HK 22: Hadron Structure and Spectroscopy IV

Zeit: Dienstag 16:30–18:30 Raum: HZO 50

Gruppenbericht HK 22.1 Di 16:30 HZO 50

Measurement of hadronic cross sections at BESIII using Initial State Radiation — •Christoph Florian Redmer 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 precisely determined observables in the Standard Model. Despite the achieved precision of 0.54 ppm, there remains a discrepancy of more than three standard deviations between the Standard Model prediction and the direct measurement. The uncertainties of the Standard Model prediction are currently completely dominated by hadronic contributions, where the largest comes from the hadronic vacuum polarization. Hadronic cross sections measured at e^+e^- colliders can be used as experimental input to improve the calculations, making use of the optical theorem. At the BESIII experiment in Beijing these cross sections are determined using the method of Initial State Radiation. This presentation will give an overview of the recent results and the current status of the analyses.

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HK 22.2 Di 17:00 HZO 50

Feasibility Studies for Ξ Baryon Spectroscopy in Antiproton-Proton Reactions with the PANDA Detector — •Jennifer Pütz, Albrecht Gillitzer, and James Ritman for the PANDA-Collaboration — Forschungszentrum Jülich, Jülich, Deutschland

For a deep insight into the mechanisms of non-perturbative QCD it is essential to understand the excitation pattern of baryons.Up to now only the nucleon excitation spectrum has been subject to systematic experimental studies while very little is known on excited states of double or triple strange baryons.

In studies of antiproton-proton collisions the $\overline{\text{P}}$ANDA experiment is well-suited for a comprehensive baryon spectroscopy program in the multi-strange sector. A large fraction of the inelastic $\bar{\text{p}}$p cross section is associated to final states with a baryon-antibaryon pair together with additional mesons, giving access to excited states both in the baryon and the antibaryon channel.

In this study we focus on the $\Lambda\,\overline{\text{K}}$ decay of excited Ξ states. For final states containing a $\Xi\overline{\Xi}$ pair cross sections up to the order of μb are expected, corresponding to production rates of $\sim 10^6$/d at a Luminosity $L = 10^{31}\,\text{cm}^{-2}\,\text{s}^{-1}$ (5% of the design value). The strategy to study the excitation spectrum of Ξ baryons in antiproton-proton collisions will be discussed. The reconstruction of reactions of the type $\bar{\text{p}}$p $\rightarrow \Xi^{-*}\bar{\Xi}^+$ with $\Xi^{-*} \rightarrow \Lambda\,\text{K}^-$ (and their charge conjugate) with the $\overline{\text{P}}$ANDA detector will be presented.

HK 22.3 Di 17:15 HZO 50

Radiative corrections to the magnetic moments of proton and neutron — •Norbert Kaiser — Physik Department, Technische Universität München, 85748 Garching

The radiative corrections of order α/π to the magnetic moments of the proton and the neutron are estimated. The photon-loop diagram of the vertex-correction type is evaluated with phenomenological nucleon vector form factors. Infrared-finiteness and gauge-invariance require the inclusion of the wave-function renormalization factor from the self-energy diagram. Using recent empirical form factor parametrizations the corrections amount to $\delta\kappa_p = -3.42 \cdot 10^{-3}$ and $\delta\kappa_n = 1.34 \cdot 10^{-3}$. The effects from photon-loops with internal $\Delta(1232)$-isobars are also studied. For two customary versions of the $\Delta N\gamma$-vertex and spin-3/2 propagator, these radiative corrections have values of $\delta\kappa_p^{(\Delta)} = (-0.9, 0.0) \cdot 10^{-3}$ and $\delta\kappa_n^{(\Delta)} = (1.2, -0.8) \cdot 10^{-3}$, respectively. Taking these ranges as a systematic error, our estimates read $\delta\kappa_p = (-3.9 \pm 0.4) \cdot 10^{-3}$ and $\delta\kappa_n = (1.5 \pm 1.0) \cdot 10^{-3}$.

