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 studies photoproduction of hadrons in the forward angles, where the high linear polarization plays an essential role to decompose 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 to study creation of strange quark and anti-quark pair near the production thresholds, such as photoproduction of the ϕ meson, hyperons and excited hyperons. The correlation between the polarization angle and the scattering plane (beam asymmetry) reveals the spin-parity combination of exchanged particles.

The first topic we chose is the Σ^{*-} photoproduction. The cross-section and the beam asymmetry of the $\gamma n \rightarrow \Sigma^{*-}K^{+}$ reaction are measured by using the LEPS spectrometer. The aim of the experiment is to know the reaction mechanism and the strength of the transition from a neutron to a Σ^{*-} by emission of a strange meson such as K and K^{*}. The experimental results provide stringent tests for theoretical models for hadrons and their interactions.

The second topic is a photoproduction of another excited hyperon, $\Lambda(1405)$, which is a candidate of a meson-baryon molecule resonance. The experiment has been carried out using a newly developed wide-acceptance counter, which is called TPC. The TPC detects decay products of excited hyperons and distinguishes $\Lambda(1405)$ from Σ^{*0}. We have observed striking energy dependence in the production rate of $\Lambda(1405)$. It could be a consequence of the unique structure of $\Lambda(1405)$.

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