HK 44: Elektromagnetische und Hadronische Sonden I

Zeit: Freitag 14:00–16:00 Raum: 1B/C

Gruppenbericht HK 44.1 Fr 14:00 1B/C

Exclusive results for the $e^-A \to X$ reaction — •Oliver Buss, Tina Leitner, and Ulrich Mosel — Institut für Theoretische Physik, Universität Gießen

We investigate electron scattering off nuclei using a transport approach for the description of the the final state interactions. Our major aim is the description of exclusive observables such as pion production and nucleon knockout within the kinematical range of $W < 2$ GeV and $Q^2 < 2\mathrm{GeV}^2$.

The nuclear ground state is modeled within a local Thomas-Fermi approach including mean fields and realistic density distributions. For the e^-A reaction we apply impulse approximation and include quasi-elastic scattering, resonance excitations and direct pion production for the initial vertex. The particles being produced in the initial reaction are transported out of the nucleus using the *GiBUU* off-shell transport model which allows for a full coupled channel treatment of the final state interactions.

Within the same framework, also pion production in neutrino nucleus scattering can be analyzed. The good description of electron scattering serves as a benchmark for this reaction which is an essential background for current neutrino oscillation experiments.

This work is supported by DFG.

HK 44.2 Fr 14:30 1B/C

Investigation of the ^{3}He–η Final State in dp-Reactions at ANKE — •Tobias Rausmann, Paul Goslawski, Alfons Khoukaz, Timo Mersmann, Malte Mielke, Michael Papenbrock, and Alexander Täschner for the ANKE-Collaboration — Institut für Kernphysik, Westfälische Wilhelms-Universität, Münster, Germany

The existence of η-mesic nuclei is an open issue of research in hadron physics. In order to search for the possible formation of such a bound systems, production measurements with an η meson and a light nucleus in the final state are of great interest. Therefore, the reaction d+p→^{3}He+η has been investigated at the ANKE spectrometer with high precision using a continuously ramped accelerated beam at excess energies ranging from below threshold up to Q=+12 MeV. Due to the full geometrical acceptance of the ANKE spectrometer high statistics data have been obtained from which information about the final state interaction and thus about the scattering length of the η-nucleus system have be gained. 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. The results of the measurements at higher energies will be presented and compared with the results obtained close to threshold.

Supported by the COSY-FFE program

HK 44.3 Fr 14:45 1B/C

Search for ω-mesic nuclei* — •Karoly Makonyi for the CBELSA/TAPS-Collaboration — II Physikalisches Institut, Heinrich-Buff-Ring 16, 35392 Giessen

The existence and properties of ω-mesic nuclei are being studied with the tagged photon beam of the ELSA accelerator in Bonn. The combined setup of the Crystal Barrel and MiniTAPS detector systems, which form a 4π electromagnetic calorimeter, was used for detecting the $\omega \to \pi^\circ + \gamma$ decay mode. The recoiling proton was identified with an aerogel Cherenkov detector. A first experiment on a carbon target has been performed. The status of the analysis will be presented.

* Funded by DFG (SFB/TR16)

HK 44.4 Fr 15:00 1B/C

Determination of cascade effects in pionic hydrogen — Dimitrios Anagnostopoulos[1], Daniel Covita[2], Hubert Gorke[3], Detlev Gotta[3], Alexander Gruber[4], Thomas Jensen[5], Albert Hirtl[4], Paul Indelicato[5], Eric-Olivier Le Bigot[5], Valeri Markushin[6], Johann Marton[4], Mikhael Nekipelov[3], Joaquim dos Santos[2], Philipp Schmid[4], Sophie Schlesser[5], Leopold Simons[6], •Thomas Strauch[3], Joao Veloso[2], and Johann Zmeskal[4] — [1]Univ. Ioannina, Greece — [2]Univ. Coimbra, Portugal — [3]IKP, FZ Jülich — [4]Stefan Meyer Inst., Wien — [5]Lab. Kastler-Brossel, Univ. Paris VI — [6]PSI, Villigen

