

HK 45: Elektromagnetische und Hadronische Sonden

Zeit: Donnerstag 14:15–16:00

Raum: A

HK 45.1 Do 14:15 A

 σ -Channel Threshold Enhancement in Double-Pionic Fusion*

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The double-pionic fusion process has been measured at CELSIUS-WASA for the first time exclusively and kinematically completely for the basic reaction $pn \rightarrow d\pi^0\pi^0$ at $T_p = 1.04$ GeV as well as for $dp \rightarrow {}^3\text{He}\pi^0\pi^0$ and ${}^3\text{He}\pi^+\pi^-$ at $T_p = 0.9$ GeV.

In all cases we observe a huge low-mass enhancement in the σ -channel of the $\pi\pi$ invariant mass distribution. This enhancement at the $\pi\pi$ threshold is much larger than anticipated from previous inclusive measurements, accompanied with the excitation of a $\Delta\Delta$ intermediate system, however, not accompanied with a high-mass enhancement as speculated previously. It points to a strong attractive interaction in the $\Delta\Delta$ system, may be even to the formation of a bound state. Such an assumption leads to a quantitative description of the inclusive data on $dd \rightarrow {}^4\text{He}X$, too.

Exclusive data on the latter reaction will be provided by the analysis of the last WASA run at CELSIUS as well as by measurements at WASA@COSY.

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HK 45.2 Do 14:30 A

Measurement of the reaction $dd \rightarrow \alpha K^+ K^-$ with ANKE/COSY

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Precise knowledge of the $a_0(980)$ and $f_0(980)$ coupling constants to kaons would allow one to determine the $K\bar{K}$ content of the a_0/f_0 . However, the values for $g_{a_0 K\bar{K}}$ and $g_{f_0 K\bar{K}}$ are still poorly known.

The isospin-violating (IV) a_0/f_0 mixing amplitude is in leading order proportional to the product of $g_{a_0 K\bar{K}}$ and $g_{f_0 K\bar{K}}$. Since the a_0 and the f_0 are rather narrow overlapping resonances, a_0 - f_0 mixing should give the dominant contribution to the IV effect via the reaction chain $dd \rightarrow \alpha f_0(I=0) \rightarrow \alpha a_0(I=1) \rightarrow \alpha(\pi^0\eta)$. Any observation of $\pi^0\eta$ production in the $dd \rightarrow \alpha X$ reaction would be a direct indication of IV.

An experiment on the reaction $dd \rightarrow \alpha(\pi^0\eta)$ is under preparation for WASACOSY. As a first step, a measurement of the $dd \rightarrow \alpha f_0 \rightarrow \alpha K^+ K^-$ cross section has been performed with ANKE in spring 2006. An upper limit of 100 $dd \rightarrow \alpha K^+ K^-$ events has been obtained from a first data analysis. The present status of the analysis will be presented.

This work is supported by DAAD.

HK 45.3 Do 14:45 A

Investigation of the ${}^3\text{He}$ η Final State in dp-Reactions at ANKE

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The existence of η -mesic nuclei is still an open issue of research. To investigate the possibility of the formation of such bound systems, production measurements with one η meson and one light nucleus in the final state are of great interest. By studying total and differential cross sections at low excess energies, information about the final state interaction and therefore about the scattering length of the η -nucleus system can be obtained. The latter is closely related to the properties of such a possible bound state and has to be determined with high accuracy. Therefore, the reaction $d+p \rightarrow {}^3\text{He}+\eta$ has been investigated at the ANKE spectrometer with high precision using a continuously ramped accelerator beam at excess energies ranging from below threshold up to $Q=+12$ MeV. Due to the full geometrical acceptance of the ANKE spectrometer high statistic data for this reaction have been obtained. Additionally, data at excess energies of $Q = 20, 40$ and 60 MeV have been recorded in order to determine total cross sections and to investigate contributions from higher partial waves. Results on the total and differential cross sections as well as consequences for the scattering length determination method will be presented and discussed.

