The photoproduction of mesons off ^7Li

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The photoproduction of mesons off ^7Li has been studied at the MAMI accelrator for photon energies up to 830 MeV. The experiment used the Glasgow photon tagging device and the combined Crystal Ball/TAPS electromagnetic calorimeter. With the almost 4π acceptance of CB/TAPS, high quality data have been obtained and different reactions could be studied.

First, results for the photoproduction of $\pi^o\pi^o$ and $\pi^o\pi^{+/-}$ pairs motivated by the much discussed in-medium properties of the σ-meson will be presented. Previous results indicated a shift of the strength to small invariant mass for $\pi^o\pi^o$ but not for $\pi^o\pi^{+/-}$. However, comparisons to transport model calculations have shown that final state interaction (FSI) can produce similar effects [1]. Therefore, in a new series of experiments with improved statistical quality, data was also taken for the light nucleus ^7Li, serving as a better reference point for FSI. Total cross sections and invariant mass distributions will be presented.

In addition, the coherent production of single π^o-mesons was investigated with high precision. Coherent photoproduction of π-mesons is interesting in several aspects. Since in the energy region of interest this reaction is completely dominated by the excitation of the $\Delta(1232)$ resonance, it can serve as a sensitive tool for the study of Δ in-medium properties. Furthermore, since due to the dominant Δ-excitation the elementary production amplitudes for proton and neutron are identical, the cross section is proportinoal to the square of the nuclear mass form factor, which is less well-known than the corresponding charge form factors. Recently, first results of the nuclear mass form factor extracted from this reaction for heavier nuclei have been published [2]. Here, we will present a first simplified plane wave (PWIA) analysis of the measured angular distributions for the Li-nucleus in view of its mass form factor.

Finally, first results for the coherent photoprodcution of η mesons will be discussed in the context of the formation of light η-mesic nuclei. Preliminary results of the $\eta \rightarrow \gamma\gamma$ and $\eta \rightarrow 3\pi^o \rightarrow 6\gamma$ decays will be presented.

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[1] F.Bloch et al., Eur. Phys. J. **A32** (2007) 219.

[2] B. Krusche, Eur. Phys. J. **A26** (2005) 7-18.

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