Exclusive Measurement of the Non-Mesonic Weak Decay of ${}^{5}_{\Lambda}He$

KEK-PS E462 collaboration

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In KEK-PS E462, we are measuring two-nucleon pairs ($n+p$ or $n+n$) from the non-mesonic weak decay of ${}^{5}_{\Lambda}$He. If the non-mesonic decay predominantly takes place from $\Lambda N \to NN$ decay mode, two nucleons from its decay must have strong back-to-back angular correlation and two-nucleon sum energy must have peaking at Q-value of $\sim$150 MeV. So from the $n+p$ or $n+n$ coincidence counts from ${}^{5}_{\Lambda}$He decay, we can accurately measure the ratio of decay widths, $\Gamma(\Lambda p \to np)/\Gamma(\Lambda n \to nn)$.

In Year 2000 run, we identified about 20,000 ${}^{5}_{\Lambda}$He production. Preliminary spectrum of neutron from ${}^{5}_{\Lambda}$He decay was obtained as shown in Fig. . Althogh we selected very light hypernucleus so as to minimize the final state interaction(FSI) effect of decay nucleons, yet the neutron energy spectrum does not show any peaking at around 76 MeV (Q-value/2). This results suggests large contribution of $\Lambda NN \to NNN$ decay mode in the non-mesonic decay mode.

We could also identify 60/10 $n+p$,$n+n$ back-to-back coincidence. The experiment will be continued for Year 2001 and it is expected that we will inprove the statistics by a factor of more than three and will directly obtain $\Gamma(\Lambda p \to np)/\Gamma(\Lambda n \to nn)$ ratio free from FSI effect.

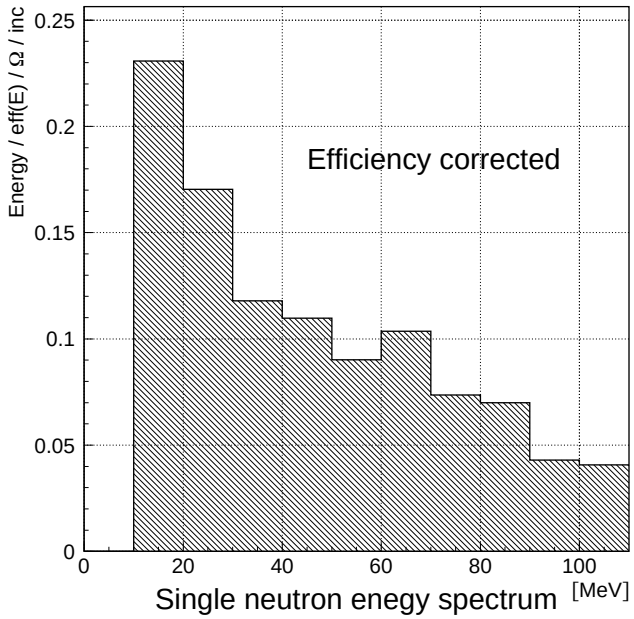

Figure 1: Energy spectrum of neutron from ${}^{5}_{\Lambda}$He decay (Acceptance and Energy-dependent efficiency corrected). There is no peaking at Q-value/2$\sim$76 MeV, suggesting significant contribution of two-nucleon induced non-mesonic decay mode ($\Lambda NN \to NNN$)