

A study of self-vetoing balloon vessel for liquid-scintillator detectors

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KamLAND-Zen searches for neutrinoless double-beta decay with an ultra-pure liquid-scintillator (LS) filled with a custom-made clean nylon balloon. The primary backgrounds are radioactive impurities such as uranium and thorium series.

To reduce them, we developed a self-vetoing balloon vessel for a future upgrade program, "KamLAND2-Zen", instead of the current nylon-made balloon.

We selected a Polyethylene-Naphthalate (PEN) film that has a blue photon emission and performed the feasibility studies.

Due to its scintillation properties, we estimated that 99.7% of a ^{214}Bi background could be identified in the KamLAND.

Moreover, thanks to the different waveforms between the LS and the PEN, we recently established the pulse-shape-discrimination for ^{212}Bi background. We evaluated its background rejection efficiency as more than 90%.

Resulting from these studies, we proved to be able to use 100% of the fiducial volume.

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No, this is an entirely new submission.

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