Contribution ID: **47** Type: **talk**

K^+Σ^- photoproduction within an isobar model

Thursday, 30 June 2022 12:15 (15 minutes)

We have used an isobar model to study the $K^+\Sigma^-$ photoproduction reaction on a neutron target with focus on the resonance region. In order to achieve a reasonable agreement with the data, we included spin-3/2 and spin-5/2 nucleon resonances in the consistent formalism [1,2], where spurious lower-spin modes vanish in the amplitude, together with a Δ resonance and two kaon resonances on top of the Born terms.

The free parameters of the model were adjusted to the experimental data from the CLAS [3] and LEPS [4] Collaborations on differential cross sections and photon beam asymmetry. The cornerstone of this analysis was an upgrade of the fitting method. Previously, we used only the plain χ^2 minimization, which cannot prevent us from overfitting the data. We, therefore, introduced a regularization method, the least absolute selection shrinkage operator (LASSO), which, together with information criteria, restricts the number of nonzero parameters and prevent us from overfitting the data.

In our analysis [5], we arrived at two models: Fit M, whose parameters were fitted with the Minuit code only, and fit L, where we used the more advanced LASSO. Both models describe the data in a similar way and we observe only slight differences in the $\mathrm{d}\sigma/\mathrm{d}\Omega$ data description at very forward angles where the fit M is flat whereas fit L produces two broad peaks, and in the photon beam asymmetries above 2 GeV at backward kaon angles where the fit M produces a bump. Surprisingly, no hyperon resonances are needed for the correct data description in either model. On the other hand, the $N(1720)3/2^+$ nucleon resonance was found to be very important in both models.

[1] V. Pascalutsa, Phys. Rev. D 58, 096002 (1998).
[2] T. Vrancx, L. De Cruz, J. Ryckebusch, and P. Vancraeyveld, Phys. Rev. C 84, 045201 (2011).
[3] N. Zachariou et al., arXiv:2106.13957.
[4] H. Kohri et al. (LEPS Collaboration), Phys. Rev. Lett. 97, 082003 (2006).
[5] P. Bydžovský, A. Cieplý, D. Petrellis, D. Skoupil, and N. Zachariou, Phys. Rev. C 104, 065202 (2021).

Primary author: SKOUPIL, Dalibor (Nuclear Physics Institute CAS, Rez)

Presenter: SKOUPIL, Dalibor (Nuclear Physics Institute CAS, Rez)

Session Classification: 4; Thu-IIb