HK 1: Hadron Structure and Spectroscopy I

Zeit: Montag 14:00–16:00 Raum: HZO 50

Gruppenbericht HK 1.1 Mo 14:00 HZO 50

Hadron Spectroscopy with COMPASS — •Boris Grube for the COMPASS-Collaboration — 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. The two-stage spectrometer has a good acceptance for charged as well as neutral particles over a wide kinematic range and is thus able to measure a wide range of reactions. One of the main goals of the experiment is the study of the light-meson spectrum. In diffractive reactions, a rich spectrum of isovector mesons is produced using a 190 GeV/c negative pion beam. The resonances decay typically into multi-body final states and are extracted from the data using partial-wave analysis techniques. We have performed the so far most comprehensive analysis of this kind on the $\pi^-\pi^-\pi^+$ final state, for which COMPASS has acquired a large data set of 46 million event. In a novel approach, we take into account the dependence of the production process on the squared four-momentum transfer t from the beam to the target. As a consequence, we were able to better separate resonant and non-resonant contributions and to extract for the first time the dependence of the resonant and non-resonant amplitudes on t. We will discuss results from this analysis.

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 1.2 Mo 14:30 HZO 50

Inclusive charmonium production in energy region above 4 GeV at the BESIII experiment — •Simon Nakhoul, Klaus Goetzen, Ralf Kliemt, Frank Nerling, and Klaus Peters for the BESIII-Collaboration — GSI Helmholtz Center for heavy Ion research, Planckstrasse 1, Darmstadt, Germany

Since 2003, the XYZ charmonium-like states have become a hot topic in the hadron spectroscopy field. The Beijing Spectrometer III (BESIII) at the Beijing Electron-Positron Collider II (BEPC II) is one of the leading experiments in the XYZ-related physics. It has brought us numerous breakthrough discoveries like the observation of $Z_c(3900)$ and $Z_c(4020)$. In order to understand the nature of these intriguing states and their decay patterns, an inclusive analysis is performed using the recoil mass technique approach for different particles ($\pi^+\pi^-$, K^+K^-, $\pi^0\pi^0$, K_sK_s) at center of mass energies above 4 GeV. The aim of this analysis is to search for new unobserved XYZ decay channels and to provide accurate inclusive cross section measurements for $e^+e^- \to X_{c\bar{c}} + \pi^+\pi^-$ ($X_{c\bar{c}} = J/\psi, h_c, \psi(2S)$ ...) and compare them to the corresponding exclusive BESIII measurements.

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HK 1.3 Mo 14:45 HZO 50

Investigation of h_c decay patterns at BESIII — •Meike Kuessner — Ruhr-Universität Bochum, Institut für Experimentalphysik I, 44780 Bochum

The BESIII experiment at the BEPCII electron-positron collider in Beijing offers excellent opportunities to study rare charmonium decays, due to the high statistics data samples which were recorded at center of mass energies between $\sqrt{s} = 2 - 4.6$ GeV.
Although the existence of the pseudovector charmonium state h_c ($J^{PC} = 1^{+-}$) has already been confirmed experimentally in 1992, the decay pattern remained almost unknown. Only half of the expected decay channels, regarding the total resonance width, have been observed. The h_c state goes hand in hand with a special experimental challenge due to the circumstance that it can not be produced directly in e^+e^- annihilation or via radiative transitions from vector charmonium states. In the analysis presented here, the h_c state is studied in the production processes $\psi(2S) \to \pi^0 h_c$ and $Y \to \pi^+\pi^- h_c$ (where Y denotes the $\psi(4160)$, $Y(4230)$, $Y(4260)$, or $\psi(4415)$ state).
Preliminary results of the search for unknown h_c decay modes will be presented, based on $448 \cdot 10^6$ $\psi(2S)$ events and data sets recorded at $\sqrt{s} = 4.180$, 4.230, 4.260, and 4.420 GeV corresponding to 6180 pb^{-1}. Besides a discussion of the performed data selection, preliminary results for measured branching fractions of the h_c state will be presented.
Supported by DFG (FOR 2359)

HK 1.4 Mo 15:00 HZO 50

Study of Light Hadrons in radiative J/Ψ Decays at BESIII — •Jens Olaf Frech — Ruhr-Universität Bochum, Inst. für Experimentalphysik I, 44801 Bochum

