Recent results from KamLAND

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KamLAND (Kamioka Liquid scintillator Anti-Neutrino Detector) is the 1,000 ton liquid scintillator (LS) detector (Fig. 1) located in Kamioka mine in Japan. KamLAND achieved extremely low-background level ($^{238}\text{U} \sim 10^{-18} \text{g/g}$ and $^{232}\text{Th} \sim 10^{-17} \text{g/g}$) with the LS purification systems and opened new horizon of neutrino physics via direct evidence of neutrino oscillation with reactor anti-neutrino [1] and first observation of geo-neutrinos [2].

Next program of KamLAND is search for neutrino-less double beta decay ($0\text{nbb}$): the KamLAND-Zen experiment. Observation of $0\text{nbb}$ would definitively establish the Majorana nature of the neutrino, and provide information on the absolute neutrino mass scale. KamLAND-Zen aims to search $0\text{nbb}$ up to effective electron neutrino mass of 50 meV and started in 2011. We present recent results of KamLAND-Zen [3]. In addition, we also present recent measurement of geo-neutrino with dataset including the reactor downtime in Japan [4].


Fig.1. Schematic diagram of the KamLAND detector