Low energy double-pion photoproduction in nuclei

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We have investigated $\pi^0\pi^0$ and $\pi^\pm\pi^0$ photoproduction off nuclei at incident beam energies of $400-460$ MeV [1]. For the pion-pair production on the nucleons we have used a theoretical model developed in Ref. [2]. A full coupled-channel treatment of final state interactions is performed by means of the semi-classical BUU transport model.

We observe that elastic and charge-exchange scattering of the final state pions with the nucleons in the surrounding nuclear medium yields a downward shift of the $\pi\pi$ invariant mass distribution. We show that the target mass dependence of the $\pi^0\pi^0$ invariant mass spectrum as measured by the TAPS collaboration [3] can be explained without introducing medium effects beyond absorption and quasi-elastic scattering of the final state particles. On the other hand, we find considerable discrepancies with the data in the $\pi^\pm\pi^0$ channel, which are not understood.

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