Contribution ID: **90** Type: **talk**

The study of πΣ photoproduction in the Λ*(1405) region

Monday 27 June 2022 17:40 (15 minutes)

The measurements of $\pi\Sigma$ mass distributions in the $\gamma p \longrightarrow K^+\pi\Sigma$ 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 $MB \longrightarrow \pi\Sigma$ 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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Session Classification: 1; Mon-IV