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Reduction of 10C background for the KamLAND-Zen experiment

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KamLAND is the neutrino detector located in Kamioka, Japan.
And it can also detect low energy events by using 1 kton pure liquid scintillator contained in a transparent balloon of 13 m in diameter.
KamLAND-Zen is neutrinoless double-beta decay experiment by using Xenon of about 400 kg in KamLAND.
Used Xenon is isotopically enriched in the 136Xe.
In this experiment, Xenon gas is dissolved in liquid scintillator contained in transparent mini-balloon of 3.08 in diameter.

KamLAND-Zen published search for neutrinoless double-beta decay in August of 2016.
In this paper, obtained a lower limit for the neutrinoless double-beta decay half-life is longer than 1.07 x 10^26 yr at 90% C.L.
Corresponded Majorana neutrino mass is 6 - 165 meV.
And in this measurement, the dominant background was 10C decay events.

10C are muon spallation products.
And 10C couldn't be remove by muon veto because half-time is long (27.8 s).
To reduce 10C background, we use some kinds of analytic method.

The most sure method is a triple coincidence tag of a muon, a neutron-capture gamma-ray , and 10C decay.
This method is realized by newly introduced dead-time free electronics.
In addition to this method, we are under developing a likelihood cut by hadron shower points, and particle identification by pulse shape distributions.

In this poster, we introduce these method for reducing 10C background in detail.

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