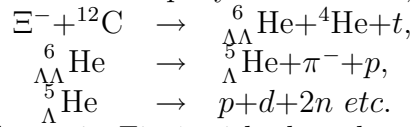


Study of $S = -2$ Nuclear System by Emulsion and Scintillating Fiber Hybrid Method (PS-E373)

In the E373 experiment, about 40% of the data have been analyzed.

Among them, we have found two events with sequential decay topology of double- Λ hypernucleus. The second "NAGARA" event (formation and decay of a ${}_{\Lambda\Lambda}^6\text{He}$ nucleus) has confirmed attractive $\Lambda\Lambda$ interaction by its energy of $1.01 \pm 0.20 {}^{+0.18}_{-0.11}$ MeV, recently[1]. The nuclide and its decay mode have been uniquely identified as;



The event is shown in Fig.1 with the schematic drawing. This findings brought the 7th publication prize of JPS into the paper, "Direct observation of sequential weak decay of a double hypernucleus" [2], presented by KEK-E176.

The second event of twin single- Λ hypernuclei event was found with the most clear topology in the world as shown in Fig.2. The events of this kind shall be expected to give us binding energy of Ξ^- in nucleus. Unfortunately, the event was not reconstructed uniquely, because the track (#5) escaped from emulsion stack and was not recorded in the fiber-block detector. However, the interpretations are understood as;

1. $\Xi^- + {}^{12}\text{C} \rightarrow {}_{\Lambda}^7\text{Li} + {}_{\Lambda}^6\text{He}$
 $B_{\Xi^-} = 1.6 \pm 0.3$ MeV (0.9 ± 0.3 , if ${}_{\Lambda}^7\text{Li}$ is produced in the excited state.)
2. $\Xi^- + {}^{12}\text{C} \rightarrow {}_{\Lambda}^7\text{Li} + {}_{\Lambda}^5\text{He} + n$
 $B_{\Xi^-} = 1.1 \pm 0.4$ MeV (0.4 ± 0.4 , if ${}_{\Lambda}^7\text{Li}$ is produced in the excited state.)
3. $\Xi^- + {}^{14}\text{N} \rightarrow {}_{\Lambda}^9\text{Be} + {}_{\Lambda}^5\text{He} + n$
 $B_{\Xi^-} = 10.0 \pm 1.0$ MeV (6.9 ± 1.0 , if ${}_{\Lambda}^9\text{Be}$ is produced in the excited state.)

References

- [1] H. Takahashi *et al.*, Phys. Rev. Lett. **87**, (2001) 212502.
 [2] S. Aoki *et al.*, Prog. Theor. Phys. **85**, (1991) 1287.

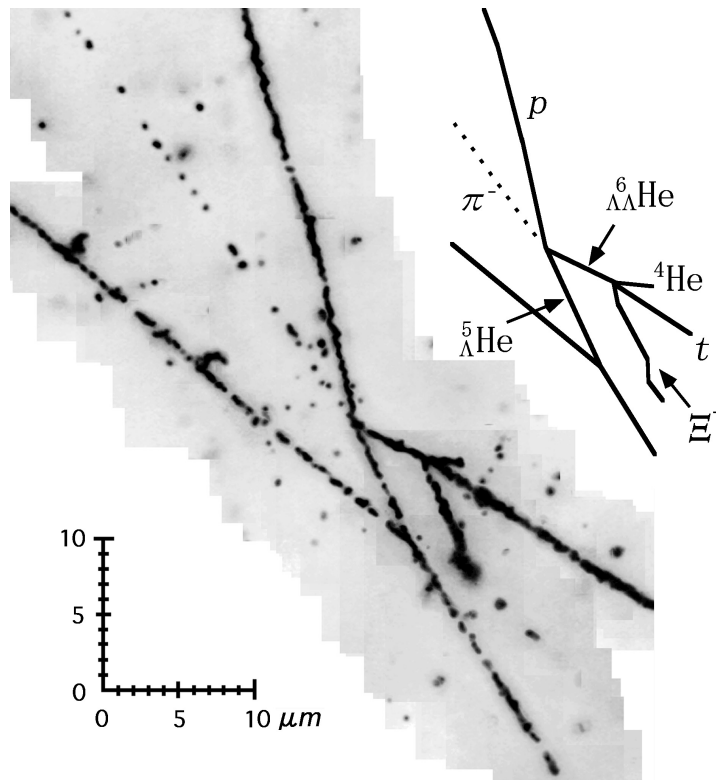


Figure 1. An emulsion image of ${}^6_{\Lambda\Lambda}\text{He}$ double- Λ hypernucleus (*Lambda*) with its schematic drawing.

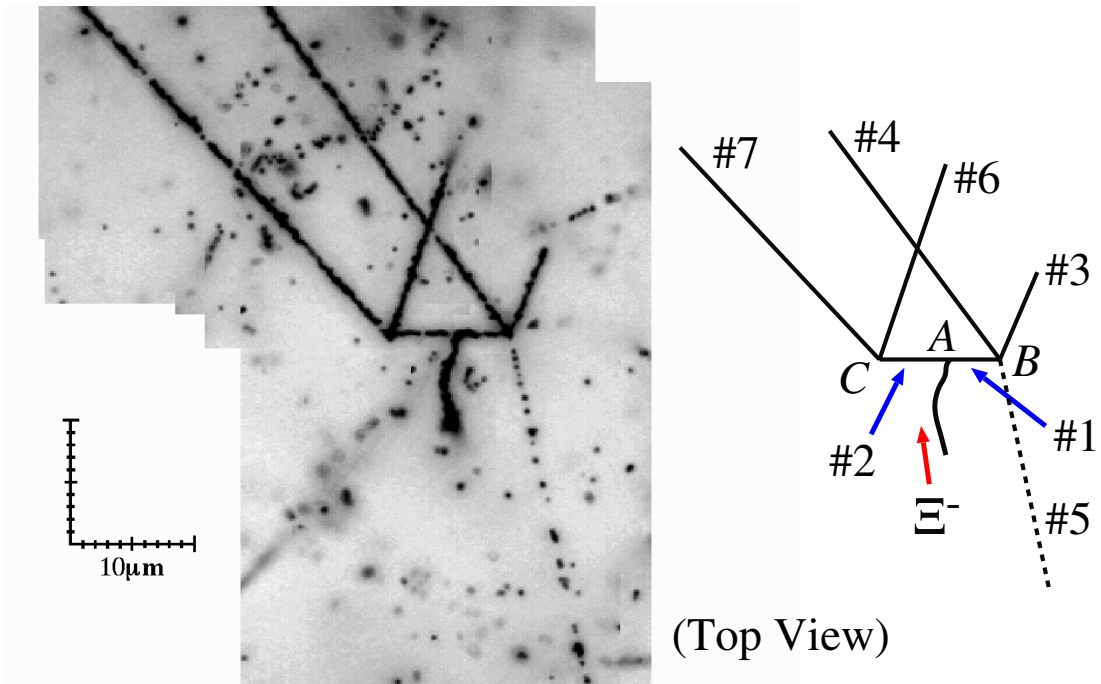


Figure 2. An emulsion image of the second twin single- Λ hypernuclei event and its schematic drawing.