HK 57: Hadron Structure and Spectroscopy VIII

Zeit: Freitag 14:00–15:45 Raum: HS 13

Gruppenbericht HK 57.1 Fr 14:00 HS 13

Partial Wave Analysis with PAWIAN — •Bertram Kopf — Institut für Experimentalphysik I, Ruhr-Universität Bochum

PAWIAN (**Par**tial **W**ave **I**nteractive **An**alysis Software) is a powerful and user-friendly software package with the ability to perform spin parity analyses with data obtained from different hadron spectroscopy experiments. After a brief summary of the features of PAWIAN, an exemplary coupled channel analysis with various $\bar{p}p$-annihilation and $\pi\pi$-scattering data performed with this package will be presented. In this context important aspects on the extraction of resonance properties by considering analyticity and unitarity conditions will be discussed.

HK 57.2 Fr 14:30 HS 13

Search for the Y(2175) in photo-production at GlueX — •Abdennacer Hamdi[1,2], Klaus Götzen[1], Frank Nerling[1,2], and Klaus Peters[1,2] — [1]Institut für Kernphysik, J. W. Goethe-Universitat, Max-von-Laue-Str. 1, 60438 Frankfurt am Main, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Planckstraße 1, 64291 Darmstadt, Germany

Quantum Chromodynamics is the theory that describes how hadrons are built from quarks and gluons via the strong interaction. Many predictions have been observed, but many others are still pending and under experimental investigation. Of particular interest is how gluonic excitations give rise to exotic states. One class of such states are hybrid mesons that are predicted by theoretical models and Lattice Quantum Chromodynamics calculations. The Y(2175), as observed in electron-positron experiments, is discussed to be the strangeonium partner of the Y(4260), and thus a candidate for e.g. a hybrid meson or tetraquark state. We present the status and plans to search for this state in photoproduction at the GlueX experiment in Jefferson Lab's Hall D, which started physics data taking in 2016. This work is supported by HGS-HIRe.

HK 57.3 Fr 14:45 HS 13

Partial Wave Analysis of $\bar{p}p \to \phi\phi$ at $\overline{\text{P}}$ANDA — •Iman Keshk for the PANDA-Collaboration — Ruhr-Universität Bochum

The $\overline{\text{P}}$ANDA experiment at FAIR in Darmstadt (Germany), which is currently under construction, will provide excellent opportunities to search for exotic states in anitproton-proton annihilations. Lattice QCD calculations predict the tensor glueball at a mass of $2.4\,\text{GeV}/c^2$, while various experiments observed tensor resonances in the same mass region in the $\phi\phi$ system. The reaction $\bar{p}p \to \phi\phi$ offers a gluonrich environment and will be studied with $\overline{\text{P}}$ANDA by performing an energy scan from about $2.25\,\text{GeV}/c^2$ up to $2.7\,\text{GeV}/c^2$. Contributing resonances in the $\phi\phi$ system can then be identified by means of a mass independent partial wave analysis. For the identification of resonances produced in this formation process the extraction of phase motions is a strong indication for their presence. Monte Carlo studies performed to address the feasibility to identify contributing resonances utilizing the partial wave analysis software PAWIAN will be discussed.

HK 57.4 Fr 15:00 HS 13

Applying Model Comparison Techniques to Hadron Spectroscopy — •Florian Kaspar[1], Fabian Krinner[1], Boris Grube[1], Stephan Paul[1], Dmitri Ryabchikov[1], Sebastian Uhl[2], and Stefan Wallner[1] — [1]Physik-Department E18, Technische Universität München — [2]formerly: Physik-Department E18, Technische Universität München

Hadron spectroscopy is one of many examples in physics which require complex statistical modeling. Large data sets reveal ever more structures of the underlying physical processes and their backgrounds. This drives the development of more advanced models, simultaneously making it difficult to gauge improvements in data description and inference quality. There is a variety of different criteria available to compare the performance of statistical models. We discuss the utility and validity of some of these criteria for the analysis of hadron spectroscopy data. Where possible we verify them on simulated data and compare the implications of their underlying assumptions.

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HK 57.5 Fr 15:15 HS 13

Incorporating Spin into Rescattering Effects via Partial Wave Projections - The $a_1(1420)$ — •Mathias Wagner, Mikhail Mikhasenko, and Bernhard Ketzer for the COMPASS-Collaboration — Universität Bonn, Helmholtz-Institut für Strahlen-und Kernphysik, 53115 Bonn, Germany

In the recent past several new particle candidates were found which do not fit into the simple constituent quark models for mesons and baryons. Different concepts were introduced in order to find an explanation for these exotic states. One of them is a rescattering effect. Here, triangle diagrams can produce resonance-like signals, both in the intensity and the relative phase of the corresponding partial wave.

For example, the $a_1(1420)$ signal observed by the COMPASS experiment, in the $J^{PC} = 1^{++}$ partial wave decaying to $f_0(980)\pi$, can be well described with a simplified $K^*\bar{K} \to f_0\pi$ rescattering model neglecting the spin of the intermediate K^*. Including the spin of intermediate particles will modify the amplitude.

Exploiting the isobar model we can describe the rescattering as a dispersive integral over a partial wave projection of the $K\bar{K}\pi$ final state onto the 3π final state, using a general πK P-wave amplitude instead of the Breit-Wigner parametrization for K^*. This method allows us to include the spin of the K^* appearing as an intermediate $K\pi$-resonance via Wigner-D-matrices, using rotational properties of the helicity amplitudes. Our approach built from analyticity and Lorentz-invariance is considered as an alternative to the method of Feynman diagrams, which is based on an effective Lagrangian. *Supported by BMBF.*

HK 57.6 Fr 15:30 HS 13

K^+ Σ^- Photoproduction at the BGO-OD Experiment — •Johannes Gross — Physikalisches Institut der Universität Bonn

The BGO-OD experiment at the ELSA accelerator facility uses an energy-tagged bremsstrahlung photon beam to investigate the excitation spectra of the nucleon. The setup consists of a highly segmented BGO calorimeter surrounding the target, with a particle tracking magnetic spectrometer at forward angles.

This unique combination is ideal for investigating low momentum transfer processes due to the acceptance and high momentum resolution at forward angles. In addition, the reconstruction capabilities of mixed charged final states is ideal for the investigation of strangeness photoproduction as part of an extensive experimental program. Preliminary results for K^+ Σ^- photoproduction will be presented.

These first data were acquired using a novel analysis technique, where K^+ are identified in the BGO calorimeter via their time-delayed weak decay. This is complemented by the high momentum resolution and extreme forward acceptance of K^+ detection in the forward spectrometer.

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