

Search for neutrinoless double beta decay with the KamLAND-Zen experiment

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Neutrinoless double beta decay is a hypothetical nuclear transition which if observed will allow to establish Majorana nature of neutrino, determine the absolute neutrino mass and the neutrino-mass hierarchy, to verify the lepton number violation and possible contribution of right-handed admixture to weak interaction, help to test leptogenesis, existence of Nambu-Goldstone bosons (majorons) and other effects beyond the Standard Model.

The KamLAND-Zen experiment is searching for neutrinoless double beta decay of Xe-136 by using xenon-loaded liquid scintillator inside the KamLAND detector. The experiment is located in the Kamioka underground laboratory (Hida, Japan) at the depth of approximately 1000 m.

The previous phase of the experiment called KamLAND-Zen 400 used 13 tons of Xe-loaded liquid scintillator contained in a 3.08-m-diameter spherical inner balloon placed at the center of the KamLAND detector. The amount of the enriched xenon gas was almost 400 kg. The KamLAND-Zen 400 experiment was finished at the end of 2015 with the upper limits on the effective Majorana neutrino mass are in the range of 61–165 meV.

Status of the current phase of the experiment called KamLAND-Zen 800 will be reported. The amount of enriched Xe during this phase will be increased up to ~750 kg. The production and installation of a new 3.84-m-diameter mini-balloon will be shown. The expected sensitivity on the effective Majorana neutrino mass will be discussed.

Progress on R&D for the next phase of the experiment – KamLAND2-Zen – will be also presented.

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