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

HK 22.4 Di 17:30 HZO 50

Precise nucleon-nucleon potentials from chiral EFT — •Patrick Reinert, Evgeny Epelbaum, and Hermann Krebs — Institut für Theoretische Physik II, Ruhr-Universität Bochum, Germany

Ab initio calculations in few- and many-body systems require precise two-nucleon forces as input. We present new nucleon-nucleon (NN) potentials up to fifth order in chiral effective field theory, whose adjustable parameters have been fitted to the 2013 Granada database of experimental NN scattering data. We employ a new local regularization scheme for long-range forces in momentum space which does not distort the long-range behavior of the interaction and allows for a systematic extension to three-nucleon forces and currents. Furthermore, the contact interaction part of the potentials is studied and we discuss both the removal of redundant contact interaction terms at fourth order as well as the inclusion of sixth order contact interactions in F-Waves and their effects on the two-nucleon system.

HK 22.5 Di 17:45 HZO 50

Search for Light Exotic Baryons at the A2 Experiment — •Dominik Werthmüller for the A2-Collaboration — School of Physics and Astronomy, University of Glasgow, United Kingdom

The recent claim of a heavy hidden-charm pentaquark by the LHCb collaboration reignites the question of whether exotic baryons can also be built only from light quarks. The existence of a strange pentaquark, initially alleged by the LEPS collaboration in 2003, was never convincingly substantiated. On the other hand, the unusual properties of certain nucleon and hyperon states, such as the $N(1440)$, the $N(1535)$, and the $\Lambda(1405)$, could be attributed to an exotic pentaquark nature. Moreover, there are new hints of a potentially exotic signature in the ηN system.

Light exotic baryons can be produced in photoproduction reactions at the tagged-photon beam experiment A2 located at the MAMI electron accelerator facility in Mainz. This contribution will give an overview of recent results and current activities on the search for light exotic baryons at A2.

HK 22.6 Di 18:00 HZO 50

Searches for exotic resonances in baryonic decays of charmonia — •Jan Reher — Insitut für Experimantalphysik I, Ruhr-Universität Bochum

The BESIII experiment, located at the BEPCII electron-positron-collider at the Institute for High Energy Physics in Beijing, offers high-statistics datasets at center of mass energies corresponding to J/Ψ and $\Psi(2S)$ masses. These large samples allow studies of rare and exotic particles.

The final state $\Lambda\bar{\Lambda}\pi^+\pi^-$ is studied based on $448 \cdot 10^6$ $\Psi(2S)$- and $1.3 \cdot 10^9$ J/Ψ events, because exotic tetraquark states with masses below the mass of the J/Ψ and decaying to a $\Lambda\bar{\Lambda}$ pair were predicted. Since the above final state is dominated by well known decays via $\Psi \rightarrow \Sigma^{\pm}(1385)\ \bar{\Sigma}^{\mp}(1385)$, $\Psi \rightarrow \Xi^-\ \bar{\Xi}^+$ and $\Psi(2S) \rightarrow J/\Psi\ \pi^+\pi^-$, a partial wave analysis is performed using these contributions. Deviations from the PWA result, especially in the invariant $\Lambda\bar{\Lambda}$ mass, may be indications for exotic particles.

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HK 22.7 Di 18:15 HZO 50

D_{21} — **Evidence for Yet Another Dibaryon Resonance ?***. — •Tatiana Skorodko[1], Mikhail Bashkanov[2], and Heinz Clement[1] for the WASA-at-COSY-Collaboration — [1]Physikalisches Institut der Universität Tübingen — [2]School of Physics and Astronomy, University of Edinburgh, UK

Exclusive measurements of the quasi-free $pp \rightarrow pp\pi^+\pi^-$ reaction have been performed by means of pd collisions at T_p = 1.2 GeV using the WASA detector setup at COSY. Total and differential cross sections have been obtained covering the energy region $T_p = 1.08 - 1.36$ GeV ($\sqrt{s}$ = 2.35 - 2.46 GeV), which includes the regions of $N^*(1440)$ and $\Delta(1232)\Delta(1232)$ resonance excitations. Calculations describing these excitations by t-channel meson exchange are at variance with experimental differential cross sections and underpredict substantially the measured total cross section. An isotensor ΔN dibaryon resonance with $I(J^P) = 2(1^+)$ produced associatedly with a pion is able to overcome these deficiences. It corresponds to the state D_{21} predicted by Dyson and Xuong and later-on by Gal and Garcilazo.

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