1 - 19 Role of $N^*(2120)$ in $K\Lambda(1520)$ Photon and Hadronic Productions

Xie Jujun

The baryon spectrum and the baryon couplings are two of the most important issues in hadronic physics and they are attracting much attention. Both on the experimental and theoretical sides, the nucleon excited states below 2.0 GeV have been extensively studied[1]. However, the current information for the properties of states around or above 2.0 GeV is scarce. On the other hand, in this energy region, many theoretical approaches have predicted missing N^* states, which have not been so far observed. Hence, the study of the possible role played by the 2.0 GeV region nucleon resonances in the available accurate data is timely and could shed light into the complicated dynamics that governs the high excited nucleon spectrum.

The associate $K\Lambda(1520)$ ($\equiv K\Lambda^*$) photon and hadronic production reactions might be adequate to study the N^* resonances around 2.0 GeV, as long as they have significant couplings to the $K\Lambda^*$ pair. This is because the $K\Lambda^*$ is a pure isospin 1/2 channel and the threshold is about 2.0 GeV. Besides, these reactions require the creation of an $s\bar{s}$ quark pair. Thus, a thorough and dedicated study of the strangeness production mechanism in these reactions has the potential to gain a deeper understanding of the interaction among strange hadrons and also on the nature of the nucleon resonances.

Using an effective Lagrangian approach and the isobar model, we studied the associate $K\Lambda^*$ photon and hadronic production at low energies. In addition to the contact, t-channel $\bar{K}$ exchange, and s-channel nucleon pole contributions, we considered also the contributions from the u-channel $\Lambda(1115)$ hyperon pole term and a nucleon resonance with mass and width around 2.1 GeV and 200 MeV, respectively. The results show that when the contributions from the later processes are taken into account, both the CLAS[2] and the previous LEPS data[3,4] can be simultaneously described. Actually, we find an overall good description of the data, both at forward and backward K^+ angles, and for the whole range of the measured γp invariant masses. The CLAS data, clearly support the existence of a spin-parity $J^P = 3/2^-$ nucleon resonance with a mass around 2.1 GeV, a width of at least 200 MeV and a large partial decay width into $K\Lambda^*$. Such resonance might be identified with the two stars $N^*(2120)$ state as shown in Ref. [1].

The role of this $N^*(2120)$ state has also been investigated in the hadonic reactions. The results show that the contributions from $N^*(2120)$ resonance are very important. Furthermore, the invariant mass distribution and the Dalitz Plot are also predicted which can be tested by the future experiments.

References

[1] K. A. Olive, K. Agashe, C. Amsler, et al., Chin. Phys. C, 38(2014)090001.

[2] K. Moriya, et al., Phys. Rev. C, 88(2013)045201.

[3] N. Muramatsu, J. Chen, W. C. Chang, et al., Phys. Rev. Lett, 103(2009)012001

[4] H. Kohri, et al., Phys. Rev. Lett, 04(010)172001.