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Present status of the search for the $K \rightarrow \pi^0 \nu \nu$ decay with the KOTO detector at J-PARC

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We have performed a search for the $K \rightarrow \pi^0 \nu \nu$ decay with the KOTO detector at J-PARC. The KOTO detector was designed to observe the decay and measure its branching ratio (BR). Focusing on this rare “golden” decay in quark flavor physics provides an ideal candidate to probe for physics beyond the standard model (BSM). The established experimental upper limit of the branching ratio was set by the KEK E391a collaboration at 2.6×10^{-8} . This is still well above the SM value of the branching ratio, which is predicted to be 3.0×10^{-11} with minor uncertainties.

The signal of importance is the pair of photons from the π^0 decay and no coincident signals from veto counters. This along with a large discernible transverse momentum provides us with unique signature. KOTO utilizes a Cesium Iodide (CsI) electromagnetic calorimeter as the main photon detector in combination with hermetic veto counters to ensure that there are no other detected particles.

This talk will cover a description of the improvements to the detector, current status of analysis on data collected in 2015-2016, and future prospects.

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