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Search for the rare decay $K_L \rightarrow \pi^0 \nu \bar{\nu}$ at J-PARC KOTO experiment

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The KOTO experiment aims to observe the CP-violating rare decay, $K_L \rightarrow \pi^0 \nu \bar{\nu}$, at J-PARC.

We will present the new analysis result of $K_L \rightarrow \pi^0 \nu \bar{\nu}$ search in the KOTO experiment.

In this analysis we used the data set collected in 2016, 2017 and 2018.

The data was taken with a new trigger system and a new barrel photon veto detector which had been installed just before the 2016 run to suppress $K_L \rightarrow 2\pi^0$ background.

This data set has 1.5 times the statistics of the 2015 physics run used to set the best upper limit to-date for the branching fraction of the decay, $K_L \rightarrow \pi^0 \nu \bar{\nu}$.

From the 2015 analysis we learned the importance of understanding the neutron-induced backgrounds and reducing the signal loss due to accidental hits triggering the veto detectors.

Since then we have developed new analysis methods to reduce the neutron-induced backgrounds by collecting larger neutron-enriched control samples, and to improve on the identification of accidentals by analyzing the time evolution of the waveform recorded in veto detectors.

In this talk, the analysis result using these new analysis methods will be presented.

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Session Classification: Hot topics