

## HK 47: Hadronenstruktur und -spektroskopie

Zeit: Donnerstag 16:30–19:00

Raum: HZ 1+2

**Gruppenbericht**

HK 47.1 Do 16:30 HZ 1+2

**XYZ physics at BESIII experiment** — ●ZHIQING LIU — Johannes Gutenberg University of Mainz, Johann-Joachim-Becher-Weg 45, D-55099 Mainz, Germany

Searching for exotic particles (XYZ particles) with quark content different from conventional baryons and mesons are of high interest in particle physics. Using the large data samples collected above 4 GeV, the BESIII experiment was able to study the XYZ particles in an improve precision. Recently, BESIII has discovered the charged charmoniumlike states  $Z_c(3900)$ ,  $Z_c(4020)/Z_c(4025)$ , which is obviously good candidates for four quark state. In addition, BESIII also observed the  $X(3872)$  particle in  $Y(4260)$  radiative transition and  $Z_c(3900)$  in  $DD^*$  decay channel, which would help us understand their nature in a more deeper way. In this talk, I'll review all the recent results at the BESIII experiment, together with our future plan toward the study of XYZ physics.

**Gruppenbericht**

HK 47.2 Do 17:00 HZ 1+2

**Hadron Spectroscopy with COMPASS** — ●FLORIAN HAAS<sup>1</sup> and COMPASS COLLABORATION<sup>2</sup> — <sup>1</sup>Physik Department E18 TU München — <sup>2</sup>CERN

COMPASS is a multi-purpose fixed-target experiment at the CERN Super Proton Synchrotron aimed at studying the structure and spectrum of hadrons. One 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 and 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. We present new results from the analyses of this data set. One focus lies on the search for new mesons in diffractively produced multi-particle final states. Novel analysis methods are applied to study the dependence of partial waves on the squared four-momentum transfer  $t'$  from the beam to the target. This leads to a better separation of resonant and non-resonant contributions. In addition a new analysis scheme was developed that permits to extract information about the  $\pi^+\pi^-$  subsystem in the  $\pi^-\pi^+\pi^-$  final state with only minimal model bias. Finally central-production reactions are studied in order to search for glueball candidates in the scalar sector. Supported by BMBF, MLL and the Cluster of Excellence Exc153 "Origin and Structure of the Universe"

HK 47.3 Do 17:30 HZ 1+2

**Electronic width of X(3872)** — ACHIM DENIG, ZHIQING LIU, and ●MARTIN RIPKA — KPH Uni Mainz

The structure and origin of the exotic X(3872) resonance, is still a subject of investigations. Recently it was also observed at BESIII. The X(3872) is a candidate for a Tetraquark, a Meson molecule or various other models. A precise measurement of its electronic width can help to support or disfavor some of the theoretical models. Although it is not a vector resonance, we found methods to study the structure of X(3872) with ISR methods at the BESIII experiment in Beijing/China. In this talk we present preliminary results of a new measurement of the upper limit of the electronic width of X(3872).

HK 47.4 Do 17:45 HZ 1+2

**Lattice investigation of tetraquark candidates** — ●JOSHUA BERLIN<sup>1</sup>, ABDOU ABDEL-REHIM<sup>2</sup>, CONSTANTIA ALEXANDROU<sup>2</sup>, MATTIA DALLA BRIDA<sup>3</sup>, MARIO GRAVINA<sup>2</sup>, GIANNIS KOUTSOU<sup>2</sup>, and MARC WAGNER<sup>1</sup> — <sup>1</sup>Goethe-Universität Frankfurt am Main, Institut für Theoretische Physik, Max-von-Laue-Straße 1, D-60438 Frankfurt am Main, Germany — <sup>2</sup>Department of Physics, University of Cyprus, P.O. Box 20537, 1678 Nicosia, Cyprus Computation-based Science and Technology Research Center, Cyprus Institute, 20 Kavafi Street, Nicosia 2121, Cyprus — <sup>3</sup>School of Mathematics, Trinity College Dublin, Dublin 2, Ireland

We present the status of an ongoing long-term lattice QCD project concerned with the study of light and heavy tetraquark candidates, using a variety of different creation operators. The computation of disconnected diagrams, which is technically challenging, is discussed in

detail.

