

Measurement of $\sigma_{1/2}$ and $\sigma_{3/2}$ in Photoproduction of $\pi^0\pi^0$ and $\eta\pi^0$ Pairs off Neutrons in the Nucleon Resonance Region

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Meson photoproduction offers unique possibilities to investigate the nucleon and its excited states. Double meson photoproduction has the great advantage of enabling access to higher lying nucleon resonances that have no significant decay mode to the nucleon ground state via photoproduction of single mesons. Among the different meson pairs $2\pi^0$ is in particular interesting as non-resonant background terms as pion-poles or Kroll-Rudermann are strongly suppressed because photons couple only weakly to neutral pions. In addition, photoproduction of $\eta\pi^0$ meson pairs is a very selective decay channel since the isoscalar properties of the η forbid its production in cross-over $N^* \rightarrow \Delta^*$ transitions. Whereas for the reactions on the proton a lot of experimental data is available, data for the reactions on the neutron is sparse. In addition, even though in recent years much progress in the theoretical description of the results was achieved, the available models are still very controversial even at low energies where only few resonances contribute. The measurement of single and double polarization will help to reveal the different resonance contributions and thereby serve as an important input for the theoretical description of the structure and the excitation spectrum of the nucleon.\\ This work presents results of the helicity dependent cross sections of photoproduction of $\pi^0\pi^0$ and $\eta\pi^0$ meson pairs off quasi-free protons and neutrons in the second and third nucleon resonance region.

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