

## Study of the normalization modes in search the rare decay of $K_L^0 \rightarrow \pi^0 \nu \bar{\nu}$ with the KOTO detector

*Saturday, 7 July 2018 11:00 (20 minutes)*

The KOTO experiment aims to observe the  $K_L^0 \rightarrow \pi^0 \nu \bar{\nu}$  decay and measure the branching rate. The Standard Model (SM) prediction for the mode is  $2.4 \times 10^{-11}$  with a small theoretical uncertainty. An experimental upper limit of  $2.6 \times 10^{-8}$  was set by the KEK E391a collaboration [1]. A comparison of experimentally obtained results with SM calculations permits a test of the quark flavor region and a search for physics beyond the SM. The experimental method lies in the detection of two photons and nothing else. KOTO uses a Cesium Iodide (CSI) electromagnetic calorimeter to measure the photon positions and energies. All other detectors compose a hermetic veto system to confirm no extra detectable particle.

A critical part of the blind analysis includes a detailed study of the normalization modes,  $K_L^0 \rightarrow \pi^0 \pi^0 \pi^0$ ,  $K_L^0 \rightarrow \pi^0 \pi^0$ , and  $K_L^0 \rightarrow \gamma \gamma$ . These modes are used to calculate the KL flux and efficiencies of kinematic and veto cut requirements. This talk will discuss the analysis results of the normalization modes and provide the framework for our anticipated final branching ratio result which is expected to surpass the sensitivity of the Grossman-Nir limit [2].

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