Non-Diffractive Processes in ω and ϕ Photoproduction

Alexander Titov

Advanced Science Research Center, JAERI, Tokai, Ibaraki, 319-1195 Japan
Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna 141980, Russia

We perform sophisticated treatment of the non-diffractive channels in combined ω and ϕ-photoproduction at few GeV. For the ω photoproduction, the main accent is made on the nucleon resonances dynamics. The resonant amplitudes are calculated from effective Lagrangians with the $N^* \to \gamma N$ and $N^* \to \omega N$ coupling constants fixed by the empirical helicity amplitudes and the vector meson dominance model. In our study we use all low mass N^* listed by Particle Data Group. The contributions from the nucleon resonances are found to be significant in changing the differential cross sections in a wide interval of t and various spin observables. In particular, we suggest that a crucial test of our predictions can be made by measuring single and double spin asymmetries.

On the next step, we use the found resonant amplitude to analyzes of the backward ϕ photoproduction in order to explore the status of OZI-rule. We found that existing experimental data favor in strong enhancement of the ϕNN, ϕNN^* coupling constants as compared with ωNN, ωNN^*, which manifests for enhancement of the hidden strange component($\bar{s}s$ sea) in a nucleon. We show that a crucial test of this effect can be made by measuring single and double spin asymmetries.

The spin observables at forward ϕ photoproduction may give unique information about unnatural parity exchange amplitude which is associated with such exotic channels as direct $\bar{s}s$-knockout[2] or anomalous trajectories[3]. We discuss such a possibility, assuming forthcoming data from LEPS (SPring-8) and TJLab.

References

[1] A.I. Titov and T.S.-H. Lee, Phys. Rev. C **66** (2002).
[2] E.M. Henley, G. Krein, S.J. Polock, and A.G.Williams, Phys. Lett. **B269** (1991) 31.
[3] A. I. Titov, Y. Oh, S.N. Yang and T. Morii, Phys. Rev. C **58**, (1998) 2429.
[3] T. Nakano, H. Toki, in *Proceedings of the International Workshop on Exiting Physics and New Accelerator Facilities*, SPring-8, Hyogo, 1997 (World Scientific Singapore, 1998), p.48.