Search for Excited State of Σ Hypernucleus in the J-PARC E13 Experiment

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One of the main items of the J-PARC E13 experiment is the search for excited states of the ${}^{4}_{\Sigma}$He hypernucleus via the ^{4}He(K^-,π^-) reaction at 1.5 GeV/c. The missing-mass spectrum of the ^{4}He$(K^-,\pi^-)X$ reaction was obtained in an angular range from 0 to 20 degrees. We show the count-base spectrum of the missing-mass in the angular range from 2 to 14 degrees. The ground state of ${}^{4}_{\Lambda}$He and ${}^{4}_{\Sigma}$He were clearly observed in the missing-mass spectrum. We also show three missing-mass spectra divided by the reaction angle.

KEYWORDS: Σ hypernuclei, ΣN interaction, Lane's term, missing-mass spectroscopy

1. Introduction

The NN interaction has been studied in detail through both the structure of nuclei and NN scattering experiments. On the other hand, the YN interaction is not well understood yet. The main difficulty for the studies of the YN interaction is that the YN scattering experiments are hard to be performed, due to the short lifetime of hyperons ($c\tau \sim$ a few cm). Instead, the YN interaction has been studied through the structure of hypernuclei. Among the YN interactions, the ΛN interaction is relatively well