H-dibaryon Resonance Search: Report on E522

May 26, 2003

R.L.Jaffe pointed out in 1977 that the hyperfine splitting in the $S = -2$ six-quark system pushes one state well below the $\Lambda\Lambda$ mass. He estimated that this dihyperon, the H particle, would be stable against strong decay.[1][2] Despite of many search experiments after his prediction, the existence of a deeply-bound H seems to be unlikely. Recently, Jaffe also discuss about the possibility of a H-resonance state decaying into $\Lambda\Lambda$ close to the $\Lambda\Lambda$-threshold as were suggested by other theories. Several candidates for dibaryon resonance have been reported during the last thirty years, but they have not been considered seriously due to poor statistics, resolution and other ambiguities. Recently, an enhancement in the $\Lambda\Lambda$-invariant mass spectrum near the threshold was observed in the $^{12}C(K^-,K^+\Lambda\Lambda)$ reaction by the KEK-E224 experiment. [3] It suggests a possible existence of a $\Lambda\Lambda$-resonance, possibly H-dibaryon resonance. The main purpose of our experiment is to confirm this result as more reliable statistics. The first run was carried out with large volume scintillating fiber target detector in the December of the 2002 at K2. The perspective view of the experimenatl setup shown in Fig.1. We have collected about 50,000 (K^-,K^+) events, out of them 200 events are expected to be $\Lambda\Lambda$ events. The data taking and analysis are undergoing now. Figure.3 shows typical mass spectrum of outgoing particles from the taken data and Figure.4 shows a sample of images of two-Λ emission from the (K^-,K^+) reaction point in SCIFI target. The invariant mass of $\Lambda\Lambda$ will be determined by the two vertices. In order to estimate exact systematic error on the $\Lambda\Lambda$ invariant mass plot which could come from human-scanning, about 1600 simulation images were mixed in real data. From the July of this year, we will start image-scanning for the all of the taken data.

References

[1] R.L. Jaffe *Phys. Lett.***38**, 195(1977); **38**,617(E)(1997)

[2] Edited by S.Somma,M.Morita,K.Nakai,and T.Yamazaki,**Proceedings of the Eleventh International Conference on Particle and Nuclei**,Kyoto,Japan,April 20-24, 138c

[3] J.K. Ahn *et al.*, *Phys. Lett.* **B444**, 267(1998)

