Scanning systems for searching double strangeness nuclei in nuclear emulsion

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Scanning systems for detecting double Lambda hypernucler events in nuclear emulsion plates with high statistics are presented. The systems are complexes of optical microscopes and computers to provide fast emulsion scanning and image recognition for vertex-like objects. We recently introduced a two-stage process of vertex detection to exclude misdetected objects. The method can be expected to reduce conventional eye-check works and increase search speed for double Lambda hypernuclear event.

KEYWORDS: Double Lambda Hypernucleus, Nuclear emulsion

1. Introduction

Double Λ hypernucleus is one of the most important subjects to investigate baryon-baryon interaction. The mass measurement of double Λ hypernuclei is a unique experimental approach to obtain the information about the Λ-Λ interaction, which is the doorway to understand the hyperon-hyperon interaction. The first double Λ hypernucleus was observed in a nuclear emulsion plate exposed by cosmic ray [1]. In KEK-PS E176, the existence of the double Λ hypernucleus was confirmed among nearly 80 Ξ^- hyperon stopping events [2]. In KEK-PS E373, seven events of double Λ hypernuclei were detected among several hundreds' Ξ^- hyperon stopping events [3].

Nuclear emulsion plate has been the most suitable detector to study double Λ hypernucleus. It is a photographic film, which records the tracks of charged particles. After photographic development, the tracks are observed as sequences of black dots or lines in the emulsion layer through an optical microscope with high accuracy of sub micro meters. The production and the chain decays of double Λ hypernuclei can be visible by fine spatial resolution of the emulsion. A double Λ hypernuclear event shall be seen like a branch, which consists of several black tracks and three vertices as shown in Fig. 1.

2. New searching method for double Λ hypernucleus

2.1 The hybrid emulsion method and Overall scanning method