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Coherent double neutral Pion Photoproduction off Deuterons

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Photoproduction of meson pairs off nucleons has gained a lot of interest mainly because it allows to study sequential decays of nucleon resonances via some intermediate excited states. This may give access to states that have only tiny decay branching ratios for direct decays to the nucleon ground state by emission of a single meson. In particular, pion pairs and pi-eta pairs have been studied in detail during the last few years.
In the present talk we will discuss recent results from the production of π^0 pairs from deuterons. The study of quasifree production from protons and neutrons bound in the deuteron helps to disentangle the isospin decomposition of the production amplitudes.
However, for π^0 pairs also the coherent reaction mechanism off the deuteron, i.e. the final state $\pi^0\pi^0 d$ is of great interest. Also this reaction can of course contribute to the isospin decomposition but there is a more exciting aspect. Recently, a narrow resonance structure has been observed in the $pn \to d\pi^0\pi^0$ reaction which has been discussed as a possible candidate for an unconventional six-quark, d*(2380) di-baryon resonance. If such a state exists it should in principle also show up in* $\gamma d \to d\pi^0\pi^0$*, although the production cross section would be much smaller than in the hadron induced reaction.*
Coherent photoproduction of mesons off the deuteron or other light nuclei has so far almost not been explored. The only final state which is reasonably well studied is $d\pi^0$ *in the energy range of the* Δ *resonance. Apart from that there are only few results for* η*,* η'*, and* $\eta\pi$ *production.*
In the present contribution we summarize recent preliminary results for the $\gamma d \to d\pi^0\pi^0$ *reaction. The experiment was performed at the tagged photon beam of the MAMI accelerator in Mainz with the combined Crystal Ball/TAPS electromagnetic calorimeter. The excitation function for this reaction was studied from the energy region of the tentative d*(2380) state throughout the second and third resonance region of the nucleon.

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