HK 4: Hadron Structure and Spectroscopy I

Time: Monday 14:00–16:00 Location: H-ZO 20

Invited Group Report HK 4.1 Mo 14:00 H-ZO 20

Recent Kaon Photoproduction Results from CLAS — •David Ireland — University of Glasgow, Glasgow, United Kingdom

Kaon photoproduction in the resonance region affords an ideal opportunity to study the spectrum of nucleon resonances. It is, however, crucial that polarization observables be measured in order to disentangle contributing processes. The prospect of a "complete" measurement being made is not far off, but a number of double polarization observables have already been measured using the CLAS detector at the Thomas Jefferson National Accelerator Facility in the US. This talk will review some of the recent results for the $\gamma p \to K^+\Lambda$ and $\gamma p \to K^+\Sigma^0$ reactions. Preliminary measurements of the photon beam asymmetry, Σ, and the double polarization observables O_x and O_z, using a beam of linearly polarized tagged photons will also be discussed.

Invited Group Report HK 4.2 Mo 14:30 H-ZO 20

Baryon Structure and Spectroscopy at ELSA — •Reinhard Beck for the CBELSA/TAPS-Collaboration — Helmholtz-Institut für Strahlen- und Kernphysik, Nußallee 14-16, D-53115 Bonn

Photoproduction of single and multi-meson final states have been investigated at the electron stretcher ring ELSA to study the spectrum and the properties of excited baryons. Especially, the measurements of double polarization observables is of crucial importance to increase the sensitivity for small resonance contributions and to reduce the ambiguties in the existing solutions for the excitation spectrum.

With the Crystal Barrel/TAPS experiment at ELSA, new precise data with linearly and circularly polarized photons on a longitudinally polarized target have been taken. The first results for the double polarization observables E and G in single and multi-meson photoproduction will be presented and compared to quark model predictions and existing partial wave solutions.

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HK 4.3 Mo 15:00 H-ZO 20

Measurement of the $\gamma n \to K^+\Sigma^-$ at Jefferson Lab — •Sergio Anefalos Pereira — Instituto Nazionali di Fisica Nucleare, Laboratori Nazionali di Frascati, Via E. Fermi,40 -I 00044 Frascati (Roma)

A comprehensive study of the electromagnetic strangeness production has been undertaken at Jefferson Lab. Among the six elementary strangeness photoproduction reactions on the nucleon, $\gamma n \to K^0\Lambda$, $\gamma n \to K^0\Sigma^0$, $\gamma n \to K^+\Sigma^-$, $\gamma p \to K^+\Lambda$, $\gamma p \to K^+\Sigma^0$, $\gamma p \to K^0\Sigma^+$, there are cross section data for all γp reactions. For the γn reactions, there is only data for the $\gamma n \to K^+\Sigma^-$ channel, and in a very limited energy and angular range. The actual theoretical predictions for the strangeness photoproduction cross section on neutron differ widely depending on the data set fitted for the proton channels.

Here will be presented preliminary $\gamma n(p) \to K^+\Sigma^-(p)$ differential cross section measured with the CLAS large acceptance spectrometer at the Jefferson Lab Hall-B, over a wide range of kaon scattering angles (10° and 140°) using a deuterium target with a tagged photon beam in the energy range from 1.0 up to 3.6 GeV. These measurements can be used to improve the predictive power of the actual theoretical description of hyperon photoproduction by adding more constraints to the Kaon-Hyperon-Nucleon coupling constants.

HK 4.4 Mo 15:15 H-ZO 20

A new look at the $[\mathbf{70}, 1^-]$ baryon multiplet in the $1/N_c$ expansion — •Nicolas Matagne[1] and Florica Stancu[2] — [1]Institut für Theoretische Physik, Universität Giessen, Germany — [2]University of Liège, Institute of Physics B5, Sart Tilman, B-4000 Liège 1, Belgium

So far, the masses of excited states of mixed orbital symmetry and in particular those of nonstrange $[\mathbf{70}, 1^-]$ baryons derived in the $1/N_c$ expansion were based on the separation of a system of N_c quarks into a symmetric core and an excited quark. Here we avoid this separation and show that an advantage of this new approach is to substantially reduce the number of linearly independent operators entering the mass formula. A novelty is that the isospin-isospin term becomes as dominant in Δ as the spin-spin term in N resonances.

HK 4.5 Mo 15:30 H-ZO 20

Gauge-invariant coupling to spin-$\frac{3}{2}$ resonances. — •Vitaly Shklyar, Horst Lenske, and Ulrich Mosel — Institut für Theoretische Physik, Universität Giessen, Germany

A gauge invariant interaction of the Δ-resonance to the final πN and γN is discussed. It is shown that the gauge-invariant coupling invented by Pascalutsa eliminates 'off-shell' degrees of freedom only for the Rarita-Schwinger propagator but fails in the general case. The origin of the problem is discussed and a generalized gauge-invariant coupling is deduced. Finally, the full Lagrangian depends on one free parameter which reflects a freedom in choosing an 'off-shell' content of the theory. The calculated πN scattering amplitude shows no dependency on the specific choice of the parameter. This reflect the fact that physical observables do not depend on any 'off-shell' contributions and do not depend on the free parameter of Lagrangian.

Work supported by DFG.

HK 4.6 Mo 15:45 H-ZO 20

From the ABC Effect to the ABC-Resonance – the First Genuine Dibaryon State?* — •Mikhail Bashkanov for the WASA-at-COSY-Collaboration — Physikalisches Institut der Universität Tübingen

The ABC effect – an intriguing low-mass enhancement in the $\pi\pi$ invariant mass spectrum – is known from inclusive measurements of two-pion production in nuclear fusion reactions. Its explanation has been a long-standing problem since 50 years.

New exclusive and kinematically complete measurements of the most basic fusion reaction $pn \to d\pi^0\pi^0$ have been carried out with WASA at COSY covering the full energy region, where the ABC effect can be observed. These measurements with a two orders of magnitude higher statistics than the previous CELSIUS-WASA measurements reveal the ABC effect to be the consequence of a narrow resonance in the pn and $d\pi^0\pi^0$ systems with a mass 90 MeV below the $\Delta\Delta$ mass and a width of 50 MeV. The latter is 5 times smaller than what is expected from a conventional t-channel $\Delta\Delta$ excitation. According to the angular distributions the quantum numbers should be $I(J^P) = 0(1^+)$ or $0(3^+)$. Such a dibaryon resonance has been predicted by various theoretical calculations, some of which even predict this resonance to be a member of a dibaryon multiplet.

From the fact that the ABC effect is observed also for double-pionic fusion processes to heavier nuclei, we conclude that this resonance is robust enough to survive even in nuclei. * supported by BMBF, COSY-FFE, DFG (Eur. Graduate School) and Wallenberg Foundation