The project PIONIC HYDROGEN aims at a precise measurement of the strong interaction shift and width in pionic hydrogen and deuterium being directly related to the πN scattering lengths [1]. The determination of the πN scattering lengths constitutes a high-precision test of the methods of Chiral Perturbation Theory. To extract hadronic shifts and widths correctly it is necessary to take into account the effects during the atomic de-excitation cascade. Most prominent are Coulomb de-excitation and molecular formation. Access to these effects from the pionic atom X-ray energies and line shapes will be discussed. In addition, to study Coulomb de-excitation in absence of strong interaction a high statistics measurement of muonic hydrogen was performed. Results will be compared to predictions of cascade models.

[1] http://www.fz-juelich.de/ikp/exotic-atoms

HK 44.5 Fr 15:15 1B/C

Measurement of the depolarizing $\overrightarrow{p}e$ cross section using comoving electrons — •Dieter Oellers for the PAX-Collaboration — Institut für Kernphysik, Forschungszentrum Jülich, Deutschland

In order to perform experiments with polarised antiprotons (PAX-Collaboration) one needs an effective way to produce a stored polarized antiproton beam. FILTEX showed that an unpolarised proton beam is polarised when travelling through a polarised hydrogen target. For this result there exist two competing theoretical explenations. One with a strong contribution from electrons while the other sees an almost exact cancellation of all electron effects. New calculations by Walcher and Arenhoevel suggest a very large cross section for the spin-exchange between protons and electrons of $\langle \sigma P_{zz} \rangle \approx 2 \cdot 10^{13}$ barn at small relative velocities $T \approx 1.7\,keV$. First results of a depolarising measurement at these low energies are shown in this talk.

HK 44.6 Fr 15:30 1B/C

Hadron attenuation and color transparency at JLab energies — •Murat M. Kaskulov, Kai Gallmeister, and Ulrich Mosel — Institut für Theoretische Physik, Universität Gießen

We present detailed studies of the hadron attenuation in the electromagnetic reactions off nuclei at present and future JLab energies. The Giessen Boltzmann–Uehling–Uhlenbeck transport approach GiBUU is used to model the intranuclear dynamics and hadronization of transmitted hadrons. The early onset of the pionic color transparency observed recently at JLab will be critically examined.

HK 44.7 Fr 15:45 1B/C

Decays, contact P-wave interactions and hyperfine structure in Omega- exotic atoms — •Mikhail Krivoruchenko and Amand Faessler — Institut für Theoretische Physik der Universität Tübingen, Baden-Württemberg

Contact P-wave interactions connected to the Larmor interaction of a magnetic dipole and Thomas spin precession in the filed of an electric quadrupole are described and their implications for spectroscopy of exotic Omega-atoms are studied. In order to evaluate the magnitude of the contact P-wave interactions as compared to the conventional long-range interactions and the sensitivity of spectroscopic data to the Omega-hyperon quadrupole moment, we consider 2P states of Omega-atoms formed with light stable nuclei with spins I > 1/2 and atomic numbers Z < 10. The energy level splitting caused by the contact interactions is 2-5 orders of magnitude smaller than the conventional long-range interactions. Strong decay widths of p-Omega- atoms due to reactions p+Omega- -> Lambda+Xi + 180 MeV, induced by t-channel kaon exchange, are calculated. Omega- atoms formed with the light nuclei have strong widths 5-6 orders of magnitude higher than splittings caused by the contact interactions. The low-L pattern in the energy spectra of intermediate- and high-Z Omega-atoms thus cannot be observed. The Omega- quadrupole moment can be measured by observing x-rays from circular transitions between high-L levels in Omega- exotic atoms. The effect of strong interactions in 208Pb-Omega- is negligible starting from L = 10.The contact P-wave interactions exist in ordinary atoms and muonic atoms.