Gruppenbericht

1. First observation of in-medium modifications of the omega meson in photonuclear reactions — DAVID TRINKA for the CBELSA/TAPS collaboration — II. Physikalisches Institut, Heinrich-Buff-Ring 16, 35392 Giessen

One of the exciting topics in nuclear physics is the modification of experimentally observable properties of vector mesons such as mass and width, when embedded in a medium. A variety of theoretical models predict a mass shift of the ω-meson in the order of -140 MeV < m - m0 < -15 MeV and a broadening of the width within a range of 20 to 50 MeV at normal nuclear densities (i.e. [1]). A promising approach is to study the decay $\omega \rightarrow \pi^0 + \gamma$ in photonuclear reactions. This mode accounts for 9 - 10% of the total width, while for the $\rho$ it is only 6 - 10%. Consequently, it provides an exclusive probe to study the ω-meson properties in matter. Simulations prove that distortions due to FSI of the pions can be strongly suppressed ([2]). The experiment was carried out at the ELSA accelerator facility in Bonn using the Crystal Barrel/TAPS detector array. C, Ca, Nb and Pb have been used as targets while the Li2 target was used as a reference measurement. An $\omega$ mass shift by about 10% has been observed in the fully inclusive invariant mass spectra as well as after applying kinematical constraints to suppress rescattered pions. Furthermore, the dependence on the $\omega$-momentum has been studied. Mass changes are only observed for $\omega$-mesons with momenta less than 500 MeV/c ([1]).


Neutron Polarizabilities from Deuteron Compton Scattering — ROBERT P. HILDEBRANDT, HARALD W. GRIESSHAMMER, and THOMAS R. HEMMERT — Institute for Theoretical Physics (T39), TU München, Germany

Due to the lack of stable single neutron targets for Compton scattering, experimental access to the neutron polarizabilities is much harder than in the proton case. One possible way to determine the neutron polarizabilities is Compton scattering off the deuteron. Therefore, an accurate description of the Chiral Dynamics inside the deuteron is needed as, one has to correct for the proton polarizabilities and binding effects.

In this work, we extend Chiral Effective Field Theory calculations of Compton scattering off the deuteron by including explicit $\Delta(1232)$ degrees of freedom [1], finding very good agreement with experimental data, including the often discussed SAL-data measured at a photon energy of 95 MeV. We further discuss the well-known problem to recover the correct Thomson-limit in ChEFTs and show how to solve it [2]. This leads us to a consistent description of deuteron Compton scattering below the pion threshold and to perform high-precision fits of the isoscalar and isovector internal form factors of constituent quark models. As a result we find that the helicity amplitudes and transition form factors of constituent quark models should be compared with the analysis of bare resonances, where the pion cloud contributions have been subtracted. Finally, we will compare our results with recent lattice QCD calculations for the N → A transition. The quenched calculations of Alexandrou et al. can describe the E/M and S/M ratios for $Q^2$ up to 4.0 (GeV/c)² reasonably well but overestimate the dominant magnetic $g_m^\pi$ factor by nearly a factor of 2 at large $Q^2$.

are determined to obtain the full $N^*(1520)$ propagator.