

CANDLES – Search for Neutrino-less Double Beta Decay of ^{48}Ca –

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CANDLES is the project to search for neutrino-less double beta decay ($0\nu\beta\beta$) of ^{48}Ca .

$0\nu\beta\beta$ 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 system by using CaF_2 scintillators.

The CANDLES system aims at a high sensitive measurement

by a characteristic detector system and ^{48}Ca enrichment.

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.

On the other hand,

^{48}Ca enrichment is also effective for the high sensitive measurement,

because natural abundance of ^{48}Ca is very low (0.19%).

We have studied ^{48}Ca enrichment and succeeded

in obtaining enriched ^{48}Ca although it is a small amount.

Now we have developed the CANDLES III system,

which contained 350 g of ^{48}Ca without enrichment,

at the Kamioka underground laboratory.

Two improvements, a light-concentration system and a new DAQ system,

were installed for the CANDLES III system.

The light-concentration system improved a energy resolution

by increasing a PMT photo-coverage by 80%.

The new DAQ system, which is a dead time less system,

improved a rejection efficiency

for a characteristic background origin.

Now we checked detector performance

with the light-concentration system and the new DAQ system.

Here we will report the detector performance for background rejection,

and the expected sensitivity with the light-concentration system and the new DAQ system.

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