

HK 18: Hadron Structure and Spectroscopy III

Zeit: Dienstag 14:00–16:00

Raum: HS 13

Gruppenbericht

HK 18.1 Di 14:00 HS 13

Search for four- and six-quark exotics with charm and strange quark content. — ●ELISABETTA PRENCIPE¹, JENS SOEREN LANGE², JAMES RITMAN¹, and ASHISH THAMPI¹ — ¹Forschungszentrum Juelich, IKP1, Leo Brandt strasse, 52428 Juelich, Germany — ²JLU, Physikalisches Institut II, Heinrich-Buff-Ring 16, Giessen, Germany

The e^+e^- asymmetric colliders BaBar and Belle collected a huge data sets, roughly 1.5 ab^{-1} , running at the energy in the center of mass of $\Upsilon(nS)$, where $n=1, 2, 3, 4, 5$ ($n=5$ at Belle, only). Even if they stopped data taking since almost 10 years, this represents the biggest available statistics at e^+e^- colliders, with great and unique possibilities in data analysis.

The present report summarizes the main goals of a combined BaBar+Belle data analysis project, approved since 1 years at FZJ, focused on the search of 4-quark states with $c\bar{c}s\bar{s}$ quark content, which main purpose is to analyze the invariant mass systems of $J/\psi\phi$ and $D_s^+ D_{s0}^*(2317)^-$ in different decay mechanisms. This is the first approved project in hadron spectroscopy with combined BaBar+Belle data sets. Possible search for 6-quark bound states is also possible and here introduced, with extrapolation and expectations with the full available statistics. Preliminary results on MC simulations and off-resonance data are presented, in an analysis of the $J/\psi\phi$ invariant mass system performed in continuum and through B decays. Feasibility studies are also shown for the analysis of the $D_s^+ D_{s0}^*(2317)^-$ invariant mass system.

HK 18.2 Di 14:30 HS 13

Analysis of $e^+e^- \rightarrow p\bar{p} + (\eta, \omega, \eta', f_1)$ at BESIII — ●MARCEL RUMP, JOHANNES BLOMS, NILS HÜSKEN, JOHANNES KELLERS, ALFONS KHOUKAZ, and FREDERIK WEIDNER — Westfälische Wilhelms-Universität Münster, Münster, Germany

Since the discovery of the $\chi_{c1}(3872)$ state by the BELLE experiment in 2003, a large number of new states were found in the mass region around $4 \text{ GeV}/c^2$, which apparently do not fit into the scheme of conventional charmonium states. The possibility that some of these states could be of exotic nature has raised interest on charmonium physics to a new level. Using data collected with the Beijing Spectrometer III (BESIII) in positron-electron annihilations at the Beijing Electron-Positron Collider (BEPCII) above 4 GeV allows studying final states including a $p\bar{p}$ pair and different light mesons. Systematic searches for heavy resonances as well as their decays via nucleon resonances are performed analysing $e^+e^- \rightarrow p\bar{p} + (\eta, \omega, \eta', f_1)$. In this talk, the current status of the analysis will be discussed.

HK 18.3 Di 14:45 HS 13

Study of the invariant mass system $J/\psi\phi$ in B decays and continuum with BaBar and Belle combined data sets — ●ASHISH THAMPI¹, ELISABETTA PRENCIPE¹, JAMES RITMAN¹, and JENS SOEREN LANGE² — ¹IKP-1, Forschungszentrum Juelich, Leo Brandt Strasse, 52428 Juelich, Germany — ²JLU Giessen, Physikalisches Institut II, Heinrich-Buff-Ring 16, Germany

The importance of analyzing the $J/\psi\phi$ invariant mass system is known, due to the controversial interpretation of two enhancements observed at 4140 and $4274 \text{ MeV}/c^2$, and two more peaks observed at 4500 and $4700 \text{ MeV}/c^2$ by the LHCb experiment in the same invariant mass system through B^+ decays.

The Belle experiment, located around the interaction point of the asymmetric energy e^+e^- collider at KEK (Tsukuba, Japan), collected $772 \text{ Mio. } B\bar{B}$ pairs at the center of mass energy corresponding to the $\Upsilon(4S)$ production. This report will present the preliminary results of MC simulations for the B decay using data collected at the energy in the center of mass of the $\Upsilon(4S)$, and also will show preliminary results of $e^+e^- \rightarrow J/\psi\phi$ in continuum, by analyzing all data sets collected by Belle at $\Upsilon(nS)$. The goal of this project is to analyze the invariant mass system of $J/\psi\phi$ in different production mechanisms, and combine these Belle results with the corresponding results of an equivalent BaBar analysis to gain sufficient statistics, and perform eventually angular analysis for a better understanding of the $c\bar{c}s\bar{s}$ spectrum.

