New developments on the double pion photoproduction on the proton

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In the last years, we have developed a model for two pion photoproduction on nucleons for energies up to 800 MeV. This model includes N, $\Delta(1232)$, $N^*(1440)$, $N^*(1520)$, $N^*(1700)$ and the ρ meson. These last two resonances were included in the model in order to solve the puzzle of the $\gamma p \to \pi^+\pi^0 n$ reaction without spoiling the early agreement with the $\gamma p \to \pi^+\pi^- p$ and $\gamma p \to \pi^0\pi^0 p$ reactions. The important contribution of these ρ and $\Delta(1700)$ resonances comes from subtle interferences with the dominant mechanisms. This model has been succesfuly tested in total cross section and invariant mass distributions. Using this model we evaluate polarization observables on which recent experiments are providing new information. We evaluate cross sections for spin 1/2 and 3/2 obtaining good agreement with Mainz experimental data. We also took advantage of the succes of the model to evaluate the contribution of the $(\gamma, 2\pi)$ channels to the GDH sum rule. Integrating up to 800 MeV the integrand of the GDH sum rule we found a value of 0.22. The integral kept increasing as a function of the upper limit of the integration giving hints of a possible non convergence of the GDH sum rule, but these results should not be considered conclusive, given the fact our model has only been tested up to 800 MeV. On the other hand we also calculated the contribution of the $(\gamma, 2\pi)$ channels to the weighted GDH sum rule leading to the vector polarizability γ. Our results supported convergence of this integral but we still found a sizeable contribution to the integral above 800 MeV. We also evaluate the proton polarization asymmetry Σ which is under investigation at GRAAL in Grenoble.

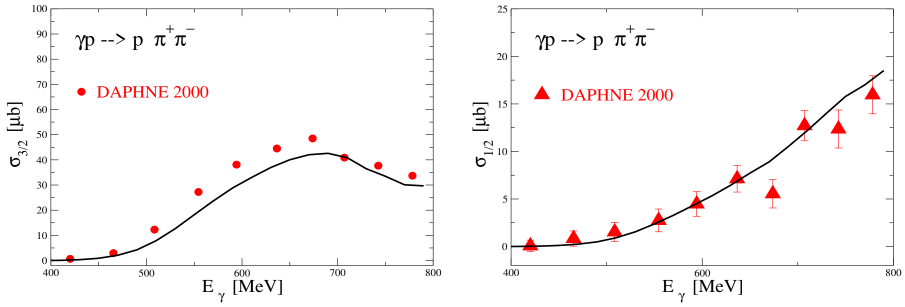

Figure 1: $\sigma_{3/2}$, $\sigma_{1/2}$ for $\vec{\gamma}\vec{p} \to p\pi^+\pi^-$ with 3 charged particles in DAPHNE acceptance. Experimental data from [3].

References

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