*supported by FZ-Juelich FFE grants

HK 45.4 Do 15:00 A

Exclusive Measurement of the $p+{}^6\text{Li} \rightarrow {}^7\text{Be}+\eta$ reaction

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While the low energy η -nucleon interaction is well studied, the data for η -nucleus interaction is scarce. Practically no measurement exists on the η -nucleus final state interaction for nuclei heavier than ${}^4\text{He}$. The reaction $p+{}^6\text{Li} \rightarrow {}^7\text{Be}+\eta$ was measured by GEM in order to shed some light on the interaction of η -meson and ${}^7\text{Be}$ and, possibly, find glimpses of a bound state.

Experimentally, the reaction $p+{}^6\text{Li} \rightarrow {}^7\text{Be}+\eta$ can be investigated by detecting either η decay products or the heavy recoil nucleus ${}^7\text{Be}$, which is convenient, when the particles are emitted in a small forward cone. In this case, however, the target thickness (counting rate) is limited by the energy resolution. On the other hand the decay of the excited ${}^7\text{Be}$ to triton and alpha-particle allows us to select only the ground and first excited ${}^7\text{Be}$ states.

The experiment took place in September 2006. The Big Karl spectrometer was used as a tool for our measurements. At the focal plane, a new detection system was built, since the standard focal plane detectors are not suitable for such strongly ionizing particles. Low pressure avalanche chambers and scintillator layers were placed into the huge vacuum box. This detection system was used to identify the particles and reconstruct their four-momentum vectors at the target.

The ${}^7\text{Be}$ missing mass spectra is to be reconstructed. First results will be presented.

HK 45.5 Do 15:15 A

Towards double-polarization measurements at ANKE

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A key feature of the experiments planned at ANKE is the use of polarised beams and targets which allow one to perform double-polarization measurements[1]. The focus is on the study of three-body final states with the aim of extracting basic spin-dependent two-body scattering information close to threshold. After installation and commissioning of the necessary equipment, this contribution will present the first results from the pilot measurement of the polarized deuteron charge-exchange break-up reaction $p(d,2p)n$ at COSY energies.

[1]. A. Kacharava et al., COSY Proposal No.152, "Spin Physics from COSY to FAIR", arXiv:nucl-ex:0511028.

Project is supported by COSY-FFE program

HK 45.6 Do 15:30 A

Status report on WASA at COSY

— ●CHRISTIAN PAULY for the WASA-at-COSY-Collaboration — Forschungszentrum Jülich

The installation of the WASA detector setup at COSY has been accomplished during summer 2006, and the facility is now on track to start its physics program beginning of 2007 as originally scheduled.

Various improvements to the original detector setup have been carried out, among them a complete renewal of the data acquisition system. Together with the extended capabilities of COSY this will allow for high statistics measurements of η and η' decays and dedicated production experiments in isospin filtering reactions, providing suitable tools to investigate fundamental symmetries and symmetry breaking patterns in hadronic systems.

After the successful detector commissioning end of 2006, we are now looking forward to a first production run in April 2007, aiming for a precision determination of the Dalitzplot slope parameter for the isospin breaking $\eta \rightarrow 3\pi^0$ decay, where recent experimental results from KLOE and Crystal ball differ beyond the quoted errors. The feasibility of such a measurement using the WASA detector setup could already be demonstrated during the operation of WASA at CELSIUS.

We report on the present status of the facility and give an outlook on the proposed physics program.

HK 45.7 Do 15:45 A

Do unpolarized electrons affect the polarization of a stored proton beam?

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Understanding the interplay of the nuclear interaction with polarized (anti)protons and the electromagnetic interaction with polarized electrons in polarized atoms is crucial to progress towards the PAX goal to eventually produce stored polarized antiproton beams at FAIR. Presently, there exist two competing theoretical scenarios: one with substantial spin filtering of (anti)protons by atomic electrons, while the second one suggests an almost exact self-cancellation of the elec-

tron contribution to spin filtering. The existing experimental data from the FILTEX experiment allow neither an unambiguous discrimination between the two scenarios nor do they give a direct constraint on the role of the spin-flip scattering in spin filtering. We have started to investigate the depolarization effect of a proton beam stored at COSY injection energy of $T_p = 45$ MeV by electrons in a ^4He storage cell target, as in effect inverse to a polarization buildup by polarized electrons. In this presentation, the experimental realisation including the detector setup (Silicon Tracking Telescopes) and the required COSY machine performance are discussed.