das daraus resultierende Ergebnisse präsentiert. Diese Arbeit wird unterstützt vom BMBF and dem Maier-Leibnitz-Labor sowie dem Exzellenzcluster 'Origin and Structure of the Universe' unterstützt.

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4π-continuous mode polarized solid state target — •Stefan Runkel, Hartmut Dutz, Stefan Goertz, Marcel Bornstein, and Scott Reeve — Physikalisches Institut Universität Bonn

For high quality measurements of polarization variables at CB-ELSA the Polarized Target Group in Bonn focusses much of its efforts on the improvement of the instrumentation and hardware. Currently one of the main tasks is the competition of a 4π-continuous mode target which could be used to maintain higher mean polarization values at lower temperatures. The new cryostat uses specially designed pre-cooling elements as well a unique superconducting inverse notched coil for polarization. Due to this development the need for the cumbersome alternation of polarization and data-taking is removed and makes an external polarizing magnet unnecessary. In addition the data-taking period in cold operation is increased. It is designed to provide a transversal and a longitudinal polarization if necessary.

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Hadron Identification with Time-of-Flight Method at COMPASS — •Nicolas du Fresne von Hohenesche — Institut für Kernphysik, Mainz, Deutschland

An import study of the COMPASS experiment is the extraction of fragmentation functions from pion and kaon multiplicities. Semi-inclusive deep inelastic scattering (SIDIS) is measured with a 160 GeV muon beam on a fixed target. The charged hadrons are identified with the RICH, a Ring Imaging CHerenkov detector. Depending on the refractive index of the filling gas, kaons, pions and proton can be identified only in a limited momentum range between 10 and 50 GeV.
In 2010, an additional trigger hodoscope was installed in front of the RICH, here not only to detect scattered muons but also low momentum hadrons due to the good time resolution of the scintillator slabs. With an offline method, the time-of-flight is calculated thus allows the identification of the low momentum tracks.
Supported by BMBF

HK 77.7 Do 18:30 HSZ-304

Measurement of radiative widths at COMPASS — •Stefanie Grabmüller — Technische Universität München, Physik-Department E18, 85748 Garching

COMPASS is a multi-purpose fixed-target experiment at CERN SPS, that investigates the structure and spectroscopy of hadrons. Dissociation of pions on nuclear or hydrogen targets provides clean access to the light meson spectrum. During a short run with π^- beam on lead in the year 2004, about 4 million exclusive $\pi^-\pi^-\pi^+$ events have been collected. For the 3 million events with low momentum transfer $t' < 0.01\,\text{GeV}^2/c^2$, coherent scattering off the nucleus as a whole can be assumed, with contributions from Reggeon (Pomeron) and quasi-real photon exchange. For the lowest $t' < 0.001\,\text{GeV}^2/c^2$, the electromagnetic interaction part becomes apparent.

The partial-wave analysis of these data leads to the observation of resonances as the $a_2(1320)$ dominantly produced by quasi-real photon exchange. The extraction of their radiative widths will be presented.

This work is supported by BMBF, Maier-Leibnitz-Labor München and the DFG Cluster of Excellence Exc153.

HK 77.8 Do 18:45 HSZ-304

A Geant4 based MC simulation for the COMPASS-II experiment at CERN — •Tobias Szameitat, Steffen Bauer, Horst Fischer, Florian Herrmann, Kay Königsmann, Michael Kunz, Tobias Kunz, Pasquale Malm, Christopher Regali, Robert Schäfer, Katharina Schmidt, Stefan Sirtl, and Johannes ter Wolbeek — for the COMPASS collaboration, Physikalisches Institut,

Albert-Ludwigs-Universität Freiburg

A dynamical and geometrical picture of the nucleon is provided by the theoretical framework of Generalized Parton Distributions (GPDs). Experimentally the GPDs can be accessed in exclusive measurements such as Hard Exclusive Meson Production and Deeply Virtual Compton Scattering. Upgrades of the COMPASS-II setup performed through 2012 allow for measurements of such exclusive reactions. The COMPASS-II experiment at CERN is a fixed-target experiment for the investigation of the spin structure of the nucleon and for hadron spectroscopy. The experiment is built as a multi-purpose two stage spectrometer. For a detailed understanding of the spectrometer acceptance a new Geant4 based simulation tool has been developed. We report on the implementation of the different detectors in Geant4 and key-performance figures. Supported by BMBF, DFG and EU FP7 (Grant Agreement 283286).