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Construction and performance of 4-D CsI calorimeter for the $K_L¥to¥pi^0¥nu¥bar¥nu$ search of KOTO experiment

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One of the key issues of the search for the $K_L \to \pi^0\nu\bar{\nu}$ decay mode is to suppress the backgrounds to the signature with only two photons from the π^0 in the final state. We use an electromagnetic calorimeter and hermetic veto counters in the KOTO experiment at J-PARC. The calorimeter is made of 50 cm-long undoped CsI crystals stacked in a 1.9 m-diameter cylinder. Each crystal is read out with a PMT on the back surface of the crystals. A major background is caused by neutrons generating two showers in the calorimeter. Neutrons tend to have interactions deeper than photons. In the autumn of 2018 we upgraded the calorimeter by installing 4000 silicon photomultipliers (SiPMs) on the front surface of the crystals. The depth information is available by measuring the timing difference between SiPMs and PMTs. The construction and performance of this new calorimeter by using data of 2019 will be presented. Less than 0.5 neutron background events are expected when we reach the sensitivity of one $K_L \to \pi^0\nu\bar{\nu}$ event. The signature has a branching fraction of $(3.0 \pm 0.3) \times 10^{-11}$ in the standard model.

I read the instructions

Secondary track (number)

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Primary author: KOTERA, Katsushige (DESY/Shinshu University (JP))

Presenter: KOTERA, Katsushige (DESY/Shinshu University (JP))

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