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Results and Status from KamLAND-Zen (15' + 5')

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The KamLAND-Zen (KamLAND Zero-Neutrino Double-Beta Decay) experiment, located in Kamioka mine, in Japan, is one of the leading experiments for the search of $0\nu\bar{\nu}\beta\beta$ decay in ^{136}Xe dissolved in the liquid scintillator (LS). In 2011, initial $0\nu\bar{\nu}\beta\beta$ decay search with high sensitivity was quickly achieved, owing to the extremely low radioactivity in the already existing KamLAND detector. Based on initial 213.4-day dataset (phase-1, October 2011-June 2012), we set a lower limit on the $0\nu\bar{\nu}\beta\beta$ decay half-life of $T_{1/2}^{0\nu\bar{\nu}} > 1.9 \times 10^{25}$ yr at 90% C.L. Since the sensitivity in phase-1 was limited by a background contribution from ^{110m}Ag , we purified LS and Xe gas aiming at the reduction of ^{110m}Ag . The preliminary results based on 114.8-day dataset (phase-2, December 2013-May 2014) after the purification were reported in 2014 and we obtained that ^{110m}Ag background peak was reduced by more than a factor of 10. By combining phase-1 and phase-2 data, we reported a preliminary lower limit on the $0\nu\bar{\nu}\beta\beta$ decay half-life of $T_{1/2}^{0\nu\bar{\nu}} > 2.6 \times 10^{25}$ yr at 90% C.L.

At the end of 2015, we removed a 3.08-m-diameter spherical inner balloon from KamLAND detector and this event corresponds to the end of KamLAND-Zen 400 dataset. The $0\nu\bar{\nu}\beta\beta$ decay search sensitivity will steadily increased by accumulating additional low background data after the last report. Furthermore, we are preparing for the next phase, KamLAND-Zen 800 to realize the better sensitivity, about 2×10^{26} yr in a 2 year measurement. The enlarged inner balloon is newly constructed to increase the Xe amount to 800kg and cleaner material for the inner balloon can achieve larger fiducial volume.

In this talk, a review of the KamLAND-Zen 400 results will be given, followed by a report on the ongoing operations for the preparation of KamLAND-Zen 800.

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