Study of Λ Identification Method by the $\pi^- p \to K^0\Lambda$ Reaction for a Λp Scattering Experiment at J-PARC

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The $\pi^- p \to K^0\Lambda$ reaction is an important elementary process to produce Λ from a proton target and is a key for a Λp scattering experiment where the momentum of Λ should be tagged from the missing momentum of the (π^-, K^0) reaction. However, the (π^-, K^0) spectroscopy method has not been established yet due to the difficulty of the K^0 detection. Therefore, we have proposed a new K^0 detection method where π^+ and π^- from the K^0 decay are measured by a forward magnetic spectrometer and a detector cluster surrounding the target, respectively. The feasibility of the K^0 detection method was confirmed by analyzing the J-PARC E40 data taken with such a detector system. In the analysis, Λ's were successfully identified in the missing mass spectrum of the $\pi^- p \to K^0 X$ reaction.

KEYWORDS: Strangeness, Hypernuclear Physics, Particle Physics, J-PARC

1. Introduction

The nuclear force has been intensively studied by a lot of pp and pn scattering experiments in the wide-range energy. Meson-exchange models well reproduce the attractive potential in the long-range ($\geq$ 1 fm) region. In the short-range part, however, the nuclear force becomes quite repulsive, and it