Single Charged Particle Identification in Nuclear Emulsion using
Multiple Coulomb Scattering Method
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In J-PARC E07 experiment, emulsion experiment for double strangeness system,
particle identification is an important aspect to purify \( \Xi^- \) stop events. Through the
experiment, we expect \( \Xi^- \) stop event with ten time higher statistics than that of previous
experiment (KEK PS-E373). \( \Xi^- \) stop events which include double\( \Lambda \) hypernucleus, twin-
\( \Lambda \) hypernuclei and so on give us important information such as \( \Lambda-\Lambda \) and \( \Xi-N \) interaction.
Besides, \( \Xi^- \) stop events are interesting itself because experimental data about \( \Xi^- \) 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. \( \delta \) 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.]

References