HK 47.5 Do 18:00 HZ 1+2

**A Partial-Wave Analysis of Centrally Produced Two-Pseudoscalar Final States in  $pp$ -Reactions at COMPASS** — ●ALEXANDER AUSTREGESILO — Physik-Department E18, Technische Universität München

COMPASS is a fixed-target experiment at the CERN SPS which focused on light-quark hadron spectroscopy during the data taking periods in 2008 and 2009. A world-leading data set was collected with a 190 GeV/ $c$  hadron beam impinging on a liquid hydrogen target in order to study, inter alia, the central exclusive production of glueball candidates in the light-meson sector. Especially the double-Pomeron exchange mechanism ought to be well suited for the production of mesons without valence quark content. We select centrally produced systems with two pseudo-scalar mesons in the final state from the COMPASS data set recorded with an incoming proton. The decay of this system is decomposed in terms of partial waves, where particular attention is paid to the inherent mathematical ambiguities of the amplitude analysis. Furthermore, we discuss possible parametrisations that are able to describe the mass dependence of the partial-wave analysis results of  $\pi\pi$  and  $K\bar{K}$  final states.

Supported by BMBF, MLL and the Cluster of Excellence Exc153 'Origin and Structure of the Universe'.

HK 47.6 Do 18:15 HZ 1+2

**Hunting for  $K^{*+}(892)$  in 3.5 GeV  $pp$  and  $pNb$  reactions** — ●DIMITAR MIHAYLOV for the HADES-Collaboration — Excellence Cluster "Universe", Boltzmannstr. 2, 85748, Garching, Germany

The production of the kaon excitation  $K^{*+}(892)$  has never been investigated for  $pp$  collisions at energies near to the production threshold. The HADES spectrometer provides the unique opportunity to investigate the production of the  $K^{*+}(892)$  particle at kinetic beam energy of 3.5 GeV for both  $pp$  and  $pNb$  reactions. The analysis of the  $pp$  data will provide information about the production cross section for  $pp$  collisions as well as a reference for the study of the  $pNb$  data and consequently, it will improve our knowledge about  $pn$  reactions, scattering reactions inside the nucleus, production of the  $K^{*+}(892)$  excitation through secondary processes (e.g.  $\pi N \rightarrow K^{*+}\Lambda$ ) etc.

In this analysis the  $K^{*+}(892)$  particles are reconstructed by using the decay channel  $K^{*+}(892) \rightarrow K_S^0\pi^+ \rightarrow \pi^+\pi^-\pi^+$ . The statistics of the data is enough for a differential analysis. In order to apply acceptance and efficiency corrections to the  $pp$  data we have performed simulations of the two dominant production channels.

HK 47.7 Do 18:30 HZ 1+2

**Phenomenology of a pseudoscalar glueball and charmed mesons in the extended linear sigma model** — ●WALAA I. ESHRAIM, FRANCESCO GIACOSA, and DIRK RISCHKE — J. W. Goethe University, Frankfurt am Main, Germany

In the framework of the so-called extended linear sigma model (eLSM), we include a pseudoscalar glueball with a mass of 2.6 GeV (as predicted by Lattice QCD simulations) and we compute the two- and three-body decays into scalar and pseudoscalar mesons. This study is relevant for the future PANDA experiment at the FAIR facility. As a second step, we extend the eLSM by including the charm quark according to the global  $U(4)_r \times U(4)_l$  chiral symmetry. We compute the masses, weak decay constants and strong decay widths of open and hidden charmed mesons. The results are in good agreement with the experimental data.

HK 47.8 Do 18:45 HZ 1+2

**Radiative corrections to charged pion-pair production** — ●STEFAN PETSCHAUER and NORBERT KAISER — Physik-Department, Technische Universität München, James-Frank-Straße 1, D-85747 Garching

We calculate the one-photon loop radiative corrections to the charged pion-pair production process  $\pi^-\gamma \rightarrow \pi^+\pi^-\pi^-$ . In the low-energy region this reaction is governed by the chiral pion-pion interaction. Electromagnetic counterterms are included in order to remove the ultraviolet divergences generated by the photon-loops. Infrared finiteness of the virtual radiative corrections is achieved by including soft photon radiation below an energy cut-off. The purely electromagnetic inter-

action of the charged pions mediated by one-photon exchange is also taken into account. We present radiative corrections to the total cross sections as well as to the mass spectra. One finds that the effects are

of the order of a few percent.

This work has been supported in part by DFG and NSFC (CRC110).