

HK 29: Hadron Structure and Spectroscopy III

Time: Wednesday 14:00–15:30

Location: SCH/A316

Group Report HK 29.1 Wed 14:00 SCH/A316
Probing the hadron spectrum with the GlueX experiment at Jefferson Lab — ●ANNIKA THIEL — Helmholtz-Institut für Strahlen- und Kernphysik, Nussallee 14-16, 53115 Bonn

One of the primary goals of non-perturbative QCD is the understanding of the hadron spectrum. A particular interesting aspect is the question, if and where states containing gluonic excitations contribute to the spectra. This issue has been tackled by different experiments using various production mechanisms without conclusive answers. A complementary production mechanism is the use of photoproduction, which is utilized by the GlueX experiment at Jefferson Lab.

The GlueX experiment started data taking in 2017 and is focused on the measurement of neutral as well as charged final states at photon energies up to 12 GeV. An important tool is the use of linearly polarized photons, which allows to shed light on the question whether natural or unnatural exchange dominates in the production of different states. Various results have been extracted in recent years, ranging from the extraction of polarization observables for different final states over the investigation of excited Λ states to the determination of the J/Ψ cross section at threshold.

This presentation will show the current status of the GlueX experiment and give an overview about the published results as well as ongoing analyses.

HK 29.2 Wed 14:30 SCH/A316

Partial-wave analysis of $\tau^- \rightarrow \pi^- \pi^- \pi^+ \nu_\tau$ at Belle* — ●ANDREI RABUSOV, DANIEL GREENWALD, and STEPHAN PAUL — Technical University of Munich, James Franck Str. 1, 85748 Garching

We present preliminary results of a partial-wave analysis of $\tau^- \rightarrow \pi^- \pi^- \pi^+ \nu_\tau$ in data from the Belle experiment at the KEK e^+e^- collider. We demonstrate the presence of the $a_1(1420)$, $a_1(1640)$, and $\pi(1300)$ resonances in τ decay and measure their masses and widths. We also present validation of our findings using a model-independent approach. Our results can improve modeling in simulation studies necessary for measuring the τ electric and magnetic dipole moments and Michel parameters.

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HK 29.3 Wed 14:45 SCH/A316

Diffraction resonance production in the reaction $\pi^- + p \rightarrow \pi^- K_S^0 K_S^0 + p$ at 190 GeV/c from COMPASS — ●MATHIAS WAGNER for the COMPASS-Collaboration — Universität Bonn, Helmholtz-Institut für Strahlen- und Kernphysik, Bonn, Germany

Understanding of the light-meson spectrum is a necessity for the search for exotic states such as hybrid mesons. Especially the $\pi^- \pi^+ \pi^-$ system proved very fruitful in this respect by providing, among others, clear evidence of the spin-exotic $\pi_1(1600)$ meson. A possible supernumerous state, the $a_1(1420)$, is established by the COMPASS collaboration as an evidence for a triangle singularity in the $3\pi\text{-}\pi KK$ coupled interaction. Therefore, it is extremely interesting to look for both the $\pi_1(1600)$ and the $a_1(1420)$ in the πKK final state.

Since the identification of charged kaons in COMPASS is severely limited at high momenta, we investigate the $\pi^- K_S^0 K_S^0$ system by reconstructing secondary K_S^0 decay vertices. First results of the event selection and the $\pi^- K_S^0 K_S^0$ mass spectrum in diffractive production

at COMPASS are presented. Possible resonances are $a_{J>1}$ and $\pi_{J>0}$, and in the two-body subsystems we expect in the $K_S^0 K_S^0$ system the f and ρ states with even and odd spin, respectively, and K_J^* in the $\pi^- K_S^0$ system. For these, the corresponding invariant-mass spectra as well as the Dalitz-plots are presented.

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HK 29.4 Wed 15:00 SCH/A316

Partial-Wave Analysis of the $\pi\pi\omega$ Final State at COMPASS* — ●PHILIPP HAAS for the COMPASS-Collaboration — Physik-Department, Technische Universität München

The COMPASS experiment is a multi-purpose fixed-target experiment at the CERN SPS. One of its major goals is to study the light-meson spectrum with high precision. Of special interest is the search for so-called exotic mesons which cannot be described as quark-antiquark states. To this end, COMPASS has acquired large data samples on diffractive production of excited light mesons by scattering a 190 GeV/c π^- beam off a proton target. Using this data set, COMPASS studied the $\pi_1(1600)$, which is a promising candidate for a so-called spin-exotic hybrid meson in great detail in the $\eta\pi$, $\eta'\pi$, and $\rho\pi$ decay modes. However, lattice QCD predicts that the $\pi_1(1600)$ dominantly decays into $b_1(1235)\pi$.

The $b_1(1235)\pi$ decay mode has so far not been studied at COMPASS. As $b_1(1235)$ dominantly decays into $\omega(782)\pi$, a partial-wave analysis of $\omega\pi\pi$ including the $\omega \rightarrow 3\pi$ decay is necessary to access the $b_1(1235)\pi$ decay mode. We will present our development of a partial-wave analysis of the $\omega\pi\pi$ final state. We will focus on modeling the $\omega(782)$ decay in the partial-wave analysis.

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HK 29.5 Wed 15:15 SCH/A316

Investigation of the decays $\chi_{cJ} \rightarrow \eta'\pi^+\pi^-$ and search for the spin exotic meson $\pi_1(1600)$ at BESIII — ●FREDERIK WEIDNER, SALLEH AHMED, ANJA BRÜGGEMANN, NIKOLAI IN DER WIESCHE, HANNAH NEUWIRTH, ANN-CHRISTIN SCHLUSE, ANNA THEIMANN, and ALFONS KHOUKAZ for the BESIII-Collaboration — Westfälische Wilhelms-Universität, Münster, Germany

In recent years the search for exotic hadrons has produced more and more states which seem to be incompatible with the conventional classification as a two or three quark state. However, in most of these cases the classification of these particles is inconclusive. An interesting opportunity is given by states with quantum numbers which cannot be produced by the conventional quark model, such as $J^{PC} = 1^{-+}$ in case of the $\pi_1(1600)$, which was seen in multiple experiments.

With the BESIII experiment decays of the χ_{cJ} mesons can be investigated through their production in radiative decays of the $\psi(2S)$ meson. Here, a large number of events has been recorded by the BESIII detector and additional data taking is ongoing. When considering the decay of these charmonia into three pseudoscalar mesons, spin exotic quantum numbers like $J^{PC} = 1^{-+}$ can be accessed. Additionally, precision measurements of branching ratios of the χ_{cJ} states can help solidify our understanding of the charmonium system. In this talk the current status of the search for the $\pi_1(1600)$ in the decay $\chi_{c2} \rightarrow \eta'\pi^+\pi^-$ by the means of a partial wave analysis will be presented.

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