Energy resolution of the LEPS new Tagging system

Y. Kato[1] , D.S. Ahn[1], W.C. Chang[2], S. Daté[3], T. Emori[4], S. Fukui[5], H. Fujimura[4] , K, Horie[6], T. Hotta[1], T. Ishikawa[7], H. Kohri[1], T. Matsumura[8], N. Muramatsu[1], T. Nakano[1], M. Niiyama[1], Y. Nakatsugawa[4], Y. Ohashi[3], A. Sakaguchi[6], H. Shimizu[7], S, Shimizu[6], T. Sawada[1], T. Tsunemi[4], T. Yorita[1], M. Yosoi[1]

[1] *Research Center for Nuclear Physics (RCNP), Osaka University, Ibaraki, Osaka 567-0047, Japan*

[2] *Institute of Physics, Academia Sinica, Taipei, Taiwan 11529, Republic of China*

[3] *Japan Synchrotron Radiation Research Institute, Sayo, Hyogo 679-5198, Japan* [4] *Department of Physics, Kyoto University, Kyoto 606-8502, Japan*

[5] *Department of Physics Nagoya University, Aichi 464-8602, Japan*

[6] *Department of Physics, Osaka University, Toyonaka, Osaka 560-0043, Japan*

[7] *Laboratory of Nuclear Science, Tohoku University, Sendai, Miyagi 982-0826, Japan*

[8] *Department of Applied Physics National Defense Academy, Yokosuka, Kanagawa, 239-8686, Japan*

At the SPring-8/LEPS beamline, a high energy photon beam is produced via the backward Compton scattering of laser light from the 8 GeV electron beam circulating in the SPring-8 storage ring. The photon energy is determined by measuring the energy of the recoiling electron which loses its energy due to the collision. In the ring magnet the recoiling electron is deflected more than the primary beam. The tagging system is used to measure this deviation. The first tagging system which was used until 2003 consists of Silicon Strip Detectors (SSD) with a strip pitch of 0.1 mm together with a plastic scintillator hodoscope. But because of the bad timing resolution of SSD, about 14% of the events have more than one candidate of electron track and cannot determine the photon energy in an photon intensity of around 600kcps. Because of the improvement of SPring8 accelerator system, electron current increased in 2003 and this condition became worse. To cope with the high photon beam intensity, the tagging system was replaced by a scintillation fiber hodoscope with a 1 mm pitch together with a plastic scintillator hodoscope in 2003. The photon energy resolution of fiber tagging system is expected to be worse than SSD tagging system because of the larger position resolution. The photon energy resolution of the tagging system is important for photoreactions which missing mass technique is necessary, especially for the Θ^+ search via the $\gamma d \to \Theta^+\Lambda(1520)$ reaction. Importance of photon energy resolution in the Θ^+ search is evident in the analysis of the LD2 data with the SSD tagging system. More LD2 data will be taken with the fiber tagging system to increase the statistics.

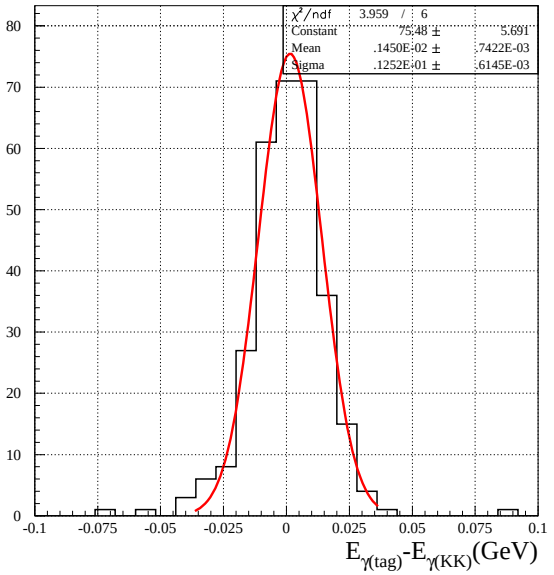

Figure 1: difference of photonenergy determined by tagging system and photonenergy calculated from the measured momentum of K^+K^- by assuming the reaction is $\gamma p \to pK^+K^-$.

To estimate the photon energy resolution of fiber tagging system, we have carried out the experiment with LH2 target and fiber tagging system. Photon energy resolution is estimeted from the $\gamma p \to K^+\Lambda(1116)$ reaction and the $\gamma p \to p\phi$ reaction. Figure 1 shows the difference between photonenergy determined by tagging system and photonenergy calculated from the measured momentum of K^+K^- by assuming the reaction is $\gamma p \to pK^+K^-$. After subtracting the contribution from the momentum resolution of LEPS spectrometer using Monte Carlo simulation, photon energy resolution of the tagging system is found to be around 10MeV. It is almost the same as the SSD tagging system and better than expected value. There is a possibility that the emittance or the energy resolution of electron beam of SPring8 improved. Further investigation is necessary about this point.