Θ^+ Photoproduction accompaneid by $\overline{K}^*$ at SPring-8/LEPS

Y.Nakatsugawa[1] for LEPS collaboration
[1] *Department of Physics, Kyoto University, Kyoto 606-8502, Japan*

Since the discovery of a candidate of pentaquark Θ^+ at SPring-8/LEPS [1], there have been many experiments, but even the existence of the Θ^+ has not been confirmed. We plan to take new data with new Time Projection Chamber which is used for liquid target in order to further investigate Θ^+, etc. in a wider kinematic region. Maximum photon energy of the BL33LEP is increased up to about 3GeV by using a deep-UV laser (wave length is 257nm) , which is over the threshold of the $\gamma + N \rightarrow \overline{K}^* + \Theta^+$ reaction (2.7GeV). The results of other experiments indicates that K* N Θ^+ coupling is weak. In case of the $\gamma + N \rightarrow \overline{K}^* + \Theta^+$ reaction, K meson can be exchanged between γ and target nucleon. Then it is possible to observe Θ^+ photoproduction even if the target is proton in this reaction. In addition, there are some theoretical approaches which says that we can determine the parity of the exchanged particle from the decay asymmetry of $\overline{K}^*$ meson, and may get information on the parity of Θ^+ itself. Since the standerd detectors at LEPS have only forward acceptance, decay particles of $\overline{K}^*$ meson can hardly be detected without new Time Projection Chamber. The Time Projection Chamber is the main detector in this experiment.

In this experiment, we use liqid hydrogen target and backward compton scattering photon of which maximun energy is around 3GeV. In September 2007, we carried out the test experiment with almost full setup. In this test experiment, we estimated the performance of Time Projection Chamber, clarified the problems of the setup and modified some parts of it. The production experiment started in January 2008. The data taking is still going on and analysis of the data is underway. At the present, performance of the Time Projection Chamber is worse then expected (Position resolution is ∼0.4mm in xy direction and ∼1mm in z direction. K meson can not be clearly identified.). That is due to analysis program and it admits of improvement. However, some hadorons like $\Lambda(1116)$ can be reconstructed with Time Projection Chamber (Figure 2). This experiment will be running until August 2008.

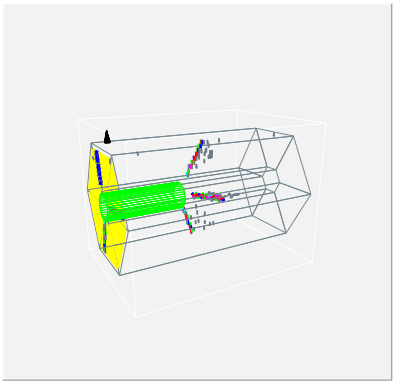

Figure 1: tracks of charged particles which detected by Time Projection Chamber

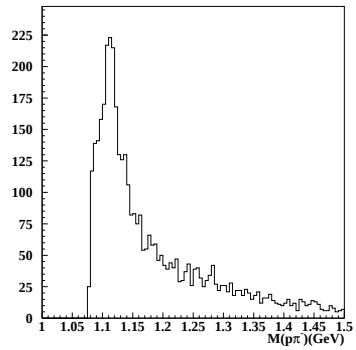

Figure 2: Invariant mass of $p\pi^-$. A peak of $\Lambda(1116)$ can be seen.

References

[1] T. Nakano *et al.* [LEPS Collaboration], Phys. Rev. Lett. **91**, 012002 (2003) [arXiv:hep-ex/0301020].