Performance Test of CDC and SSD for the p n $\to$ p Λ Experiment

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We are planning to make an experiment for the strangeness production directly by the weak interaction through the p n $\to$ p Λ reaction [1]. The experiment is proposing to measure a weak process with a faint cross section among strong processes which are the strong background. A great reduction of the background and detectors work under very high counting rate are essential. The RCNP Ring-Cyclotron experiment E120 is the first experiment carried out to develop tracking detectors operated under such high counting rate.

The proton beam of 416 MeV in energy from the RCNP Ring-Cyclotron was used for the experiment at the ES beamline. The beam protons were bombarded on a beryllium target of 1.5 mm in thickness placed in the ES beamline vacuum chamber. Typical beam intensity was 4 nA. Protons from the quasi-elastic scattering and pions were used to study the performance of a prototype of the central drift chamber (pCDC) and a prototype of the silicon micro-strip detector (pSSD). The pCDC was a drift chamber consist of 3 x- and 3 u-cells (see Fig.1). Each x-cell had 4 and each u-cell had 3 sense wires, and cell sizes were 54mm(W)$\times$40mm(H)

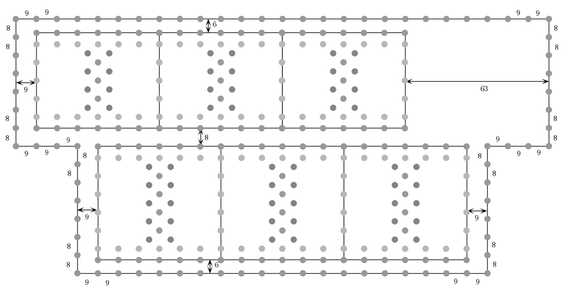

Figure 1: Cell structure of pCDC. The upper 3 are u-cells and lower 3 are x-cells. These 6 cells were surrounded by ground wires for shielding.

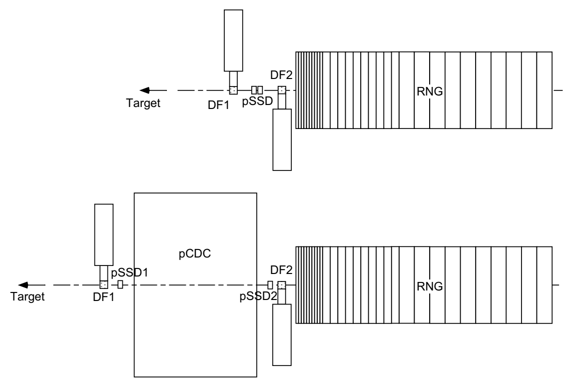

Figure 2: A schematic view of the experimental setups for the SSD test (top) and for the CDC test (bottom).

and 54mm(W)$\times$32mm(H), respectively. The u-cell wires were tilted by 54mm/500mm (about 6 degrees) respect to the x-cell wires. Pre-mixed gas, 90 % Argon and 10 % Methane, was used as the chamber gas. The signals from pCDC were discriminated and sent to a multi-hit TDC. The prototype SSD used for this experiment was essentially same as that developed for the SPring-8/LPES project reported by T. Hotta *et al* [2]. The pulse height information from the pSSD was digitized by a CAMAC flash ADC. Fig.2 shows a schematic view of the experimental setups for the pCDC performance study (top) and the pSSD performance study (bottom). Two plastic scintillation detectors for defining (DF) and range telescope detector (RNG) were also used.

The position resolution of pCDC was estimated in various conditions. Typical counting rate of a single wire of pCDC was a few 100 kHz. Fig.3 shows a summary of the pCDC position resolution. The position resolutions in the direction perpendicular to the sense wires were

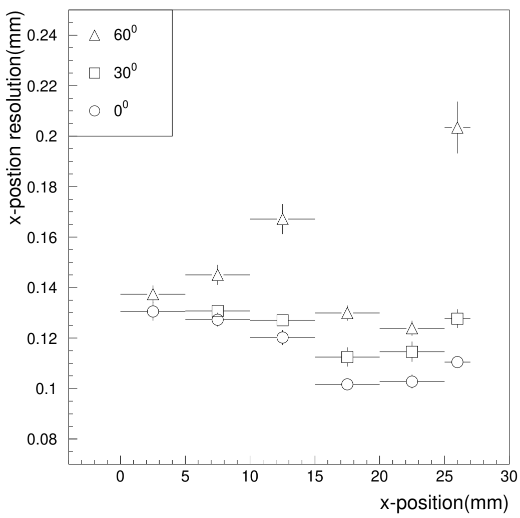

Figure 3: A summary of position resolution of pCDC. X-position resolutions are plotted as functions of x-position. 0 mm corresponds to the sense wire position and 27 mm corresponds to the cell boundary. The position resolutions were estimated for particle injection perpendicular to the wire plane (circle), and for tilted injection by 30 (square) and 60 (triangle) degrees.

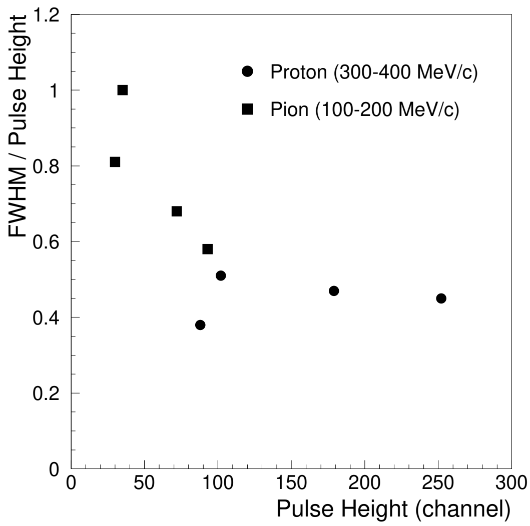

Figure 4: A summary of the energy resolution of pSSD. Energy deposit resolution of pSSD for protons (circle) and pions (square) is plotted as a function of energy deposit in pSSD.

ranged from 100 to 200 μm depending on the positions and angles of the incident particles.

Fig.4 shows a summary of the energy resolution of pSSD. Energy deposit resolution of pSSD for protons (circle) and pions (square) is plotted as a function of energy deposit in pSSD. Each point corresponds to different particle incident angle, thus different average energy deposit in pSSD. The energy resolution looks to be scaled with the particle energy deposit in pSSD, and the resolution is good enough to make the p/$\pi^{\pm}$ particle identification in the p n $\rightarrow$ p Λ experiment with the SSD information.

References

[1] T. Kishimoto *et al.*, RCNP Ring-Cyclotron proposal E122; S. Ajimura *et al.*, RCNP Annual Report 1997, pp.95.

[2] T. Hotta *et al.*, RCNP Annual Report 1997, pp.239.