Nuclear

PHYSICS

The linearly polarized photon beam is produced by backward-Compton scattering of laser photons from 8 GeV electrons at BL33LEP. The current LEPS facility is dedicated to studying photoproduction of hadrons at forward angles, where high linear polarization plays an essential role in the decomposition of various reaction processes.

The beam polarization is high and can be changed easily by changing the laser polarization. The LEPS covers photon energy region from 1.5 GeV to 2.9 GeV, which is suitable for studying the creation of excited baryons containing a strange quark or an anti-strange quark near the production thresholds. The production and decay properties of the excited hadrons shed light on their structure in terms of confined quarks.

The first article reports new results of the penta-quark Q+ study in the $\gamma C \rightarrow K^+K^-$ pn reactions. Firstly, in order to check the validity of the 5-sigma evidence that we obtained by analyzing the data taken in 2002–2003, the same analysis was applied to the new data taken in 2006–2007. A strong narrow peak in the Fermi-motion corrected K^- missing mass was not reproduced in the new data set. Then, we applied an exclusive analysis to both data sets, where background processes due to γp reactions were identified by energy loss information in a plastic counter that was placed just after the liquid-deuterium target. Clear signal enhancements in the γn contributions were seen in the both sets, and the inconsistency turned out to be partly due to fluctuations in the proton contribution of the previous data set. The signal enhancement was also confirmed by a Monte-Carlo-based exclusive analysis.

The second article shows the progress of the LEPS2 project at BL31LEPS, in which we aim to improve both the beam intensity and the detector acceptance. For the experiments at LEPS2, a new type of time-of-flight counter, i.e., the resistive plate chamber (RPC), will be constructed. RPCs will cover a large area of ~10 m^2 with a good time resolution of ~50 ps. The results of a test experiment with a prototype RPC are presented.

Takashi Nakano
Research Center for Nuclear Physics
Osaka University