HK 18.4 Di 15:00 HS 13

Shedding light on exotic charmonium: Reconstruction of a hybrid candidate with PANDARoot by means of a genetic al-

gorithm — ●CHRISTIAN WILL, MARKUS MORITZ, and KAI-THOMAS BRINKMANN for the PANDA-Collaboration — 2nd Physics Institute, Justus-Liebig-University Giessen

One of the most interesting fields in modern high energy physics is the experimental study of quantum chromodynamics. The PANDA-experiment at FAIR aims to explore this field by probing hadrons with unprecedented precision and sensitivity. It will use proton-antiproton collisions to reach center-of-mass energies of up to 5.5 GeV . Combined with a high luminosity, this will make the detection of exotic resonances with tiny cross sections feasible. In order to support the experiment with simulations, the software framework PANDARoot was developed.

In this talk, the reconstruction of a hybrid candidate in the charmonium sector with PANDARoot will be presented. The decay channel involving the hybrid candidate ultimately decays into seven photons, which makes it an excellent candidate to evaluate the performance of the electromagnetic calorimeter. While seven photons already create immense combinatorical background within the signal channel, there exist at least four background channels with a very similar decay pattern. Hence it is important to maximize the statistical significance of the signal. For this, different optimization algorithms were evaluated, where a genetic algorithm was found to be the most suitable one. Its features and performance will be discussed. This project is supported by BMBF and HIC for Fair.

HK 18.5 Di 15:15 HS 13

Neutral pion-pair production in singly-virtual two-photon scattering at BESIII — ●MAX LELLMANN, ACHIM DENIG, and CHRISTOPH FLORIAN REDMER for the BESIII-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität, Mainz, Germany

The anomalous magnetic moment of the muon a_μ is one of the most precisely measured observables of the Standard Model, yet it shows a discrepancy of about 3.7σ between Standard Model prediction and measurement. It is still under discussion whether this discrepancy is a hint for New Physics or a proof for the poor understanding of strong interaction at low energies.

Information on the production of pion pairs in two-photon fusion processes plays an important rule in the calculation of the hadronic light-by-light scattering contribution to a_μ .

The BESIII experiment, located at the institute of high energy physics in Beijing/China, offers a perfect testbed for the investigation of two-photon processes at small momentum transfers. The process $e^+e^- \rightarrow e^+e^- \gamma\gamma^* \rightarrow e^+e^- \pi^0\pi^0$ is measured at the BESIII experiment at centre-of-mass energies between 3.77 and 4.23 GeV with a total integrated luminosity of about 7 fb^{-1} . This presentation will discuss the current status of the analysis.

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HK 18.6 Di 15:30 HS 13

Measurement of the Electromagnetic Transition Form Factor of the η' Meson — ●SASCHA WAGNER for the A2-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz

Electromagnetic Transition Form Factors (TFF) allow us to study the intrinsic structures of hadrons and gain knowledge of their compound particles and properties. Furthermore the TFF of the light pseudoscalar mesons are an important quantity to reduce the theoretical uncertainty of the hadronic light-by-light scattering of the anomalous magnetic moment of the muon. These TFF are accessible in accelerator experiments like the Mainzer Mikrotron (MAMI) and the Crystal Ball experiment via particle decays in the time-like region.

In the A2 collaboration at MAMI experiments with bremsstrahlung photons are conducted. In 2014 dedicated experiments for the photoproduction of η' and ω mesons took place with a special photon tagging device constructed mainly for measurements of the η' , the so-called End-point Tagger, covering the high-energetic region of the bremsstrahlung spectrum.

In this contribution the measurement of the Dalitz decay $\eta' \rightarrow \gamma^*\gamma \rightarrow e^+e^-\gamma$ with the Crystal Ball and TAPS setup will be discussed. Simulation studies for the photoproduction processes as well as first results of the 2014 measured data will be presented.

HK 18.7 Di 15:45 HS 13

Measurement of the Pion Form Factor above 1 GeV using

Initial State Radiation at BESIII — ●YASEMIN SCHELHAAS and ACHIM DENIG for the BESIII-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland

The anomalous magnetic moment of the muon $a_\mu = (g_\mu - 2)/2$ is one of the most precise measured variables in physics. However, there is a discrepancy of 3.7 standard deviations between the Standard Model (SM) prediction and the direct measurement, known as the $(g - 2)$ -puzzle. The accuracy of the SM prediction can be improved using ex-

perimental measurements of hadronic processes at e^+e^- colliders. One of the most important processes is $e^+e^- \rightarrow \pi^+\pi^-$. Using a data set of 3.1 fb^{-1} taken at a center of mass energy of 4.18 GeV, its cross section is measured at the BESIII experiment at the BEPCII collider in Beijing, exploiting the Initial State Radiation technique. The analysis aims at the determination of the pion form factor above 1 GeV, which is also interesting for spectroscopy. In this presentation an overview of the current status of the analysis is given.

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