

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

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Neutrinoless double beta decay is an extremely rare nuclear transition which could establish the nature of neutrino (Majorana or Dirac particle), determine the absolute neutrino mass and the neutrino-mass hierarchy, check the lepton number conservation and possible contribution of right-handed admixture to weak interaction, 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 2700 m.w.e. In the KamLAND-Zen 400 phase of the experiment the detector consisted of 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 currently best limit on neutrinoless double beta decay of Xe-136. Using commonly adopted nuclear matrix element calculations, the corresponding upper limits on the effective Majorana neutrino mass are in the range of 61–165 meV. Currently we are preparing the next phase of the experiment called KamLAND-Zen 800 with an expansion of the detector volume up to  $\sim 800$  kg of enriched Xe. The R&D for the KamLAND2-Zen –the further detector upgrade –will be also presented.

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**Session Classification:** The "intensity frontier": high intensity experiments, rare processes and precision tests