

Xi -atom X-ray measurement at J-PARC - a new direction of Hyperball project

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Study of Xi-N interaction is important for unified understanding of baryon-baryon interaction. NN interaction has been well studied by plenty of scattering experiments, and Lambda N interaction by spectroscopy of hypernuclei.

On the otherhand, we will investigate the Xi N interaction through a Xi- atomic X-ray measurement.

Energy shifts and widths of Xi atomic X rays provide information on the Xi- nuclear potential near the nuclear surface.

Combining systematic Xi X-ray data and Xi hypernuclear data (e.g. J-PARC E05)

Xi N interaction can be studied.

An intense K- beam ~ 1.8 GeV, optimal momentum for Xi production, is now available at the J-PARC K1.8 beam line.

Two Xi -atom experiments are planned at K1.8 (J-PARC E03, E07).

They will be the first experiments to measure the Xi atomic X-rays.

In both experiments,

Xi hyperons are produced via the (K^-, K^+) reaction and

X-rays from Xi atom are measured by Hyperball.

Hyperball is a large acceptance germanium detector array, and it successfully observed hypernuclear gamma-rays.

For each experiment, Hyperball is specifically configured.

E07 searches double Lambda hypernuclei and measures Xi atomic X-ray.

It employs combination of nuclear emulsion plates,

Hyperball installed near the emulsion,

and a magnetic spectrometer system.

Xi hyperons are produced in a diamond target located upstream of the emulsion, some of which are trapped by a nucleus in the emulsion (Ag, Br ...).

Xi producing events are tagged by the spectrometer,

and Xi stopped events are selected

by looking at an emulsion image where Xi is traced to be implanted using information from the counters.

In this method, Xi-X-ray from for Ag and Br nuclei can be obtained with almost no background.

On the other hand,

E03 dedicated to measure the Xi X-ray,

employs a nuclear target of a specific element in stead of emulsion.

Xi hyperons are produced in the target and partly stop inside.

Xi producing events are tagged by the spectrometer, while

Xi non-stop events are rejected by a SSD detector installed at

the downstream of the target.

With this method, high statistics can be achieved.

As a first step of E03, a Fe target will be used.

In this paper, these two experiments will be described.

In particular, new Hyperball system dedicated to E07 experiment is introduced.

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