

## The study of $\pi\Sigma$ photoproduction in the $\Lambda^*(1405)$ region

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The measurements of  $\pi\Sigma$  mass distributions in the  $\gamma p \rightarrow K^+ \pi\Sigma$  photoproduction reaction [1, 2] probe the energy region of the  $\Lambda(1405)$  resonance, just below the  $\bar{K}N$  threshold, and present new challenges for the theoretical models of  $\bar{K}N - \pi\Sigma$  coupled channels interactions. Adopting the model presented in [3] we describe the photoproduction reaction in terms of tree level amplitudes followed by the meson-baryon rescattering in the final state. For the latter we employ the  $MB \rightarrow \pi\Sigma$  amplitudes generated by our recent  $\bar{K}N$  model [4]. Although our approach is similar to the one used earlier in [5], we use a different way to unitarize the photoproduction amplitude and avoid some non-relativistic approximations adopted in [5].

Our preliminary results show that the tree level photoproduction graphs (Weinberg-Tomozawa, Born and anomalous ones) provide relatively small and flat  $\pi\Sigma$  mass distributions. It is the final state  $MB$  rescattering (with the  $K^+$  treated as a spectator) that is responsible for the peak structure and larger magnitude of the computed cross sections. A direct comparison of the generated  $\pi\Sigma$  mass spectra with those reported by the CLAS collaboration [1] is currently finalized and will be presented at the meeting.

- [1] K. Moriya *et al.* (CLAS Collaboration), Phys. Rev. C 88 (2013) 045201.
- [2] N. Wickramaarachchi *et al.* (GlueX Collaboration), a talk at the HYP22 conference.
- [3] P.C. Bruns, arXiv:2012.11298 [nucl-th].
- [4] P.C. Bruns, A. Cieplý, Nucl. Phys. A 1019 (2022) 122378.
- [5] S.X. Nakamura and D. Jido, PTEP 2014 (2014), 023D01; arXiv:1310.5768 [nucl-th].

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