Contribution ID: **480** Type: **Talk**

Upgrade of the KamLAND-Zen Mini-balloon and Future Prospects

Wednesday, February 20, 2019 9:00 AM (20 minutes)

The observation of a neutrino-less double-beta ($0\nu\beta\beta$) decay would be evidence of neutrino's Majorana nature, and it might be a clue to explain the baryon asymmetry and the extremely light neutrino masses. The half-life of $0\nu\beta\beta$ decay is more than 10^{26} year in case of ^{136}Xe, thus it is important to make radiopure detector to find the very rare decay.
KamLAND-Zen is a $0\nu\beta\beta$ decay search experiment with Xe loaded liquid scintillator (XeLS) containing 90.77\% enriched ^{136}Xe.
The mini-balloon is a container for holding XeLS at the center of the KamLAND detector without impairing the extremely low radiation environment.
We have installed a new mini-balloon with a thickness of 25 μm and a radius of 1.92 m, which was made in a class 1 clean room and is almost twice as large as the last one. The mini-balloon is going to hold about 750 kg of Xe gas in the XeLS and $0\nu\beta\beta$ decay search will start soon.

After the KamLAND-Zen experiment, it is planned to do a $0\nu\beta\beta$ decay search experiment with a remodeled KamLAND detector to improve the energy resolution (KamLAND2-Zen).
I will also talk about novel hardware improvements to collect data without loss just after a large light yield event such as a cosmic ray muon spallation at KamLAND2-Zen.

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Session Classification: Dark matter and other low-background experiments

Track Classification: Dark matter and other low-background experiments