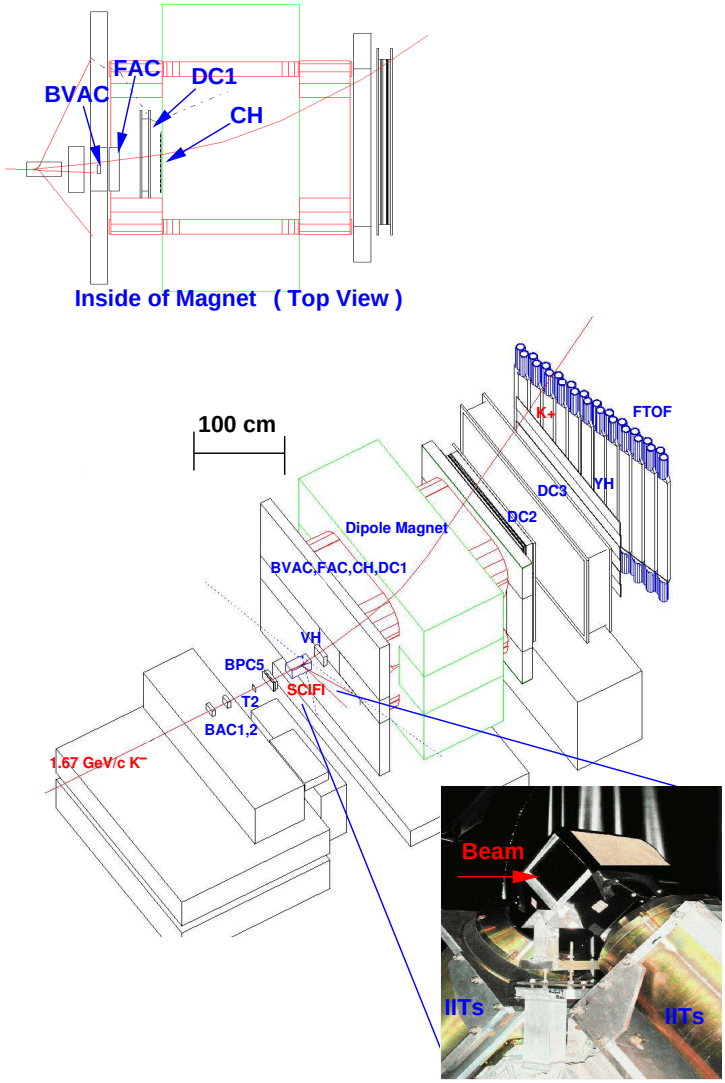


Figure 1: Perspective view of the E522 setup

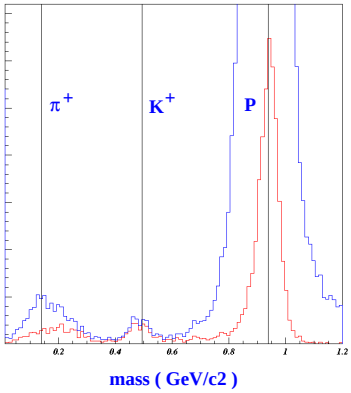
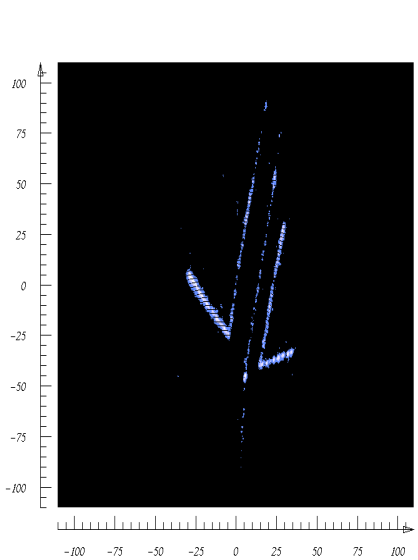


Figure 2: Mass spectrum of outgoing particles. The three black lines indicate mass position of each particles,π^+,K^+,p, reported on particle data booklet. Red means taken data by 2nd level trigger and blue means that of the 2nd-level plus parts of the first-level trigger.



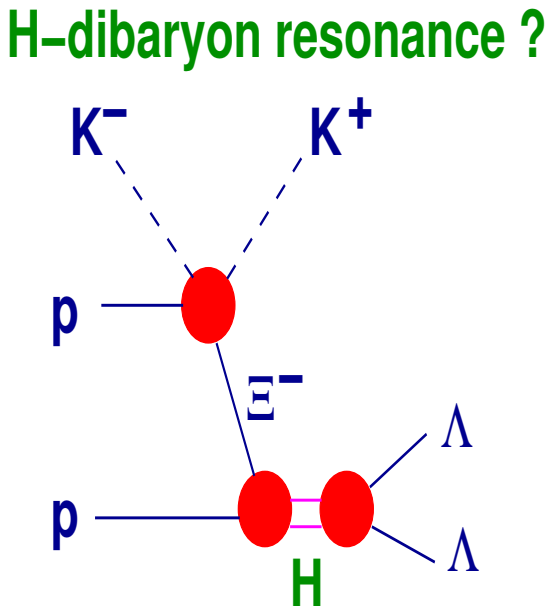


Figure 3: Two Λ-emission from the (K^-,K^+) interaction point in the SCIFI block. The whole size of the SCIFI detector is 20cm for thickness and 10cm for width and height. Invariant mass of ΛΛ will be determined by the two vertices