Systematic Study of Double Strangeness System

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Recently, the "NAGARA" event (formation and decay of a ${}^{6}_{\Lambda\Lambda}$He nucleus) has confirmed attractive $\Lambda\Lambda$ interaction by its energy of $1.01 \pm 0.20\ ^{+0.18}_{-0.11}$ MeV [1]. The event was presented by a hybrid-emulsion experiment, E373 at KEK-PS. In the experiment, the expected number of double-hypernucleus events is nearly ten.
We proposed a new hybrid-emulsion experiment to study double strangeness ($S = -2$) system, systematically, to BNL and the proposal was accepted as E964 on Oct. 2001. In E964, the statistics is expected to be no less than ten times as large as E373.
The experimental setup is shown in the figure bellow. The K^- beam (p_{K^-}=1.7GeV/c) is available with a better K^-/π^- ratio (≥ 9) at AGS D-line. (K^-,K^+) reactions in diamond target located in the upstream of emulsion stack are triggered by spectrometer system. The emulsion stack is sandwiched between two units of Double-side SSD (DSSD) systems. Using fully automated scanning system under development, Ximinus hyperons reconstructed by the upstream DSSD are followed in the emulsion until their stopping. Scintillating-fiber blocks cover the emulsion-DSSD system to measure energies of daughters from decay of $S = -2$ system and detect in-flight decays of neutral particles, such as Λ hyperons. Hyperball (Ge detector) [2] is also used to measure X- and γ-rays from Ξ^- atom formed in the emulsion.
Using this apparatus, we propose to make a mini chart of nuclei with $S = -2$ and then $\Lambda\Lambda$ interaction must be understood, systematically. The H-dibaryon is also searched for by the measurements of decay modes of $S = -2$ system and of $\Lambda\Lambda$ enhanced production [3]. ΞN interaction is studied by the X-ray measurement, for the first time.
In my talk based on newly results of E373 [4], physics motivation and experimental procedure of E964 are introduced.

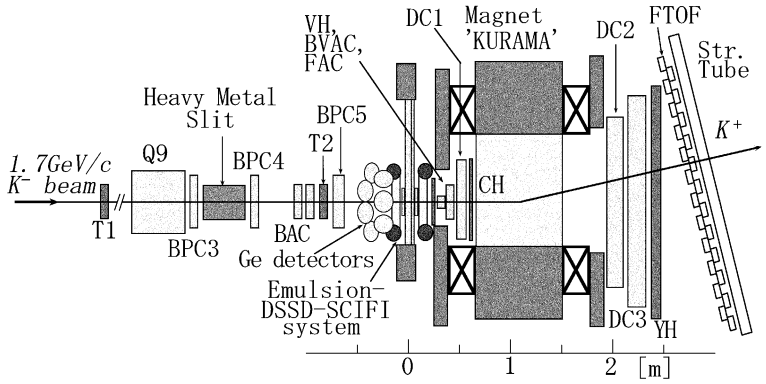

Figure 1: Experimental setup of BNL-AGS E964 (top view).

References

[1] H. Takahashi *et al.*, Phys. Rev. Lett. **87**, (2001) 212502.
[2] Y. Miura *et al.* and M. Ukai *et al.* in this conference.
[3] J. K. Ahn *et al.*, Phys. Lett. **B444**, (1998) 267.
[4] H. Takahashi *et al.* in this conference.