Single Charged Particle Identification in Nuclear Emulsion using Multiple Coulomb Scattering Method

K.T.Tint[#], K. Nakazawa, K. Hoshino, K.Itonaga, J. Yoshida, M.K.Soe,
S. Kinbara, A. Mishina, H. Ito, Y. Endo, H. Kobayashi

Graduate of Education, Gifu University, Gifu 501-1193, Japan.
 # a corresponding author: E-mail khintt@phys.ed.gifu-u.ac.jp

In J-PARC E07 experiment, emulsion experiment for double strangeness system, particle identification is an important aspect to purify Ξ^- stop events. Through the experiment, we expect Ξ^- stop event with ten time higher statistics than that of previous experiment (KEK PS-E373). Ξ^- stop events which include doubleΛ hypernucleus, twin-Λ hypernuclei and so on give us important information such as Λ-Λ and Ξ^--N interaction. Besides, Ξ^- stop events are interesting itself because experimental data about Ξ^- stop is very few.

We are developing a PID technique for single charged particles having low momentum using by "Second difference" reflecting Multiple Coulomb Scattering. A charged particle moving in nuclear emulsion is deflected by many small-angle scatters due to Coulomb interaction, depends on the momentum of the particle. It is possible to discriminate the mass of a particle by evaluating the behavior of scattering near stopping point. We introduce "Second difference", i.e. δ plane, defined as in Fig. (1), and intend to use its distribution as Probability Distribution Functions for likelihood method.

We performed Geant4 simulation and obtained the second differences of several hundred of tracks for various single charged particles in emulsion. Fig. (2) shows their geometric mean distributions of among 0.2mm-2.0mm range. It is promising in the separation of single charged unknown particles in emulsion.

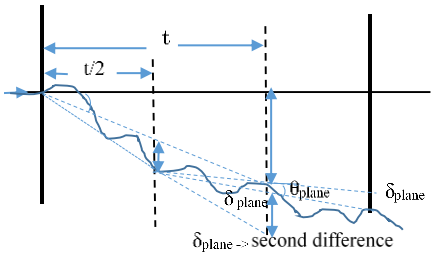

Fig. (1) Second difference in multiple scattering

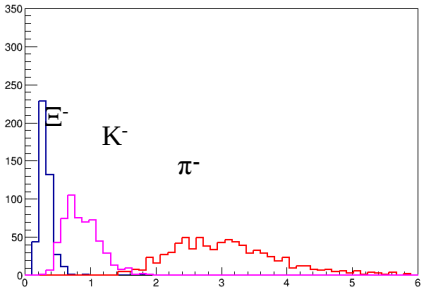

Fig. (2) Second difference distribution

References

[1] H. Bichsel, D.E. Groom, and S. R. Klein, PDG (2006).