Evaluation of the inefficiency of a charged particle detector for the KOTO experiment

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The $K_L \to \pi^0 \nu \nu$ is a rare direct CP-violating decay with a small uncertainty in the prediction of the branching ratio. There are three-order gaps between expected branching ratio in several new physics and the SM prediction, the $K_L \to \pi^0 \nu \nu$ is a powerful tool for searching new physics[1]. The first goal of KOTO experiment is to observe this decay for the first time. To achieve this purpose, we use an upgraded detector from the former experiment (KEK E391a [2]) and a high intensity Kaon beam at J-PARC. For the identification of $K_L \to \pi^0 \nu \nu$, we measure two gamma from this decay by a CsI calorimeter and ensure no extra particle exists by hermetic veto counters (fig.1). Because the branching ratio predicted in SM is too small(2.4×10^{-11}), rejection power against the extra particle is important.

In particular, Charged Veto (CV) is a key component for the observation. CV is a charged particle detector put just upstream of the calorimeter and consists of two layers of plastic scintillator (fig.2). An important role of CV is to reject charged Kaon decays below one-10^{10}th. To achieve this goal, CV is required 10^{-3} inefficiency against a charged particle which penetrates CV toward the calorimeter. We measured inefficiency of CV using drift chambers and the calorimeter at the KOTO beam line before the physics run. In this talk, a result of the inefficiency measurement will be presented.

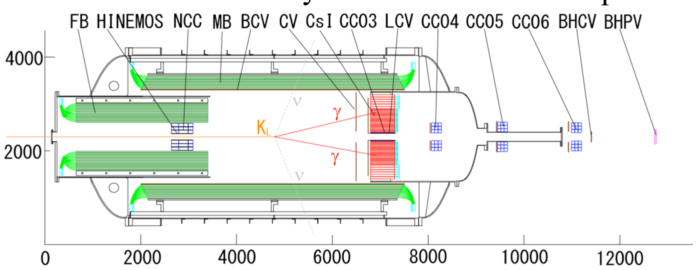

fig. 1 identification method.

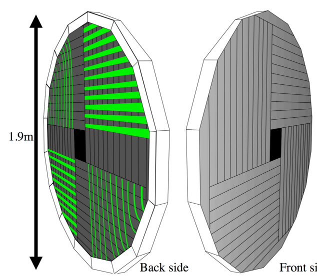

fig. 2 1 layer of CV

References

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