

CANDLES project to search for neutrino-less double beta decay of ^{48}Ca

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Neutrino-less double beta decay ($0\nu\beta\beta$) is acquiring great interest after the confirmation of neutrino oscillation which demonstrated nonzero neutrino mass. Measurement of $0\nu\beta\beta$ provides a test for the Majorana nature of neutrinos and gives an absolute scale of the effective neutrino mass.

In order to search for $0\nu\beta\beta$ of ^{48}Ca , we proposed CANDLES project and a detector system by using CaF_2 (pure). The CANDLES III system, which is one of the CANDLES project, aims at a high sensitive measurement by a characteristic detector system. The system realizes a complete 4π active shield by immersion of the CaF_2 scintillators in liquid scintillator. The active shield leads to a low background condition for the measurement.

Now we have developed the CANDLES III system, which contained 350 g of ^{48}Ca at the Kamioka underground laboratory. In 2016, we have installed a shielding system in the CANDLES III system to reduce background events by the high energy γ -rays, which were emitted from neutron capture reaction on surround materials. By the system, we reduced the background events from neutron capture by two orders of magnitude. After this upgrade, we started a double beta decay measurement and obtained result. Furthermore, we started development of next detector system. In this system, we will use a CaF_2 scintillating bolometer and enriched ^{48}Ca . In this paper, we will report result of ^{48}Ca double beta decay measurement by using the CANDLES III system and current status of the CaF_2 scintillating bolometer and enrichment of ^{48}Ca .

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