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# Latest KamLAND-Zen results and the impact of muon spallation on the 0□□□ search

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Neutrinoless double beta decay (0□□□) is an extremely rare process that, if observed, would confirm the Majorana nature of neutrinos. KamLAND-Zen, an extension of the KamLAND neutrino detector in Japan using 136Xe dissolved in liquid scintillator, currently sets the most stringent limit on the 0□□□ half-life of Xe-136. In this talk, I will present the latest KamLAND-Zen results, based on the complete dataset. A major challenge in this search arises from long-lived radioactive isotopes produced by muon spallation on xenon. This is possibly a limiting background, making precise tagging essential—not only for KamLAND-Zen, but also for next-generation detectors. I will discuss the current likelihood-based spallation tagging method, which relies on neutron captures correlated with the long-lived isotopes, and briefly introduce a machine learning approach using transformer models trained on FLUKA simulations. I will conclude with an update on KamLAND2-Zen, the ongoing upgrade that will extend the 0□□□ search with improved background suppression and increased sensitivity.

## Collaboration you are representing

KamLAND

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