

# The Recent Results of Strangeness Photoproduction in the Threshold Region at ELPH-Tohoku

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Strangeness photoproduction processes near the threshold offers invaluable opportunity for the investigation of hadron structure and coupling constants that involve strangeness in hadron physics. The process had been intensively studied by measuring  $K^+$  such as  $\gamma + p \rightarrow K^+ + \Lambda(\Sigma^0)$ . However, there had been no reliable data on the neutron and the theoretical investigation suffered seriously from the lack of the data. We have been making an effort to measure the  $\gamma + d \rightarrow K^0(\Lambda) + X$  reaction in the  $\pi^+\pi^-$  ( $p\pi^-$ ) decay channel of  $K_S^0$  ( $\Lambda$ ) using a liquid D2 target and internally-tagged photon beams ( $E_\gamma = 0.8-1.1$  GeV) at Research Center for Electron Photon Science (ELPH), Tohoku University.

Having succeeded to collect exploratory data of  $K^0$  with the original NKS spectrometer [1], we have renewed the spectrometer (NKS2) and taken data in 2005-2007, obtaining the differential and total cross-section of  $K_S^0$ . The results are compared with recent theoretical studies (Iso-bar models and a Regge-plus-resonance model). The comparison suggests a backward angular distribution of  $K_S^0$  in CM [2].

Further upgrade of the NKS2 spectrometer specifically in the vertex region has been completed to increase acceptance for  $K + \Lambda$  coincidence measurement in  $\gamma + d$  reaction. We took data in 2010 after the detector upgrade. As the first data from 2010 run, we obtained  $\gamma + d \rightarrow \Lambda + X$  differential crosssection as a function of momentum, as a function of angle, and integrated crosssection as a function of beam energy [3].

The analysis of  $K^+ + \Lambda$  and  $K^0 + \Lambda$  channels are in progress. In this talk, we will present the recent results of NKS2. Additionally, the future plan of the NKS2 experiment will be shown.

[1] K. Tsukada *et al.*, Phys. Rev. **C78** (2008) 014001, and Erratum 2011.

[2] K. Futatsukawa *et al.*, EPJ Web of Conferences **20**, (2012) 02005.

[3] B. Beckford, Doctoral thesis, Tohoku University, 2013