The BESIII experiment, which is located at the symmetric electron-positron collider BEPCII in Beijing, has a center of mass energy between $\sqrt{s} = (2 - 4.6)$ GeV. It has recorded $1.3{\cdot}10^9$ J/Ψ events.
Lattice QCD predicts the lowest lying scalar glueball at a mass of 1.5 and 1.7 GeV/c^2. This leads to a mixing with the nearby mesons, which complicates the identification of glueballs. Radiative J/Ψ decays into two pseudoscalars provide an opportunity to study the states observed in the relevant region, as only intermediate states with even total angular momenta are allowed.
Using the large J/Ψ data sample mentioned above, the reaction $J/\Psi \to \gamma\eta\eta$ is studied, since it is a gluon rich process.
A status report for the study of the glueball candidates $f_0(1500)$ and $f_0(1710)$ will be presented.

Supported by DFG (FOR 2359)

HK 1.5 Mo 15:15 HZO 50

Measurement of η' and $f_1(1285)$ production in two-photon collisions at BESIII — •Dominik Schollmayer, Achim Denig, and Christoph Florian Redmer — Institut für Kernphysik, Universität Mainz, Deutschland

To further improve on the uncertainty of the Standard Model prediction of the anomalous magnetic moment of the muon, precise data on the production of mesons in two-photon collisions are of interest. The BESIII experiment at the e^+e^- collider BEPCII in Beijing has collected more than 10 fb^{-1} of data at center of mass energies between 3.773 GeV and 4.6 GeV. Based on these data the production of the η' and $f_1(1285)$ mesons in two-photon collisions is studied. The analysis aims at the determination of the radiative decay width and transition form factor in the region of momentum transfer below 3 GeV^2. In this presentation we will give an overview of the current status of the analysis.

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HK 1.6 Mo 15:30 HZO 50

Measurement of the $e^+e^- \to p\bar{p}$ cross section via initial state radiation at BESIII — •Alaa Dbeyssi[1], Samer Ahmed[1], Paul Larin[1], Dexu Lin[1], Frank Maas[1,2,3], Cristina Morales[1], Christoph Rosner[1], Yadi Wang[1], and Bo Zheng[1] for the BESIII-Collaboration — [1]Helmholtz-Institut Mainz, Mainz, Germany — [2]Institute of Nuclear Physics, Mainz, Germany — [3]PRISMA Cluster of Excellence, Mainz, Germany

This contribution reports on the recent measurements of the $e^+e^- \to \bar{p}p$ cross section using the initial state radiation technique with an undetected photon at the BESIII experiment in Beijing. The analysis is based on data sets, corresponding to an integrated luminosity of 7.408 fb^{-1}, collected at center of mass energies between 3.773 and 4.600 GeV. Preliminary results on the measured proton form factors in the time-like region are presented. The proton magnetic form factor is determined in 30 intervals of the proton-antiproton invariant mass between 2.0 and 3.8 GeV/c^2 under the assumption that the electric and the magnetic form factors are equal ($|G_E| = |G_M|$). The proton form factor ratio is also measured in the region between 2.0 and 3.0 GeV/c^2.

HK 1.7 Mo 15:45 HZO 50

Hybrids as three-body states from a Faddeev-equation — •Christian Söhngen[1], Gernot Eichmann[2], Christian S. Fischer[1], and Richard Williams[1] — [1]Justus-Liebig-Universität, Gießen, Deutschland — [2]IST, Lisboa, Portugal

We report on recent progress in the description of hybrid states in the framework of Dyson-Schwinger/Faddeev equations [1]. Based on explicit solutions for the quark and gluon propagators and their interactions we formulate a three-body equation describing hybrids as bound states of non-perturbative quark, antiquark and gluon constituents. This setup builds on the analogous three-body framework for baryons [2] that has provided very satisfactory results for the octet and decu-

plet spectrum [3]. We discuss the hybrid's constituents and report on first results for the emergent bound state properties.

[1] G. Eichmann, H. Sanchis-Alepuz, R. Williams, R. Alkofer and C. S. Fischer, Prog. Part. Nucl. Phys. 91 (2016) 1

[2] G. Eichmann, R. Alkofer, A. Krassnigg and D. Nicmorus, Phys. Rev. Lett. 104 (2010) 201601

[3] H. Sanchis-Alepuz and C. S. Fischer, Phys. Rev. D 90 (2014) no.9, 096001