Neutron Energy Spectrum from Non-Mesonic Weak Decay of ${}^{5}_{\Lambda}$He

S.Okada[a] for KEK-PS E462 collaboration

[a] *Tokyo Institute of Technology*

We performed an experimental study on the Non-Mesonic Weak Decay (NMWD) of ${}^{5}_{\Lambda}$He hypernucleus in ^{6}Li(π^{+},K^{+}) reaction in order to study the weak interaction between baryons in ΛN$\rightarrow$NN process (KEK-PS E462). In this report, a present result of single neutron energy spectrum from ${}^{5}_{\Lambda}$He (Λn$\rightarrow$**nn**, Λp$\rightarrow$**n**p) is shown (Figure 1). The vertical axis corresponds to the number of neutrons from unit ${}^{5}_{\Lambda}$He decay. It can be noted that we achieved about 150 times higher statistics for the number of neutron from NMWD than the last experiment[1], whose statistics of single neutron has only $\sim$10. While the proton energy spectrum needs high energy threshold ($\sim$40MeV) because of energy loss in the target, the neutron energy spectrum is advantageous for observing the form of low energy part in nucleon energy spectrum.

In the previous experiment (KEK-PS E369), the single neutron energy spectrum from ${}^{12}_{\Lambda}$C was obtained as shown in Figure 2 [2]. The solid and dotted lines are the theoretical calculations by Ramos *et al.*[3] assuming that ΛN$\rightarrow$NN and ΛNN$\rightarrow$NNN(2N-induced), respectively (The vertical axis is arbitrary). In their calculation, the FSI (Final State Interaction) effect is considered for both of these processes, and they assumed that $\Gamma(\Lambda n\rightarrow nn)/\Gamma(\Lambda p\rightarrow np)=1$. When only ΛN$\rightarrow$NN process is considered, it has a broad peak at the half of Q-value($\sim$76MeV). The experimental result has a low energy tail instead of peaking there. This indicates that there are large ΛNN$\rightarrow$NNN contribution or/and larger FSI effect than the theoretical assumption. So we performed this experiment for light hypernucleus, ${}^{5}_{\Lambda}$He.

Although we were expected that the single neutron energy spectrum should have more clear peaking at Q/2 in the present experiment because of the smaller nuclear size, yet the observed shape is very similar to the neutron spectrum of ${}^{12}_{\Lambda}$C hypernucleus. This seems to suggest the considerable contribution of ΛNN$\rightarrow$NNN process.

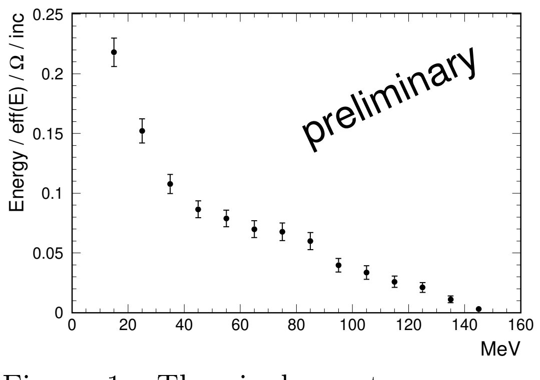

Figure 1: The single neutron energy spectrum from NMWD of ${}^{5}_{\Lambda}$He.

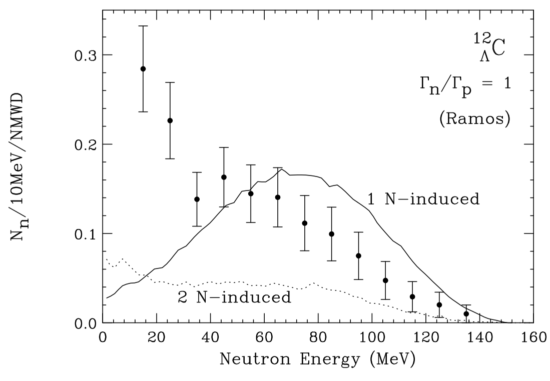

Figure 2: The single neutron energy spectrum from NMWD of ${}^{12}_{\Lambda}$C [2].

References

[1] J.Szymanski, *et al.*, Phys. Rev. **C43** (1991) 849.
[2] J.H.Kim, *et al.*, to be published.
[3] A.Ramos, *et al.*, Phys Rev. **C55** (1997) 735.